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The Costs and Benefits of Privatization in Argentina: A Microeconomic Analysis

by

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1. Introduction[1]

Since the beginning of the 1980s, the world has undergone a major shift in thinking about the appropriate economic role of the state. Privatization of State-Owned Enterprises (SOEs) has been at the core of this change ever since Britain and France initiated privatization planning. In the last two decades, several countries have launched ambitious privatization programs. Although the extent, form, and pace of change have varied from country to country, the general trend has been similar: the state has gradually withdrawn from directly producing goods and services.

Despite the existence of this phenomenon, we still have little empirical knowledge about how well privatization works in practice. Few studies have analyzed the impact of privatization. Early empirical research found mixed results regarding the relative performance of private versus public firms (see Caves, 1990; Vining and Boardman, 1992). More recent research finds private ownership to be generally more efficient than public ownership (cf. e.g., Megginson, Nash, and Van Randerborgh, 1994). These studies focus only on the question of productive efficiency. Recently, however, La Porta and Lopez-de-Silanes (1999) studied the Mexico-wide privatization experience of the 1980s and early 1990s. They analyze how privatization changed the performance of SOEs over a broad set of outcomes. Additionally, these authors consider the possibility that the increased profitability of privatized companies exacted a social cost in terms of higher prices or layoffs.

In this paper, we follow La Porta and Lopez-de-Silanes (1999) to evaluate the Argentine privatization program. Thus, we study the effects of privatization on profitability, operating efficiency, productivity, output, investment, employment, wages and prices. The structure of the Argentine public firms, however, was very different from those in the privatized Mexican public sector. In Argentina, the state mostly owned a few large natural monopolies. In Mexico, the state ran a large number of firms across several productive sectors. Thus, although both privatization programs have been massive, the Mexican experience is richer in the number of cases compared to the Argentine one, though the Argentine privatization program was enormous relative to the size of the economy. Mexico privatized around 1,000 firms of various sizes spread out all over

[1] Section 6 of this paper is part of a joint project of Sebastián Galiani, Ernesto Schargrodsky and Paul Gertler while Section 7 is part of a joint project of Sebastián Galiani and Federico Sturzenegger. Corresponding author: Sebastián Galiani, Universidad de San Andrés, Vito Dumas 284, (B1644BID) Victoria, Provincia de Buenos Aires, Argentina, Tel: (54-11) 4746-2608, sgaliani@udesa.edu.ar. We are grateful for the comments of Alberto Chong, Florencio Lopez-de-Silanes and Máximo Torero. Matías Cattáneo, Hernán Moscoso, Mariano Tappatá and Germán Sturzenegger provided excellent research assistance.

the economy, but some of the largest public companies such as PEMEX or the electricity companies have not been privatized. Argentina, on the other hand privatized a smaller number of firms of much larger average size (cf. e.g., Galiani and Petrecolla, 1996; Galiani and Petrecolla, 2000; Lustig, 1992).

The particular features of the Argentine privatization process allow us to study the direct impact of privatization in sectors in which, as the state was a monopolist, the whole industry was transferred to the private sector. In those cases, laid-off workers may lack the possibility of utilizing their sector-specific human capital in other firms of the economy, or consumers may lack the possibility of being supplied by other providers. Rather than restricting attention only to the impact of privatizations on firms, we measure the direct impact of privatization on consumers' and workers' welfare.

We propose two direct measures of the welfare impact of privatizations. First, the Argentine program involved the privatization of local water and sewerage firms. Changes in population health associated with these privatizations would provide a measure of the impact of privatization that goes beyond transfers of consumer surplus. We evaluate how the privatization of local water and sewerage firms affected both access to these services and child mortality. Second, the Argentine program involved massive layoffs. Profitability gains in privatized firms may have been obtained at the expense of workers (Shleifer and Summers, 1988). We measure the effect of privatizations on workers' wages by comparing the before and after wages of a random sample of laid-off workers from the former state oil company (YPF) with a matched counterfactual group built using micro data gathered from an ongoing household survey.

Thus, in this paper we address three questions:

1) How did privatization affect the performance of firms and through which channels, i.e., market power or productivity gains?
2) Are there direct welfare impacts of privatization that can be rigorously identified in an econometric sense? In particular, has the privatization of water and sewerage services improved or worsened population health?
3) Part of the efficiency gains of privatized firms may have come from the breach of explicit and implicit contracts between workers and firms. What is the evidence of this for Argentina? What has been the effect of the privatization of YPF on laid-off workers' earnings?

The purpose of this paper is therefore to assess the efficiency as well as some significant distributional impacts of the Argentine privatization program. This is done by considering privatization as a policy instrument and by exploiting the fact that exposure to the privatization process of a group of economic units (i.e., SOEs, public banks, households and workers) varied both by unit and by year. Thus, we exploit a similar statistical identification strategy to document some of the costs and benefits of privatization. Although we are not able to identify all of the efficiency and distributional impacts of privatization by applying this treatment-and-control-group approach, our main contribution to the literature is to document causal effects of privatization on measures of efficiency and distribution.[2]

Our results show that the profitability of the non-financial firms increased after privatization. Both operating income to sales and net income to sales increased significantly as a result of privatization. Large increases in operating efficiency underpin these gains in profitability. Thus, we find overall a huge increase in the operating efficiency of privatized firms in Argentina. Employment cuts, however, play a significant role. Employment decreased approximately 40 percent as a result of privatization. Labor productivity not only increased because employment decreased, but also because privatized firms increased production. Regarding the impact of privatization on investment, all the measures analyzed are positively and significantly affected by privatization. Investment itself increased by at least 350 percent as a result of privatization. This result is consistent with the view that one of the main motives to sell the SOEs in Argentina was to re-establish investment. Finally, we do not find any statistically significant effect of privatization on prices. In the post-privatization period, prices did not decrease, although the efficiency gains we document entail that they should have fallen if the quality improvements were not large enough.

Contrary to the case of non-financial firms, we do not find overall large increases in operating efficiency after the privatization of public banks. However, some indicators of efficiency performed well because of privatization. Output per employee increased 20 percent while the average number of employees per branch decreased 37 percent as a result of privatization. As in the case of the non-financial firms, employment cuts are a big part of the

[2] Although several studies describe the privatization process in Argentina, none of them attempts to identify the causal effects of privatization on broad measures of performance (see, for example, Gerchunoff, 1992; FIEL, 1999; and Galiani and Petrecolla, 2000).

story. Employment decreased approximately 36 percent because of privatization. Thus, on several indicators, the privatized banks seem to be more efficient after privatization than before. Finally, the average capitalization ratio (Net Worth/Assets) increased 5 percent due to privatization. The higher capitalization rate of the privatized banks means a more solvent system, which is quite important in countries as vulnerable to external shocks as Argentina.

In terms of the direct measures of welfare analyzed, we find a negative and statistically significant effect of the privatization of water services on child mortality. The estimated coefficient implies a decrease of approximately 5 percent in child mortality rates induced by the privatization of water provision. Turning to our estimate of the earnings losses of displaced workers, it appears that there is a huge redistribution cost associated with the privatizations of SOEs. These substantial earning losses due to displacement amount to approximately 50 percent of the real earnings of the workers before privatization, after taking unemployment into account.

This paper analyzes the effects of privatization on several measures of firm performance, and on consumers' and employees' welfare. It should be taken into account that we perform a partial equilibrium analysis. This paper does not evaluate general equilibrium effects of the massive privatization program implemented in Argentina.[3] Indeed, it would be possible to argue that the current macroeconomic crisis that the country is suffering is to some extent related to the previous privatization policies. For example, if the privatization package distorted the equilibrium path of the exchange rate, it could have induced a severe and unsustainable misallocation of resources in the economy. Moreover, the debt financing of the acquisitions contributed to the deep increase in the country's indebtedness. In addition, the massive layoffs associated with privatization undoubtedly contributed to the sharp increase in unemployment. However, rather than a macroeconomic study, we conduct an exclusively microeconomic analysis of the industries and markets in which privatization took place.

The paper is organized as follows. In Section 2, we document the Argentine privatization program. In Section 3, we present the sample of privatized firms. Sections 4 and 5 present the results of the effect of privatization on the performance of both financial and non-financial firms. Lastly, we study some direct welfare impacts of privatization. In Section 6, we evaluate the impact of the privatization of water and sewerage companies on both access to these services and

[3] Additionally, the numerous accusations of corruption associated with the privatization of the Argentine public firms are excluded from our analysis.

child mortality. Section 7 examines the impact of privatization on the earning losses of long-term displaced workers. Finally, Section 8 presents our conclusions.

2. The Argentine Privatization Program

In 1989, Argentina was in the midst of an acute bout of hyperinflation driven by the monetization of large fiscal deficits. The newly appointed administration launched an ambitious privatization program in Argentina. This program included most SOEs, as well as other state assets that were not operated as independent firms (cf. e.g., Galiani and Petrecolla, 1996; Galiani and Petrecolla, 2000; and Heymann and Kosacoff, 2000). The Argentine privatization program was quite remarkable in terms of its extent and speed. It was launched together with other deep structural reforms, such as financial and trade liberalization, the implementation of a monetary currency board in 1991 (*Plan de Convertibilidad*), the emancipation of the Central Bank, the decentralization of the health and education services, and other pro-market actions such as a general deregulation of economic activities.

Deriving fiscal revenues from the privatization of the SOEs was a crucial component of the stabilization programs launched by the newly elected government. According to Gerchunoff (1992), the main objective of the privatization program, at least at the beginning, was to solve the (intertemporal) fiscal problems. There were also specific company-related reasons driving the privatization process. After a long period of negative net investment, the companies needed high levels of capital investment to improve both the quality of and access to their services. The public sector had way to fund those investments. In addition to its direct effects, the privatization program signaled a clear change in the direction of the country's economic development.

SOEs in Argentina were, mainly, large vertically integrated natural monopolies. Because of these characteristics Argentina privatized a small number of very large firms, and the Argentine privatization program was huge relative to the size of the economy. Under the objective of raising privatization revenues, in many sectors the authorities decided to maintain a monopolistic structure in order to make the new private companies more attractive to the potential buyers. With the same objective, prices were raised in the immediate pre-privatization period. The tax structures under which the new companies were to operate were simplified. Moreover, the liabilities of the companies were absorbed by the state before transferring them to private hands. In addition, the new companies enjoyed considerable "regulatory freedom" at the

outset of the program. The creation of the relevant regulatory agencies was delayed or neglected during the early years of the privatization program.

The transfer of companies and assets to private control took several forms, such as total sale through open international auctions, concessions, public offerings of shares, licensing, leases with or without purchase options, management contracts, and the issue of exploration permits. The government obtained revenue in the form of cash and external debt bonds. Moreover, a positive fiscal impact resulted from a reduction in current losses, which had been previously financed by the public budget, and a positive flow of taxes from the privatized companies. Table 1 presents the revenues from privatizations per sector in federal and provincial transfers according to Ministerio de Economía (2000). The table shows the income for every sale (annual canons paid for concessions are not included).

