

Modeling trade and financial liberalization effects for Argentina

Abstract

The significant real effects arising from the present international financial crisis suggest that the workings of the financial sphere significantly affect the value of social production, the distribution of income and wealth, and the magnitude of income poverty, all important social welfare indicators. Reflecting this, I depart from a real-focused single-country model targeted to a developing economy (the IFPRI Standard Model) and account for the workings of the financial sphere and ‘money in the production function’ in the tradition started by Milton Friedman (1969). I then apply the model in a stylized way to identify the effects of current and capital account liberalization in Argentina, and validate the model in the light of econometric estimates. The model is then linked to behavioral microsimulations, getting distributional and poverty indicators at household level. Preliminary results suggest that trade liberalization increases inequality and that capital account liberalization leads to higher output volatility and increases in the income share of the skilled workers.

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List of Abbreviations

- B\$ Billions of Argentinean pesos
- Eq(s). Equation(s)
- LDC Least Developed Country
- p.p. Percentage points
- RHG Representative household group

1. Introduction

The international debate on the effects of the last wave of globalization in LDCs allows us to outline the basic positions towards globalization present in the debate, identify the channels by which current and capital account liberalization -the central features of the last wave of globalization (Taylor 2004)- affected the levels of activity, employment, income distribution and poverty, and note that these effects depend on important and interesting ways on institutional and other country-specific characteristics (Goldberg and Pavcnik 2007,p41).

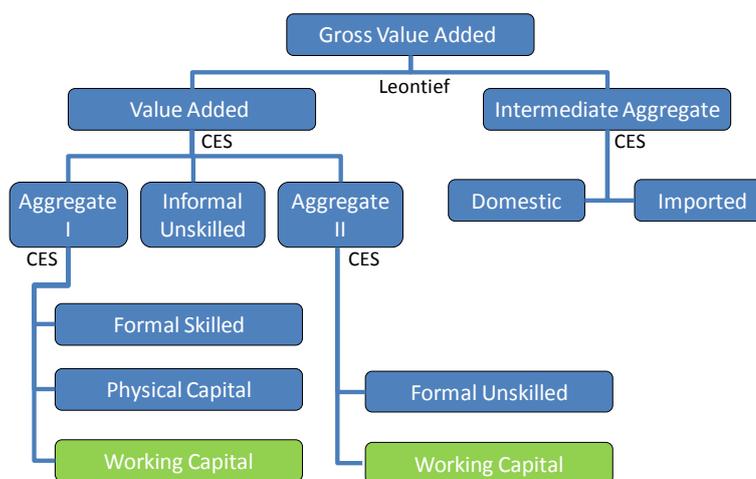
To evaluate the effects of globalization in a developing country, a strategy is derived from the perception that a set of inter-linkages which are worth highlighting was at stake. Given the presence of economic policies and shocks that affected the economy with large indirect and second-round effects, the most pertinent framework seems to be that of macroeconomic CGE models, which allows to i) model explicitly the markets of goods, factors and assets (Bourguignon and Pereira da Silva 2003, pages 12-18); ii) combine macro-level changes in the stocks of financial assets and money, the activity level and the employment level (prone for macro analysis) with a structural adjustment story (prone for CGE analysis); iii) contribute to close the gap between macro and CGE models identified by Sherman Robinson (2006).

A suitable macro CGE model should account for the channels identified in the globalization debate; the structural characteristics common to developing countries¹; and country-specific characteristics. Importantly, the model should capture the workings of the financial side of the economy and the transmission channels linking it to the real side of the economy: the former allows to track the specific forms of savings and asset stocks, an essential part of the economic process (Tobin 1981,p.13); the latter's relevance is indicated by the series of financial crisis hitting LDCs and the recent crisis originated in developed countries with worldwide reverberation.

¹ According to Richard Agenor and Peter Montiel (1999,p.4), “among the distinctive aspects of development macroeconomics are the usefulness of a three-good (exportables, importables and non-tradables) disaggregation of production and the roles of financial repression, informal markets, public sector production, imported intermediate goods, working capital, and labor market segmentation”.

To build this model, I take a CGE model with neoclassical core whose code is publicly available as starting point (the IFPRI Standard model), and increasingly incorporate the financial sphere in nested versions of the model². Among other things, I incorporate financial institutions, a matrix of financial assets and liabilities held by the economic actors in the model, and a transmission channel from the financial to the real sphere in the tradition of ‘money in the production function’ started by Milton Friedman (1969), including working capital as a variable factor in the sector-specific production functions (as shown in the following diagram). The use of working capital affects the efficiency with which real factors are used. Its level of use and its wage are jointly determined to equilibrate firms demand and banks supply for it. A detailed review of macro financial-CGE (FCGE) models suggest that the modest efforts done so far adding macro and financial elements to structural adjustment models (e.g. IMMPA model, Bourguignon’s et al “maquette”, etc.) omit this transmission channel.

Diagram: Money in the production function



The model is then applied in a stylized way to the Argentinean liberalization during the Convertibility Plan (1991-2001). This case seems especially interesting to analyze given that the period of liberalization in Argentina was associated with a series of crises and a severe worsening of income distribution which culminated in the collapse of the Plan. When shaping the model to account for the Argentinean case, stylized characteristics of

² They are nested in the sense that subsequent models differ from previous ones only by endogenizing some variables and including additional equations to explain them.

the economy are reflected, including the fixed exchange rate, deposit dollarization, wage curves determining real wages, and disentangling of trading partners (Mercosur vs. rest). The calibration of the model parameters assume that the starting observed point is a solution point of the model, following the tradition started by Shoven and Whalley (1972). Then external shocks are applied to the model, including trade liberalization and capital flows allowed by the capital account liberalization, and sensitivity analysis is done, throwing light on the model workings and on the effects of liberalization on growth and income distribution in Argentina.

After linking the model with microsimulations to identify the effects on income distribution and poverty at the household level -adapting a methodology designed by Bourguignon et al (2004) to the Argentinean Permanent Household Survey-, I conclude, seeking to contribute with my analysis to i) the modelling of the effects of globalization on growth and income distribution in developing countries; ii) the understanding of the effects of globalization in growth and distribution in Argentina; iii) the empirical relevance of extending the macro-CGE framework to include behavioural microsimulations.

Chapter 2 maps the channels highlighted in the present international debate on the effects of globalization on growth and inequality in developing countries. Chapter 3 explains the main features of how these channels were materialized in Argentina. Chapter 4 takes stock of the channels identified in previous sections. Chapter 5 reviews existing models. Chapter 6 describes the macro-CGE models and Chapter 7 their calibration. Chapter 8 analyzes the model workings and the effects of liberalization in Argentina, and Chapter 9 deals with sensitivity analysis. Chapter 10 deals with microsimulations, and Chapter 11 concludes.

2. The international debate

In this section, I review the literature on the effects that the different spheres of globalization have had on growth and income distribution at a theoretical and empirical level, starting with a conceptualization of globalization and an outline of the basic positions. Given that in the last two decades the liberalization of current (particularly, trade) and capital accounts was the central feature of globalization in LDCs (Taylor 2004), the literature review mainly focus on the effects of these spheres. While describing the transmission channels at stake, I identify with a mark (St. Fact Gn) the stylized facts to be modeled.

What is globalization?

Globalization is defined as the growing interdependence and interconnectedness of the modern world through increased flows of goods, services, capital, people and information, in a process driven by technological advances and reductions in the costs of international transactions, which spreads technology and ideas, raises the share of trade in world production and increases the mobility of capital. It is also reflected in the diffusion of global norms and values, the spread of democracy and the proliferation of global agreements and treaties, including international environmental and human rights agreement (DFID 2000).³ In this way, globalization includes two clearly distinct phenomena: one related to technological changes and one related to political, economic and social choices (Helleiner 2001).

How do the different spheres of globalization affect growth and distribution? Basic positions

³ A definition with less emphasis on social choices is provided by Bhagwati (2004, p.3): “Economic globalization constitutes integration of national economies into the international economy through trade, direct foreign investment (by corporations and multinationals), short-term capital flows, international flows of workers and humanity generally, and flows of technology”.

A worldwide debate on the effects that globalization –specially the last wave⁴- have on national growth, distribution and poverty is taking place essentially from the beginning of last decade (Milanovic 2002). Even when there are multiple opinions in this debate, it is possible to distinguish among the participants three basic positions on globalization: the first one, a Pro-Globalisation one, the second, an Anti-Globalisation one, and lastly one which understanding globalization as a definitely complex and multifaceted process, looks for a more regulated global environment e.g. Wade (2001).

The Pro-Globalisation view conforms the mainstream view and has two basic identifiers: first, it sustains that globalization has basically benign effects that by themselves spurs growth and contributes to the reduction of poverty (Milanovic 2003), and second, it minimizes or even denies the distributive problem. The Anti-Globalization view sustains that globalization inherently comes with more exploitation at individual and country level. They have been caricatured by Pro-Globalizers as characterized by a linked trilogy of discontents constituted by an anti-capitalism – anti-corporation – anti-globalization mindset (Bhagwati 2004,p3). Their main proponents are Ralph Nader and Pierre Bourdieu (Bhagwati 2004). Finally, the authors from the position for a more regulated global environment observe that the arrival of globalization does not assure greater rates of growth, that it typically generates more instability in growth, particularly in the developing countries, and that it tends to worsen the income distribution inside these countries and at worldwide level (Foster and Szekely 2001; Milanovic 2002; Milanovic 2003); finally, it emphasizes that in general not only growth but also distribution play a relevant role in the determination of poverty (White 2001). In conclusion, their evidence points to a revision of the prevailing Pro-Globalization vision.

More specifically, from the Pro-Globalization position it is emphasized that the acquisition of high rates of growth and poverty reduction can be generated by implementing the pack of macro policies of trade and capital openness, fiscal discipline, property rights, etc. typical of the Washington Consensus, and it is suggested that globalization, at least in general, does not worsen income distribution and that, in turn,

⁴ As described in World Bank (2002), globalization had a first wave (1870 to 1914) driven by advances in transportation and negotiated reductions of barriers at worldwide level, second wave (1950 to 1980) focusing on integration among the developed countries and the present (third) wave (1980 to now).

income distribution has only scant incidence on poverty (Dollar and Kraay 1999; Dollar and Kraay 2000; WorldBank 2002; Fischer 2003). For example, Dollar and Kraay (2000) suggest that “Standard pro-growth macroeconomic policies are good for the poor” (Dollar and Kraay 2000,p6) and “Income of the poor rises one-for-one with overall growth” (Dollar and Kraay 2000,p1), which implies that, on average, globalization is not only beneficial for the poor but also neutral in distributive terms. Recently the World Bank (2002), even with the general message that globalization is overall reducing inequality (WorldBank 2002,p2) has accepted that in some cases income inequality may worsen, but putting the blame out of the globalization process, signaling the need for costly complementary policies that should be done apparently without compromising the speed at which liberalization is done (e.g. modify the education system to serve all levels of society well) (WorldBank 2002,p14).

Contrasting this view, the authors from the regulatory position present evidence which shows that the period in which the last bout of globalization expanded is characterized by more inequality between countries (Milanovic 2003) and within countries (Foster and Szekely 2001), and less growth (Milanovic 2003). In this view, the distribution neutrality of globalization found by World Bank seems to reflect a problem with the data which, in turn, may be due to a concious attempt to shift the debate away from income distribution: as pointed out by Oxfam (2000), while data used by Dollar and Kraay (2000) comes principally from the 1970s and 1980s, much of the recent trade and capital account liberalization took place in the 1990s.

If the regulatory approach is right, if globalization is not a deus ex machina for world problems and the malignant side of globalization can not be ignored (Milanovic 2003), then a redesign in globalization may lead to more broadly shared benefits and even a higher and more stable rate of growth (Stiglitz 2002). However, it is not obvious how specifically this redesign should eventually be made. To help in answering this question, and keeping in mind the MDG of halving poverty, one of the pre-requisites is to understand the specific channels by which the main spheres of globalization affect the two basic drivers of poverty: growth and income distribution (Ravallion 2001; White 2001).

Effects of trade openness on growth

In mainstream view trade liberalization is expected to have positive medium and long run effects on growth. The former would come from liberalization producing changes in relative prices signals, which in turn generate a reallocation of resources (St. Fact G1) against the sectors without comparative static advantages and in favor of the sectors with them, which increases efficiency in resource allocation (Taylor 2004; Winters, McCulloch et al. 2004); in other words, trade liberalization is expected to switch production from non-tradable goods and inefficient import-substitutes towards exportable goods where developing countries have a comparative static advantage (Taylor 2004). The latter would come from increased access to technology, improved access to intermediate and capital goods, and benefits of increased scale⁵ and competition (Winters, McCulloch et al. 2004).

However, these positive effects are not guaranteed (Winters, McCulloch et al. 2004). The possibility of positive production externalities in import-competing sectors as well as other market failures imply that trade liberalization may not be beneficial, even in the long run. Rodriguez and Rodrik (2001) illustrates this point with a two-sector-economy model where only one of the sectors enjoys ‘learning by doing’: when openness induces the developing country to rely more on the other sector (e.g. the primary one), the country’s growth rate gets harmed, with the country falling into what UNCTAD (2002) has called an “international poverty trap”, a situation by which the link with the international economy keeps the country underdeveloped⁶. Wood et al (1996) makes a similar point concerning educational investments: for a country where educational levels are relatively low, trade liberalization may lead to specialization in goods of low skill intensity, losing some positive externalities derived from educational investments, hence lowering its growth rate.

Besides, if not accompanied by sound demand policies, liberalization may imply a switch in aggregate demand outside the liberalizing country, reducing the demand of the country’s output and hence growth (Stiglitz 2002). For example, it may be the case that

⁵ A point also made by Bhagwati (2004).

⁶ A poverty trap is defined as a situation when ‘poverty has effects that act as the causes of poverty’ (Nissanke and Thorbecke 2005,p23).

the adoption of international prices leads to an increase in the demand for net imports. If real devaluation does not take place (e.g. because of capital inflows and/or a fixed exchange rate coupled with downward inflexibility in domestic prices) as frequently observed in the LAC context of last bout of liberalization) then producers will shift to non-tradables and net imports will be sustained, affecting aggregate demand and output (Taylor 2004; Evans 2005), especially if compensating demand policies (e.g. fiscal or monetary policy) are absent. From other point of view, to the extent that acquiring production capabilities takes time, an inappropriate timing of trade liberalization may make national firms collapse in the sight of a competition for which they are not conveniently prepared, reducing domestic output (Stiglitz 1998). The associated output contractions may then be reinforced by its bi-directional effects with physical investment flows. Finally, trade liberalization may lead to “immiserizing growth”, with negative terms of trade shocks reducing the nominal value (and the purchasing power) of domestic production, even when the domestic production might be growing in physical terms (Bhagwati 2004).

The mainstream view has been supported by econometric work trying to prove a significant and positive link from trade openness (or liberalization) to growth at X-country level. Regressing per capita income on a trade openness indicator (exports plus imports divided by GDP) and controls with observations of around 100 countries, Dollar and Kraay (1999) concludes that trade openness has a positive and significant effect on growth. However, Rodrik (2000) argues that the supposedly positive effect is spurious, due to econometric misspecifications, particularly in the election of the trade openness indicator⁷: Rodrik (2000) contends that the (exports+imports)/gdp indicator is “selected to bias the results in favor of showing a statistically and quantitatively significant link between trade liberalization and growth”, and emphasizes that it is a well-known fact that the countries which perform well usually increase their trade/GDP ratios as a by-product.⁸ In other words, Rodrik suggests that Dollar and Kraay’s regressions suffer from a serious problem of reverse causation.

⁷ The same comment appears in Birdsall and Hamoudi (2002) and Milanovic (2003)

⁸ Rodrik also points out other Dollar and Kraay’s arbitrary selection criteria which are misleading, including mismatches between the periods where taxes lowered and the period where trade volumes increased (the instrumental variable).

Rodrik's critics have argued that reverse causation, even when in theory could be relevant, is not such in practice, and come with regressions where reverse causation is taken into account and the positive significant effect from openness remains. Different ways of taking into account reverse causation have been applied, including: i) instrumenting openness with borders and distances among countries, building on a gravity model for international trade, and controlling for the effect of country-size (population and area) on per capita income, as Frankel and Romer (1999) and Frankel and Rose (2002)^{9 10}; ii) regressing in differences and instrumenting openness by lagged openness, as in Dollar and Kraay (2003). The first approach has been criticized by Rodriguez and Rodrik (2001) for the existence of channels by which geography might affect income with independence of the trade channel (e.g. via affecting the availability of natural resources) and for lack of answer to the relevant policy question at stake: how policy-induced barriers to international trade affect growth. As claimed by the authors, "trade restrictions (...) will work differently from natural or geographical barriers to trade". It is also to be noted that in most cases the authors regress per capita incomes (and not growth), and positive differences in per capita incomes associated to positive differences in openness (*ceteris paribus*) would be indicative of trade openness positively affecting growth rates only under certain departure levels for trade openness and income. Besides, Lee et al (2004) sustains that lagged openness is not a reliable instrument, as it may lead to increase the imports of physical capital and hence provoke growth by a channel which is independent of present openness. Finally, all this econometric studies trying to find a strong link between trade openness and growth have been criticized because of a possible need of combination with other sound policies in order for trade liberalization to lead to sustained growth (e.g. to encourage investment) (Winters, McCulloch et al. 2004). More in general, it may simply be wrong to assume that an equal model applies to every country; that dynamics and path dependency are irrelevant, and that measurements across countries are homogeneous (Winters, McCulloch et al. 2004). In the end, it may be the case that the relationship between trade openness and growth is a contingent one, dependent on a host of country and external characteristics which should be identified (Rodriguez and Rodrik 2001).

⁹ As explained by Frankel & Romer, 'Just as a country's income may be influenced by the amount its residents trade with foreigners, it may also be influenced by the amount its residents trade with one another' (Frankel and Romer 1999 p.380).

¹⁰ The latter also incorporates controls for closeness to the Equator and to the Tropics and continental dummies.

Effects of trade openness on income distribution

The literature on the effect of trade liberalization or trade openness on income distribution mainly is composed of studies which describe the main channels by which trade liberalization affects income distribution and a series of econometric studies which have applied very different methodologies arriving to different conclusions.

Concerning the mechanisms by which trade liberalization affects income distribution, conventional trade theory (Heckscher-Ohlin theory with its companion Stolper-Samuelson theorem) deals in a static way with only two factors, two sectors and two countries, and its corollary is that trade liberalization increases the relative price of the relatively abundant factor in each country leading to a fall in inequality. This may be misleading, particularly in the light of empirical evidence suggesting that trade liberalization is not reducing inequality in the developing world (Milanovic 2002). As argued in the following paragraphs, to analyze the mentioned mechanisms with more realism, it is particularly important to distinguish one or more of the followings: a dynamic framework, and the existence of more factors, more sectors and more countries.

In the short run, openness to trade in a small economy will affect income distribution by the increasing adoption of international prices. In the imports side, the competition of cheaper imported goods will erode the rents (profits, wages, land rents) in the protected sector of producers at home (Milanovic and Squire 2005), with the consequent alteration in income distribution. In the exports side, the action will come mainly from a reduction in wedges (taxes and subsidies) to exports¹¹, with reduction of taxes (subsidies) increasing (lowering) the incomes of exporters. Specifically, and as described by Goldberg and Pavcnik (2007), the last globalization wave seems to have led to increase the demand for skilled workers, increasing the skill premium and affecting income distribution. Part of this change in factor demand can be explained for middle-income countries by a simple extension of the traditional trade theory, accounting for skilled labor, unskilled labor and capital (St. Fact G2); and distinguishing low, middle and high income countries: as low income countries entered in the world

¹¹ Also in taxes and subsidies to inputs imported for the purpose of subsequent exporting, with an importance depending on the importance of outsourcing in the economy.

markets and started to export unskilled-intensive goods (e.g. China's textiles), the comparative advantage of middle-income countries may have shifted from unskilled to relatively skilled workers (Goldberg and Pavcnik 2007,p61), with an associated change in factor demand.

The medium-run changes in income distribution are related to the medium-run transmission channel explained in the "trade liberalization and growth" section: as changes in relative price signals lead to factor reallocation, the average wages earned by the factors change due to i) the presence of original sector-specific wage distortions and ii) the effects that the reallocations have on sector-specific wages (St. Fact G3). The mentioned reallocations are partly motivated by developed countries outsourcing, a mechanism by which firms in the developed countries shift the production of some intermediate goods to developing countries. With the production of these intermediates being relatively skill-intensive¹², this helps to explain the increase in the skill premium commented above (Goldberg and Pavcnik 2007,p62).

In the long run, the productivity and technology transfers brought by trade are likely to generate new changes in factor demands, factor returns and income distribution (Evans 2005). Particularly, and in the context of international capital inflows, trade liberalization may have led to a fall in the price of imported capital goods and increases in the physical capital stock of developing countries with 'skill-biased' embodied technology (Goldberg and Pavcnik 2007,p63) also helping in explaining the skill premium increase (St. Fact G4).

Besides, the potential switch in aggregate demand outside the liberalizing country described in the section "trade liberalization and growth" may also have lasting distributional effects. Especially when liberalization was done prior to the installation of social safety nets, lost jobs may have worsened income distribution (Stiglitz 2002) (St. Fact G5).

Finally, the changes in income distribution generated by trade liberalization will depend significantly on factor endowments (which will impact on the reallocation of resources and on the possibility of productivity and technology transfers) and on market institutions (which will resolve the market disequilibria in favor of changes in prices or

¹² Characterized as skilled from the LDC perspective but as unskilled from the developed country perspective.

in quantities) (St. Fact G6), as well as on the international rate of profit, which will influence the national rate of profit (St. Fact G7) to the extent that capital is perfectly mobile at the international level. In relation to labor market institutions, trade liberalization will usually come with reduced activity-based or skill-based sindicalization, allowing for more wage flexibility (Milanovic and Squire 2005). Public finances will also have a role on income distribution: as tariffs and subsidies are cut, government will attempt to budget their finances, which may imply increasing existent taxes, incorporating new ones, or decreasing public expenditure. If these variations are not distributionally neutral, income distribution may be significantly affected (Evans 2005).

Concerning the regressions approach, there is a series of econometric studies supporting the mainstream view, suggesting that trade openness and/or liberalization has no systematic effect on income distribution (Edwards 1997; Dollar and Kraay 2000; Behrman, Birdsall et al. 2001; Londono 2002); a series suggesting that it worsens income distribution (Spilimbergo, Londono et al. 1999; Barro 2000; Lundberg and Squire 2003); and one which suggest that the effect of trade openness may be context-dependent: they may be pro-equality in middle or high income countries but pro-inequality in poor countries, as in Milanovic (2002) or the effect may depend on investments in human capital (Edwards 1997).

Milanovic (2002) analyzes the effects of trade openness and FDI on income distribution in developed and developing countries, using seemingly unrelated regressions (SURE), a class of regression targeted to a system of simultaneous equations. The author do X-country regressions, regressing the ratio between expenditure or income (depending on availability) of each decile and the mean income in each country on a set of factors including trade openness, with data on income by deciles coming from household surveys of “almost 90 countries” around two benchmark years: 1988 and 1993, on a set of factors which include: 1) the degree of trade openness as imports + exports normalized by GDP; 2) FDI in recipient country, also as a percentage of GDP; 3) interaction terms between trade openness and GDP and between FDI and GDP to take account of possible diverse effects of these spheres of globalization depending on the level of development of countries; 4) other controls. He applies regressions both in levels and first differences, finding significant effects of trade openness only in levels, with the sign of the effect depending on country’s initial income level: his evidence

suggests that for countries with per capita GDP below \$5000-\$6000 , it is the rich who benefit relatively more from openness; above that range, it is the relative income of the poor and the middle class which increases.

Edwards (1997,p206), in turn, regresses the change in the gini and in the income share of the poorest quintile of 27 developing and 17 developed countries over the 70's and 80's on variables accounting for trade liberalization¹³, increase in the percentage of population with secondary education, macroeconomic conditions (GNP, growth and inflation, a dummy identifying developed countries). His results suggest that “trade reform (...) does not appear to have significantly affected changes in income distribution”(Edwards 1997,p209). He suggests that investment in education leads to a reduction in inequality, but unfortunately he does not interact education with openness, which would have allowed to determine if the effect of trade liberalization depends on the human capital stock of the country (e.g. by affecting the education premium).

Behrman et al (2001) study uses an unbalanced panel of 93 national household surveys microdata¹⁴ of 17 Latin American countries over the 1977-2000 period. It groups individuals in poor, middle-class and rich according to the position in the country-level income distribution, classifying those in the first three deciles as poor; those in the tenth decile as rich; and the rest as middle-class. It regress the differences between the log of the average incomes of the rich group and the middle class group over that of the poor group, applying first-difference OLS on a set of covariates that include direct measures of the liberalization effort, as well as controls for average individual and time-varying country-characteristics which are assumed to have different effects across the income distribution (e.g. inflation). The purpose of regressing the differences (and not the levels) of income is essentially to get rid of the effect on wages of country-specific (time-varying and fixed) differences. The purpose of applying OLS in first-differences is to avoid the endogeneity problem as country's inequality may affect their liberalization efforts. Both are devised that intend to to avoid omitted variable biases. Particularly, the liberalization effort is accounted for with a trade policy index (the “average level of tariffs and tariff dispersion” and a capital account liberalization index

¹³ Specifically, these are: average tariffs; average quantitative restrictions coverage; the World Bank index of outward orientation; average collected tariff ratio; Wolf's index of import outward orientation; and average black-market premia.

¹⁴ With the exemptions of surveys for Argentina and Uruguay, which are urban, but where the urban populations have 70% and 90% of the total population, respectively.

that averages a) controls to FDI; b) limits to profits repatriation; c) limits to foreign credit to domestic private sector; d) controls to capital flows (Behrman, Birdsall et al. 2001,p13). Their results suggest that trade liberalization does not significantly affect inequality, something which they interpret as trade liberalization having a set of offsetting effects on inequality.

Effects of capital account openness on growth

In mainstream view, “free capital movements help channel resources into their most productive uses, and thereby increase economic growth and welfare—nationally and internationally” (Camdessus 1998). More in detail, financial globalization is expected to enhance growth by a series of channels described by Prasad et al (2003) that directly or indirectly affect growth. The former include increasing domestic savings; reducing the cost of capital from increased risk sharing; transferring technology and developing domestic financial sectors. The latter are conformed by increasing specialization in production due to the possibility of augmented risk sharing; and improving macro policies and institutions by the disciplining force of the market. Besides, capital account liberalization is expected to allow for economic activity smoothing, with countries borrowing in bad times and lending in good times (Gottschalk and Cirera 2003; Prasad, Rogoff et al. 2003).

However, the regulatory approach has highlighted that 1) the presence of market failures in the international capital market (Rodrik 1999), 2) the necessity of a sequential opening of the economy (McKinnon 1991) and 3) the lack of sound domestic and international institutions and policies (WorldBank 2002; Prasad, Rogoff et al. 2003) may induce international capital mobility not to enhance - and possibly to harm- growth.

The existence of informational asymmetries, agency problems, self-fulfilling expectations, bubbles (rational and otherwise), and myopia are common examples of market failures in worldwide capital markets (Rodrik 1999,p22). These, combined with international capital mobility, may generate irrational changes in the direction of capital flights, as acknowledged by World Bank (2002). It is found that capital account liberalization comes with a significant increase in volatility of capital flows, which in turn makes the rate of growth less stable (Birdsall 1999; Wade 2001). Even worse, as capital flows tend to move procyclically, they provide an additional source of instability

(Stiglitz 2002; Prasad, Rogoff et al. 2003), probably also generating uncertainty, a loss in efficiency, and a lower trend growth (Gottschalk and Cirera 2003). As described by Taylor (2004), capital account liberalization, especially across LAC, has led to capital inflows that led to appreciated real exchange rates (via changes in the nominal exchange rates or in domestic prices) and to domestic credit expansions. The former switched demand outside the liberalizing country. The latter stimulated absorption of domestic and foreign goods, and lifted both aggregate demand and imports, affecting the domestic activity level and external balances. Sooner or later, due to unsustainable external balance or capital outflow, the demand expansion ended.

