
Inequality and Welfare Changes: Evidence from Nicaragua

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In countries that have implemented mass privatization programs, such as the transition economies of Eastern Europe, it seems reasonable to think that the divestment process affected the overall economy, rather than a single firm, group of firms, or economic activity. The large flow of workers from the public to the private sector alone might have affected economywide inequality. To the extent that it also affected labor-market institutions, privatization could have significantly affected private-sector, as well as public-sector, inequality through changes in employment, productivity, and wages.¹ Privatization of public utilities, in turn, might have affected consumer welfare through changes in access, pricing, and service quality.²

Nicaragua's privatization occurred under conditions that were nearly identical to those that the transition economies of Eastern Europe faced: Nicaragua had undergone a socialist period, and authorities had conducted extensive

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1. Newbery (1995), for example, shows that such reforms as privatization might increase income inequality through price changes.
2. See McKenzie and Mookherjee (chapter 2) and references therein.

transfer of ownership to the public sector through nationalization and expropriation of private enterprises (De Franco 1996; Buitelaar 1996). In 1989, two years before initiating the privatization effort, most of the country's productive capacity was in public hands. Excluding the banking sector, public utilities, and state-held infrastructure services, including airports and ports, state owned enterprises (SOEs) produced approximately 30 percent of GDP.³

Unlike the former socialist countries of Eastern Europe, however, Nicaragua was under a planned economy for only a decade (1980–90), during which time the country experienced civil war. When the socialist regime lost the 1990 elections, the newly elected government initiated a large-scale, economic liberalization program aimed at stabilizing the economy, including the divestment of SOEs (CORNAP 1993). In addition to the political constraints that transition economies typically face (e.g., pressure to move swiftly from a command to a market system, low financial savings, and strong union power), Nicaraguan authorities faced an unusually large demand for firms whose main asset was cultivable land, especially from war veterans and demobilized army soldiers. In addition, immigration pressures were strong, as the former elite and professional middle and upper-middle classes returned from abroad.

We divide Nicaragua's privatization process into two overlapping phases: 1991–96 and 1995–99. The first phase was characterized by the divestment of SOEs under the control of the National Corporation of the Public Sector, known by its Spanish acronym, CORNAP. Created in 1990 to privatize some 350 SOEs that operated in various sectors (e.g., farming, fishery, industry, forestry, mining, commerce, trade, transportation, construction, and tourism), CORNAP assumed direct control of the SOEs, 22 of which it clustered into shareholding companies labeled as corporations. The second phase of privatization began in 1995 and continued through at least 1999, the last year for which data are available. During 1995–98, a comprehensive reform package was launched, aimed at the eventual full privatization of public utilities. In certain areas, however, private-sector participation was immediately allowed, and some SOEs were given in concession to the private sector (e.g., in telecommunications and electricity, where private participation had been allowed since 1995 and 1997, respectively). Despite severe data constraints, this chapter attempts to capture the welfare effects of reform, with regard to changes in access, pricing, and service quality.

Data and Methodology

The data used were obtained, for the most part, from three surveys: Living Standard Measurement Surveys for 1993 and 1998 (LSMS-93 and LSMS-98,

3. Value added comprised 45 percent of manufacturing, 70 percent of mining, and 26 percent of agriculture. For a full account, see CORNAP (1993).

respectively), conducted by the Nicaraguan Instituto de Estadísticas y Censos, and the Household Income and Expenditure Survey for 1999 (HIES-99), conducted by the Central Bank of Nicaragua.

The LSMS-93 and LSMS-98 were nationwide surveys based on methods the World Bank used in its Living Standards Measurement Study. LSMS-93 included information on household characteristics, including education, health, employment, migration, and household expenditures. LSMS-98 added an extended questionnaire, which included questions on anthropometric data, fertility, time allocation, independent businesses, and household savings. Both surveys had a complex design that used population weights, two-stage sampling, and stratification; both interviewed some 25,000 individuals in approximately 4,500 households.

The HIES-99 was a nationwide urban survey that collected information on housing, household characteristics, and household income and expenditure. Like the two LSMSs, the HIES-99 also had a complex design using population weights, two-stage sampling, and stratification; some 5,900 households in approximately 4,800 dwellings were interviewed.

For employment and earnings data, we use those portions of the survey that list the principal job of all individuals aged 15 and older. Given the differences at the individual level in hours worked per day and days per week, as well as frequency of payment, earnings were computed in hourly terms to facilitate comparisons. In the case of consumption expenditures, data was gathered on weekly household consumption of food products, monthly household consumption expenditures, and biannual expenditures on clothing and home appliances. Again, the various measures were homogenized into a single frequency unit. All expenditure data were transformed into monthly real data using the consumer price index reported by the Central Bank of Nicaragua.