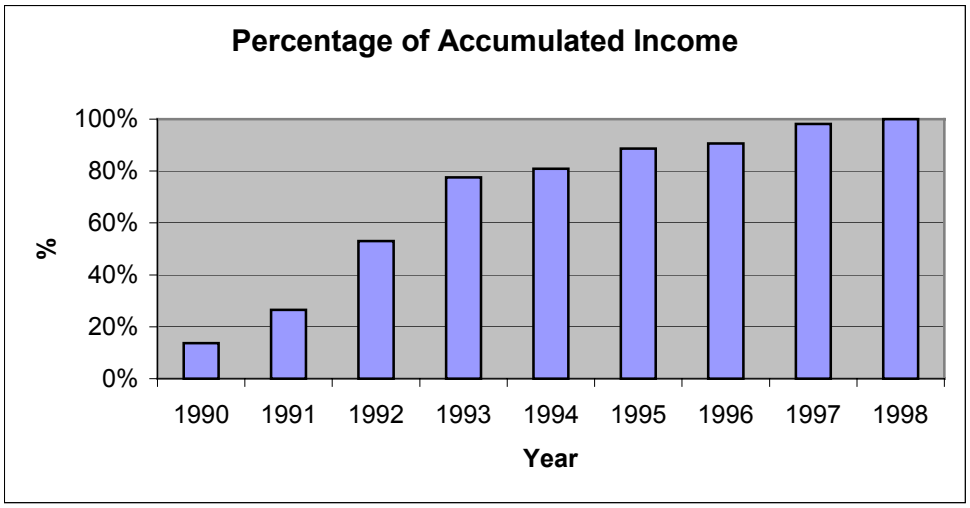
Table 1. Privatization Revenues (by sector)

	Total Income (Mil. USD)	**% Total**	**Cash (Mil. USD)**	**Bonds Market Value (Mil. USD)**	**Other (Mil. USD)**	**Bonds Nominal Value (Mil. USD)**
Federal Privatizations						
Petroleum and Gas	7,594	0.391	6,716	878	-	1,271
Electricity	3,908	0.201	1,989	1,451	468	2,586
Communications	2,982	0.154	2,279	703	-	5,150
Gas	2,950	0.152	1,553	1,397	-	3,116
Transport	756	0.039	284	183	290	1,314
Petrochemical	438	0.023	418	20	-	132
Banks and Financial Services	394	0.020	394	-	-	-
Steel	158	0.008	143	14	-	30
Deriv. From Petroleum and Gas	116	0.006	116	-	-	-
Pipelines	77	0.004	77	-	-	-
Construction	20	0.001	20	-	-	-
Other Manuf. Industries	11	0.001	11	-	-	-
Hotels and Restaurants	8	0.000	3	5	-	13
Chemical	5	0.000	3	2	-	3
Electronics	2	0.000	1	-	1	1
Agriculture	2	0.000	2	-	-	-
Total Federal	**19,422**		**14,009**	**4,653**	**759**	**13,615**
Provincial Privatizations						
Electricity	2,085	0.471	2,068	-	18	-
Petroleum and Gas	1,703	0.385	1,703	-	-	-
Water and Sewages	589	0.133	589	-	-	-
Paper	50	0.011	50	-	-	-
Total Provincial	**4,427**		**4,410**	**-**	**18**	**-**

Source: Ministerio de Economía (2000). Other revenues include the use of trusts and liabilities assumed by the companies.

Figure 1 shows the accumulation of privatization revenues during the decade. 80.9 percent of the total income from privatizations was obtained in the period 1990-94. Mostly small companies and some residual shares of large companies were sold in the second half of the decade.

Figure 1.



3. The Sample

According to the official statistics (CEP, 1998 and Central Bank (BCRA)), 154 privatization contracts were signed during the 1990s. However, the sample of privatized SOEs that will be analyzed in our study is smaller than the number of signed contracts for several reasons:

1) Several SOEs were split vertically and horizontally into smaller units or assets, and privatized separately. In the majority of these cases, it is not possible to obtain pre-privatization financial statements and performance indicators reported separately according to the criteria used to break up the SOEs.[4] This reduces the number of observations, since our unit of analysis has to be the SOE and not the private companies that emerged from the process.

[4] The only exemption was *Ferrocarriles Argentinos,* the railway public enterprise. The company was divided into 11 units (operating lines or corridors) given in concession, and it was possible to find data by business unit for the pre-privatization period.

2) Concessions of roads, freeways and docks cannot be analyzed since there are no financial statements available for the pre-privatization period. Roads, freeways and docks were not organized as companies under public ownership.
3) The sale of state minority participation in private companies is not considered in our study since the privatization itself did not imply a change in management objectives of those firms.
4) Within the oil sector, some contracts involved exploration permits of areas where the state oil company (YPF) did not operate before (*areas petroleras marginales*).
5) Several SOEs were liquidated or ceased operation.
6) In a few cases, data for the SOEs are not available.

Our sample is drawn from the universe of privatization contracts. We have been able to collect data for 21 non-financial federal SOEs and for all the privatized banks. Our database for non-financial SOEs accounts for 81.7 percent of the state income from the sale of companies that continued operating as private, separate companies after being privatized, and 72.4 percent of the total income from sales.[5] Appendix 1 describes the industrial structure and the data sources for the sectors included in our study.

As stated above, our unit of analysis is the SOE. Therefore, we aggregate the information from all the companies that resulted from the privatization of each SOE, with the exception of the railway SOE, *Ferrocarriles Argentinos,* for which it was possible to find data by business unit for the pre-privatization period. Table 2 presents the set of non-financial companies included in our study.

[5] The income from concessions is not considered in these calculations. *Aguas Argentinas* and the railway companies were privatized in this manner. Information on total income from concessions is not available.

Table 2. Non-Financial Companies Included in Our Database

State Owned Company Name	Private Company name	Years with data Public	Years with data Private
Obras Sanitarias	Aguas Argentinas	88/92	93/97
ENTEL	Telefónica Telecom	85/90	91/99
Ferrocarriles Argentinos	Trenes de Buenos Aires Metrovías Ferrovías Transp. Metropolitanos Gral. Roca Transp. Metropolitanos Gral. San Martín Transp. Metropolitanos Belgrano Sur Ferroexpreso Pampeano Ferrosur Roca Ferrocarril Mesopotámico Nuevo Central Argentino Buenos Aires al Pacifico	Cargo: 89/92 Urban Passenger: 91/92	Cargo: 93/99 Urban Passenger: 93/99
Aerolíneas Argentinas	Aerolíneas Argentinas	86/89	92/94
Gas del Estado	TGS TGN Dist. de gas Metropolitana Dist. de gas Buenos Aires Norte Dist. de gas Noroeste Dist. de gas del Centro Dist. de gas del Litoral Dist. de gas Cuyana Dist. de gas Pampeana Dist. de gas del Sur	87/92	93/99
YPF	YPF	87/90	91/99
Hidronor	Transener Hidroeléctrica Piedra del Aguila Hidroeléctrica Cerros Colorados Hidroeléctrica Alicura Hidroeléctrica El Chocón	86/91	93/99
Segba	Edenor Edesur Edelap Central Costanera Central Puerto	86/91	92/95
SOMISA	SIDERAR	87/91	95/98
Encotel	Correo Argentino	89/96	97/00
Tandanor	Tandanor	88/91	94/99

A group of smaller non-financial privatized firms is not considered in our study for the reasons set forth in the following table:

Table 3. Non-Financial Privatizations Not Included in Our Database

Divested Assets from YPF	Ceased or Liquidated	Not Operating as Companies in Public Period	Information not Found
86 oil marginal areas	Astillero Domecq Garcia	Administración General de Puertos (AGP) - 6 Docks.	Altos Hornos Zapla
Area Petrolera Aguaragüe	Carboquímica Argentina	Elevador Terminal del Puerto de Quequen	Canal 11
Area Petrolera El Huemul - Koluel Kaike	Fabricaciones Militares (Acido Sulfúrico, de armas Matheu, Pilar, Río Tercero Cargas, San Francisco)	Elevadores Puerto de Buenos Aires	Canal 13
Area Petrolera Palmar Largo		Elevadores Puerto Diamante	Fabricaciones Militares (San Martin, ECA, Tolueno Sintético, Área Militar Córdoba)
Area Petrolera Puesto Hernández	ELMA	Elevadores Terminales de Rosario	
Area Petrolera Santa Cruz I	Empresa de Desarrollos Especiales	Highways	Hipódromo Argentino
Area Petrolera Santa Cruz II	Entesa	Hotel Llao Llao	Interbaires
Area Petrolera Tierra del Fuego	Forja Argentina	Navigation waterways	Petroquímica Bahía Blanca
Area Petrolera Tordillo	Hipasam	Unidad Portuaria San Pedro	Radio Belgrano
Area Petrolera Vizcacheras	Induclor		
Buques Tanque (YPF)	Intesa		
Destilería Dock Sud (YPF)	Radio Excelsior		
Destilería San Lorenzo (YPF)	Satecna		
Oleoductos del Valle (YPF – 70%)	Sidinox		
Planta de Aerosoles Dock Sud (YPF)	Sisteval		
Puerto Rosales (YPF - 70%)	Sitea		
Refinería Campo Durán	Tanque Argentino Mediano		
	Tecnología Aeroespacial		

Finally, we construct a separate database for the banking sector, where for regulatory reasons we have monthly data for an extended number of variables, and where we have a control group composed of non-privatized public banks and private banks. The privatized provincial banks are set forth in the following table:

Table 4. Privatized Banks Included in Our Database

Bank	Privatization Date	Number of Available Monthly Observations	
		Pre-Privatization	Post-Privatization
Caja de Ahorro	Mar-94	8	62
Chaco	Nov-94	14	58
Entre Ríos	Jan-95	17	57
Formosa	Dec-95	29	45
Misiones	Jan-96	23	23
Río Negro	Mar-96	30	41
Salta	Mar-96	31	43
Tucumán	Jul-96	35	39
San Luis	Aug-96	37	25
Santiago del Estero	Sep-96	38	36
San Juan	Nov-96	34	34
Previsión Social de Mendoza*	Nov-96	41	18
Mendoza*	Nov-96	41	27
Jujuy	Feb-98	47	20
Municipal de Tucumán	Aug-98	60	14
Santa Cruz	Dec-98	53	10
Santa Fe	Jan-99	50	9

Notes:

* In May-98, the Bank of Mendoza acquired the privatized Banco de Previsión Social de Mendoza.

4. Non-Financial Firms

With the objective of analyzing the costs and benefits of privatization, in this section we study the effects of privatization of non-financial firms on several measures of firm performance, including: profitability, operating efficiency, productivity, output, investment, employment, wages and prices.

Suppose one is interested in estimating the influence of a policy instrument on an outcome for a group – in our case, for example, the effect of privatization on productivity. Thus, the group consists of State-Owned Enterprises i = 1…N observed over a sample horizon t = 1…T. Suppose further that the policy instrument (i.e., the privatization of a firm) changes in a

particular period t for a segment of the group (or, as in our case, that it changes for all the SOEs but at different points in time). Let dP_{it} be a zero-one indicator that equals unity if the privatization was operative for firm i in period t. Firms of the group that experience privatization react according to a parameter α. The standard statistical model to estimate α is the following two-way fixed effect error component model:[6]

$$y_{it} = \alpha \ dP_{it} + \lambda_t + \mu_i + \varepsilon_{it} \qquad (1)$$

where μ_i is a time-invariant effect unique to firm i, which also captures industry differences; λ_t is a time effect common to all firms in period t; and ε_{it} is an individual time-varying error distributed independently across individuals and time and independently of all μ_i and λ_t (cf. Chamberlain, 1984; Heckman and Robb, 1985).

The behavior of the difference estimator of α provides the answers the question in which we are interested: how the expected value of a specific variable y (i.e., the dependent variable in equation (1) changes in any period if the SOE is privatized. Thus, $\alpha = E(y_{it} \mid dP_{it} = 1) - E(y_{it} \mid dP_{it} = 0)$ for all i and t. This estimator assumes that the mean change in the privatized and non-privatized firms is the same. Thus, the change in the outcome measured in the comparison group serves to benchmark common period effects among SOEs.

As explained in the previous section, even though all the SOEs in our data set were privatized, this occurred at different points in time.[7] The Argentine privatization program induced some exogenous variation in the transfer of enterprises across SOEs and time. Thus, our identification strategy exploits the fact that exposure to privatization varied by both firm and year.[8]

As we do not have information for the whole period for every company, our 21 non-financial firms comprise an unbalanced panel.

