Liberalization of trade in services: A CGE analysis for Argentina, Brazil and Uruguay

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LIBERALIZATION OF TRADE IN SERVICES: A CGE ANALYSIS FOR ARGENTINA, BRAZIL AND URUGUAY[1].

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Abstract: In this paper we use two computable general equilibrium models to evaluate gains of liberalization of trade in services for Argentina, Brazil and Uruguay. We employ two CGE models for the calculations. For the Argentine and Uruguayan cases, we apply a model built by the authors (see Chisari (2009)) based on the MPSGE. For Brazil, our study uses the GTAP model – adapted by Rutherford (2005) that also works on an MPSGE platform. We also consider two basic cases of liberalization of trade in services: 1) mobility of goods, in which there is mobility of services across borders, as it is the traditional case of exports and imports of goods, and 2) trade presence, that is location in the domestic country of new operators with a new technology for producing services.

We estimate the gains from improvements in efficiency, quality and productivity of the industries of services, due to more intense competition in the domestic market as well as from reductions in the implicit mark up on domestic services due to barriers to trade. Quality advancements lead to gains in welfare of a similar order, or even higher than expected in the case of productivity improvements. To address the case of trade presence, a latent technology is defined *in situ*, operative or not depending on relative prices (its market share in the overall equilibrium of the economy is endogenous). This is especially relevant for the case of telecommunications. We also observe that: 1) the economy's specific endowment of factors will limit the expected gains of the liberalization if the latent technology is unsuitable or incompatible with them, 2) governments can face some dilemmas regarding domestic market regulations, if the liberalization of trade in financial services called for a change in regulations so that the domestic demand for government bonds were to fall.

Keywords: Computable general equilibrium, liberalization of trade, trade in services

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1 INTRODUCTION

In this paper we use two computable general equilibrium models to evaluate gains of liberalization of trade in services for Argentina, Brazil and Uruguay. We replicate the economies of those economies and simulate several scenarios following other countries´ experience and suggestions of the literature.

As a guide for policy, computable general equilibrium (CGE) models are a very useful tool for ex ante experimentation. They place the discussion within a frame that is neither entirely normative nor completely positive, but intermediate, and make it possible to take into account the structural differences between the economies. Not only they can show what industries contract or expand, they also give some hints on the political economy of a trade reform.

We estimate the gains derived from improvements in efficiency, quality and productivity of the industries of services, due to more intense competition in the domestic market. One interesting result is that quality advancements lead to gains in welfare of a similar order or even higher than the expected in the case of productivity improvements. Additionally, we estimate the gains obtained from a reduction in the implicit mark up of domestic services due to barriers to trade.

We consider two basic cases of liberalization of trade in services: 1) mobility of goods, in which there is mobility of services across borders, as it is the traditional case of exports and imports of goods, and 2) trade presence, that is location in the domestic country of new operators with a new technology for producing services.

To address the second case, a latent technology is defined *in situ*, ant it will be operative or not depending on relative prices. Thus, two technologies will be competing within the same industry and market forces will determine, at the end of the day, their market share in the overall equilibrium of the economy. This is specially relevant for the case of telecommunications.

We see that the economy's specific endowment of factors will limit the expected gains of the liberalization if the latent technology is unsuitable or incompatible with them. For example, if trade presence intensively uses human capital that is unavailable in the economy, the welfare improvements will be less than expected, or will only be possible when the supply of human capital will respond to the new requirements.

We will also see that governments can face some dilemmas regarding domestic market regulations. If the liberalization of trade in financial services called for a change in regulations so that the domestic demand for government bonds were to fall, the long-term gains could be overshadowed by the immediate costs. This could occur, for example, if greater trade presence had to be accompanied with less strict regulations on (issued by the government) bonds holdings. Hence, the so called "home bias", real or induced by financial regulations, could have to be lower after liberalization.

The results of the computational exercises are presented as changes in: 1) welfare of households (measured in terms of the equivalent variation), for example associated with the breakdown of restrictions (whose magnitude includes estimations from other papers, cf. Berlinski (2008) and Dee (2004 and 2005)), 2) rates of profit and the activity levels of industries, 3) prices of goods and factors[2], and 4) macroeconomic indicators, like the fiscal net result and the trade balance, to

[2] Note that said results refer to annual magnitudes.

assess the feasibility of reforms. We try to identify the dilemmas and contradictions that the liberalization of trade in services could pose to the economies with respect to the trade surplus, income distribution and the fiscal situation, as well as to illustrate them quantitatively to understand their magnitude and relevance.

We employ two CGE models for the calculations. For the Argentine and Uruguayan cases, we apply a model built by the authors (see Chisari (2009)) based on the MPSGE (see, for example, Rutherford and Paltsev (2000)). This kind of model allows for a greater degree of flexibility to design the simulations. For Brazil, our study uses the GTAP model – adapted by Rutherford (2005) that also works on an MPSGE platform.

The following section presents a brief review of the literature. This helps to identify some of the exercises that must be considered to place our work within the context of the current discussion. Then, the next section develops a simplified version of the economic model. In this frame we highlight the simulation exercises inspired in the literature and those we built derived from our own analysis based on the structural characteristics of the countries. This reveals how relevant some macroeconomic dilemmas are (such as the way government bonds affect prices given greater financial liberalization) or the development of new industrial organizations in sectors with highly-intensive technology use (for example, when allowing for the trade presence of entrant suppliers of telecommunications). Following that, we classify the main simulations, briefly describing their isolated treatment or among themselves. The following sections analyze the results for Argentina, Uruguay and Brazil. The paper closes with some lessons and key conclusions. The paper also includes an appendix that describes the model for Argentina and Uruguay. The model for Brazil is the GTAP version.

2 THE LITERATURE ON THE LIBERALIZATION OF SERVICES IN A COMPUTABLE GENERAL EQUILIBRIUM

Dee's (2003) discusses the special characteristics that models applied to trade in services must take into account and summarizes some methods to quantify the barriers to trade in services. It mentions that the services are often tailored to the buyers and that this has to do with the regional characteristics of the demand or the regulatory framework in which they operate. It also discusses the mobility of production factors starting from capital mobility when barriers to foreign direct investment (FDI) have been eliminated.

Markusen Rutherford and Tarr (1999) model FDI stressing the intensive use of skilled labor. Lejour and Rojas-Romagosa (2006) give an overview of the literature on FDI modeling in a general equilibrium. Konan and Maskus (2006) present a model of this kind for the case of Tunisia, a country where the elimination of restrictions on trade in services would have more impact than the liberalization of trade in goods.

Rutherford, Tarr and Shepotylo (2005), within a similar context, incorporate the impact of income distribution and of the liberalization of FDI, indicating that the key component of welfare gains (in Russia) is associated, as in Konan and Maskus (2006), with the elimination of the restrictions on FDI in services. To that end, they model the elimination of the implicit mark-up in the prices of services while also considering that the productivity changes endogenously via a Dixit-Stiglitz structure, which implies some substitution between the business services and the production factors.

Markusen and Strand (2006) sustain that the increase in the trade in services results from technological change, basically in telecommunications, which allows for gains in the spatial fragmentation of the activities. The results of their model show gains for small countries with skilled labor that can export services to larger and more developed countries.