For selected descriptive statistics, establishment-level data generated by the Ministry of Labor was used to calculate national labor-market aggregates. Administrative data from public utilities, regulatory agencies, CORNAP, and the Central Bank of Nicaragua were used to calculate performance of CORNAP divestment, including number of privatized firms, beneficiaries of the privatization process, divestment methods, and fiscal effects of the divestment process.

Privatization Process

Divestment of CORNAP Enterprises

CORNAP's divestment of commercial enterprises occurred almost entirely between 1991 and 1998 (De Franco 1996). At the beginning of the period, most enterprises under CORNAP had large debts, and a large portion of their assets were subject to restitution claims from previous owners whose

property had been confiscated in the 1980s. The capital stock of most SOEs under CORNAP was highly depreciated or obsolete. Many SOEs presented negative cash flows, and their revenue contribution to the government was less than the large quasi-fiscal deficits that they generated.

The above constraints forced CORNAP to divest enterprises through various methods: liquidation, merger and acquisition, restitution, and sale or lease. Liquidation consisted of dissolving the enterprise, usually justified on grounds of financial nonviability, lack of investor interest, or other reasons rendering the firm inoperable. Merger or acquisition consisted of fusing an SOE to an existing firm, or incorporating it into a state institution, such as a ministry or government facility (whenever it was believed that the state should continue providing the good or service in question). Restitution involved returning firms, assets, or shares to their previous owners or their relatives or heirs. Finally, firms could be divested through a sale of the firm, assets, or shares, or through a lease, which gave temporary rights to the assets of a firm and/or the management thereof. This arrangement also gave the leasing party the option to buy the firm. Certain enterprises used only one method, while others used various ones (Central Bank of Nicaragua 1996). As table 3.1 shows, by 1998, nearly 98 percent of the 351 enterprises under CORNAP—with the exception of a few manufacturing and construction firms—had been divested (De Franco 1996).

Table 3.2, which summarizes the results of CORNAP divestment, shows that, for the 1991–96 period, acquisitions and restitutions corresponded to approximately 25 percent and 28 percent, respectively, of total divested assets. The remainder was divested through sales or leases. In terms of beneficiaries, more than 47 percent of total assets divested through CORNAP ended up in the hands of entrepreneurs, roughly 28 percent remained in the public sector through acquisitions by other government institutions, and the remainder went to workers and war veterans. As table 3.2 shows, all restitutions went to entrepreneurs, while all acquisitions went to other government institutions. Distribution of divested assets among beneficiaries and the structure and incentives that emerged from the divestment process suggest that privatization might have consequently affected income distribution. For example, Buitelaar (1996) explains that 47 percent of divested manufacturing firms became conventional firms, 15 percent co-managed firms, 8 percent worker-owned firms, and the remainder liquidated. Buitelaar also shows that 68 percent of conventional firms were returned to the original owners, who had been expropriated during the 1980s. These firms were the only ones with access to new capital investment and the only ones that increased efficiency and profitability. Comanaged firms also increased productivity to a lesser extent, while worker-owned firms were unable to do so. Worker-owned firms tended to underinvest, which eventually led to their failure, with most workers turning to agricultural activities.

Table 3.1 Nicaragua: Privatization under CORNAP, 1993 and 1998

Corporation or enterprise	Number of enterprises	Year privatized	
		1993	1998
Corporations and enterprises under CORNAP	351	289	343
Farming public-sector corporations	80	76	80
Agroindustry (CONAZUCAR)	9	8	9
Banana production (BANANIC)	2	2	2
Coffee (CAFENIC)	14	13	14
Livestock (HATONIC)	16	16	16
Milk (CONILAC)	3	3	3
Poultry (CAN)	5	5	5
Promotion of agroexport products (AGROEXCO)	7	7	7
Rice (NICARROZ)	8	8	8
Tobacco (TABANIC)	5	5	5
People's industry corporations (COIP)	89	57	83
Primary sector of economy linked	30	23	30
Fishery (INPESCA)	7	7	7
Forestry (CORFOP)	13	10	13
Mining (INMINE)	10	6	10
Internal and external trade linked	83	73	81
Commerce (CORCOP)	34	33	34
Construction supply (CATCO)	21	14	19
Foreign trade enterprises (CONIECE)	7	7	7
Imports and farming services (IMSA)	11	9	11
Pharmaceuticals (COFARMA)	10	10	10
Transportation and construction linked	28	23	28
Construction enterprises (COENCO)	6	6	6
Transportation (COTRAP)	22	17	22
Nicaraguan tourism corporation (COTUR)	30	27	30
Autonomous enterprises ^a	11	10	11
Agroindustrial enterprise of Sébaco	1	1	1
Agroindustry (IFRUGALASA)	2	2	2
Agroindustry (YUCASA)	1	1	1
Construction (SOVIPE-ENFARA)	1	1	1
ENDEPARA African palm El Castillo	1	1	1
ENDEPARA African palm Kucra Hill	1	1	1
Engineers (PROA)	1	1	1
Enterprise Arlen Siu	1	1	1
Grains (ENABAS)	1	0	1
SOVIPE Investments	1	1	1

a. Enterprises whose shares corporations under CORNAP did not hold.