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[6] Possibly including a set of control regressors that vary across both units and time.

[7] As explained before, some small privatized firms are not included in our data set. However, even if we had information on those small privatizations, the appropriateness of pooling small and large firms in our econometric analysis would be disputable.

[8] Naturally, the number of observations included in the control group each year decreases every time a firm is privatized. Nevertheless, it is worth noting that if the statistical model specified to identify the impact of privatization on the random variable y is correct, this is not an issue.

Table 5. Number of Companies by Year in Our Data Set

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Public	1	4	7	10	15	14	18	14	1	1	1	1				
Private							2	4	18	19	19	18	19	18	16	1

We are interested in analyzing the change in performance of our sample of firms following privatization. We rely on six broad indicators of performance: (1) profitability, (2) operating efficiency, (3) employment and wages, (4) capital investment, (5) total output, and (6) prices. Appendix 2 describes our variables. We express nominal variables in 1999 pesos, deflating them by the aggregate CPI index.[9]

Following La Porta and Lopez-de-Silanes (1999), we calculate two profitability ratios: operating income to sales and net income to sales. Evaluating changes in operating income offers a superior measure of efficiency gains, whereas evaluating changes in net income provides a useful summary statistic of the full impact of privatization on the performance of the SOEs. We could also have evaluated the impact of privatization on the ratio of operating (net) income to fixed assets but our measure of fixed assets (PPE) is not reliable because of the difficulties in consistently measuring PPE in periods of extreme price instability. It is observed that PPE adjusts dramatically downwards after privatization. Moreover, it is likely that PPE could have been overstated in the SOEs' balance sheets because the cost of public investment projects had been extremely high.

We also examine three indicators of operating efficiency to capture changes in the ability of firms to produce output from any given level of inputs (cf. La Porta and Lopez-de-Silanes, 1999). We compute the logarithm of unit costs, defined as the ratio of cost of labor and intermediate inputs to sales; the logarithm of sales per employee; and the logarithm of output per employee.

We also analyze the impact of privatization on labor variables: the logarithm of total employment and the logarithm of real average wages. In order to assess the impact of

[9] For several variables, however, the data for the year 1989 is not entirely reliable because there are severe difficulties in producing consistent balance sheet accounts in periods of extreme price instability. We have detected some outliers in 1989. Naturally, there are other outliers dispersed across the data set.

privatization on capital formation, we examine the level of investment.[10] Here, we consider the logarithm of investment, the logarithm of investment to sales, the logarithm of investment to total employment, and the logarithm of investment to fixed assets (PPE). Finally, we examine the behavior of output and prices.

Before analyzing the impact of privatization on these indicators, we need to discuss some econometric issues. Although it is customary to study the influence of a policy instrument on a (conditional) mean outcome, it is advisable in our case to also study the influence of privatization on the (conditional) median of the distribution of the firm performance indicators studied.

Let:

$$y_{it} = \alpha_{\theta}\, dP_{it} + \lambda_{\theta t} + \mu_{\theta i} + \varepsilon_{\theta it} \qquad (2)$$

with $Q_{\theta}(y_{it}|\, dP_{it}, t, i) = \alpha_{\theta}\, dP_{it} + \lambda_{\theta t} + \mu_{\theta i}$, where $Q_{\theta}(y_{it}|\, dP_{it}, t, i)$ denotes the θth conditional quantile of y given dP for a given unit i and period t. This is the quantile regression model of Koenker and Basset (1978). The quantile regression model is concerned with the distribution of a scalar random variable y conditional on a vector of covariates **x** where the θ-quantile of y conditional on **x** is a linear function in **x**. For example, consider the case where θ equals 0.5. This is the median regression. This estimator is obtained by minimizing the sum of absolute errors and is referred as the least absolute deviation (LAD) estimator.

The LAD estimator is a robust alternative to the ordinary least squares (OLS) estimator for estimating the parameters of a linear regression function.[11] A potentially serious problem in our data set is the presence of severe "outliers" in many of the measures of firm performance under analysis. The LAD estimator protects us against outliers in the dependent random variable y and is preferable over the OLS estimator in this respect.

Additionally, the impact of privatization on any outcome considered in our study is likely to be heterogeneous across SOEs. Furthermore, this heterogeneity is unlikely to be successfully parameterized. Thus, the OLS estimate of α in equation (1) is probably to estimate a mixture of

[10] We do not attempt to measure directly the impact of privatization on the stock of fixed assets because of the severe measurement errors in this variable already discussed.

[11] In this context, robust connotes a certain flexibility of the statistical procedures to deviations from the distributional assumptions of the hypothesized models (see Koenker and Bassett, 1978).

different population parameters (different privatization impacts across industries) with a severely skewed distribution. The median impact of privatization on any outcome will be less influenced by extreme observations (impacts) than the mean impact of privatization on any outcome. Thus, the impacts of privatization on any performance indicator are likely to be better represented on its median than on its mean. In that case, equation (2) could instead be estimated with θ equal to 0.5 and the consequent redefinition of the parameter of interest.

The heterogeneity of impacts of privatization across SOEs also leads us to study the percentage change of any variable y with respect to privatization instead of the level impact of privatization on these variables whenever that is practical.[12] We think it is reasonable to assume that the former parameter is much less heterogeneous across industries that the latter one.

Turning now to the results, it is first worth noting that the profitability of privatized firms increased dramatically in the post-privatization period. The SOEs in our sample were highly unprofitable during the pre-privatization period. La Porta and Lopez-de-Silanes (1999) find similar results for Mexico. Table 6 shows simple before and after comparisons for the mean and median operating income to sales and net income to sales ratios. Both profitability performances show statistically significant jumps after privatization. The huge differences that exist between the mean and median statistics, especially in the pre-privatization period, suggest that the parameter (of interest) in equation (2) is more appealing than the one in equation (1).

Table 6. Changes in Profitability for the Sample of Non-Financial Privatized Firms

Variable	Mean before privatization	Mean after privatization	t-statistic for change in mean	Median before privatization	Median after privatization	z-statistic for change in median
Operating income to sales	-0.579	-0.158	2.59 ***	-0.100	0.055	4.32 ***
Net income to sales	-0.479	0.030	3.49 ***	-0.157	0.040	15.90 ***

*** Statistically different from zero at the 0.01 level of significance. The number of observations is 170.

[12] The percentage change of any variable y with respect to privatization is given by 100 [Exponential(α) – 1], where α is the estimated coefficient in the regression functions (1) or (2).

In Table 7, we report the estimate of the impacts of privatization on both the conditional mean and the conditional median of the set of indicators we propose to analyze. Thus, we report the difference in difference estimates of the impact of privatization on the set of indicators proposed. The distinction between these estimates and the before and after estimates reported in Table 6 is that the difference in difference estimates also controls for the common aggregate effects (year effects) on the dependent variable studied. We confirm the significant increase in profitability after privatization. Both operating income to sales and net income to sales increased substantially as a result of privatization. This result and, indeed, all the results reported in Table 7, are qualitatively robust to the parameter analyzed (mean or median).

Table 7. Changes in Performance for the Sample of Non-Financial Privatized Firms

Variable	Number of observations	Mean Regressions	Median Regressions
I. Profitability			
Operating income/sales	168	0.75 *	0.83 ***
		(0.41)	(0.01)
Net income/sales	168	1.03 **	1.06 ***
		(0.45)	(0.01)
II. Operating efficiency			
Log (unit cost)	126	-5.63 ***	-0.1 ***
		(1.46)	(0.06)
Log (sales/employment)	145	1.02	0.09 ***
		(0.69)	(0.02)
Log (production/employment)	111	4.53 ***	0.38 ***
		(1.33)	(0.07)
III. Labor			
Log (employment)	148	-0.65 **	-0.50 ***
		(0.31)	(0.04)
Log (average real wage per employee)	72	0.096	-0.34 ***
		(0.35)	(0.07)
IV. Investment			
Log (investment)	88	1.7 *	1.51 ***
		(1.03)	(0.22)
Log (investment/sales)	88	1.3	0.29 ***
		(0.87)	(0.09)
Log (investment/employment)	71	4.25 ***	2.21 ***
		(1.5)	(0.07)
Log (investment/non-current assets)	86	2.07 ***	1.8 ***
		(0.79)	(0.06)
V. Output			
Log (production)	150	6.4 ***	0.22 ***
		(0.96)	(0.03)
VI. Prices			
Log (prices)	155	-0.11	-0.02
		(0.19)	(0.03)

Notes:

(i) All regressions include year and firm fixed effects. Standard errors are in parentheses.

(ii) *** Statistically different from zero at the 0.01 level of significance. ** Statistically different from zero at the 0.05 level of significance. * Statistically different from zero at the 0.1 level of significance.

(iii) For each firm, we exclude from the sample the observation for the year in which the company was privatized due to the lack of reliable data during the transition period. Results are pretty much the same if we also exclude the two years before privatization.

(iv) None of the results changes qualitatively if we exclude from the analysis the data for 1989. In general, rather, the estimates become more precise.

(v) Obviously, the observations for 1985 and 2000 are excluded from the estimated regression functions since the models include year effects.

(vi) The number of observations varies across regressions because there is not information for all variables for every firm during the sample period.

Large increases in operating efficiency underpin these gains in profitability. The impact of privatization on the (conditional) median unit costs shows a reduction of the latter of 10 percent. This effect is close to the effect found by La Porta and Lopez-de-Silanes (1999) for Mexico. The impact of privatization on (conditional) mean unit costs, however, is implausibly large. Most likely, it shows the pervasive upshot of extreme effects in some SOEs. As this occurs with other variables as well, we emphasize the results of the impacts of privatization on the conditional median of the performance measures studied, although none of the reported results change qualitatively if we do so. The median sales to employment ratio also increases 10 percent because of the privatization of the SOEs. Finally, the impact of privatization on labor productivity, measured by the ratio of production to total employment is dramatic. The impact of privatization on the median level of productivity shows an increase of 46 percent. Thus, overall we find a huge boost in the operating efficiency of the privatized firms in Argentina.

As in the Mexican case, employment cuts are a big part of the story. Employment decreased approximately 40 percent as a result of privatization. It is likely that this figure underestimates the layoffs experienced by privatized firms because in some SOEs, employment was already falling during the immediate pre-privatization period. For example, a significant proportion of the layoffs in YPF occurred two years before the privatization of that firm.[13] Nevertheless, our results show that a substantial proportion of the layoffs occurred after the firms were privatized.

Labor productivity not only increased because employment decreased, but also because privatized firms increased production. The median level of production increased 25 percent because of privatization.

The impact of privatization on the real average wage for a pool of workers is unlikely to be identified because the composition of workers' human capital is liable to change with the layoffs associated to privatizations. On the one hand, many workers were laid off in early retirement plans and hence, on average, SOE workers had more tenure than the average remaining worker in the privatized firms.[14] Additionally, clientelistic employment positions

[13] In Section 7, we study in detail the impact of privatization on workers laid off from YPF.

[14] For example, in the case of YPF, a random sample of laid-off workers shows that, in 1991, just before the privatization of the firm in 1993, the mean (median) age of these laid-off workers was 43 (43) years while the mean (median) age of the employees in the manufacturing sector was 34 (33) years (Household Survey, all urban agglomerates). Furthermore, in 1991 only 10 percent of the laid-off workers from YPF were younger than 30 compared to 43 percent of the employees in the manufacturing sector.

disappeared because of privatization and these positions had probably been rewarded an above-average wage. On the other hand, casual evidence shows that managers' real wages increased substantially because the privatized firms had to pay competitive wages to attract skilled executives to replace the prior politically appointed SOEs' directors. Thus, when we consider the impact of privatization on average wages at the firm level, the fixed effect assumption of the difference in difference estimators breaks down as the composition of the workers' human capital has likely changed with the privatization of the SOEs. Nevertheless, the estimated impact of privatization on average real wages seems to be negative or nil.[15] There appears to be huge variability in this impact across firms reaffirming our suspicion that the identified effect of privatization on wages is mainly driven by composition effects instead of productivity effects (see also La Porta and Lopez-de-Silanes, 1999).

