Winners and Losers from Utility Privatization in Argentina.
Lessons from a General Equilibrium Model

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Abstract: The economics rates of return for utility privatization projects in Argentina are very high, wheter or not distributional weights are considered. But there is a very high shadow price for regulatory activity, which tends to be ignored in most privatization exercises. And how serious a government is about the fair distribution of gains from reform is reflected in how serious it is about regulation

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Winners and Losers from Utilities Privatizations: Lessons from a General Equilibrium Model of Argentina

Omar Chisari, Antonio Estache and Carlos Romero

1. Introduction

In 1989, Argentina initiated a process of privatization of its infrastructure services that was at the forefront of the international experience. The breadth of the sectoral changes and their quick implementation did not initially reflect a dramatic concern for efficiency in the delivery of basic public services. They were driven instead by the need to alleviate the fiscal burden imposed by public utilities and the need to get the private sector involved in financing the increasingly pressing expansion requirements of these sectors. The concern for efficiency was a byproduct of the need to regulate the sector to avoid abuse by the private providers of activities with monopolistic features. But efficiency improvements are now becoming one of the expected benefits of the changes as more is known about the regulatory options available throughout the country.

Indeed, Argentina's reforms are not concluded yet as many provincial water and electricity distribution companies are still in the hands of the public sector. But overall, Argentina's structural adjustment is proceeding well, including a clear technological change, the flexibilization of its labor market and the change in the pricing rules of the key utilities. Much has been written on the institutional aspects surrounding these changes but, besides the publication of a few sector specific performance indicators, no detailed assessment of their impact on the economy is available. This is why the lessons from this paper could still be useful to the design of provincial regulatory schemes as well as to other countries considering similar reforms.

The main purpose of this paper is to assess both the efficiency and distributional impacts of privatization in electricity, gas, water and sanitation, and telecommunications services.[1] This is done by comparing the economy in 1993, the first year in which all the major privatization had taken place, and in 1995, the last year for which data is available. The paper assumes that the changes observed in the privatizations already implemented in these sectors will be duplicated when most provincial services are privatized. It is unlikely that all provinces will manage to concession their water and electricity distribution services but in terms of the macroeconomic impact, what has already been achieved accounts for most of the impact the reform is likely to have. About 33% of industrial production, almost 50% of services and over 40% of the population are concentrated around Buenos Aires. Moreover, large electricity users throughout the country can bypass the local distribution companies and access the wholesale electricity

[1] Shirley and Galal recently published the results of a detailed Bank study that focused on the efficiency aspects of privatization in the UK, Chile, Mexico and Malayisa but followed quite a different methodology and did not address the equity aspects of privatization. For a quick overview of their main results: see Galal, A. and M. Shirley (1994), "Does Privatization Deliver? Highlight from a World Bank Conference," EDI Development Studies.

market. The only sector significantly affected by the assumption is the water sector where privatization has been limited so far to a few provinces in addition to Buenos Aires.

The analytical framework is provided by a computable general equilibrium model. In spite of its well known general limitations, this approach is particularly useful in this context for the following reasons. First, in a structural adjustment context, it allows a careful calibration of the key technological parameters based on information requirements much less demanding than those of econometric models. Second, it allows comparative static simulations of the impact of changes within the sector or across the economy one at the time or simultaneously, as needed. This is quite useful because it tracks down the direct and indirect impacts of all the changes in one utility or assesses the impact of a similar change (e.g. changes in all tariffs, in productivity or even in quality standards) across utilities. The direct effect focuses on the impact of these changes through the direct consumption of the privatized goods. The indirect impact accounts for the impact of the reform importance on the capital and labor markets, and through the consumption of other goods and services. Third, it allows an assessment of the interactions between privatization and other significant macroeconomic changes such as the "Tequila Effect."

A last advantage of the tool is the possibility of using the design of the model's closure rules of the model to assess the importance of the effectiveness of the regulator in determining the inter-personal and inter-sectoral distribution of gains and losses from utilities' privatizations. More specifically, this assessment is based on a comparison of two types of simulations. The first set of simulations computes a solution to the model in which the utilities' tariffs are endogenous (within the limits imposed by regulation), and productivity and quality gains are diffused throughout the economy. This would be the outcome expected under perfectly effective regulation. The second type of simulation assumes fixed utilities prices which means that the gains from privatization are appropriated by the capital owners of the sector as a quasi-rent. This would be the expected outcome under ineffective regulation and it is a lower bound for the gains from private operation of utilities. The difference between the results of the first and second simulation provides an estimate of the quasi-rent the new owners of utilities are likely to fight for as well as an indication of the economic gains from effective regulation.[2] Thus, the distribution of these gains across income classes is relatively easy to assess by tracking down the effects through the labor and capital markets to each owner group of these assets.

The paper is organized as follows. The next section provides a brief summary of the major changes that have occured in the delivery of utilities service in Argentina since 1989. Section 2 describes the structure of the model. Section 4 provides an overview of the key changes observed in each sector in terms of prices, technical efficiency and quality standards. Section 5 presents the results of simulation of the overall efficiency and distributional effects of private operation of these services. Section 6 estimates the initial impact of the transfer of operation from the public to the private sector. Section 7 compares the relative importance of the Tequila effect and of the Privatization effects. Section 8 concludes.

[2] An alternative interpretation could be that the walrasian solution illustrates what a full pass through would imply for the economy while the fixed price solution measures the implication for the economy of a cost plus regulation in which the "plus" factor is detemined by the efficiency gains achieved by the private operators of utilities or a price cap regulation in which the cap is equal to the price under the public operation of the sector and the productivity gains (the "x" factor in RPI -x) are set at 0 for ever.

2. Argentina's Privatizations

Some degree of restructuring took place in each sector before the transfer to private operators. This section summarizes for each sector the changes most relevant for the simulations to be discussed later. The description is not encompassing but gives a sense of the major structural adjustment mentioned earlier.

Electricity. The restructuring of the sector began in 1991 with the transfer of most public enterprises under federal control to the private sector, the reorganization of the institutions of the sector and the introduction of a new regulatory framework. The three stages of production in the sector—generation, transmission and distribution—were vertically disintegrated and different regulatory criteria where adopted for each activity. Generation became competitive, and transmission and distribution became regulated private monopolies. The regulation of the tariff and of the quality of the distribution and transmission services is particularly detailed in the new regulatory framework to ensure that the final users enjoy the benefits of competition in the generation sector. The regulatory mechanism is essentially and RPI-x where the productivity gains x will be adjusted after 5 years. Roughly a third of all distribution companies have now been concessioned. These cover over 60% of the population of the country. Since the provincial concession strategies are essentially copies of the National distribution concessions, the conclusions drawn from simulations of the model based on the first wave of concessions are likely to be representative of what will be observed in the area of jurisdiction of each distribution company.

Gas. Gas restructuring took place at the end of 1991 when the transport and distribution activities were separated into two transporters and eight regional distribution concessions. Its production activities are included in the Mining sector of the National Accounts (the major gas producer, YPF with over 60% of total production, was not as successful in terms of the promotion of competition in the economy). It provides the major input for the privatized companies and sales are concluded at an unregulated price. However, since the other activities are controlled by local monopolies, as in electricity, a good regulation of tariff and quality was needed and was introduced with the reform. The regulatory mechanism is essentially an RPI-x where the productivity gains x will be adjusted after 5 years.

Water. While few provincial privatizations in the water sector have occured, the largest and the best documented is the privatization that transferred the responsibility for water and sanitation service in the Buenos Aires Metropolitan Area to Aguas Argentina in May 1993. Competition was achieved through a bidding process and the resulting concession contract has become the main regulatory instrument available to the regulators. It stipulates service obligation, investment requirements and quality standards monitored by the national sector regulator. The tariff adjustments are based on a cost plus rule. It is clear that the analysis of sector performance is based on the information for a single company but since this company involves about 30% of Argentina's population and its regulation is serving as a model for most of the others, it still seems reasonable to model this privatization experience as well.

Telecommunications. The transfer of the telecoms company to private operators was concluded in November 1990. It was in fact the first infrastructure service concessioned. The service is now provided by two companies. Their tariffs are regulated and service and quality obligations detailed in their concession contracts. The regulatory mechanism is essentially an RPI-x where the productivity gains x will be adjusted after 5 years. Since it was the first concession, the government ended up gave up the effective short term control over monopoly powers to ensure the entry of private investors and operators in the sector. This is the reason why current tariffs are likely to be revised soon. There is an ongoing debate about the need to rebalance tariffs but since a decision has yet to be made, the current rates have been used to assess the efficiency and distributional impact of privatization in this sector.

3. Basic Analytical Structure of the Model

The model is built around a social accounting matrix (SAM) constructed for 1993 which isolates every utility from the other accounts.[3] It is consistent with national accounts for 1993, which is also the first year in which all national utilities were formally managed by private operators. Its basic structure is provided in Table 3.1. The figures in parenthesis provide the value (in billion US$) at current prices. As can be seen, spendings have to equate revenue for each aggregate account. The model identifies 21 domestic production sectors, 10 for goods and 11 for services. In addition to the usual activities under services, the SAM identifies electricity generation, electricity distribution, gas, water and communications as separate sectors. Three factors of productions are accounted for: labor, physical capital and financial capital. Labor and financial capital are mobile across sectors while physical capital is sector specific. Domestic consumer groups are divided into 5 income classes and there is only one foreign consumer and one foreign producer. The small open economy assumption is relied on, implying that Argentina is a price taker in the international markets.

[3] An earlier version of the model without detailed infrastructure accounts was presented in Chisari, O. and C. Romero (1996), "Distribucion del ingreso, asignacion de recursos y shocks macroeconomicos," Serie Financiamento del Desarollo #36, CEPAL, United Nations.