As highlighted by Mc Kinnon (1991), the capital account liberalization may not be growth enhancing if done before the following sequence is executed: i) the government gets fiscal equilibrium hence allowing for price stability; ii) capital markets are opened at domestic level; iii) the current account is liberalized slowly and orderly, following a “five-to ten-year adjustment period” toward zero tariffs after converting quantitative restrictions to tariffs, with tariffs better cascading downward from domestic finished consumer goods, to manufactured intermediate products, to industrial raw materials and energy. Besides, once this sequence was executed, capital account liberalization should not be taken in a big-bang way, but rather as a process, starting with FDI, continuing with long-term flows; followed by short-term flows; and concluding with outflows by residents -first institutional investors, then individuals- (Gottschalk and Cirera 2003). Brecher and Diaz-Alejandro (1977), departing from previous work by Bhagwati (1973), shows sufficient conditions under which a capital inflow after the opening of the capital account before eliminating import tariffs leads to “immiserizing growth”, by which the economy grows but aggregate welfare falls. They consider a small tariff-imposing country within the standard two-commodity two-factor model of international trade with an economy incompletely specialized in the production of labor-intensive goods and constant returns to scale in production. The economy receives a capital inflow that is small enough for the host-country to continue incompletely specialized. With the capital inflow being the only source of savings for the economy, it is directly added to the existing physical capital stock¹⁵, expanding the domestic production possibility frontier. To the extent that non-residents receive the full (untaxed) value of the marginal product

¹⁵ A unitary price for the capital stock is implicitly assumed.

of its capital (i.e. its market rate of return), the authors demonstrate that the capital inflow leads to shift national income down and domestic income up. As explained by the authors (Brecher and Alejandro 1977,p317), the fall in national income can be decomposed in i) “the well-known loss due to tariff-created distortions in consumption and production, given only the initial factor endowments”; ii) “the loss or gain that would result even from accumulation of nationally owned capital in the presence of a tariff for reasons expounded by Johnson (1967)”; and iii) “the loss arising when foreign profits are subtracted to determine national income”. As explained in Johnson (1967), the accumulation of capital in the protected industry attract resources there increasing the waste through an excess cost of additional protected production. While these workers increase their contribution to output at tariff-distorted market prices, they may lower it at social prices, hence driving social welfare down. In essence, the tariff distorsion channels the capital inflow towards the production of the good where the country has no comparative advantage (the capital-intensive one) and, provided the inflow of capital does not lead the country to completely specialize in capital-intensive goods, it makes aggregate welfare fall once foreign profits on the incoming capital are deducted.

Finally, the absence of a series of institutions and policies at international and national level could make the capital account liberalization harm growth. These include international coordination on accounting standards, absence of global imbalances, transparency, absence of corruption, and penalized risky lending practices to investors (WorldBank 2002; Prasad, Rogoff et al. 2003). Also, the capital account liberalization may hurt the government’s autonomy in different ways. The actual or faired presence of capital outflows may induce governments to apply a set of economic policies which is supposed to be “market friendly”, i.e. induce capital not to emigrate from the country, sacrificing the execution of economic policies well routed in the development problems of the country at stake. For example, governments may execute restrictive demand policies and liberalize the labor market because these policies are perceived to be market friendly even in the presence of a huge recession which may call for an stimulus to aggregate demand. With a fix exchange rate regime, governments will lose some autonomy to drive aggregate demand (and hence the activity level) as the domestic interest rate will be basically driven by the international rate (Bhagwati 2004). Lastly, governments may lose some taxing autonomy as the capacity to tax capital will be

reduced by the possibility of domestic capital flowing out to jurisdictions with tax exemptions.

The econometric evidence seems to suggest that capital account liberalization does not enhance growth (Stiglitz 2002,p45): even when a positive statistical association is found in general terms (but with exceptions for countries of high growth but late or partial financial globalization (China, India) and countries of low growth but financially opened (South Africa), the positive effect of financial globalization on growth is elusive, the majority of recent studies finding no effect or a mixed effect (generally with only FDI having a positive effect on domestic investment and growth), not supporting the theoretical argument of financial globalization increasing per se economic growth (Prasad, Rogoff et al. 2003). As a brief illustration, Rodrik (1998), using a cross-country regression approach on almost 100 countries, finds that capital openness does not have a significant effect on growth; Kraay (1998) who regresses growth on three measures of capital account openness, concludes that “capital account liberalization... does not appear to have measureable first-order effects on key macroeconomic outcomes such as growth”.

Effects of capital account openness on income distribution

The effects of capital account liberalization on income distribution is a topic which remains relatively uncovered by the literature. Among the few studies on the area, Behrman et al (2001) suggests that capital account liberalization may lead to capital inflows that in turn make the price of capital fall and physical investment go up (St. Fact G8)¹⁶. With capital being complementary of skilled labor and substitute of unskilled labor, the gap between their wages increases and income distribution worsens. In this argument, it is implicitly assumed that the capital inflow leads to increased foreign savings that do not (completely) offset domestic savings, such that the overall level of savings (and investment) increases¹⁷. When the authors perform regressions to estimate the effect of capital account liberalization on income distribution – with a methodology described in the section “trade liberalization and growth”, they find that international

¹⁶ The fall in the price of capital will be included in the model in the sense that trade liberalization will affect the price at which physical capital can be imported.

¹⁷ Otherwise, one would conclude that they confuse financial and physical capital.

financial liberalization does increase inequality, reinforcing the validity of their theoretical argument. Besides, Milanovic (2002) –with a methodology described in the same section - suggests that capital account liberalization does not affect income distribution.

3. The case of Argentina

Having described the international debate on the channels by which trade and capital account liberalization affect growth and inequality in LDCs, in this section I provide a concise description of how the Argentinean economy evolved during the Convertibility Plan (April 1991-December 2001), identifying with a mark (St. Fact An) the stylized facts to be modeled

Following a history of hyperinflation with annualized 4-digit inflation rates during the eighties, Argentina faced a resurgence of inflation in the beginning of 1991. The Argentinean authorities decided then to implement a currency board regime pegging the local currency to the U.S. dollar (St. Fact A1), with the main purpose of stabilizing the economy. Given that the nominal exchange rate was perceived as a main signal in the process of local price formation, by anchoring it the government expected to keep the domestic inflation rate below the international one, allowing the country's competitiveness to increase over time.

The government set the parity in February and gave it law status in April of 1991¹⁸ under the Law of the Convertibility. The Law also prohibited price indexation, allowed contracts and payments in external currency and obliged the national monetary authorities to backup the monetary base with international reserves (Cavallo and Cottani 1997), plus a limited room for flexibility¹⁹ (St. Fact A2). As such, the Convertibility Plan severely limited the available macroeconomic policy instruments, affecting the public sector ability to implement monetary expansion, fiscal deficit monetization, and

¹⁸ In February the conversion rate is fixed at 10.000 australes for 1 dollar. In April 1 the Law 23.298 (self-baptized "Convertibility Law") set a new currency (the Argentinean peso), with a conversion of 1 peso to 10.000 australes, fixing the conversion rate at 1 pesos for 1 dollar.

¹⁹ The international reserves providing the backup of the monetary base included, with a roof of 20% of the total, external-currency-denominated public debt titles. This allowed the Central Bank to issue pesos with a backup of public debt titles. The limit is then increased to 30% with the Tequila crisis (1995).

exchange rate policies²⁰. However, the authorities believed that “years of fiscal and monetary indiscipline had resulted in hyperinflation”(Cavallo and Cottani 1997,p17), so the side-effect of losing some autonomy in the conduct of economic policy was accepted.

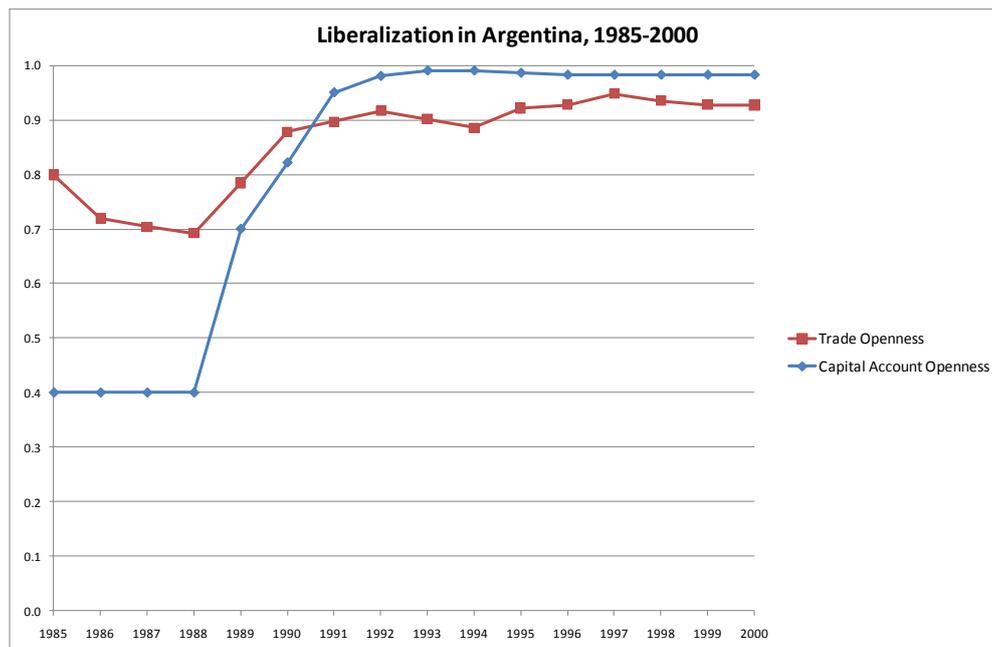
The stabilization tool was adopted together with a broader package of reforms, which included trade and capital account liberalization and a series of measures aimed at reducing the interference of the public sector in the economy²¹. In the end of the 1980s Argentina implemented some unilateral liberalization and, in January of 1991, introduced a 22% uniform tariff rate for most of the tariff universe (Berlinski, Kume et al. 2006,p10). While trade liberalization was general, it was more pronounced for the Mercosur area (St. Fact A3). In March, the Asuncion Treaty determined the conformation of a free trade area with Brazil, Uruguay and Paraguay (Mercosur area) starting in the beginning of 1995, stating in its article 5 that: “during the transition period, the main instruments for the constitution of a Common Market will be: a program of trade liberalization, which will consist of tariff reduction (...) progressive, linear and automatic, accompanied by the elimination of non-tariff restrictions or measures with equivalent effects, as well as other restrictions to trade among the conforming States”. For the area out of Mercosur, a common external tariff was agreed, with multiple exceptions and a convergence path to the common external tariff. The agreed average tariff for extrazone was, for agricultural products: 10%/12%, for capital goods: 12%/16%, for consumption goods: 18%/20% (Berlinski 1998; Berlinski 2004; Berlinski, Kume et al. 2006). Financial opening included reduction in restrictions to mobility to all forms of capital, with equal treatment to national and foreign capital; free entry of direct and portfolio investment, elimination of the barriers to the entry of foreign banks, free bank emission of negotiable financial securities in foreign currency and unrestricted entry of foreign capital in pension funds (Bustelo 2002; Damill, Frenkel et al. 2002) (St. Fact A4).

²⁰ The scope of use of the former two instruments becomes tightened to the result of the balance of payments. The last instrument becomes only available by modifying the legislation.

²¹ A Policy Matrix accounting for the evolution of Capital Account Policy, Other Monetary and Financial Policies, Trade Policy, Fiscal Policy, Privatizations and Deregulations, and Labor Market Policy is displayed in Annex.

Quantitative measures of liberalization suggest that significant liberalization occurred in Argentina in the period immediately before and at the outset of the Convertibility Plan. Escaith and Paunovic (2004), expanding work done by Lora (1997) and Morley et al(1999), provides a trade openness index and a capital account openness index for the period. The former is a normalization of a simple average of the average level of tariffs and the average dispersion of tariffs. The latter is a transformation of the average of four components: i) sector controls of foreign investment, ii) limits on profits and interest repatriation, iii) controls on external credits by national borrowers and iv) controls to capital outflows, with the sources for these components being the IMF's Balance of Payments Arrangements and independent information from various World Bank country memoranda. The normalizations means that the indexes are always in the [0,1] interval, with the index increasing with the degree of openness²². As acknowledged by Morley et al(1999), these indexes are only proxies for actual trade and capital account openness: they neglect non-tariff trade barriers, and subjectively translate verbal descriptions of capital account controls into indexes. However, they do look at the public sector efforts (rather than their outcomes) to implement economic liberalization. They give a clear indication of the liberalization in the period surrounding the start of the Convertibility Plan: while the index for trade openness was 0.692 for 1988, it was already 0.917 in 1992, and 0.927 in 2000; while the capital account openness index was 0.400 in 1988, it was already 0.980 in 1992, and 0.982 in 2000.

²² For each dimension (trade and capital account), and with r being the raw indicator, M (m) being the maximum (minimum) raw indicator across the 18 LAC countries considered in the 1970-2000 period, the actual indicator is generated with the $I=(M-r)/(M-m)$ function.



Source: Escaith and Paunovic (2004), with methodology generated by Lora (1997) and Morley et al (1999) and data increasingly generated by all of them.

Concerning the effects of the Convertibility Plan, and as described by Dr. Domingo Cavallo, the Ministry of Finance who put in place the Plan, it was a “useful tool to stop hyperinflation in Argentina” with “resounding success” (Cavallo and Cottani 1997,p17). However, together with the trade liberalization, previous and initial inflation left the economy relatively uncompetitive. As documented by Damill et al (2002,p19), the real exchange rate at the beginning of the Plan (relating the domestic CPI with that of the US in constant currency) was significantly appreciated in relation to the previous period (42% of the level prevailing in the 1986-1988 period, 44% of that prevailing in the 1986-1990 period, and 83% of that in the 1990Q4-1991Q1 period), and it continued appreciating during the course of the Plan. The exchange rate together with trade liberalization hurt tradable activities - as acknowledged by Cavallo (Cavallo and Cottani 1997,p18) -, leading to a structural shift of production and factors out of the tradable goods. It also led to trade deficits that characterized the Plan from its second year to the end. The trade deficit worsened further as a result of capital account inflows, which led to expansions in the domestic activity level.

During the Plan, the economy was hit by large capital account inflows and outflows (St. Fact A5) that had a dominant role in the short run macroeconomic dynamic of the country. These inflows and outflows largely were determined by developments in the

international financial markets. During the first three years of the Convertibility Plan²³, the returns on financial investments in the developed world were low and, together with an impulse given by an unusually large IMF loan²⁴, generating positive capital flows to the country (Damill, Frenkel et al. 2002,p22). This increased the external debt of the country and, together with the current account increasing deficits, shifted up the external financial fragility of the country²⁵. With the 1994 US Federal Reserve interest rates increase, the capital inflows were reduced and then reversed. With the significant external loan package coordinated by the IMF in 1995 acting as a catalyzer for additional funding(Cavallo and Cottani 1997,p19), the capital inflow was restarted. Then, with the contagion of other financial crisis (East Asian, Russian, Brazilian), the capital inflow was again reduced and then reversed.

The periods of high capital inflows (1991-1994 and 1996-1998) generated positive and negative effects: on the positive side, they allowed to expand the international reserves held by the central bank, the monetary aggregates and domestic credit, lowering the domestic interest rates and leading through demand and supply channels to expansions of the activity level; on the negative side, they led to a worsening of the international investment position of the country –with expansion of the public and private external debt and foreign holding of firms-, and a consequent increase in net investment income paid to non-residents. By appreciating in real terms the domestic currency, capital inflows also led to a worsening of the country's trade deficit (St. Fact A6). This led to persistent current account deficits due to the permanent trade imbalances (commented above) and increasing net investment income outflows. Then, when the economy was hit by contractions of the capital inflows (and capital outflows), the balance of payment turned into deficit, and the monetary and activity level contracted. Independently of these cycles, Argentinean firms faced tight financial constrains during the whole period (St. Fact A7) (Fanelli, Bebczuk et al. 2002).

²³ And also in the two years previous to the Plan.

²⁴ In July 1991 the IMF approved a stand-by facility for SDR 780 millions (approx 1.1 billion US\$), which was replaced by an extended fund facility in March 1992 of SDR 2.483 billions (approx 3.501 billion US\$), 161% of quota (Cavallo et al, 1997, p19).

²⁵ The concept of financial fragility was created by H. Minsky as a measure of the economy's lack of ability to deal with shocks to its conditions of financing (e.g. a sudden increase in foreign interest rates) without resulting in any generalized disorganization in flows of payments among economic agents. The external financial fragility applies to changes in the external conditions of financing and is usually measured as the ratio of external debt to exports or current account deficit to exports.

Minsky, H., Ed. (1982). Can "IT" happen again? Essays on Instability and Finance. New York.

Overall, during the Convertibility Plan the country received a significant net capital inflow that was partly used to finance the increasing current account deficit and partly for domestic financial deepening. The capital flows were particularly volatile and, in the relative absence of available macroeconomic (fiscal, monetary and exchange rate) instruments to absorb the shocks, the volatility was transmitted to the activity level (St. Fact A8).

As the external financial fragility of the economy increased, the private sector perceived higher risks of devaluation of the domestic currency and default of domestic debts. The private sector increasingly accumulated external assets in its portfolio (St. Fact A9), avoiding devaluation and default risks at the cost of lowering the expected return and reducing the international reserves and liquidity of the country. The domestic financial transactions were increasingly dollarized – allowing the holders of foreign-currency-denominated assets to pass the devaluation risk to the liability holders -. The dollarization was asymmetric (e.g. the degree of dollarization was different in the assets and liability sides of the banks), generating currency mismatches and thus balance sheet effects and associated social costs of leaving the Convertibility Plan. When sustained capital outflows led to unbearable external and internal credit contractions, and in the context of political disturbances, the public authorities were forced to abandon it. The Plan ended in December of 2001 when the Ministry Domingo Cavallo terminated the monetary and exchange regime that he had inaugurated ten years before and established controls and restrictions to the foreign exchange transactions.

The two capital flow cycles described above generated corresponding well-defined cycles in the activity level and in the employment rates²⁶, with the latter accompanied by a significant downward trend. Specifically, the real appreciation of the domestic currency with a liberalizing trade market led to a high labor-capital wage ratio - labor being basically a non-tradable production factor and capital a tradable one, generating imports and the gradual introduction of physical capital into the production process, implying in turn the adoption of a labor-saving technology characteristic of the developed countries where these imports came from (Altimir and Beccaria 2000; Bisang

²⁶ Considered as employed and also as full-time employed over population in working age.

and Gomez 2000; Damill, Frenkel et al. 2002). This process reduced labour demand and affected the total hours worked, the real wages and the labor income. In the relative absence of social safety nets, they worsened income distribution. As argued and econometrically tested by Damill et al (2002), the adjustment of the relations between employment and output took place during 1991-1996, and significantly drove the full-time employment rate down. As suggested by Milanovic and Squire (2005), the mentioned incorporation of technology into the production process was not neutral, biasing labor demand in the direction of the more educated workers (St. Fact A10).

In parallel to the labor demand contraction, the incorporation of women to the labor force throughout the nineties increased the gap between the supply and the demand for labor leading to upward trends in the involuntary unemployment and underemployment rates (Damill, Frenkel et al. 2002).

As described by Altimir and Beccaria (2000) and econometrically tested by Damill et al (2002), wages varied following general patterns across different sectors, strongly influenced by the unemployment rate, in a way consistent with wage curves derivable from insider-outsider or efficiency wage theories (Blanchflower and Oswald 1994). As econometric work by Damill et al (2002) suggests, the (hourly) real wages were significantly and inversely related to the unemployment rate during the Convertibility Plan in Argentina, with an elasticity of -0.102 (St. Fact A11) for the urban population of Argentina when dummy controls for sector and regional specificities are included.

The mentioned changes in the factor market severely affected income distribution (Goldberg and Pavcnik 2007, p40). In particular, the distribution worsened during the period essentially driven by the increase in the education premium at the tertiary/university level and by the direct and indirect effect of unemployment on labor factor income (Altimir and Beccaria 2000), something not acknowledged by the authorities²⁷.

²⁷ Cavallo and Cottani (1997, p17), for example, claim that the convertibility did not cause regressive income distribution.

4. Model requirements

Here I simply take stock of the domestic policies and transmission mechanisms identified in Chapters 2 and 3, in order to make sure that they are captured in the model.

Domestic Policies (P)

Id.	Previous Id.	Requirement
P1	A1	Domestic currency was pegged to the U.S. dollar in a 1 to 1 relation
P2	A2	National monetary authorities backup the monetary base with international reserves (allowing a limited room for flexibility)
P3	A4	National and foreign capital received equal treatment, with free entry of direct and portfolio foreign investment
P4	A3	The country's trade liberalization was larger for Mercosur area than for the rest of the world

Transmission Mechanisms (M)

Id	Previous Id	Requirement
M1	G1	Trade liberalization produced changes in relative commodity prices signals - i.e. increased adoption of international prices - that in turn led to factor reallocation
M2	G2 to G5 G8 A10	Real appreciation cum trade liberalization reduced the relative price of imported capital goods and, financed by foreign capital inflows, led to increase the stock of physical capital in the economy. In turn, imported physical capital embodied a skill biased technology that shifted labor demand in favor of the skilled, lifting the skill premium.
M3	G6	Domestic factor endowments and market institutions (by shaping equilibrating mechanisms) affected how liberalization hit the country's income distribution
M4	A11	Real wages varied inversely to the unemployment rate, with an elasticity of around 0.102
M5	A5 A8	The economy was hit by large and volatile capital account flows. In the relative absence of available macroeconomic (fiscal, monetary and exchange rate) instruments, capital flows volatility was transmitted to the activity level

M6	A6	Capital inflows allowed expanding the international reserves held by the central bank, the monetary aggregates and domestic credit, lowering the domestic interest rates and leading via demand and supply channels to expansions of the activity level. But they also led to a worsening of the international investment position of the country –with expansion of the domestic public and private external debt and foreign holding of firms-, and a consequent increase in the net investment income paid to non-residents. By generating a real appreciation, capital inflows also led to a worsening of the country's trade deficit
M7	A7,A9	While Argentinean firms were subject to tight financial constrains, the private sector increasingly accumulated external assets
M8	G7	While the international capital markets lacked perfect mobility, the international rate of profit had some influence on the national rate of profit

5. Review of existing models

CGE models: origins, concept, types and uses

As explained by Robinson (1989), “Computable general equilibrium (CGE) models can be seen as a natural outgrowth of input-output and linear programming models, adding neoclassical substitutability in production and demand, as well as an explicit system of market prices and a complete specification of the income flows in the economy” (Robinson 1989p.888). The first application was done by Johansen (1960) and the first developing country application by Adelman and Robinson (1978). The evolution of CGE models was closed to policy concerns in the international agenda: “In the early 1970s, international attention shifted to a concern about income distribution”, and models included prices and incomes, as it was perceived that rapid growth and structural change did not suffice to reduce poverty and that large groups of poor people were not benefitting from growth. In the late 70s and 80s, with a growing concern with issues of foreign debt, policy analysis focused on questions of “structural adjustment”²⁸. How could countries bring about the changes in the structure of production and trade required to adapt to lower levels of foreign resources? What macroeconomic adjustments were required, and what was their impact on medium to long-run growth and structural change? Faced with a foreign exchange crisis that significantly affected growth, issues of income distribution and poverty alleviation gradually lost priority in the international agenda, and policy-modelers reacted, among other actions, improving the treatment of foreign trade in CGE models.

In essence, a “CGE model works by simulating the interaction of various economic actors across markets” using the following components: 1) the actors or agents whose behavior is analyzed (e.g. consumers and producers); 2) their behavioral rules, reflecting their assumed motivation (e.g. producers decide their factor uses at given prices in order to maximize profits); 3) signals observed by the agents that affect their actual behavior (typically prices); 4) the rules of the game for the interaction of agents

²⁸ As mentioned in Robinson (1989), “structural adjustment” is a catch-all term. I will use it as Robinson (1989, p.891) defines it: “an adjustment to some shock that requires not only compositional changes in production, resource allocation, demand, and relative prices, but also changes in macroeconomic aggregates such as income, investment, absorption, consumption and government expenditure”.

(e.g. perfect competition); 5) system constrains (e.g. markets for products and factors clean) (Robinson 1989,p906) .

As a consequence, CGE models are essentially structural, capturing market mechanisms explicitly, specifying explicitly demand and supply behaviors with roles for prices and demand and supply elasticities. “Walras rather than Keynes is the patron saint (...)” (Dervis, de Melo et al. 1982, p. 6), i.e. their spirit is essentially microeconomic. However, in order to gain realism, the factor and products equilibrium concepts that come from the Arrow-Debreu general equilibrium theory are sometimes enriched by additional equilibria concepts and ad-hoc elements. The former include: 1) flow equilibrium in the market for loanable funds; 2) equilibrium in specific asset markets; and 3) intertemporal equilibrium, with agents behaviour based on their expectations about the future course of the economy. The latter include the following “structuralist” features: 1) limited substitution elasticities in a variety of important relationships (“elasticity structuralist”); 2) absence or lack of proper work of various markets – e.g. restrictions of factor mobility, rigid prices, rationing, neoclassical disequilibrium, non-profit maximizing behavior by firms- (“micro structuralist”); 3) equilibrating mechanisms among macro aggregate nominal flows (“macro structuralism” typical in Lance Taylor’s work). Models are then set in a continuum going from Walrasian to Keynesian models, and can be classified in different ways, e.g. according to the equilibrium concepts they include, the ad-hoc devices they have, their treatment of expectations, their size, etc. In any case, the Walrasian model is “an uneasy host for incorporating macro phenomena”, not being still an “acceptable reconciliation of micro and macro theory” (Robinson 1989,p895) .

Macro financial CGE models

A detailed survey on macro financial CGE models seems useful to frame the set of models I build²⁹. These models generally depart from traditional CGE models that already incorporate flow equilibria in product and factor markets, so that the assumptions in these markets are critical. Also as traditional CGE models, they incorporate a functional relationship between the real exchange rate and the trade balance, being this a critical transmission channel, and tend to reflect imperfect substitution between imports and domestic goods, and imperfect transformation between domestic goods and export goods, giving a degree of isolation to the domestic price level and reflecting the difficulty of changing trade shares at the sector level.

However, they significantly differ from traditional CGEs. While in traditional CGEs the “loanable funds” market collects savings and purchases capital goods in a single account, financial CGE models focus on the elaboration of this account (Robinson 1991), adding a set of imperfectly substitutable assets that capture imperfections in the capital markets. These models are generally designed to analyze the short and medium run impact on economic performance and income distribution in developing economies of structural adjustment and stabilization programs implemented in response to external macro shocks (e.g. increased oil prices, declined availability of foreign borrowing). Given their concern with the short and medium run effects on the economy, they tend to directly incorporate macro phenomena and to have a simple treatment of expectations³⁰. They all break the neoclassical separation between the real and financial spheres of the economy and, for doing this, each of them has at least one of the structuralist (elasticity, micro or macro) features described above.

²⁹ A detailed survey of CGE models is out of the scope of the dissertation. McKibbin and Sachs (1989) Global and McKibbin and Wilcoxon (1999) G-Cubed dynamic GE models of the world economy divides the world into regions and deals with financial assets (public bonds, foreign investment positions), but its perfect foresight assumption, perfect substitutability among financial assets and global lets the case at stake out of the domain of applicability of the models. Dynamic Stochastic General Equilibrium models are left out also due to their lack of concern with structural adjustment and perfect foresight assumptions. A financial model for Argentina (Chisari 2006) is left out given its lack of focus on external shocks? (see http://www.mecon.gov.ar/peconomica/basehome/modelos_equilibrio2008.html). An IMF model -Kahn-Knight model- (CHECK), being financial but without supply side, is also left out of the survey.

³⁰ As mentioned in Robinson (1991), “long-run models which assume full employment and embody steady-state equilibria with rational (or model-consistent) expectations will miss most of the action”.

In the following Table I review 16 macro financial CGE models in detail³¹, focusing on the concepts of equilibria and the structuralist features they incorporate, and on the channels by which the performance of the financial sphere affects the real one. Models are identified by the authors, adding a character (A,B) for models from authors with more than one model being surveyed.

- Their factor markets tend to be similar, with the capital stock being immobile across sectors and with some form of wage rigidity in the the labor market: a fixed nominal wage (Taylor ('A') 'Foreign assets and balance of Payments, Rosenzweig and Taylor, Decaluwe et al), a price-indexed nominal wage (Taylor ('B') IS-LM in the Tropics, Easterly 1990), or a wage curve by which the real wage is affected by the unemployment rate (Fargeix and Sadoulet, Vos).
- The product markets tend to assume perfect competition, but in some models prices are determined as a mark-up on variable costs (e.g. Yeldan), are fixed by the government (Decaluwe et al), or even have the overall price level being the variable that equilibrates the money market (Yeldan).
- Asset markets tend to clear via quantity adjustment, with the interest rate sometimes equilibrating sources and uses of funds by banks (Taylor-A), with ex-ante savings sometimes limiting fixed investment (Decaluwe et al, Yeldan, Vos, Lewis in the scenario with fixed interest rate), but also sometimes with investment driving savings (Taylor-B, Easterly). They include a large set of financial assets, and can include currency, deposits, loans, required reserves, domestic and foreign bonds, international reserves held by the central bank, with these assets sometimes classified according to their currency denomination (local vs. foreign).
- A variety of exchange rate regimes are modeled, including fixed and flexible (as in traditional CGE models), but also administered fluctuation (IMMPA) and crawling peg (Taylor-B).
- By including the financial sphere, these models allow to track the economic actors portfolios (sizes and compositions). They enrich the way in which the relationship with the rest of the world is captured, allowing to explain financial flows between residents and non-residents, their effects on the domestic economy liquidity, and valuation effects (e.g. due to a depreciation of the exchange rate).

³¹ DSGE models were not included in the review given their lack of focus on the structural characteristics of LDCs and income distribution.

