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Argentina's Privatization: Effects on Income Distribution

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Until the 1990s, Argentina's government directly administered a substantial portion of the country's economy. Telephone and electricity, fuel production and distribution, railways, banks, and a range of other services—from hotels to television stations—were all part of the public sector. In August 1989, the Public Sector Reform Law (No. 23696) was signed. The law stated a set of general rules to be used in privatizing most of Argentina's publicly owned enterprises (POEs). In 1997, the first major privatization—the national telephone company—occurred and, by 1997, most of the privatization plan had been completed.

This chapter evaluates this reform's distributive effects by estimating privatization's effects on Argentina's consumers, workers, and fiscal condition. We use survey data where available and estimate the change in standard measures of income distribution and poverty attributable to privatization. We restrict our analysis to the 1989–97 period. More recently, Argentina has experienced pronounced macroeconomic instability. The

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role that privatized firms have played in this crisis is a critical issue requiring careful study; however, the issue is beyond the scope of this chapter.

Two factors limited our ability to obtain definitive results. First, the available data were of poor quality, thereby restricting their analysis to the household sample in the Greater Buenos Aires area. Second, during the period that privatization occurred, Argentina's economy underwent significant transformation, including substantial trade liberalization and long-term macroeconomic stabilization. Thus, concurrent changes in economic organization made it more difficult to identify the specific effects of each reform.

Reform Period (1989–97): An Overview

During privatization, Argentina's economy underwent significant macroeconomic changes (table 5.1). In early 1991, a strict stabilization program was implemented, bringing an end to hyperinflation, which had started in 1989. The 1994 collapse of the Mexican economy also affected Argentina's macroeconomic aggregates.

As table 5.1 shows, the government deficits of the 1980s were a key factor in increasing pressure toward privatization. In several cases, privatization was organized to maximize the immediate revenue accrued to the government. In addition, the level of investment in most public utilities was inadequate. Total gross fixed investment fell from 23 percent of GDP in the early 1980s to about 15 a decade later. Lack of investment was part of a more general phenomenon with 20 years of no aggregate economic growth. After 1992, investment levels gradually recovered, reaching 24 percent of GDP by 1997–98.

Per capita income bottomed out after the hyperinflation of 1989–90. From 1991 to 1998, per capita income grew steadily, with only a short slowdown in 1995 in reaction to the Tequila crisis. Beginning in 1992, income inequality also increased, partly affected by the plan for structural reform. Table 5.1 shows that the Gini coefficient dropped 10 percent immediately after stabilization; subsequently, it rose steadily, reaching levels that in 1997 were 7 percent higher than the average for the 1985–90 period. However, the economic conditions that determined the evolution of income inequality during the 1990s inherently differed from those of the 1980s. While annual inflation averaged 50 percent during the 1980s, the decade of the 1990s was characterized by sustained price stability.[1]

Poverty indicators show an important decline immediately after hyperinflation ended. After 1993, however, the percentage of households below the poverty line increased significantly and never recovered to these low

1. Canavese, Escudero, and Alvaredo (1999) have shown that the 1980s inflation was especially harmful to low-income households.

Table 5.1 Argentina's macroeconomic indicators, 1985–97 (percent)

Year	Inflation rate	Urban unemployment rate	Fiscal surplus (percent GDP)	GDP growth rate	Gini coefficient
1985	672.2	6.1	–4.0	–6.7	40.9
1986	90.1	5.5	–3.1	7.1	41.7
1987	131.3	5.8	–5.0	3.0	44.4
1988	387.7	6.3	–6.0	–2.1	44.9
1989	4,923.6	7.6	–3.8	–6.9	51.5
1990	1,343.9	7.4	–1.5	–2.3	46.1
Average, 1985–90	1,258.1	6.5	–3.9	–1.3	44.9
1991	84.0	6.4	–0.5	11.8	46.1
1992	17.3	7.0	0.6	11.0	44.2
1993	7.4	9.6	1.2	6.4	44.3
1994	3.8	11.5	–0.1	5.8	45.7
1995	1.6	17.4	–0.5	–2.8	48.4
1996	0.1	17.2	–1.9	5.5	48.4
1997	0.3	14.9	–1.5	8.1	48.0
Average, 1991–97	16.4	12.0	–0.4	6.5	46.4

Sources: Bebczuk and Gasparini (2001); Gasparini and Escudero (1999).

levels. During 1991–96, the proportion of households with unsatisfied basic needs decreased from 10.1 percent to 6.1 percent. This decline may, in fact, be directly associated with increased access to public services related to privatization.

Structural reforms—government rationalization, privatization, and trade liberalization—brought increased unemployment. The high, sustained rate of unemployment may explain, in part, the evolution of inequality and poverty.

Privatization Process

Argentina's privatization program was large relative to the size of the country's economy: 154 privatization contracts were signed during the 1990s. The federal revenue collected from privatization in the 1990s reached $19.44 billion.[2] During 1991–92, these revenues represented more than 1 percent of GDP and about 10 percent of public revenues. Table 5.2 shows the sectors subject to privatization, total revenue from sale, and dates of privatization. (The list includes only companies privatized or given in concession by the federal government; some firms were sold by subnational governments.)

2. This figure understates the true amount of revenue obtained from privatization, since it excludes revenue from royalties received from POEs that were privatized as concessions and revenues from privatization of provincial and local POEs.

Table 5.2 Privatization of federal publicly owned enterprises, 1990–99

Sector privatized	Total revenue (millions of US dollars)	Dates of privatization
Oil and gas production	7,594	1990–99
Electricity	3,908	1992–98
Communications	2,982	1990–92
Gas transport and distribution	2,950	1992–98
Transportation (airlines, rail, ships)	756	1990–94
Petrochemical and oil derivatives	554	1991–95
Banks and finance	394	1994–99
Steel	158	1992–92
Other	126	1991–99
Railways	Concession	1991–95
Highways	Concession	1990–93
Ports	Concession	1990–94
Airports	Concession	1998
Radio and television	Concession	1990–91
Water and sewerage	Concession	1993
Mail service	Concession	1997
Total revenue	**19,422**	

Source: Argentina Ministry of the Economy.

The main revenue sources were the oil and gas sectors; together with electricity, they accounted for 60 percent of sales proceeds.

The selling mechanism most frequently used was international, competitive tenders with open bidding. Public utilities were tendered by price after a prequalification stage. In the case of utility concessions, exclusivity of service provision was usually granted for a fixed period. Whenever possible, competition was favored (i.e., in the wholesale energy market). In addition, several features of the sale contract were used to please special interest groups and, hence, find political support. For example, in most cases, employment stability was guaranteed to certain personnel of companies, and sometimes this extended to tenure and level of unionization.

Effects on Public Utilities

Privatization had significant effects on Argentina's public utilities. We focus on the effects of the privatization process on the telecommunications, electricity, water, and natural gas sectors.

Telecommunications

Until 1990, Argentina's national public telephone company, ENTEL (Empresa Nacional de Telecomunicaciones), controlled most of the country's service. In November 1990, the government transferred the company to the private sector as part of Argentina's first public-service concession.

ENTEL was thus divided into the north market (Telecom) and the south market (Telefónica de Argentina). These two companies became the exclusive providers of basic telephone and international services (in their respective areas) for seven years; a two-year extension followed, based on satisfactory performance. The companies' 51 percent control of shares was sold in a competitive, international public biding. Tariffs were regulated, using a British-style retail price index (RPI), minus a factor for innovation (RPI – x) mechanism adjusted every five years.[3] Certain service and quality obligations were imposed in the concession contract. Of the total number of shares, 10 percent were reserved for employees and 5 percent for cooperatives. French (32.5 percent), Italian (32.5 percent), US (10 percent), and Argentinean (25 percent) shareholders acquired the Telecom shares. Telefónica de Argentina's major shareholders were the United States (20 percent), Argentina (14.56 percent), and Spain (10 percent). Public bonds were used to cover a large proportion of the initial payment.

At the time of privatization, Argentina's regulatory entity, National Communication Commission (CNC), established a tariff discount of up to 25 percent for pensioners collecting the minimum payment. After privatization, regulatory changes were introduced that were expected to have distributive effect. For example, low-consumption customers were favored through increasing tariff blocks. Before January 1997, interurban calls cross-subsidized urban services; hence, the rest of the country subsidized the Greater Buenos Aires area (Chisari and Estache 1997).[4] In 1997, consumers were divided into four tariff groups (households, commercial consumers, professionals, and government), and within-group charges became uniform across country regions. At the time of privatization, regulation mandated that the supplier could suspend service if a bill had not been paid 30 days after the due date. Because of high reconnection charges, this policy tended to increase the cost for users with credit constraints and highly variable income. New postsale, regulatory changes limited this suspension of service only to outgoing calls for the first 60 days (after that the full service could be discontinued). In addition, in 1997–98, both companies were mandated to install 1,000 semipublic phones for receiving calls located in schools, aid centers, and other intermediate associations without charging connection or fixed monthly fees.

After privatization, quality and productivity improved. For example, the average annual growth rate of lines installed increased from 5.2 percent in 1980–89 to 12.2 percent in 1991–97, while the rate for public telephones

3. The RPI – x mechanism adjusts prices according to variations in the retail price index minus a factor, x, estimating the degree of technological progress and productivity.

4. In October–November 1999, competition was introduced in the long distance market; the new companies were allowed to operate and offer services in each other's previously exclusive areas.

grew from 7.6 to 25.3 percent over the same period. Lines available and lines installed per employee increased considerably; other key quality measures also improved (e.g., pending repair orders, repair waiting time, and network digitalization) (Ennis and Pinto 2003).

Electricity

Before reform, POEs provided electricity generation, transmission, and distribution. Provincial governments controlled distribution. In the case of the Greater Buenos Aires area, SEGBA, a public company, was the only provider. Restructuring began in 1991. Each of the three stages of production was subject to a different regulatory framework. Competition was allowed at the generation level. Transmission and distribution, when privatized, became regulated private monopolies (concessions). The regulatory mechanism for these monopolies was basically an RPI-x system, with the productivity gains *x* adjusted every five years. Private companies in the distribution segment hold roughly 70 percent of the market (covering more than 60 percent of the country's total population). Furthermore, the three largest companies control about 50 percent of the market.

Private firms that trade daily in the wholesale market or MEM (Mercado Eléctrico Mayorista) hold about 60 percent of Argentina's electricity generation. This industry is less concentrated, with the three largest firms providing about 30 percent of total supply (Millan, Lora, and Micco 2001). MEM's CAMMESA (Compañía Administradora) determines the spot price every day according to estimated demand and cost-quantities schedules that the generation firms submit. Distribution companies and large users represent wholesale-market demand; they submit their expected demands to CAMMESA, which uses this information to determine the spot price. Bosch, de Gimbatti, and Giovagnoli (1999) provide a careful description of this system. Other large users can also sign contracts directly with firms in the generation stage.