Details on the data sources used to construct the accounts are provided in an appendix available (in Spanish) from the authors but it may be helpful to summarize here the most critical assumptions we had to make. First, some of the basic production data was not readily available for 1993 and we had fill the holes with 1986 data, the last year for which detailed information was available. Second, the matrix of intermediate purchases is based on the 1984 data adjusted to the values of the national census of 1993. Third, the distribution of the factor income across income groups is based on the distribution observed in the province of Buenos Aires in 1991. Finally, the distribution of the consumption basket per type of goods and services is based on the 1986 household consumption survey. In both the input and output matrix and the household consumption, consistency for consumption and production with the national accounts data was obtained by relying on the RAS method.[4] As for the government distribution between goods and services, data is available for 1993 for the national and provincial governments. Municipal expenditures are assumed to be distributed in the same proportion as the average for the two other government levels. The infrastructure data was based on the information on assets, inputs and expenditures available in the annual balances of the companies of the sector and complementary data provided by the national regulatory entities and the Sectoral Secretariat (Energy, Water Resources, Communications).

The rest of this section presents a simplified non-analytical version of the model to help the reader follow its main economic aspects.

Consumers. Consumers' utility is modeled as a Cobb-Douglas between all goods except for retail trade which is assumed to be purchased in fixed proportions with the rest of the goods and services. The preferences of domestic agents are assumed to follow an Armington specification which implies no perfect substitutability in preferences between domestic and imported goods.[5]

Expenditures are distributed between domestic and imported consumption goods and investments. Goods and services of "privatized" firms combine quantity and quality features but a change in quality is not necessarily associated with a change in the price of the service provided by the privatized firm. An increase in service failures increases cost for the buyer of services because the consumer needs to buy a higher number of physical units to reach the desired flow of services. This "naive" modeling approach allows for instance to model the costs of power losses or interruptions as a proportion of unit costs. Prices can be differentiated per income groups.

The budget constraint for each income group reflects total expenditures in goods and services as well as indirect taxes varying by the type of good and service, and direct taxes. Income sources are labor income in the private sector and in the public sector, and capital income in private firms; revenue from profits on domestic sales and sales abroad, and revenue from participation in the privatized firm redistributed in proportion to shares owned. Total

[4] See Bacharach, M. (1970), Biproportional Matrices and Input-Output Change, Cambridge University Press.

[5] Although not necessary to ensure that the economy does not end up specializing, by assumption, the capital installed in the tradeable sectors cannot be reallocated.

capital wealth (physical + financial) can be negative if the consumer group is in debt.[6] Families also get public sector transfers.

Table 1: Summary SAM and Economic Features of the Model for 1993

(in billion US$; 1993 GDP: US$256.329 billion)

		Expenditures				
		Domestic Prod. Sectors	**Private Consumption**	**Government Consumption**	**Investment**	**External Sector**
Revenues	**Domestic Production Sectors** **(21 sectors, including separated infrastructure services)**	Domestic Purchases: *CES value added for private firms *Leontief value added for privatized firms *non-tradeable prices are market clearing for given levels of rationing in factor markets *combination with other goods and services in fixed proportions (132.370)	Spending on domestic goods * Cobb-Douglas utility in goods * fixed proportion with goods for retail trade * separate quantity, price and quality for each privatized service * rationing possible (175.082)	Spending on goods and services: * Cobb-Douglas social welfare function in purchases of goods and service, bonds, retirees services and investment; * purchases of goods and services are in fixed proportions (6.085)	Final demand for investment goods (42.816)	Exports: * the foreign consumer has a Cobb-Douglas utility in exports and imports * he can issue Bonds to pay for net imports *Argentina is a price taker in exports and imports * whatever Argentina can't consume is sold abroad at given price (16.237)
	External Sector	Imports fixed proportion with value added (8.182)	Spending on imports * imperfect substitution with domestic substitutes (8.727)		Imports of capital goods * fixed proportion with value added (4.150)	
	Government	Trade tax revenue (1.282)	Trade tax revenue (1.133)			
		Direct taxes paid by firms (22.461)	Direct taxes paid by households (4.519)			
		Indirect taxes (25.283)				
	Families **(5 income classes)**	Labor income net of taxes: * initial unemployment (60.786)		Salaries and Public Sector Transfers (43645)		
		Capital income net of taxes * can be domestic or foreign (122.266)				
	Investment		Private Savings (37.196)	Public Savings (4.948)		Foreign Savings (4.822)

[6] An increase in the cost of debt leads to an increase in the supply of labor and a decrease in consumption by the indebted income classes.

Private Firms. The private firms are those for which there was no change in ownership or any major organizational change during the period covered by the study. They produce goods and services intended for intermediate and final consumption as well as export and investment. This differentiation is necessary to account properly for the differences in the tax treatment of the various destinations (for instance, exporters do not pay the VAT and benefit from discounts on their gross income tax). There is no technological differentiation across these sectors. Exporters of goods are price-takers abroad and exports of services are price inelastic (i.e. they are constant). Non-tradeable prices are determined as solution variables and adjust with factor income until markets reach equilibrium. Credit requirements are constant per unit of output.

The product is obtained by combining intermediate inputs and value added in fixed proportions. The value added itself is obtained by combining labor and capital inputs in a CES production. The inter-industrial transactions requirements are proportional to total production and to exports respectively. Privatized goods and services are also proportional to output which is different from the assumption made for consumers where rationing could occur.[7] However, firms can be subject to adjustment in quality of services just as consumers and hence can face differences in cost for the same service.[8] A quality improvement is equivalent to a cut in the absolute value of the input requirements. Remuneration includes total payments to capital and hence amortization. This means that the savings and investment decisions are taken by households in the model.

Privatized Utilities. The privatized firms sell mostly to the domestic market, except for gas where some exports occur. With the exception of some differentiation due to regulation, service obligations or to taxes according to their final users, each utility sector is assumed to sell a single product. Their profit function includes any subsidy that could be transferred by the public sector a differentiation of tariffs into retail, wholesale or commercial and residential as necessary. The quality variables are modeled as an improvement in the overall efficiency of the sector.

Outputs are limited by capacity and transmission constraints are incorporated through the value added function. The product of the privatized sector is also based on a fixed proportions production function for intermediate inputs and the value added function in the privatized sector are assumed to be Cobb-Douglas. This description of the technology of the private and privatized firms is key to model the changes in productivity, efficiency and quality. Price regulation in turn is modeled as RPI-x, where x is set to 0 at the beginning of the contract.

[7] Purchases of electricity in the wholesale market correspond to generation, purchases on the retail market correspond to distribution.

[8] This assumes that there is no possibility of using “home-made” substitutes for infrastructure services.

The Public Sector. The government maximizes social welfare including current collective goods produced with goods and services purchased, employment, credit (which can be domestic or international), retirees services and a proxy for future collective goods: public investment. The function is a Leontief in which goods and services are combined in fixed proportions as a single input. Pensions, bonds services, investments, and current operative expenses are a constant proportion of total government income in this model. The government faces a budget constraint given by the sum of tax revenue, bonds but also revenue from their share of ownership in the "privatized assets."

The Rest of the World. The foreign consumer has a Cobb-Douglas utility function. He faces faces a budget constraint. His revenue includes payments from its share of capital in the privatized sectors. Argentina is supposed to be a price taker in the international markets.

The Factor Markets. The labor market in not in equilibrium so that unemployment is a possible outcome of any reform. The investment goods industries are divided into two main categories: those providing capital goods for private firms and those that construct specific capital for each one of the privatized utilities (electricity, gas, water and telecommunication). This procedure allows the recognition of the differential impact of investment schedules established by the regulatory contracts—for example, as network expansion commitments—on the economy (mainly on the rate of unemployment and the trade balance); therefore, special effort was devoted to determine the input composition of each industry.

The Market for "Bonds." The financial market is highly simplified in this model—when compared to the sophistication of Argentina's financial sector. Its inclusion in the model is, however, important because it allows an assessment of the distribution of the welfare consequences of changes in access to credit. This access is particularly important to the financing of infrastructure investment but it is also very important to assess the extent to which the expected gains of infrastructure reforms can be offset by failures to reform other sectors, the capital market in this case.

As previously mentioned, there are fixed requirements of credit per unit of output in each production sector, including recently privatized utilities. Additionally, domestic consumers can be separated into net debtors (typically the four poorest income brackets, to meet their demand for durable goods) and net creditors (the fifth income bracket); the rest of the world was considered a net creditor too for the benchmark. In terms of the bonds market, debtors were represented as issuers and creditors as subscribers. Therefore for domestic families and for the foreign consumers, bonds were introduced in the model giving them initial endowments but also introducing preferences for bond holdings as arguments in their utility functions.[9]

The domestic bonds market adjusts to the internal credit disequilibria of the families and of the government and to Argentina's disequilibrium with the rest of the world. Internally, the first 4 quintiles sell "bonds" (which is basically a credit instrument) to the richest. A net increase in the demand for bonds thus reduces the purchasing power of the 4 poorest income groups. An increase in the price of bonds is compensated by a decline in the purchase of other goods and with an increase in the labor supply which can contribute to an in increase in unemployment.

[9] The information on sectoral and personal net financial positions was obtained from monetary authorities and estimated using purchases of durables goods and total capital holdings.

The firms also demand bonds as a fixed proportion of their value added. For them, an increase in the price of bonds implies a cut in the marginal product of labor; which in turns leads to a reduction in the demand for labor, adding to the unemployment problem.