Balistreri, Rutherford and Tarr (2007) employ a Dixit-Stiglitz structure (of variety of goods) for business services so as to model endogenous productivity gains through the introduction of new varieties (that would grant entry to a higher number of suppliers). The authors model the liberalization of barriers to the trade in services both for domestic and foreign goods.

A crucial element in many of the models cited is the estimations of equivalents ad valorem of the barriers to the trade in services. Table 1 presents the estimations used in several of the above-mentioned papers[3].

Table 1: Trade in services. Ad valorem equivalent barriers utilized in literature (%)

Sector	FDI bariers	Type 1 barriers: Border trade	Type 3 barriers: Foreign presence	Domestic firms Mark up	Multinationa production Mark up
	Rutherford, Tarr, Shepotylo (2005)	Konan and Maskus (2006)		Balistreri, Ruthelford, Tarr (2007)	
Telecoms	33	200	30	12	25
Insurance	s.d	50	50	s.d	s.d
Financial Services	36	30	30	8	17
Transport	53	50	3	42	57

Source: Own elaboration.

Many of them utilize MPSGE, often contained in a GAMS environment, for their experiments. Overall, the MPSGE is a Walrasian-type structure that self-calibrates. That is, it has the advantage of reducing the cost of programming the calibration every time one wishes to make a slight change in the model, something that is necessary when working with GAMS. GAMS is an optimization program, which can be adapted to maximize a neutral objective function that is subject to the constitutive equations of the general equilibrium model. However, not all of the Walrasian or general equilibrium structures can be reduced to optimization models. The complementary approach allows us to tackle such cases (for example, minimum wages). Nonetheless, we can work simultaneously with the two, thus taking advantage of both. Such is the strategy that we followed in our model.

Whalley (2004) downplays the conclusions of the quantitative studies, arguing that they do not consider the heterogeneity of the services activities. He focuses on the barriers to trade in services in the countries and on interpreting the quantitative findings generated by the models, and recognizes that the credibility of the estimations obtained in CGE models depends on the validity of the assumptions and the availability of the data, as well as that the precision of the estimations can challenge the importance of the computed gains in welfare. However, he claims that the

[3] We have based our estimates of ad valorem equivalents for constrains in Berlinski et al (2008) analysis.

possibility of conducting this exercise has the benefit of the information obtained and the externality of generating a demand for data that can improve future estimations.

3 THE BASIC ECONOMIC MODEL.

To present the counterfactual exercises we sum up the causal elements in the CGE model in this section. This is a simplified model with a reduced dimension. We also leave aside some markets, as well as unemployment. Appendix A describes the models for the Argentine, Uruguayan and Brazilian cases in greater detail.

For now, let us consider an economy with only one domestic agent, whose utility function depends on domestic goods *c*, services *a*, imported goods *m* and bonds held by households b^F: $u(c,a,m,b^F)$. The equations correspond to the usual optimal conditions, which equal the marginal substitution rate to relative prices given by the quotient between the price of domestic goods in international terms p^* and the prices of imported goods p^*_m:

[1] $u_c / u_m = p^* / p^*_m$.

$u_c / u_a = p^* / p_a$

$u_c / u_b = p^* / p_b$

Superscript *F* indicates the variables corresponding to households. The following equation is the budget constraint of the domestic agent. *w* represents wages, L^0 is the endowment of labor, and π and π_a are benefits in the industries producing goods and services, respectively. The parameters η and θ represent the participation of domestic agents in each ($0 < \eta , \theta < 1$). To simplify, we also assume that the participation in capital ownership coincides with the latter two (the rest of the world retains the complementary shares).

[2] $(1+t)p^* c + p^*_m m + p_a a + p_b b^F = w L^0 + \pi\eta + \pi_a\theta + rK\eta + p_b b^F_0$.

Equation [2] assumes that the consumer only pays taxes on the purchase of domestic tradable goods. This is a simplification given that the model includes all of the taxes in the economy. The last term reflects the initial bonds held by the household.

The production of domestic goods *c* and exports *x* in terms of capital and employment is given by:

[3] $x + c = F(L,K)$.

The benefits of the tradable industry are:

[4] $\pi = p^* (x+c) - w L - r^* K - p_a a^d$

where r^* indicates capital remuneration and $p_a a^d$ are expenditures on services, which are assumed in fixed coefficients with the total aggregate value:

[5] $a^d = \alpha F(L,K)$.

The maximization conditions of benefits are:[4]

[6] $\left(p^{*} - \alpha\ p_a\right)F_K - r^{*} = 0$,

[7] $\left(p^{*} - \alpha\ p_a\right)F_L - w = 0$,

when the levels of capital use and labor are determined optimally. At the level of the services industry, the corresponding equations to define benefits, optimal conditions, and the output function are:

[8] $\pi_a = p_a\ \beta G\left(L_a\right) - w\ L_a - \theta\beta G\left(L_a\right) p^{*}$,

[9] $a^{s} = \beta G\left(L_a\right)$,

[10] $(p_a - \theta p^{*})\beta G'(L_a) - w = 0.$

The last term represents the use of tradable goods in the services sector (in fixed coefficients given by θ) . We also assume that the sector only employs labor to produce services. Once again, this is a simplification in this reduced version.

The government has a budget constraint given by:

$tp^{*}\ c + p_b b_0^{G} = w\ L^{G} + p_b b^{G}$.

The left side represents tax and bonds sales. The right side represents the purchases of labor and bonds (so that there is a net position in bonds). Notice that here we assume that the government is not participating actively in the markets for goods or services, although that does not occur in the general model. Here the government collects taxes and mainly use the proceedings to hire workers and repay debt.

We also include familiar equilibrium conditions in the labor market, in the services market, and in the bonds market:

[11] $L_a + L + L^{G} = L^{0}$,

[12] $a^{d} + a^{F} - a^{s} = 0$.

[13] $b^{G} + b^{F} - b_0^{G} - b_0^{F} = 0$.

Note that in this version, the external sector does not buy domestic bonds, which is also a strong assumption that we leave aside in the general model. Given these assumptions, we can obtain an equilibrium in the following current account as:

[14] $p^{x}\ x = p_m^{*}\ m\ + (1-\eta\ )r^{*}\ K + \ (1-\eta)\pi + (1-\theta)\pi_a$.

In the above equations we also hypothesize that neither imports nor exports exist of services which might result from trade barriers or transportation costs, or both.

Once found an equilibrium, we conduct several counterfactual computational exercises:

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[4] We assume that the degree of homogeneity of F and G is less than one.

Exercise 1: Elimination of barriers on the import of services. To explore the impact of eliminating barriers or lowing costs, we take barriers as the equivalent to mark-ups λ on the international prices of services s^*. In addition, we define transportation costs as a percentage of the international price as c. Therefore, there is no trade (of imports) because: $p_a < s^* (1 + \lambda + c)$.

Some models in the literature assume that β and α are functions of λ, that is, that a greater liberalization of trade in services stimulates their productivity (β is greater if λ is smaller) and improves its quality (α is lower if λ is lower). However, objections also exist in the literature as to how far trade can be liberalized and its impact on λ as small domestic suppliers of these services could be replaced by larger foreign firms, with stronger market power to make λ rise.

The positive effects of greater trade would thus be conditioned by the degree of competitiveness ex post. A reduction in λ owing to the new trade policy would increase the purchase of services to be used as intermediate inputs. Since the observed share of low income deciles in the capital of firms is small, for the sake of simplification our explorations consider that the excess mark-up is entirely absorbed by the richest decile in the domestic economy, by the rest of the world, or by the government (the last only being the case for Uruguay).