Transmission is done through two systems: STEEAT (Sistema de Transporte de Energía Eléctrica de Alta Tensión) and STEEDT (Distribución Troncal). Transener obtained a 95-year concession of STEEAT, a system that connects every region in the country to the same electricity network. STEEDT distributes electricity within a specific region from the generators to the distribution companies. The entire transmission system is subject to the principle of open access, which allows indiscriminate network access when committed capacity is not compromised.

As of 2000, 70 percent of distribution had been privatized. EDENOR, EDESUR, and EDELAP are the main private distribution companies, created after SEGBA's privatization. The Law established that pricing should be in accordance with cost and, hence, rules out cross-subsidization. Subsidies are available for pensioners, charities, and government-financed nonprofit organizations. (ANSES, the social security agency, reimburses

companies for pensioners collecting minimum pension.)[5] In addition, the National Electricity Fund finances broader regional subsidies. In 1994, Edenor and Edesur signed an agreement with the government to provide electricity to "very poor" neighborhoods in special ways, such as use of collective meters. The agreement affected 650,000 users who previously had been illegally connected, with attendant inefficiencies and safety issues. The program succeeded: Companies' collection rate reached 85 percent in 1997 and quality of service improved significantly.

At the national level, privatization considered two concession areas: (1) the concentrated market, connected to the national or provincial distribution system, and (2) the scattered market, with no electricity supply. Users in scattered areas are serviced by alternative systems (e.g., diesel-run), and have special tariffs, with provinces paying any associated subsidy.

Privatization of SEGBA. In 1992, energy generation, transmission, and distribution facilities in the Greater Buenos Aires were sold. Three companies were created to handle the distribution stage: Edenor, Edesur, and Edelap. Edenor has a 95-year concession with the exclusive franchise to distribute electricity in the northern section of Greater Buenos Aires. The concession area comprises a territory of about 4,650 square kilometers (km^2), with a total population of more than 7 million and 2.2 million customers. During its first two years, Edenor suffered losses. Over the 1992–95 period, its owners invested $400 million and reduced energy losses from 30 percent to 16 percent—mainly through improved metering, invoicing, and collection of charges for electricity delivered but not previously paid for. Edesur distributes electricity in the southern section of Greater Buenos Aires. The company started operations in September 1992 (at the same time as Edenor), and has some 2 million customers. Edelap, which started operation in December 1992, is the electricity distributor for Greater La Plata, with 270,000 customers.

Water and Sewage

In many areas of Argentina, water and sewage services have been privatized. A national water and sanitation organization (Ente Nacional de Obras Hídricas de Saneamiento) finances water and sewage projects across the country and strengthens regulatory capacity at the provincial level. The two main markets are the city and province of Buenos Aires. Water service in the city of Buenos Aires was privatized in the early 1990s, while privatization in the province occurred in 1998.[6]

5. Pensioners subject to these benefits are given a 50 percent discount on the fixed charge and the first 210 kilowatt hours (kWh) of electricity used in the last two months; all consumption above 210 kWh is billed at the normal tariffs, and users with bimonthly consumption above 430 kWh receive no discount.

6. The effect of this privatization is not part of this study's analysis.

Privatization of water and sewage services affected low-income households in several ways. The main advantage was opportunity for increased access; however, not everyone benefited from the extended network. Some households, for example, cannot afford to take on the new obligations.

City of Buenos Aires. Aguas Argentinas, S.A. is the sole provider of potable water and services for the city of Buenos Aires. In April 1993, the company obtained an exclusive, 30-year concession; as of June 30, 1998, it supplied potable water to some 7.8 million residents and sewage services to about 5.9 million. Tariff adjustments are based on a cost-plus rule. The concession contract stipulated service obligations, investment requirements, and quality standards. At the time of privatization, metering of water consumption was limited to only 15 percent of connections. After privatization, some users were allowed to switch to the metering option. If meters were unavailable or the household chose not to switch, a fixed charge was billed. If the customer chose metering, fixed charges were reduced 50 percent (Chisari and Estache 1997, Abdala 1996). The licensee can charge interest if bills are not paid on time and cut off the service 180 days after the due date (low-income users and hospitals may be exempt after government evaluation). In general, residents in the serviced area are required to enter the network. If they prefer to have their own water well and not connect to the network, they must obtain permission from the licensee, who will accept the request upon verifying that water from the alternative source meets established quality standards.

Province of Buenos Aires. In 1998, the provincial government of Buenos Aires decided to privatize AGOSBA, provider of water and sewage services in 50 of the province's 134 municipalities. AGOSBA's territory was divided into six concession areas, and potential private operators were invited to bid on any combination of the six. The privatization process consisted of two parts: (1) a technical offer presenting the credentials of prospective concession operators, demonstrating their ability to meet legal, technical, and financial requirements, and (2) an economic offer, which was a one-time payment to the province. The rules allowed for bidding on more than one area, but a single bidder could not be awarded all areas. In the end, five concession areas went to one operator, ABA (Agua de Buenos Aires), while the remaining one went to the consortium AGBA (Aguas del Gran Buenos Aires). ABA began operations in July 1999 and AGBA in January 2000. The two concessions have exclusive rights to service these areas for 30 years.

Natural Gas

Prior to privatization, the natural gas industry consisted of two companies: GE (Gas del Estado) and YPF (Yacimientos Petrofíleros Fiscales). In 1992,

GE was privatized and awarded a 35-year concession. A new regulatory institution, ENARGAS (Ente Nacional Regulador del Gas) was created, and a new set of sector regulations was established. The industry was divided into three segments: production, transportation, and distribution. Sector reform also entailed creation of wholesale and retail markets. In the wholesale market, producers, distributors, customers, and wholesalers determined prices and volumes. In the retail market, the regulator ENARGAS set the ceiling price. Sector competition was encouraged. For example, access to transportation and distribution was open to third parties, and transportation capacity could be resold. Producers and transmission companies could not hold stock in distribution companies; producers, consumers, and distribution companies could not hold stock in transportation companies; and transportation companies could not trade natural gas.

Following privatization, efficiency improved. Capacity utilization increased, while consumption restrictions and leakage decreased. Since 1992, the number of consumers of network-provided natural gas increased an average of 3 percent annually, although Abdala (1998) suggests that this percentage differs little from the penetration rate GE achieved a decade earlier. Sector investment rose from an annual average of $84 million (under public ownership) to $348 million (under private control).

Data Limitations

The data useful for empirically evaluating privatization's effects on Argentina's firms and citizens are of low quality. To assess the social effects, we use systematic data from two sources: Household Expenditure Surveys (HES 1985–86 and 1996–97) and Permanent Household Surveys (PHS).[7] These surveys consider household expenditure and income variables, in addition to occupational, demographic, and educational ones. The 1985–86 HES was relatively limited with regard to reporting monetary variables. For the year surveyed, inflation was 41.3 percent; however, because the interviews were spread over a long period, comparing nominal values from interviews can be problematic. Moreover, this survey was directed only at households in the Federal Capital and Greater Buenos Aires area. The 1985–86 HES survey did not include several key questions introduced in the 1996–97 survey concerning availability of telephone and other services. While the 1996–97 HES survey covers urban households at a national level, for the purpose of comparison, we use only that portion of the survey corresponding to Greater Buenos Aires.

7. In August 1997, the INDEC, Argentina's statistical agency, conducted a national Social Development Survey that provided data on household quality of life and access to social services across the country. Since no comparable survey was conducted before privatization, before and after comparisons are not possible.

Biannual PHSs, available for 1980 through 1999, are conducted in May and October in Greater Buenos Aires (after 1980, other metropolitan areas were incorporated). These data are the main source for tracking employment information in Argentina's economy. Labor force participation, income, educational composition, and other household characteristics are the main components.

Consumption Effect

Utility sectors—telecommunications, natural gas, electricity, and water and sewerage—have properties that make them suitable for studying the elusive consumption effect of privatization on income distribution. First, these are the privatized sectors that most directly affect household consumption. Second, the goods and services they produce are less easily substituted by other privately produced goods.[8]

To study privatization's effects on consumption, two key factors should be considered: (1) change in relative prices, and (2) change in access to public services. To estimate changes in consumer welfare resulting from privatization, we first examine changes in expenditure in selected public services and the corresponding budget shares per income deciles. Next, we report the evolution of prices, provide potential measures of the changes in access, and estimate the change in consumer welfare. Finally, using these results, we examine the change in inequality and poverty attributable to privatization of various public services.[9]

Household Budget Shares

During 1985–86 and 1996–97, household budget shares for telecommunications, natural gas, water, and electricity experienced a remarkable boost for all deciles and public services (with the sole exception of electricity in decile 10) (table 5.3). These pronounced changes might reflect the binding quantity constraints that existed before privatization.

Telecommunications and natural gas witnessed the largest increases (lower deciles had greater increases). Generally, budget shares do not decline with income; only shares in natural gas, water, and electricity for 1996–97 followed this pattern. The substantial increase in telephone budget shares for middle deciles may indicate the significant quantity restric-

8. The case of natural gas still presents a significant problem; the alternative of bottled gas is readily available and used throughout Argentina.

9. Navajas (1999) provides an alternative approach to analyzing the welfare effects of price changes stemming from privatization in Argentina.

Table 5.3 Budget shares, by decile, 1985–86 and 1996–97

	1985–86			1996–97		
Decile	Telecom	Natural gas	Water and electricity	Telecom	Natural gas	Water and electricity
1	0.30	0.50	2.25	1.82	2.91	4.69
2	0.33	0.73	2.64	2.19	2.64	4.20
3	0.46	0.94	2.63	2.32	2.47	3.73
4	0.75	0.94	2.93	2.57	2.49	3.62
5	0.68	0.94	2.29	2.35	2.18	3.10
6	0.63	0.96	2.61	2.65	2.05	2.94
7	0.99	0.99	2.44	2.53	1.94	2.74
8	0.87	0.95	2.32	2.56	1.65	2.48
9	0.95	0.74	2.00	2.27	1.38	2.10
10	1.08	0.54	1.78	2.15	0.94	1.45
Average	**0.80**	**0.81**	**2.28**	**2.33**	**1.74**	**2.61**

Sources: 1985–86 HES, 1996–97 HES, INDEC.

tions and rationing in place before sector reforms. Similarly, that budget shares were increasing in income in 1985–86 likely reflects limitations in access and high-income groups' ability to circumvent restrictions by paying special fees or bribes. Furthermore, the quality of telecommunication services was low before privatization, which presumably lowered desired budget shares. For example, before privatization, the waiting time for repairing telephone lines was very long.