- They capture a variety of links going from the financial to the real side. These include impacts on the aggregate supply and demand for goods.
 - Concerning the former, they tend to reflect it via a “working capital” channel. As explained by Decaluwe et al (1994,p263-4), this channel incorporates firms credit dependency, and was pioneered by Kapur (1976) and Mathieson (1980). “In these studies, they consider that there is a direct link between bank credit availability and the level of production. The link is introduced in their models by supposing that the fixed or variable capital stock used by the firms is financed in a certain proportion by bank credit”. In some studies the cost of working capital hits the effective production cost of firms and, in turn, the firm’s desired level of production (the ‘maquette’, IMMPA); in others the higher production cost is passed along to consumers (Taylor-A). Finally, in some models the availability of working capital directly hits the production possibilities of the firm, as working capital is entered as an argument in a Leontief production function that does not allow for substitution away from working capital (Decaluwe, Naastepad).
 - Concerning effects from the financial sphere to the demand for goods, they reflect i) the positive effect of real balances on consumption (Easterly); ii) the negative effect of the interest rate on physical investment (the Bourguignon, Branson and De Melo ‘maquette’, Thissen); iii) the positive effect of international capital inflows on investment (via relaxing binding financial constraints, Vos). The mentioned effects on the demand for goods in turn affect the overall supply of goods contemporaneously (to the extent that factor use is flexible) or with a lag, as investment decisions affect the capital stock supply and the production possibility frontier.

Overall, all these models break the neoclassical duality between the real and the financial spheres and major differences show up in how the loanable funds market is modeled and how the performance of the financial sphere affects the real side of the economy.

Table. Macro Financial CGE Models

Sphere	IFPRI Standard Model	Taylor (1981A) IS-LM in the Tropics	Taylor (1981B) CB: "Foreign Assets and Balance of Payments"	Bourguignon, Branson and De Melo "Maquette" (1992)	Rosenzweig and Taylor (1990)	Easterly (1990)	Lewis (1992)	Decaluwe et al (1994)	Fargely and Sahnouet (1994)	Yeldan (1997)	Vos (1997) for Philippines	Adim & Beun asset market model (1998)	Thissen (2000)	Naastepod (2002)	IMPA (2003)	Agenor and Montiel (2008)
Factors closures (Default: labor and capital wages are the equilibrating variables and only labor is mobile)	Wages or factor uses are flexible. Factors are mobile or immobile across activities	The labor wage is fixed or price-indexed and the employment level is flexible	Fixed wages (fixed real mark-up for capital) with flexible labor use and capacity utilization	Default or Keynesian mark-up pricing with endogenous capacity utilization	The labor wage is fixed and the employment level is flexible	Fixed or price-indexed labor and capital wages, with flexible employment level and capacity utilization	Default	Fixed labor wage with flexible employment level	Labor wage adjusts partially through a wage curve and employment level is flexible	Fixed labor wage with flexible employment level	Labor wage adjusts partially through a wage curve and employment level is flexible	Default closure	Labor wage adjusts partially through a wage curve and employment level is flexible	Labor wage is price-indexed and the employment level is flexible	In a segment of the labor market wages are price-indexed or move along wage curves with flexible employment level. Land is fully employed and immobile even across agricultural activities.	A version allows for rigid labor real wage and flexible employment level
Products closures (Default: prices are market-clearing)	Prices vary to clear markets	Default	Demand-driven quantities clear the markets		Default	Demand-driven quantities clear the markets	Default	Mostly quantity adjustment given a strong degree of price rigidity (even the producer price for exports is fixed via an equalization public fund)	Default	Prices are set as markups over variable costs, and product market closure is achieved via quantity adjustment. The overall price level clears the money market.	Fix-flex prices": Mark up pricing and quantity adjustment in some sectors, price adjustment in others	Default	Default	Fix-flex prices (see Vos 1997)	Default	Default
Asset markets and their closures (Default: quantity adjustment)	Assets markets not explicitly modeled	Deposits, loans from households and banks to firms, and banks reserves. Asset demands are in terms of stocks. Working capital is not rationed. Interest rates are endogenous.	Households demand the following imperfectly substitutable assets: deposits, foreign assets and a non-tradable ("gold" or "land"). There are also loans from banks to firms.	Money holdings (against consolidated financial system), domestic bonds, foreign bonds, equity, loans, international reserves. The portfolio composition of assets by households and liabilities by firms depends on asset returns. The interest rate adjusts to clear the money market. The return on equity is endogenously given by the return on physical capital.	Currency, Deposits, Loans, Bonds, Equity. Loans provided by and deposits of non-residents, Foreign Exchange Reserves of Central Bank, Rediscounts, Required reserves, CES and CET functions determine composition of household's assets and firms liabilities. The interest rate adjusts to equate bank sources and uses of funds. The price of equity adjusts to clear the equity market.	Deposits, Loans, Required Reserves, Foreign Assets, Bonds denominated in local and foreign currency.	The core of the financial system is provided by deposits and loans from banks. See below.	Money, Deposits, Loans, International reserves held by Central Bank, Bonds, Equity.	Currency, Deposits, Loans, Bonds, Foreign currency held by Central Bank and households, Equity.	There are domestic and foreign currency, public and private bonds and saving deposits. The interest rate equilibrates banks sources and uses of funds	A syste of "supply-led finance (credit rationing) with fixed nominal returns and perfectly elastic liability demand" is at work. (p.333)	Currency holdings, deposits in domestic banks in local and foreign currency, deposits abroad, equity, bonds, loans, international reserves, required reserves	Currency holdings, deposits in domestic banks in local and foreign currency, equity, bonds, loans, international reserves, required reserves and excess reserves. Asset returns are calculated with ad-hoc conditions, e.g. interest rate on bonds follow a uniform rate of variation path.	Loans, Deposits, Rediscounts, Bonds, Required Reserves. Asset returns are determined by regulation, with the financial system being supply-led as in Vos (1997)	Currency, deposits (in local and foreign currency), bonds (in middle-income country version) and deposits abroad, among other assets. The public bonds market has a market-clearing price. The interest rates on deposits and loans are linked to the rate on rediscounts.	Currency holdings in local and foreign currency, deposits in domestic banks in local and foreign currency, deposits abroad, bonds, loans, international reserves, and required reserves. At the prevailing lending rate, banks supply of liquidity to firms is perfectly elastic
Loanable funds market ("Saving-Investment" closure)	Savings or investment driven	The interest rate equilibrates the market	Investment-driven	Savings-driven (rationed credit)	Not explicit	Investment-driven (foreign savings being the equilibrating variable)	Either i) the interest rate is fixed at a level where planned savings are below planned investment (credit rationing); or ii) the interest rate equilibrates planned savings and investments.	Savings-driven via credit rationing	The interest rate equilibrates the market	Savings-driven	Savings-driven ("prior-savings approach")	As Lewis (1992)	Not explicit	Ex-post investment function has a roof given by available savings	The interest rate equilibrates the market	Savings-driven

Table. Macro Financial CGE Models (cont.)

Sphere	IFPRI Standard Model	Taylor (1981A) IS-LM in the Tropics	Taylor (1981B) ChS: "Foreign Assets and Balance of Payments"	Bourguignon, Branson and De Melo "Maquette" (1992)	Rosenzweig and Taylor (1990)	Easterly (1990)	Lewis (1992)	Deaton et al (1994)	Fargreis and Sadoulet (1994)	Yeldan (1997)	Vos (1997) for Philippines	Adim & Bevan asset market model (1998)	Thissen (2000)	Nastepud (2002)	IMMPA (2003)	Agenor and Montiel (2008)
Fiscal closure (Default: flexible fiscal saving)	Flexible gov. savings or tax rates	Default	Fiscal institution is absent	Default	Default	Default	Default	Default	Default	Default	Default	Default	Default	Default	Public transfers to households are flexible	Fiscal institution is absent
RoW closure 1: exchange rate regime	Fixed or flexible	Fixed	Crawling peg	Fixed or flexible	Fixed	Fixed	Flexible (and other schemes e.g. premium rationing scheme for imports)	Fixed	Fixed or flexible	Flexible	Fixed	Flexible	Fixed	Fixed	Fixed, flexible or administered	Fixed or flexible
RoW closure 2: balance of payments	The balance is limited to the trade balance and transfers	With an omitted capital account, foreign reserves held by the central bank change as derived from the endogenous trade balance.	With an omitted capital account, foreign reserves held domestically (by the central bank and households) change as derived from the endogenous trade balance.	The balance of payments is always in equilibrium in the fix exchange rate regime, government borrowing equilibrates it	Endogenous trade balance, capital account balance and overall balance	Endogenous trade balance, capital account balance overall balance	Exogenous international capital flows determine the capital account balance and, with a change in sign, the current account balance	Exogenous exports, Armingtonian imports and exogenous capital account flows determine the overall result of the balance of payments.	The current account, the capital account (via endogenous capital flight) and the overall result of the balance of payments (in the fixed exchange regime case) are endogenous.	Exogenous (limited) borrowing abroad by private and public sectors determine the capital account balance and, with a change in sign, the current account balance	While capital flows are exogenous and exports are derived from CET functions, imports adjust to equilibrate the balance of payments.	Foreign savings are exogenous	Endogenous current account balance and exogenous capital flows reflecting limited access to foreign borrowing determine the endogenous overall result of the balance of payments.	Exogenous capital account, endogenous current account and overall result	Limited access by banks to international capital markets is assumed to close their gap between sources and uses of funds, such that the overall balance of payments may end in disequilibrium.	Residents are allowed to exogenously hold assets abroad, but non-residents are not allowed to hold domestic assets
Intertemporal equilibrium (Default: single period without role for expectations)	Absent	Default	Perfect-foresight, multiperiod model	Adaptive expectations, multi-period model	Multi-period	Default	Default	Default	Multi-period, adaptive expectations	Default	Multiperiod	Multi-period	Multi-period, average of adaptive and rational expectations	Default	Adaptive expectations, multiperiod	Default
Core links from financial to real sphere	Absent	Depending on selected parameters of saving and investment functions, monetary contractions can either lift or reduce the activity level. Firms borrow to finance working capital needs, but pass along the financial costs without effect on total output.	Financial credit chasing producer's goods (p,152); excess supply of loans leads to price level increases that lower the real interest rate and lifts physical investment	The interest rate affects physical investment. Also working capital channel	The interest rate affects physical investment	Real balances hit consumption and firms interest payments affect their cash flow and hence their investment levels	The interest rate affects real investment and hence the composition of aggregate demand (not the activity level, determined by the full employment assumption). A working capital channel is also present.	Credit supply limits the firms effective demand for variable production factors and physical investment, with short and medium run effects.	Money emission leads to inflation and real wage fall, lifting labor use and output. A working capital channel is also present	Money emission leads to inflation and real wage fall, lifting labor use and output.	Exogenous capital inflows may boost investment	With full employment, financial decisions (e.g. public deficit bond-financed) vs money-financed) may affect output composition	The interest rate affects real investment	Increasing the availability of binding working capital credit (working capital being a Leontief argument in the production function) allows to lift firms product	A working capital channel allows fall in interest rates (via the Central Bank reducing the rediscount rate) to reduce the effective cost of labor, stimulating labor use and production	Same as IMMPA (2003)

6. Nested Models for Argentina

Having identified the stylized facts to include in the model and surveyed macro financial CGE models, I proceed to describe the modeling approach I take, first broadly contrasting my model against those surveyed and then providing a detail description referring to specific equations.

My modeling strategy has two focus of attention:

1. Try and help in understanding the structural adjustment effects of trade and capital account liberalization, with special emphasis on growth and income inequality in a middle-income country, applying it in a stylized way to the Argentinean economy during the Convertibility Plan (March 1991 – December 2001).
2. Contribute to the existent debate over the economic significance of including the financial sphere in CGE models that Adam and Bevan (1998) mention. For this, and as Adam and Bevan (1998), I start from a non-financial CGE model that captures in a conventional way the structural adjustment effects of liberalization and subsequently incorporate in extended models the financial sphere, allowing in the process for additional macroeconomic relationships and rigidities. In the incorporation of the financial sphere, I account for the presence of financial stocks and the consistency between stocks and flows in the economy that was remarked by Tobin (1969), trying to correct for a potential bias caused by the omission of the financial sphere.

In the construction of the models, I intend to honor the view that “computable general equilibrium (CGE) models can be seen as a natural outgrowth of input-output and linear programming models, adding neoclassical substitutability in production and demand, as well as an explicit system of market prices and a complete specification of the income flows in the economy” (Robinson 1989p.888). In this framework, I include a transmission channel from the financial to the real sphere along the tradition of ‘money in the production function’ started by Friedman (1969). Specifically, I include (endogenous) working capital as a (substitutable) factor in the (CES) production function, affecting the efficiency with which real factors are used in economic activities

and, as a result, the overall supply of output and the structure of production³². As argued by Milton Friedman (1969), the money supply is not necessarily neutral in the short run: “the separation of the act of sale from the act of purchase (provides money with a) fundamental productive function” (p.3), such that “(...) real cash balances are at least in part a factor of production” (p.14).³³ This differs from the treatment of working capital in existent FCGE models where either: 1) working capital is totally absent (e.g. Thissen 2000); 2) working capital is not included in the production function but affects the effective cost of the real factors (e.g. IMMPA model); 3) working capital acts as a constraint to hire real production factors, without any substitution allowed between working capital and real factors (e.g. Decaluwe et al 1994, Naastepad 2002). By including this transmission channel and linking financial conditions in the country to external capital flows, the model reflects the strong influence that external capital flows had on the activity level, where other models (e.g. IMMPA) assume that the domestic country (via the banking sector) can borrow on world capital markets any amount at the prevailing interest rate³⁴.

The most extended version of the model incorporates factor markets not only for labor and physical capital, but also for working capital. Skilled labor and capital have a low substitution elasticity, which helps to shape the primary income distribution as observed in the last globalization wave. In the commodity markets, it disentangles different regions with which the country trades. It accounts for imperfections in the financial markets, but trying to keep a root on microeconomic theory (asset portfolio determined as a choice coming from utility theory³⁵, Walrasian adjustment of the interest rate on loans). Capital inflows together with a fixed nominal exchange rate are channelled into Central Bank foreign reserves and monetary expansion and into the financing of current account imbalances. The model accounts for a degree of dollarization of deposits. In the absence of devaluation, prices and nominal values are measured in natural units (the

³² The idea of including working capital in the form of “money in the production function” was suggested by Sherman Robinson.

³³ Friedman illustrates this in the following way: a retailer can economize on his average cash balances by hiring an errand boy to go to the bank on the corner to get change for large bills tendered by customers. When it costs ten cents per dollar per year to hold an extra dollar of cash, there will be a greater incentive to hire the errand boy, that is, to substitute other productive resources for cash. This will mean both a reduction in the real flow of services from the given productive resources and a change in the structure of production, since different productive activities may differ in cash-intensity, just as they differ in labor- or land- intensity” (p.14) (the underline is mine).

³⁴ The world supply of loans is assumed to be perfectly elastic.

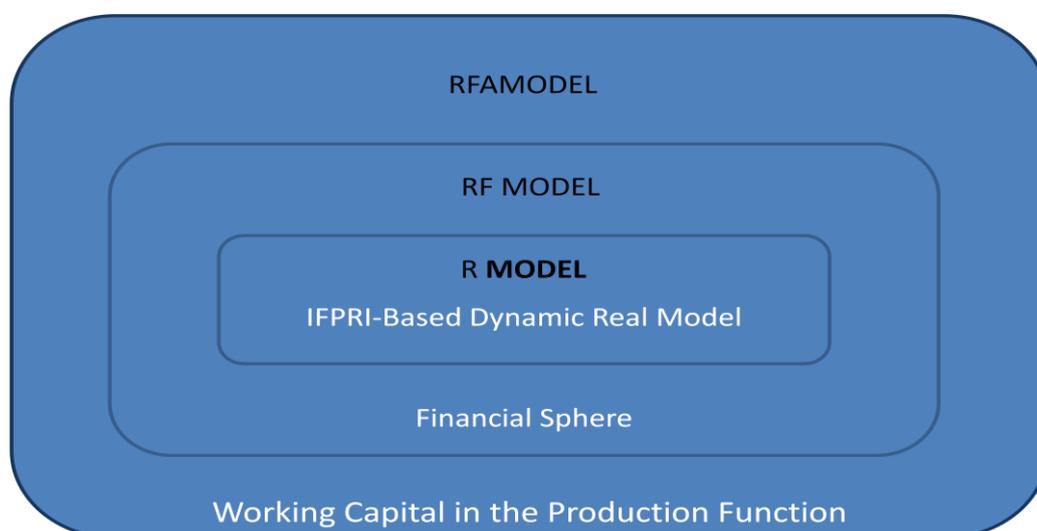
³⁵ As in Adam and Bevan (1998) and Naastepad (2002)

numeraire is given by the nominal exchange rate). The model treatment of expectations is very simple, as in most FCGE models. The model includes a high variety of macroeconomic policy instruments, including different tax rates, government expenditures, deficit monetization, rediscount levels and rediscount rates, and bank required reserve ratios. Finally, the model captures all the stylized facts described in a previous section. As any of the surveyed models, the model only allows to track income distribution at a rather aggregate level (e.g. that in the representative household groups).

Description of the models equations

In this section I describe the set of nested macro CGE models I build for Argentina with increasing inclusion of the financial sphere, departing from the IFPRI Standard Model and building on the literature review on the effects of current and capital account liberalization, on specificities of the Argentinean economy, and on a literature review of macro CGE models. The nested models, as shown in the below diagram, are called real model (R), real financial model (RF) and real financial augmented model (RFA), and are nested in the sense that the latter ones include the former ones but endogeneizing some variables and including additional equations. The real model is a straightforward extension of the IFPRI Standard model, the real financial model incorporates the financial sphere, and the real financial augmented model includes endogenous working capital as a production factor. The model equations are presented in Annex II.

Diagram: Nested Models



Real Model

1. Stylized actors

The disaggregation of sector of activity, commodities, production factors, representative households, the rest of the world and the financial sector in the model mainly seeks to frame the forces which affected income distribution and the level of activity in Argentina during the Convertibility Plan and as such is pretty much stylized. Economic activity is disaggregated into primary, industrial, construction, private services and public services sectors, reflecting different pricing, distribution rules, tradability and evolution of trade taxes. The set of commodities coincide with the set of activities but, as usual in the CGE literature, the relation between activities and commodities is not bi-univocal: an activity is allowed to produce more than one commodity and a commodity can be produced by more than one activity. Factors are classified in capital and labor, with labor sub-classified according to skills and formality³⁶. Given that the big bulk (98%) of the skilled are formal in Argentina, the model includes four factors: formal skilled, formal unskilled, informal unskilled and capital³⁷. The model includes three representative household groups (RHG): skilled wage recipients, unskilled wage recipients, and capitalist households. Reflecting the different evolution of taxes to Mercosur Area and probably different traded commodity varieties, the rest of the world is disentangled into Mercosur and Extra-Mercosur. The financial sector is divided into commercial banks and the central bank.

2. Price formation

Domestic goods, imports and exports

As in the 1-2-3 model of Shantayanan Devaragan, Jeffrey Lewis and Sherman Robinson (1990), domestic prices are partially insulated from changes in foreign prices via assuming imperfect substitutability among commodities of different origins and destinations - i.e. domestic outputs used domestically are different goods, imports, and exports. The prices of domestic goods are endogenous and market-clearing (eq. 64),

³⁶ Formality is distinguished at the factor level and not at the activity level because the available data on formality is at the factor level.

³⁷ A similar treatment can be found in IMMPA model, where a high perceived disutility of work or a fear of an adverse signaling effect on future employers detract skilled workers from looking for a job and/or working in the informal sector.

with excess demands generating price increases and excess supplies generating price decreases. Regional dollar-denominated CIF world prices are exogenous (small country assumption). Domestic currency denominated regional import prices as perceived by demanders are calculated as regional CIF dollar-denominated import prices times the nominal exchange rate (fixed reflecting the exchange regime) plus regional ad-valorem import tariffs (eq. 3). Domestic currency denominated regional export prices as perceived by producers are analogously calculated as dollar-denominated FOB world export prices times the nominal exchange rate minus ad-valorem export taxes (eq. 5). The worldwide import (export) price is an average of the regional import (export) prices, with weights given by endogenous import (export) quantities (eqs. 4 and 6).

Other prices

As in IFPRI Standard Model, the sector-level prices of composite goods ('absorption prices'³⁸) are determined to make the sector-level value of absorption consistent with the sum of the values of imports and domestic spending on domestic output (eq. 7); the producer prices are calculated such that the value of production is consistent with the sum of the values of exports and domestic spending on domestic output (eq. 8); and the value added prices are determined such that payments for value added and intermediate consumption fully exhaust the producer revenues (eq. 10). The CPI, the price of capital (at replacement cost) and the price of intermediate aggregates are differently weighted averages of composite good prices: the consumer price index (CPI) weights by using the commodity value shares in overall final consumption (eq. 1), the price of capital weights by the commodity value shares in overall physical investment (eq. 12), and the price of intermediate aggregates weights by the intermediate input coefficients (eq. 11). Finally, the GDP deflator simply measures the ratio between domestic value added calculated at the current value added price and at the base-year value added price (eq. 2).

3. Production and trade

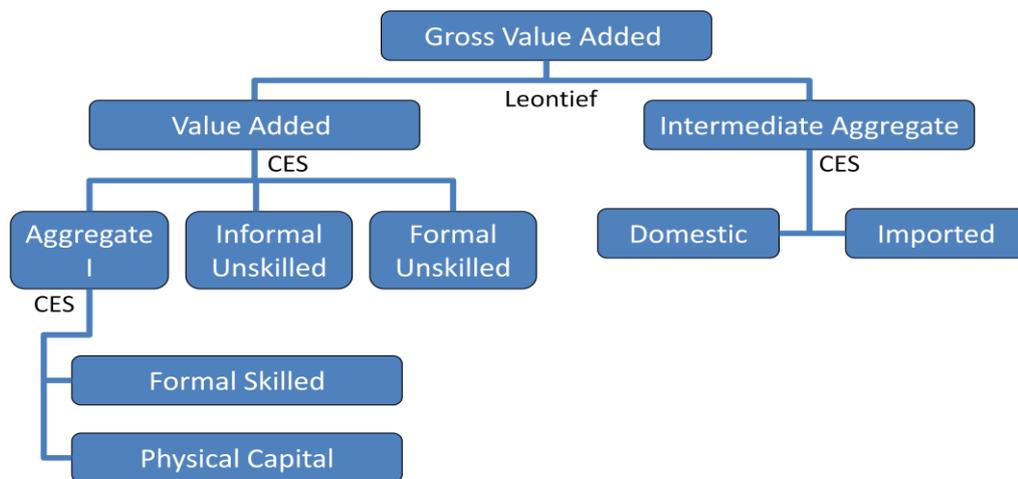
The production function

Domestic output supplies are generated with a nested production function, as diagrammed below. At the top, gross domestic output uses value added and a set of

³⁸ Absorption as in the IFPRI Standard Model, which includes the conventional (macro) use of the term (C+G+I) plus intermediate use by domestic activities.

intermediate inputs in fixed proportions (eqs. 14 and 15). Value added is a CES³⁹ function of i) a physical capital - skilled labor CES composite, ii) informal unskilled labor and iii) formal unskilled labor (eqs. 16 and 18), with the composite having a lower elasticity among factors and hence reflecting that increases in the physical capital stock lowered the demand for unskilled rather than skilled workers (see factor demand below).

Diagram: Production Function



Trade

For non-tradable commodities absorption coincides with domestic production (eqs. 27 and 31). For tradable commodities (primary and industrial), and as described for intermediates, absorption is a CES function of imperfectly substitutable domestic and imported commodities (i.e., an Armington function, eq. 24), with the optimal mix achieved through expenditure minimization under perfect competition such that a fall in the relative price of imports makes the imported share of absorption go up in real terms

³⁹ CES functions have a constant elasticity of substitution among its arguments and have the Cobb-Douglas as a special case (unitary elasticity): in a CES function, a 1% increase in the marginal rate of technical substitution (MRTS) among two factors generates a decrease in the input ratio equal to the elasticity parameter of the function. Assuming profit maximization and perfect competition, the ratio between the MRTS of two inputs equal their price ratio, and then a 1% increase in their price ratio generates a percent decrease in the input ratio given by the elasticity parameter. In the CES function, the shift parameter indicates the state of technology, the share parameters account for the relative participation of each factor in the output (at original relative prices), and the function exponent determines the value of the constant elasticity of substitution (the latter one being the inverse of the former one plus one), and has values which assures convexity to the origin. The function is homogeneous of degree one, so that a proportional increase in the arguments generates an increase of the same proportion on output i.e. returns to scale are constant. Source: Chiang, A. C. (1987). Métodos Fundamentales de Economía Matemática.

(eq. 25). Tradable goods produced domestically are allocated either to exports or to domestic sales, with imperfect transformability between them captured through a Constant Elasticity of Transformation (CET) function⁴⁰ (eq. 28) and the exported share of production increasing in real terms with the relative price of exports (eq. 29). Imperfect substitutability (transformability) also between imports from (exports to) Mercosur and extra-Mercosur is assumed, deriving optimal mixes in analogous ways (eqs. 26 and 30).

4. Factor markets

Factors supply and demand

The factor demands of each sector of activity are derived from firms short-run profit maximization under perfect competition (eqs. 17 and 19). The supply of physical capital results from the accumulation of excesses of past sector-specific gross physical investments over depreciations and, once installed in a sector, is immobile (eq. 65). The supplies of skilled and unskilled workers are exogenous. Following Harris and Todaro (1970) migration model tradition, unskilled workers have imperfect mobility between the formal and informal segments of the labour market⁴¹. Specifically, a positive (negative) fraction of the unskilled in the informal segment move each period to the formal segment if there is an expected wage gain (lose), with expected wages calculated as wages times probabilities of finding a job, proxied in turn by one minus the unemployment rates (eq. 37). Skilled, formal unskilled and informal unskilled are mobile across activity sectors. Unemployment is only allowed in the formal segment of the economy.

Factor wages

For the immobile factor (capital), supply-demand equilibrium in each sector is reached via adjustment of sector-specific wages (wage distortions, eq. 19). For informal unskilled workers, the equilibrium is reached via variation of their economy-wide wage (eq. 35). Finally, for formal (skilled and unskilled) workers, wages adjust only partially

⁴⁰ CES functions modified such that they are concave to the origin

⁴¹ This can be due to absence or poor functioning of institutions to process and provide relevant information on job opportunities to jobseekers, which impede workers in the informal sector to engage in on-the-job search. Searching for a job in the formal segment may require, literally, being 'physically present at the doors of potential employers' (Agénor, Jensen et al. 2005,p20).

through a real wage curve (eq. 34), allowing for unemployment (Blanchflower and Oswald 1994)⁴².

5. Institutions: income, expenditures, and savings

Households

The income of skilled and unskilled representative household groups (RGHs) is composed of (endogenous) labor income, (exogenous) public transfers and net interest flows paid by the banks. The income of the capitalist RHG is composed of endogenous dividend income⁴³ and exogenous interest flows on their holdings of domestic bank deposits, public bonds and deposits abroad, net of interest flow on their bank loans (eqs 39-40). The interest flows paid by or to households are calculated multiplying the financial stocks held by them by the relevant rates of return, both fixed in the Real model⁴⁴ (eqs. 96-99). Households save a share of their income (the propensity to save) which adjust proportionately (eq. 54) such that the overall savings (of households, firms, public and foreign sectors) finance the overall planned investment of the economy and spend the rest of their income (eq. 41). RGHs consumptions are allocated over available goods with a Linear Expenditure System (LES) derivable from the maximization of a Stone-Geary utility function (eq. 42).

Enterprises

Before-tax firm profits are composed of endogenous physical capital income and exogenous interest flows received from banks on their deposits minus exogenous interest flows paid to banks on their loans plus, in the case of the private service sector, bank profits (eqs. 43-44) in turn determined as the difference between interests earned and paid by the bank (eq. 45). To get to after-tax profits, a fixed fraction is deduced to pay for profits tax and exogenous public transfers are added (eq. 46). To the extent that

⁴² Wage curves can be theoretically justified in different ways, including that workers gain negotiating power over their wages with lower unemployment -Blanchard, O., Ed. (2009). Macroeconomics.

or, as in Shapiro & Stiglitz efficiency wage model, with unemployment acting as a substitute for monitoring employees. Wage curves differ from Philips curves in that the latter relates the level of unemployment and the rate of growth of nominal wages (Agénor, Jensen et al. 2005,p18).

⁴³ As in Adam and Bevan (1998), dividends refer to distributed profits.

⁴⁴ This means that the current savings are not accumulated into net wealth, reflecting a stock-flow inconsistency also present in the IS-LM model, as noted by James Tobin in the start of his Nobel Lecture.

after-tax firm profits are positive, an exogenous fraction of them (the “pay-out ratio”) is used for dividend payments (eq. 47), the rest being saved by the firm (eq. 55). The fraction of dividends paid to non-residents is determined by their (exogenous in the Real Model) share in the firms’ equity (eq. 49). Firms gross physical investments follow Tobin's Q type functions depending on the sector remuneration for physical capital and the financial unitary cost of physical capital –a cost that is included in Lewis (1992) model of the investment function (eq. 61), and is financed by owned and externally provided savings.

Government

The government gets its income from taxing value added, firm’s profits, the labour formal wage bill, imports and exports, all relevant in terms of revenue and/or redistributive effects, plus transfer of the net interest earned by the Central Bank, all relevant components of government revenue in Argentina (eq. 50-52). The value added tax (VAT) is relevant from both points of view, being regressive since it taxes consumption, and the poorest deciles in Argentina unsurprisingly show a higher propensity to consume. VAT is modeled as an activity tax. Following the country’s tax regulation, firms’ profit taxes are calculated as a share of before-tax profits. Banks profits are indirectly taxed in the model as their profits are transferred to the private services sector, and then taxed). The most important labor taxes are those charged to employee and employers (and not to self employee), and are proportional to the gross wages in the formal sector. Taxes to exports and imports are ad-valorem. Public current expenditures include public consumption as well as public transfers and interest payments (eq. 53). The difference between public sector income and them determines public savings (eq. 56).