An increase in λ could occur if the liberalization were to create imperfect domestic competition. This could imply that an increase in productivity is associated with a loss vis-à-vis the allocation of resources. Most of the literature assumes that the liberalization of the trade in services would generate a competitive market structure. In contrast, Konan and Van Assche (2006) model the liberalization of telecommunications in Tunisia under the assumption that there will be one sole entrant. So, they define alternative counterfactual scenarios simulating: (i) that the installed firm and the entrant compete á la Cournot or establish a Cartel, (ii) that the firms confront identical costs or alternative costs that differ from the two firms, and (iii) that the entrant could export remittances of gains or maintain them in the country where the investment is being made. Chisari et al. (2003) have already explored this last aspect for the case of regulated public services, showing the choice of alternative regulation mechanisms that influence the performance of the trade balance.

Note that we should take into account the change in condition [14] as a consequence of the liberalization. In the case of the above reduced model we can say:

[15] $$p^x x = p_m^* m + s^* a^* + (1-\eta) r^* K + (1-\eta)\pi .$$

In this equation a^* represents the net imports of services, while s^* is the international price. An increase in imports will have to be covered by a higher amount of exports, that is, it will have to boost the export effort that the economy will have to make, even though cheaper or better services will become available. The net effect depends on parameter values and should be examined in a general equilibrium.

Exercise 2: Elimination of barriers on the export of services. As in Case 1, the exports of services from Argentina may be subject to a mark-up factor or additional costs that are collected by the rest of the world. Let us call p_a^* the international price. So, domestic producers would see a price $p_a^*(1-\lambda^*)$ where λ^* is the mark-up of the rest of the world prior to liberalization. An international negotiation could mean simultaneously eliminating λ and λ^*. This would be an expected positive effect of the opening, most probably based on expectations of reciprocity.

Exercise 3: Gains from improvement in quality, productivity, and efficiency. The effect on welfare of reducing α is a gain in the quality of domestic services, which help the rest of the industries reduce their expenses in services per unit of aggregate value. This effect is similar to a positive externality of one output sector over the rest of the output sectors. For example, insurance services could become more agile and the transaction costs or the judicial costs from controversies could drop. On the other hand, increasing β corresponds to higher productivity owing to a higher level of competition. This is equivalent to a rise in the total productivity of factors in the services sector, which, following the improvement produces more units with the same endowment of labor (and capital in the general model). Efficiency gains mean that the services sector employs fewer intermediate inputs to produce one output unit, thus freeing resources that can be absorbed of by the rest of the economy. Equation [8] captures this effect via a reduction in θ.

Exercise 4: Trade presence and technology adoption. In this case trade liberalization leads to the entry of new firms with new technology. These entrants contest the incumbents' market share. Therefore, incumbents will see a reduction in the reward of their specific capital. To take into account competition between both kinds of firms it is necessary to modify equation [9] to account for a new supplier and the associated equations. For example, the new output of services will be given as: $a^s = \beta G\left(L_a\right) + H(\,Ke\,)$, where *Ke* is the international mobile capital used in the new competitor's output, whose output is given by function *H*. It would also be necessary to consider the new payment of dividends in equation [14]. It is possible to study two sub-cases of this scenario. In one of them the technology of entrants is the same as that employed by incumbents with the only difference that domestic specific capital is replaced with international mobile capital (though the rest of the parameters remain the same). This sub case is identified with **–T** in the simulations that follow below. In Chisari et al (2008) we also studied an additional case, in which we assume that the entrant's technology is the same as that used in the US. This is not presented here.

Exercise 5: Changes in the preferences for domestic bonds after liberalizing the financial sector. Trade presence in financial institutions may make it necessary to modify the regulatory policy of investment (especially the requirements to purchase domestic bonds that are often imposed on financial institutions). In this case the utility function should be modified, for example, as $u(c,a,m,\varepsilon b^F)$. And the third first-order condition listed in [1] could now be written as $u_c / u_b = p^* / \varepsilon\, p_b$. This change in preference will impact on the prices of domestic bonds and could explain the reluctance of some governments to reform trade of financial services.

Exercise 6: Modifications in the intensity of factor use due to trade presence or the need to compete. Opening the economy, in particular trade presence, may make it necessary to increase the intensity in the use of scarce factors, like human capital, to supply industries using foreign technology. Some economies may find it difficult to improve the supply of factors quickly, resulting in limited short-term gains. However, this can be seen when different technologies are put to compete as was mentioned for Case 4 above; changes in relative prices in favor of scarce factors would put a natural limit to entry.

The above exercises are subject to sensitivity evaluations to examine the changes in the results owing to:

- Modifications in the elasticities of substitution between domestic and imported services, and in the degree of labor and capital mobility between industries (even between services and the rest of the world).
- Different kinds of labor with different degrees of mobility between industries. A reduction in the mark-up of the rest of the world (barriers) on exports of domestic services.

4 THE NATURE OF LIBERALIZATION EXERCISES IN THE TRADE IN SERVICES

The model used in this paper for Argentina and Uruguay is an updated and expanded version of the model built by Chisari et al. (2009) for Argentina, 2004. It has 29 output sectors, which use labor and specific capital in their value added functions (Cobb-Douglas so that these simulations are neutral and guarantee a solution). Intermediate inputs are used in fixed coefficients among themselves and with value added. Each sector is divided into three sub-sectors to capture the differences in tax treatment (especially VAT) for each destination (domestic market, exports and investment). There are ten income deciles, each having a utility function (Cobb-Douglas), a government sector and the rest of the world. The model includes unemployment given the characteristics of the Argentine and Uruguayan economies. We assume a constant real wage for the simulations. Unemployment is not considered for Brazil, since we use for that economy a version of GTAP.

The two services under analysis – Telecommunications and Financial and Insurance Services – have a key participation in Argentina's GDP (2.6% and 4.3%, respectively). Table 2 presents data on the production structure, the factoral structure, the input-output relations and the sales structure of these services.

Table 1: Argentina, Brazil y Uruguay. Composition of costs and destination of sales. (% of sectoral VBP)

Costs	**Argentina -2004-**		**Uruguay -2000-**		**Brazil – 2001-**	
	Fin. Serv. and Ins.	**Telec.**	**Fin. Serv. and Ins.**	**Telec.**	**Fin. Serv. and Ins.**	**Telec.**
Raw Materials	35.0	48.6	15.5	27.2	41.9	27.9
Value Added	65.0	51.4	84.5	72.8	58.1	72.1
- Employment	29.7	11.4	19.0	26.9	44.7	23.0
- Capital	35.3	40.0	65.5	46.0	13.4	49.1
Sectoral Gross Sales	100.0	100.0	100.0	100.0	100.0	100.0
Destination of Sales	**Argentina -2004-**		**Uruguay -2000-**		**Brazil – 2001-**	
	Fin. Serv. and Ins.	**Telec.**	**Fin. Serv. and Ins.**	**Telec.**	**Fin. Serv. and Ins.**	**Telec.**
Intermediate Sales	72.9	63.3	32.0	56.0	49.8	47.9
Exports	0.0	2.8	2.6	4.9	1.2	3.1
Final Consumption	27.1	33.9	65.4	39.1	49.0	49.0
Sectoral Gross Sales	100.0	100.0	100.0	100.0	100.0	100.0

Source: Own elaboration.