Price Evolution

Several previous studies evaluated price performance following privatization; however, the outcomes varied depending on the choice of baseline and final years. To estimate privatization's effects on prices of the affected services, we first discuss the evolution of prices over the period and fix preprivatization and postprivatization dates. We then evaluate the effects of price change on consumer welfare between these two dates.[10]

In general, when the government administered the firms, they used tariffs as macroeconomic instruments to control inflation. In most cases, those prices included a distributional component (Navajas and Porto 1990). Immediately before privatization, the evolution of real tariffs in most sectors reflected an explicit government policy aimed at making a POE sale more attractive. Thus, while hyperinflation caused real tariffs to decline significantly in 1989, prices started to increase in real terms in 1990–91.

10. Consumption data are available for only two points in time: 1) before the privatization (1985–86), and 2) after privatization (1996–97); thus, one can identify only one overall change in price elicited from any type of dynamic price behavior over the period.

Telecommunications

Before privatization, the real tariff decreased during high inflation in 1989 and then increased after 1990, fully recovering before change in ownership. This pattern is consistent with the price behavior in other sectors. After privatization, the value of each pulse went from $0.0484 in November 1990 to $0.0455 in December 1997. However, this comparison is not straightforward, as time per pulse changed according to type of call, beginning in 1990. After privatization, connection charges decreased dramatically. For residential users, connection charges fell 88 percent, while commercial and professional users saw even greater decreases (96 percent and 94 percent, respectively). In 1997, fixed charges and tariffs for local calls increased, while the price of long distance calls decreased.

The Latin American Foundation for Economic Research, known as FIEL, provides information on price evolution in the commercial and residential sectors (FIEL 1999). The foundation's index uses the basket of calls and services corresponding to 1996. It does not incorporate connection costs, but takes into account changes that occurred in the time-per-pulse for various calls. Deflated by the wholesale price index (WPI), the index of residential tariffs in constant pesos decreased nearly 18 percent from 1990 to 1998. The decrease in the index of commercial tariffs is even greater (55 percent). For the residential sector, the behavior of real tariffs after privatization has not been uniform, with tariffs declining until 1996 and rising thereafter.

Because of data limitations, the FIEL index cannot be constructed for the period before privatization. INDEC offers an alternative index, using a basket based on the 1985–86 HES. Figure 5.1 presents the annual averages of this price index between 1985 and 2000, relative to the consumer price index (CPI). In the welfare calculation that follows, we use these numbers to determine the change in telecommunication prices associated with privatization.

In 1998, connection charges in Argentina were above the international average. Fixed charges were also relatively high; even after the tariff rebalancing of 1997, long distance tariffs remained above international standards. High connection and fixed charges made telecommunication services more expensive for low-income households, who generally use it less intensively (and hence at a higher unitary price). The 1997 rebalancing decreased variable charges in long distance calls, making the tariff structure even more regressive.

Electricity

Figure 5.2 shows the evolution of electricity tariffs (including taxes) for various consumption segments.[11] In residential and commercial segments,

11. Residential tariffs are deflated using the CPI. Residential tariffs with taxes include value-added tax (VAT) and national taxes. Commercial and industrial tariffs are deflated by the RPI, and tariffs with taxes for these sectors only incorporate national taxes. Moreover, all tariffs include fixed and variable charges. See Ennis and Pinto (2003).

Figure 5.1 Consumer price index, 1985–2000 (annual averages)

Source: INDEC.

prices tended to decline. On the other hand, industrial electricity prices remained relatively constant. In general, a declining tendency should be the rule as technological improvements lower generation and distribution costs. In Argentina's case, however, extensive organizational changes in the country's electricity sector and the fact that pricing before privatization was used for political and distributional objectives can make the technological trend less important.

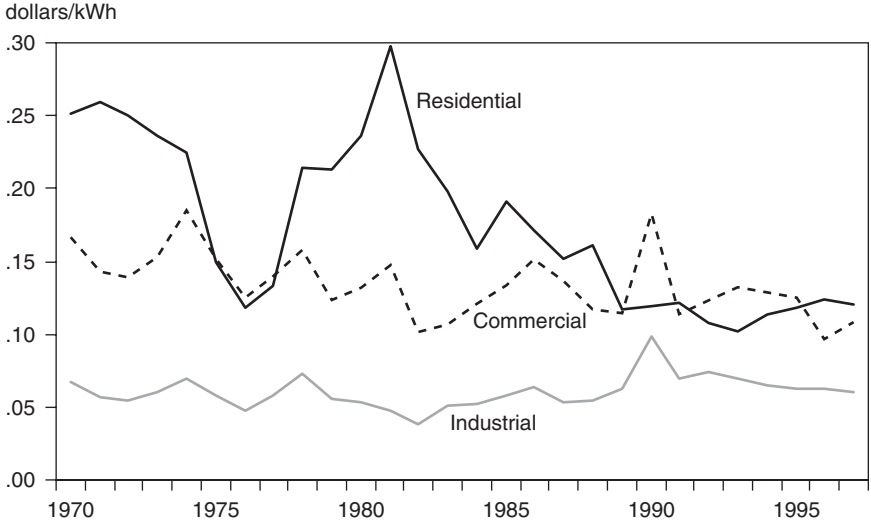
Taxes significantly affect final consumer electricity prices in Argentina. For example, residential tariffs, including taxes, decreased from 1986 to 1996 (from $0.172 to $0.124); over the same decade, tariffs before taxes increased (from $0.095 to $0.097). This observation is important because the demand elasticity of electricity tends to be low, and taxes were a significant component of prices during the period before privatization.[12]

Natural Gas

In the natural gas sector, residential consumer prices, when deflated by the CPI, showed a decreasing trend from 1980 to 1998 (figure 5.3). However, price behavior was not uniform during the period: prices decreased in real values until 1989, rose from 1990 to 1992, and stabilized thereafter.

12. To complete the analysis, Ennis and Pinto compared electricity prices in Argentina with those in other selected countries. They found that the tariffs charged in Argentina in 1996 were relatively competitive and even below international averages in all segments. See Ennis and Pinto (2003).

Figure 5.2 Evolution of electricity-sector tariffs with taxes, 1970–97
(dollars/kWh, 1997 constant prices)



Source: FIEL (1999).

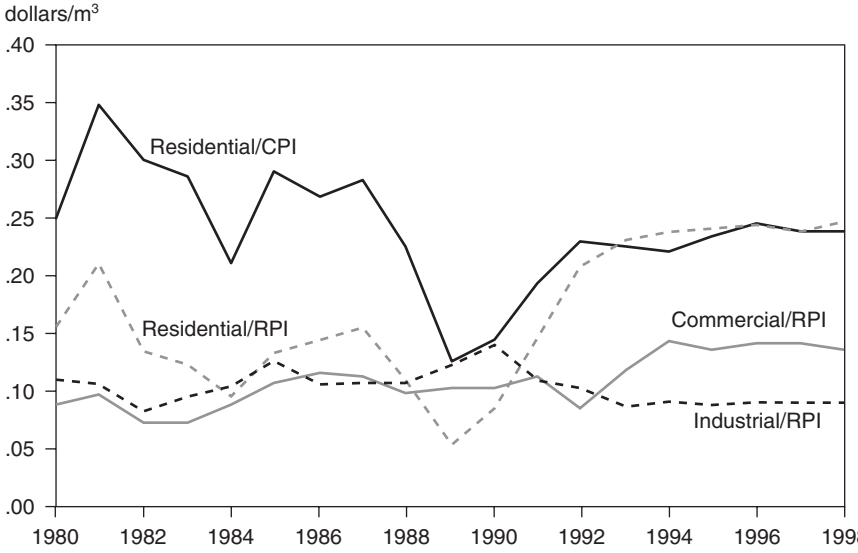
Commercial and industrial tariffs were relatively stable during the 1980s. While commercial tariffs tended to increase somewhat after 1993, industrial tariffs tended to decrease. Tariffs in Argentina's natural gas sector are generally below international averages for all user types.

Access to Public Utilities

This study used HES data to analyze privatization's effects on access to selected public services. For 1985–86, "households with access" are those households that report a positive expenditure for the corresponding public utility.[13] For 1996–97, the study measures access in two ways. The first way is a direct measure based on the following questions from the 1996–97 HES: "In the block where your house is located, is there: a water network, an electricity network, a gas network?" and "Does your house have a telephone?" Unfortunately, these questions were not asked in the 1985–86 HES. We present the estimates obtained using this first alternative in table 5.4. Clearly, after privatization, the degree of access to public utilities changed notably. Access to water services increased significantly,

13. In the cases of natural gas and water, Ennis and Pinto considered only the expenditure on the service provided through the network.

Figure 5.3 Evolution of natural gas sector tariff, 1980–98
(final prices, dollars/m^3, 1997 constant prices, various deflators)



CPI = consumer price index
RPI = retail price index

Source: Ennis and Pinto (2003).

as did access to telephone, natural gas, and electricity (with respective increases of 33, 32, and 11 percent, respectively).

The second way to evaluate the changes in access is to define "households with access" in 1996–97 as those households with a positive expenditure on the services. This method is most consistent with the 1985–86 HES measures, except that, in 1996–97, the expenditure reported was not restricted to network provision, as it was in 1985–86. Measuring access using positive expenditure, however, is not without problems. First, illegal connections tend to be reported as zero expenditure, even though for welfare calculations households with illegal connections should be counted as having access to the service (this is especially relevant in the case of electricity). Second, in the case of water and natural gas, private substitutes (e.g., wells and bottled gas, respectively) were common in Argentina. The observed changes in this study's measure of access during the reform period might simply reflect the household's decision to switch from alternatives to formal provision through the network. Finally, one additional limitation arises for the 1996–97 HES using the number of households that report a positive expenditure. During that period, information on water and electricity expenditure is reported as a single category. To maintain consistency, we aggregated 1985–86 data on water and electricity into a single category.

Table 5.4 Access by income group (direct measure) (percent)

	1985–86[a]				1996–97[b]				Percent change			
Decile	Natural gas	Water	Electricity	Telephone	Natural gas	Water	Electricity	Telephone	Natural gas	Water	Electricity	Telephone
1	21.98	10.26	65.20	18.32	46.44	46.44	98.98	22.81	111.28	352.75	51.81	24.55
2	41.11	25.44	80.49	26.48	62.78	61.37	99.60	39.64	52.69	141.27	23.74	49.68
3	50.20	28.63	87.45	33.73	77.48	68.39	99.79	53.51	54.35	138.89	14.11	58.67
4	54.95	38.83	90.48	43.59	83.13	75.81	100.00	57.72	51.30	95.25	10.53	32.42
5	65.56	34.07	92.96	47.04	86.50	75.05	99.59	68.51	31.95	120.26	7.13	45.65
6	68.35	43.53	93.53	49.64	91.24	79.84	100.00	78.21	33.50	83.43	6.92	57.55
7	78.65	47.19	97.00	61.42	93.69	84.32	99.80	82.69	19.12	78.67	2.88	34.62
8	77.74	55.84	95.99	67.15	96.33	87.14	100.00	86.73	23.91	56.06	4.18	29.16
9	85.04	58.03	97.45	75.91	97.96	91.22	100.00	89.80	15.20	57.20	2.62	18.29
10	90.94	63.02	99.25	82.26	99.18	96.33	100.00	92.86	9.06	52.85	0.76	12.88
Average	**63.29**	**40.43**	**89.91**	**50.41**	**83.45**	**76.57**	**99.78**	**67.22**	**31.77**	**89.41**	**10.97**	**33.26**

a. For 1985–86, households that reported expenditures greater than zero were considered to have access to the corresponding public utility.
b. Access to public utilities for 1996–97 was based on the household survey questions: “In the block where your house is located, is there: water network, electricity network, gas network?” and “Does your house have a telephone?”