Following La Porta and Lopez-de-Silanes (1999), we evaluate the contribution of layoffs to the changes in profitability. We compute operating income for the post-privatization period for each SOE maintaining the pre-privatization level of employment. Then, we estimate model (2) for the operating income to sales ratio. The coefficient of the privatization dummy variable drops to 0.67.[16] Thus, only 20 percent of the estimated increase in the median operating income to sales ratio seems to be due to workers' layoffs, a figure considerably lower than the one estimated by La Porta and Lopez-de-Silanes (1999) for Mexico.[17]

Regarding the impact of privatization on investment, all the measures analyzed are positively and significantly affected by privatization. Investment itself increased at least 350 percent as a result of privatization. This effect is enormous and well above the one found in Mexico by La Porta and Lopez-de-Silanes. This result is consistent with the view that one of the main motives to sell the SOEs in Argentina was to re-establish investment.

Finally, we consider the behavior of prices. The main difficulty in identifying the impact of privatization on prices is that prices were usually increased prior to privatization of firms – substantially in some cases – in order to attract private investors. Moreover, prices were not

[15] At least sixty percent of the estimated (conditional) median impact of the privatizations on real wages may be explained by the change in the average age of the workers if the data from YPF is representative of all privatizations. We estimated an earnings function using wage data from the random sample of displaced workers from YPF for the year 1991 and computed the implied decrease in average real wages as the result of the estimated change in the average age of the workers of YPF after privatization.

[16] It is still statistically different from zero at the 1 percent level of significance.

[17] This statistic may overestimate the contribution of layoffs to profits because it assumes that the laid-off workers were completely unproductive.

raised just before every privatization but, rather, their increase tended to be associated with the launch of the privatization package at the beginning of the 1990s. Thus, there is not enough variability across both firms and time in the changes in prices as a result of privatization to identify the effect of the latter on the former. Furthermore, we lack enough data in the immediate pre-privatization period to document this effect. Additionally, the quality of several products supplied by the privatized firms increased significantly after privatization. These changes in quality are difficult to measure but widely acknowledged in several sectors such as telecommunications and electricity.[18]

Under these restrictions, we do not find any statistically significant effect of privatization on prices. Nevertheless, prices did not fall in the post-privatization period, when the efficiency gains we documented entail that prices should have fallen if the improvements in quality were not large enough. Thus, these results suggest that there is an important regulatory mission to be undertaken in Argentina.[19]

5. Results: Banks

The Argentine banking sector went through an important transformation after the Tequila financial crisis of 1995 following the devaluation of the Mexican peso in December of 1994. Under the currency board, the monetary authority, the Central Bank (BCRA), faced severe limits to acting as a lender of last resort. Thus, it could not bail out the banks that were facing solvency problems. Instead, the BCRA helped these banks to be acquired, to merge or, in the case of public banks, privatized. This process led to a significant reduction in the total number of banks operating in the country from 168 in December 1994 to 122 two years later (Burdisso et al., 1998).

The data set used in this study was compiled by the Central Bank and contains monthly financial information for all the entities that comprised the Argentine financial system from the

[18] For example, our results on the effect of privatization on child mortality in Section 6 should come from a mix of better access and improved water quality.

[19] FIEL (1999) also finds that most of the real prices of the goods and services provided by the former SOEs did not increase during the 1990s even though most of them were raised at the beginning of the decade. Nevertheless, the prices of the goods and services of most privatized firms are indexed to the US CPI. Since 1995, this has implied that the prices of the privatized firms could have increased 18.5 percent with respect to the domestic CPI. However, these changes in prices are not identified as a result of the privatization even though they are caused by the regulatory framework. Clearly, this regulatory pricing policy is inconsistent with a fixed exchange rate policy such as the one adopted by Argentina during the 1990s.

period June 1993 to September 1999. It includes the basic balance sheet accounts, the net income structure, and some physical data such as information on employees and branches for each bank. Although the data set covers the period when almost all privatizations took place, not all the information is available for every bank variable at every moment. In particular, more disaggregated data are available as we look at more recent periods.

These data have the advantage of being perfectly comparable across institutions, as well as before and after the privatizations, since the Central Bank as regulator of the financial system requires the entities to present their balance sheets using uniform accounts and criteria. In 1991, there were 35 public banks in Argentina. They were owned mostly by the provinces (27 banks) but also by national and municipal governments (8 banks). Between 1992 and 1999, 19 of these public banks were privatized, 2 were merged and, hence, only 14 banks remained under public ownership by September 1999. From the 19 privatized banks, we include 17 in our study, since there were two banks in the data set for which no pre-privatization information was available. These are the cases of Banco de La Rioja (privatized in July 1994) and Banco de Corrientes (May 1993). The privatization of the Banco Hipotecario Nacional is not covered here either because it was undertaken after September 1999. The variables used in the study are detailed in Appendix 2.

When an SOE is privatized, the government usually tries to make the firm more attractive to buyers and ultimately sells it – after a restructuring process – without the "undesirable" assets and liabilities. In the case of the Argentine public banks, most of the provincial governments formed a residual entity with the low quality assets and liabilities. To be able to face the short term liabilities, the Argentine government, the Inter-American Development Bank and the World Bank created the "Fondo Fiduciario para el Desarrollo Provincial" (FFDP) to lend money and technically assist the provinces to privatize their banks. Thus, the privatization of provincial banks involved the creation of residual entities with the purpose of keeping the low quality assets and liabilities that would not be attractive to potential buyers. For this reason, stock variables such as total assets and deposits are worthless for detecting changes in performance due to ownership changes. Instead, we consider performance ratios.

We are interested in analyzing the change in performance of our sample of banks following privatization. We rely on five broad indicators of performance: (1) profitability, (2) operating efficiency, (3) employment, (4) capitalization, and (5) loan growth. Appendix 2

describes our variables. We express nominal variables in 1999 pesos deflating them by the aggregate CPI index.

Turning now to the results, it is worth noting first that most profitability indicators of privatized banks increased dramatically in the post-privatization period. Table 8 shows simple before and after comparisons for the mean and median profitability indicators. Looking at the profitability ratios, almost every indicator is negative in the pre-privatization period and turns positive after it. The median increase of the profit margin, operating margin, interest margin, return on equity (ROE) and return on assets (ROA) are all statistically significant.[20] However, the median operating income per branch decreased after privatization.

Table 8. Changes in Profitability for the Sample of Privatized Banks

Variable	Mean before privatization	Mean after privatization	t-statistic for change in mean	Median before privatization	Median after privatization	z-statistic for change in median
Profit Margin (%)	-27.07	22.32	1.09	-15.51	7.53	100.62 ***
Operating Margin (%)	-37.56	-15.52	0.56	-22.67	5.96	109.99 ***
Interest Margin (%)	-0.83	0.79	3.41 ***	0.20	0.55	101.71 ***
Operating Income per Branch	142	123	-0.61	145	107	11.47 ***
ROA (%)	-0.007	0.002	4.93 ***	-0.002	0.001	167.20 ***
ROE (%)	-2.305	1.224	0.66	-1.141	1.149	98.91 ***

Notes:

(i) *** Statistically different from zero at the 0.01 level of significance. ** Statistically different from zero at the 0.05 level of significance.

(ii) Number of observations: Profit Margin: 987; Operating Margin: 985, Interest Margin: 955; Operating Income per Branch: 723; ROA: 1148 and ROE: 1148.

[20] The changes in the interest margins are mainly due to the reduction in the non-performing share of loans after privatization. When we perform a test of mean differences on the interest margin without netting the non-performing loans, we only reject the hypothesis of equal means at the 10 percent significance level. This improvement in the loan performance after privatization could be the result of private banks implementing a better management of credit decisions, or just because the "bad loans" were placed on the residual entity. In the latter case, again, the bank fixed effect assumption in the before and after estimator breaks down.

We now analyze the influence of the privatization of banks on the set of performance indicators selected estimating the model described in equation (1). In contrast to the case of non-financial firms, not all the public banks were privatized during the 1990s. Following our definition of the parameter α in the previous section, we only include the public banks in the control group. In Table 9, we present two different estimates of the impact of the privatization of banks on their performance. In the first column, the data one year before and one year after the privatizations are not included in the analysis while in the second column they are included. The data just before privatization could be misleading since the government could be trying to restructure the banks before privatization to increase their attractiveness or, in case of corruption, could have modified the financial records to favor friends at the auctions (the *cooked-book* hypothesis). The year after privatization could be considered as one dedicated to the restructuring process (see La Porta and Lopez-de-Silanes, 1999).

We report the difference in difference estimates of the impact of privatization on the set of indicators proposed. Most results are similar across samples. The overall positive impact of privatization on profitability is not confirmed. Even though we find a statistically significant increase in ROA, which increases as a result of the privatization of public banks, we do not find any statistically significant impact on ROE. The impact on the operating income per branch, however, is negative and statistically significant. The interest margin also increased in association with the privatization of banks. However, the evidence suggests that the privatization impact on both the profit and operating margins is not statistically significant.

Contrary to the case of non-financial firms, we do not find large increases in operating efficiency after the privatization of public banks. The impact of privatization on the (conditional) mean average costs is nil. In addition, the impact of privatization on the mean administrative expenses is positive and statistically significant. They shoot up 36 percent as a result of privatization. However, other indicators of efficiency performed better because of privatization. Output per employee rises 20 percent while the average number of employees per branch has falls 37 percent as a result of privatization. As in the case of the non-financial firms, employment cuts are a big part of the story. Employment decreases approximately 36 percent due to privatization. Thus, on several indicators, the privatized banks seem to be more efficient after the privatization than before. This result is in line with the results found in Burdisso et al. (1998).

Table 9. Changes in Performance for the Privatized Public Banks

Variable	Column 1		Column 2	
	Number of observations	Coefficient	Number of observations	Coefficient
I. Profitability				
ROA	2,007	0.01 *** (0.002)	2,246	0.01 *** (0.001)
ROE	2,007	0.031 (0.03)	2,246	0.04 (0.05)
Profit Margin	1,724	1.22 (0.94)	1,923	1.24 * (0.77)
Operating Margin	1,666	0.30 (1.08)	1,864	-0.06 (0.84)
Interest Margin	1,675	0.02 *** (0.004)	1,874	0.03 *** (0.01)
(Operating Income) / Branch	1,311	-227.67*** (73.73)	1,462	-199.45*** (59.90)
II. Operating efficiency				
Log (Average Cost)	1,859	0.01 (0.03)	2,089	-0.02 (0.03)
Log (Administrative Expenses)	1,996	0.31 *** (0.02)	2,226	0.44 *** (0.02)
Log (Output/employee)	1,392	0.19 *** (0.03)	1,581	0.14 *** (0.03)
Log (Employees/Branch)	1,507	-0.46 *** (0.02)	1,694	-0.55 *** (0.02)
III. Employment				
Log (Employees)	1,513	-0.45 *** (0.02)	1,702	-0.59 *** (0.02)
IV. Capitalization				
Capitalization	2,010	0.07*** (0.01)	2,249	0.08*** (0.01)
V. Loan Growth				
Loan growth (%)	1,922	0.03*** (0.01)	1,462	0.07*** (0.01)

*** Statistically different from zero at the 0.01 level of significance. ** Statistically different from zero at the 0.05 level of significance. * Statistically different from zero at the 0.1 level of significance.