Non-Residents

Foreign savings are determined as non-residents income net of non-residents expenditures, more specifically by the sum of domestic net imports (valued at world prices) plus net transfers, net interests and dividends paid to non-residents (eq. 57). Current and capital account transactions with non-residents are captured in a Balance of Payments register, with the current account balance determined as foreign savings, changed of sign (eq. 67). The capital account balance is determined as the sum of the increases in non-resident holdings of domestic bonds, deposits and equity minus the increase in deposits abroad held by domestic actors (capitalist households and banks)

(eq. 68). The overall balance of payments result from summing the the current and capital account balances (eq. 66).

Macro closures, commodity closures, factor closures, and numeraire⁴⁵

“Closures” determine which variables are to vary in order to equilibrate specific markets. The macro closures are the saving-investment closure, the fiscal closure and the rest-of-the-world ones, and are described first. Savings are investment-driven, with the marginal propensity to save of households varying in order to make the overall savings flow (determined in eq. 58 by households, firms, public and foreign sectors) consistent with the overall investment value (determined in eqs. 59-60). The public sector has exogenous tax rates and real expenditures (essentially outcomes of policy decisions), with its savings endogenously determined. There are fixed foreign savings with flexibility in the real exchange rate achieved through adjustment in the prices of domestic goods and a fixed nominal exchange rate (reflecting Argentina’s Currency Board). With the capital account balance also fixed, the variation of international reserves becomes pre-determined.

There are also commodity and factor closures in this model. As described before, the equilibria in the commodity markets are achieved via Walrasian price-adjustment that equilibrates the composite supply with its demand, determined in turn as the sum of the demand for intermediate use, final consumption, private and public investment by sector of origin (determined in eq. 62 in the light of investment decisions by sector of destination and capital composition by sector of origin), and public consumption (eq. 64). Equilibria in the markets for physical capital and informal workers are determined via full wage-adjustment and equilibria in the markets of formal workers via partial wage-adjustment with unemployment. The equilibrium identity between savings and investments is used to check the model’s calibration (eq. 63). The numeraire in the model is given by the nominal exchange rate.

⁴⁵ Discussions of them can be found in Adelman, I. and S. Robinson (1978). Income Distribution Policies in Developing Countries. Stanford, CA, Stanford University Press.

, Taylor, L. and F. J. Lysy (1979). "Vanishing Income Redistributions: Keynesian Clues About Model Surprises in the Short Run." Journal of Development Economics 6(1): 20.

Real Financial Model

In this model interest rates and financial stocks are allowed to vary endogenously. In particular, the interest rate on deposits in domestic banks is determined with an LM equation that captures transactions demand and liquidity preference and where, as in Lewis (1992), *ceteris paribus*, increases in the real stock of money (proxied by the monetary base divided by the GDP deflator) decrease the interest rate, and increases in transactions (proxied by real GDP) increase it (eq. 114). The interest rate on bank loans is determined by the interest rate on deposits adjusted by the reserves ratio (exogenously determined by the Central Bank) and an exogenous mark-up rate (eq. 92). The return on bonds adjust to clean the bonds market (eqs 93-94). Sector-specific returns on equity are determined by the ratio between after-tax profits and equity (eq. 95). Interest rates on Central Bank rediscounts and on bank required reserves in the Central Bank are exogenously determined by the Central Bank, while return on deposits abroad is exogenous determined in the international financial markets (small country assumption).

Assets-liability Matrix

Financial stock holdings are represented in an assets-liabilities matrix below and in financial balance sheets (Annex III). The cells inside the matrix have financial stocks, with the asset holder in the column and the liability holder in the row. The financial net wealth of each institution, accumulated through past and present savings, is given by the sum of the values in its column minus the sum of the values in its row. The sum of the financial wealth of all the institutions is necessarily zero. There are separate equations to update the financial net wealth⁴⁶ of households (eq. 104), enterprises (eq. 105) and the public sector (eq. 82 and 106). Portfolio balance equations are also present in the model for households (eq. 69), firms (eq. 79), banks (eq. 83) and the Central Bank (eq. 91).

⁴⁶ Omitting capital gains to keep the model to avoid over-complicating the model.

Matrix of Assets and Liabilities

	HHs (Sk,Un)	HHs (Profit- Earning)	Enter prises	Govern ment	Rest Of World	Comm Banks	Central Bank
HHs (Sk,Un)						Loan	
HHs Prof-ear						Loan	
Enterps.		Equity			Equity	Loan	
Gov.		Bond			Bond		Bond
RoW		Deposits Abroad				Deposit Abroad	Intern. Reserves
Comm Bank	Deposit	Deposit	Deposit		Deposits		Rediscount
Central Bank	Currency	Currency				Required Reserves	

Households assets demand

As shown in the above matrix, skilled and unskilled households allocate their assets in cash holdings (for transaction purposes) and domestic bank deposits. Capitalist households are assumed not to face informational difficulties and transaction costs to enter into other financial markets (as in IMMPA), holding then also equity in private firms⁴⁷, bonds, dollar denominated deposits in domestic banks and deposits abroad (eq. 69).⁴⁸ Currency held by households is exogenous and proportional to their initial consumption values.⁴⁹ Skilled- and unskilled households deposits are determined as a residual from their portfolio balance equation (eq. 69). Deposits by capitalist households are consistent with the stock of required reserves held by the bank sector, and the allocation into local-denominated deposits and dollar-denominated deposits follow a fixed rule (eq. 71). The portfolio allocation of capitalist households among bonds, equity and deposits abroad is determined maximizing a CES utility function (see demonstration in Annex IV) with arguments being the expected earnings of the assets,

⁴⁷ Modeled as financial claims on firms net (physical and financial) wealth.

⁴⁸ The inclusion of different denominations in assets provides a source of variation for income and wealth distribution, and prepares the stage for a stock devaluing the domestic currency as it will tend to increase the wealth share of dollar-denominated asset holders. The desired holding of dollar-denominated is assumed to equal that of local-currency deposits, reflecting historical data. If the model is extended to incorporate expected devaluation, this should be adjusted.

⁴⁹ Endogeneizing the households currency holdings proved to break a critical transmission channel in the model: that going from international capital inflows to increases in bank loans for working capital.

as in Adam and Bevan (1998) (eqs. 72-78). This reflects the perception that agents look at relative returns when deciding portfolio asset shares and have risk aversion (they tend to avoid corner solutions)⁵⁰. A perceived probability of default on domestic assets (present in IMMPA) is incorporated affecting their expected return.

Enterprises assets demand

Firms allocate their financial assets in domestic bank deposits⁵¹, as derived from its portfolio balance (eq. 79).

Rest of the world assets demand

Non-residents hold deposits in domestic banks, equity and bonds, with the flows altering the values of these stocks being exogenous⁵².

Commercial banks assets demand

Commercial banks hold required reserves, lend to households and firms and deposit abroad. Total bank assets are essentially determined by banks liabilities (deposits), given that their net financial wealth is fixed⁵³. Required reserves are consistent with the required reserves ratio times total deposits (eq. 84). The rest of the portfolio is allocated using a CES utility function as explained for capitalist households (eqs. 85-90).

Central Bank assets demand

The Central Bank provides some limited exogenous credit to banks (i.e. rediscounts) and buys an exogenous limited amount of public bonds (i.e. deficit monetization). The variation of international reserves held by the Central Bank is the overall result of the balance of payments, which in turn is assumed to be a constant fraction of the capital account balance (eq. 102) given by historical data (see calibration section).

⁵⁰ This approach has the additional advantages of simplicity and low data requirements.

⁵¹ This means that firms in a given sector simultaneously have deposits and loans. This may be observed due to: a) different periods of loans and deposits and b) some enterprises getting loans while others depositing funds into banks. The same argument holds for other institutions.

⁵² The idea of exogenous international capital was at the heart of the ISS money and finance project, which sought to correct the imbalance where many macro models saw the capital account as a balancing item which adjusted to the current account. This view was also applied to aid by Howard White in the early 90s, with the main idea that aid creates deficits rather than fills them

⁵³ As commented in the enterprises section, their profits are transferred to private sector enterprises.

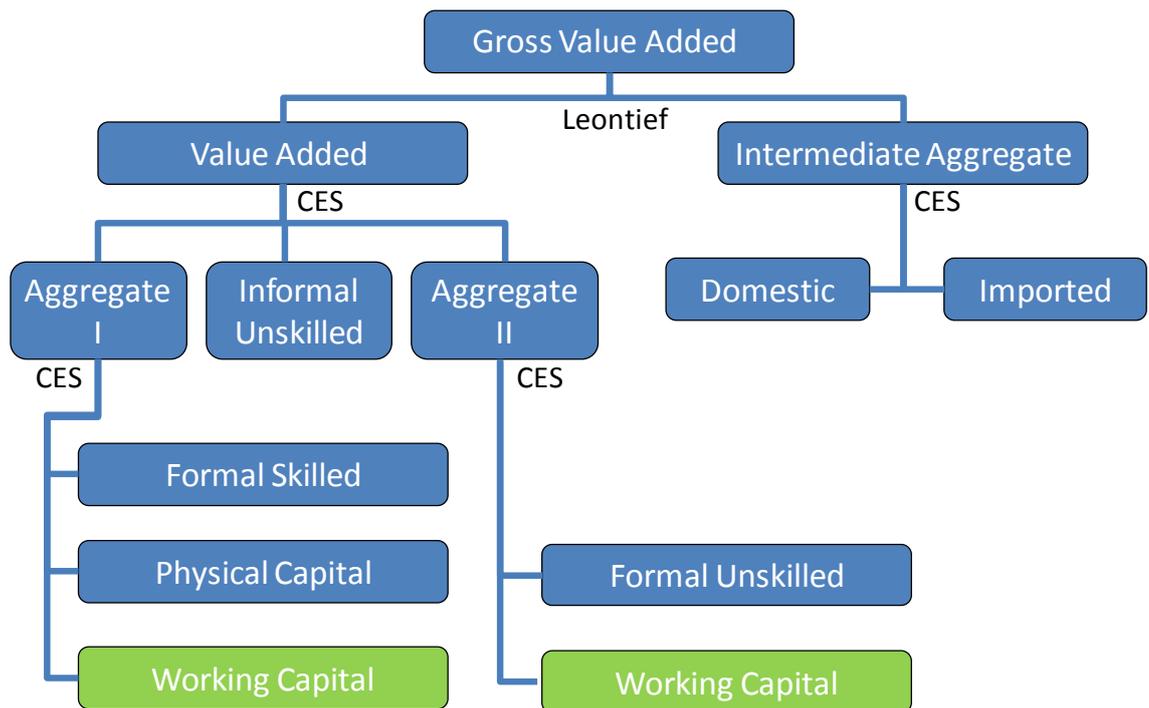
Stock flow consistency

Financial flows are accumulated into stocks in the same period than the flow is produced (eqs. 104-112). For example, the stock of foreign deposits in domestic banks in a given period is the previous one adjusted by the flow during the given period.

Real Financial Augmented Model

Following Friedman's (1969) 'money in the production function' tradition, working capital is included as a factor in the production function, affecting the efficiency with which real factors are used in the formal economic activities and, as a result, the overall supply of output and the structure of production. A market for working capital is specified, with roles for its demand and its supply and a market-clearing 'price'. Its demand is derived from firms' short-run profit maximization, together and analogously to their demand for real factors. Its nominal supply to the enterprise aggregate is determined by banks as the total asset value of banks times the sum of the shares of enterprises which was derived maximizing the bank's CES utility function on asset earnings (eq. 117). The nominal supply of working capital is translated into a real one dividing by the GDP deflator (eq. 115). The real return on working capital loans adjusts until market-clearing is reached, unless a minimum wage for working capital is hit before, putting a break to the productive use of working capital and its effect on the activity level (eqs. 116 and 119-120). Finally, the return by real unit of working capital is translated into a return by nominal unit of working capital multiplying by the GDP deflator (eq. 121). The share of working capital allocated to each sector is the same whether it is observed in nominal or real terms (eq. 118).

Diagram: Production Function with Working Capital



Real Financial Augmented Short-Run Model

This version of the model allows for higher effects of the shocks considered on aggregate supply. Specifically, a minimum real wage for physical capital is assumed, with capacity utilization becoming flexible when this minimum is achieved, the wage curve concerns nominal instead of real wages, and the elasticity in the wage curves are reduced from 0.1 to 0.01 such that the model approaches the case of real wage rigidity.

7. Model Calibration

Once the model is specified, its parameters need to be assigned. They can be econometrically estimated or, as usual in CGE models, calibrated. As argued by Dawkins et al (2001), calibration is conceptually similar to conventional estimation, in the sense that both refer to choosing parameter values subject to a goodness of fit criterion with respect to data. With independence of the existing debate about the relative merits of estimation versus calibration, calibration can be conceptualized as a special case of estimation: estimation in the case of under-identification, where the number of parameters to be estimated exceeds the number of observations. Calibration is widely used in microeconomic models, has become in recent years a mainstream form of empirical investigation in macroeconomics, and is a widely used technique in natural and life sciences (Dawkins, Srinivasan et al. 2001). The reason for calibrating vis-à-vis estimating the model is to keep the focus on the main causal chains at stake (i.e. the effects of liberalization and the economic significance of including the financial sphere in the model). In any case, calibration does have a cost: the numerical model one gets lacks a complete and consistent econometric formulation which, in turn, precludes the use of the model for forecasting, with its results only yielding “indications of the relative orders of magnitude for possible policy (or shock) adjustments in the economy” (Dawkins, Srinivasan et al. 2001, 3677). The goal of the analysis becomes getting a quantitatively informed insight for policy input and better understanding of the economic processes at stake, being able to answer questions of the following type: Which effects are large? Which are the major stresses under which the economy is subjected? Are these opposite to received wisdom? If so, why?

In principle, one would like to follow best practices when doing calibration. However, as explained by Dawkins et al, there is no discussion in the literature as to what these are. As usual, in calibrating a general equilibrium model, the numerical values of some model parameters are typically set exogenously, while others, the calibrated parameters, are endogenously determined so as to reproduce the benchmark data⁵⁴ as an equilibrium of the model. This follows a tradition started by Shoven and Whalley (1972), who, when seeking to calculate the welfare costs of differential tax treatment of capital

⁵⁴ It refers to the microconsistent equilibrium dataset derived from adjusting basic data in order to satisfy the equilibrium conditions of the model.

income by sector in the US, introduced the use of the equations characterizing the equilibrium solution of the model to solve for the values of the parameters whose values had not been set exogenously. Essentially, they converted the parameters into variables, and solved for their values by trivially imposing equilibrium as an identifying restriction, using benchmark data.

Calibration and the SAM

The benchmark data is usually organized in CGE models in a Social Accounting Matrix (SAM), which “provides a complete account of the circular flow in the economy” (Robinson 1989 p.907), with its level of disaggregation depending on the problem at hand. The SAM must satisfy certain conventions: “the rows and columns represent the income and expenditure accounts (respectively) of the various actors, and must always balance. A SAM is thus defined as a square matrix, with the totals of corresponding rows and columns always being equal”, such that there are “no leakages or injections into the system and every flow must go from some actor to some other actor” (Robinson 1989 p. 898).

For the purpose of calibrating the model for Argentina, I designed and completed the cells of a SAM targeted to the Argentinean economy at the beginning of the Convertibility Plan, taking account of real and financial flows, arriving at a Conceptual and a Numeric SAM which are presented below. In the current accounts of the SAM, there are activities (sectors), commodities, factors, and the actors included in the model: households, enterprises, government, rest of the world, commercial banks (from now on, simply referred as banks) and the Central Bank. Each of the actors in the current account has also a capital account which describes how it allocates its savings into financial and real investments. The categories of activities, commodities, factors, households and enterprises follow those already defined for the model. Payments in the SAM, as usual, are made from accounts in the columns to accounts in the rows. The description the flows present in the SAM follows the order in which the accounts are presented there, going downwards:

- Activities –producers- get their income from the commodities account and pay for intermediate inputs to commodities, for value added at factor cost to factors and for value-added tax to the government.

- Commodities get their income from selling intermediate inputs to activities, consumption goods to households and government, exports to the rest of the world, and gross fixed physical investment to the (capital accounts of) the government and enterprises⁵⁵. Their income is spent in payments to activities - for production-, to the rest of the world -for imports- and to the government –for taxes on imports and exports-.
- Factors get their income from adding value in activities, and spend it in payments to households (labor income), enterprises (physical and working capital factors), and to the government (taxes to factors).
- Households get after-tax labour income from factors, dividends from enterprises, transfers from the government and interest payments from banks (on domestic deposits), from government (on public bonds) and from non-residents (on deposits abroad). They allocate this income in consumption, in paying interests on their bank loans, and in savings.
- Enterprises receive (capital) factor income, transfers from the public sector and from domestic banks (in the case of private service enterprises) and interest payments on domestic deposits. They pay interests on their bank loans and taxes on their profits, saving a fraction of their post-tax profits and then distributing the rest among capitalist households and non-residents, these last two in a proportion which depends on their equity shares.
- The government gets income from taxes and eventual central bank profits, and spends in public consumption, transfers to households and enterprises, and interest payments on their bonds stock, saving the difference.
- Non-residents receive income from the country's imports, distributed profits to non-residents and interests on their holdings of domestic deposits and bonds, and pay for the country's exports and for interests on deposits abroad by domestic agents.
- Banks get interest payments on their loans to households and enterprises, their bond holdings and their deposits abroad. They pay interests on deposits to households, enterprises, and non-residents, and on Central Bank rediscounts, transferring their profits to the private service enterprise sector.

⁵⁵ So that changes in stocks are assumed to be null in the initial year.

- The Central Bank receives income on their bond holdings, rediscounts and reserve deposits abroad, and pays interests on the Central Bank foreign debt, transferring eventual profits to the central government.
- Households allocate their savings into acquiring property in enterprises, public bonds, deposits in domestic banks (in local or foreign currency) and abroad, and currency.
- Enterprises allocate their retained post-tax profits in domestic deposits.
- Non-residents allocate their savings in acquiring property in domestic enterprises, public bonds, deposits in domestic banks and lending to the Central Bank.
- Banks allocate the savings received by them in reserves at the Central Bank, lending to households, enterprises, non-residents and acquisition of public bonds.
- The Central Bank allocates received funds in public bonds, foreign reserves, and rediscounts to commercial banks.

Conceptual Social Accounting Matrix Argentina

		CURRENT ACCOUNTS									CAPITAL ACCOUNTS						
		Activities	Commodities	Factors	Households	Enterprises	Government	Rest of the World	Banks	Central Bank	Households	Enterprises	Government	Rest of the World	Banks	Central Bank	TOTAL
C U R R E N T A C C O U N T S	Activities		Supply matrix														
	Commodities	Intermediate Consumption			Private Consumption		Public Consumption	Exports				Private Investment	Public Investment				
	Factors	Value added at factor cost															
	Households			Factor income to households		Profits distributed by enterprises to households	Interests paid by government on hh's holdings of gov bonds & Gov transfers to hhs	Interests paid by non-residents on household deposits abroad	Interests paid by banks on household's deposits								
	Enterprises			Factor income to enterprises			Government transfers to enterprises		Interests paid by banks on enterprises deposits & Transfer of profits								
	Government	Taxes on value added	Taxes on imports and exports	Taxes on labor		Taxes on profits				Transfer of profits from Central Bank to gov							
	Rest of the World		Imports			Profits distributed by enterprises to non-residents	Interests paid by government on non-residents' holdings of gov bonds		Interests paid by banks on non-resident' deposits								
	Banks				Interests paid by households on bank loans	Interests paid by enterprises on bank loans	Interests paid by government on banks' holdings of gov bonds	Interests paid by non-residents on banks deposits abroad									
	Central Bank						Interests paid by government on central bank' holdings of gov bonds	Interests paid by non-residents on Central Bank foreign reserves	Interests paid by banks on rediscounts								
C A P I T A L A C C O U N T S	Households				Household savings										Variation in loans by banks to households		Variation in households liabilities and net wealth
	Enterprises					Enterprise savings				Variation in property of enterprises by households			Variation in property of enterprises by non-residents	Variation in loans by banks to firms		Variation in firms liabilities and net wealth	
	Government						Public Savings			Variation in household's holdings of public bonds			Variation in non-residents' holdings of public bonds	Variation in banks' holdings of public bonds	Variation in Central Bank's holdings of public bonds	Variation in government's liabilities and net wealth	
	Rest of the World							Foreign savings		Variation in household's deposits abroad				Variation in banks' deposits abroad	Variation in Central Bank's foreign reserves	Variation in non-resident's liabilities and net wealth	
	Banks									Variation in household's deposits at banks	Variation in firms' deposits at banks		Variation in non-residents' deposits at banks		Variation in rediscounts	Variation in bank's liabilities	
	Central Bank									Variation in household's cash holdings					Variation in banks' reserve requirements		Variation in central bank's liabilities
	TOTAL										Variation in households assets	Variation in firms assets		Variation in non-residents assets	Variation in banks' assets	Variation in Central Bank's assets	

Calculating the cells of the Numeric SAM

The SAM cells are calculated in three main steps, choosing year 1991 as the benchmark one⁵⁶. First I prepare an aggregated proto-SAM, a table where I keep activities, commodities, factors, households and enterprises aggregated into a single activity, a single commodity, etc, and where consistency is not assured: agents sources of income do not necessarily match their uses, i.e. row sums may differ from column sums. Second, I disaggregate the accounts in the proto-SAM, still without assuring consistency. Finally, I eliminate inconsistencies using Cross Entropy, particularly using a GAMS code elaborated by Sherman Robinson & Moataz El-Said, selecting macro controls for GDP, aggregate demand components apart from private consumption⁵⁷, and tax receipts. I slightly modified the code to assure that the sector-specific payments to capital coincide with the payments from capital to the sector-specific enterprises, and that the commodity shares in private investment are the same than the ones in public investment, to be consistent with the uniqueness of the capital good composition assumed in the model. The details of the construction of the Numeric SAM can be seen in Annex V⁵⁸, and an aggregated Numeric SAM is presented below.

⁵⁶ While in theory any anomalies in the economy for the benchmark year might be transmitted to the model results, tainting the conclusions, Roberts (1994) examines the significance of this in a model of Poland by calibrating to five different benchmark years, and concludes that model results are robust to the choice of benchmark year.

⁵⁷ Which is obtained as residuals in National Accounts.

⁵⁸ And for further clarification, you can write to me at d.debowicz@ids.ac.uk

Numeric Social Accounting Matrix Argentina 1991 – In Billions of Dollars at 1993 Prices

		CURRENT ACCOUNTS									CAPITAL ACCOUNTS					
	Activities	Commodities	Factors	Households	Enterprises	Government	Rest of the World	Banks	Central Bank	Households	Enterprises	Government	Rest of the World	Banks	Central Bank	TOTAL
CURRENT ACCOUNTS	Activities	312.58														312.58
	Commodities	122.72			148.27		10.52	21.51				28.62	0.85			332.49
	Factors	182.20														182.20
	Households			108.95		25.32	15.92	3.35	0.45							153.98
	Enterprises			63.73			0.34		6.80							70.87
	Government	7.66	1.83	9.52		2.16				11.89						33.07
	Rest of the World		18.07			0.99	13.25		1.82							34.14
	Banks				1.38	6.00	6.27	0.20								13.85
	Central Bank						6.50	0.62	4.77							11.89
CAPITAL ACCOUNTS	Households				4.33									1.77		6.10
	Enterprises					36.40				-11.01			8.26	6.06		39.71
	Government						-19.73			11.99			1.99	2.40	4.19	0.85
	Rest of the World							8.46		0.76				0.54	2.16	11.91
	Banks									0.64	11.09		1.66		-1.96	11.43
	Central Bank									3.72				0.67		4.39
	TOTAL	312.58	332.49	182.20	153.98	70.87	33.07	34.14	13.85	11.89	6.10	39.71	0.85	11.91	11.43	4.39

Exogenous parameters and calibration

The elasticities are choice parameters, except for those in the wage curve equations (0.10), which are taken from an econometric estimation for Argentina during the period of the Convertibility Plan done by Damill, Frenkel et al (2002). Elasticities in the production function are 0.8, except for that in the skilled-capital composite, which is assigned a 0.2 value, reflecting evidence of low substitution between skilled labor and physical capital for middle-income countries reported by Agenor et al (2005,p11). Those in the import-domestic Armington function and export-domestic CET function are 4.5, and those for import origins and export destinations 1.5, reflecting especially low substitution and transformation possibilities between Mercosur area and the rest of the world⁵⁹. The migration elasticity among segments of the labor market equals 0.1. The elasticities in the LES consumption function after adjusting for Engel law satisfaction are around 1.10 for the industrial commodity and 0.91 for the others. The semi-elasticity in the investment function equals 0.2. Elasticities of money demand are 2 respect to interest rate on deposits and 1 respect to real GDP changes. Elasticities in the CES utility functions on asset earnings equal 1.05, such that the asset shares in the portfolios of capitalist households and banks tend to be pretty stable (they would be stable with a value approaching 1).

In relation to the remaining choice parameters, the originally perceived probabilities of default were set at 0, the annual depreciation of the capital stock at 2%, and the nominal exchange rate at 1. The sensibility of the balance of payment result to the capital account balance was calculated as the benchmark ratio of the balance of payment result and the capital account balance, resulting into 0.203. The natural unemployment rates was assumed to be rather low (3%).

As usual in CGE models, most initial prices are given a value of 1⁶⁰, allowing to directly read most values in the SAM as quantities: for example, by setting the initial PM (import price perceived by the demander) equal to 1, the benchmark QM (import quantity) is read directly from the value paid by demanders for imported commodities in

⁵⁹ The elasticities in the CES and CET functions (ε) inform the ρ parameters which enter explicitly in the model, with $\rho=1/\varepsilon-1$ in the CES and $\rho=1/\varepsilon+1$ in the CET functions.

⁶⁰ Excluding those which are assigned as a function of other prices e.g. $pwer_{c,r}$.

the SAM. The setting of the original prices together with the use of benchmark data as identifying restrictions allows to calibrate the remaining model parameters, with the only exception of those in the LES consumption function. For example, for each commodity which is both imported and demanded domestically, the scale (α_c^q) and the share parameters (δ_c^q) in the import-domestic Armington function are assigned using as identifying restrictions the Armington function and the import-domestic demand equilibrium ratio (eqs. 24 and 25), with the remaining elements in the equations already set: ρ_c^q from the exogenous Armington elasticity, the associated prices (PM and PD) from the arbitrary unitary setting, and the associated quantities (QQ, QD and QM) from reading values of absorption, domestic demand of domestic good and import of the commodity in the SAM. For the case of the LES consumption function, the calibration of its marginal share ($\beta_{c,h}^m$) and subsistence ($\gamma_{c,h}^m$) consumption parameters inputs, in addition, the already calculated Engel-Law-consistent consumption elasticities and (for calibrating $\gamma_{c,h}^m$) Frisch parameters taken from De Melo and Tarr (1992).

8. Simulations

Simulations and Models

Given my thesis focus, I concentrate on shocks which are related to the foreign sector. I perform 10 simulations on the 4 models described, largely focusing the description of the results on the transmission mechanisms at work, in order to get a deep insight on the models workings. The complete set of simulations include five simulations where the impulse to the economy is given via the capital account of the balance of payments (K1 to K5), and five where the impulse is essentially given in the trade balance of its current account (T1 to T5)⁶¹.