Sources: 1985–86 HES and 1996–97 HES, INDEC.

Increased access was generally higher when measured using this second method, except in the case of telephones. The proportion of households with a positive expenditure on natural gas was substantially higher than the proportion of households that reported having a gas network in the block where they live. Based on this finding, it is evident that network substitutes for natural gas were relatively popular in Argentina (especially for low-income households). The direct measure is the most appropriate for across-time comparisons of natural gas because, while 1985–86 expenditures account only for natural gas obtained through the network, 1996–97 data include expenditures on natural-gas substitutes, which likely constituted a significant share (table 5.4).

Take-Up Decision

If a high proportion of consumers with potential access choose not to use a service—that is, if take-up is low—then the benefits of increasing access by privatizing the service are smaller. The 1996–97 HES allows one to consider take-up decisions by decile. This variable is constructed by determining the number of households connected to the corresponding public service when the service is made available to them. On average, take-up decisions are high: 99.88 percent for electricity, 97.39 percent for water, and 87.49 percent for natural gas. For all deciles, electricity and water show a high percentage of household adoption; for natural gas, the take-up percentage increases with income, starting with 45.61 percent for the poorest households. These numbers are consistent with the fact that poor households mainly use bottled gas. It is noteworthy that Argentina's electricity, natural gas, and telecommunication connections are not mandatory for consumers. While connection to the water network is not mandatory either, proof of an alternative source of potable water is required (and private wells are relatively popular).

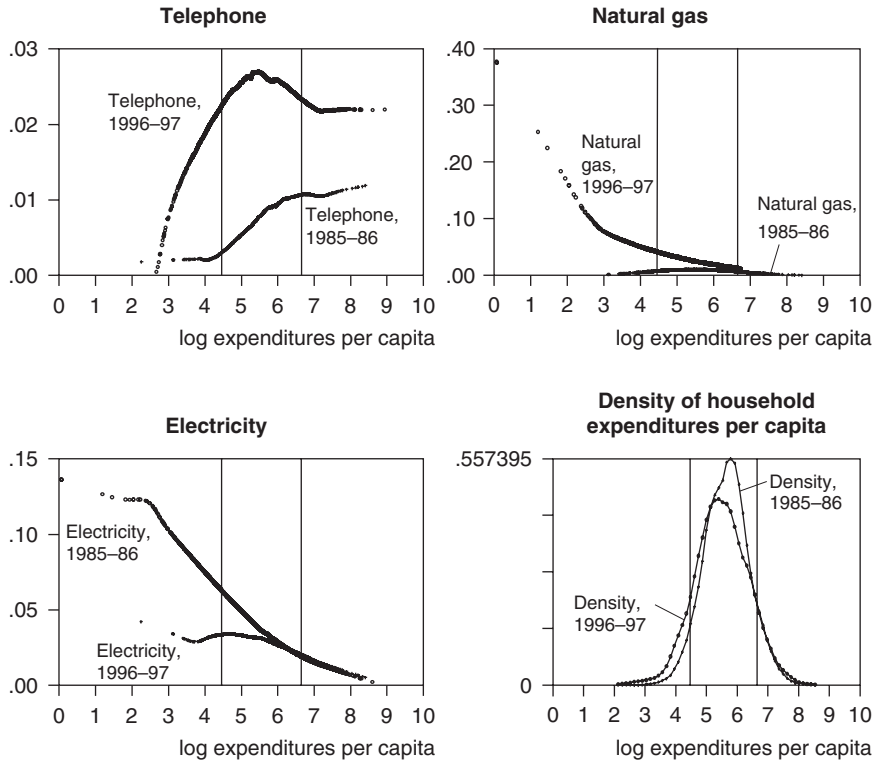
Change in Consumer Surplus

In general, a change in the price of a good or service will have a greater effect on consumers who devote a larger share of their budget to purchasing such goods or services. Thus, in order to estimate the changes in welfare, we start by estimating the average budget for the relevant services.

Engel Curves: Nonparametric Estimation

To approximate the welfare effects brought about by a price change in telephone, natural gas, and electricity services, this section uses a nonparametric method to estimate both Engel curves for the various services and distribution of consumers across expenditure levels. Given a change in price,

Figure 5.4 Engel curves for selected public services, 1985–86 and 1996–97



knowing the budget share for each income level and distribution of agents across income allows one to better determine the main winners and losers and their importance in number.

In the 1996–97 HES data, expenditure on electricity is pooled with that on water and sewage. For this reason, to compute the Engel curve for electricity, we also pooled the expenditure data for 1985–86 HES. Then, for the electricity sector, we use the change in prices and access corresponding to that service but use the price elasticity corresponding to the pooled expenditure data. Unfortunately, no results were obtained for water services.[14]

Figure 5.4 presents the budget share for public services (telephone, water and electricity, and natural gas) across levels of total expenditure per capita

14. In 1985–86 on average, expenditure on water was less than half that on electricity; there is some evidence that the proportion of total expenditure corresponding to water remained relatively stable during the decade under study (FLACSO 1998), while that for electricity clearly increased.

(expressed in logarithms). It also compares consumer density by level of income/expenditure for 1985–86 and 1996–97. For all four graphs, the vertical lines indicate the cutoff expenditure levels for deciles 1 and 9. In constructing these figures, the agents reporting zero shares were included in the sample, assuming they represented consumers without access (in this regard, these estimates are comparable to the budget shares reported in table 5.3). Considering households with zero shares as not having access represents an upper bound in the number of households with no access. Some households report a zero share even if they do have access because they consume a minimum amount of service (that they deem not worth reporting) or because they wish to hide their consumption.

For 1996–97, natural gas and electricity show monotonically decreasing budget share curves. For 1985–86, the telephone curve increases monotonically; in all other cases, the curves increase, peak, and then decrease (suggesting that the corresponding public service is a normal good for low-expenditure households and becomes an inferior good for higher-income ones).

We performed the same calculations without including consumers with zero-share expenditure in the corresponding service. Although the figures are not shown, all Engel curves sloped downward—that is, conditional on spending a positive amount. Thus, the budget share spent on each corresponding public service decreased systematically with rise in living standards.

First- and Second-Order Approximations to Consumer Surplus

To estimate the change in agents' utility resulting from the observed price change for public services after privatization, we calculated two possible approximations: (1) a first-order approximation (FOA), and (2) a second-order approximation (SOA). The FOA of the change in utility stemming from the price change was calculated using the following formula:

$$\Delta_1 U_j^h = -\left(\Delta \log p_j\right) x_0^h w_{j0}^h,$$

where p_j represents the price of service j, w_{j0}^h the expenditure share of household h on public service j before privatization, and x_0^h the total household expenditure per capita. The FOA is the weighted average of the log change in prices, where the weights are given by the amount that each household h spends on each particular public service before price change.

The SOA of the change in utility resulting from price change allows for some quantity response. In terms of w_j^h, the expenditure share in public service j of household h, the SOA can be expressed as:

$$\Delta_2 U_j^h = -\left(\Delta \log p_j\right) x_0^h w_{j0}^h \left[1 + \frac{\Delta \log p_j}{2} \frac{\partial \log w_j^h}{\partial \log p_j}\right].$$

We use these numbers, $\Delta_i U_j^h$, in calculating the change in inequality and poverty reported in tables 5.8 and 5.9.

Finally, we incorporate into our calculations the change in utility caused by access changes. As the privatization process may have variously affected household access, we divide the total number of households into four groups: households with access before and after privatization, households that gained access after privatization, households that no longer had access after privatization, and households with no access in both periods. The first group was affected through the price change in privatized services; thus, the change in their consumer surplus is simply $\Delta_i U_j^h$. For households that gained access, the change in consumer surplus can be approximated using the difference of the virtual price (the price that would make their expenditure in the service equal zero) and the price after privatization.[15] The last two groups are affected through the price changes of goods and services that substitute for those that have been privatized. Given the information available, one cannot assess the effect on these last two groups, although it will likely be less important.

To compute the FOA and SOA, it is necessary to estimate price change during the reform period and the virtual prices for each service and household. In addition, calculating the SOA requires estimating the elasticity of demand (i.e., $\partial \log w_j^h / \partial \log p_j$). Based on the information presented earlier (figures 5.1 to 5.3), we concluded that the best estimates with regard to price change are those provided in table 5.5.

Determining the change in prices attributable to the privatization of public utilities is a controversial issue. Various studies reach different conclusions. For example, Delfino and Casarin (2001) suggest that privatization produced price increases. On the other hand, Urbiztondo, Artana, and Navajas (1998) conclude that prices decreased in percentages similar to those presented in table 5.5. Our estimated price changes were computed using an index of final prices and deflating them by the RPI. We chose the years of the available expenditure surveys, 1985–86 HES and 1996–97 HES, for the comparison. While the results are sensitive to the years used, we believe they are reasonable years upon which to base our comparisons. The 1988–89 period was one of high inflation, with significant devaluation of prices for public services. Thus, choosing the initial prices during the years that prevailed just before privatization would have distorted the results. The period starting in 1991 proved relatively stable. By 1996, prices in privatized firms

15. The authors also estimated the premium associated with having access to public services, using a hedonic rental regression. Ennis and Pinto used household rent payments or imputed rents as the dependent variable and indicators of access to the various public services (in addition to a set of control variables) as explanatory variables. For lack of data, however, it was not possible to include potentially important neighborhood characteristics in the regression (e.g., neighborhood amenities or crime levels) or estimate this hedonic rental regression for any year other than 1996–97. In general, they found positive premiums associated with access, but the relationships were not highly significant. See Ennis and Pinto (2003).

Table 5.5 Change in relative utility prices (percent)

Utility	1985–86	1996–97
Electricity	100.00	67.49
Natural gas	100.00	86.56
Telephone	100.00	83.94

Sources: FIEL (1999), INDEC (www.indec.menoc.ar).

had probably adjusted to what one can consider normal levels. Hence, 1996 is a reasonable year for measuring prices after privatization. Choosing a later year would imply smaller price decreases—or even increases, as shown in Delfino and Casarin (2001), where 1999 prices are used.