The benchmark simulation of the model includes both a positive unemployment level and a commercial deficit. This implies that in addition to a disequilibrium in the labor market, the rest of the world is financing consumption and domestic investment. The implication for the bond market is an increase in the demand for bonds issued by domestic agents and purchased by foreigners. With an increase in the international interest rate, as in the case of the Tequila effect, foreign investors stop buying domestic bonds.[10]

4. Changes in the Performance of Utilities Operated Privately

Ideally, to assess the impact of the reforms in each sector, a comparison would be made of the performance of utilities under private operation with their performance under public management. This is however not as straightforward as it seems. Much of what a reasonable regulator would consider to be useful indicators are not formally or systematically collected by the public managers of these utilities. Most of the efficiency and quality indicators are only available since the private operators took charge and so the only progress that can be traced with some degree of consistency is that of these private operators. And even then, there are great differences in availability across sector. In electricity for instance, only three distribution companies of over 25 major companies are subject to the national electricity regulatory requirements. In Gas and Telecommunications, there are fewer firms involved and most controlled by the sector regulators. The most serious problem however was in the Water sector. In addition to the fact that this main privatized water company is only responsible for the needs of about 30% of the population, there is generally much less information available for that private provider than for any other private provider of utility services.

It is easier to assess the changes that private operation brings to these services because Law 19.550 imposes publication requirements on the cost composition of each privatized firm. This information provides a good indication of the changes that are taking place in each sector and is the basis of the discussion presented below to ensure a comparable criteria across sectors. Strict comparisons between the public and the private performance will be provided when available. The basic characterization of gains in each sector is expressed in terms of efficiency gains, labor productivity gains, investment increases, quality gains and changes in tariff. Most of

[10] Between October 1993 and October 1995, the LIBOR jumped from 3.4% to 5.8% and the PRIME from 6% to 7.8%, while the dometic interest rate increaed from 9% in October 1993 to 14% in November 1994 and over 33% in March 1995. Simultaneously, unemployment increased from 9.3% to 12.2% and the share of problem portofolio over total portfolio increased to over 10% in the 3rd quarter of 1994 and to over 30% in the 2nd quarter of 1995. This fact was used in the calibration of the model.

the information was found in the balance sheets of the private operators. Table 4.1 presents the main performance indicators used in the simulations discussed later.

The base is year 1993, the first year in which private operators were in charge in each one of the sectors previously under national government management as mentioned earlier. It is also the first year for which detailed data is available for private operators in all sectors through their annual report and balances. It is important to remember that these indicators do not measure the changes that occurred with the change in ownership but rather the changes that occurred in a 2–year period under private sector management. There are of course many other indicators available but in most cases they tell story similaras that told in Table 4.1. They should be considered with some care as many different elements are interacting and the time span used to compare is relatively short—which for infrastructure services is quite important as it takes time to invest and it takes time before these investments lead to increased production. For the water sector for instance, labor productivity initially increased tremendously as employment was reduced by 47% to determine the base year data used in this table. Since then, the expansion requirements have been such that the company has had to recruit to work on the investment program without a short run increase in water production which explains the deterioration observed in Table 4.1.

Table 4.1: Changes in Performance between 1993 and 1995

	Electricity Generation	Electricity Distribution	Gas Distribution	Water Distribution	Telecoms.
First year of private operation	1992	1992	1992	1993	1990
Efficiency gains (measured as reduction in intermediate inputs purchases as a share of total sales value)	19.51%	6.26%	8.84%	4.86%	11.28%
Labor productivity gains (measured as GWh/staff for electricity, 000m3/staff for gas, population served/staff for water, lines in service/staff for phones)	23.1%.	17.59%	4.79%	-27.58%	21.25%
Increases in investment (as in concession contracts for gas and actual investments for the other sectors)	8.65%	n.a.	4.56%	75.97%	28.1%
Improvements in quality (measured as reductions in losses (net of consumption by transmission)/production for electricity and gas, water unaccounted for/production for water, lines in repair/lines in service for phones	n.a.	10%	27.8%	6.12%.	4.56%
Changes in legal average tariffs (defined as legal tariffs defalcted by retail price index)	n.a.	-9.5%	-0.5%	5.5%	-4.9%

Note: The table reflects the changes achieved under private management of the services. Indeed, 1993 data reflects the first year in which all sectors had benefited from some initial adjustment by the private operator. 1995 is the last year for which data is available at the time of this writing.

In general however, Table 4.1 shows continuing improvements under private management. For most sectors, the most dramatic adjustment in labor productivity took place immediately after the private take-over of operations in 1990-1991 for all sectors except water.

This can be seen in Table 4.2 which shows the changes in labor productivity observed just before the private operators actually took over. It took a bit longer to achieve the efficiency gains measured in Table 4.1 and used for the main simulations discussed below.

As for other performance indicators, the assessment task was quite challenging. Non-labor productivity indicators (such as purchases of intermediate inputs) were difficult to assess because most of the public companies did not follow commercial accounting practices. There was also problem is assessing the impact on investment because, the investment program is typically spread over several years. As typical, the largest increases in relative terms occurred in the first year of operation of each firm since the public managers did not invest at all in most cases as a result of the fiscal constraints of the country. None of the available quality indicators can easily be modeled so only simulations on the yields from gains in this area for 3 sectors could be done, having to exclude water. Finally, average tariffs continued to fall in electricity and gas. After a reduction in tariff at the time of the privatization in water, the average tariff has begun to increase even if the legal tariff is still below what it was under public management. Our best estimates of some of these indicators are in Table 4.2.

Table 4.2: Changes in Performance at the Time of Privatization

	Electricity Generation	Electricity Distribution	Gas Distribution	Water Distribution	Telecoms
Efficiency gains (measured as reduction in intermediate inputs purchases as % of total sales value)	43.4%	21.3%	1.3%	n.a.	n.a.
Labor productivity gains (measured as GWh/staff for electricity, 000m3/staff for gas, population served/staff for water, lines in service/staff for phones)	95.1%	80.3%	35.6%	75.2%	37.8%
Changes in real average tariffs (defined as total sales value by a physical indicator of production)	n.a.	4%	n.a.	-1.92%	n.a.

Sources: see Data Appendix Available upon request from the authors

5. Assessing the Long Run Efficiency And Distributional Effect of Private Operation

There are many ways to assess the effect of the changes described in the previous section on the rest of the economy and on the various income classes. The main focus of the discussion of the efficiency effects of the reforms on the rest of the economy is on the standard macroeconomic indicators. This includes levels of activities in the 21 sectors of the economy identified by the SAM as well as prices and the usual expenditure categories. As for the distributional effects of the reform, the analysis is based on an indicator of welfare change in each income group as well as the calculation of a Gini coefficient for the economy. Since personal distribution depends heavily on factors relative rewards, they are also included in the table.

The choice of simulations can also be quite helpful in differentiating the analysis of the effects of the reform by type of change. In addition to tracking down the effects of all the changes observed in each sector on the rest of the economy, the simulations can also be designed to isolate the effects of each one of the changes identified in Table 4.1. For instance, the effect of

improving labor productivity gains in all infrastructure sectors on the country's unemployment rate can be a very important policy concern.

From this point forward, we are considering the total operational gains achieved in each utilities' sub-sector to be the sum of the effects of four specific changes:

- *Efficiency*: changes in inputs per unit of output modeled as a reduction in a_{ri} in equation [9] in the appendix; the efficiency gains are taken as reductions in the quantity of inputs used by the privatized sector to obtain one unit of output (i.e. as a cut in the same proportion of the input-output coefficients of the column corresponding to the specific sector); the gains are unincorporated and generate an increase in capacity of the economy to generate a surplus.
- *Productivity*: changes in labor productivity modeled as a reduction in the relevant L_{ri} in equation [10]; productivity gains are computed as efficiency gains in work so that less L is needed to obtain a given level of service;
- *Quality*: changes in quality measured in terms of product changes and modeled as changes in a_{ri}, and ar_{ri} in equation [9]; they are computed as reductions in the coefficients of the quantity of the privatized inputs needed to produce one unit of output in the other sectors;
- *Tariffs*: for fixed prices: they are modeled as the actual utilities price changes observed.

There are also other ways of squeezing information out of the model. The selection of the closure rule is an important instrument to that effect. To mimic the adjustment that takes place in Argentina now that price deregulation is the prevailing policy, prices can be assumed to adjust freely throughout the economy to any of the changes identified in Table 4.1. But this implies that regulation is effective and that the private providers of public services are unable to generate their monopolistic positions to extract rents. In that sense, this kind of simulation provides an upper bound for the gains from privatization in Argentina. On the other hand, if the regulator is ineffective, the rent could be quite significant. This can be simulated by keeping the price of the infrastructure services fixed, implying that any reduction in cost that results from the reforms accrues to the private operator. This then provides a lower bound for the gains from privatization. It turns out that this effect is most important in terms of the distribution of income since the distribution of ownership of capital is the key determinant of who gets the rent.

More specifically, the design of the two closure rules used can be summarized as follows:

- Flexible price: under this closure rule, all domestic prices adjust to clear the markets, except salaries so that there is unemployment in the model; for the markets for privatized services, prices are determined by the economy as in the case of all non-tradeable goods; the prices of tradeable goods are fixed in foreign currency since Argentina is assumed to be a price taker in international markets; the capital market is also somewhat peculiar since capital is sector specific, the rates of return are endogenous to each industry; finally, the outcome of the trade balance is offset in the bonds market and if the domestic economy requires financing, the prices of bonds increase.
- Fixed price: under this rule, the prices of privatized services are given but the rule for the determination of tradeables and non-tradeable prices and the rules for the labor market are

not altered; since the prices of the privatized utilities are set in foreign currency, quantity variables are needed to have all the required endogenous variables; in fact, their price function is as if they were minimum prices. If the tariff declines, say as a result of improvements in efficiency for instance, rationing occurs: at the regulated price, a competitive industry would be willing to sell more than the monopoly but cannot do so; this approach reproduces the process in which the firm can capture a monopoly rent.