As can be seen, for Argentina, Financial and Insurance Services (F&I) use proportionally more foreign intermediate inputs than Telecommunications and have a substantially greater

capital/labor ratio (3.5 vs. 1.2). On the demand side, the main destination for both services are intermediate sales.

In the Uruguayan case, the data used in constructing the social accounting matrices as of the year 2000 were based on Katz et al. (2004). Telecommunications and Financial and Insurance Services have a significant participation in Uruguay's GDP (10.7% and 2.6%, respectively), and this will explain the relevance of exercises in that industry for the whole economy. We can see that Telecommunications buys proportionally more intermediate inputs than Financial Services. Instead, Financial Services have a considerably greater capital/employment relationship (3.5) than Telecommunications (1.7). On the demand side, the chief destination of financial services is final consumption, whereas Telecommunications targets intermediate sales.

The data used in the case of Brazil are based on the social accounting matrices elaborated by GTAP as of 2001. The two services considered here (Telecommunications and Financial and Insurance Services) have a dissimilar participation in Brazil's GDP (8.1% and 1.7%, respectively) according to the GTAP database. Table 1 shows that Financial Services buy proportionally more intermediate inputs than Telecommunications. Telecommunications has a substantially higher capital/labor proportion (2.1) than Financial Services (0.3). On the demand side, the key destinations of the two services are final consumption and intermediate sales are almost of identical proportions.

5 COUNTERFACTUAL EXPERIMENTS

To compute the results, we use two general equilibrium models. For the cases of Argentina and Uruguay, we employ a model built by Chisari et al. (2009) based on MPSGE by Rutherford (1995). This model offers a greater degree of flexibility to design the simulations. For Brazil, the study uses the GTAP model that Rutherford (2005) adapted to work on an MPSGE platform.

The services included in these estimations are Telecommunications (TEL) and Financial and Insurance Services (F&I). We consider two types of shocks: quantity includes changes in productivity, efficiency, quality, and technology substitution. Price shocks correspond to modifications in the percentages of mark-up on prices associated with the reduction in trade barriers. Furthermore, we simulate the shocks of prices associated with the change in the equivalents ad valorem of the estimated restrictions using Dee (2005). Moreover, we study some cases that combine simulations, for example, decreases in mark-ups with the available technology compared with situations in which technology coexists with other new technology using different or proportionally different factors. Note that the models for Argentina and Uruguay include the bonds markets and the fixed real wage to calibrate the economy to that of the year of reference.[5]

The living standards of the households are indicated by the income level – *Poorest Household* for lower income households and *Wealthiest Household* for the counterpart (where the former aggregates the first five deciles and the latter aggregates the remaining five deciles). The unemployment rate and government transfers have strong repercussions on the first, while the welfare of the second depends relatively more on capital remuneration. Both Argentina and

[5] Regarding the last one, we cannot overlook that productivity improvements in the economy could induce an increase in the real wage, which would have a negative effect on almost every indicator.

Uruguay evidence a set of transfers from the government to the households; so, the fiscal situation is reflected in their living standards.

5.1 A taxonomy of the main simulations in this study

As we mentioned, service industries studied in this paper are "Telecommunications" and "Financial and Insurance Services" (F&I), We use a_{NT} and a_{TN} to indicate the amount of said services inputs *N* purchased by tradable industries *T* and, similarly, the amount of tradable inputs purchased by the services industries. In line with the previous section, a reduction in the first coefficient will imply greater efficiency in the use of services inputs in the tradable industries. However, we will also interpret this as an improvement in the quality of the services. So, to obtain an effective unit of the corresponding service, it will be necessary to buy fewer units. Let us make an analogy with the agricultural sector to understand why. An improvement in quality of seeds will mean that a higher proportion of the "seed"-buying sectors will find themselves in better conditions to sow or produce flour. Likewise, more efficiency in the use of inputs by the services would be reflected in a reduction of the second coefficient. From both cases we should expect welfare gains as resources will be freed that can potentially be used elsewhere in the economy.

As was mentioned, some of the models in the literature assume that the expected changes in these technology coefficients are functions of λ, that is, that a greater liberalization of trade in services stimulates efficiency (a_{TN} is lower if λ is lower) and improves its quality (a_{NT} is lower if λ is lower). As we also mentioned in Section II, some object to the idea that trade liberalization is condition enough to reduce λ. Small domestic suppliers of services could be replaced by other larger international firms with greater market power to raise λ. The beneficial effects of more trade would thus be conditioned by their ex-post level of efficiency and the ex-post structure of the industrial organization.

Let us now consider the counterfactual exercises used in the models for Argentina, Brazil and Uruguay:

- **QUA. The Effect of reducing a_{NT} on welfare.** The decrease in this coefficient is similar to a gain in the quality of domestically produced services, which help the rest of the industries reduce their purchases of services per unit of aggregate value. We also evaluate the improvement in the quality of the service for customers, who, in turn, have to buy fewer units of the good to obtain an effective unit of the desired service. This savings are used to buy other goods in the economy. These exercises also include all of the industrial demand of the service under study; improvements in quality work as an externality and increase the rate of profit of industries. Since it is adopted by the service sector, but increases profits of the rest, it is difficult to find incentives to increase quality beyond the forces of competition within the service sector itself. It is assumed a 10 percent reduction in the necessary amount of the service to obtain a unit of output.
- **EFF. Welfare gains by decreasing a_{TN}** . This corresponds to an increase in productivity owing to greater efficiency We assume a 10-percent reduction in the demand for intermediate inputs by the services sectors considered in the analysis. A reduction in this coefficient frees resources to be used elsewhere in the economy. In

this case there are clear incentives to adopt more efficient techniques since they increase directly the rate of profit of the services industry.

- **PRO. Improvements in productivity.** We consider increases in total factor productivity, understood as reductions in the necessary amount of value added to obtain a unit of output. We simulate productivity growth by increasing the output of the services under study by 10 percent without increasing the factor demand. As in the previous case, there are neat incentives for individual firms to adopt new techniques.
- **MUP. More intensive domestic competitive conditions.** This is represented as a reduction in λ owing to the opening to the trade in services, which would lead to an increase in the purchases of foreign services to be used as intermediate inputs or for final demand (unless domestic prices were disciplined to fall in equal proportion). However, as we have mentioned, according to some international literature, trade opening could generate an increase in λ, rather than a decrease, should the liberalization create imperfect domestic competition. This would cause the smallest and most competitive firms to disappear after the opening and be replaced by other larger and more concentrated firms. This may imply that productivity growth is associated with a loss from the viewpoint of the allocation of resources. In general, we assume a 20-percent drop in the mark-up.
- **T1 and T2. Competition of technologies.** We reconsider the previous simulations to take into account the possibility of competition of technologies due to the liberalization. That is, we admit presence of entrants to the domestic market. They use a new technology; basically it uses international mobile capital and is more efficient in the use of intermediate goods. In these cases, the model evaluates endogenously the welfare gains derived from allowing the two competing technologies to be operative simultaneously. Hence, we can determine the industrial organization ex post without assuming a mandatory substitution; the scale of operation of each technology will be determined by the market workings and as both industries produce the same good, competitive costs will explain their market share. Simulations of individual cases can be presented in associated ways. For example, the case MUP-T stand for mark up changes due to competition of technologies.
- **LIB and LIB-P. Financial liberalization and changes in regulation.** An increase in the presence of international operators in the domestic financial sector may call for a change in the norms and regulation of the portfolio composition, and more specifically, in the proportion of government bonds in total holdings. This is tantamount to a change in preferences for domestic bonds, which can (in the short term) offset the main gains resulting from improved quality and efficiency. These exercises are useful for understanding the immediate resistance to reforms that can ultimately generate gains in the long term. We indicate with LIB the case of liberalization of financial services, and with LIB-P the same case when regulations are adapted by the government (we assume that it is equivalent to a reduction of 5% in the price of bonds issued by the public sector).