We believe Argentina's economy entered another abnormal path in 1998, with overall deflation that did not translate into the prices of public services for regulatory reasons (their prices were dollar indexed). By 1999, the prices of public services were again misaligned because of macroeconomic instability. Thus, we exclude these periods from our calculations. An important lesson from the price increases of the late 1990s is that the regulatory framework of an unstable country, such as Argentina, should be adapted to handle extreme macroeconomic situations. Estache, Carbajo, and de Rus (1999) evaluate the potential gains that could be obtained from improving the regulation of Argentina's privatized public utilities.

To estimate the virtual prices and the expression $(\partial \log w_j^h / \partial \log p_j)$, we use the results of the following Engel equation:

$$w_{hj} = \alpha_j + \beta_j \log p_j + \gamma_j \log x_h + \delta_j (\log x_h)^2 ,$$

so that

$$\frac{\partial \log w_j^h}{\partial \log p_j} = \frac{\hat{\beta}_j}{w_j^h}.$$

This estimation uses the subsample of households with access to each public service.[16] We use a Heckman two-step correction method to account for potential bias.[17]

Using the price elasticities computed in table 5.6, we obtain the prices that would make those shares equal zero, even under unrestricted access. These virtual prices are used to calculate the welfare change associated with consumers who had no access before privatization and gained access

16. It should be noted that the estimation is based on weak data and only two data points. For electricity, the authors use the expenditure share on water and electricity and the corresponding electricity prices for 1985–86 and 1996–97.

17. The additional step is required because estimates could be inconsistent if omitted variables correlated with access also affected the services demand.

Table 5.6 Heckman two-step correction

Variable	**Telephone** (tsh) **tacc = 1** Coef-ficient	Standard error	**Natural gas** (gsh) **gacc = 1** Coef-ficient	Standard error	**Electricity** (wesh) **eacc = 1** Coef-ficient	Standard error
Lp	–0.0997	0.0063*	–0.0342	0.0043*	0.0033	0.0021
lexppc	–0.0673	0.0070*	–0.0739	0.0029*	–0.0408	0.0033*
lexppc2	0.0047	0.0006*	0.0051	0.0003*	0.0017	0.0003*
lambda	0.0005	0.0011	–0.0067	0.0008*	–0.0156	0.0010*
_cons	0.7047	0.0324*	0.4323	0.0198*	0.2063	0.0120*
Number of observations	4,666		5,812		7,335	
R-squared	0.14		0.31		0.22	
Adjusted R-squared	0.14		0.31		0.22	

tsh = telephone expenditure share; tacc = households with access to telephone; gsh = natural gas expenditure share; gacc = households with access to natural gas; wesh = water and electricity expenditure share; eacc = households with access to electricity; Lp = log of prices; lexppc = log of expenditures per capita; lexppc2 = log of expenditures per capita squared; lambda = inverse Mills ratio; cons = constant; * = significantly different from zero, with 90 and 95 percent confidence.

Note: The variable lambda in the regression is the inverse Mills ratio constructed using the estimates of a standard logit regression. See Ennis and Pinto (2003). For natural gas and electricity, this variable differs significantly from zero.

Source: Authors' calculations, based on 1985–86 and 1996–97 HES (INDEC).

after privatization. The virtual prices (per decile), p_v, are shown in the last column of table 5.7; they are, in general, decreasing in income.

We then compute the change in consumer surplus, using the prices reported in table 5.5 and the elasticities and virtual prices obtained from table 5.6. We calculate the FOA and SOA of the mean decile change in welfare resulting from privatization of service *j,* incorporating both changes in price and access. Throughout our computations, we assume that consumers who initially had access did not lose it after privatization.

Table 5.7 reports the percentage change in expected utility (i.e., the expected change in utility as a percentage of initial total expenditure).[18] The second and third columns show the results of calculating the expected change in utility for households with access before and after privatization. The fourth and fifth columns show the corresponding values for households that gained access after privatization. The sixth and seventh columns present the total expected change in utility (the sum of the corresponding previous columns). Since the price elasticity for electricity does not differ significantly from zero (and with the wrong sign) (table 5.6), we use the elasticity without the Heckman adjustment (also showing an inelastic demand).

Figures 5.5, 5.6, and 5.7 show that the increase in consumer surplus for households with access to telephones in both periods is higher for those households in the middle and upper declines of the income distribution. For natural gas and electricity, the benefits are relatively uniform across income distribution. In telephone and natural gas, the change in utility

18. See appendix 5A for the formulas used in the calculations reflected in table 5.7.

Table 5.7 Mean change in consumer surplus across deciles

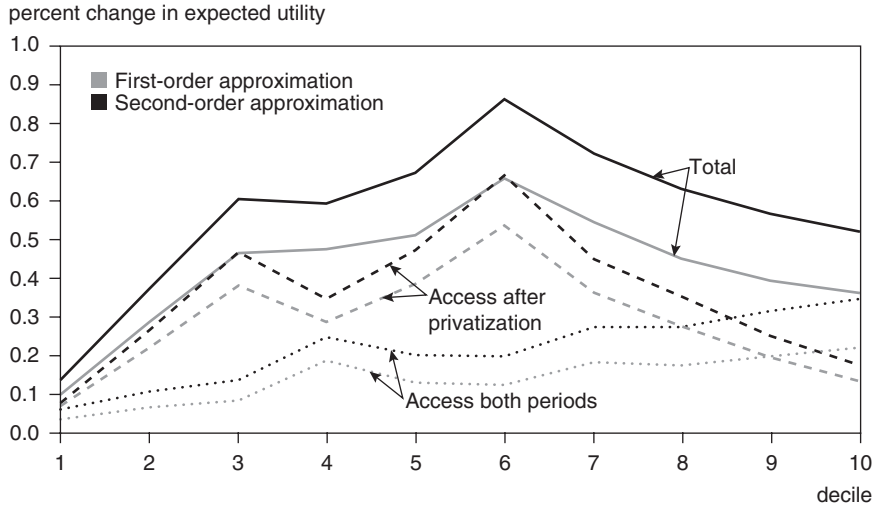
Decile	Household access for both periods		Household access after privatization		Total		Virtual price (p_v)
	FOA	SOA	FOA	SOA	FOA	SOA	
Telephone sector							
1	0.0354	0.0626	0.0622	0.0763	0.0975	0.1389	164.7599
2	0.0653	0.1054	0.2230	0.2653	0.2883	0.3707	152.7779
3	0.0873	0.1385	0.3792	0.4673	0.4666	0.6058	146.8454
4	0.1826	0.2487	0.2906	0.3442	0.4732	0.5930	147.1503
5	0.1293	0.2007	0.3823	0.4708	0.5116	0.6715	138.4307
6	0.1237	0.1990	0.5401	0.6615	0.6639	0.8605	136.1053
7	0.1818	0.2750	0.3646	0.4486	0.5464	0.7236	134.0514
8	0.1727	0.2746	0.2782	0.3561	0.4510	0.6307	129.4471
9	0.1978	0.3129	0.1970	0.2521	0.3948	0.5650	128.1028
10	0.2215	0.3463	0.1361	0.1746	0.3576	0.5209	124.9354
Average	0.1609	0.2495	0.2978	0.3685	0.4588	0.6181	136.3856
Natural gas sector							
1	0.0788	0.0885	0.7015	0.7933	0.7804	0.8818	229.8922
2	0.1247	0.1431	0.5583	0.6203	0.6829	0.7633	210.1655
3	0.1661	0.1885	0.7291	0.8226	0.8952	1.0111	198.1320
4	0.1534	0.1780	0.8125	0.8940	0.9660	1.0720	198.1804
5	0.1527	0.1820	0.5506	0.6167	0.7033	0.7987	188.9667
6	0.1572	0.1878	0.4899	0.5591	0.6471	0.7469	175.2390
7	0.1600	0.1951	0.2818	0.3221	0.4418	0.5172	168.8682
8	0.1409	0.1756	0.2668	0.3115	0.4077	0.4871	156.0288
9	0.1270	0.1650	0.1334	0.1590	0.2604	0.3240	145.1724
10	0.0964	0.1370	0.0568	0.0693	0.1531	0.2063	133.0477
Average	0.1378	0.1690	0.4250	0.4801	0.5628	0.6491	175.2874
Electricity sector							
1	1.0284	1.1743	2.0229	2.1496	3.0513	3.3239	350.6822
2	1.2616	1.4450	0.9598	1.0355	2.2214	2.4804	310.8645
3	1.3235	1.5211	0.4617	0.5056	1.7852	2.0266	273.4237
4	1.4561	1.6613	0.2566	0.2802	1.7128	1.9415	275.2321
5	1.0901	1.3000	0.1009	0.1115	1.1910	1.4115	255.8005
6	1.2465	1.4577	0.0430	0.0483	1.2895	1.5060	235.3945
7	1.1716	1.3907	–0.0652	–0.0743	1.1064	1.3164	221.0698
8	1.0869	1.3036	–0.0087	–0.0100	1.0782	1.2936	205.8540
9	0.9321	1.1521	–0.0495	–0.0586	0.8826	1.0935	188.3328
10	0.8490	1.0722	–0.0397	–0.0506	0.8093	1.0217	161.9198
Average	1.1423	1.3478	0.3427	0.3665	1.4850	1.7144	245.9665

FOA = first-order approximation
SOA = second-order approximation

Source: Authors' calculations, based on HES (INDEC).

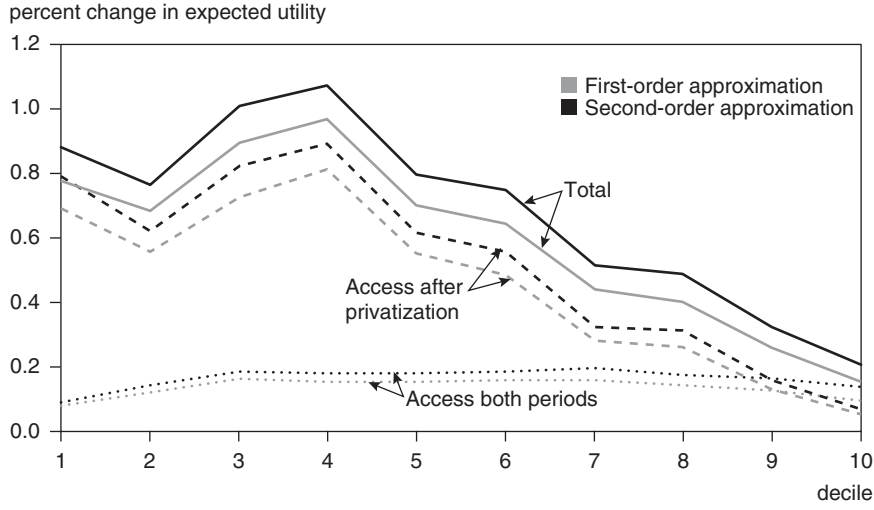
resulting from increased access is more important than the change stemming from decreased price. However, this is not the case for electricity, where access was relatively high before privatization. An important finding is that the access effect was significant for low-income households who gained access to electricity. For telephone and natural gas, households in the middle deciles of income distribution benefited the most. The values of changes in consumer surplus associated with electricity are considerably higher than those associated with the other services.