As discussed in more detail below, the effects of technological improvements and efficiency gains have a substantial impact on the interpersonal distribution of income through the effects of changes in the unemployment rate. In general terms, the poorest tend to depend much more than the richest on the state of the labor market and this is turn is directly and indirectly influenced by the privatization of utilities. The impact of privatization is indeed not only through labor productivity gains in utilities and through reduction in the costs of sectors using utilities services as an input, but also through reductions in input requirements of the production of utilities services. For instance, the privatized utilities buy intermediate inputs from the manufacturing sectors for an equivalent of 23% of their value added, services for 19% and primary inputs for 12% as seen in Table 5.1 which summarizes the input-output matrix. Moreover, the interaction between utilities is quite significant as well. The water sector is the largest client of the electricity sector for instance.

The changes in performance derived from the privatizations act on the level of welfare of the various income groups through the following channels:

- directly, through the consumer (residential) prices of the privatized services
- indirectly, through the changes in input costs of the industries using these services
- indirectly, through the reduction in prices of the inputs purchased by the privatized utilities
- directly or indirectly through remuneration in the factor markets.

Table 5.1: Summary Input-Output Matrix Uses for the SAM

(% of Gross output value)

	Agriculture	Industry	Infrastructure	Construction	Services
Agriculture	8.48	13.29	5.88	3.32	0.37
Industry	7.08	20.37	8.88	41.67	10.14
Infrastructure	0.12	2.22	18.43	0.39	1.56
Construct.	0	0	0	0	0
Services	12.31	12.76	8.86	12.59	17.37
Imports	0.18	5.98	0.45	0.94	0.35
Value Added	71.5	45.4	57.5	41.1	70.2
Output	100	100	100	100	100

Source: see Data Appendix available upon request from the authors.

The effects can be separated into two main types: macroeconomic and income distributional. Just to give the reader a global feeling for the changes brought about by the operational gains estimated, Table 5.2 presents a summary of a general equilibrium calculation of the levels and distribution of gains across income classes from the efficiency and quality improvements due to the privatization process and those that could be achieved from effective regulation. To give some perspective on the relative importance of the gains achieved, these gains are also expressed in terms of the annual expenditures of each income class on utilities in 1993.

Table 5.2: Gains from Private Operation of Public Utilities

Income class	Savings from operational gains (A) (in millions of 1993 US$)	Savings from effective regulation (B) (in millions of 1993 US$)	(A)/income class expenditure on utilities	(B)/income class expenditure on utilities
1 (poorest)	197	138	29%	20%
2	259	142	31%	17%
3	373	121	37%	12%
4	403	214	32%	17%
5 (richest)	1047	302	59%	17%
Total	**2279**	**915**	**41%**	**16%**

Note: these figures represent annual gains. (A) is the equivalent variation computed in terms of the $ revenue of each income class. It is calculated by applying the total gains in the fixed price simulation to the income in the base year. (B) is computed by applying the differences in gains between the fixed price and the flexible price simulations. In net present value and over a period of 10 years, the (A) gains represent a total varying between US$ 8.2 billion and US$14.4 billion with discount rates varying between 12% and 18% and amortization rates between 0% and 10%. The gains from efficient regulation under similar assumptions vary between US$ 3.3 billion and US$ 5.8.

This table summarizes some of the key lessons of the paper:

- operational gains clearly benefit strongly all income groups: on average these gains represent the equivalent of 41% of what households tend to spend on utilities services even when the regulator allows the new owner of the sector to keep as much as possible of these gains as a quasi-rent; these gains also represent about US$ 2.3 billion or 0.9% of Argentina's GDP
- the gains from effective regulation add up to 16% on average when the regulator is as effective as it should be and the quasi-rent generated by improvements in efficiency, productivity, quality and tariffs are distributed throughout the economy; these gains also represent a gain of almost US$ 1 billion or 0.35% of GDP which can be seen as an approximation of the shadow price of effective regulation; it also shows why private operators have a very strong incentive to contest any decision by regulators that forces them to share the quasi-rent with the rest of the economy.
- the direct gains are relatively significantly higher for the higher income classes (59% as compared to 29% for the poorest) and this is explained by the fact that when regulation is not effective, the gains from privatization are turned into a quasi-rent captured by the richest who are the largest domestic owners of capital of the infrastructure services; part of these gains are also captured by the foreign consumers and by the government since they own a large share of the "privatized" assets;
- the indirect gains through effective regulation, in contrast, tend to favor the poorest income classes relatively more even if it is clear that all tend to gains from efficient regulation, even the richest.

All sectors did not contribute equally to these changes. Table 5.3 summarizes an estimate of the relative contribution of each sector to initial changes and to the general equilibrium effects of the reforms. It shows that the main initial shock came from electricity distribution (33%) while water had the smallest initial impact (0.2%). This is a somewhat biased result since one of the largest gains of the water privatization was the access to private funds to finance the expansion of

the network to increase access to water services and that increase will only take place over time. The largest general equilibrium gains came from gas which is a key input not only for various industries but also for heating and cooking in many of the poorest households. Note also that the gains from reform in electricity only increased modestly after the initial shock. This is because all the gains were achieved through the creation of a competitive market which remains competitive in the longer run and which only benefits from marginal improvements from privatization in some of its own infrastructure inputs. Note finally that the general equilibrium gains in the water sector are much larger than the initial shock reflecting the employment increases needed to ensure the expansion of the network and from increased access by the poor to the service.

Table 5.3 Relative Sectoral Contribution to Changes

(as % of total changes)

	Participation in initial change	*Participation in general equilibrium welfare gains*	
		Fix price	*Flexible price*
Electricity Generation	13.2	14.4	15.8
Electricity Distribution	33.0	22.3	19.5
Gas	26.0	44.9	41.4
Water	0.2	5.5	2.4
Telecoms	27.0	12.9	20.9

Note: the contribution to changes is calculated with respect to changes in the value added and is computed as a % of the total value in $. The general equilibrium effects are based on the sum of the sector specific simulations for all changes.

The following section provides details as to how these estimates were calculated and how these conclusions were reached.

5.1 Macroeconomic Effects

The analysis of the macroeconomic effects is relatively complex since it involves simultaneous changes in the familiar's expenditure decisions, in the demand for factors and in the government's revenue. The relative importance of these interactions can be adjusted through the various assumptions made for parameter values and this is why general equilibrium model shows that ex-post observations can be subject to various interpretations and reflect very different theoretical assumptions about the actual structure of the economy.

Before discussing some of the more specific results, it may be worth highlighting how the various sources of gains affect both supply and demand. The supply side can be affected by any improvement that frees resources. These include: (i) the simple efficiency gains since they free resources; (ii) increases in quality since they reduce costs directly; and (iii) labor productivity gains can reduce production costs. But the demand side is not indifferent to these changes. The increase in consumption derived from the higher revenue of the owner of the sector or from lower unemployment can neutralize or offset some of the expansionary impact on the supply side. For instance a potential increase in exports can be offset by the increased domestic demand that results from higher domestic income. The assessment of how these interactions work is at the core of some of the explanations given next.

5.1.1 Effects of Sector Specific Changes

In terms of GDP, the largest general equilibrium impact is obtained from the gas sector as seen in Table 4. The smallest impact is from the water sector reform but this is probably because most of the gains would come from increases in investments which are not considered in this simulation as explained earlier. As for unemployment, reforms in gas and water lead to some decline even when the regulator performs poorly (fixed price case) while the reforms in telecoms leads to increases. The specific impact of the electricity reforms on unemployment depend on the effectiveness of the regulator but in general they did not have much impact on unemployment. The net effect on macroeconomic productivity is somewhat surprising. The less effective regulators are, the larger the total productivity gains. In fact, the total productivity gains from an ineffective regulator is three times larger than under an effective regulator. This is due to a large extent to the gas sector where a wide distribution of the economic rent leads to a significant deterioration in productivity.

The results in terms of total labor productivity are influenced by the generalized decreasing marginal productivity of the economy. If the level of activity expands in the labor intensive sectors (and the unemployment rate falls); the average producivity should be declining or at least not increasing significantly. The productivity gains achieved in the Argentine economy during the first years of the 1990s should then also be explained by the changes observed in the other sectors of the economy--very often as incorporated into the imports of capital goods.

As for international trade, the results are clearer and closer to expectations. While the reform in utilities do not have much of an impact on imports (because there is not much shift in the sources of capital in the sectors), the sign of their effect on exports depends on the overall performance of sector specific regulators of gas, water and electricity. If they are effective, exports increase, if they are not, they decrease. Similarly, when the quasi-rent is kept by the sector specific capital, the relative price of tradeable increases only by a fifth of what it improves when regulators are effective.

Table 5.4: Sector Specific Macroeconomic Effects of Private Management of the Sector

(measured in changes over base year 1993, except for U in absolute terms)

	Electricity Generation		**Electricity Distribution**		**Gas**		**Water**		**Telecoms.**		**Total**	
	p fixed	*p flex*	*p fixed*	*p flex*	*p fixed*	*p flex*	*p fixed*	*p flex*	*p fixed*	*p flex*	*p fixed*	pflex
GDP	0.05	0.10	0.17	0.21	0.36	0.31	0.02	0	0.07	0.19	0.70	0.79
Industrial production	-0.01	0.09	0.21	0.29	-0.07	0.20	-0.01	0	0.04	0.10	0.16	0.66
Unemployment	0	-2.47	-1.08	1.17	-1.93	-6.76	-3.22	-2.36	6.75	3.21	2.35	-4.50
Price of tradeable/price of non-tradeable	-0.12	0.18	0.77	0.78	-0.33	0.64	-0.05	-0.02	0.22	0.88	0.49	2.48

Exports/Imports	0.09	0.67	-0.25	0.67	-2.95	0.42	-0.31	0.02	0.75	0.77	-2.47	2.52
Industrial exports	0.41	1.41	0.36	2.15	-6.84	-2.11	0.50	0.07	1.40	1.59	-4.91	2.72
GDP/ Employment	0.09	-0.13	0.09	0.39	0.19	-0.42	-0.29	-0.22	0.88	0.60	1.01	0.32

Note: n.s. stands for not significant.