Name	Description
K1	Increase the probability of default on domestic assets by 10 percentage points
K2	Increase the risk-free world interest rate by 10 percentage points
K3	Lower non-residents deposits in domestic banks by 10 percent.
K4	Lower non-residents holdings of equity in domestic firms by 10 percent
K5	Increase non-residents public bond holdings by 10 percent
T1	Lower the import taxes by 10 percent
T2	Lower the export taxes by 10 percent
T3	Increase the world prices of exports by 10 percent
T4	Reduce the world prices of import by 10 percent
T5	Devalue the domestic currency by 10 percent

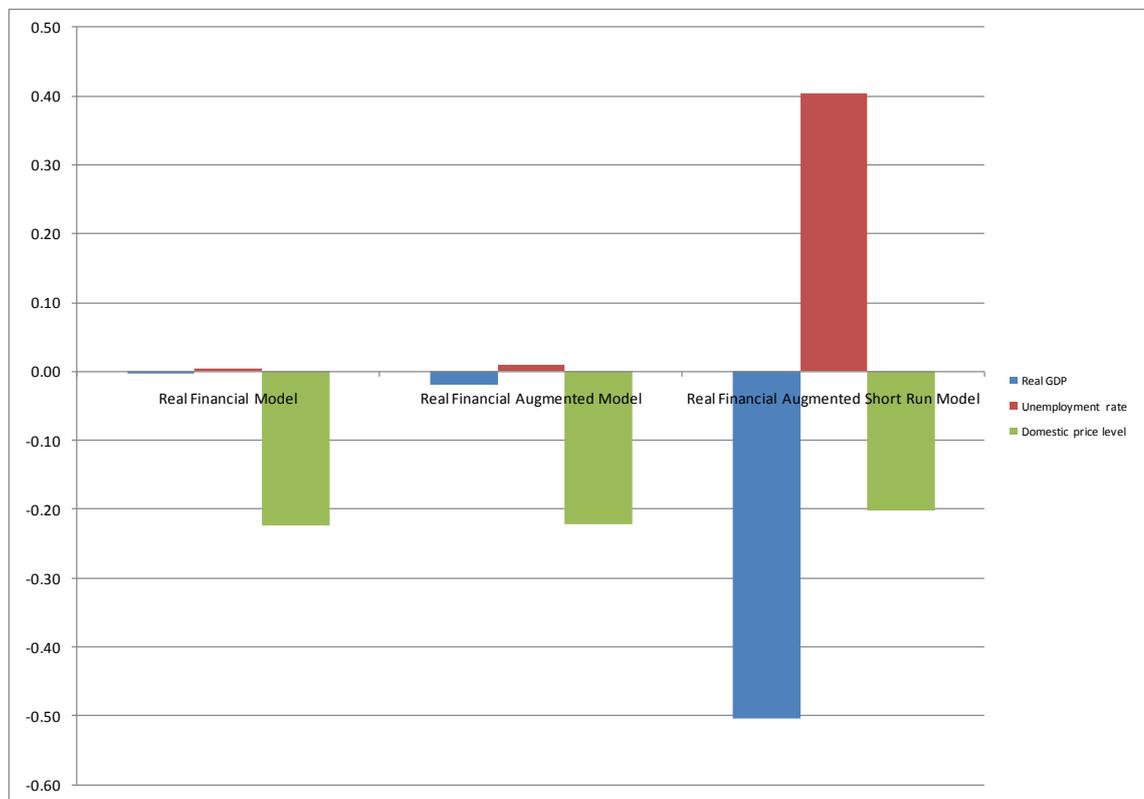
The results of the simulations are summarized in the following Table. However, for the sake of conciseness here I report in detail the results of only two simulations which were relevant for the performance of the Argentinean economy during the nineties: one related to capital account liberalization (K1) and one related to trade liberalization (T1). The results of the remaining simulations, which help in improving the understanding of the models workings, is located in Annex VI.

⁶¹ The devaluation simulation also gives an impulse in the capital account, as it changes the domestic value of dollar-denominated assets and capital account flows.

Simulation K1. 10% increase in perceived probability of default on domestic assets

Anticipating the conclusions, and as shown in the following graph, the shock leads to a contraction of the activity level, an increase in the unemployment rate and price deflation in all the financial models, with the economic contraction being significant only in the real financial augmented short run model, where GDP contracts 0.50% and the unemployment rate increases 0.40 percentage points.

Graph. Macro Effects of 10% Perceived Increase in Domestic Assets Default Probability ⁶²



⁶² Real GDP and domestic price level variations in percentages, unemployment rate variation in percentage points.

Real Model

This model is essentially non financial and as such does not account for the effect of changes in the perceived probability of default on domestic assets.

Real Financial Model

The shock reduces the expected return on domestic assets, increasing the relative remuneration of foreign assets and hence their attractiveness, provoking that for those with the option of depositing abroad (capitalist households and banks) reassign their asset portfolios substituting away from domestic assets into deposits abroad. In this process, the economy suffers capital outflows and proportional cuts in the stock of international reserves held by the Central Bank that reduce the current account deficit that the economy is able to finance. The impulse also puts in motion forces that lead banks to finally reduce their deposits abroad⁶³, anyway with an overall fall in capital inflows for the economy driven by capitalist households inflow fall.

Table. Balance of Payments

	Base (B\$)	% Change
<u>Current Account</u>	-8.46	3.56
Trade Balance	3.44	9.58
Exports of Goods and NFS	21.51	0.75
Imports of Goods and NFS	18.07	-0.93
Investment Income	-11.90	-0.24
Interests	-10.91	-0.28
Profits and Dividends	-0.99	0.23
<u>Capital Account</u>	10.62	-3.56
Non Financial Private Sector	7.50	-5.06
Public Sector	1.99	FIXED
Commercial Banks	1.13	0.13
<u>Balance of Payment Result</u>	2.16	-3.56

With a fixed nominal exchange rate, this reduction in the current account deficit is achieved through domestic deflation that depreciates the real exchange rate and leads to increase the trade superavit and reduce the deficit in the current account: the exports value increases 0.75% and the imports value falls 0.93%, increasing the share of exports

⁶³ In turn, this is due to 1) the reduction of deposits by capitalist households in domestic deposits (as they are perceived as more prone to default), which reduces the asset portfolio of the banks, and 2) increases in the rates of return on bank loans and bonds holdings -explained below- which give incentives for banks to substitute away from foreign assets into domestic ones.

and decreasing that of imports in aggregate demand (0.11 p.p. and 0.07 p.p., respectively), as shown in the following Table.

Table. Aggregate Demand Components Shares

	Base	p.p. change
<i>Absorption</i>	98.20%	-0.18
Private Consumption	77.35%	-0.17
Fixed Investment	15.37%	-0.01
Public Consumption	5.49%	0.00
Exports	11.22%	0.11
Imports	-9.43%	-0.07
<i>GDP (C+I+G+E-M)</i>	100.00%	0.00

Producer prices fall proportionately less in the tradable sectors (as their export prices do not fall), providing incentives for firms to mobilize resources out of construction and private services to the sectors producing tradable commodities i.e. increasing the shares of agriculture and industry into total value added, producing commodities for export destination or import substitution.

Table. Sector Value Added Shares

	Base	p.p. change
Agriculture	7.9%	0.020
Industry	18.0%	0.015
Construction	5.5%	-0.003
Private Services	61.6%	-0.032
Public Services	7.1%	0.000
Total	100.0%	0.000

Overall, the fall in domestic prices lowers the demand for factors at given nominal wages and leads to a marginal cut in the use of formal workers (0.002% for skilled, 0.01% for unskilled) and in the nominal wage of every factor⁶⁴. With the growing primary sector being a particularly intensive user of informal unskilled workers (as can be observed in the SAM), the real wage of the informal unskilled goes up (0.06%) and the real wages of the other factors go marginally down (0.01% for capital, 0.005% for formal skilled, 0.003% for formal unskilled).

⁶⁴ Non-tabulated

Table. Factor Use

	Base (mill. individuals)	% change
Formal Skilled	1.43	-0.002
Formal Unskilled	7.39	-0.01

Table. Real Wages

	Base	% change
Formal Skilled	16.82 (\$000/year)	-0.005
Formal Unskilled	9.29 (\$000/year)	-0.003
Informal Unskilled	9.29 (\$000/year)	0.06
Capital	0.20 (%)	-0.01

These changes in turn lead to a marginal increase in the income share of the informal unskilled (0.008 p.p.) that, together with a fall in dividends caused by the domestic deflation⁶⁵, lifts the household income share of the unskilled and reduces that of the capitalist households (both by 0.02 p.p.).

Table. Factor Income Shares

	Base (%)	p.p. change
Formal Skilled	13.2	-0.001
Formal Unskilled	37.7	-0.003
Informal Unskilled	14.1	0.008
Physical Capital	35.0	-0.004

Table. Household Income Shares

	Base (%)	p.p. change
Skilled	14.1	0.00
Unskilled	64.6	0.02
Capitalist	21.3	-0.02

The commented fall in the Central Bank's international reserves leads to a contraction of the monetary base (0.77%) which exceeds that of the CPI (0.22%), making real liquidity in the economy shrink and the bank rates of return increase (0.06 p.p. on deposits and 0.10 p.p. on loans). The return on equity falls in every sector except in the primary one since being highly export-intensive is quite insulated from the revenue falls caused by domestic deflation. The falls in domestic prices, wages, employment and output lower the tax base and public revenue (0.22%) increasing the public deficit and

⁶⁵ Which is only partially offset by increases in the returns of bonds and domestic deposits held by the capitalist RHG which are described below.

the public sector supply of bonds, lowering their price and increasing their rate of return (0.15 p.p.). In turn, the higher rate paid by the public sector on its bonds has an immediate reinforcing effect on the public sector deficit, which shows a final increase of 0.33%. The increase in the public deficit is compensated by increasing private savings, lowering the private consumption demand as evidenced in the fall of the aggregate demand share of consumption (-0.17 p.p.).

Table. Rates of Return

	Base (%)	% change	p.p. change
Bonds	48.7	0.32	0.15
Deposits	23.0	0.28	0.06
Equity, agriculture	20.7	0.22	0.05
Equity, industry	20.6	-0.09	-0.02
Equity, construction	21.2	-0.42	-0.09
Equity, private services	23.5	-0.37	-0.09
Loans	35.0	0.28	0.10

Table. Public Sector Finance

	Base (B\$)	% change
<u>Total Revenue</u>	21.18	-0.22
Direct Taxes	9.50	-0.22
Indirect Taxes	11.68	-0.21
<u>Total Expenditure</u>	53.65	0.06
Consumption	10.52	-0.23
Transfers	12.11	FIXED
Domestic Interest Payments	16.91	0.05
Foreign Interest Payments	13.25	0.36
Investment	0.85	-0.22
<u>Total Financing</u>	32.47	0.33
Non Financial Private Sector	11.99	0.10
Bank	2.40	-0.55
Central Bank	16.09	FIXED
Rest of the World	1.99	FIXED

Real Financial Augmented Model

The deposit contraction generated by the shock reduces the supply of working capital loans by banks (0.34%), negatively affecting the productivity of and the producers' demand for the real factors besides the negative effect of falling prices on factor demand and use. The economic contraction is larger than in the real financial model, but is still

tiny: the effects on the use of formal workers (-0.01% skilled, -0.02% unskilled), on the unemployment rate (0.01 p.p.) and on total output (-0.02) are pretty insignificant.

Table. Factor Use

	Base (mill. Individuals and B\$)	% change
Formal Skilled	1.43	-0.01
Formal Unskilled	7.39	-0.02
Working Capital	17.15	-0.34

Table. Macroeconomic Indicators

	Base	change
Real GDP	189.86 B\$	-0.02%
Unemployment rate	14.0%	0.01 p.p.
CPI	1.00	-0.22%

Concerning distribution, there are real wage increases for working capital (driven by its supply contraction) and for the informal unskilled (as before) that drive changes in factor income shares. At the household level, the unskilled income share increases (as in the real financial model), and the capitalist household income share falls, with the contraction of the income share of physical capital more than offsetting the working capital share increase, as the share of physical capital in value added is much larger than the working capital's one (31.7% vs. 3.3%).

Table. Real Wages

	Base	% change
Formal Skilled	16.82 (\$000/year)	-0.02
Formal Unskilled	9.29 (\$000/year)	-0.01
Informal Unskilled	9.29 (\$000/year)	0.04
Physical Capital	0.20 (%)	-0.06
Working Capital	0.35 (%)	0.66

Table. Factor Income Shares

	Base (%)	p.p. change
Formal Skilled	13.2	0.00
Formal Unskilled	37.7	0.00
Informal Unskilled	14.1	0.01
Physical Capital	31.7	-0.01
Working Capital	3.3	0.01
Total	100.0	0.00

Table. Household Income Shares

	Base (%)	p.p. change
Skilled	14.1	0.00
Unskilled	64.6	0.02
Capitalist	21.3	-0.02

Overall, and as in the real financial model, the shock has marginal effects on the activity level (-0.02%) and the unemployment rate (+0.01 p.p.), a deflationary effect (CPI lowers 0.22%), and leads to a slight increase in the unskilled RHG income share (0.02 p.p.).

Real Financial Augmented Short Run Model

In this model, there are indeed significant effects on unemployment (+0.40 p.p.) and the activity level (-0.50%) in the short run, together with deflation in the order of magnitude seen in previous models (-0.20%).

Table. Macro Indicators

	Base	change
Real GDP	189.86 B\$	-0.50%
Unemployment rate	14.0%	0.40 p.p.
CPI	1.00	-0.20%

As in the RFA model, the capital outflow contracts liquidity and working capital in the economy, causing a fall in the demand for the real factors. But in the present model this leads to quantity rather than to price adjustments: with physical capital capacity utilization being flexible, the use of the physical capital stock falls by more than 0.50%; with wage curves that essentially fix nominal wages⁶⁶, the use of the formal workers shrink (0.54% skilled, 0.63% unskilled). So, the shock generates a significant cut in the use of labour, physical capital and working capital, getting a significant contraction in the activity level (0.50%).

⁶⁶ With nominal wages being a function of the unemployment rate with a very low (0.01) elasticity.

Table. Factor Use

	Base (mill. Individuals and B\$)	% change
Formal Skilled	1.43	-0.54
Formal Unskilled	7.39	-0.63
Physical Capital	288.65	-0.56
Working Capital	17.15	-0.55

In turn, the contraction of the economy reduces firms profits and lowers the return on equity in every sector (0.08 p.p. in primary sector, 0.18 p.p. in industry, 0.10 p.p. in construction, and 0.22 p.p. in private services). The contraction also significantly reduces the demand for working capital and leads to falls in the nominal remuneration of working capital (and other) loans (-0.12 p.p.) and deposits (-0.08 p.p.). As before, public revenue falls with the contraction of the economy, increasing its deficit and its supply of public bonds, leading in turn to a fall in the price of bonds and hence an increase in their return (+0.47 p.p.).

Table. Rates of Return

	Base (%)	p.p. change
Bonds	48.7	0.47
Deposits	23.0	-0.08
Equity, agriculture	20.7	-0.08
Equity, industry	20.6	-0.18
Equity, construction	21.2	-0.10
Equity, private services	23.5	-0.22
Loans	35.0	-0.12

The household income distribution changes in the same direction than in previous models, in favor of unskilled households and against capitalist households, with a higher intensity -the unskilled RHG increases and the capitalist RHG decreases their income shares by 0.03 p.p.- driven by the hit of falling equity returns on dividends and hence on the income of the capitalist households.

Table. Household Income Shares

	Base (%)	p.p. change
Skilled	14.1	0.00
Unskilled	64.6	0.03

Capitalist	21.3	-0.03
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Simulation T1: 10% fall in import taxes

Real Model

The fall in import taxes, with an original uniform tariff rate of 5.7%, lowers the import prices perceived by the domestic demanders and increase the ratio of imports to GDP (+0.13 p.p.). Also, by its direct effect on public revenue (-0.58%), it increases the financing needs of the public sector (0.46%).

Table. Aggregate Demand Components Shares

	Base	p.p. change
<i>Absorption</i>	98.20%	0.00
Private Consumption	77.35%	0.00
Fixed Investment	15.37%	0.00
Public Consumption	5.49%	0.00
Exports	11.22%	0.13
Imports	-9.43%	0.13
<i>GDP (C+I+G+E-M)</i>	100.00%	0.00

To increase imports, domestic demanders substitute away from domestically produced goods, generating excess supply of domestic goods which leads to a domestic price fall, anyway allowing for a fall in the relative price of imports (of 0.28%). The fall in the domestic price leads to an increase in the relative price of exports (0.23% overall⁶⁷), giving producers an incentive to increase exports (export GDP share increases 0.13 p.p. and export value increases 1.16%). As a result of the imports and exports increases, the degree of openness (measured as the trade/GDP ratio) goes up by 0.26 p.p., and mobile factors shift to the sectors producing export goods (the primary sector value added share increases 0.012 p.p. and that of industry 0.002 p.p.).

Table. Sector Value Added Shares

⁶⁷ The relative price of exports is allowed to vary in different magnitude than the relative price of imports given that the sector weights in exports and imports differ.

	Base	p.p. change
Agriculture	7.9%	0.012
Industry	18.0%	0.002
Construction	5.5%	0.000
Private Services	61.6%	-0.013
Public Services	7.1%	-0.001
Total	100.0%	0.000

The fall in the prices of imports and domestically produced goods for domestic use lowers the CPI (0.27%) and, in turn, increases factor real wages⁶⁸. The factor intensively used in the growing export sectors - the informal unskilled workers—see its demand and real wages increase above the average, while the formal workers are particularly hit by the reduction of the private services sector.

Table. Real Wages

	Base	% change
Formal Skilled	16.82 (\$000/year)	0.02
Formal Unskilled	9.29 (\$000/year)	0.02
Informal Unskilled	9.29 (\$000/year)	0.13
Capital	0.20 (%)	0.09

The above-average increase in the wages of informal unskilled labour and capital increases their factor income shares (by +0.01% each one) and reduce those of the formal factors. Capitalist households, who receive dividends associated to the capital factor income, increase their share in household income, the skilled decrease theirs, and the unskilled keep their share constant given offsetting effects of formal and informal unskilled shares.

Table. Factor Income Shares

	Base (%)	p.p. change
Formal Skilled	13.2	-0.01
Formal Unskilled	37.7	-0.01
Informal Unskilled	14.1	0.01
Physical Capital	35.0	0.01

⁶⁸ This effect offsets the effect on wages coming from the decrease in the output prices of producers linked to the commented fall in the price of goods produced domestically for domestic use.

Table. Household Income Shares

	Base (%)	p.p. change
Skilled	14.1	-0.01
Unskilled	64.6	0.00
Capitalist	21.3	0.01

Overall, the degree of openness of the economy increases (0.26 p.p.), income distribution changes in favour of the capitalist households, and factor use, the unemployment rate and real GDP do not suffer significant variations (there are tiny expansions of factor use and the activity level⁶⁹).

Real Financial Model

The transmission channels in the real sphere of this model work similarly than in the last model. The total import ratio increases (+0.11 p.p.), public revenues go down (-0.65%) and the public deficit goes up (1.15%). There is some deflation in the domestic economy, and factor reallocation in favour of producing export goods, increasing the degree of openness (+0.28 p.p.). Real wages increase, particularly for the informal unskilled workers (0.16%) and capital (0.09%), affecting factor and household income shares (capitalist households +0.01 p.p., skilled households -0.01 p.p.). There are no significant changes in overall factor use, real GDP or the unemployment rate.

In relation to the financial side of the economy, the CPI deflation increases the real liquidity in the economy of the nominal currency supply and leads to a fall in the returns on bank deposits (-0.02 p.p.) and loans (-0.03 p.p.). Primary producers increase their originally high export share of output, avoiding the pervasive effects of the domestic deflation, and benefit from the decrease in intermediate input prices, increasing its profits and equity return (+0.03 p.p.). The other sectors also benefit from the fall in input prices but are more harmed by direct import competition and/or fall in output prices and end up with a fall in their profits and equity returns (industry 0.05 p.p., construction 0.06 p.p., private services 0.08 p.p.). The public sector, in order to finance a higher public deficit, needs to pay a higher return on public debt (+0.28 p.p.). This leads capitalist households to substitute away from non-primary equity into primary

⁶⁹ In turn an unintended result generated by the wage curve working in reverse: the fall in the CPI increases real wages and leads to lower unemployment rates, increasing the employment level and production.

equity, public bonds and deposits abroad, and banks to substitute away from loans into deposits abroad⁷⁰. As can be seen in the following Table, these changes affect the balance of payments with real sphere consequences. The increase in the return on public bonds augments the net interest payment to non-residents holding domestic public bonds, and the increase in deposits abroad reduces the capital account superavit⁷¹. In order to balance the payments with non-residents, the economy needs to increase its trade superavit (3.35%).

Table. Balance of Payments

	Base (B\$)	% Change
<u>Current Account</u>	-8.46	0.55
Trade Balance	3.44	3.35
Exports of Goods and NFS	21.51	1.21
Imports of Goods and NFS	18.07	0.80
Investment Income	-11.90	-0.58
Interests	-10.91	-0.65
Profits and Dividends	-0.99	0.26
<u>Capital Account</u>	10.62	-0.55
Non Financial Private Sector	7.50	-0.82
Public Sector	1.99	FIXED
Commercial Banks	1.13	0.28
<u>Balance of Payment Result</u>	2.16	-0.55

Overall, the model provides a structural adjustment story which is conceptually similar to the one in the real model, but with changes in financial portfolios which end up leading to increase net exports.

Real Financial Augmented Model

The effects in this model are similar to the last one, with the following exemptions:

- The generated deflation (of 0.27% in terms of the GDP deflator) leads to a small increase in the real working capital supply (0.15%) which allows the economy to increase production slightly above the one resulting in the last model (real GDP grows 0.022% instead of 0.015%).

⁷⁰ Not tabulated.

⁷¹ The additional interest inflow generated only partially offsets the effects of the increase in the return on public bonds on the net interest payments.

- With an inelastic demand for working capital⁷², the increase in the working capital supply leads in turn to a proportionally larger fall in its real wage (0.18%).
- The fall in the wage of working capital lowers the financial cost of physical investment for firms more than in last model and induces them to increase their physical investment levels (fixed investment increases 0.18% in real value) crowding-out private consumption and leading to an increased demand for the construction sector output, leading to increase its value added share in the economy.

Real Financial Augmented Short Run Model

Apart from reducing the price of imports as perceived by domestic demanders (0.54%), the (10%) tariff reduction lowers public revenue (0.50%) and public savings (2.96%), letting a gap between savings and investments which is filled by additional household savings. These savings fuel the net wealth of households. In particular, the net financial wealth and the asset holdings of capitalist households increase, and they accordingly increase their deposits abroad (by 0.39%), reducing the capital account surplus of the balance of payments of the country, and the current account deficit which the country can afford (2.14%). To reduce the current account deficit, the trade balance needs to improve⁷³ via increasing exports (1.28%) and reducing imports (0.23%), for which a real devaluation (in the form of a fall of 0.33% in domestic prices) needs to take place.

Table. Balance of Payments

	Base (B\$)	% Change
<u>Current Account</u>	-8.46	2.14
Trade Balance	3.44	9.23
Exports of Goods and NFS	21.51	1.28
Imports of Goods and NFS	18.07	-0.23
Investment Income	-11.90	-1.15
Interests	-10.91	-1.35
Profits and Dividends	-0.99	1.04
<u>Capital Account</u>	10.62	-2.14
Non Financial Private Sector	7.50	-3.16
Public Sector	1.99	FIXED
Commercial Banks	1.13	0.91
<u>Balance of Payment Result</u>	2.16	-2.14

⁷² Elasticities in the production function are between 0.2 and 0.8, as explained in the calibration section.

⁷³ As can be seen in the Balance of Payments Table, a fall in dividends paid by domestic firms to non-residents and an increase in the public sector interest payments to non-residents also play a role.

The fall in domestic prices reduces the producer prices and, at given nominal wages, lowers firms factors demands, leading to reduce the use of formal skilled workers (0.63%), formal unskilled workers (0.77%), physical capital (0.64%) and working capital (0.09%), with increase in the unemployment rate (0.49%) and reduction of the overall activity level (0.58%).

Table. Factor Use

	Base (mill. Individuals and B\$)	% change
Formal Skilled	1.43	-0.63
Formal Unskilled	7.39	-0.77
Physical Capital	288.65	-0.64
Working Capital	17.15	-0.09

The domestic deflation increases the availability of working capital in real terms, and the recession reduces the demand for working capital, lowering its real wage (0.93%), and reducing then the financial cost of physical investment, boosting physical investment and the construction sector, whose value added share increases (0.04%). The export increase boosts the share of the primary sector in total value added (0.08%). Finally, the recession, by lowering the value added of the private activities, lifts the value added share of the public activity (0.03%).

Table. Sector Value Added Shares

	Base	p.p. change
Agriculture	7.9%	0.08
Industry	18.0%	-0.02
Construction	5.5%	0.04
Private Services	61.6%	-0.13
Public Services	7.1%	0.03
Total	100.0%	0.000

Given the intensive use of formal unskilled workers in the public sector, the formal unskilled workers increase their factor income share (0.02%), and leads also to a marginal increase in the household income shares of the unskilled households (0.003%).

Table. Factor Income Shares

	Base (%)	p.p. change
Formal Skilled	13.2	0.012
Formal Unskilled	37.7	0.017
Informal Unskilled	14.1	-0.004
Physical Capital	31.7	-0.007
Working Capital	3.3	-0.017
Total	100.0	0.000

Table. Household Income Shares

	Base (%)	p.p. change
Skilled	14.1	-0.002
Unskilled	64.6	0.003
Capitalist	21.3	-0.001

9. Sensitivity Analysis

In this chapter I perform sensitivity analysis on the real financial augmented (RFA) model⁷⁴, simulating an increase in the perceived probability of default on domestic assets. The chosen increase is 30 (instead of 10) percentage points, which makes the variations in the endogenous variables easier to note. To start with, I briefly recall the results generated by an increase in the expected probability of default on domestic assets (shock 'K1'): when the expected returns of holding domestic assets fall, capitalist households' portfolios are reassigned in favor of foreign assets, provoking a reduction in the capital inflow to the economy⁷⁵ that reduces domestic liquidity and the supply of working capital. This, in turn, leads to increase the wage of working capital and the bank loans rate, in turn discouraging physical investment. With less investment, the construction activity shrinks and the demand for the existent physical capital contracts (given the construction activity intensively uses it), lowering the wage of physical capital, and dividends paid to residents and non-residents.

Besides, the fall in the capital inflows leads to a devaluation (in the form of a fall in domestic prices) that provides signals for the economy to increase exports and reduce imports, overall improving the trade and the current account balance of payments, partially compensating for the negative effect of the portfolio reassignment on the balance of payments of the country⁷⁶. The devaluation leads the economy to shift mobile factors to the tradable sectors (the primary sector, intensive in exports; and the industrial sector, intensive in the production of imperfect substitutes for imports). The domestic deflation leads to reduce the factor demands at given nominal wages, reducing in turn the use of formal workers, the activity level and the nominal wages of every real factor. The fall in wages, prices and factor uses lower public revenues and increase the public deficit. Factor income changes in favour of the informal unskilled (benefitting from the growth in the value added share of the primary sector) and of working capital (given its wage increase) and against physical capital (hit by the shrinking of the

⁷⁴ When trying to perform sensitivity analysis on the RFAS model, 7 out of the 17 parameter configurations made the solver crash, suggesting that the rigidities imposed in this model (the only difference with the RFA model) make the model less robust - at least to changes in elasticity parameters.

⁷⁵ Only partially offset by the capital inflow increase by domestic banks, driven in turn by increases in the rate of return on bank loans and domestic bond holdings.

⁷⁶ There is also an increase in the net investment income paid to non-residents caused by an increase in the rate of return on deposits that only partially offsets the positive effect of the improving trade balance on the current account balance.

construction activity). At the household level, then, income changes in favor of the unskilled RHG and against the capitalist RHG.

Import-Domestic Armington elasticities

The Armington elasticities take values from 0.5 to 4.5, passing through 1 and 2.25⁷⁷. The larger they are, the easier it is to substitute imports by domestic production, and hence the larger the extent to which the needed improvement in the trade balance occurs through contracting imports rather than through boosting exports; at the sector level, this translates into resources shifting towards industry (intensive in the production of import substitutes) and out of the primary sector (intensive in the production of export goods), with a negative effect on the demand and the real wages of the informal unskilled workers, intensively used in the primary sector. As the Armington elasticities grow and the bulk of the adjustment is passed to import contraction, trade and trade taxes revenue shrink, reducing public revenue and increasing the public deficit.

As the Armington elasticities grow, the real depreciation needed to improve the trade balance and compensate for the capital outflow shrinks; the domestic price level increases; and, for nominally given working capital loans, the real supply of working capital falls, increasing the equilibrium (nominal and real) wage of working capital and lowering its demand and use. The higher wage on working capital translates then into increases in bank rates that i) increase the flow of interest payments to non-residents; ii) discourage investment, lowering the demand for the construction activity and for the existent physical capital, a factor intensively used in construction. In turn, this leads to a fall in the real wage of physical capital and in the dividends paid to residents and non-residents.

The effect of the shock on the activity level is essentially invariant to the Armington elasticity: as the Armington elasticities grow and domestic deflation is less severe, the price level ends up in a higher level and the availability (and use) of working capital in real terms in a lower one. However, given the small share of working capital in value added, this does not have a visible direct effect on the activity level. Besides, the lower use of working capital and the higher level of domestic prices have offsetting effects on labour demand, letting their use essentially unaffected.

⁷⁷ 1 is not allowed by the CES function, so a number close to it was chosen.

The larger the Armington elasticities, the higher the increase in the real wage and the income share of working capital; the lower the increase in the wage and the factor income shares of the informal unskilled workers; and the higher the fall in the real wage and the income share of physical capital and the capitalist RHG.

Export-Domestic destination CET elasticities

The export-domestic CET elasticities also take values from 0.5 to 4.5, passing through 1 and 2.25⁷⁸. The larger they are, the easier that transforming domestic production into exports is, and hence the larger the extent to which the needed improvement in the trade balance occurs via boosting exports. At the sector level, this translates into more resources shifting towards the sector that is intensive in the production of export goods (the primary sector) and out of that intensive in the production of import substitutes (the industrial sector), with a negative effect on the demand of the skilled and unskilled formal workers intensively used in the industrial sector. As the CET elasticities grow and the bulk of the adjustment is passed to boosting exports, trade and trade taxes revenue expand, increasing public revenue and lowering the public deficit and the interests paid by the public sector to residents and non-residents on its debt.

As the CET elasticities grow, the real depreciation (via domestic price fall) needed to improve the trade balance and compensate for the capital outflow shrinks. A smaller fall of the domestic price level means that the effect of the capital outflow on working capital gets exacerbated. This, in turn, leads to increase the equilibrium (nominal and real) wage of working capital and to lower its level of use. The higher wage on working capital translates then into increases in bank rates that discourage physical investment, lowering the demand for the construction activity and for the existent physical capital, which is intensively used in the construction sector. As a result, the wage of working capital goes down in real terms.