5.2 Productivity (PRO), efficiency (EFF) and quality (QUA) gains due to liberalization.

For Argentina, Table 3 shows a striking similarity in productivity and quality gains in terms of the domestic product and welfare. That is, a 10-percent rise in the total productivity of the factors is almost the equivalent to a 10-percent improvement in the quality of the services herein considered. This basically reflects the structural characteristics of the Argentine economy. We also obtain positive results from the 10-percent improvement in efficiency in the services sectors, although the magnitude is more moderate because this exercise is basically reflected in an increase in labor productivity and not in all of the factors. Note that the change in the trade surplus is not always positive and that the activity level of these services is lower than in the quality factor of (QUA) because of lower usage of these inputs in the rest of the economy. This is noticeable in the case of Telecommunications. As to the political economy, it is difficult to find sectors or households that have been negatively affected by these changes and that could have disputed the reform, taking into account that it also benefited the government.

Table 1: Argentina, Brazil and Uruguay. Computable General Equilibrium Model simulations. Results corresponding to productivity, efficiency and quality changes (%)

Indicators	Argentina			Uruguay			Brazil		
	PRO	EFF	QUA	PRO	EFF	QUA	PRO	EFF	QUA
Real GDP	0.94	0.76	1.13	3.18	0.70	1.60	1.18	0.57	1.09
Real Investment	1.12	0.72	1.09	3.23	0.67	1.51	0.37	0.20	0.03
Trade* (superavit)	-1.09	-0.82	0.19	-	-	-	-	-	-
Trade* (deficit)	-	-	-	13.80	3.19	6.20	0.00	-0.01	-0.01
Activity level									
Agriculture	0.19	0.08	0.17	1.97	0.30	0.87	0.16	-0.06	0.43
Industry	0.54	0.25	0.57	2.15	0.35	1.27	0.87	0.01	1.40
Services	0.19	0.27	0.24	1.74	0.38	0.87	-0.23	0.03	2.26
TEL Sector	6.83	0.00	-3.02	7.93	0.37	-2.69	6.09	0.70	2.16
F&I Sector	5.52	-0.13	-4.75	10.16	0.11	-0.26	5.39	0.91	2.55
Home Welfare	-	-	-	-	-	-	2.18	0.87	1.71
Poorest Household	1.42	0.84	1.30	2.43	0.53	1.28	-	-	
Wealthiest Household	0.90	0.65	0.95	3.38	0.67	1.49	-	-	-
Government Fiscal Situation	0.67	0.40	0.91	1.51	0.35	0.90	0.67	0.09	4.39

*Source: Based on Chisari, Romero y Maquieyra (2008) results. PRO: 10 % productivity increase in services. EFF: 10 % efficiency increase in services. QUA: 10 % quality improvement in services. Same model is used for Argentina and Uruguay (Chisari et al (2006)) and GTAP for Brazil. * Note: Percentage changes refers to constant price variations, signs take initial calibration as reference (Superavit for Argentina, deficit for Uruguay and Brazil)*

Uruguay is a different case. The impact of productivity improvement (Table 1) and its effects have had a greater magnitude than in Argentina because the Telecommunications and Financial Services activities represent about 12 percent of the economy's GDP. In contrast, Argentina registered half as much. On the other hand, improvements in QUA do not match the productivity level. This implies that the gains derived from domestic improvements in the sectors are more relevant than their externalities, which we did not observe in the Argentine case. Note that, given

the relative importance of the selected activities, the deterioration in the trade balance is substantially higher than the similar effect seen in Argentina's PRO and EFF. As to income distribution, the welfare of poor households continues to be linked to the adjustments in the public sector because of the set of transfers that characterize the economy. Among the sectors in the economy and except in the case of EFF, industry continues to benefit most from improvements.

Table 3 also presents the findings of the model's productivity simulations calibrated with the Brazilian data. We use a GTAP model with its own database. Unlike the Argentine and Uruguayan cases, this model assumes full employment and the financial transactions are less detailed. The gains in productivity, quality and efficiency (in that order) boost welfare and, as in the previous cases, household gains surpass the government's gains, except in the simulations for Quality. The impact on the external sector, however, of these experiments is practically null.

5.3 Productivity, efficiency and quality under competition of technologies and international mobility of capital.

We re-examined the above simulations assuming that liberalization implies the domestic installation of a technology using mobile capital with respect to the rest of the world (PRO-T, EFF-T and QUA-T). To perform these simulations we assumed that new producers of services enter the economy, and that they produce perfect substitutes of domestic services. It is also assumed that they employ intermediate consumption and labor in the same proportion as the domestic industries, but that they replace domestic capital for international capital. This exercise tries to capture the possibility of capital mobility across both domestic sectors and the rest of the world. The industrial structure of TEL and F&I is determined endogenously with the solution of the model.

The simulated improvements in productivity, quality and efficiency (Table 4) are assumed to occur only in the new activities, and installed ones must adapt to the change. In general, this happens with a reduction in their participation in the market as a whole and with a decrease in the remuneration of the fixed factor (specific capital). In general, the second effect dominates the first.

In the Argentine case, the overall standard of living of the households rises once again, although this change is not as striking for the Richest Household because the ownership of specific capital is already concentrated there and it is specific capital that sees a reduction in its reward, due to a more intense competition. In the case of Quality, the welfare of the Richest Household shows greater changes than in the cases of PRO-T and EFF-T.

As mentioned, this exercise also shows how the industrial structure is altered in the services sector after a liberalization of this kind. However, the new industry does not generate a significant displacement of the existing one as the specific capital tends to absorb the decrease in the sector's prices. In all our cases of technology substitution (for all countries), the share of entrants rises to a range of between 5 and 11 percent; again, the reason for the limited replacement is the fact that the reward of non-mobile capital of incumbents tends to absorb the differences in productivity, quality or efficiency. We should expect a progressive replacement, rather than a sudden change in the pattern of the industrial structure. The impact on the trade surplus is positive in PRO-T and negative in the other two cases.

In Uruguay, the positive effects on GDP and Investment are higher than in Argentina. We can see that PRO-T diminishes the trade deficit while the positive results of EFF-T and QUA-T are quite clear. Additionally, the effect for the Richest Household is higher than that for the Poorest Household in all three cases. As in the case of Argentina, the presence of the new technology reduces the welfare gains for all deciles.