The privatization process has also implied a supply increase in the credit market. Finally, an important issue is the solvency of the privatized banks. The average capitalization ratio (Net Worth/Assets) increased 5 percent because of privatization. This increase in capitalization is

statistically significant. It is important to note that the average capitalization of the banks in the year before privatization was –10 percent; this helps to understand the rationale for privatization. The higher capitalization rate of the privatized banks means a more solvent system, which is quite important in countries as vulnerable to external shocks as Argentina. This is in line with the consensus that the reforms taken by the BCRA after the Tequila crisis regarding the approval of mergers, liquidation of bankruptcy banks, and privatizations helped to strengthen the financial system.

6. Privatization of Water and Sewerage Companies: Access to Services and Welfare

In this section, we study the impact of the privatization of water and sewerage companies on both access to services and child mortality. There are three reasons for our selecting the privatization of water and sanitation services as the focus of our analysis.

First, access to water supply and sanitation is a fundamental need. The significance of water, as distinct from other infrastructure industries, lies in the fact that human survival depends on access to water that is free of unhealthy pollutants. The health and economic benefits of water supply and sanitation supply to households and individuals (especially children) are well-documented. The lack of a suitable domestic water supply leads to disease through two principal transmission routes: waterborne disease transmission which occurs by drinking contaminated water and water-washed disease which occurs when there is lack of water. Approximately 4 billion cases of diarrhea each year cause 2.2 million deaths throughout the world, mostly among children under the age of five. These deaths represent approximately 15 percent of all child deaths under the age of five in developing countries (cf. WHO, 2000). Diarrhea is the most important public health problem affected by water and sanitation and can be both waterborne and water-washed. Water, sanitation, and hygiene interventions reduce diarrheal disease by between one-quarter and one-third on average (cf. Esrey et al., 1991). Thus, of all privatizations, the transfers of the provision of water and sanitation services are the ones that could have the highest impact on a direct measure of welfare such as health.

Second, the proportion of people in the world with access to water and sanitation facilities has remained constant over the period 1990-2000 in spite of all the efforts and programs to increase the access of the poor to these services (cf. WHO, 2000). Thus, it is of

special interest to test whether the privatization of water and sanitation services caused an increase in access.

Third, water and sanitation is a natural monopoly in which declining long run average costs make it the most efficient for only a single firm to serve the market. Moreover, water differs from other natural monopolies in the importance of the externalities present. Both the natural monopoly feature and the health effects of water and sanitation create a high level of public interest in the sector (see Shirley, 2000).

Between 1991 and 2000, several provincial privatizations in the water sector occurred, in addition to the privatization of the federal SOE Obras Sanitarias de la Nación, which transferred the responsibility for water and sanitation service in the Buenos Aires Metropolitan Area to the private company Aguas Argentinas in May 1993.[21] The provision of water has been privatized in localities covering approximately 60 percent of the population of the country (as of the 1991 census). Water and sanitation privatizations are dispersed throughout the decade. Thus, there are localities in Argentina where privatization has not yet taken place, while, in those where it occurred, there is variability across both localities and time. This political experiment generates an exogenous variation in the provision of water and sanitation services across time and space. We exploit this instrument to identify the causal effect of water and sanitation privatization on both access to water and child mortality.

Table 10 shows the access to both water and sanitation services in urban areas in 1991. The level of connections to the water network is high (approximately 70 percent of the population) but certainly far from achieving full coverage as in the capital. The incidence of connection to sewerage networks is much lower (approximately 37 percent of the population). Apart from that, the privatized and not privatized localities during the whole decade do not show substantial differences in the proportion of the population (households) with access to the water network.

[21] The first potable water service of Argentina was provided by Obras Sanitarias de la Nación (OSN) in 1870. Initially it served 30,000 people and coverage continued to expand until 1960. That expansion ended in the 1970s. In the 1980s, coverage as a share of population actually contracted. The jurisdiction of OSN was nationwide until 1980. At that point, it was restricted to the federal capital and 13 localities of greater Buenos Aires. Responsibility for service in the rest of the country was transferred to provincial governments (see Artana et al., 1999).

Table 10. Access to Water Services, 1991

	Water Service		Sewage Service	
	Proportion of urban population with connection (%)	Proportion of urban households with connection (%)	Proportion of urban population with connection (%)	Proportion of urban households with connection (%)
Total	70	73	37	41
Localities privatized between 1990 and 1999	71	74	40	45
Localities not privatized between 1990 and 1999	69	70	29	32
Localities privatized between 1990 and 1997	77	80	44	49
Localities not privatized between 1990 and 1997	64	66	30	33
Federal Capital (privatized between 1990 and 1997)	98	98	94	94

Notes:

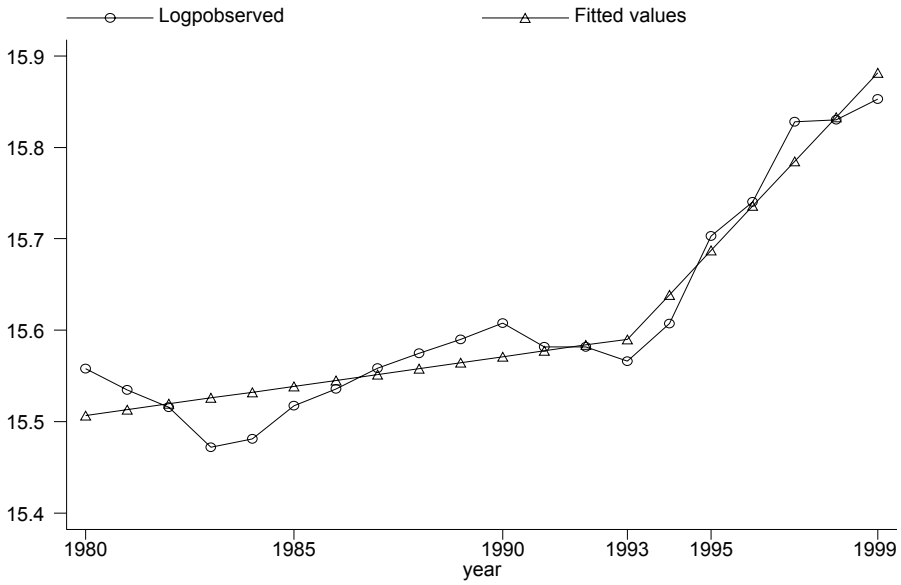
1. The data are obtained from the 1991 census of households and population.
2. Urban population: All localities with more than 5,000 habitants in 1991.
3. A locality is in the privatized group if the privatization of water services occurred between 1990 and 1997 (1999). Obviously, all the localities in the group privatized between 1990 and 1997 are in the group privatized between 1990 and 1999.

Artana et al. (1999) analyze the first two privatizations of water and sewage services in Argentina: Aguas Argentinas (formerly OSN) and Aguas de Corrientes. For Corrientes, they report significant increases in access using official data for the period 1991 to 1995. The number of connections in the area covered by Aguas de Corrientes rose by 22 percent and the number of sewerage connections by 50 percent during this short period, which translates into an additional 7 percentage points of the population covered by water services and 12 percentage points of the population covered by sewerage services. These increases in coverage are extraordinary by any standard. For Aguas Argentinas, we obtained similar data from the regulator for the period 1980 to 1999 and we estimated the following regression function (where the notation is self-explanatory, and t equals 1, 2, 3,…,20):

$$\text{Log (Population served)} = \text{const.} + \underset{(0.001)\ ***}{0.0064\ t} + \underset{(0.006)\ ***}{0.042\ (t - 14)\ I_{\{t>14\}}}$$

$$R^2 = 0.94$$

Figure 2. Logarithm of Population Connected to the Water Network and Fitted Values Aguas Argentinas, 1980-1999



The increase in the access to water services in the area covered by Aguas Argentinas after privatization also seems to be exceptional. During this period, the population covered by access to water services increased by approximately 3 percent per year.[22]

These figures, however, are not estimates of the causal effect of privatization of water on access to service. First, there is a measurement error problem since although the firms know exactly how the connections have expanded, this translates noisily into figures for population served. We only have household data on access to service from the 1991 census, and from a random survey conducted in 1997 (Encuesta de Desarrollo Social (EDS)), which covered all urban localities with more than 5,000 habitants and in which the questions about access to water connections were identical to the census questions. Second, and more importantly, connections could have also expanded without privatization. Thus, to identify the causal effect of privatization on access to water, we exploit the fact that between 1991 and 1997, the two dates for which we possess household access information, some privatizations affecting several

[22] According to our estimates, the population served increased 4.8 percent per year while population itself increased approximately 1.7 percent per year.

localities had already occurred. Thus, for the localities that were randomly chosen in the EDS survey, we perform a test of the difference in difference of the proportion of households with access to the water network in 1991 and 1997 between urban localities where water provision had been privatized and those where it had not. The results are reported in Table 11.

Table 11. Proportion of Households with Access to Water Connection, 1991-1997

	Water (%)	
	All localities	**Excluding Federal Capital**
Localities not privatized: 1991 Census data	86.6	86.6
Localities not privatized: 1997 EDS, Survey data	89.8	89.8
Localities not privatized: Difference 1997 – 1991	3.2	3.2
Localities privatized: 1991 Census data	73.0	64.0
Localities privatized: 1997 EDS, Survey data	78.0	71.4
Localities privatized: Difference 1997 – 1991	5.0	7.4
Difference in difference estimate	1.8	4.2
z-test for difference in the changes in proportions	2.83 ***	5.78 ***

Notes:

1. Only the localities randomly chosen in the EDS survey are included in the 1991 estimates. Sampling weights are used to estimate the proportions reported in the table.
2. The statistic of contrast $z = \frac{(p_{97}^{Lpriv} - p_{91}^{Lpriv}) - (p_{97}^{Lnpriv} - p_{91}^{Lnpriv})}{\sqrt{\frac{p_{97}^{Lpriv}(1-p_{97}^{Lpriv})}{n_{97}^{Lpriv}} + \frac{p_{97}^{Lnpriv}(1-p_{97}^{Lnpriv})}{n_{97}^{Lnpriv}}}}$, where p is the proportion of households with access to water connection in year t in a locality where water has been privatized between 1991 and 1997 (Lpriv) or in a locality where water has not been privatized between 1991 and 1997 (Lnpriv), and n is the number of observations. Note that there is not sample variability when we estimate p for 1991 since these statistics are estimated from census data.
3. *** Statistically different from zero at the 0.01 level of significance. ** Statistically different from zero at the 0.05 level of significance. * Statistically different from zero at the 0.1 level of significance.
4. A locality is in the privatized group if the privatization of water services occurred between 1990 and 1997.

Thus, we find a statistically significant increase in the access to water services caused by the privatization of firms. Similar results are found in terms of population. Note that the increase is more pronounced when we exclude the federal capital where access was already complete before the privatization. Also, note that the increase in the access to water services in the privatized regions is approximately 11 percent (from 64.0 percent to 71.4 percent, excluding Buenos Aires). This increase is consistent with the increase in access to water services that we estimated for OSN for the period 1993-1997. Thus, it is reasonable to conclude that the estimates of the increase in access to water services induced by privatization between 1991 and 1997 underestimate the causal impact of the privatizations of water services on access because the network expansion induced by privatization is phased over a longer period than the one covered by the test we conduct.

Finally, we evaluate the impact of the privatization of water services on child mortality. Mortality data are compiled in Argentina by the Ministerio de Salud. The data are constructed at the locality level, disaggregated by age. Although the data are not publicly available, we have been able to access the data for the 66 localities in the country with 100,000 or more inhabitants. These account for 58.6 percent of the total population and 64.4 percent of the urban population. We focus here on child mortality (mortality of children below 5 years of age) since children are more vulnerable to water-related diseases such as, for example, diarrhea (WHO, 2000). We divide the number of deaths by the number of children of that age to obtain Mortality Rates, the dependent variable of the following analysis.