The clearest lesson from Table 5.4 is that the economy is not losing in the aggregate as a result of the observed performance of the privatized utilities and that the total gains are larger when prices are flexible, although problems can appear in the distribution of the gains between the various income classes, the government and the foreign owners as discussed later. It is noteworthy that some of the gains can be high enough to off-set losses in some other activities. The gains in construction for instance are often large because that sector supplies the richest quintile who always benefits from the reform as the main domestic owner of the privatized capital.

5.1.2 Effects of Changes in Specific Performance Indicators

A quick look at the disaggregation of the effects of sectoral changes by source of change can be quite useful as seen in Table 5.5. The simulation answers the following question: “imagine that the reform manages to improve only one performance indicator at the time in all sectors simultaneously, how would the macroeconomic indicators react?” The only safe prediction made by the model is that whatever performance indicator is concerned, improvements will always lead to lower import requirements. Another relatively safe bet is that, with the exception of the direct effect of increases in labor productivity in each sector through employment reductions, any improvement in the performance of the utilities will lower unemployment. Any improvement in the performance indicators tends to improve aggregate productivity (except improvements in efficiency) or the country’s export performance (except when the quality improves only and the regulator is effective).

Table 5.5: Effect of Changes in Performance Indicators on Selected Macroeconomic Aggregates

	Efficiency		**Labor productivity**		**Quality**	
	p fixed	p flex	p fixed	p flex	p fixed	p flex
GDP	+	+	-	+	+	+
Unemployment	none	-	+	+	-	-
Price of tradeable/price of non-tradeable	-	+	+	+	-	+
Exports/Imports	+	+	+	+	-	+
GDP/Employment	+	-	+	+	+	-

The effect on the other macroeconomic indicators is not as easy to predict, in particular it is not easy to predict how each improvement will contribute to the international competitiveness of the country. The relative price of tradeable good is only guaranteed to improve with improvements in labor productivity. It is guaranteed to deteriorate with improvements in efficiency and the sign of the effect of the improvement in quality depends on the performance of the regulator. Quality improvements will only help when the regulator is effective in ensuring that the rents are shared by all in the economy.

5.1.3 Sector Specific Effects of Changes

Table 5.6 summarizes the major impact of the reforms on the other sectors of the economy. The most obvious observation is that when the regulator is effective, the only sector that loses is sector 1 (agriculture, forestry and fisheries). All other sectors benefit from the reforms when prices are flexible. When prices are not flexible and the owners of utilities get to keep the quasi-rent generated by the reforms, a few more sectors stand to lose in addition to sector 1: lumber and wooden products, transport material and equipments, and financial services, insurance and enterprise services.

The gains are almost always larger when the regulators are effective (except in construction). The largest gains under flexible prices are achieved by non-metallic mineral products, commerce, basic metallic industries, restaurant and hotels, and personal and social services. When the regulators are not as effective as they should be, basic metal industries are still gaining but much less than before and construction becomes one of the main winner. These results suggest that construction is the only sector that would have an incentive to endorse a poor regulatory performance.

Table 5.6: Changes in Sectoral Activity Levels

Sector	Description	P Flex	P Fixed
1	Agriculture, Forestry and Fisheries	-0.10	-0.19
2	Mining	0.25	0.11
3	Foods, Beverages and Tobacco	0.44	0.08
4	Textiles and Leather	0.54	0.04
5	Lumber and Manufacture of Wooden Products	0.11	-0.06
6	Paper, Cardboard and Editorials	0.88	0.30
7	Basic Chemical and Petrochemical Industries	0.49	0.14
8	Non-Metallic Mineral Prod. (excl. derived from petroleum)	1.27	0.38
9	Basic Metal Industries	3.51	1.47
10	Metallic Prod., Home Appliance and Capital Goods	0.83	0.17
11	Transport Material and Equipment	0.21	-0.11
15	Construction	0.70	0.97
16	Commerce, Restaurant and Hotels	1.26	0.84
18	Transport	0.83	0.51
19	Financial Services, Insurance and Enterprise Services	0.10	-0.05
20	Personal and Social Services	1.52	0.83
	Weighted Average	**0.686**	**0.349**

To see how these results are obtained and how changes in the performance of utilities have general equilibrium impacts, consider the two following extreme cases: basic metal industries and construction. Activity in the first adjusts to changes in the inter-industrial production chain while activity in the latter sector essentially depends on the revenue of the richest income group which is also the group that tends to benefit the most from a poor distribution of the quasi-rent created by ineffective regulation. The basic metal industry's key inputs include electricity and mining (which also supplies gas). This is why any improvements in quality or productivity in electricity and gas tend to have so dramatic effects in these sectors. The changes observed in the construction are driven by investment plans. In this model, investment plans are driven by the consumers and the government (not the firms). Since the utilities functions are Cobb-Douglas (with a few exceptions irrelevant here), the demand for investment goods is proportional to revenue, in particular the richest one. Since the revenue of the richest income class is relatively larger when the regulator is ineffective, the demand for investment is higher in that case and so is the demand for construction services.

The poor performance of the agricultural sector can be explained by the fact that this sector is not a heavy direct user of the privatized services. In fact, gains in other sectors tend to result in competition for some of the key resources it tends to use such as labor and financing, so that the gains achieved through an increased demand from the food industry are not large enough to compensate for the losses resulting from tougher competition in the factor markets.

5.2 Distributional Effects

There are many ways of looking at the distributional implications of the reforms. One is to compare factor incomes. The most standard one is to compute the Gini coefficient. A more

revealing indicator however is to compute the impact on the income level of families in terms of some form of welfare indicator. In this paper, it is computed in terms of equivalent variation adapted to compute the effect of changes in prices as well as in quality.

Consider $v(p, M, \gamma)$, the indirect utility function of the representative agent, depending on the price vector p, the agent's revenue M and a quality or a quantity variable γ which can also represent rationing of a service. If, as a result of a policy change, the price vector with initial value p_o becomes lower, say p_1, the equivalent variation EV is computed as:

$$v(p_o, M+EV, \gamma) = v(p_1, M, \gamma)$$

It is the variation in income that maintains the consumer at the same level of utility he or she would achieve from the reduction of price at the initial income level. In other words, it is the amount one would have to give the consumer to make him/her give up the change in price (willingness-to-accept). It can be computed in a similar way to assess the impact of an improvement in quality.

Similarly, the equivalent variation can be computed for the equivalent monetary compensation of a quality improvement or for an increase in access to a public service from $\alpha_{o \text{ to } \alpha 1}$:

$$v(p, M+EV, \alpha_{o23}) = v(p, M, \alpha 1).$$

In general terms, to identify the sources in the welfare changes for each income class, the following facts need to be recognized: (i) the relative importance of the cost of services provided by privatized sectors in the household budgets; and (ii) the distribution of factor ownership across income classes.

Table 5.7 presents the basic structure of household expenditures in a summary form. It shows that the relative importance of the utilities services is much higher for the poorest income classes. It is however worth noting that this observation holds only for the subsectors of gas and electricity where the poorest income group spends about three times what the richest pay in relative terms. For water the opposite is true: the share of expenditure on water services spent by the richest income class is about twice the share spent by the poorest. Finally, Table 5.7 shows that telecom services are relatively more important to the middle class than to any other class.

Table 5.7: Composition of Household Expenditures per Income Class

(as % of total expenditures)

	Income classes				
	1 (poorest)	**2**	**3**	**4**	**5 (richest)**
Agricultural goods	6.06	4.22	3.33	2.73	1.76
Industrial Goods	45.74	42.69	40.66	38.64	34.05
Non-utilities Services	43.73	49.45	42.78	55.65	61.46
Utilities (total)	4.47	3.65	3.23	2.98	2.72
Electricity	2.19	1.51	1.20	0.99	0.69
Gas	1.05	0.73	0.58	0.48	0.33
Water	0.33	0.34	0.36	0.41	0.66
Telecoms	0.90	1.07	1.10	1.09	1.04

Source: see Data Appendix available upon request from the authors.

Table 5.8 shows the distribution of factor income across income classes and confirms the expectation of many in terms of the distribution of assets and factor income. It explains why the richest income class stands to gain the most from a poor distribution of the quasi-rents generated by the privatizations: they are the largest owners of capital in the economy. In fact about 90% of total capital is concentrated in the two highest income groups.

Table 5.8 Distribution of Factor Income per Income Classes (1993)

	Composition (as % of total class income)				Shares (as % of total factor income)		
	Labor	Physical Capital	Financial Capital	Transfers	Labor	Capital	Total Income
1 (poorest)	71.72	19.42	0.40	8.46	11.22	3.76	7.32
2	64.03	26.65	0.41	8.90	14.52	7.64	11.02
3	64.25	26.97	0.95	7.84	21.41	10.73	15.42
4	62.84	29.19	1.92	6.04	27.85	16.34	22.15
5 (richest)	28.86	61.00	5.73	4.41	25.00	61.51	44.07

Source: see Data Appendix available upon request from the authors.

Table 5.9 completes the description of the stylized facts about the distribution of ownership by focusing on the ownership of the privatized utilities. It shows that the public sector remains a key player in electricity distribution since many of the provincial utilities have not yet been privatized. It also shows that a large share of the returns and rents generated in these sectors will go abroad since 50% of the ownership is foreign in electricity generation, gas and telecommunications. The domestic private sector is a significant owner of the privatized water

utilities and of the gas sector as well. A somewhat cynical conclusion that can be drawn from this table is that the public sector does not necessarily have a strong incentive to have an effective regulation of water and electricity distribution since it is a major owner of sector specific capital in these activities and in the short run, it may stand to gain a large share of the quasi-rents generated in these sectors.