As commented above, higher CET elasticities translate into a contraction of the industrial sector in the economy and a fall in the demand for formal workers, which exacerbate the fall in their real wages and uses, aggravating the contraction of the economy. The contraction of the economy reduces the increase in the real wage of the informal unskilled (intensively used in the growing primary sector).

⁷⁸ 1 is not allowed by the CES function, so a number close to it was chosen.

The above explanation means that with larger CET elasticities, the factor income shares of the formal workers increase (as their wages and levels of use increase), and the income share of physical capital falls (as its real wage falls), translating in turn into an increase in the income share of the skilled RHG (who collects the income of the formal skilled workers) and a fall in the income share of the capitalist RHG (driven by the income share of physical capital).

Armington and CET elasticities

With low (0.5) values for both (Armington and CET) elasticities, the devaluation which is needed to offset the capital outflow generated by the shock is strikingly larger than with high elasticities (7.53% vs 0.78%), with relevant implications along the economy. The sharp devaluation translates, in turn, into a fall in domestic prices that ends up shifting up the real supply of working capital (by a significant 3.54%), reversing the sign of the changes in the causal chain that goes through the wage of working capital, the share of working capital in factor income, the interest rate on bank loans (they all fall instead of increase), physical investment, construction activity, demand and wage of physical capital, and share of physical capital in factor income and of capitalists in household income (they increase rather than fall). In turn, the increase in working capital use increases the productivity of the other factors, increasing their demand, and leading to increase (rather than decrease) the use and the real wages of formal workers and the level of activity.

As the level of activity increases, the bulk of the improvement of the trade superavit is increasingly passed from import contraction to exports boost⁷⁹. In turn, this means that factors move towards agriculture (+0.17%) and even (marginally) out of industry (-0.01%), with a positive effect on the income share of the informal unskilled workers (intensively used in agriculture).

A higher fall in domestic prices (and nominal wages) translates into a smaller public revenue and public savings⁸⁰. With investment growing, the savings-investment gap which opens needs to be filled by household savings, with the bulk falling on the capitalist households. This increases the stock of financial wealth of the capitalist RHG, and (ceteris paribus) their deposits abroad, reducing even more the capital inflow to the

⁷⁹ For example, when moving from the results of the shock with $\varepsilon=4.5$ to $\varepsilon=1.5$, imports contract by 42% (4.26/2.58) while exports expand by 65% (4.26/2.58).

⁸⁰ Only partially offset by the expansion of factor use and the activity level.

economy and calling for a larger improvement of the trade and the current account balances.

Elasticities in the assets portfolios

In this short section different values are assigned to the elasticity that informs how responsive the asset portfolio shares of the capitalist RHG are to changes in the asset earnings. While the Table informs the results for elasticity values between 0.5 and 2, the economically relevant interval goes above 1, where an increase in the rate of return of a given asset calls for an increase (rather than a fall) of the share of the portfolio assigned to that asset, and hence to increase the demanded quantity of that asset. I focus on the capitalist households group, given that the changes in the capital flows proved to be driven in the model by their decisions (and not those of the banks).

When the domestic assets return fall (due to the increase in the perceived probability of default attached to them), the capitalist RHG responds allocating a higher share of their assets into foreign papers (deposits abroad). As the portfolio elasticity of the group increases, assets become closer substitutes to them, and they become more responsive to changes in returns. This simply exacerbates the readjustment of its portfolio in favor of deposits abroad and, then, all the causal chain which comes after this readjustment, exacerbating the contraction of the economy and the redistribution in favor of the unskilled and against the capitalist RHG by the transmission mechanisms explained above. The results (even when conceptually similar) are quantitatively very different, and show that assuming for example an elasticity of 1.05 (as was the case in previous simulations) makes a big difference from assuming one in the limit of 1.

Comparison with econometric estimates for validation purposes

For the purpose of validating some model parameters, the elasticity values coming from the model can be compared to the elasticity parameters estimated with econometric techniques. While the Argentinean public sector was not running an econometric macro model for the analyzed period 1991:2001, a macro model for Argentina run by Damill et al (2002,p24) regressing imports for the period 1993:2001 estimates the elasticity of imports at constant prices to changes in the real exchange rate in 0.244⁸¹, with the real exchange rate calculated in the study simply by dividing the domestic CPI by the CPI of the United States⁸² and controls for contemporaneous and (one-period) lagged real income. Another study econometrically explaining imports in Argentina during the nineties distinguishing imports from Mercosur from imports from other origins, finds the elasticity in the 0.7-0.8 range (Catao and Falcetti 2002).

For the mentioned comparison I calculate, for the considered elasticity values in the Armington function, the CET function and the capitalist household portfolio share function, the implicit elasticity of imports respect to changes in the real exchange rate. For this, I divide the percentage change in the value of imports by the percentage change in the real exchange rate, in turn the ratio between the import price level faced by domestic demanders and the domestic price level, the latter only including commodities produced and sold domestically.

For the elasticity values chosen in the model, the result is 4.12. For the experiments done in this section the elasticity values are in the [0.61 - 4.48] interval. The results suggest that the import elasticity i) crucially depends on and is positively correlated with the Armington elasticity; ii) does not depend on the CET elasticity alone; iii) depends negatively on the elasticity in the portfolio shares function.

The excess of the implicit import elasticity in the model over the econometric estimate could be indicating that the elasticity parameters in the model should be revised downwards. However, the evidence is not compelling given that:

- i) the general equilibrium nature of the elasticity coming from the model differs from the ‘ceteris paribus’ assumption in the econometrically estimated elasticity: while the econometric regression estimates the elasticity of imports respect to the

⁸¹ The regression controls for contemporaneous and (one-period) lagged real income.

⁸² The nominal exchange rate is 1 across the period making local currency and dollars equivalent.

real exchange rate keeping the real income constant, in the CGE model the real income varies endogenously. In the experiments, the real income tended to fall and the real exchange rate to go up; given that real income is positively correlated with imports in the model by assumption, the fall in real income provided a source for the CGE import elasticity to exceed the econometrically estimated one.

- It is indeterminate which of the elasticity parameters present in the model should eventually be revised: there are different combinations of the Armington, CET and portfolio share elasticity parameters which would provide the model with an import elasticity matching the econometrically estimated one.
- The real exchange rate calculated by Damill et al (2002) seems to differ from the one in the CGE model and from an ideal one. In their study, domestic prices are measured by the domestic CPI, such that: i) differential variations in the domestic prices faced by other demanders (e.g. firms and the public sector) are neglected; ii) imports demanded by consumers affect the measure of domestic prices; import prices are measured by the United States CPI, such that: i) differential variations in the import prices from other origins (e.g. China) are neglected; ii) differences between the Argentinean import basket and the basket consumed by US consumers is neglected.

Table. Sensitivity Analysis on import-domestic origin Armington elasticities increasing 30% the perceived probability of default on domestic assets
Relative deviations from base (%) *

	Base		↑PDEF by 30%			
	Amount	Unit	$\varepsilon = 0.5$	$\varepsilon = 1.001$	$\varepsilon = 2.25$	$\varepsilon = 4.5$
Balance of Payments ^Δ						
<u>Current Account</u>	-8.46	B\$	12.63	12.56	12.42	12.27
Trade Balance	3.44	B\$	32.92	32.95	33.00	33.05
Exports of Goods and NFS	21.51	B\$	4.26	3.93	3.30	2.58
Imports of Goods and NFS	18.07	B\$	-1.20	-1.60	-2.36	-3.22
Investment Income	-11.90	B\$	-0.54	-0.60	-0.71	-0.84
Interests	-10.91	B\$	-0.70	-0.76	-0.86	-0.99
Profits and Dividends	-0.99	B\$	1.19	1.12	0.97	0.81
Current Transfers			FIXED	FIXED	FIXED	FIXED
<u>Capital Account</u>	10.62	B\$	-12.63	-12.56	-12.42	-12.27
Non Financial Private Sector	7.50	B\$	-17.96	-17.86	-17.67	-17.44
Public Sector	1.99	B\$	FIXED	FIXED	FIXED	FIXED
Commercial Banks	1.13	B\$	0.60	0.59	0.57	0.55
Public Deficit	11.99	B\$	1.17	1.19	1.21	1.24
Price of domestic goods	1.00	\$	-1.19	-1.11	-0.95	-0.78
Real GDP	189.86	B\$	-0.06	-0.06	-0.06	-0.06
Factor use						
Formal Skilled	1.43	mill. indiv	-0.03	-0.03	-0.03	-0.03
Formal Unskilled	7.39	mill. indiv	-0.06	-0.06	-0.06	-0.06
Working Capital	17.15	B\$	-0.87	-0.93	-1.04	-1.16
Tradables Value Added Shares						
Agriculture	10.9	%	0.10	0.09	0.08	0.07
Industry	25.8	%	0.03	0.03	0.04	0.05
Real Wages						
Formal Skilled	16.82	th\$/indiv	-0.06	-0.06	-0.06	-0.06
Formal Unskilled	9.29	th\$/indiv	-0.03	-0.03	-0.03	-0.03
Informal Unskilled	9.29	th\$/indiv	0.29	0.26	0.21	0.15
Physical Capital	0.20	% of stock v.	-0.13	-0.14	-0.17	-0.19
Working Capital	0.35	% of stock v.	1.74	1.84	2.05	2.28
Factor Income Shares						
Formal Skilled	13.2	%	-0.01	-0.01	-0.01	0.00
Formal Unskilled	37.7	%	-0.03	-0.03	-0.02	-0.01
Informal Unskilled	14.1	%	0.04	0.04	0.03	0.03
Physical Capital	31.7	%	-0.04	-0.04	-0.04	-0.05
Working Capital	3.3	%	0.03	0.03	0.03	0.04
Household Income Shares						
Skilled	14.1	%	-0.01	-0.01	-0.01	0.00
Unskilled	64.6	%	0.08	0.08	0.08	0.08
Capitalist	21.3	%	-0.07	-0.07	-0.07	-0.08
Elasticity of imports r.t. RER			1.01	1.44	2.47	4.12

* Except for shares, where absolute deviations from base are reported

Δ In the balance of payments, following national accounts system, a + (-) means that the flow leads country's international reserves holdings to increase (fall)

Table. Sensitivity Analysis on export-domestic destination CET elasticities increasing 30% the perceived probability of default on domestic assets
Relative deviations from base (%)*

	Base		↑PDEF by 30%			
	Amount	Unit	$\varepsilon = 0.5$	$\varepsilon = 1.001$	$\varepsilon = 2.25$	$\varepsilon = 4.5$
Balance of Payments^Δ						
<u>Current Account</u>	-8.46	B\$	13.18	12.97	12.62	12.27
Trade Balance	3.44	B\$	35.83	35.19	34.12	33.05
Exports of Goods and NFS	21.51	B\$	0.89	1.29	1.95	2.58
Imports of Goods and NFS	18.07	B\$	-5.76	-5.16	-4.18	-3.22
Investment Income	-11.90	B\$	-0.99	-0.96	-0.90	-0.84
Interests	-10.91	B\$	-1.21	-1.16	-1.07	-0.99
Profits and Dividends	-0.99	B\$	1.37	1.24	1.02	0.81
Current Transfers			FIXED	FIXED	FIXED	FIXED
<u>Capital Account</u>	10.62	B\$	-13.18	-12.97	-12.62	-12.27
Non Financial Private Sector	7.50	B\$	-18.78	-18.47	-17.95	-17.44
Public Sector	1.99	B\$	FIXED	FIXED	FIXED	FIXED
Commercial Banks	1.13	B\$	0.84	0.77	0.66	0.55
Public Deficit	11.99	B\$	2.18	1.97	1.60	1.24
Price of domestic goods	1.00	\$	-1.40	-1.25	-1.01	-0.78
Real GDP	189.86	B\$	-0.04	-0.05	-0.06	-0.06
Factor use						
Formal Skilled	1.43	mill. indiv	-0.02	-0.02	-0.02	-0.03
Formal Unskilled	7.39	mill. indiv	-0.03	-0.04	-0.05	-0.06
Working Capital	17.15	B\$	-0.78	-0.87	-1.02	-1.16
Tradables Value Added Shares						
Agriculture	10.9	%	0.07	0.07	0.07	0.07
Industry	25.8	%	0.07	0.06	0.06	0.05
Real Wages						
Formal Skilled	16.82	th\$/indiv	-0.04	-0.05	-0.05	-0.06
Formal Unskilled	9.29	th\$/indiv	-0.02	-0.02	-0.03	-0.03
Informal Unskilled	9.29	th\$/indiv	0.20	0.20	0.18	0.15
Physical Capital	0.20	% of stock v.	-0.08	-0.11	-0.15	-0.19
Working Capital	0.35	% of stock v.	1.60	1.76	2.02	2.28
Factor Income Shares						
Formal Skilled	13.2	%	-0.01	-0.01	-0.01	0.00
Formal Unskilled	37.7	%	-0.02	-0.02	-0.02	-0.01
Informal Unskilled	14.1	%	0.03	0.03	0.03	0.03
Physical Capital	31.7	%	-0.03	-0.03	-0.04	-0.05
Working Capital	3.3	%	0.03	0.03	0.03	0.04
Household Income Shares						
Skilled	14.1	%	-0.02	-0.01	-0.01	0.00
Unskilled	64.6	%	0.07	0.07	0.08	0.08
Capitalist	21.3	%	-0.06	-0.06	-0.07	-0.08
Elasticity of imports r.t. RER			4.11	4.12	4.12	4.12

* Except for shares, where absolute deviations from base are reported

Δ In the balance of payments, following national accounts system, a + (-) means that the flow leads country's international reserves holdings to increase (fall)

Table. Sensitivity Analysis on Armington and CET elasticities increasing 30% the perceived probability of default on domestic assets
Relative deviations from base (%)*

	Base		↑PDEF by 30%			
	Amount	Unit	$\varepsilon = 0.5$	$\varepsilon = 1.001$	$\varepsilon = 2.25$	$\varepsilon = 4.5$
Balance of Payments^Δ						
<u>Current Account</u>	-8.46	B\$	20.58	15.13	13.02	12.27
Trade Balance	3.44	B\$	50.76	38.81	34.54	33.05
Exports of Goods and NFS	21.51	B\$	4.26	3.17	2.76	2.58
Imports of Goods and NFS	18.07	B\$	-4.59	-3.61	-3.30	-3.22
Investment Income	-11.90	B\$	-0.05	-0.47	-0.73	-0.84
Interests	-10.91	B\$	-0.68	-0.78	-0.93	-0.99
Profits and Dividends	-0.99	B\$	6.93	2.95	1.37	0.81
Current Transfers			FIXED	FIXED	FIXED	FIXED
<u>Capital Account</u>	10.62	B\$	-20.58	-15.13	-13.02	-12.27
Non Financial Private Sector	7.50	B\$	-29.52	-21.60	-18.53	-17.44
Public Sector	1.99	B\$	FIXED	FIXED	FIXED	FIXED
Commercial Banks	1.13	B\$	2.66	1.27	0.74	0.55
Public Deficit	11.99	B\$	6.72	3.11	1.73	1.24
Price of domestic goods	1.00	\$	-7.53	-3.12	-1.39	-0.78
Real GDP	189.86	B\$	0.15	0.01	-0.05	-0.06
Factor use						
Formal Skilled	1.43	mill. indiv	0.04	-0.01	-0.02	-0.03
Formal Unskilled	7.39	mill. indiv	0.10	-0.01	-0.05	-0.06
Working Capital	17.15	B\$	3.54	0.42	-0.76	-1.16
Tradables Value Added Shares						
Agriculture	10.9	%	0.17	0.12	0.09	0.07
Industry	25.8	%	-0.01	0.02	0.04	0.05
Real Wages						
Formal Skilled	16.82	th\$/indiv	0.09	-0.01	-0.05	-0.06
Formal Unskilled	9.29	th\$/indiv	0.05	-0.01	-0.02	-0.03
Informal Unskilled	9.29	th\$/indiv	1.50	0.63	0.29	0.15
Physical Capital	0.20	% of stock v.	1.05	0.21	-0.09	-0.19
Working Capital	0.35	% of stock v.	-5.64	-0.52	1.54	2.28
Factor Income Shares						
Formal Skilled	13.2	%	-0.05	-0.02	-0.01	0.00
Formal Unskilled	37.7	%	-0.15	-0.06	-0.03	-0.01
Informal Unskilled	14.1	%	0.13	0.07	0.04	0.03
Physical Capital	31.7	%	0.16	0.02	-0.03	-0.05
Working Capital	3.3	%	-0.09	-0.01	0.03	0.04
Household Income Shares						
Skilled	14.1	%	-0.18	-0.06	-0.02	0.00
Unskilled	64.6	%	-0.01	0.06	0.08	0.08
Capitalist	21.3	%	0.18	0.00	-0.06	-0.08
Elasticity of imports r.t. RER			0.61	1.16	2.37	4.12

* Except for shares, where absolute deviations from base are reported

Δ In the balance of payments, following national accounts system, a + (-) means that the flow leads country's international reserves holdings to increase (fall)

Table. Sensitivity Analysis on capitalist household portfolio elasticity increasing 30% the perceived probability of default on domestic assets
Relative deviations from base (%)*

	Base		↑PDEF by 30%				
	Amount	Unit	$\epsilon = 0.5$	$\epsilon = 1.001$	$\epsilon = 1.05$	$\epsilon = 1.5$	$\epsilon = 2.0$
Balance of Payments^Δ							
<u>Current Account</u>	-8.46	B\$	-86.20	0.94	12.27	162.62	411.55
Trade Balance	3.44	B\$	-230.61	2.92	33.05	434.45	1230.84
Exports of Goods and NFS	21.51	B\$	-16.26	0.22	2.58	39.17	135.12
Imports of Goods and NFS	18.07	B\$	24.55	-0.29	-3.22	-36.09	-73.50
Investment Income	-11.90	B\$	5.42	-0.18	-0.84	-10.05	-63.44
Interests	-10.91	B\$	6.45	-0.20	-0.99	-11.79	-70.33
Profits and Dividends	-0.99	B\$	-5.88	0.11	0.81	9.07	12.30
Current Transfers			FIXED	FIXED	FIXED	FIXED	FIXED
<u>Capital Account</u>	10.62	B\$	86.20	-0.94	-12.27	-162.62	-411.55
Non Financial Private Sector	7.50	B\$	128.88	-0.61	-17.44	-240.87	-610.83
Public Sector	1.99	B\$	FIXED	FIXED	FIXED	FIXED	FIXED
Commercial Banks	1.13	B\$	-45.99	-4.80	0.55	71.71	189.90
Public Deficit	11.99	B\$	-8.35	0.14	1.24	15.86	72.90
Price of domestic goods	1.00	\$	5.49	-0.07	-0.78	-9.96	-25.65
Real GDP	189.86	B\$	0.35	-0.01	-0.06	-0.95	-4.43
Factor use							
Formal Skilled	1.43	mill. indiv	0.15	0.00	-0.03	-0.38	-1.91
Formal Unskilled	7.39	mill. indiv	0.40	-0.01	-0.06	-0.63	-1.40
Working Capital	17.15	B\$	6.41	-0.23	-1.16	-15.15	-45.70
Tradables Value Added Shares							
Agriculture	10.9	%	-0.48	0.01	0.07	1.03	3.22
Industry	25.8	%	-0.34	0.00	0.05	0.78	3.05
Real Wages							
Formal Skilled	16.82	th\$/indiv	0.36	-0.01	-0.06	-0.83	-3.58
Formal Unskilled	9.29	th\$/indiv	0.20	0.00	-0.03	-0.31	-0.67
Informal Unskilled	9.29	th\$/indiv	-0.98	0.00	0.15	2.54	8.86
Physical Capital	0.20	% of stock v.	1.16	-0.04	-0.19	-2.34	-8.96
Working Capital	0.35	% of stock v.	-11.12	0.45	2.28	38.77	276.04
Factor Income Shares							
Formal Skilled	13.2	%	0.02	0.00	0.00	-0.12	-0.76
Formal Unskilled	37.7	%	0.10	0.00	-0.01	-0.24	-0.90
Informal Unskilled	14.1	%	-0.19	0.00	0.03	0.40	1.20
Physical Capital	31.7	%	0.26	-0.01	-0.05	-0.64	-2.94
Working Capital	3.3	%	-0.19	0.01	0.04	0.60	3.41
Household Income Shares							
Skilled	14.1	%	0.00	0.00	0.00	-0.06	0.85
Unskilled	64.6	%	-0.59	0.01	0.08	1.24	10.10
Capitalist	21.3	%	0.59	-0.01	-0.08	-1.18	-10.95
Elasticity of imports r.t. RER			4.48	4.15	4.12	3.62	2.87

* Except for shares, where absolute deviations from base are reported

Δ In the balance of payments, following national accounts system, a + (-) means that the flow leads country's international reserves holdings to increase (fall)

10. Microsimulations

For this section, having gathered the data and defined the methodology to be applied - in the lines of Bourguignon et al (2004) – I am doing the econometric work.

11. Conclusions

Note: this chapter is in construction.

With a straightforward adaptation of the real-focused IFPRI Standard model, one gets a structural adjustment story where external shocks and policies hit the structure of production of the economy and income distribution. The story is internally consistent and essentially neoclassical, with optimizing agents and flexible prices⁸³. As it was shown, the effects on income distribution essentially depend on whether the shock leads to mobilize resources to the tradable or the non-tradable sectors, and on the factor intensity use of these sectors. No significant effects on the activity level of the economy show up.

However, if one is interested in the short-run effects of these shocks on the activity level, then the inclusion of relations that are conventional in macro models and a modification in the production function helps. By allowing the model to capture 1) nominal rigidities⁸⁴, 2) the relations present in the IS-LM model, 3) the financial assets and liabilities held by the economic actors and 4) working capital in the production function, real and financial external shocks lead not only to changes in the composition of aggregate demand -as analyzed by Robinson (1991)- but significantly affect unemployment and output. Paraphrasing Adam and Bevan(1998), the financial inclusion together with complementary devices allows the model to answer relevant questions like 1) how do expected defaults on domestic assets affect the economy? 2) are the short-run effects of different capital flows affecting the economy differently?

Model results concerning the effects of liberalization on growth and distribution were analyzed. Of the two models capturing the effect of ‘money in the production function’, only the real-financial-augmented model showed to be robust to different elasticity

⁸³ The wage curve is actually a departure of this framework which was included to account for the procyclicality of wages observed in Argentina.

⁸⁴ Embedded in the essence of traditional Keynesian theories of fluctuations according to David Romer Romer, D., Ed. (1996). Advanced Macroeconomics.

values in the real and financial sectors. In this model, the effects of trade liberalization and financial shocks facilitated by financial liberalization suggest that:

- Trade liberalization increases inequality, benefitting the capitalist households and worsening the position of the unskilled households. Interestingly, it was seen that the sign of the effects of liberalization on the skilled households income share depends on whether import taxes or export taxes are dropped, as the effect depends on 1) original taxes (export taxes are higher for industrial goods) and 2) degrees of participation of the sectors in exports and imports and 3) sector level differences in the factors value added shares.
- Capital liberalization facilitates capital flows and, by affecting the activity level, increases output volatility. In terms of distribution, capital inflows (outflows) consistently improve (worsen) the income share of the skilled households.

As acknowledged by Robinson (1991) and Adam and Bevan (1998), the financial inclusion adds richness to the model specification, allow to capture better the macroeconomic phenomena and policy instruments and, as emphasized by Adam and Bevan (1998), permit addressing additional questions. However, the model construction and simulations illustrate the costs associated to including portfolio considerations in terms of data requirements and tendency of the models to crash.

Future research agenda.

For the model to account for the economic cycles generated by external shocks, it should be made dynamic. A serious consideration of formation of expectations should be done, with some synergy with New Keynesian DSGE models potentially exploited. Also, as commented, the financial versions tend to crash⁸⁵ when faced with extreme shocks, something that seemed to be related to the difficulty of capturing significant quantity adjustments in a model with neoclassical core. To overcome these difficulties, the literature concerning models in the Keynesian tradition, including work by Lance Taylor (2004) and Richard Aghion (2006) and New-Keynesian DSGE Models such as Blanchard and Gali (2007) should be reviewed, identifying and implementing needed model modifications.

⁸⁵ Something also reported by Adam and Bevan (1998)

Annex I. Policy Matrix for Argentina

Note: rows for last three years are under construction.

	Capital Account Policy	Others Monetary and Financial Policies	Commercial Policy	Fiscal Policy	Privatizations (default) / Deregulations	Labour Market Policy
1989	Elimination of restrictions on trading foreign currencies, completely abolishing exchange controls	Rescheduling of public bonds	Increase in taxes to exports	Suspension of subsidies for industrial promotion		
	Financial institutions are obliged to make repayments of deposits in same currency than deposits		Suspension of refund to exports	Increase in prices of public services (e.g. telephone)		
			Decrease in import tariffs (maximum tariff 30%)	Intervention of public companies and development of mechanisms for their privatization		
			Abolishing of requisite of previous permission needed for imports	Generalization of VAT (the largest source of fiscal incomes), and reduction of its rate (from 15% to 13.5%). Decrease in rate of Profits Tax		
1990		"Bonex Plan": compulsive conversion of fixed term deposits in banks to public bonds of long maturation denominated in dollars	Augment of taxes to exports	"Unique Cash (Register)" for public companies	Telephones	
			Reappearance of refunds to exports	Reduction of number of areas of Central Administration	Airlines	
			Decrease in import tariffs (maximum tariff 24%). Elimination of payments in excess of declared rates ("sobretasas").	Augment in tax to assets of the companies and in tax rate of VAT (to 15.6%). Enlargement of VAT base. Derogation of taxes to capital, to net wealth and other minor taxes.	Petrochemicals	
			Negotiation for Mercosur Area, and Treaty of Integration, Cooperation and Development between Argentina and Brazil, defining the consolidation of a common market in following five years		Concession on petroleum and routes	

	Capital Account Policy	Others Monetary and Financial Policies	Commercial Policy	Fiscal Policy	Privatizations (default) / Deregulations	Labour Market Policy
1991	April 1: Convertibility Law instals currency board regime, rigidly linking national currency ("peso") to dollar, totally liberalizing the exchange market, allowing foreign-currency denominated contracts and strongly restricting the capacity to manoeuvre of the monetary policy.	April 1: Use of adjustment by price index in contracts is explicitly prohibited by Convertibility Law	Elimination of a large part of taxes to exports	Law related to the cancellation of public debts	Telephone shares ("acciones") are sold	Through an "Employment Law", the government introduces new ways of hiring employees with smaller taxes and less restrictions for firing workers ; also, a very restricted unemployment insurance (1997 estimation: only 6% of unemployed covered) is devised
	Tax to stock market operations are eliminated		Decrease in import tariffs and appearance of 4 rates (0% raw inputs and machinery, 11% intermediate goods, 22% most consumption goods and 35% e.g. electronic goods; then rates become respectively 5%, 13%, 22%, 35%), all plus "statistical" rate of 3pp	VAT increases to 16%; then to 18%. Tax to Personal Goods is created.	Concession of extractable fuels	
	Banks and companies are authorized to issue negociable obligations in foreign currency and commercial papers		Regime of temporary imports	Nation-Provinces Agreement: transfer of some services (education, health, some social programmes) to provinces, taking account of sending resources to provinces	Concession of trains	
			Quantitative restrictions are eliminated, except for automobile vehicles, which have special regime	From this year, low fiscal deficits are the rule (1pp of GDP vs. 4pp in the 80s)	Dissolution of public companies	
			March: Treaty of Constitution of Mercosur, expliciting the intention by Argentina, Brazil, Uruguay and Paraguay of conforming a common market by the end of 1994, with free circulation of goods, services and productive factors, setting a Common External Tariff and a common commercial policy, plus the coordination of macroeconomic policies and the armonization of legislations in pertinent areas		Deregulation of transport of freight	

	Capital Account Policy	Others Monetary and Financial Policies	Commercial Policy	Fiscal Policy	Privatizations (default) / Deregulations	Labour Market Policy
1992		September: Central Bank Organic Letter (simile Constitution): Obligation of Central Bank to keep reserves of at least 80% (or 70% in exceptional circumstances) of the monetary base, allowing in the remaining holdings of public bonds; limits both to credit to government and to rediscounts of Central Bank; independence of Central Bank. Limited system of deposit guarantees. Rules on prevision for payment default, on risk diversification, on capital requirements and on reserve rate requisites over deposits of immediate eligibility become more strict, exceeding international standards.	Refunds to exports increase	Agreement of Amplified Facilities with IMF	Gas (transport and distribution)	Reduction in compensation for death associated to work, and, more generally, for sickness and accidents associated to work
		Law of Financial Entities is reformed.	"Statistical" rate for imports increase from 3% to 10%	Amplification of VAT coverage. Increase in tax rate of Profits (from 20% to 30%)	Water	
		Bank legal reserves ("encajes") in dollars are authorized	Tariffs are scales in 9 rates going from 0% (for capital goods not produced in Argentina, medical products and fuels) to 20% (for consumption goods)	Nation-Provinces Agreement: a minimum transfer from Nation to Provinces is guaranteed.	Electricity	
		By Fiscal Administration Law, repatriation of argentineans resources abroad tax exempted is accepted	Tariffs are reduced (with maximum tariff becoming 22%)	Regularization of debts with pensioners, giving them public bonds	Iron and steel industries	
			Progress in Mercosur's system of preferences		Deregulation of mining, pharmaceutical products, automovile transport and ports law	
1993	Law of Investment Funds	Brady Plan: agreement by which public debt to banks is substituted by long term bonds (up to 30 years) with a nominal value of a little more than 25 billion dollars, with reductions in capital and interest.	Common External Tariff Agreement (CED) in Mercosur	The pension regime is reformed: workers start to opt between staying in public regime of distribution or deriving personal payments to an individual system of capitalization managed by a company called Manager of Pensions, which start to become a source of credit for public sector. Previously, the government takes measures to reduce expenditures (to compensate for reduced incomes)	YPF (Fiscal Oilfields)	
		Deposits of less than 30 days are prohibited	Regime of free tax zones ("francas")	Nation-Provinces Agreement: tax structures are coordinated	Hydroelectric and thermal centrals	
		Norms of "securitization"	Application of anti-dumping devises, with quantitative restrictions and increases in tariffs	Modification of tax to Profits	Electricity transmission	
			Regime of "specialization and restructuring", giving benefits of lower tariffs against exports		Concession of trains and subways	