Consider the evaluation of the impact of the privatization of water provision on child mortality.[23] The difference in difference estimator of the impact of privatization on mortality, α, is obtained by estimating the following regression function:

$$\text{Mortality Rates}_{it} = \alpha\, \text{dPriv}_{it} + \beta\, x_{it} + \lambda_t + \mu_i + \varepsilon_{it} \qquad (3)$$

where Mortality Rates_{it} are the mortality rates of children below 5 years of age in locality i and year t, x_{it} is a set of control variables (income and inequality)[24] that vary both across localities and time, and dPriv_{it} is a zero-one indicator that equals unity if in locality i and period t the main

[23] It is also worth noting that most privatizations also included the provision of sanitation services.

provider of water services is a private firm. When $dPriv_{it}$ is zero, the main provider of water services in locality i and period t may be a public firm or a cooperative. Finally, μ_i is a time-invariant effect unique to locality i, λ_t is a time effect common to all localities in period t, and ε_{it} is a locality time-varying error distributed independently across locality and time, and independently of all μ_i and λ_t.

In Table 12, we report the results of this exercise. We find a negative and statistically significant effect on child mortality of the privatization of water services. The estimated coefficient implies a decrease of approximately 5 percent in child mortality rates induced by the privatization of water services. Thus, we find that the privatization of water services induced both an increase in the access to water services and a reduction in child mortality.

Table 12. The Effect of Privatization on Child Mortality Rates 1990-1999

	Dependent Variable: Mortality Rates
$DPriv_{it}$	- 0.21*
	(0.12)
Number of observations	658
Number of localities	66

Notes:
1. All regressions include year and province fixed effects.
   *** Statistically different from zero at the 0.01 level of significance.
   ** Statistically different from zero at the 0.05 level of significance.
   * Statistically different from zero at the 0.1 level of significance.

7. Privatization and Worker Displacement: Wages and Welfare Distribution

A great deal of attention has been devoted in recent years to the consequences of worker displacement for individual labor market performance (see, among others, Hamermesh, 1989 and Hall, 1995). Worker displacement is generally defined as the separation of workers "without cause" that does not involve recall. This type of involuntary rupture in employment relationships is usually associated with the consequences of structural change, sectoral reallocation or technological innovation. Displacement is usually followed by a period of slow rebuilding of

[24] Household Income and Inequality (the ratio of top 10 percentile to bottom 10 percentile of the distribution of per

employment relationships, as workers displaced from long-term jobs require time to find a new acceptable match (see Hall, 1995). Therefore, the emphasis of work on displacement is on long-term losses after displacement. The workers displaced because of the privatization of SOEs constitute an alternative valuable source for studying the consequences of worker displacement for individual labor market performance.

One good reason to study worker displacement is that its consequences can yield insights into the wage determination process. Human capital theory predicts that, to the extent that experience and skills acquired on the job are general, displaced workers should not suffer large wage losses upon reemployment. In contrast, workers with accumulated industry or firm-specific capital or workers extracting industry or firm-specific rents are likely to sustain large pay cuts when changing firms or sectors.[25] Thus, even if the privatization of SOEs induces a socially efficient reduction in the level of employment in the privatized firms, this may badly harm the laid-off workers. Hence, part of the efficiency gains of privatized firms may have come from the breach of implicit and explicit contracts between workers and firms. In this section, we explore to what extent workers displaced from privatization suffer long-term earning losses, relying on a survey conducted of a random sample of displaced workers from the former state oil company YPF.

One of the salient characteristics of the Argentine privatization program is the huge reduction in employment associated with it. Employment decreased approximately 40 percent as a result of privatization. A very important question in itself but, also, as part of a broad study of the microeconomic benefits and costs of privatization is the following: what has been the effect of the privatizations on laid-off workers' earnings? In order to address this question, we rely on a survey of a random sample of workers that were displaced from YPF in 1991 as part of the restructuring process of the firm before its privatization. The sample of the survey was a list of all displaced workers from YPF during 1991, which yielded 504 observations. The survey was conducted in the first week of August of 2001. In 1991, the surveyed individuals resided in Buenos Aires, La Plata, Mendoza, Cutral Co, General Mosconi or Comodoro Rivadavia.

In terms of measurement challenges, it is worth noting that because SOEs' workers may have been extracting rents, their wages did not reflect their productivity. Therefore, strictly, a

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capita family income) data are obtained from the Permanent Household Survey (INDEC).

long-term earnings loss because of privatization estimates a dimension of the distributive cost of privatization, and not necessarily a destruction of worker-specific human capital. Thus, our concern lies in the distribution of the costs of what otherwise appears to be an efficient reform. Nonetheless, the impact of privatization on long-term earnings is not a minor point in society's perception of the costs and benefits of privatization.

Certainly, the welfare of workers not only depends on their earnings but also, among other things, on their fringe benefits, health insurance and the stability of their jobs. Thus, it is informative to consider the overall subjective impact of privatization-driven displacement on the laid-off workers' welfare. We find that approximately 60 percent of the displaced workers in our sample consider that they were worst affected because of displacement.[26,27,28] Nevertheless, even if revealing, this is only a subjective appraisal of the overall costs of displacement.

In addition to the earnings losses, laid-off workers in the United States experience more unemployment than non-displaced workers (see, e.g., Ruhm, 1991). In our sample, even in the long-term, we also find that this is the case.

First, we need to consider the age distribution of the displaced workers in our sample. Since displacement because of privatization was concentrated among workers older than 40, 30 percent of the surveyed individuals are older than 59 years at the present time. Indeed, 60 percent of the sampled individuals are between 39 and 59 years and none of the displaced workers is younger than 28 years now.

In what follows, to draw inferences about this sample of displaced workers, we construct comparison groups from the ongoing household survey. The household survey is conducted twice per year – in May and October – in the main 28 urban agglomerates of the country.

The male labor force participation rate among the individuals younger than 60 displaced from YPF is 90 percent.[29] Ideally, we would compare the statistics obtained from the survey of

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[25] By rent, we refer to the difference between what an employed worker can get from his employment relationship and his *outside option*.

[26] Individuals were asked to consider the overall impact of displacement from YPF on their welfare, taking into account that they received a severance payment at the time of displacement.

[27] Approximately 80 percent of the sample reported that the major loss among the benefits they lost because of displacement was the health insurance package.

[28] Of those individuals currently employed, 50 percent consider that they are in a permanent (stable) job while 37 of them consider that their current occupation is only a temporary job. The remaining 13 percent of the workers is not sure about how to classify their current occupation with respect to its stability.

[29] The female labor force participation rate is 70 percent although there are only 33 females younger than 60 years in the sample.

the displaced workers from YPF with the same statistics estimated from the May 2001 wave of the household survey in all urban agglomerates.[30] Unfortunately, at the time of writing, only the data tapes of Greater Buenos Aires are available for May 2001. It is preferable to contrast estimates of 2001 with statistics obtained using data from the same year since the recession deepened during that year. Thus, we compare the statistics obtained from the sample of displaced workers with the same statistics estimated using the data of greater Buenos Aires for May 2001.[31] The labor force participation rate among males between 28 and 59 years in greater Buenos Aires is 96.3 percent. The participation rate in this control group and in the displaced workers' sample differs at the 1 percent level of significance. Similarly, we find that the unemployment rate among males displaced from YPF is 26.4 percent while this statistic in the control group is 13.9 percent.[32] Thus, we find that even though the labor force participation rate of the displaced workers, 10 years after displacement, is slightly below the labor force participation rate of a comparable group in the population, their unemployment rate is twice as high as the population unemployment rate.[33]

7.1. The Long-Term Impact of Job Displacement on Earnings

While the bulk of the evidence on worker displacement comes from the United States, there is no evidence at all from Latin America. Even as different methods and data sets have been used to study the problem of worker displacement, the evidence from the United States is unambiguous: in addition to the direct income loss associated with unemployment, workers face large and persistent earnings losses after displacement (see, e.g., Jacobson et al., 1993).

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[30] Alternatively, we compare the statistics obtained from the survey of the displaced workers from YPF with the same statistics estimated from the May 2001 wave of the household survey using data from the urban agglomerates of Chubut, Greater Buenos Aires, La Plata, Mendoza, Neuquen and Salta. These regions geographically match the places where our sample of displaced workers resides.

[31] The data gathered at the beginning of May 2001 and at the beginning of August 2001 are perfectly comparable. It was only since October 2001 that the level of economic activity imploded in Argentina.

[32] The comparison with a control group formed using data from the urban agglomerates of Chubut, Greater Buenos Aires, La Plata, Mendoza, Neuquen and Salta from the October 2000 wave of the household survey are identical: the male participation rate is 94 percent while the male unemployment rate is 10.5 percent.

[33] These differences become more accentuated for skilled workers (at least some college or tertiary degree). The male unskilled (at most high school) unemployment rate among workers displaced from YPF is 28 percent while the male skilled unemployment rate in the same sample is 20 percent. The same statistics in the control group are, respectively, 15.8 and 6.4 percent.

Most of the research on the impact of job displacement on earnings assumes that workers' earnings at a given date depend on the time since displacement through a set of dummy variables for the number of quarters after (and possibly before) displacement (see, e.g., Jacobson et al., 1993).

Consider the simplest case in which we observe earnings at time t_0 before displacement and earnings at time t_h. At time t_j, where $h > j > 0$, a group of workers were displaced from their jobs. If a longitudinal data set were available, we would estimate the displaced workers' earnings losses as the difference between their actual and expected earnings had the events that led to their job losses not occurred. Thus, we would estimate a two-way fixed effect error component model such as the following:

$$y_{it} = \alpha\, dDP_{it} + \beta_t x_{it} + \lambda_t + \mu_i + \varepsilon_{it} \qquad (4)$$

where $t = 0$ or h; y_{it} is the logarithm of earnings of worker i in period t, x_{it} is a set of control variables (standard human capital variables included in a earnings equation) that vary both across localities and time, and dDP_{it} is a zero-one indicator that equals unity in period h if individual i in period j was displaced from his or her job. Finally, μ_i is a time-invariant effect unique to individual i, λ_t is a time effect common to all individuals in period t, and ε_{it} is an individual time-varying error distributed independently across individuals and time, and independently of all μ_i and λ_t. It is worth noting that, in general, β is not allowed to be a time-varying parameter. Indeed, by default, the regression function (4) models the "returns to education" as time-invariant. This assumption is not free of problems since it assumes that the growth rate of earnings is not affected by the change in relative prices.

The control group would be the workers not displaced. Thus, it is critical that displacement represents an event exogenous to the wage profile of the displaced individuals and hence, the expected wages of the control group are the expected wages of the displaced workers had they kept their jobs. In the case of privatization, while in principle displacement seems to be an event exogenous to workers' decisions, in practice, it is not. Displaced workers are older than retained workers and displacement is dominated by selection based on individual characteristics. However, the main problem with this counterfactual group is that the wages of the retained workers are not the expected wages of the displaced workers had privatization not taken place

since privatization affects the whole functioning of the firm including productivity and real wages. Furthermore, since our parameter of interest measures long-term earning losses due to displacement caused by privatization, the control group would be formed by individuals that have not been displaced since privatization and, hence, it constitutes an unusual group of workers that is not likely to be comparable to the group of workers displaced because of privatization.