Table 5.9: Distribution of Ownership of the Sector

	Electricity Generation	Electricity Distribution	Gas	Water	Telecoms
Public Sector	32.36	76.04	17.57	34.75	30.00
Foreign	49.66	15.29	50.51	17.36	51.42
Domestic	17.98	8.67	31.92	47.89	18.58

Source: see Data Appendix available upon request from the authors.

The rest of this section shows how the general equilibrium effects of the reforms affect the distribution.

5.2.1 Distributional Effects of Sector Specific Changes

Table 5.10 shows the distributional implications of all reforms in each sector. The last column estimates the total impact of the private operation of public utilities in Argentina. It shows that the overall distribution of income improves as indicated by the negative sign on the Gini co-efficient. The overall improvement is however 6 times larger when the regulators are effective and prices are “walrasian.” The last two columns also show that the largest gains are for the poorest as indicated by the highest equivalent variation. But once more the distribution of gains is somewhat different when the regulators are not effective. This is because under ineffective regulation, average labor income gains, the major source of wealth among the poorest, is only about a fifth of what it would be under effective regulation. Also note that, while both average labor and capital income tend to improve with the reforms, capital income earners are on average much better off than labor income earners and hence havea much stronger incentive to push for the reforms.

The poorest stand to gain the most from improvements in gas and electricity (major inputs in their consumption basket). They also stand to gain relatively more from improvements in water, although their main source of gain (access) is not modeled here. Finally the middle income class stands to gain the most from improvements in telecommunications, but only if the regulator is effective. Otherwise they end up paying a huge rent to the private operators of the services.

Table 5.10: Decomposition of Sector Specific Distributional Effects

	Electricity Distribution		Gas		Water		Telecoms.		Total	
	p fixed	*p flex*	*p fixed*	*p flex*	*p fixed*	*p flex*	*p fixed*	*p flex*	*p fixed*	p flex
Gini	0.01	0	-0.05	-0.22	-0.06	-0.06	-0.06	0.07	-0.06	-0.24
EV for income group 1 (poorest)	0.29	0.41	0.54	1	0.13	0.09	0.08	0.21	1.19	1.99
EV for income group 2	0.21	0.29	0.47	0.74	0.10	0.07	0.11	0.26	1.03	1.57
EV for income group 3	0.18	0.21	0.51	0.65	0.10	0.07	0.11	0.26	1.05	1.38
EV for income group 4	0.16	0.17	0.39	0.56	0.09	0.06	0.04	0.24	0.78	1.20
EV for income group 5 (richest)	0.25	0.32	0.43	0.45	0.00	-0.01	0.19	0.35	1.02	1.30
average labor income	0.40	0.40	-0.19	0.33	-0.03	-0.01	0.12	0.49	0.24	1.29
average capital income	0.44	0.56	0.51	0.71	0.01	0	0.54	0.17	1.60	1.68

Note: Gini and average factor income are expressed as % change over base year (1993). EV (equivalent variations) in terms of total income of the bracket.

5.2.2 Effects of Changes in Specific Performance Indicators

Table 5.11 shows that the only two performance improvements that can significantly contribute to improve the distribution of income are better sector efficiency and service quality. All other indicators tend to deteriorate income distribution. Improvements in labor productivity tend to increase unemployment and this tends to hurt the poor more than the rich. In fact, the direct effect tends to hurt the thrid and fourth quintile proportionately more because they benefited relatively more from employment in public enterprises (these two income classes combined equal about 42% of the public employment in 1993) but did not benefit much from the reforms since they own very little of the capital of the privatized firms. The highest income group benefited from 34.8% of public jobs but was not as exposed to the consequences of privatization because it includes the main owners of the privatized utilties and thus gets a direct access to the payoffs from privatization.

Increases in investment tend to benefit the owner of the utilities relatively more than the poor workers even if these tend to benefit from less unemployment when investment is higher. In fact, the average labor income ends up being higher under all performance improvements except quality improvements but these improvements are lower than the gains achieved on average by capital income.

In terms of specific income groups, the calculation of the equivalent variation for each income group is quite revealing. It shows that in general only improvements in firm efficiency and service quality tend to benefit every consumer group. In the other cases, the four poorest quintiles are worse off. The only exception is when bad regulators allow the utilities to benefit from the rent generated in the sector. This can be seen easily in the EV of the richest quintile: it is the only income group improving its welfare through changes in any of the indicators In relative terms, the poorest tend to gain the most from efficiency and quality improvements and lose the

most from improvements in labor productivity even if average labor income is higher. Finally, a good regulator leaves all income classes better off than a bad regulator.

Table 5.11: Effects of Changes of Performance Indicators on the Distribution of Income

	Efficiency		**Labor productivity**		**Quality**	
	p fixed	*p flex*	*p fixed*	*p flex*	*p fixed*	*p flex*
Gini coefficient	better	much better	much worse	worse	better	much better
EV for Income Group 1 (poorest)	better	much better	much worse	worse	better	much better
EV for Income Group 2	better	much better	much worse	worse	better	much better
EV for Income Group 3	better	much better	much worse	worse	better	much better
EV for Income Group 4	better	much better	much worse	worse	better	much better
EV for Income Group 5 (richest)	better	much better	better	much better	better	much better
Average Labor Income	worse	better	better	much better	better	much better
Average Capital Income	better	much better	better	much better	better	much better

6. Initial Effect of the Change to Private Operation

So far what has been measured are the gains from private operation of the utilities, but the initial gains achieved in preparation for the change in ownership in all sectors between 1991 and 1993 (except water which was concessioned in 1993 only) were quite significant as well. There are various reasons why the general equilibrium effect of the privatization decision is hard to assess in this case. First, there are data problems. Many of the public enterprises did not have proper accounting, were vertically integrated without separate accounting for the various types of activities (as in electricity) or were not required to provide consistent information. Some of these gaps were closed in preparation for the privatization process, but as was the case for the water sector, the basic knowledge of the state of the assets and quality of the service was so poor that much of what was published in the data sheets and presented to potential bidders were rough estimates. Second, the environment in which these firms performed had changed quite a bit also, including for instance the tax code or the international capital markets. This is why a precise estimate of the initial impact is so hard to achieve.

It seems worth trying to assess this impact through a counterfactual simulation in which the private operator of the firm follows the employment, pricing and input purchases policies followed by the public owners of the utilities before they took over. But even this exercise is subject to data limitation because the relevant data is not available for all sectors. The gains from the initial impact on all sectors can only be assessed for the efficiency and quality variables for electricity and gas (input purchases) and labor productivity gains in all sectors. This is one of the reasons why the results presented in Table 6.1 provide a lower bound estimate of the initial impact of the privatization.[11] They represent US$ 1.8 billion per year for all sectors and the initial improvement in price regulation that also resulted from the privatization resulted in an even bigger impact in terms of changes in regulatory rules. If they had been implemented effectively

[11] Another reason is that the government never would have allowed these utilities to close had they been public but they would have had to finance them through explicit and implict subsidies which are not picked up here.

since the beginning, the additional gains could have been the equivalent of US$ 1 billion. This was not the case however, at least in water and telecoms this was not the case and to be conservative in our assessment of the gains from the reform, we will ignore this estimate.

Table 6.1 shows that the gains from the reform represented on average about 30% of what people spend on utilities (or about 1.1% of their income) and that effective regulation would have yielded an extra 10% discount (or about 0.4% of their income). The gains from effective regulation were however fairly unevenly distributed. The middle class would have been much more penalized than the poorer and the largest winner would have been the richest. The reason is that the middle class spends more but does not enjoy all the gains due to more employment.

Table 6.1: Minimum Gain Achieved between the Transfer to the Private Operators and 1993

Income class	**Savings from operational gains (A)** (in millions of 1993 US$)	**Savings from effective regulation (B)** (in millions of 1993 US$)	**(A) as % of income class expenditure on utilities**	**(B) as % of income class expenditure on utilities**
1 (poorest)	205	0	30%	0%
2	222	18	27%	2%
3	342	-89	34%	-9%
4	335	-97	27%	-8%
5 (richest)	549	1123	31%	63%
Total	**1653**	**955**	**30%**	**10%**

Note: see Table 5.2

7. How Constraining Are Macroeconomic Shocks for Gains from Privatizations?

The welfare gains estimated so far are quite significant but they are second best estimates since they take as given other distortions in the economy. For instance, they assume that salaries do not adjust to clear the labor market. In fact, it is reasonable however to ask to what extent these gains can be affected by other shocks or adjustments to the economy including institutional adjustments that reduce some of the distortions in the economy. For instance, and sticking to the very sensitive issue of labor market adjustment, the recent developments in Argentina provide strong evidence that the labor market followed a pattern much more dramatic than suggested by the simulations presented so far. Unemployment indeed increased from 9.3% in 1993 to over 18% in 1995. How can this be reconciled with some of the simulations which suggest declines in unemployment?

The reconciliation comes from the inclusion in the model of the so-called “Tequila effect” which hit Argentina at the end of 1994 and early 1995. Around that time, the Mexican crisis lead to a confidence problem among international investors and international interest rates increased steadily during that period. The LIBOR, for instance, increased by about 2.5%. The way in which this international shock affected the economy was complex, but it can be captured through the net debt position of the industries and of the various income groups.

Table 7.1: Financial Exposure of Consumers

Income classes		2	3	4	

	1 (the poorest)				5 (the wealthiest)
Distribution of Credit between Consumers	-14.25	-28.12	-35.28	-22.35	100
Stock of Debt as % of Total Income	46.33	60.72	54.46	24.02	-54.02

Source: Chisari, O and C. Romero (1996), "Distribucion del ingreso, asignacion de rescursos y shocks macroeconomicos - Un modelo de equilibrio general computado para la Argentina en 1993," Serie Financiamento del Desarollo, #36, CEPAL, United Nations, Santiago de Chile.