	Capital Account Policy	Others Monetary and Financial Policies	Commercial Policy	Fiscal Policy	Privatizations (default) / Deregulations	Labour Market Policy
1994	Law of financial entities is modified such that foreign capital enterprises are treated in equal terms than national ones.		Definition of CET	Employers taxes are reduced (see Labour Market)	Electric centrals	Reduction of employers taxes in some economic sectors
				The new pensions regime comes into effect	Electricity distribution	
					Shares of gas (transport and distribution) are sold	
1995		Modification of Organic Letter of Central Bank: capital requirements increase; banking reserves are converted into dollars; Central Bank is authorized to restructure the banks in problems; deposit guarantees are augmented; funds ("fiduciarios") are created for dealing with liquidity problems. In general terms, prudential regulation increases.	Export refunds are reduced: extra-Mercosur get in the 2%-20% range: intra-Mercosur agreement on progressive reduction	VAT increase to a rate of 21%; the taxable base of Profits and Personal Goods is enlarged	Electricity centrals	A 6-month "trial" period is incorporated, such that the employer benefits from a reduction in taxes and besides is able to rescind the contract without noticing the employee in advance neither giving a severance pay
			CET comes into effect, with a relatively small number of products exception until year 2001 (394 in Argentina, 324 in Brazil, 439 in Paraguay, 960 in Uruguay in around 10.000 positions). Capital goods may have different tariffs, but have to lineally converge to common ones.		Bahia Blanca Petrochemicals	Employer taxes are generalized to all sectors; they are also quantitatively reduced
			Increase in tariffs to imports			A new form of hiring which facilitates the firing of workers and with reduced employer taxes is incorporated
						Specialised "Work Risk Insurances" companies become obligatory hired by employers and employees in relation to insurance for sickness and accidents.
						Flexibility is incorporated into the distribution of the period of work
1996		Modification to Law of Financial Entities: legal framework applicable to the assets and liabilities of financial entities which are liquidated.	Maximum refunds, extra-zone and intra-zone, are modified	Fuel tax increases. The taxable base of Profits is enlarged	Provincial Banks	Employers taxes are reduced and reductions cross all sectors: from an average 33.0% (for year 1993) of brut remuneration goes to 21.2%.
			Refunds to the production of capital goods are suspended	The regime of family benefits is modified		

	Capital Account Policy	Others Monetary and Financial Policies	Commercial Policy	Fiscal Policy	Privatizations (default) / Deregulations	Labour Market Policy
1997/ 1998	Mercosur: rules of operation of banks of one country into other Mercosur country are created	Liquidity requirements increase	CTEs are increased, and "statistical" rate is derogated	Increase in tax rate of Profits, becoming 35%	Postal mailing	1998: "trial" period is reduced to one month
				Tributary reform: VAT rate is reduced (from 21% to 10.5%) in the case of basic food; the VAT base starts to include new services: cable TV (tax rate 10.5%), pre-paid medical services and graphic advertising (21%). Internal taxes increase.	Airports	1998: the quantity of ways of hiring such that firing is easy and employers tax are smaller is reduced.
				Interests of credits undertaken by companies start to be taxed	Mechanisms for transferring nuclear centrals are developed Congress approves selling of National Mortgage Bank	
1999/ 2000						
2001	December: end of Convertibility Plan					

Sources: Heymann, D (2000) "Políticas de reforma y comportamiento macroeconomico" United Nations - EUDEBA, Buenos Aires; Altimir, O y L. Beccaria (2000) "El mercado de trabajo bajo el nuevo regimen economico en Argentina" United Nations - EUDEBA, Buenos Aires; Penido de Freitas, M.C, and D.Magalhaes Prates (2000), "La experiencia de apertura financiera en Argentina, Brasil y Mexico", Revista de la Cepal 70, downloadable from <http://www.eclac.cl/publicaciones/>; www.infoleg.gov.ar on text of Laws and Decrees and Connell, A. (2001) "Los desafios del Mercosur ante la devaluacion de la economia brasilena", downloadable from <http://www.eclac.cl/publicaciones/Estadisticas/8/LCL1498P/lcl1498e.pdf>

Note: from 1977 the financial system is partially liberalized by elimination in this year of restrictions to entry of new institutions and expansion of bank nets by national or external institutions, with principle of national treatment to foreign banks (rules applicable to external institutions not less favourable than those applicable to national ones).

Annex II. Mathematical Statement of the Model

- Equations in Latex/PDF

Annex III. Financial Assets and Liabilities by Institution

Households

Assets	Liabilities
Domestic equity	Domestic borrowing
Public bonds	Financial wealth
Deposits at domestic banks	
Deposits abroad	
Cash holdings	

Firms

Assets	Liabilities
Deposits at domestic banks	Domestic equity
	Foreign equity
	Domestic borrowing
	Financial wealth

Government

Assets	Liabilities
----	Public bonds
	Financial wealth

Commercial Banks

Assets	Liabilities
Loans to households	Deposits at domestic banks
Loans to domestic firms	Rediscounts
Public bonds	Financial wealth
Reserve requirements	
Deposits abroad	

Central Bank

Assets	Liabilities
Public bonds	Cash in circulation
International reserves	Reserve requirements
Rediscounts	Central Bank's debt with non-residents
	Financial wealth

Annex IV. Derivation of demanded asset shares

See Latex document

Annex V. Construction of the SAM

In this Annex the details of the construction of the Social Accounting Matrix (SAM) is explained. The SAM is constructed in three main steps, choosing year 1991 as the benchmark one⁸⁶. First I prepare an aggregated proto-SAM, a table where I keep activities, commodities, factors, households and enterprises aggregated into a single activity, a single commodity, etc, and where consistency is not assured: agents sources of income do not necessarily match their uses, i.e. row sums may differ from column sums. Second, I disaggregate the accounts in the proto-SAM, still without assuring consistency. Finally, I eliminate inconsistencies using Cross Entropy, particularly using a GAMS code elaborated by Sherman Robinson & Moataz El-Said, selecting macro controls for GDP, aggregate demand components apart from private consumption⁸⁷, and tax receipts. I slightly modified the code to assure that the sector-specific payments to capital coincide with the payments from capital to the sector-specific enterprises, and that the commodity shares in private investment are the same than the ones in public investment, to be consistent with the uniqueness of the capital good composition assumed in the model.

⁸⁶ While in theory any anomalies in the economy for the benchmark year might be transmitted to the model results, tainting the conclusions, Roberts (1994) examines the significance of this in a model of Poland by calibrating to five different benchmark years, and concludes that model results are robust to the choice of benchmark year.

⁸⁷ Which is obtained as residuals in National Accounts.

Step 1. Construction of the aggregated PROTO-SAM:

The construction is explained cell by cell, following the order in which the cells are calculated. The SAM is at 1993 prices, following National Direction of National Accounts (NDNA) data. When values are not originally in 1993 prices, they are converted using the GDP deflator as informed by NDNA.

Cell	Estimation
Taxes on value added	Data provided under special request by the National Direction of Fiscal Research and Analysis (NDFRA, Chart Recaudación Nominal 1980-2006) ⁸⁸ .
Taxes on imports	
Taxes on exports	
Taxes on labour	
Taxes on profits	
Public consumption	As informed in Table of Public Expenditure 1991-2001 (TPE), p. 25 in System of National Accounts (SNA)..
Public Investment	Sum of 'Capital Goods' and 'Construction' items in TPE.

⁸⁸ For tax to profits, data is not available for 1991 so 1992 data is used instead.

Cell	Estimation
Public transfers to households	<p>Total public transfers to private sector times share of household sector in the transfers.</p> <p>Total transfers from 'Transfers' item in TPE.</p> <p>Households share estimated from data provided under request by NDNA for closest year with available data (1993). Specifically, calculated as the share in total public transfers of pensions, scholarships, transfers to cooperatives and to other cultural and social institutions.</p>
Public transfers to enterprises	Total public transfers (informed in TPE) minus transfers to households.
Value added at factor cost	GDP at basic prices as informed by SNA (Table Total Supply – Total Demand 1980-2005).
Private consumption	<p>Calculated as GDP at market prices times the domestic consumption share minus the value of public consumption.</p> <p>GDP at market prices estimated as value added at factor cost plus indirect taxes (taxes to value added, imports and exports).</p> <p>Domestic consumption share taken from Chart I.1. Global Supply and Demand (GS&D) in SNA</p>
Private Investment	<p>GDP at market prices times investment share minus value of public investment.</p> <p>Investment share from GS&D.</p>

Cell	Estimation
Exports	GDP at market prices times export share. Export share from GS&D.
Imports	GDP at market prices times import share. Import share from GS&D.
Gross value added	Value added at factor cost times the relation between gross production and value added at factor cost for the year closest to 1991 informed by NDNA (1993).
Intermediate consumption	Gross value added minus value added at factor cost minus taxes to value added
Households factor income	Share of labour in value added (included tax to labour) times value added at factor cost minus tax to labour, with mentioned share coming from NDNA data on income generation ⁸⁹
Enterprises factor income	Value added at factor cost minus households factor income minus tax to labour

⁸⁹ 1993 proxy as closest year with available data for year of the SAM (1991).

Cell	Estimation
Interests paid by households to banks	<p>As the rest of interest payments, they are calculated as a relevant interest rate times a relevant stock (at the closest available point to the middle of the year).</p> <p>Interest rate: rate on loans as in BCRA data: Document C7.2 'Tasas de interés bancarias' 'Tasas activas'.</p> <p>Stock: loans to households as in Financial Entities Balance – Mortgage and Personal Loans.</p>
Interests paid by enterprises to banks	<p>Interest rate: rate on loans</p> <p>Stock: excess of total bank loans to private sector over loans to households. Total bank loans as in Financial Entities Balance – Total Loans to Private Sector.</p>
Interests paid by government to foreign sector	<p>Interest rate: rate on bonds, coming from series on returns of Argentinean public bonds elaborated and provided as special request by R. Schefer from CEMA.</p> <p>Stock: 'External Position of Non-Financial Public Sector' in International Investment Position by Sector and Concept (IIP) elaborated by National Direction of International Accounts (NDIA).</p>
Interests paid by government to banks	<p>Interest rate: rate on bonds</p> <p>Stock: bonds held by commercial banks as in Financial Entities Balance – Credit to the Public Sector</p>

Cell	Estimation
Interests paid by government to central bank	Interest rate: rate on bonds Stock: Central Bank holdings of public bonds as in Central Bank Balance – Sources of creation of the monetary base, Public sector
Interests paid by government to households	Interest rate: rate on bonds Stock: total public debt informed by NSNA minus value of bond stocks held by other agents.
Interests paid by foreign sector to domestic households	Interest rate: risk-free world interest rate, as informed by US Federal Reserve for U.S. government securities - Treasury bills (secondary market)" , 6 month maturity, annualized ⁹⁰ http://www.federalreserve.gov/releases/h15/data.htm Stock: ‘External Assets of Non-Financial Private Sector’ in IIP
Interests paid by foreign sector to banks	Interest rate: risk-free world interest rate Stock: ‘External Assets of (non Central Bank) Financial Sector’ in IIP
Interests paid by foreign sector to central bank	Interest rate: risk-free world interest rate Stock: ‘Central Bank foreign assets’ as informed in IIP

⁹⁰ The one year maturity one was not used because it was discontinued during the analyzed period.

Cell	Estimation
Interests paid by banks to households	<p>Interest rate: on deposits, taken from BCRA data: Chart IX. Annual interest rate on deposits for 60 or more days, monthly data, arithmetic average.</p> <p>Stock: Financial Entities Balance – Deposits of the Private Sector – ‘Cajas de Ahorro’</p>
Interests paid by banks to enterprises	<p>Interest rate: rate on deposits.</p> <p>Stock: Financial Entities Balance – Total Deposits of the Private Sector minus households deposits</p>
Interests paid by banks to foreign sector	<p>Interest rate: on deposits</p> <p>Stock: of ‘External Liabilities of Financial Sector (excluding Central Bank)’ in IIP.</p>
Interests paid by banks to central bank	<p>Interest rate: on rediscounts, as informed by Central Bank</p> <p>Stock: Central Bank Balance – ‘Credit Granted by the Central Bank to financial institutions’.</p>
Transfer of profits from domestic banks to enterprises	Residual from bank’ current sources and uses of funds.
Transfer of profits from central bank to government	Residual from central bank’ current sources and uses of funds

Cell	Estimation
Dividends paid to non-residents	'Net utilities and dividends' account in the Balance of Payments (BoP)
Dividends paid to domestic households	Payout times excess of enterprise incomes over expenditures minus dividends paid to non-residents. Payout rate informed by exchange market commission bulletin for 1991
Household savings	Residual from household current sources and uses of funds
Enterprise savings	Residual from enterprise current sources and uses of funds
Public savings	Residual from government current sources and uses of funds
Foreign savings	Residual from non-residents' current sources and uses of funds
Variation in Central Bank's foreign reserves	Subtracting January 1991 from January 1992 stock value of 'External Assets of Central Bank' as informed in IIP.
Variation in domestic banks' deposits abroad	Subtracting Jan. 1991 from Jan. 1992 stock value of 'External Assets of (non Central Bank) Financial Sector' in IIP.

Cell	Estimation
Variation in non-residents' deposits at domestic banks	Subtracting Jan. 1991 from Jan. 1992 stock value of 'External Liabilities of Financial Sector (excluding Central Bank)' in IIP.
Variation in non-residents' holdings of public bonds	Subtracting Jan. 1991 from Jan. 1992 stock value of 'External Position of Non-Financial Public Sector' in IIP
Variation in household's deposits abroad	Subtracting Jan. 1991 from Jan. 1992 stock value of 'External Assets of Non-Financial Private Sector' as informed in IIP.
Variation in property of enterprises by non-residents	Subtracting Jan.1991 from Jan.1992 stock value of 'External Liabilities of Non-Financial Private Sector' in IIP.
Variation in household's cash holdings	Subtracting Dec.1990 from Dec.1991 stock value of Central Bank Balance – Monetary circulation out of the financial system.
Variation in banks' reserve requirements	Subtracting Dec.1990 from Dec.1991 stock value of 'Monetary base held into the financial system' – Central Bank Balance.
Variation in Central Bank's holdings of public bonds	Subtracting Dec 1990 from Dec 1991 stock value of Central Bank Balance – Sources of creation of the monetary base, Public sector.

Cell	Estimation
Variation in households' deposits at domestic banks	Subtracting Dec 1990 from Dec 1991 stock value in Financial Entities Balance – Deposits of the Private Sector – Saving Accounts.
Variation in loans by domestic banks to households	Subtracting Dec 1990 from Dec 1991 stock value in Financial Entities Balance – Credit to the Private Sector – items Personal Loans and Mortgages.
Variation in loans by domestic banks to firms	Subtracting Dec 1990 from Dec 1991 stock value in Financial Entities Balance - Total bank credit to private sector minus credit to households.
Variation in firms' deposits at domestic banks	Subtracting Dec 1990 from Dec 1991 stock value in Financial Entities Balance – 'Total deposits' and then subtracting 'Variation in households' deposits at domestic banks'
Variation in domestic banks' holdings of public bonds	Subtracting Dec 1990 from Dec 1991 stock value in Financial Entities Balance – Credit to the Public Sector.
Variation in household's holdings of public bonds	Calculated as residual to equilibrate incomes and expenditures of capital account government in the SAM

Cell	Estimation
Variation in property of enterprises by households	Calculated as residual to equilibrate incomes and expenditures of capital account households in the SAM.
Variation in rediscounts	Calculated as residual to equilibrate incomes and expenditures of capital account central bank in the SAM

Step 2. Disaggregation of the PROTO-SAM:

Departing from the aggregated PROTO-SAM, accounts are disaggregated in the following cells as explained in the right-hand columns:

Cell	Disaggregated account/s	How
Value added at factor cost	Activities and Factors	1) Split across activities, using NSNA data on value added by sector of activity for closest year to 1991 (1993); 2) For each activity, following NDNA Data Chart Accounts of Income Generation for close available year (1993), split factor income into i) formal labor, ii) informal labor and iii) capital –physical and working, as in NSNA data; 3) Attribute i) and ii) by skill following income shares in Permanent Household Survey.

Cell	Disaggregated account/s	How
Gross Value Added: Supply matrix	Activities and Commodities	Split among activities following the proportion of activity-specific payments (for value added, intermediates and tax to value added) in total activity payments. Imputed to commodity by excluding secondary production from each activity (negligible given the low disaggregation level).
Intermediate consump-tion	Activities and Commodities	Split in a two-step process. In Step 1 intermediate consumption is split across activities, following shares of activities in intermediate consumption as informed by NDNA (1993). In Step 2 activity-specific values are distributed across commodities following shares of intermediate inputs by activities in MIPAr97 Use Table at basic prices (Chart 3) ⁹¹
Private consump- tion	Commodities and Households	Split across commodities following commodity shares in column 'Final Consumption' of Input-Output, and then across households following shares of (interest-adjusted) incomes
Private investment	Enterprises & Commodities	Split first across enterprises –following value added shares- and then across commodities - following shares in 'Gross Fixed Capital Formation' column of Input-Output Table (Chart 12 MIPAr97)-

⁹¹ Activities: of the 124 existent ones, agriculture is 1 to 14; industry is 15 to 92; construction is 96; public services are 113,114 and 116, private services are the remaining ones. Commodities: of the 195 existent ones, agriculture is 1 to 38; industry is 39 to 147; construction is 148; public services is 180 to 183, rest are private services.

Cell	Disaggregated account/s	How
Public consumption	Commodities	Split following shares in ‘Public consumption’ column of Input-Output Table (Chart 12 MIPAr97)
Public investment	Commodities	Split following shares in ‘Gross Fixed Capital Formation’ column of Input-Output Table (Chart 12 MIPAr97)
Exports	Commodities and Regions	Split using export value data by sector (classified by CIIU revision 2 at 3 digits) and partner generated by Banco de Datos Estadísticos de Comercio Exterior ⁹² .
Imports	Commodities and Regions	Split using export value data by sector (classified by CIIU revision 2 at 3 digits) and partner generated by Banco de Datos Estadísticos de Comercio Exterior ⁹³ .
Taxes on value added	Activities	Split across activities following value added shares.
Taxes on labor	Factors	Split among formal (skilled and unskilled) workers according to their shares in income of formal labor.

⁹² Facilitated by Gonzalo Varela, University of Sussex.

⁹³ Facilitated by Gonzalo Varela, University of Sussex.

Cell	Disaggregated account/s	How
Taxes on imports	Commodities and Regions	Split accounting for region- and sector-specific data on tariff rates and import values. See section on time-specific data for details on tariff rates.
Taxes on exports	Commodities and Regions	Split accounting for region- and sector-specific data on export tax rates and export values. See section on time-specific data for details on export tax rates.
Taxes on profits	Enterprises	Following the value added shares
Public transfers to households	Households	Attributed to the unskilled who typically account for the bulk of these transfers.
Public transfers to enterprises	Enterprises	Split following enterprises value added shares ⁹⁴
Households factor income	Households	The after-tax income of the skilled is allocated to skilled households and the after-tax income of formal and informal unskilled (the second being untaxed) allocated to unskilled households.

⁹⁴ Further research is planned if the Survey to 500 largest companies is accessed.

Cell	Disaggregated account/s	How
Enterprises factor income	Enterprises and Factors	<p>Split following values of capital income by sector as informed in ‘Income Generation’ Chart (NDNA)</p> <p>Enterprises receive the income of (physical and working) capital associated to the specific activity where they operate.</p>
Dividends paid to households	Enterprises and Households	Split according to value added sector shares and attributed entirely to capitalist household.
Dividends paid to non-residents	Enterprises	Split according to value added sector shares
Household savings	Households	Split in proportion to (interest-adjusted) incomes
Enterprise savings	Enterprises	Split according to value added sector shares
Interests paid by government to households	Households	Attributed to capitalist households.

Cell	Disaggregated account/s	How
Interests paid by non-residents to households	Households	Attributed to capitalist households.
Interests paid by households to bank	Households	Split across households in proportion to households factor incomes, including labour payments and dividends
Interests paid by banks to households	Households	Split across households in proportion to households factor incomes, including labour payments and dividends
Interests paid by enterprises to bank	Enterprises	Split following activity-specific borrowed loans during the year as informed by the Central Bank Department of Monetary and Financial Statistics
Interests paid by banks to enterprises	Enterprises	Split according to value added sector shares
Variation in loans by domestic banks to firms	Enterprises	Split according to shares of 'Loans by activities', information provided by the Central Bank Department of Monetary and Financial Statistics

Cell	Disaggregated account/s	How
Variation in property of enterprises by households	Enterprises and Households	Split according to the shares in Variation in loans by domestic banks to firms, assuming for simplification that the provision of financial capital by banks and households follow the same activity-level pattern. Attributed to capitalist households.
Variation in property of enterprises by non-residents	Enterprises	Split according to the shares in Variation in loans by domestic banks to firms, assuming for simplification that the provision of financial capital by banks and non-residents follow the same activity-level pattern.
Variation in firms' deposits at domestic banks	Enterprises	Split according to value added sector shares
Variation in household's deposits abroad	Households	Attributed to capitalist households.

Cell	Disaggregated account/s	How
Variation in household's holdings of public bonds	Households	Attributed to capitalist households.
Variation in household's cash holdings	Households	Split in proportion to household's consumption levels
Variation in households' deposits at domestic banks	Households	Split in proportion to household's saving levels
Variation in loans by domestic banks to households	Households	Split in proportion to (interest-adjusted) incomes

Annex VI. Additional shocks to understand model workings

Having described the results of simulations T1 and K1 in Chapter 8, in this Annex I report the results of the remaining simulations, highlighting the transmission channels present in the model and referring the explanations given in Chapter 8 as and when needed.

Note: this Annex is under review

Results of 10 External Shocks for Analysis of Workings of Nested Models
Relative deviations from base (%) except for shares and other rates,
where absolute deviations from base are reported

	Base		Perceived prob of default on domestic assets ↑10 p.p.				Risk-free world interest rate ↑10 p.p.				Deposits held by non-residents ↓10%				Equity held by non-residents ↓10%				Bonds held by non-residents ↑10%				
	Amount	Unit	R	RF	RFA	RFAS	R	RF	RFA	RFAS	R	RF	RFA	RFAS	R	RF	RFA	RFAS	R	RF	RFA	RFAS	
Balance of Payments^Δ																							
Current Account	-8.46	B\$	..	3.56	3.60	4.75	..	23.42	21.49	16.32	9.37	8.04	8.10	10.29	13.03	13.77	13.92	18.47	-32.20	-34.16	-34.47	-37.47
Trade Balance	3.44	B\$	..	9.58	9.67	14.36	-221.07	-191.86	-184.41	-203.43	22.90	17.28	17.51	26.58	31.82	35.28	35.55	54.76	-78.64	-83.64	-84.23	-95.64
Exports of Goods and NFS	21.51	B\$	..	0.75	0.75	0.82	-15.72	-13.75	-13.53	-14.62	1.81	1.36	1.36	1.51	2.52	2.80	2.78	3.19	-5.96	-6.34	-6.29	-6.75
Imports of Goods and NFS	18.07	B\$	..	-0.93	-0.95	-1.76	23.38	20.17	19.01	21.33	-2.21	-1.66	-1.72	-3.26	-3.06	-3.38	-3.46	-6.63	7.88	8.37	8.55	10.17
Investment Income	-11.90	B\$	..	-0.24	-0.24	-0.78	63.93	72.14	68.61	70.43	0.04	0.72	0.70	-0.37	0.06	-0.42	-0.39	-2.71	-0.14	-0.09	-0.14	1.02
Interests	-10.91	B\$	..	-0.28	-0.28	-0.93	70.24	79.19	75.28	77.66	..	0.75	0.72	-0.55	..	-1.43	-1.40	-4.12	..	0.11	0.07	1.55
Profits and Dividends	-0.99	B\$	..	0.23	0.24	0.83	-5.39	-5.33	-4.77	-9.03	0.49	0.40	0.42	1.53	0.68	10.71	10.74	12.81	-1.70	-2.35	-2.44	-4.73
Capital Account	10.62	B\$	..	-3.56	-3.60	-4.75	..	-23.42	-21.49	-16.32	-7.47	-8.04	-8.10	-10.29	-10.38	-13.77	-13.92	-18.47	25.65	34.16	34.47	37.47
Non Financial Private Sector	7.50	B\$	..	-5.06	-5.11	-6.81	..	-32.50	-29.85	-22.13	..	-1.38	-1.47	-4.70	-14.69	-20.45	-20.67	-27.41	..	14.51	14.95	19.42
Public Sector	1.99	B\$	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	137.05	137.05	137.05	137.05	
Commercial Banks	1.13	B\$	..	0.13	0.14	0.65	..	-4.32	-3.71	-6.36	-70.39	-66.62	-66.59	-65.62	..	6.45	6.48	8.50	..	-16.40	-16.47	-17.92
Public Deficit	11.99	B\$	..	0.33	0.36	1.67	-8.20	-15.47	-14.62	-20.16	0.24	0.64	0.70	3.20	0.33	1.19	1.29	6.58	-0.87	-4.54	-4.74	-7.73
Price of domestic goods	1.00	\$	..	-0.23	-0.23	-0.22	5.31	4.56	4.24	4.12	-0.55	-0.42	-0.42	-0.41	-0.77	-0.85	-0.84	-0.86	1.90	2.04	2.00	1.98
Real GDP	189.86	B\$	..	0.00	-0.02	-0.50	0.06	0.05	-0.30	1.19	-0.01	0.00	-0.04	-0.96	-0.01	-0.01	-0.07	-1.94	0.02	0.02	0.16	1.01
Factor use																							
Formal Skilled	1.43	mill. Indi	..	0.00	-0.01	-0.54	0.05	0.04	-0.07	0.92	0.00	0.00	-0.02	-1.02	-0.01	-0.01	-0.03	-2.08	0.02	0.02	0.07	0.69	
Formal Unskilled	7.39	mill. indi	..	-0.01	-0.02	-0.63	0.18	0.15	-0.10	4.13	-0.01	-0.01	-0.04	-1.19	-0.02	-0.02	-0.06	-2.42	0.05	0.06	0.16	2.34	
Physical Capital	288.65	B\$	..	..	..	-0.56	..	..	..	-0.76	..	..	..	..	..	..	..	-2.15	..	..	..	-0.19
Working Capital	17.15	B\$	..	..	-0.34	-0.55	..	..	-6.74	-5.80	..	..	-0.74	-1.13	..	..	-1.17	-1.95	..	..	2.99	3.52
Tradables Value Added Shares																							
Agriculture	10.9	%	..	0.02	0.02	0.07	-0.43	-0.37	-0.36	-0.67	0.05	0.04	0.04	0.13	0.07	0.07	0.08	0.28	-0.16	-0.17	-0.18	-0.31	
Industry	25.8	%	..	0.02	0.02	0.00	-0.30	-0.25	-0.24	-0.06	0.04	0.03	0.03	0.00	0.05	0.06	0.06	0.00	-0.12	-0.13	-0.13	-0.05	
Real Wages																							
Formal Skilled	16.82	th\$/indiv	..	0.00	-0.02	0.09	0.12	0.10	-0.16	-3.63	-0.01	-0.01	-0.04	0.16	-0.01	-0.02	-0.06	0.39	0.04	0.04	0.15	-1.72	
Formal Unskilled	9.29	th\$/indiv	..	0.00	-0.01	0.17	0.09	0.07	-0.05	-3.64	-0.01	-0.01	-0.02	0.32	-0.01	-0.01	-0.03	0.67	0.03	0.03	0.08	-1.77	
Informal Unskilled	9.29	th\$/indiv	..	0.06	0.04	-0.53	-1.29	-1.27	-2.00	0.09	0.16	0.10	0.06	-1.01	0.22	0.22	0.17	-2.03	-0.52	-0.47	-0.34	0.69	
Physical Capital	0.20	% of stock v.	..	-0.01	-0.06	0.01	0.29	0.10	-1.20	3.86	-0.01	-0.03	-0.13	0.02	-0.02	-0.05	-0.19	0.05	0.07	0.15	0.51	2.80	
Working Capital	0.35	% of stock v.	..	..	0.66	0.05	..	..	13.79	13.85	..	..	1.44	0.28	..	..	2.30	-0.10	..	..	-5.46	-5.32
Factor Income Shares																							
Formal Skilled	13.2	%	..	0.00	0.00	0.01	0.02	0.03	0.04	-0.49	0.00	0.00	0.00	0.01	0.00	0.00	-0.01	0.03	0.01	0.00	0.01	-0.26	
Formal Unskilled	37.7	%	..	0.00	0.00	0.01	0.09	0.10	0.15	-0.24	-0.01	0.00	-0.01	0.03	-0.02	-0.01	-0.02	0.05	0.03	0.02	0.03	-0.15	
Informal Unskilled	14.1	%	..	0.01	0.01	0.00	-0.19	-0.17	-0.21	-0.13	0.02	0.01	0.01	-0.01	0.03	0.03	0.03	-0.02	-0.07	-0.07	-0.07	-0.03	
Physical Capital	31.7	%	..	0.00	-0.01	-0.02	0.08	0.05	-0.21	0.65	-0.01	-0.01	-0.03	-0.03	-0.01	-0.02	-0.05	-0.06	0.03	0.04	0.12	0.53	
Working Capital	3.3	%	..	..	0.01	0.00	..	..	0.22	0.20	..	..	0.02	0.00	..	..	0.04	0.00	..	..	-0.09	-0.09
Household Income Shares																							
Skilled	14.1	%	..	0.00	0.00	0.00	-0.42	-0.42	-0.42	-0.90	-0.01	-0.01	-0.01	-0.01	-0.02	0.00	-0.01	0.00	0.05	0.03	0.03	-0.22	
Unskilled	64.6	%	..	0.02	0.02	0.03	-2.50	-2.45	-2.46	-2.50	0.01	-0.01	-0.01	0.00	0.01	0.07	0.07	0.08	-0.02	-0.09	-0.08	-0.10	
Profit-earning	21.3	%	..	-0.02	-0.02	-0.03	2.92	2.88	2.88	3.41	0.01	0.02	0.02	0.01	0.01	-0.07	-0.06	-0.08	-0.03	0.06	0.05	0.32	