In this study, conversely, we focus on a family of alternative parameters. We consider that they are the parameters of interest in a study of the costs and benefits of privatization. First, we define displaced workers' earnings losses (DWEL) to be the difference between the actual and expected earnings of a displaced worker where the expected earnings of a displaced worker from a privatized firm is the expected earnings taken over the population of similar individuals in terms of observable socioeconomic variables instead of the workers not displaced from a privatized firm (DWEL I). We argue that, in general, this parameter is the appropriate evaluation of the costs of displacement because of privatization in terms of earnings. However, Argentina has a relatively generous system of severance payment (see Galiani and Nickell, 1999). Thus, when displaced, workers received a non-negligible severance payment which they could invest and obtain a flow of income. Naturally, workers may invest it differently, meeting with varying degrees of success depending in part on their entrepreneurship abilities. Nonetheless, they could invest it in secure coupon bond with a fixed interest rate and constant, regular repayment of interest (e.g. US Treasury bonds). Thus, an alternative estimate of the displaced workers' earnings losses is the difference between their actual and expected earnings where their actual earnings also incorporate the potential flow of interests on a coupon bond over the severance payment received at the time of displacement and where the expected earnings are defined in the same way as before (DWEL II).

In order to estimate our parameters of interest, consider the data-generating process of the earnings of a typical displaced worker. In period 0, they are given by:

$$y_{i0} = c_0 + \beta_0 x_{i0} + \mu_i + \varepsilon_{i0} \qquad (5)$$

while in period h they are given by:

$$y_{ih} = c_h + \beta_h x_{ih} + \alpha + \mu_i + \varepsilon_{ih} \qquad (6)$$

Thus, if we knew the parameter vector $\{c_t,\beta_t\}_{t=0,h}$, a consistent estimate of α would be given by the following before and after estimator: $\hat{\alpha} = \Delta\omega_{it}$, where $\omega_{it} = y_{it} - c_t - \beta_t x_{it}$. Thus, $\hat{\alpha} = \Delta\omega_{it} = \alpha + \Delta\varepsilon_{it}$. However, we do not know $\{c_t,\beta_t\}_{t=0,h}$. To circumvent the lack of information we face, we estimate an earning equation in a sample representative of the population in periods 0 and h. We therefore estimate the parameter vector $\{c_t,\beta_t\}_{t=0,h}$ using a control group. It is bears pointing out that our estimator of α is the simplest version of the conditional difference in difference matching estimator (see Heckman et al., 1997).

In our sample, t = 1991 and 2001. We estimate the parameter vector $\{c_t,\beta_t\}_{t=1991,2001}$ by estimating earnings equations using household survey data from the greater Buenos Aires agglomerate for the surveys of October 1991 and May 2001. We only sample males between 18 and 59 that had an occupation at the time these household surveys were conducted. The dependent variable is the logarithm of the monthly earnings of the workers in their main occupations. We exclude unpaid workers from the sample. The conditioning variables are a set of schooling dummies and the age and the age squared of the sampled individuals. The schooling dummy variables measure the maximum level of the educational system attended by an individual and whether or not it has been completed. The base category in the regression function is complete primary schooling.

Since the household survey only captures earnings in the month previous to the survey, we only consider the earnings of the displaced workers that were employed at the time they were surveyed in 2001. To estimate DWEL II, we assume a monthly interest rate of half a percent over the severance payment. In Table 13 we present our best estimates of DWEL I and DWEL II.

The results are unambiguous: displaced workers face long-term substantial earnings losses. Our estimate of our statistic DWEL I is 51.8 percent of the earnings before privatization.[34] This estimate is substantially higher than the one obtained by applying the before and after estimator to the displaced workers' data set: 39.4 percent. However, there are two reasons why this latter measure does not capture the full effect of displacement on workers' earnings. First, this measure does not control for macroeconomic factors that cause changes in

[34] Remember that the percentage change of y with respect to privatization is given by 100 [Exponential(α) – 1].

workers' earnings regardless of whether they are displaced.[35] Second, this measure does not account for the earnings growth that would have occurred in the absence of job loss; in the long-term, workers' earnings may return to their pre-displacement levels, but not to the levels expected prior to their job losses (see Jacobson et al., 1993).

As expected, our statistic DWEL II is somewhat lower than DWEL I at 41.7 percent. Still, we estimate a quite substantial earnings loss after displacement, well above the earnings losses because of displacement estimated in the United States. Thus, it appears that there is a huge redistributive cost associated with the privatizations of SOEs: displaced workers incur substantial earnings losses. What is more, since unemployment is higher among displaced workers than among a comparison group in the population, the earning losses because of displacement are higher than the one estimated by our statistic DWEL II. Indeed, we estimate that after taking into account unemployment, the earnings losses caused by privatization are approximately 50 percent of the real earnings of the workers before privatization.

Table 13. The Effect of Privatization on Displaced Workers' Earnings Flows (Employed Workers)

DWEL I (α)	DWEL II (α)
-0.73 ***	-0.54 ***
(0.055)	(0.052)
Number of displaced workers' observations: 150	Number of displaced workers' observations: 139

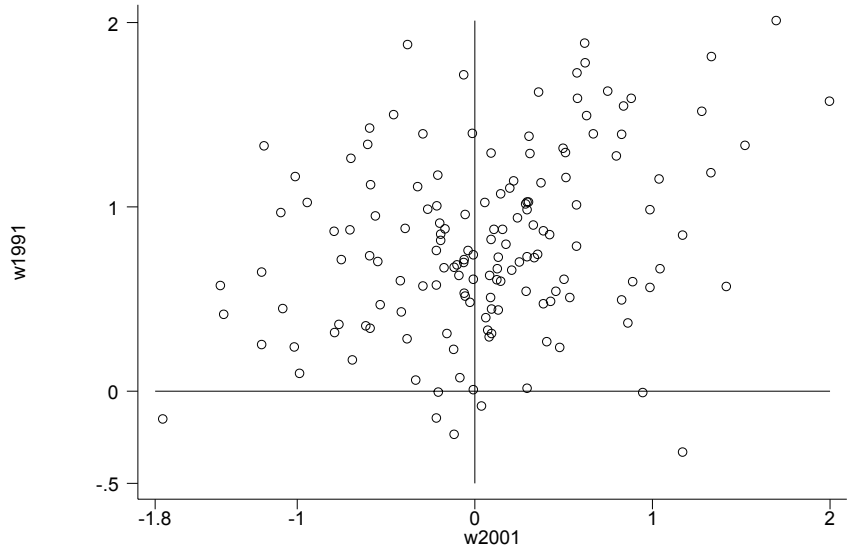
Notes:

1. Standard errors are computed by assuming that our estimate of $\{c_t,\beta_t\}_{t = 1991,2001}$ coincides with the true parameter values. However, bootstrap standard errors are less than 10 percent off from the ones reported. Thus, none of the results would change if instead, bootstrap standard errors were reported.
2. *** Statistically different from zero at the 0.01 level of significance. ** Statistically different from zero at the 0.05 level of significance. * Statistically different from zero at the 0.1 level of significance.
3. The estimate of DWEL II does not change at all if we do not impute the potential monthly flow of interests because of investing the severance payment in a secure coupon bond to a few observations that report they actually obtain monetary profits from the investment they did with the severance payment they received after displacement.

[35] In our case, even inflation is not captured by our before and after estimate although it is straightforward to capture this effect by the slightly modified before and after estimator.

Finally, it is worth asking from where the earning losses of displaced workers come. Figure 3 shows the correlation of our estimates of ω_{1991} and ω_{2001}. Notice that ω_t measures the rent of a worker (i.e., the difference between what an employed worker gets from his employment relationship and his *outside option*). As can be observed, almost all workers extracted (positive) rents in 1991 while only half of them where still obtaining (positive) rents in 2001.

Figure 3. Displaced Workers Earnings Rents: 1991 and 2001
(The 2001 earnings do not include interest)



8. Conclusions

In this paper, we evaluated both the efficiency and some significant distributional impacts of the Argentine privatization program. This was done by considering privatization as a policy instrument and by exploiting the fact that exposure to privatization of a group of economic units (i.e., SOEs, public banks, households and workers) varied both by unit and by year. Thus, we exploited a similar statistical identification strategy to document some of the costs and benefits of privatization. Although we were not able to identify all the efficiency and distributional impacts of privatization by applying this treatment and control group approach, we contributed to

the literature by documenting a wide set of causal effects of privatization on measures of efficiency and distribution.

Following La Porta and Lopez-de-Silanes (1999), we studied the effects of privatization on profitability, operating efficiency, productivity, output, investment, employment, wages and prices for both the financial and non-financial privatized firms in Argentina during the 1990s. We also studied two direct measures of the welfare impact of privatizations. First, the Argentine program involved the privatization of local water and sewerage firms. Changes in population health associated with these privatizations would provide a measure of the impact of privatization that goes beyond transfers of consumer surplus. We evaluated how the privatization of local water and sewerage firms affected both access to service and child mortality. Second, the Argentine program involved massive layoffs. Profitability gains in privatized firms may have been obtained at the expense of workers. We measured the effect of privatizations on workers' earnings by comparing the before and after wages of a random sample of laid-off workers from the former state oil company (YPF) with a matched counterfactual group build up using micro data gathered from the ongoing household survey.

We find that the profitability of the non-financial firms increased after privatization. Both operating income to sales and net income to sales increased significantly as a result of privatization. Large increases in operating efficiency underpin these gains in profitability. The impact of privatization on the (conditional) median unit costs shows a reduction of the latter of 10 percent. The median sales to employment ratio also increases 10 percent because of the privatization of the SOEs. Finally, the impact of privatization on the median level of productivity shows an increase of the latter of 46 percent. Thus, overall we find a huge increase in the operating efficiency of the privatized firms in Argentina. However, employment cuts are a big part of the story. Employment decreased approximately 40 percent as a result of privatization. Labor productivity not only increased because employment decreased, but also because privatized firms increased production. The median level of production increased 25 percent because of privatization. Regarding the impact of privatization on investment, all the measures analyzed are positively and significantly affected by privatization. Investment itself increased at least 350 percent as a result of privatization. This result is consistent with the view that one of the main motives to sell the SOEs in Argentina was to re-establish investment. Finally, we do not find any statistically significant effect of privatization of prices. Nevertheless, in the post-

privatization period, prices did not decrease, when the efficiency gains we documented entail that they should have fallen if the quality improvements were not large enough. Thus, there is an important regulatory mission to be accomplished in Argentina.

Contrary to the case of non-financial firms, we do not find large increases in operating efficiency after the privatization of public banks. The impact of privatization on the (conditional) mean average costs is nil. In addition, impact of privatization on the mean administrative expenses is positive and statistically significant. They have increased 36 percent as a result of privatization. However, other indicators of efficiency performed better because of privatization. Output per employee increased 20 percent while the average number of employees per branch has decreased 37 percent as a result of privatization. As in the case of the non-financial firms, employment cuts play a leading role. Employment decreased approximately 36 percent because of privatization. Thus, on several indicators, the privatized banks seem to be more efficient after the privatization than before. The privatization of public banks has also implied an increase in credit supply (loans grew by about 3 percent). Finally, the average capitalization ratio (Net Worth/Assets) increased 5 percent because of privatization. The higher capitalization rate of the privatized banks means a more solvent system, which is quite important in countries as vulnerable to external shocks as Argentina.

On the direct measures of welfare analyzed, we find a negative and statistically significant effect on child mortality of the privatization of water services. The estimated coefficient implies a decrease of approximately 5 percent in child mortality rates induced by the privatization of water provision. Turning to our estimate of the displaced workers earning losses, it appears that there is a huge redistributive cost associated with the privatizations of SOEs: displaced workers incur substantial earnings losses. The earning losses because of displacement, after taking into account unemployment, are approximately 50 percent of the real earnings of the workers before privatization.

Overall, our results paint a favorable picture of privatization. We have identified extraordinary increases in the efficiency of the privatized firms. We have also identified that privatization has succeeded in satisfying other important objectives such us restoring investment and enhancing the solvency of the financial system. Finally, we considered some direct impacts of privatization on welfare and found mixed results. Thus, although we found important benefits of privatization, we also found direct costs associated with them. However, a caveat is in order

here. It should be taken into account that we perform a partial equilibrium analysis. This paper analyzes the effects of privatization on several measures of firm performance, and on consumers' and employees' welfare in the markets affected by the privatizations. We do not evaluate potential macroeconomic effects of a massive privatization program such as the one implemented in Argentina.