Figure 5.5 Telephone first- and second-order approximations



Source: Authors' calculations based on 1985–86 and 1996–97 HES (INDEC).

Figure 5.6 Natural gas first- and second-order approximations



Source: Authors' calculations based on 1985–86 and 1996–97 HES (INDEC).

Inequality and Poverty

One can use the estimates of change in consumer surplus to assess privatization's effect on inequality and poverty. In terms of inequality, we calculate Gini coefficients and Atkinson inequality measures under various assumptions that consider the effects of price and access changes on utility.

We assume that the expected change in utility (explained in the previous section) is the only change to initial household expenditure. For households with access before privatization, we add preprivatization household expenditure per capita and the change in utility (per capita) resulting from the change in the previously calculated price ($\Delta_i U_j^h$, i = 1, 2). For households that gained access after privatization, the procedure to compute post-privatization utility is less straightforward; one needs to compute various inequality indicators (table 5.8). In general, the effect of privatization on income inequality is small. In all cases, the Gini coefficients decrease. However, the Atkinson measure shows that, as the index of inequality rises—that is, as the importance of households with lower income increases—the privatization of natural gas, and electricity and water have significantly increased inequality.[19]

We also compare the change in the inequality measures attributable to privatization of the public services with the total changes that occurred from 1985–86 to 1996–97. The first-order effects of privatization on inequality are small; the largest change in the Gini coefficient is only −1.2 percent (the case of the SOA for electricity and water). Clearly, however, Argentina experienced a significant increase in overall inequality indicators during that period (the Gini coefficient increased about 16 percent). We conclude that, while inequality increased, privatization was not a principal contributor.

To evaluate poverty, we used the Foster, Greer, and Thorbecke measures.[20] We calculated consumers' utility after privatization by adding the corresponding estimated change in utility to the per capita expenditure before privatization. Table 5.9 reports our estimates of the change in the poverty measures attributable to privatization. The values in the first and last columns are obtained using the observed household total expenditure per capita for 1985–86 and 1996–97, while the middle columns show the effect on poverty attributable to privatization of the public services

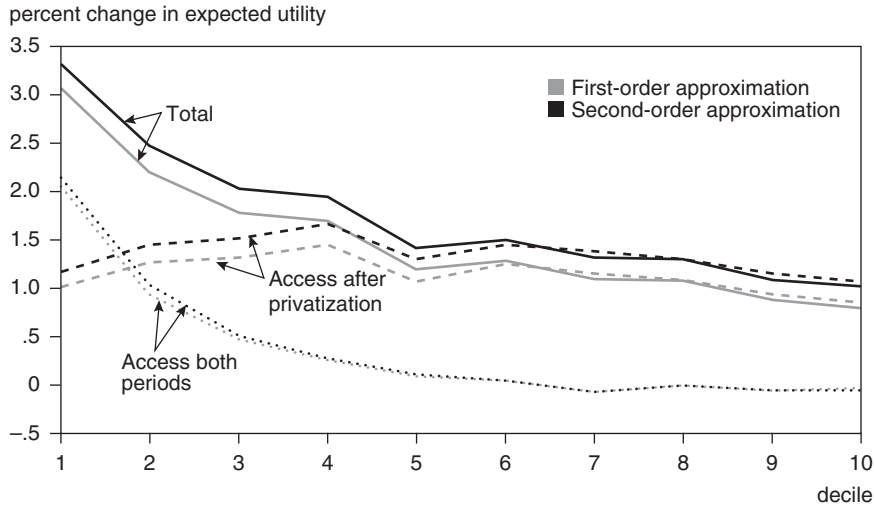
19. The purpose of the exercise is to show the effects of each sector's privatization on income distribution. Calculating an aggregate effect, including all these sectors, would involve making arbitrary assumptions on the patterns of access across the privatized sectors and the joint probability of changes in access to public services after privatization. The authors chose not to pursue that route.

20. The Foster, Greer, and Thorbecke poverty index is given by the formula:

$$P_\alpha = \frac{1}{N}\sum_{i=1}^{N}\left(1-\frac{x_i}{z}\right)^\alpha 1\left(x_i \le z\right),$$

where z denotes the poverty line, x_i total expenditure per capita in household i, N the total number of households, and 1(.) an indicator function. Different values of the parameter α describe various poverty measures. For $\alpha = 0$, 1, and 2; P_0 is the headcount ratio; P_1 is the poverty gap; and P_2 considers the distribution of the poor, respectively.

Figure 5.7 Electricity first- and second-order approximations



considered. All poverty indicators decline; the reductions are more important for electricity. We conclude that privatization's effects on the standard measures of inequality and poverty are not significant.[21]

Employment Effect

To estimate privatization's effect on employment, we examine the evolution of employment and wages in privatized sectors, using both firm-level and PHS data. We also use the PHS data to analyze qualitative changes in the labor market during the reform period. We then estimate the change in inequality attributable to privatization. Specifically, we calculate an upper bound to the change in inequality resulting from layoffs in the privatized sectors and then examine the changes in wage inequality.

The large employers subjected to privatization were railways (FFAA), the oil company (YPF), and electricity and telephone companies. Table 5.10 shows firm-level data for the main (and largest) individual firms in these sectors and the changes in employment they experienced. On average, the number of jobs in those firms decreased by a striking 67 percent. FFAA had the largest absolute reduction in workforce—75,000 jobs, representing an 82 percent decrease; however, YPF had the largest relative change, with an

21. These results do not consider privatization's effects on changes in service quality. For example, Galiani, Gertler, and Schargrodsky (2002) find that Argentina's privatization of water and sewerage had a significant negative effect on child mortality; that is, child mortality caused by waterborne diseases declined in areas where water services had been privatized.

Table 5.8 Inequality indicators

Index	1985–86	Telephone FOA	Telephone SOA	Natural gas FOA	Natural gas SOA	Electricity and water FOA	Electricity and water SOA	1996–97
Gini coefficient	0.4003	0.3964	0.3963	0.3994	0.3993	0.3961	0.3955	0.4637
Atkinson indices								
A (0.5)	0.1304	0.1285	0.1284	0.1311	0.1310	0.1278	0.1274	0.1746
A (1.0)	0.2406	0.2371	0.2371	0.2429	0.2426	0.2375	0.2366	0.3213
A (2.0)	0.4235	0.4172	0.4173	0.7785	0.6925	0.5190	0.4821	0.5930

FOA = first-order approximation
SOA = second-order approximation

Source: Authors' calculations, based on HES (INDEC).

83 percent reduction in jobs. Although employment variations are large in specific sectors, relative importance in terms of the country's aggregate employment is not that significant. Before privatization, employment in the relevant firms was 2.3 percent of the total national workforce (table 5.10). Yet, privatization's effect on the rate of unemployment was probably important. Job losses stemming from privatization equal about 13 percent of the change in unemployment from 1987–90 to 1997 (table 5.10).[22]

Changes in employment were relatively abrupt and concentrated within a short period of time. In addition, the overall economy underwent widespread restructuring during this period, making reemployment of laid-off workers difficult (Galiani, Gertler, Schargrodsky, and Sturzenegger 2001). Many workers in POEs were dismissed in preparation for privatization. The government produced an estimate of the optimal workforce size for each POE; however, this estimate significantly underestimated the reduction in workforce that finally occurred.

Estache, Carbajo, and de Rus (1999) report that employment in the railways company, FFAA, was reduced by 72,000 in the first three years after privatization, constituting 90 percent of that company's total reduction in employment. Before privatization, the federal government—under a World Bank-sponsored plan—had arranged a portion of this sector's employment reduction (Ramamurti 1997). From a total of 92,000 railway employees at the time of privatization, 30 percent accepted voluntary retirement. The petroleum company also implemented an aggressive program of voluntary retirement: 64 percent of the 37,000 workers in that company joined the voluntary retirement program at the time of the privatization.

22. These numbers are calculated using Argentina's total urban employment and unemployment. If one only considers the corresponding numbers for Greater Buenos Aires (GBA), the percentage of change in unemployment rises to 25 percent.

Table 5.9 Household poverty changes for selected public services

	Telephone		Natural gas		Electricity		
1985–86	FOA	SOA	FOA	SOA	FOA	SOA	1996–97
0.1127	0.1016	0.1016	0.0994	0.0994	0.0954	0.0950	0.1965
0.0316	0.0285	0.0285	0.0287	0.0286	0.0270	0.0266	0.0681
0.0133	0.0118	0.0118	0.0123	0.0123	0.0110	0.0108	0.0346

FOA = first-order approximation
SOA = second-order approximation

Source: Authors' calculations, based on HES (INDEC).

Thus, firm-level data indicates that job loss associated with privatization was important. However, the analysis of PHS employment data reveals a somewhat different picture. These data show no clear evidence of a significant change in privatized sectors' total participation on aggregate employment. Rather, while these sectors' public side shrank, the private side gained participation and largely compensated for reduced public employment.

The PHS does not allow one to distinguish those individuals working in a privatized company from all other workers performing activities in that sector. However, it is possible to distinguish public from private employment levels in the affected sectors. Table 5.11 shows the evolution of these numbers for 1989–97. Public employment in the privatized sectors decreased from about 2 percent to nearly 0 percent, while private-sector employment increased from 5.37 to 6.97 percent. Total private and public employment in those sectors directly affected by privatization was 7.32 percent of total employment in the economy in 1989. Even though this percentage decreased immediately after privatization began, it then recovered to 7.06 percent as employment in the private side of the privatized sectors increased by 1997.

In the sectors studied, public employment decreased from an average of 0.8 percent in the years before privatization (1989–91) to nearly 0 percent in 1997. By 1993, most of the reduction in public employment had occurred. Private employment in these sectors, however, grew over most of the decade. The process of adjustment first reduced the total labor force employed in the privatized sectors; however, levels slowly recovered as the new private organizations normalized services provision. Even though the behavior of public and private employment during this period shows an inverse relationship, the expansion of the latter did not fully compensate the reduction in former. As a result, the participation of privatized sectors in total employment experienced some decline.