Table 2: Argentina, Brazil and Uruguay Computable General Equilibrium Model simulations. Results corresponding to technological substitution and its effects on productivity, efficiency and quality changes (%)

Indicators	Argentina			Uruguay			Brazil		
	PRO-T	EFF-T	QUA-T	PRO-T	EFF-T	QUA-T	PRO (a1)	PRO (a2)	PRO (skl)
Real GDP	0.48	0.74	1.06	2.38	0.78	1.35	1.15	1.12	1.16
Real Investment	0.24	0.73	1.09	1.60	0.73	1.36	0.35	0.33	0.38
Trade* (Superavit)	2.32	-1.13	-0.39	-	-	-	-	-	-
Trade*(Deficit)	-	-	-	-6.52	2.94	7.03	0.01	0.00	0.01
Activity level									
Agriculture	0.13	0.07	0.15	2.17	0.38	0.64	0.18	0.20	0.14
Industry	0.37	0.22	0.51	2.34	0.43	1.03	0.91	0.95	0.83
Services	-0.24	0.29	0.27	0.57	0.40	0.82	-0.24	-0.25	-0.22
TEL Sector	1.86	0.07	-2.57	3.98	0.12	-2.19	6.03	5.98	6.12
F&I Sector	1.86	0.13	-4.12	6.81	0.06	-0.06	5.25	5.08	5.46
Home Welfare	-	-	-	-	-	-	2.17	2.16	2.16
Poorest Household	0.60	0.84	1.23	1.10	0.57	1.18	-	-	-
Wealthiest Household	0.13	0.66	0.95	1.66	0.73	1.34	-	-	-
Government Fiscal Situation		0.38	0.85	1.02	0.39	0.80	0.67	0.68	0.70

*Source: Based on Chisari, Romero y Maquieyra (2008) results. PRO-T: 10 % productivity increase in services with technological substitution., EFF-T: 10 % efficiency reaise in services with technological substitution, QUA-T: 10 % quality improvement in services with technological substitution. PRO (a1): Armington´s elasticity reduction between domestic and imported goods (50%). PRO (a2): Armington´s elasticity reduction between domestic and imported goods (to zero), PRO (skl): Rise in demand of skilled labor plus reduction in demand of non skilled labor. *Note: Percentage changes refers to constant price variations, signs take initial calibration as reference (Superavit for Argentina, deficit for Uruguay and Brazil)*

For Brazil, we conducted an additional exercise assuming that skill and unskilled labor are not perfect substitutes, and that the new technology is more intensive in the former. The decreases in the levels of elasticity of substitution between domestic and foreign services show no significant differences with respect to the base case of Productivity (PRO). The last exercise shows that a jump in the productivity of services differs if this industry employs a more intensive use of skilled labor. The post-liberalization demand for skilled labor declines due to improved productivity, which, in turn, causes the relative price of skilled labor to fall. The increment in the welfare level of households is maintained and GDP and Investment climb. As to its impact on the trade deficit, we see the same result obtained in Table 1, that is, practically zero.

5.4 Reduction in the implicit mark-up (MUP) on imports of services. Competition of technologies.

In this case we assume that the mark up is reduced due to competition. That is, the threat of trade in services disciplines domestic prices, and this is equivalent to a reduction in the implicit mark

up. For the overall results in general equilibrium, it becomes important to determine who was collecting the revenue that the mark up produced.

So, we considered two sub cases, depending on who is assumed to be entitled to the proceedings of the mark up. In the first case, the richest decile of the economy receives the excess profits. In the second, it is the rest of the world who has the property right on the revenue. For Argentina and Uruguay, we assumed also that the reduction is due to the presence of a new technology, that uses internationally mobile capital.

What are the plausible reductions in mark up due to liberalization in trade of services? We adopted the estimates given by Dee (2004, 2005) and Berlinski et al (2008). Reductions in Telecommunications included: Argentina 10% (1989-2005), Uruguay 5% (1997-2007); in Banks: Uruguay 14% (1997-2007), Brazil 2% (2004-2006).[6] The results are reported in Table 5.

Table 3: Argentina, Brazil and Uruguay Computable General Equilibrium Model simulations. Results corresponding to Mark up reduction and technological substitution based on Dee (2005) methodology (%)

Indicators	Argentina		Uruguay				Brazil
	MUP-T1 (T)	MUP-T2 (T)	MUP-T1 (F&I)	MUP-T1 (T)	MUP-T2 (F&I)	MUP-T2 (T)	MUP (F&I)
Real GDP	0.25	0.25	2.45	0.31	2.54	0.31	0.00
Real Investment	0.10	0.12	1.28	0.22	1.61	0.24	0.00
Trade* (Superavit)	0.68	0.52	-	-	-	-	-
Trade* (Deficit)	-	-	-11.27	-0.20	-7.50	-0.06	-0.55
Activity level							
Agriculture	0.05	0.05	2.34	0.26	2.24	0.26	0.01
Industry	0.16	0.15	2.51	0.28	2.41	0.28	0.02
Services	0.00	0.00	0.55	0.05	0.66	0.06	-0.01
TEL Sector	-2.43	-2.43	0.79	-2.99	0.75	-2.99	0.01
F&I Sector	0.12	0.12	-2.65	0.04	-2.66	0.04	-0.06
Home Welfare	**-**	**-**	-	-	-	-	0.01
Poorest Household	0.33	0.34	0.92	0.21	1.02	0.21	-
Wealthiest Household	0.06	0.07	1.47	0.20	1.79	0.21	-
Government Fiscal Situation	-	0.14	1.00	0.14	1.06	0.15	0.00

*Source: Based on Chisari, Romero y Maquieyra (2008) results. Argentina: MUP-T1 (T): Markup received by the wealthiest home plus technological substitution (10%) for Telecommunications. MUP-T2 (T): Markup received by the rest of the world plus technological substitution (10%) for Telecommunications. Uruguay: MUP-T1 (F): Markup received by the wealthiest home plus technological substitution (14%) for Financial Services, MUP-T1 (T): Markup received by the wealthiest home plus technological substitution (5%) for Telecommunications, MUP-T2 (F): Markup received by the rest of the world with technological substitution (14%) for Financial Services, MUP-T2 (T): Markup received by the rest of the world plus technological substitution (5%) for Telecommunication. Brazil: MUP (F): Markup reductio of 2% (by the rest of the World) at Financial Services imports prices. *Note: Percentage changes refers to constant price variations, signs take initial calibration as reference (Superavit for Argentina, deficit for Uruguay and Brazil)*

For Argentina, as their estimate of "shadow prices" of constraints are not large, we do not see significant differences in our model. It was observed (not shown in the Table) that the activity

[6] Based on Berlinski, et al. (2008), Kume, et al. (2008) and Vaillant, et al. (2008).

level of the corresponding domestic service sector falls (and it is replaced with the production of the entrant). Previous simulations, showed more important effects under the assumption of more intense constraints on trade of services. Regarding the impact on the external sector, trade liberalization increases slightly total required surplus, since the trade balance must be compensated for dividends paid abroad. The qualitative results for Uruguay are quite similar. In the case of Brazil, there are not significant effects, and this is due again to the almost negligible level of the implicit mark-up attributed to the constraints (the country was already liberalized in trade of services at the time of the study, as it is maintained by Kume et al (2008)).

5.5 Liberalization in trade of financial services (LIB) and regulations in Argentine portfolios

The assumption in the case of liberalization of trade in financial services and insurance (LIB, Table 6) is that it is accompanied by entry of new operators that use mobile capital (between domestic activities and the rest of the world) and that are 10 percent more productive than those already installed. As was expected, the exercise shows an improvement in aggregate GDP, together with a higher rate of exports to cover the needs of the current account, which the positive change in the trade surplus (0.56 percent) confirms.