Table 7.1 presents an estimate of this position. It shows essentially that the 4 poorest income groups were liable to the richest income group at the end of 1993. Under these conditions, a shock on the interest rate would lead to increases in the supply of labor, but also to increases in costs (wiping out the cost reduction brought about by the reforms) which in turn would lead to reductions in the demand for labor. These two effects together lead to significant increases in unemployment, consistent with those observed between 1993 and 1995.[12]

This can be seen in Table 7.2 which compares the results of the base simulations in which all sectoral changes are accounted for jointly to those of a simulation in which the international rate increases by 2.5%. It confirms the results discussed under the base case on the importance of effective regulation for the poor. It also shows that the middle class stands to lose the most from macroeconomic shocks of this type whether regulation is effective or not. The main lesson to be drawn is that the qualitative conclusions drawn so far are fairly robust but that the intensity of the gains, while significant enough to stimulate rent seeking behavior is not strong enough to offset the consequences of important macroeconomic shocks. In other words, privatization and effective regulation matter but they are not the only prerequisites for successful structural adjustments in an economy.

[12] Note that the results are still somewhat below the unemployment rate observed. This can be explained by the assumptions made on the expectation of private agents. A sensibility analysis reducing by half the elasticity with respect to the return to investment with the same international shock leads to increases in unemployment over 16% and reductions in GDP of 1.5%.

Table 7.2: Comparing the Impact of Privatizations with and without the Tequila Effect

	Base Case		Tequila Effect Case	
	p flex	p fixed	p flex	p fixed
Unemployment Rate (initial value: 9.3)	8.91	9.55	11.68	12.23
EV for income call 1 (poorest)	1.99	1.19	-0.80	-1.55
EV for income call 2	1.57	1.03	-0.96	-1.49
EV for income call 3	1.38	1.05	-1.30	-1.61
EV for income call 4	1.20	0.78	-1.23	-1.64
EV for income call 5 (richest)	1.30	1.02	-0.90	-1.19

8. Summary of Main Conclusions

The significant increase in unemployment observed since 1993 is unlikely to be due to the privatizations of utilities. In fact, these privatizations generated some significant gains for the economy and all income classes and almost all sectors are better off with the private operation of the sector. The gains from privatization, however, were not sufficient to offset the negative efficiency and distributional impact on the economy of the Tequila effect. But the government has a role to play as a regulator to ensure that the potential gains of privatization are fully realized and contribute to improvements in the income distribution of the country.

Indeed, the distribution of the gains across income classes and across sectors is driven by the effectiveness of the regulators. Effective regulation matters not only to allocation of resources but also to the income distribution and that privatization of utilities can be a win-win strategy. Indeed, rather than illustrating a trade-off between efficiency and equity, the simulations presented here reveal gains on both grounds. More specifically, the isolation of the effects of private operations of public utilities in a general equilibrium model based on the 1993 structure of the economy shows that:

- If the regulators do their job well and costs changes brought about by private operations of utilities are passed through to the final users of the services, all sectors (except for agriculture, forestry and fisheries) and all income classes are better off after the reforms. Moreover, the poorest classes tend to gain relatively more than the richest classes and the distribution of income improves as well.
- If the regulators are not effective in ensuring full pass through of the gains and allow the owners of sector specific capital in the utilities sector to keep the payoffs from changes as a quasi-rent, a few sectors will lose (agriculture, forestry and fisheries, lumber and wood manufacturing, transport material and equipment and financial services, insurance and enterprise services). All others will still gain from the reform but in all cases (except construction) less than when the regulator is effective.
- Moreover, if the regulator is not effective, the distribution of income only improves modestly as a result of the reforms and the distribution of the gains is much more even across income classes.

The gains from efficient regulation are non-trivial. While the gains from the private operation of utilities so far can be estimated at about US$ 2.3 billion or 0.9% of GDP, effective regulation can save the economy an extra US$ 0.9 billion or 0.35% of GDP. These total gains represent 80% of the investments made in the sector in 1993 ($4,047) and about 60% of the investments made in 1995 ($5,105 million). They also represent a significant rent that the main owner of the sector (including sometimes the government) is unlikely to give up easily but that the consumers should not give up either since it is equivalent to an average of 41% of what they spend on these services. This rent is even larger considering that the initial gains from privatization represented, to be conservative, about US$ 1.6 billion for the economy as a whole.

In sum, these general equilibrium estimates suggest extremely high economic rates of return for the privatization and regulation "projects" whether distributional weights are considered or not but they also reveal a very high shadow price for the regulatory activity which tends to be ignored in most privatization exercises. In fact, ineffective regulation is equivalent to a 16% implicit tax on the average consumer paid directly to the owner of the utilities' assets (rather than only to the government) but this tax is in fact higher (20%) for the poorest income class and lowest for the median income class. How serious governments are about the fair distribution of gains of reform is revealed by how serious they are about regulation.

APPENDIX: **A Formal Description of the Model.**

This appendix provides a more technical description of the model used in this paper. The specific equations are spelled out and explained for each agent.

Consumers

The representative consumer of income group h has a utility function:

[1] $U^h = U^h [c^d(h), c^m(h), I^d(h), S(h), B(h), C_r(Q_{C(h)}, \pi)]$,

It is modeled as a Cobb-Douglas between all goods except for retail trade which is assumed to be purchased in fixed proportions with the rest of the goods and services. The preferences of domestic agents are assumed to follow an Armington specification which implies no perfect substitutability in preferences between domestic and imported goods.[13]

Expenditures are distributed as follows:

- domestic consumption goods c^d , and investments I^d at price p
- imported goods c^m at prices p_m,
- "bonds" services B at prices p_b, and
- goods and services of "privatized" firms represented by an index C_r, which combines the quantity Q_C with quality π at price r_C per unit of Q_C; this way a change in quality is not necessarily associated with a change in the price of the service provided by the privatized firm. C_r can follow a multiplicative form such as: $C_r = Q_C \, v(\pi / \pi^N)$ where π^N is the normal quality level and v is a non-decreasing function of π / π^N. An increase in service failures increases costs for the buyer of services because the consumer needs to buy a larger number of physical units to reach the desired flow of services. This "naive" modeling approach allows for instance to model the costs of power losses or interruptions as a proportion of unit costs.

In some simulations, prices are differentiated per income groups r_C.

Equation [2] gives the budget constraint for income group h:

[13] Although not necessary to ensure that the economy does not end up specializing, by assumption, the capital installed in the tradeable sectors cannot be reallocated

[2] $(1+t_i)[pI^d(h) + pc^d(h)] + (1+t_m)p_m c^m(h) + (1+t_{ir})\, r_C\, C_r(h) + p_b B(h) =$

$= [wS(h) + w_g S_g(h) + \theta(h)(r_p K_{po} + r_p K_{pxo} + N^p + N^{px}) +$

$+ \theta_r(h)\,(r_r K_{ro} + N^r)]\,(1-t_d) + p_b B^o(h) + p_R\, R^o.$

The family pays indirect taxes at rates t_i and t_{ir}, depending on the type of good and service, and direct taxes t_d and taxes on imports t_m. Its income sources are labor income in the private sector S at salary w, in the public sector S_g with salary w_g and capital K_{po} in private firms remunerated at rate r_p; revenue from profits on domestic sales N^p and sales abroad N^{px} and revenue from participation in the privatized firm N^r in proportion to shares owned, indicated as θ_r; θ_r also represents the participation of the income group in each sector specific capital $r_p K_p$, $r_p K_{pxo}$ and $r_r K_r$. In the scenarii in which capital is specific, the profit rates enter fully r_p or r_r **.** B^o represents holdings of private sector bonds. The initial "holdings are negative if the consumption group is a net debtor in the benchmark simulation; in this case, an increase in p_b results probably in an increase in the supply of labor and a reduction in the expednitures of the quintile. Families also get public sector transfers represented as the purchase by the government of a service with an inelastic supply, R^o at price p_R.

Private firms

The private firms are those for which there was no change in ownership or any major organizational change during the period covered by the study. They produce goods and services intended for intermediate and final consumption as well as for export and investment. This differentiation is needed to be able to account properly for the differences in the tax treatment of the various destinations (for instance, exporters do not pay the VAT and benefit from discounts on their gross income tax). There is no technological differentiation across these sectors.

Exporters of goods are price-takers abroad and exports of services are price inelastic (i.e. they are constant). Non-tradable prices are determined as solution variables and adjust with factor income until markets are in equilibrium.

The profit function for a private firm can thus be written as:

[3] $N^p = [p - ap_b - \alpha_{pE}(zr_E + (1-z)r_C) - f(1+t_i) - f_m(1+t_m)p_m]Q^p - wL_p(1+t_{v1}) - r_p K_p(1+t_{v2}),$

and for exporters, it can be adjusted as:

[4] $N^{px} = [p_x - ap_b - \alpha_p(zr_E + (1-z)r_C) - f(1+t_i) - f_m\,(1+t_m)p_m]X^p - (wL_{px} + r_p K_{px}).$

where parameter **a** is the credit requirements per unit of output, while α_p represents the quantity of services provided by the privatized company to obtain a unit of output. Moreover, **1-z** indicates the share of privatized services requirements per unit of output purchased through distribution companies at price r_C, while **z** is the share purchased on the wholesale market at

prices r_E. Purchases of electricity in the wholesale market cosrrespond to generation, purchases on the retail market correspond to distribution.