Qualitative Changes in Employment

Argentina's public sector tends to employ workers with more education than the private sector. Nearly half of private-sector workers are low-skilled

Table 5.10 Employment in privatized firms as a proportion of total employment and change in total unemployment

Company	E		E/TE (percent)		Layoffs	Layoffs/ΔTU (percent)
	1987–90	1997	1987–90	1997		
AA (airline)	10,283	4,840	0.11	0.04	5,443	0.48
ENTEL (telecommunications)	45,882	29,690	0.48	0.27	16,192	1.43
FFAA (railway)	92,000	17,000	0.96	0.15	75,000	6.61
GE (natural gas)	9,251	3,462	0.10	0.03	5,789	0.51
OSN (water)	9,448	4,251	0.10	0.04	5,197	0.46
SEGBA (electricity)	21,535	7,945	0.22	0.07	13,590	1.20
YPF (oil)	34,870	5,700	0.36	0.05	29,170	2.57
Total	**223,269**	**72,888**	**2.32**	**0.66**	**150,381**	**13.24**

E = employment in each company
TE = total employment
TU = total unemployment

AA = Aerolíneas Argentinas
ENTEL = Empresa Nacional de Telecomunicaciones
FFAA = Ferrocarriles Argentinos
GE = Gas del Estado
OSN = Obras Sanitarias de la Nación
SEGBA = Servicios Eléctricos del Gas Buenos Aires
YPF = Yacimientos Petrolíferos Fiscales.

Sources: CNC; ENARGAS; ENRE; SIGEP; Estache, Carbajo, and de Rus (1999).

individuals, while public-sector employees tend to have secondary or post-secondary qualifications. During privatization, a significant shift occurred in employment composition by education level.[23] The electricity, gas, and water sectors have transitioned toward a more qualified labor force (especially through changes in extreme groups of the distribution of education levels, reducing the relative participation of workers with primary education and increasing workers with higher education). In telecommunications and transportation—the other major privatized sectors—the participation of workers with secondary education has increased. Before privatization, the percentage of employees in these two sectors who had completed secondary studies was 41 percent for those working on the public side and 45.5 percent for those on the private side. After privatization, this percentage increased to nearly 50 percent (by that time, virtually all employees were working on the private side).

Workers with higher levels of education increased their participation in the private side of all sectors. Since privatization reduced public employment significantly, these changes partly account for better-educated workers' increased participation in the private sector after privatization (qualified

23. Analysis of the qualitative characteristics of the labor force employed during privatization is based on detailed discussions not provided due to limited space. See Ennis and Pinto (2003).

Table 5.11 Privatized-sector employment as a percentage of all sector employment, 1989–97

	Public sector			Private sector			Total		
Year	E, NG, and W	T & T	Total	E, NG, and W	T & T	Total	E, NG, and W	T & T	Total
1989	0.51	1.44	1.95	0.05	5.32	5.37	0.56	6.76	7.32
1990	0.83	0.83	1.66	0.10	3.92	4.03	0.93	4.75	5.69
1991	1.00	0.68	1.68	0.02	4.17	4.19	1.02	4.85	5.87
1992	0.14	0.43	0.58	0.48	4.08	4.56	0.62	4.51	5.14
1993	0.00	0.11	0.11	0.41	4.97	5.38	0.41	5.08	5.49
1994	0.02	0.24	0.27	0.61	6.32	6.93	0.63	6.56	7.19
1995	0.07	0.12	0.19	0.53	5.72	6.25	0.60	5.84	6.44
1996	0.05	0.00	0.05	0.73	6.47	7.20	0.78	6.47	7.25
1997	0.05	0.05	0.09	0.53	6.44	6.97	0.58	6.49	7.06

E = electricity
NG = natural gas
W = water
T & T = telecommunications and transportation

Sources: PHS data (INDEC).

employees who lost their public-sector jobs were, in part, rehired by private firms). For all sectors considered, the percentage of workers with primary schooling has declined, on average; while the percentage of workers with secondary or higher education has increased.

On average, individuals employed in the private sector work more hours than those in the public sector. Moreover, during the 1990s, the average number of hours worked per week in the public sector decreased from 42 to 36, while that in the private sector decreased slightly from 45 to 44. The variability of hours worked in the private sector is higher than in the public sector, and this variability increased after 1991. The latter might be an indication of greater flexibility in labor-market rules during the 1990s, which allowed firms to offer a broader set of labor contracts (the frequency of part-time jobs increased significantly). Similar conclusions hold for all privatized sectors (electricity, natural gas, water, telecommunication, and transportation). The private portion of these sectors tended to employ workers for a longer time and with a higher dispersion of the number of hours worked. By 1997, most workers in these sectors became subject to the regime of private employment, which contributed to increased income heterogeneity among those workers. The average number of hours worked on the public side of the privatized sectors was higher, and the standard deviation smaller than in the public sector overall.

During 1989–95, job security decreased across all sectors; however, the decrease was more significant in those sectors directly subject to privatization (in 1995, average tenure declined from nearly 15 years to only 5).

This change suggests that employees with long careers in the POEs might have suffered the consequences of layoffs in that sector. Moreover, these individuals had a reduced likelihood of regaining employment, as they tended to be older and their skills more specialized.

Data quality and coverage were problematic with regard to privatization's effect on wages. For example, to identify wage changes associated with privatization, we considered 1991 as the preprivatization period even though the process started in 1989. Because the PHS did not distinguish between public and private organizations before 1989, it was not possible to differentiate between public and private employment in the privatized sectors before that year. Moreover, the hyperinflation of 1989–90 affected the quality of the data for those years and introduced noise in the wage structure. For these reasons, we compare the postprivatization wage structure of 1997 with that of 1991.[24] Three changes are noteworthy:

- The skill premium that workers with higher education earned significantly increased after privatization.
- The wage profile became steeper with increased tenure (i.e., wages rose as tenure did).
- No significant wage differential was found between public and private workers, either before or after privatization.

In general, the public sector tended to employ more middle- and high-income workers. The income composition of employment did not change much after privatization. In the privatized sectors, private-sector income distribution was relatively uniform before privatization (compared to the public sector), and changed toward a higher concentration of workers in the third- and fourth-income quintiles. Public-sector income distribution before privatization was bimodal (with modes in the second and fourth quintiles), and this pattern was more pronounced in the privatized sectors.

Income distribution of the labor force employed in other parts of the private sector—that is, private but not directly subject to privatization—is similar to that of the privatized sectors. The changes in the distribution were also similar, except that the proportion of agents in the fourth quintile decreased. It is possible that, after privatization, the private side may have rehired many workers employed on the public side before privatization, particularly those in the fourth quintile. This explanation is consistent with the increased proportion of fourth-quintile workers in the private side of the privatized sectors. In sum, privatization does not appear to influence greatly the evolution of worker income distribution in each of the sectors.

24. It is possible to think that, as it would take time for relative wages to fully adjust to the post-privatization equilibrium, the 1991 wage structure would better represent the structure before privatization (compared with 1989 and 1990, when Argentina underwent hyperinflation).

Table 5.12 Gini coefficient

Year	$G^{91}(1)$	$G^{91}(2)$	Change (percent)	Year (t)	$G^{t}(1)$	$[G^{91}(2) - G^{91}(1)]/[G^{t}(1) - G^{91}(1)]$ (percent)
1991	0.4390	0.4554	3.75	1995	0.5405	16.16
				1996	0.5484	14.99
				1997	0.5151	21.55

Note: $G^{91}(1)$ and $G^{t}(1)$ are the Gini coefficients for 1991; t = 1995, 1996, and 1997 when all unemployed individuals are imputed an income equal to zero. $G^{91}(2)$ is the authors' constructed measure.

Source: Authors' calculations, based on PHS data (INDEC).

Inequality and Poverty

To estimate the extent to which privatization's effects on workers affected income inequality and poverty, we considered the two main aspects of the problem. First, we investigated the effect on employment and unemployment. We provided upper-bound estimates, assuming that all workers who lost their jobs during privatization failed to find new ones after the period. Second, we computed various wage inequality measures to approximate the change in inequality that occurred among those who remained employed.

Changes in Employment Level

What is the upper bound—the maximum amount possible—for the change in income inequality attributable to the changes in employment associated with privatization? To estimate this effect, we used 1991 as their reference year and computed two Gini coefficients constructed under different assumptions. The first Gini, $G^{91}(1)$ in table 5.12, included all individuals in the 1991 survey.[25] To calculate the second Gini, $G^{91}(2)$, we assumed that all workers laid off because of privatization during 1989–95 switched to permanent unemployment. Accordingly, we then randomly selected individuals from the pool of workers employed on the public side of the privatized sectors in 1991, imputed their income as equal to zero, and recalculated the Gini coefficient with these new imputed incomes. The proportion of individuals chosen is given by the change in public employment from 1989 to 1995 in the privatized firms (table 5.11).[26] We also calculated Gini coefficients for 1995, 1996, and 1997, assigning zero income to those individuals who reported unemployment for the corresponding years.

25. Unemployed individuals were imputed an income equal to zero.

26. Given that some individuals have an income equal to zero, Atkinson inequality measures cannot be computed for certain values of the parameter v; thus, only the Gini coefficient is reported.

Table 5.13 Poverty indicators, individuals

Year	α	$P^{91}(1)$	$P^{91}(2)$	Change (percent)	Year	$P^{t}(1)$	$[P^{91}(2) - P^{91}(1)]/[P^{t}(1) - P^{91}(1)]$ (percent)
					1995	0.2475	15.37
	0	0.0914	0.1154	26.25	1996	0.2732	13.20
					1997	0.2260	17.83
					1995	0.2122	17.92
1991	1	0.0772	0.1014	31.31	1996	0.2342	10.32
					1997	0.1852	13.06
					1995	0.2033	18.54
	2	0.0724	0.0966	33.53	1996	0.2234	10.86
					1997	0.1733	14.00

Note: $P^{91}(1)$ and $P^{t}(1)$ are the corresponding measures for 1991; t = 1995, 1996, and 1997. $P^{91}(2)$ is the authors' constructed measure.

Source: Authors' calculations, based on PHS data (INDEC).

Table 5.12 shows that the Gini coefficient would have been 3.75 percent higher if all dismissed workers had remained permanently unemployed. The Ginis for 1995, 1996, and 1997 show an inequality increase of at least 17 percent over the Gini of 1991, $G^{91}(1)$, implying that privatization's unemployment effect explains, at most, 16 to 22 percent of the change in inequality (depending on the final year under consideration). The remainder may be attributable to other changes affecting the performance of Argentina's economy during that period.

Table 5.13 shows the change in the Foster, Greer, and Thorbecke poverty measure from 1991 to 1995, 1996, and 1997. $P^{91}(2)$ is calculated using the same approach as the one used to compute $G^{91}(2)$ above. The number of poor (corresponding to the poverty measure when $\alpha = 0$) would have increased 26.25 percent (from 9.14 to 11.54 percent) if all workers in privatized firms who lost their jobs had remained unemployed. One should note that the number of poor effectively increased by nearly 16 percent during 1991–95 ($[P^{95}(1) - P^{91}(1)]$), while this percentage increased between 1991 and 1996 and decreased between 1991 and 1997. The last column estimates the change in poverty resulting from privatization. The values correspond to the difference between $P^{91}(1)$ and $P^{91}(2)$ as a proportion of the effective change in the poverty indicator. These results differ, depending on the final year considered; on average, however, the change in unemployment stemming from privatization can explain only 15 percent of the total change in the number of poor individuals. The measure of poverty with $\alpha = 1$ indicates that a large proportion of poor individuals in 1995, 1996, and 1997 had income further away from the poverty line, compared to 1991.