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Appendix 1. Sector Structure and Data Sources

Gas: Gas del Estado, a vertically integrated monopoly, was privatized in December 1992 and vertically divided into several production companies, two transport companies and eight distribution companies. The transport and distribution companies operate as local monopolies. ENARGAS (Ente Nacional Regulador del Gas) is the national regulatory authority. Competition is only allowed in the market for large users, who can buy gas directly from producers.

Financial statements of Gas del Estado were obtained from ENARGAS, financial statements for the private companies were obtained from the Buenos Aires Stock Exchange (if the firms are publicly traded) and from Inspección General de Justicia.

Telecommunications: ENTEL (Empresa Nacional de Telecomunicaciones), which was transferred to private hands in November 1990, was divided into two new companies, Telecom and Telefónica de Argentina, to provide telecommunications services in the northern part and southern part of the country respectively. The companies operated as regional monopolies until 1999, when entry in the long distance market was deregulated. Entry in local markets was deregulated in 2000. The regulatory authority is the CNC (Comisión Nacional de Comunicaciones).

The sources of information were the financial statements of ENTEL obtained from SIGEN, the financial statements of Telecom and Telefónica de Argentina, Heymann and Kosacoff (2000), and statistical information from the International Telecommunications Union 1991 and 2001. No official financial statements were produced for Entel for the years 1989 and 1990. The price structure changed several times during the decade making price comparisons difficult. We use the telecommunications index of the CPI as our price variable.

Electricity: In the electricity sector, the largest SOEs were SEGBA (Servicios Eléctricos del Gran Buenos Aires), Agua y Energía Eléctrica, and Hidronor (Hidroeléctrica Norpatagónica). SEGBA was the distributor in Buenos Aires Metropolitan Area, but it also generated part of the energy it distributed. Agua y Energía Eléctrica and Hidronor were basically generators of electricity. With the privatization, the electrical sector was vertically divided into generation, transport and distribution. SEGBA was divided into three distributors (Edenor, Edesur and Edelap) and five generators (Central Puerto, Central Costanera, Central Dock Sud, Central Dique, and Central Pedro de Mendoza). Hidronor and Agua y Energía Eléctrica were divided into 6 transport companies, and 22 generators. Competition occurs, mainly, in the generation activities. The sector is now subject to regulation by the Secretary of Energy, ENRE (Ente Nacional Regulador de la Electricidad), and CAMMESA (Compañía Administradora del Mercado Mayorista Eléctrico SA). The Secretary of Energy is responsible for the norms in the sector, ENRE is responsible for the application of these norms, and CAMMESA is responsible for the coordination among the different participants in the market (generators, transporters and distributors).

We obtained SEGBA financial statements for the period 1986-1991 from SIGEN and Ministerio de Economía, and financial statements of Edenor, Edesur, Edelap, Central Puerto and Central

Costanera (the firms that resulted from the SEGBA divestiture) for the period 1992-94 from ENRE. With respect to Hidronor, we obtained two audit statements for 1987 and 1988, and the final financial statement for 1991. We also obtained data for 99.92% of the generators companies that emerged from the privatization of Hidronor. In relation to the six transport companies, we were able to find information for three of them that account for 91.7% of the privatization income of the electricity transportation companies. Our sources of information were: Ministerio de Economía, SIGEN, ENRE, Buenos Aires Stock Exchange, and the companies that were willing to collaborate.

Water and Sewage: Obras Sanitarias de la Nación was the provider of water and sewage services in the Buenos Aires Metropolitan Area and was transferred to private hands in 1992. Aguas Argentinas is the private company that provides these services under a 35-year concession. The Buenos Aires Metropolitan Area regulatory authority is ETOSS (Ente Tripartito de Obras y Servicios Sanitarios). In other parts of the country the water and sewage services are provided by a large and heterogeneous group of companies (cooperatives, municipal and provincial companies), several of which were also privatized.

We focus on Obras Sanitarias de la Nación and Aguas Argentinas. The data for these companies were obtained from official financial statements from Ministerio de Economía and SIGEN. Most of the local providers that are or were (before privatization) cooperatives or local companies do not have financial statements.

Airlines: Aerolíneas Argentinas was privatized in 1990. It operates as an unregulated oligopoly in the domestic market and competes in the international market. Information on Aerolíneas Argentinas was obtained from Ministerio de Economía (before privatization) and the official financial statements of the company (after privatization).

Railroads: Ferrocarriles Argentinos was the SOE that managed the entire country's railroad system. In a first stage towards privatization, the company was divided into three segments: cargo, urban passengers, and long distance passengers. The cargo segment was finally divided into five private companies, which obtained 30-year concessions for the payment of an annual canon and a preset investment schedule. These companies are BAP (Buenos Aires al Pacífico San Martín SA), NCA (Nuevo Central Argentino SA), Ferrocarril Mesopotámico, Ferrosur Roca, and Ferroexpreso Pampeano.

In the urban passenger sector, a new company, FEMESA (Ferrocarriles Metropolitanos SA), was created in April 1991, and then divided into seven lines according to the old Ferrocarriles Argentinos lines. One company, Trenes de Buenos Aires SA, operates two lines (Mitre and Sarmiento). Thus, in this segment there are six companies operating seven railway lines. The private companies have an investment schedule and they receive an annual subsidy, since it was generally believed that the companies would not make positive profits.

In the long distance passenger segment, it was believed that the private sector was not going to be interested since the sector was unprofitable. The operation was offered by the federal government to the provinces interested in maintaining the service. Only seven provinces

accepted this offer, and the rest of the services were discontinued. The regulatory authority is the CNRT (Comisión Nacional Reguladora del Transporte).

The data for the railways companies were obtained from SIGEN (before privatization) and from the official financial statements of the companies and Ministerio de Economía (after privatization).

Postal Services: The SOE was ENCOTEL (Empresa Nacional de Correos y Telégrafos), which was transformed into ENCOTESA (Empresa Nacional de Correos y Telégrafos SA) in December 1992. ENCOTESA was privatized in September 1997. Since December 1997 it has been controlled and operated by private hands as Correo Argentino SA. This private group has a 30-year concession for the payment of an annual canon. The regulatory authority is the CNC.

The data for postal services were obtained from SIGEN (before privatization) and from the official financial statements of the company (after privatization).

Oil: YPF (Yacimientos Petrolíferos Fiscales) was the SOE sold to the private sector in 1992. However, many of YPF's assets, such as tankers, fleet, two refineries, and most of the primary and secondary drilling areas, were sold separately. The company has operated in a non-regulated market since 1991. Repsol of Spain later acquired it.

What remained as YPF in private hands is not the same as the former public SOE. Most of the assets that were sold separately now belong to preexisting firms, which makes the comparison with the performance in public hands impossible. Taking this into account, we compare YPF to what remained of YPF in private hands. The data for both the public and private YPF were obtained from official financial statements from Ministerio de Economía and the firm's website.

SOMISA and Tandanor: These two companies were under the control of Ministerio de Defensa. SOMISA (Sociedad Mixta Siderurgica Argentina) was the main steel manufacturer in Argentina. Between 1991 and 1995 there was a "transition company", Aceros Paraná, which was later privatized as SIDERAR in 1995. Tandanor (Talleres Navales Darsena Norte), a shipyard, was transferred to private ownership in December 1991. Both SOMISA and Tandanor operate in non-regulated markets.

The data found for SOMISA are incomplete, since the only source of information is an audit report. There are no data available for Aceros Paraná (transition company for SOMISA). The data for Tandanor were obtained from SIGEN (before privatization) and from Inspección General de Justicia (after privatization).

Banks: Even though the major economic reforms in Argentina took place during the first half of the decade, the banking sector underwent an important transformation after the Tequila crisis of December 1994. The process led to a reduction in the number of banks from 168 in December 1994 to 122 two years later (Burdisso et. al., 1998). In 1991, there were 35 public banks, mostly owned by the provinces (27 banks) but also by national (4 banks) or municipal governments (4 banks). From the 35 public banks that started the decade, 19 were privatized between 1992 and 1999, 2 were merged with privatized banks and 14 banks remain owned by the public sector. We

analyze the privatization of 17 banks. We dropped two banks for which there was no pre-privatization information available (Banco de La Rioja, privatized in July 1994; and Banco de Corrientes, privatized in May 1993). We do not include the privatization of the Banco Hipotecario Nacional because it was done after the period covered by our database. They operate in a competitive market under supervision by the Central Bank.

The data set utilized is provided by the Central Bank (BCRA) and contains monthly financial information of all the entities that operated in the Argentine Financial System for the period June 1993 through September 1999. It includes the basic balance sheet accounts, income structure and some physical data (employees, branches, etc.). Although the data set covers the period in which almost all the bank privatizations took place, not all the information is available for every point in time. More disaggregated and better quality data are available for more recent periods.

Appendix 2. Description of the Variables

Variables Used in Section 4:

Variable	Description
Fixed Assets - Property, Plant and Equipment (PPE)	Value of the company's fixed assets adjusted for inflation. PPE is measured by the non-current assets.
Sales	Total value of products and services sold, minus sales returns and discounts.
Operating Income	Sales minus operating expenses, minus cost of sales, and minus depreciation.
Operating Income/Sales	Ratio of operating income to sales.
Net Income	Operating income plus other normal incomes minus other normal expenses. Note that extraordinary results and income taxes are excluded.
Net Income/Sales	Ratio of net income to sales.
Unit Costs	Total costs of sales to sales.
Employment	Total number of employees. Employees correspond to the total number of workers who depend directly on the company.
Wages per Worker	Total wage schedule paid by the firm divided by the total number of workers who depend directly on the company.
Sales/Employment	Ratio of sales to total employment.
Operating Income/Employment	Ratio of operating income to total employment.
Prices	In most cases, ratio of sales to physical output. For multiproduct firms or firms where prices are two or three-part tariffs, it equals the price index of the product constructed by INDEC (Instituto Nacional de Estadísticas y Censos). This latter definition applies only to Obras Sanitarias de la Nación, Entel, Encotel, SOMISA and YPF.
Production	Total output of the firm. For some multiproduct firms, this variable is the ratio of total sales to prices, where prices are obtained from the price index of the products as indicated above.
Production/Employment	Ratio of production to total employment.
Investment	Value of expenditure to acquire property, equipment, and other capital assets that produce revenue (Gross Investment).
Investment/Sales	Ratio of investment to sales.
Investment/Employment	Ratio of investment to total employment.

Variables Used in Section 5:

Variable	Description
ROA	Net Income/Assets.
ROE	Net Income/Net Worth.
Profit Margin	Net Income/Total Revenue; where Total Revenue = Financial Income + Service Income + Irrecoverable Charges.
Operating Margin	[Financial Income + Irrecoverable Charges + Service Income + Financial Expenditures + Service Expenditures + Administrative Expenses]/[Financial Income + Irrecoverable Charges + Other Income].
Interest Margin	[Financial Income + Financial Expenditures + Irrecoverable Charges]/ [Loans + Public Titles].
Branches	Number of branches per institution.
Employees	Number of employees per institution.
Output	Cash ($ + US$) + Public Titles + Loans + Deposits.
Administrative Expenses	Expenditures in administration (includes wages, taxes, depreciation, etc.).
Average Cost	Administrative Expenses/Output.
Capitalization	Capital/Assets; where Assets = Cash ($ + US$) + Public Titles + Loans + Participation in Other Firms + Fixed Assets + Other Assets + Intangible Assets + Foreign Subsidiaries.
Operating Income	Financial Income + Irrecoverable Charges + Service Income
Loan Growth	Logarithm of loans in year t – logarithm of loans in year t-1.