Table 4: Argentina Financial Services liberalization and regulations (%)

Indicators	LIB	LIB-P
Real GDP	0.31	-0.67
Real Investment	0.17	-1.75
Trade (Superavit)	0.56	24.58
Activity level		
Agriculture	0.06	0.27
Industry	0.17	1.03
Services	-0.17	-1,66
TEL Sector	0.06	-0,36
FyS Sector	-5.19	-4.95
Domestic Welfare		
Poorest Household	0.46	-3,81
Wealthiest Household	0.13	-1.44
Government Fiscal Situation	-	-3.44

LIB: More efficient new technology (with a productivity increase of 10% in F&Y), LIB-P: More efficient new technology plus change of regulations on portfolio (new technology with a productivity increase of 10% in F&Y and a government bond price reduction of 5%).

Liberalization of financial services to local operation of firms from the rest of the world, that purchase fewer government bonds (equivalent to a price reduction of them of 5 percent) is considered in the LIB-P exercise. That is, a significant entry of new operators requires a change in (or elimination of) regulations. Notice that in the case, all of the effects on welfare would

become negative. In some cases, the government's reduced ability to finance its debt impinges upon the amount of transfers to the poor and affects others deciles, because it indirectly diminishes the activity level of the economy (recall we are assuming constant real wages). On top of that, the increase in the required trade surplus (24.6 percent) is notable; this is due to the need of increasing the level of exports to offset the reduction in purchase of bonds of the rest of the world. This could be considered a short run effect to be reversed in the future, but it can explain the reluctance of governments to liberalize financial services.

6 MAIN LESSONS AND FINAL REMARKS

We used two models to perform experiments in general equilibrium: the Rutherford´s GTAP version –Rutherford (2005)- for Brazil, and a new version of the Argentine 2004 model based on Chisari et al. (2009) and adapted for the Uruguayan case. The latter uses the methodology developed in Rutherford (1995). Among the counterfactual exercises, we examined: improvements in efficiency, productivity and quality of services resulting from liberalization, modifications in competitive conditions due to threat of entry of competitors, different degrees of substitution between entrants´ and incumbents´ technologies, inconsistencies of factor endowments with those requested by new operators, and modifications in regulations and portfolio composition after the liberalization. We considered the simultaneous operation of incumbents´ and new adopted technologies, interpreting them as latent technologies, and observed how and to what extent the latter replaced the former.

Overall, we drew the following lessons:

1. There are significant gains in welfare as result of productivity, quality and efficiency (in that order) improvements in the services industries. Therefore, if the liberalization of trade is expected to increase competition and foster advances in productivity, quality or efficiency, there will be gains in a range of one to four percent of GDP, depending on country and scenario.

2. The absolutely inclusive relevance of the improvements in quality is striking. If a service shows better quality following the opening, it could have an impact on the economy that is comparable to the habitually estimated gains in factors productivity of the services sectors. This effect is higher in the Argentine case than in the Uruguayan case.

3. If the liberalization of trade in services is able to lower overpricing (derived from the domestic barriers to trade in services), our estimates that it is also reasonable to expect overall improvements in welfare. But if more liberalization of trade in services resulted in a higher concentration of domestic service industries (because of the presence of new operators that force exit of small competitive domestic firms) and overpricing were to rise, the net gains would turn negative yet again, even after taking into account gains in productivity and quality.

4. The above mentioned findings are confirmed when we use the data on current barriers in Argentina and Uruguay; in Brazil, today's degree of opening is quite close to the maximum if viewed from the perspective of overpricing and our simulations do not show potential residual gains. In Uruguay, however, we can see that a reduction in overpricing benefits the economy and the fiscal situation, even when it is the Uruguayan public owned enterprises that would have to sacrifice their price levels.

5. The results show that to reasonably expect gains from greater trade presence in these service industries there should be a balanced development between technology adoption and the endowment of domestic resources. Highly-intensive technology in some resources (like human capital) may generate net losses in welfare if the economy is not able to supply them. Likewise, the limited endowment of some factors could act as a constraint on gains from trade presence.

6. When technologies compete, we observed that there is a limited and progressive phase down of incumbent operators, not a sudden replacement. The reason is that incumbents accommodate the more competitive market conditions through reductions in the reward of their non mobile, specific capital.

7. The Argentine case illustrates that when the liberalization of financial services must necessarily be accompanied by a deregulation of portfolios, the governments themselves may oppose the reform in the short run because they would see the demand for their bonds drop. Hence, the gains in productivity, efficiency and quality may be limited by the loss of sources of financing.

8. Our results also confirm what we see in the social accounting matrices: changes in the standard of living of the poor are highly correlated with the modification in economic and financial situation of governments. This is due to the fact that said matrices reflect the governments' complex networks of transfers to the poorest deciles (this is clearly the case in Argentina and Uruguay). Therefore the short run financial position of governments could also explain the reluctance to adopt reforms.

It is worth mentioning that we also conducted exercises on the reciprocal case: it is the rest of the world that lowers barriers to trade in services from Argentina, Brazil and Uruguay. We observed that there will be a price increase in domestic services so as to align with international prices, and this causes the domestic living standards to fall despite an increase of the scale of operation of domestic industries. However, that can be considered only a first round effect, and probably additional gains well be observed in a dynamic context.

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A. APPENDIX: THE MODELS

Two alternative models were used for simulation. On the one hand, a standard version of GTAP for Brazil; on the other, a special model developed by Chisari et al (2009) for Argentina, also adapted for Uruguay. Here we present a simplified version of the model used in the last case, including only four goods and only one household, though the complete version includes 29 industries and goods, and one representative household for each income decile. The corresponding sub indexes for goods and services are *J = {1,2,N,R}*. There are two industries that produce tradable goods, 1 and 2, one industry that produces non regulated services, N, and one sector of regulated services, R (regulation is limited here to price regulation) All production functions are CES, though value added and intermediate inputs are used in fixed proportions.

A.1. Domestic household

This agent collects also all taxes and grants subsidies. Net welfare of this household will therefore represent social welfare. The domestic agent maximizes the utility function $u(c_1, c_2, c_N, c_R, m, BD)$ subject to:

$$[1] \quad \sum_T p_T c_T + p_R c_R + p_N c_N + p_m m + p_b(BD - BD^*) = w\overline{L} + \sum_{I/\{R\}} r_I \overline{K}_I + \theta\pi^*_R + \theta t p_R G(L_R, K_R) + TR^w v$$

where θ is the share of domestic agents in profits of the regulated sector π^*_R. The third term of the right-hand side corresponds to the compensatory transfer from domestic customers (t > 0) or to the firm from its shareholders (t < 0). Under public ownership, θ = 1. In both cases, under price cap, t is computed so that $p_R = 1/\mu(1+t)$. The last term corresponds to social transfers. To represent those programs of the government, every household is assumed to be endowed with a special good that is demanded by the public sector. The endowment is represented with *TR** and *v* stands for its price. Households also have and endowment of bonds *BD**, to be purchased or sold according to their financial condition. Therefore, *(BD-BD*)* is the net transaction at prices p_B .