Changes in Relative Wages

To assess privatization's effect on inequality, it is also important to evaluate the changes on wage distribution among employed agents. Table 5.14 shows

Table 5.14 Wage inequality among employed

Gini coefficient	1989	1991	1995	Change (percent) 1989–95	1991–95
Total	0.49	0.39	0.41	–15.9	6.2
Public	0.40	0.33	0.34	–14.2	3.7
Private	0.50	0.40	0.42	–16.6	5.5
Privatized	0.44	0.34	0.40	–5.8	16.0

Source: PHS data (INDEC).

that wage inequality across Argentina's economy substantially decreased from 1989 to 1995. However, if one compares 1991 and 1995, the previous conclusion does not hold. Wage inequality increased between those two years, and this effect is even more important in the privatized sector.[27]

Fiscal Effect

In 1989, the main POEs received fiscal transfers from the federal government equal to 1.92 percent of GDP. This number fell to 1.06 percent of GDP in 1990 (FIEL 1992). Even after these transfers, when capital expenditure is included, the POEs had a negative balance that had to be financed with private and public loans. The federal transfers imply that funds were insufficient to finance capital expenditures. The resulting limitations on investment help explain the evident obsolescence of the infrastructure and the low quality of the services provided before privatization.

In aggregate, the POEs had an operative surplus for several years before privatization began; however, certain firms were notorious for their large deficits. Ramamurti (1997), for example, documents that, before privatization, FFAA (the railways company) was receiving $829 million per year to cover its operating deficit and $298 million per year to finance capital projects—a subsidy of more than $3 million per day.

In 1990–91, just before privatization reform, government deficits were historically low, owing to the financial restrictions on the government during the hyperinflation of the late 1980s. Supporting this hypothesis is the fact that total public expenditure, as a percentage of GDP, decreased from 34 to 29 percent over this period.

Both cash and government bonds were used to pay for the privatized companies. Privatizations at all levels of government from 1990 to 1999 produced total revenue of $23.9 billion. Federal sales generated $19.4 billion (72 percent in cash and the rest in bonds, valued at market price). Additional

27. We also computed the Atkinson coefficient of inequality for various parameter values and obtained similar results. See Ennis and Pinto (2003).

cash revenue was later generated through sale of oil and telecommunications companies' shares that the government had initially retained at the time of ownership change.[28] Provincial governments, on the other hand, collected $4.4 billion (paid in cash) from privatizations that started in 1993.

During 1990–93, as a result of privatization, the government recovered $10 billion of public debt, equivalent to one-third the total amount of public bonds outstanding in 1990 and 13 percent of the total public debt in 1990 (about $79 billion). However, during the 1990s, the government consistently created new debt, more than offsetting the reductions brought about by privatization; thus, the total outstanding debt in the form of public bonds grew steadily over this period.

It is difficult to determine privatization's effects on social expenditure. Argentina undertook broad public-sector reform during the 1990s. As the number of public employees decreased—stemming not only from privatization—total public expenditures decreased from 33 percent of GDP during the 1980s to 27 percent during the 1990s. However, social expenditure, as a percent of GDP, increased over the same period.[29] The main reduction in overall public expenditure, excluding the decline in government operational costs, came from the rollback of state involvement in directly productive, economic activities. For example, energy, gas, and communications were important categories of public expenditures that experienced major reductions stemming from the privatization process.

After 1980, social expenditure (as a proportion of public expenditure) increased, peaking during the mid-1990s. While the percentage of total expenditures devoted to interest payments of the public debt decreased during the first years of privatization, it increased thereafter. There is a strong negative correlation (–0.7) between the percentage of total expenditure dedicated to social aims and the corresponding percentage used to pay interest on public debt. This correlation can indicate a crowding-out effect on social expenditures. To the extent that privatization reduced the amount of outstanding public debt, and, hence, the amount of annual interest payments, social expenditure may have increased as a result of less fiscal pressure.

Summary and Conclusions

We assessed privatization's redistributive effects in Argentina, particularly its consequences for consumption, employment, and fiscal conditions. To reiterate, the analysis was limited by the scarcity and poor quality of empirical data.

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28. Delfino and Casarin (2001) estimate that about $2 billion for these extra cash revenues originated in telecommunications privatizations.

29. Social-public expenditure includes expenditures on education, social security, health services, housing, assistance to poor households, and other urban services.

On the consumption side, we calculated the change in welfare caused by price changes and changes in access to privatized public utilities. We concentrated on privatization in the telecommunications, natural gas, and electricity sectors, but also reviewed preliminary evidence related to the water and sewerage sector. In terms of household expenditure, the electricity sector was the most important before and after privatization. The other sectors were relatively small before privatization but increased their participation notably (in terms of expenditure) as a result of reforms. With regard to access, many more households have connected to telephone, natural gas, and water networks after privatization, particularly lower-income households. However, the case of electricity is unique: The change in access was not as significant, given that connection to the electricity network was common before privatization.

Following privatization, relative prices changed; however, it is unclear how much of this change is attributable to privatization. We argue that relative prices of public services decreased because of privatization, although this conclusion is sensitive to the choice of reference periods. Even if prices have not decreased, the quality of the services provided have increased markedly in quality after privatization.

To measure privatization's effect on consumption, we computed the change in consumer surplus attributable to privatization and distinguished the effects on households with access for every period and households that gained access. The combination of these two effects revealed that the change in welfare is mostly driven by the electricity sector. For both the telecommunications and natural-gas sectors, the access effect is more important than the effect associated with price change. In general, however, these effects are relatively small. Finally, we found that the limited evidence suggests that the effects of privatizations on consumers have not produced large changes in the traditional measures of inequality and poverty.

With respect to employment, notable qualitative changes were observed after privatization; nonetheless, the quantitative effects were small. In sectors subject to privatization, the public-employment level declined by about 150,000 jobs; while the private-employment level expanded, partially compensating for the losses. In terms of working conditions, the privatized sectors have moved toward the labor organization and work terms that predominate in those sectors primarily controlled by the private sector. As our calculations show, employment changes caused by privatization have not significantly influenced the usual measures of inequality and poverty.

Finally, in terms of privatization's effects on fiscal conditions, available evidence suggests that Argentina's privatization allowed for a significant initial reduction in interest payments on the public debt. Moreover, this reduction in fiscal need might have contributed to reducing the crowding out of social public expenditures in the early 1990s.

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Appendix 5A
First- and Second-Order Approximations of Mean Decile Change in Welfare

One can let N_t^d equal the total number of households sampled from decile d in period t, F_{jt}^d the number of households in decile d at time t with access to the formal sector j, and I_{jt}^d those households with informal connection (or no access), so that $N_t^d = F_{jt}^d + I_{jt}^d$. If one considers 1985–86 the preprivatization period ($t = 0$), and 1996–97 the postprivatization period ($t = 1$), it then follows that (F_{j0}^d/N_0^d) represents the proportion of households with formal access in both periods, and $[(F_{j1}^d/N_1^d) - (F_{j0}^d/N_0^d)]$ is the proportion with no access (or informal connection) that later gained access to a formal connection. To compute the change in welfare for those households that gained access after privatization, we use the postprivatization period as the reference period and, for each household h and service j, we compute a virtual price ($p_{h,jv}$) using the estimates reported in table 5.6. Therefore, the FOA of the mean decile change in welfare resulting from privatization of public service j is

$$E\Delta U_j^d = \frac{F_{j0}^d}{N_0^d}\frac{1}{F_{j0}^d}\sum_{h\in d:A_{j0}^h=1}\Delta_1 U_j^h - \left(\frac{F_{j1}^d}{N_1^d} - \frac{F_{j0}^d}{N_0^d}\right)\frac{1}{F_{j1}^d} \sum_{h\in d:A_{j0}^h=1}(\log p_{jv}^h - \log p_{j1})w_{j1}^h x_{j1}$$

where A_{jt}^h is an indicator variable of whether household h has access ($A_{jt}^h = 1$) or not ($A_{jt}^h = 0$) to service j at time t. For the SOA, we adjust the previous calculations by allowing some quantity response; thus, the formulas for the changes in utility become

$$E\Delta U_j^d = -\frac{F_{j0}^d}{N_0^d}\frac{1}{F_{j0}^d}\sum_{h\in d:A_{j0}^h=1}\Delta_1 U_j^h\left[1 + \frac{\Delta \log p_j}{2}\frac{\partial \log w_{j0}^h}{\partial \log p_j}\right] - \left(\frac{F_{j1}^d}{N_1^d} - \frac{F_{j0}^d}{N_{j0}^d}\right)\frac{1}{F_{j1}^d}\sum_{h\in d:A_{j0}^h=1}(\log p_{jv}^h - \log p_{j1})w_{j1}^h x_{j1}\left[1 + \frac{(\log p_{jv}^h - \log p_{j1})}{2}\frac{\partial \log w_{j0}^h}{\partial \log p_j}\right].$$

Expected Welfare Change

First, we assume that the change in utility of households that gained access in decile d after the privatization of public service j is given by the following FOA and SOA:

$$E(\Delta U_j^d | A_{j0}^h = 0, A_{j1}^h = 1) = \frac{1}{F_{j1}^d} \sum_{h \in d: A_{j1}^h = 1} (\log p_{jv}^h - \log p_{j1}) w_{j1}^h x_{j1},$$

and

$$E(\Delta U_j^d | A_{j0}^h = 0, A_{j1}^h = 1) = \frac{1}{F_{j1}^d} \sum_{h \in d: A_{j1}^h = 1} (\log p_{jv}^h - \log p_{j1})$$

$$w_{j1}^h x_{j1} \left[1 + \frac{(\log p_{jv}^h - \log p_{j1})}{2} \frac{\partial \log w_{j1}^h}{\partial \log p_j} \right].$$

The previous equations represent the expected change in welfare attributed to the change in access for decile *d*, and consist of the average difference between the virtual price and the price after privatization weighed by the amount spent on public service *j*. Note that the expressions are estimated using survey data after privatization.

Because we cannot determine which households in the period before privatization (1985–86) gained access, we randomly select households from decile *d* without access before privatization and add the expected change in utility from access shown above. Assuming that all households in 1985–86 (period 0) had the same probability of gaining access after the privatization (period 1), the fraction of households chosen from decile *d* is given by

$$\tau = \frac{\left(F_{j1}^d / N_1^d\right) - \left(F_{j0}^d / N_0^d\right)}{1 - \left(F_{j0}^d / N_0^d\right)},$$

where τ is the conditional probability of having access in period 1, given that the household lacked access in period 0. The proportion of households without access in period 1, given that they did not have access in the previous period, $(1 - \tau)$, will only be affected by the privatization process if the price of substitutes changed. In this exercise, we do not consider this effect.