The inter-industrial transactions in these simplified expression are represented by a coefficient f for national goods and f_m for imported intermediate inputs. These requirements are proportional to total production Q^p ,and to exports X^p respectively. Privatized goods and services are also proportional to output which is different from the assumption made for consumers where rationing could take place. However, firms can be subject to adjustment in quality of services just as consumers and hence can face differences in cost for the same service.[14] An improvement in service quality is represented by a reduction in parameter α, i.e.

$$\alpha'(\ ) < 0.$$

If $\{A\}_{nxn}$ is the input-output matrix, this quality improvement is equivalent to a cut in the absolute value of the input requirements. Remuneration r_p includes total payments to capital and hence amortization. This means that the savings and investment decisions are taken by households in the model. The tax t_{v1} corresponds to the VAT and to the labor taxes collected at the firm level while t_{v2} corresponds to similar taxes on capital. For the sake of simplicity, the taxes on labor and capital levied on exports are not included here, even if in the model this is done more accurately.

The product is obtained by combining intermediate inputs and value added in fixed proportions. The value added itself is obtained by combining labor and capital inputs in a CES production:

$$[5]\quad VA_p = F(L_p,K_p) = [b_1 L_p^{\ k} + b_2 K_p^{\ k}]^{1/k},$$

where k is the elasticity of substitution of labor and capital while the b_i are distribution parameters used in the calibration of the model.

For exports, the value added function is similar:

$$[6]\quad VA_{px} = F(L_{px},K_{px}).$$

More generally, the product of sector j, QT_{pj}, is obtained from a fixed coefficient function (Leontief) between intermediate consumption and value added:

[14] This assumes that there is no possibility of using “home-made” substitutes for infrastructure services.

[7] $QT_{pj} = \text{mín } \{Q_{1j}/a_{1j},...,Q_{nj}/a_{nj}, Va_{pj}/av_j \}$

where Q_{ij} is the quantity consumed of good i for producing j.

Privatized utilities

The privatized firms sell to the domestic market mostly. With the exception of some differentiation due to regulation, service obligations or to taxes according to their final users, each utility sector is assumed to sell a single product. Their profit function includes any subsidy TG that could be transferred by the public sector and is written as:

[8] $N^r = r_C Q_C + r_E Q_E + r_G Q_G - [a^r p_b + \alpha_r (z r_E + (1-z) r_C)$

$+ f(1+t_i) + f_m (1+t_m) p_m](Q_C+Q_E+Q_G) - wL_r(1+t_{v1}) - r_r K_r(1+t_{v2}) + TG$,

where Q_C is the quantity of product sold to households at a unit price r_C, Q_E corresponds to the goods and services sold to the firms at price r_E y the index G is used for the public sector wherever a distinction is relevant. This also allows a differentiation of tariffs into retail, wholesale or commercial and residential as necessary. The quality variables are modeled as an improvement in the overall efficiency of the sector.

It is important to note that all outputs are limited by capacity and transmission constraints incorporated through the value added function. The product of the privatized sector is also based on a fixed proportions production function:

[9] $Q_{ri} = \text{mín } \{Q_{1i}/a_{1i},...,Q_{ni}/a_{ni}, Va_{ri}/av_{ri} \}$,

where a_{ji} is the input requeriment of j by firm i.

The value added function in the privatized sector are assumed to be Cobb-Douglas.

[10] $VA_{ri} = A\, L_{ri}^{a}\, K_{ri}^{1-a}$,

where A is a constant. The installed capital of the firm was taken as given:

[11] $K_{ri} = K^{o}_{ri}$,

This description of the technology of the private and privatized firms was used to model the changes in productivity, efficiency and quality.

Price regulation is modeled as RPI- X, where X is set to 0 at the beginning of the contract. This implies that the r_C is:

$$r_C/r_C^{O} \quad (PQ^{O}/P^{O}Q^{O} - X) \ \beta$$

where P is the price vector of private and privatized domestic goods composing the Laspeyres-index of retail prices in the based year with weights given by Q^{O} .and where is a correction coefficient for the tariffs (with =1 in the benchmark scenario).

The Public Sector

The government maximizes a social welfare **y** including current collective goods H produced with goods and services purchased G, G_r, employment L_g, bonds B_g (which can be sold domestically or internationally), retirees services R, and a proxy for future collective goods I_g, public investment:

[12] $$y = y[H(G,G_r,L_g), B_g, R, I_g].$$

The function y(.) is a Cobb-Douglas and H(.) is a Leontief in G, L_g and G_r which includes all the privatized services in fixed proportions. Pensions, bonds services, investments, and current operative expenses are a constant proportion of total government income in this model.

The government faces a budget constraint given by:

[13] $$t_i[f(pQ + p_xX) + pI^{d} + pc^{d}] + t_{v1}\, w(L_p+L_r) + t_{v2}\,(r_pK_p+r_r K_r) +$$

$$t_m p_m f_m(Q+X) + t_m p_m c^{m} + t_d(wL + w_g S_g + rK^{o} + N^{r} + N^{p} - pI^{d}) + p_b B_g^{\,o} +$$

$$\alpha_g\,(r_r K_{ro} + N^{r})$$

$$= p(G + I_g) + r_G\, G_r + w_g L_g + p_b B_g + p_R R + TG.$$

In this equation, α_g is the participation of the public sector in the ownership of capital of the "privatized" utilities.

The Rest of the World.

The foreign consumer has a Cobb-Douglas utility function:

[14] $u^F = u^F(M^c, X^c, B_x)$;

subject to the following constraints,

[15] $p_m M - z^* V^d = 0$,

for imports M, produced with a single factor V^d at price z^*,

[16] $p_x X^s - z^* V^x = 0$,

for exports X, where V^x is the quantity of the foreign factor needed to produce X^s, a perfect substitute to Argentina's exports.

This foreign consumer faces the following budget constraint:

[17] $p_x X^c + p_m M^c + p_b B_x = p_b B_x^o + z^*(V^d + V^x) + {}^* (r_r K_{ro} + N^r)$,

i.e. his revenue comes from payments to V-from its share of capital in the privatized sector- and from bonds and his expenditures are X^c in the exports markets and M^c in the imports markets.

Equation [18] sets the export prices at the international level:

[18] $p_x X^a - pX = 0$.

Considering that A_m y a A_x are the foreign technological parameters, [19] y [20] determine a linear transformation curve abroad and fixes the relative prices faced by Argentina:

[19] $M = V^d/A_m$,

[20] $X^s = V^x/A_x$.

The Labor Market

Constraint [21] describes the imbalance in the labor market and in the model is replaced by equation [22] determining the salary in the private sector of the economy. The labor market for the public sector clears as shown by [23] accounting for the fact that S_g is an obervation:

[21] $L_p + L_{px} + L_r \quad S,$

[22] $w = b\, w^*,$

[23] $L_g = S_g.$

Parameter **b** is calibrated for the equilibrium salary in the economy, so that the initial unemployment rate is equal to the observed unemployment rate; this value of **b** is then kept constant throughout the counterfactual exercises.

Investment Goods Industries.

Investment goods industries were divided into two main categories: those providing capital goods for private firms and those that construct specific capital for each one of the privatized utilities (electricity, gas, water and telecommunication). This procedure allows the recognition of the differential impact of investment schedules established by the regulatory contracts -for example, as network expansion commitments- on the economy (mainly on the rate of unemployment and the trade balance); therefore, special effort was devoted to determine the input composition of each industry.

The Market for "Bonds".

The financial market is highly simplified in this model in contrast to the sophistication of Argentina's financial sector. As already mentioned, there are fixed requirements of credit per unit of output in each production sector, including recently privatized utilities. Additionally, domestic consumers can be separated into net debtors (tipically the four poorest income brackets, to meet their demand for durable goods) and net creditors (the fifth income bracket); the rest of the world was a considered a net creditor too for the benchmark. In terms of the bonds market, debtors were represented as issuers and creditors as subscribers.Therefore for domestic families and for the foreign consumers, bonds were introduced in the model giving them initial endowments but also introducing preferences for bond holdings as arguments in their utility functions. [15]

The market for bonds is therefore represented as:

[24] $B(h) + Bg + Bx + a(Qp + Xp + Ip) + ar\,(QC + QE + QG) =$

$= Bo(h) + Bog + Box.$

The information on sectoral and personal net financial positions was obtained from monetary authorities and estimated using purchases of durables goods and total capital holdings.

The domestic bonds market adjusts to the internal credit disequilibria of the families and of the government and to Argentina's disequilibrium with the rest of the world. Internally, the first 4 quintiles sell "bonds" (which is basically a credit instrument) to the richest. A net increase in the demand for bonds thus reduces the purchasing power of the 4 poorest income groups. An increase in the price of bonds is compensated by a decline in the purchase of other goods and with an increase in the labor supply which can contribute to an in increase in unemployment. The firms also demand bonds as a fixed proportion of their value added. For them, an increase in the price of bonds implies a cut in the marginal product of labor; which in turns leads to a reduction in the demand for labor, adding to the unemployment problem.

The benchmark simulation of the model includes both a positive unemployment level and a commercial deficit. This implies that in addition to a disequilibrium in the labor market, the rest of the world is financing consumption and domestic investment. The implications for the bond market is an increase in the demand for bonds issued by domestic agents and purchased by foreigners. Due to an increase in the international interest rate, as in the case of the Tequila effect, foreign investors stop buying domestic bonds.[16]

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[15] The information on sectoral and personal net financial positions was obtained from monetarey authorities and estimated using purchases of durable goods and total capital holdings.

[16] Between October 1993 and October 1995, the LIBOR jumped from 3.4% to 5.8% and the PRIME from 6% to 7.8%, while the domestic interest rate increased from 9% in October 1993 to 14% in November 1994 and over 33% in March 1995. Simultaneously, unemployment increased from 9.3% to 12.2% and the share of problem portofolio pover total portfolio increased to over 10% in the 3rd quarter of 1994 and to over 30% in the 2nd quarter of 1995. These facts were used in the calibration of the model.

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