From utility maximization, we obtain the familiar first order conditions:

$$[2] \quad u'_{c_T} / u'_m = p_T / p_m$$

$$[3] \quad u'_R / u'_m = p_R / p_m$$

$$[4] \quad u'_N / u'_m = p_N / p_m$$

$$[5] \quad u'_N / u'_B = p_N / p_B$$

c_T is consumption of domestic tradable goods, c_R is the consumption of goods and services under regulation, *m* are imports (a good produced abroad but not domestically) and c_N is consumption of rest of services. p_T, p_R, p_N and p_m are their respective prices. *w* is the wage rate and r_I is the rate of return on capital in each sector. $\overline{L}$ and $\overline{K}$ represent the domestic agent endowments of labor and capital.

The Armington assumption is used to represent imperfect substation between domestic and imported goods.

The budget condition represents: (1) total expenses in goods, services and taxes; (2) income sources, mainly salaries, capital income and profits, as well as transfers (including pensions) received from the

government. Investment goods enter also in the utility function (not shown in this version), for it is the household who determines total savings.

A.2. Domestic Production Sectors

Y, H and *G* are the production function of the tradable, non-tradable and regulated sectors, respectively. We assume constant returns to scales in all cases. This consents the separation of each industry in tour sub industries with a differentiated tax treatment (specially for VAT) according to destination, without altering the basic structure of the model.

2.a *Tradable sectors*

There is one firm that maximizes profits in each tradable sector. The net price for the firm is the price to consumers less the cost of intermediate inputs.

[6] $$\pi_T = \left[p_T - \sum_{J \neq T} a_{J,T} p_J - a_{R,T} p_R - a_{N,T} p_N \right] Y_T(L_T, K_T) - wL_T - r_T K_T$$

for every T=1,2 and where a_{JT} , a_{NT} y a_{RT} input coefficients

Notice that firms observe the incentive given by the net price after intermediate inputs costs. The maximum profit conditions are:

[7] $$\left[p_T - \sum_{J \neq T} a_{J,T} p_J - a_{R,T} p_R - a_{N,T} p_N \right] Y_L = w$$

[8] $$\left[p_T - \sum_{J \neq T} a_{J,T} p_J - a_{R,T} p_R - a_{N,T} p_N \right] Y_K = r_T$$

In both cases, the value of marginal product (corrected for intermediate costs) is equalized to the reward of the factor. Notice that we are not assuming export or import taxes but they can be introduced easily as ad valorem taxes.

2.b *Non-tradable sector*

Services and other non tradable goods are produced using labor and capital. Capital is specialized and non mobile. Equation (9) corresponds to profits definition, and equations (10) and (11) to optimization conditions:

[9] $$\pi_N = \left[(1+t_N) p_N - \sum_{T} a_{T,N} p_T - a_{R,N} p_R \right] H(L_N, K_N) - wL_N - r_N K_N$$

In this last expression we have included a sale tax to non tradable non regulated services. This is only for the sake of this simplified presentation, since the general model considers a wide range of different taxes (see Chisari et al (2009)). The maximization conditions are:

[10] $$\left[p_N - \sum_{T} a_{T,N} p_T - a_{R,N} p_R \right] H_L = w$$

[11] $$\left[p_N - \sum_{T} a_{T,N} p_T - a_{R,N} p_R \right] H_N = r_N$$

Our model considers the possibility of price regulation in the two basic cases: price-cap and cost-plus. This is done introducing endogenous mark-ups (see Chisari et al (2009) and Chisari, Lambardi and Romero (2005)).

A.3. Rest of the world

3.a *Production sectors.*

The rest of the world produces substitutes for our exports and import goods, using a factor of production F. Equations (12) to (17) give an alternative technology available for foreign owners to fulfill their obligation of services, using mobile capital.

[12] $\pi^*_m = p_m \alpha(F_m) - w^* F_m$

[13] $\pi^*_T = p_T \beta_T(F_T) - w^* F_T$

[14] $p_m \alpha' = w^*$

[15] $p_T \beta'_T = w^*$

[16] $m^s = \alpha(F_m)$

[17] $x^s = \beta_T(F_T)$

π^*_m and π^*_T represent profits in the rest of the world industries that produce import goods and perfect substitutes of tradable goods. w^*, the numeraire, is the wage rate of the only factor used abroad. F_m and F_T are factor quantities employed in the corresponding industries. The production functions: $\alpha(F_m)$ and $\beta_T(F_T)$ give the total supply in equations (15), <16> and <17>**.** In the case of α' and β'_T constants, international terms of trade will be given by $p_T / p_m = \alpha / \beta_T$ (small economy assumption).

3.b *Households*

Consumers in the rest of the world receive the rents of foreign factors, including capital installed in Argentina. It maximizes a utility function $v(x_T, m^*)$ that depends on the consumption of our tradable goods and of import goods, as well as the demand for bonds. Their budget condition is:

[18] $p_m m^* + p_T x_T + b(BX - BX^*) = w^* \overline{F} + (1-\theta)\pi_R + \pi^*_m + \sum_T \pi^*_T + t p_R G(L_R, K_R)(1-\theta)$

Foreign agent receives profits and capital return from domestic sectors, as well as the wage rate (cost of capital) F and the proceedings of the mark-up factor. X_T are exports, that is domestic tradable goods bought by the foreign agent. The last term in equation (18) stands for the endogenous mark-up (positive) or internal subsidy (negative) computed as the difference between the benchmark tariff 1/μ (as seen by customers) and P_R.

3.c *Public sector*

The public sector is treated as a special agent. It collects tax revenues and

it, or buys goods and services (or factors, mainly Labor). It is endowed with a utility function *UG,* and therefore it is possible to estimate its welfare changes. It can also issue bonds. It also purchases investment goods.

It initial endowment of bonds is *BG** while *(BG-BG*)* stands for net purchases. Equation [18] gives the budget condition for the public sector:

[19] $TR + LG + IG + G + p_b BG = [t_N p_N H(L_N, K_N)] + p_b BG^*$

Its utility function is assumed to be Cobb-Douglas.

A.4. Market equilibrium conditions

Equations (20) to (22) represent the equilibrium conditions for factors used domestically, and (23) is the equilibrium condition for the foreign factor. Equations (24) to (27) correspond to equilibrium in markets for goods and imports. Equation (28) gives the market condition for the so called "market for transfers". While (29) corresponds to the market for bonds.

[20] $\bar{L} = L_1 + L_2 + L_R + L_N + LG$

[21] $\bar{K}_T = K_T \qquad (T = 1, 2)$

[22] $\bar{K}_N = K_N$

[23] $\bar{F} = F_m + \sum_T F_T$

[24] $G(L_R, K_R) + q_R = \sum_T a_{R,T} Y_T(L_T, K_T) + a_{R,N} H(L_N, K_N) + c_R$

[25] $Y_T(L_T, K_T) + x_T^s = a_{T,R} G(L_R, K_R) + a_{T,N} H(L_N, K_N) + c_T + x_T$

[26] $H(L_N, K_N) = \sum_T a_{N,T} Y_T(L_T, K_T) + a_{N,R} G(L_R, K_R) + c_N + G + IG$

[27] $m^s = m + m^*$

[28] $TR = TR^w$

[29] $BD + BG + BX = BD^* + BG^* + BX^*$

A solution is a vector of prices of goods, services, factors, bonds and transfers that clear all markets simultaneously. Under unemployment, wages must be determined following some additional condition (like constant real wages). Under mobility, capital reward is the same across industries.