Δ: In the balance of payments, following national accounts system, a + (-) means that the flow leads country's international reserves holdings to increase (fall)

Results of 10 External Shocks for Analysis of Workings of Nested Models (cont.)
Relative deviations from base (%) except for shares and other rates,
where absolute deviations from base are reported

	Base		Rate of tax on imports ↓10%				Rate of tax on exports ↓10%				Price of exports ↑10%				Price of imports ↓10%				Nominal exchange rate ↑10%			
	Amount	Unit	R	RF	RFA	RFAS	R	RF	RFA	RFAS	R	RF	RFA	RFAS	R	RF	RFA	RFAS	R	RF	RFA	RFAS
Balance of Payments^Δ																						
Current Account	-8.46	B\$	..	0.55	0.64	2.14	..	0.02	-0.07	-0.47	..	-10.84	-13.67	-26.25	..	-0.96	-0.07	17.77	..	-89.12	-92.50	-114.09
Trade Balance	3.44	B\$	-0.05	3.35	3.12	9.23	0.08	1.04	1.28	-0.33	2.34	-44.88	-36.12	-80.33	-0.54	-8.34	-10.63	66.86	-39.61	-286.84	-279.40	-347.82
Exports of Goods and NFS	21.51	B\$	0.95	1.21	1.20	1.28	0.75	0.83	0.84	0.80	24.38	20.88	21.49	22.21	15.07	14.47	14.35	14.90	-3.03	-19.98	-19.15	-17.66
Imports of Goods and NFS	18.07	B\$	1.14	0.80	0.83	-0.23	0.88	0.79	0.76	1.02	28.58	33.40	32.46	41.74	18.04	18.81	19.11	5.01	3.94	30.84	30.40	45.20
Investment Income	-11.90	B\$	0.01	-0.58	-0.44	-1.15	-0.02	-0.29	-0.42	-0.24	-0.68	5.27	0.73	4.58	0.16	1.73	3.03	-6.70	11.46	19.61	15.05	19.49
Interests	-10.91	B\$	..	-0.65	-0.51	-1.35	..	-0.29	-0.44	-0.21	..	6.64	1.62	6.75	..	1.75	3.18	-8.25	12.56	23.17	18.05	24.83
Profits and Dividends	-0.99	B\$	0.16	0.26	0.24	1.04	-0.28	-0.27	-0.25	-0.53	-8.12	-9.77	-9.08	-19.34	1.86	1.57	1.38	10.25	-0.74	-19.47	-17.89	-39.21
Capital Account	10.62	B\$	..	-0.55	-0.64	-2.14	..	-0.02	0.07	0.47	..	10.84	13.67	26.25	..	0.96	0.07	-17.77	..	89.12	92.50	114.09
Non Financial Private Sector	7.50	B\$	..	-0.82	-0.95	-3.16	..	-0.03	0.09	0.68	..	16.09	19.98	38.63	..	1.45	0.23	-26.21	..	131.30	135.89	167.94
Public Sector	1.99	B\$	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED	FIXED
Commercial Banks	1.13	B\$	..	0.28	0.25	0.91	..	0.03	0.05	-0.13	..	-5.04	-4.23	-9.97	..	-0.62	-0.89	7.06	..	-34.61	-33.35	-43.30
Public Deficit	11.99	B\$	0.46	1.15	1.12	2.83	0.19	0.46	0.49	0.05	-5.91	-13.63	-12.84	-25.51	-1.10	-2.68	-2.99	18.12	-5.53	-19.74	-19.42	-41.94
Price of domestic goods	1.00	\$	-0.24	-0.32	-0.31	-0.33	0.22	0.20	0.19	0.22	6.80	7.77	7.45	7.95	-3.34	-3.17	-3.08	-3.64	11.04	17.70	17.13	17.35
Real GDP	189.86	B\$	0.02	0.02	0.02	-0.58	0.02	0.02	0.01	0.11	0.32	0.33	0.07	3.58	0.35	0.35	0.46	-6.11	0.01	0.08	0.29	7.19
Factor use																						
Formal Skilled	1.43	mill. Indi	0.01	0.01	0.01	-0.63	0.01	0.01	0.01	0.09	0.21	0.22	0.14	2.72	0.23	0.23	0.27	-6.77	0.01	0.07	0.15	4.34
Formal Unskilled	7.39	mill. indi	0.04	0.04	0.04	-0.77	0.04	0.04	0.03	0.29	0.77	0.79	0.61	9.48	0.86	0.87	0.94	-7.97	0.03	0.26	0.40	18.51
Physical Capital	288.65	B\$	..	..	..	-0.64	..	..	..	-0.01	..	..	..	-0.24	..	..	..	-6.83	..	..	..	-0.28
Working Capital	17.15	B\$	..	..	0.15	-0.09	..	..	-0.19	-0.15	..	..	-4.99	-3.55	..	..	2.31	-0.33	..	..	4.93	8.07
Tradables Value Added Shares																						
Agriculture	10.9	%	0.01	0.02	0.02	0.08	-0.01	-0.01	-0.01	-0.01	0.10	0.02	0.06	-0.16	0.12	0.10	0.10	0.89	-0.08	-0.56	-0.55	-0.89
Industry	25.8	%	0.00	0.01	0.01	-0.02	0.02	0.02	0.02	0.03	-0.04	-0.11	-0.07	0.13	-0.04	-0.05	-0.07	-0.53	-0.06	-0.41	-0.36	0.06
Real Wages																						
Formal Skilled	16.82	th\$/indiv	0.02	0.02	0.03	0.21	0.03	0.03	0.02	-0.19	0.50	0.52	0.32	-6.18	0.55	0.56	0.64	3.34	0.02	0.16	0.35	-9.64
Formal Unskilled	9.29	th\$/indiv	0.02	0.02	0.02	0.31	0.02	0.02	0.02	-0.19	0.39	0.40	0.31	-6.51	0.43	0.44	0.48	3.97	0.01	0.13	0.20	-12.87
Informal Unskilled	9.29	th\$/indiv	0.13	0.16	0.18	-0.53	0.03	0.03	0.01	0.14	2.03	1.66	0.90	5.56	2.30	2.28	2.58	-4.96	-0.26	-1.44	-1.83	7.10
Physical Capital	0.20	% of stock v.	0.09	0.09	0.13	0.12	0.08	0.08	0.03	0.29	1.84	1.78	0.57	9.06	2.04	2.08	2.58	2.03	0.03	0.61	0.56	15.92
Working Capital	0.35	% of stock v.	..	..	-0.18	-0.93	..	..	0.41	0.49	..	..	11.40	13.91	..	..	-2.20	-10.09	..	..	-9.41	-5.77
Factor Income Shares																						
Formal Skilled	13.2	%	-0.01	-0.01	-0.01	0.01	0.00	0.00	0.00	-0.03	-0.10	-0.09	-0.06	-1.01	-0.11	-0.11	-0.12	0.15	0.00	0.01	0.06	-1.52
Formal Unskilled	37.7	%	-0.01	-0.01	-0.01	0.02	0.00	0.00	0.00	-0.02	-0.11	-0.08	0.00	-0.70	-0.12	-0.13	-0.15	0.16	0.02	0.08	0.21	-1.14
Informal Unskilled	14.1	%	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.08	0.04	0.00	0.17	0.09	0.09	0.10	-0.04	-0.04	-0.23	-0.26	0.08
Physical Capital	31.7	%	0.01	0.01	0.01	-0.01	0.01	0.01	0.00	0.04	0.13	0.13	-0.10	1.36	0.14	0.15	0.23	-0.07	0.01	0.15	0.16	2.71
Working Capital	3.3	%	..	..	0.00	-0.02	..	..	0.01	0.01	..	..	0.16	0.18	..	..	-0.06	-0.20	..	..	-0.16	-0.14
Household Income Shares																						
Skilled	14.1	%	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.03	0.04	0.04	0.04	-0.87	-0.15	-0.15	-0.16	-0.03	0.16	0.13	0.09	-1.41
Unskilled	64.6	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.06	0.00	-0.06	-0.27	0.02	0.00	-0.01	-0.06	-0.10	-0.72	-1.00	-1.40
Profit-earning	21.3	%	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.03	-0.10	-0.04	0.02	1.14	0.13	0.15	0.16	0.09	-0.06	0.60	0.91	2.81

Δ: In the balance of payments, following national accounts system, a + (-) means that the flow leads country's international reserves holdings to increase (fall)

Simulation K2. 10 p.p. increase in risk-free world interest rate

Real Model

- The shock provokes an interest inflow to the domestic economy paid to holders of deposits abroad (capitalist households and banks) that increases capitalist RHG incomes directly and indirectly (via higher dividends, as seen below). This increases their consumption demand and drives domestic prices up such that: 1) the real exchange rate appreciates making net exports fall; 2) factor demands at given nominal wages increase, driving formal employment levels and all nominal wages up. The increase in employment allows to expand the level of economic activity.
- The increases in prices, wages, employment levels and activity level expand the tax base and leads to a reduction of the public deficit.
- At the country level, the received interest inflow is spent in the payment of additional net imports and higher dividends to non-residents (the latter out of the increase in the nominal wage of capital).
- The domestic appreciation shifts the demand for factors towards the non-tradable sectors and lowers the demand for the (informal unskilled) factors intensively used in the (primary) export sectors, affecting in turn their relative wages and their factor income share.
- The fall in the demand for the (informal) unskilled and the interest income received by the capitalist households from non-residents drive the changes in the household income shares.

Real Financial Model

- The higher return on foreign assets leads capitalist households to increase their deposits abroad, generating a capital outflow from the domestic economy. The increases in deposits abroad and in the interest rate paid on them lead to a higher interest flow paid to residents which more than offsets the capital account outflow, letting space for increasing net imports as in the real model.
- The public deficit reduction leads to lower the rate of return paid by the public sector on its debt. The capital outflow generates a fall in the monetary supply that, combined with domestic inflation, reduce real liquidity in the economy and lead bank lending and borrowing rates to increase. With the increase in the activity level, equity return goes up in every sector except in the primary one, which is particularly hit by the fall in exports.

- The changes in the household income shares are driven as in the real model.

Real Financial Augmented Model

- The capital outflow lowers the supply of working capital and leads to a fall in the productivity of the other factors and in the use of formal workers. All this contracts the activity level, more than offsetting the positive effect of higher prices on factor demand.
- While the fall in the productivity of the other factors leads to a fall in their real wages, the fall in the supply of working capital generates excess demand for it and leads to an increase in its real wage, increasing the financial cost of physical investment and lowering the investment level in the economy, the construction activity and the demand for physical capital – intensively used in the construction sector, leading to a fall in the real wage and the income share of physical capital.
- Asset returns move as in the real financial model, except for the fall in the return of equity in the construction sector, linked to the mentioned cut in physical investment.
- The changes in the household income shares are also driven as in the real model.

Simulation K3. Cut in non-residents deposits in domestic banks

Real Model

- In this model, the shock is captured as a fall in foreign savings i.e. a cut in the current account deficit of the domestic economy that calls for increasing exports and cutting imports, with the equilibrating mechanism -with elastic import demand and export supply- being real devaluation, particularly via lowering domestic prices.
- The domestic price cut reduces firms' profits and their demand for factors, leading them to reduce employment and production levels that, in turn, affect national income and domestic absorption.
- At the sector level, the economy provides signals for producers to move factors towards the tradable sector -especially the primary one- benefitting the informal unskilled workers.
- Public savings fall as falling prices and activity level lower the tax revenue base.
- The wage increase of the informal unskilled workers leads to increase the income share of the unskilled households. As the nominal income of labour and capital shrinks, the relative importance of the (nominally fixed) interest flows as a source of household income increases, shifting the income share of the net interest recipient households (the capitalist ones).

Real Financial Model

- The shock leads capitalist households to increase their deposits abroad due to two reasons. First, as public and foreign savings fall, households increase their savings to fill the generated savings-investment gap, part of these savings being deposited abroad. Second, deflation and contraction of the activity level leads equity returns to fall⁹⁵ making deposits abroad relatively more attractive.
- As non-residents reduce their deposits in the domestic banks and capitalist household increase their deposits abroad, the net interest payments to non-residents fall.
- Income distribution at the household level changes slightly. As factor income falls, the income of each of the representative household groups (RHG) falls, but the income of the capitalist households falls proportionately less, given that their factor income fall is partially offset by increases in the returns of public bonds (linked to

⁹⁵ Except in the primary sector

the increase in the public deficit) and bank deposits (linked to the fall in real liquidity in the economy caused by the original capital outflow). As a result, the income share of the capitalist households increase, lowering those of the other RHGs.

Real Financial Augmented Model

- The contraction of the economy is reinforced by the cut in the supply of working capital that follows the capital outflows.
- The cut in the supply of working capital leads to a proportionately larger increase in its nominal wage, increasing the factor income share.
- The variations in household income shares are driven by the same factors than in the real financial model.

Simulation K4. Cut in equity stock held by non-residents

Real Model

- As in the case of the cut in non-residents deposits, the model essentially captures the impulse as a cut in foreign savings, involving the same transmission mechanisms. The impulse is higher given that the value of equity held by non-residents exceeds that of their deposits.

Real Financial Model

Compared to the cut in non-residents deposits:

- The cut in equity held by non-residents reduce their earned dividends instead of their earned interests and make banks interest payments to non-residents increase as the capital outflow lowers liquidity in the domestic economy and increases domestic interest rates. The increase in paid interests more than offsets the fall of dividends paid to non-residents, with a negative final effect on the investment income account of the balance of payments.
- Facing an increase in the rate banks can get by lending to residents, banks cut their deposits abroad, partially offsetting the original worsening of the capital account.
- The higher original impulse leads to a higher increase in the public deficit.
- Besides the income share fall of the unskilled households, the capitalist households lose income share due to a fall in their earned interests⁹⁶.

Real Financial Augmented Model

- The model behaves similarly to the real financial model with the same impulse, only that in this case the capital outflow lowers the overall supply of working capital and leads to fall in its use and increases in its remuneration and its factor income share.

⁹⁶ In turn, this fall occurs because their deposits in domestic banks become negative (sic) as an unintended result of the strong reduction in the monetary base, and the simplification that the fall in the monetary base affects the level of required reserves in the banks and, given the reserves ratio, the level of deposits, with the capitalist households deposits being the adjusting variable. This assumption is needed to capture the effect of capital flows on the monetary supply in a simple way.

Simulation K5. 10% cut in public bonds stock held by non-residents

The effects of the shock are compared to those in the same model generated by a cut in equity held by non-residents. Overall, the impulse is larger given that the value of bonds held by the non-residents exceeds their equity holdings and starts in a different item of the capital account of the balance of payments.

Real Model

- Apart from differences of magnitude, the results go in the same direction.

Real Financial Model

- The higher impulse given by the capital account outflow leads to a stronger real devaluation and hence a larger fall in the domestic prices.
- The effect on the non financial private sector capital flows is indirect instead of direct, as capitalist households endogenously increase their deposits abroad as they increase their savings (to fill the gap between overall savings and overall investment in the context of shrinking foreign and public savings) and, driven by falling equity returns in every sector except the primary one, the return on deposits abroad become relatively more attractive.

Real Financial Augmented Model

- The same comments than those in the previous section (real financial model) apply here, except that the capitalist households increase (instead of decrease) their income share given that dividends fall proportionately less than labour income, in turn a consequence of the economy shifting more strongly than in the previous simulation to sectors which intensively use physical capital (primary and industry) given the higher impulse.

Simulation T2. Elimination of export taxes

Real Model

- As with import tax reduction, the public sector loses revenue and increases its deficit.
- With the original tax rate on industrial exports (5.9%) being significantly higher than that on primary exports (1.8%), the export tax elimination not only increases the relative price of exports vis-à-vis domestic goods as perceived by producers but also increases the relative price of industrial exports vis-à-vis primary exports.
- This leads to increase industrial production and industrial exports with factors moving out of all the other sectors into the industrial one, with even the production of the primary sector falling (differently than in Mercosur implementation).
- Exports increase at the expense of falling production for the domestic market, provoking excess demand for the domestic goods and increase in the domestic prices (opposite to Mercosur case). With the price of domestic goods increasing less than the export prices, the relative price of exports increase and the relative price of imports fall, such that there is not a clear direction of the real exchange rates movements, leading to higher imports and higher degree of openness, as with Mercosur implementation.
- Domestic inflation lifts nominal profits and dividends paid to residents and non-residents. To avoid a worsening of the current account, the trade superavit is increased (opposite to Mercosur implementation).
- The increase in export prices together with domestic inflation shift the producer output prices up, in turn shifting firms factor demands up at given nominal wages, leading to nominal wage and labour use increases. With given import prices, wages increase more than the CPI and real wages increase⁹⁷. Factor demand goes up especially for physical capital and the formal unskilled -intensively used in the (growing) industrial sector-, such that their income shares increase.
- Household income distribution moves against the unskilled and the capitalist households: the income share of the unskilled households shrinks due to the shrinking of the (informal unskilled intensive) primary sector, and the income share of the capitalist households falls given that they are the only RHG that is a net

⁹⁷ As was the case in Mercosur simulation, just that then it was due to CPI falling proportionately more than nominal wages.

interest recipient, that net interests are fixed in nominal terms and that the remaining income grows as factor income (through factor wages and factor use going up) increases.

Real Financial Model

- Results in the real sphere of this model are similar to those in the real model.
- The returns for bank deposits and loans, bonds and equity go up: the inflation reduces the monetary base in real terms, and the increase in GDP augments the currency demand for transactions, leading the bank interest rates to increase; to finance the higher public deficit, the government increases its supply of bonds, generating excess supply that adjusts with its return going up; equity return, linked to the nominal increase in the remuneration of capital, increases in every sector, with the highest increase in the (growing) industrial one.
- With the increase in the public deficit, the public superavit shrinks. To make overall savings consistent with overall investment, the households increase their savings, increasing their bank deposits⁹⁸, bond holdings, equity holdings and deposits abroad. The capital outflow associated to the increase in deposits abroad is compensated by reducing the current account deficit in the balance of payments, i.e. lowering foreign savings, such that private savings increase also to compensate for the foreign savings fall.
- The capital outflow leads to a contraction in the monetary base and money supply which reinforces the increase in bank rates.
- The capitalist households reassign asset portfolio shares: with the return on bonds and equity increasing, they increase the share of these assets in their portfolio and cut that of deposits abroad (even when their deposits abroad grow in absolute value).
- The trade superavit increases to reduce the current account deficit and compensate for the higher investment income paid to non-residents, linked in turn to higher return on their public bond and domestic deposits foreign holdings.

⁹⁸ The increase in skilled and unskilled households deposits more than offsets the fall in capitalist households deposits.

Real Financial Augmented Model

- Inflation (with a partially offsetting effect of nominal increase in working capital) reduces the real supply of working capital and leads its wage to increase more than for other factors and increase its factor income share. With the fall in working capital use, output increases less than in the previous models.
- This leads to an increase in the remuneration of working capital (4.26%) and a fall in the productivity of and the demand for other factors, with adjustment in the form of lower increases in formal labour use and in the real wages of labour and capital
- The smaller increase in the activity level affects the tax base and the public deficit and leads to a higher increase in the return on bonds. This, in turn, affects the allocation of portfolio assets of the capitalist household, who now substitutes away from deposits abroad into public bonds, generating a capital inflow and an improvement in the capital account of the balance of payments which is used to finance a higher current account deficit.
- The interest rate on loans increase substantially, making the financial cost of physical investment higher and reducing the demand for the construction activity (intensive in physical capital), reducing the increase in the real wage of physical capital and reducing its share in factor income.

Simulation T3. 10% increase in foreign price of exports

Real Model

Compared to the export tax elimination simulation:

- The export prices perceived by the producers increase uniformly for agriculture and industry (10%).
- With the primary activity being originally more export intensive than the industrial one in the original situation⁹⁹, the increase in exports shifts factors to the primary activity away from the other sectors, increasing the income shares of the factors intensively used there - capital and informal unskilled workers.
- Public finances improve (rather than deteriorate) given that the tax rates do not fall and (as in the export tax elimination) the tax base increases.
- With public savings increasing, private savings are allowed to fall, allowing private consumption to increase.
- Household income distribution changes driven by growth in factor incomes and nominally fixed interest flows. With the capitalist RHG being the only net interest recipient, its income share shrinks.

Real Financial Model

Compared to the real model:

- With the reduction in the public deficit, the return on public bonds goes down, and the interest payments to non-residents fall.
- Higher activity and price levels increase the transactions demand for nominal balances and lead bank rates to increase, increasing the financial cost of physical investment and making physical investment to fall.
- The fall in private savings make private net financial wealth increase less which, in turn, makes households deposits abroad fall, originating a foreign currency capital inflow. The inflow is partly accumulated as international reserves held by the central bank (increasing as a counterpart the monetary base) and partly used to increase the economy's imports above the export increase.
- The rate at which interest income grows is lower than that of factor income. Given that capitalist households rely more heavily on interest income than the other

⁹⁹ Export shares being 25.3% vs 11.6%, respectively.

households, their income grow proportionately less. Also, because of the fixness of public transfers (received only by the unskilled), the income of the unskilled grows less than that of the skilled¹⁰⁰. As a result, the skilled households increase their income share.

Real Financial Augmented Model

Compared to the real financial model,

- Inflation leads to lower the supply of working capital and hence to 1) less growth in the activity level and 2) excess demand for it and a new equilibrium with increase in its remuneration (i.e. in the bank loans rate). This, in turn, leads to lower private investment and (households) savings, increasing final consumption demand.
- Apart from the increase in the production of the primary sector, the private services (with heavy weight in final consumption) increase and construction (tracked by investment) falls due to the change in the composition of aggregate demand.
- These changes in the sectoral structure of production lowers the demand for physical capital (intensively used in construction), informal unskilled (low intensive use in services) and skilled (low intensive use in the primary sector), and boosts the demand for the formal unskilled (intensively used in private services), with associated changes in factor income distribution: the formal unskilled workers and working capital (due to the supply fall) increase their shares, while the other factors decrease theirs.
- The increase in the income share of the skilled workers translated into an increase of the income share of the skilled households. With the public transfers received by the unskilled households being fixed and other income sources growing, their income share suffers a reduction.

¹⁰⁰ Given that factor income grows more for the unskilled than for the skilled and that interest income are negative and grow more for the skilled (continuing being negative with a higher absolute value), in absence of the original public transfers the income share of the unskilled would increase.

Simulation T4. 10% fall in foreign price of imports

Real Model

- As with an increase in the foreign price of exports, the relative price of imports fall and the relative price of exports increases, giving incentives to lift the imports and exports volumes (with increase in the value added share of the primary sector) and hence the degree of openness of the economy.
- But, opposite to that case, the fall in the import prices generate a fall in the level of domestic prices as demanders shift away from domestic goods towards cheaper imported goods which, in turn, reduces nominal profits and dividends paid to (residents and) non-residents, reducing the payment of investment income to non-residents and allowing to increase net imports, lowering the trade superavit.
- Public savings also increase as the trade value (base for trade tax revenue) increases.
- The expansion of factor use occurs now via a fall in the price of imported inputs which lowers the CPI, increases the real wages of the formal workers and is consistent with a fall in their unemployment rates¹⁰¹.
- The increase in the value added share of the primary sector shifts factor demand in favour of the informal unskilled workers and physical capital, lifting their factor income shares.
- At the household level, the fall in nominal factor incomes together with fixed interest flows increases the income share of the capitalist households as they are the only net interest recipient RHG. The higher factor income share of the informal unskilled workers translate into an increase in the income share of the unskilled households.

¹⁰¹ In turn a consequence of the wage curve unintentionally working in reverse.

Real Financial Model

Compared to the real model,

- The fall in the public sector deficit and the fall in the replacement cost of physical capital (due to domestic deflation) reduces the need for private savings, such that capitalist households accumulate less assets and withdraw their deposits abroad, originating a capital inflow which allows to finance a higher current account deficit.
- The return on public bonds fall then, together with the rate on bank deposits, given that domestic deflation and the capital inflow increases real balances in the economy and reduces the price paid on them. The fall in the returns paid on bonds and deposits, in turn, lower the interests paid to non-residents and, together with the means to finance a higher current account deficit, allows to shrink the trade superavit.
- The distribution of factor income moves as in the real model, with the income shares of capital and the informal unskilled workers growing. This, in turn, translates into the income share of the capitalist households (linked to capital income) growing (0.15%), that of the unskilled growing less as almost offset by the fall in the income share of the formal unskilled (0.003%) , and that of the skilled shrinking (0.15%)¹⁰².

¹⁰² Tabulated in Annex.

Real Financial Augmented Model

Compared to the real financial model,

- Domestic deflation increases the working capital supply, which in turn leads to a fall in the bank rates and an increase in the working capital use that shifts the productivity of the other factors up, lifting their demands and hence their wages and the employment levels of the formal workers. All together, factor use increases allow for the activity level to increase more than in the real financial model (0.48% vs 0.37%, tabulated in Annex VI).
- As the rate charged by bank on loans lower, the financial cost of physical investment for firms goes down, leading firms to increase their investment levels, increasing the capital stock available for subsequent periods.
- Household income distribution moves with the same drivers, but with the income of the unskilled households falling faster than overall household income, such that its income share falls.

Simulation T5. 10% devaluation of the domestic currency

- A motivation may come from Former Ministry's (Cavallo and Cottani 1997) discussion on the effects of devaluing the domestic currency. It could also help putting conclusions in perspective.

Real Model

- With fixed (dollar-denominated) foreign savings, the nominal devaluation is passed through to domestic prices, such that essentially no real devaluation takes place. However, given that the interest payments to non-residents are fixed in Argentinean pesos¹⁰³, the devaluation reduces the dollar-denominated interest payment to non-residents, and the shock has effects which are similar to the ones generated in the same model by an increase in the risk-free world interest rate (i.e. an interest inflow). As then:
 - The trade superavit shrinks to keep foreign savings unaltered. With elastic imports demand and export supply, a real appreciation is called for, i.e. the price of domestic goods increases proportionately more than the nominal exchange rate¹⁰⁴.
 - Resources are shifted out of the tradable sectors.
 - Inflation increases the nominal value of revenue and expenditures of the public sector without significantly affecting public savings. Given that public transfers are nominally fixed, the public deficit shrinks.
 - The shrinking of the agricultural sector reduces the real wages of the informal unskilled workers (intensively used there) and their share in factor income.
- But, differently than then, the capitalist RHG does not get additional income in the form of interests from abroad. The skilled RHG income share increases, as it is the only one fully benefitting from inflation in factor wages (the capitalist RHG has fixed interest income) and not hurt by the reduction in the informal unskilled wages (as the unskilled RHG is).

¹⁰³ It was assumed that their deposits are denominated in local currency.

¹⁰⁴ Inflation, in turn, slightly increases the dollar-denominated value of dividends paid to non-residents.

Real Financial Model

- Compared to the real model, in this model the shift away from private into public savings reduces the value of the capitalist households assets, who withdraw deposits abroad, generating a capital inflow that finances a higher current account deficit. Together with the reduction in interests paid to non-residents, it reverses the sign of the trade balance, converting the trade superavit into a trade deficit.
- Income distribution at factor and household levels also change similarly than the real model, except that the capitalist RHG, by benefitting from a higher return in pesos on their deposits abroad, increase their income share.

Real Financial Augmented Model

- It behaves as the real financial model but with working capital supply growing as driven by 1) withdrawals of deposits abroad by domestic agents (just commented) and 2) a higher conversion of the dollar-denominated capital inflows in local currency given the appreciation of the foreign currency. As usual, it leads to increases in the demand for other factors, in their productivities and in the activity level.

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