Source: Central Bank of Nicaragua.

Table 3.2 Nicaragua: CORNAP and beneficiary divestment procedures, 1991–96 and 1997–2000

Period and procedure	As percent of total asset value				Total
	Entrepreneurs	Workers	War veterans	Other government institutions ^a	
1991–96	47.4	12.9	1.5	27.9	89.7
Acquisitions	0.0	0.0	0.0	25.0	25.0
Restitution	28.4	0.0	0.0	0.0	28.4
Sales and leases	19.0	12.9	1.5	2.9	36.3
Cash and credit sales	12.1	6.1	0.5	0.0	18.7
Lease with option to buy	0.0	4.9	1.0	0.0	5.9
Transferred liabilities ^b	6.9	1.9	0.0	2.9	11.7
1997–2000	7.7	1.4	0.2	1.0	10.3
Total	55.1	14.3	1.7	28.9	100.0

a. Composed mainly of government institutions.

b. Refers to transfers of outstanding debts.

Source: Central Bank of Nicaragua.

Reform and Privatization of Public Utilities

During 1995–99, utilities remained in public hands. However, with enactment of the telecommunications law of 1995,⁴ the legal framework required to privatize utilities began to take shape and continued with passage of two other laws intended to prepare energy and water to be fully privatized and sewage to be given in concession to the private sector.⁵ Privatization of electricity distribution did not occur until 2000. Telephone service followed a year later, as did a portion of energy generation in 2002. Private participation (less than full ownership) was allowed in telecommunications in 1995 and in electricity generation in 1997.

Telecommunications

Before 1995, the state-owned Telecomunicaciones y Correos de Nicaragua (TELCOR) was the telecommunications monopoly. In 1995, the National Assembly passed a law creating a new enterprise, Empresa Nicaragüense de Telefonía (ENITEL),⁶ by exchanging TELCOR assets for shares accruing

4. See Ley 210: Incorporación de Particulares en la Operación y Ampliación de los Servicios Públicos de Telecomunicaciones (1995), and its later reform, Ley de Reformas a la Ley 210: Ley de Incorporación de Particulares en la Operación y Ampliación de los Servicios Públicos de Telecomunicaciones (1998).

5. For energy and water, see Ley de la Industria Eléctrica (1998) and Ley General de Servicios de Agua Potable y Alcantarillado Sanitario (1998), respectively.

6. The law also created another enterprise, Correos de Nicaragua, to provide postal service.

to the government. The law authorized the government to sell up to 40 percent of ENITEL shares to a firm or group of firms, which would also be awarded a management contract. The law committed the government to donate and sell 1 and 10 percent of shares, respectively, to employees, and to gradually sell remaining shares through public offerings (or bids), starting six months after the initial sale. Finally, the law entitled the government to a single control share, which it needed for any substantial sale of the company's assets, change in its social objectives, or to allow new owners to take steps to dissolve or merge the company.

Initial sale of 40 percent of company shares occurred in 2001 through a two-stage process: (1) preselection of potential buyers and (2) public bidding among selected candidates. Delays in the sales process were attributed to the burden of preselection criteria and required investment/expansion plans to which the buyer would be contractually bound.⁷ Equally important delaying factors were the difficulty of obtaining audited financial statements and large outstanding debt with providers.

One key provision of the reform was that TELCOR would remain the regulatory agency. The main regulatory mechanism would be the signing of concession contracts between TELCOR and ENITEL. Such contracts were required to state how services should be provided, service quality, coverage area, system charges, and expansion plans.

Electricity

Before reforms, the state-owned Instituto Nicaragüense de Energía (INE) was engaged in electricity generation, transmission, and distribution. In 1997, private-sector participation was allowed in generation, and some state-owned generating plants were given to the private sector in concession. In accord with emerging best practices in the sector, the 1998 law vertically separated generation, transmission, and distribution, by unbundling INE into six companies: three generation plants, one transmission company (Empresa Nicaragüense de Transmisión de Energía, S.A., or ENTRENESA), and two distribution companies.

In addition to INE's unbundling, the law created a national energy commission to design policies and strategies regarding the energy sector, while INE remained the regulatory agency. INE, therefore, is in charge of carrying out three major tasks: promoting competition by guarding against collusion among providers, keeping firms from taking dominant market positions, and setting system charges according to efficiency considerations. The objective is that final prices remain close to competitive prices and financial viability, and that sufficient revenue is allowed to recover investment, operation, and maintenance costs and service expansion-related

7. Preselection criteria included lower bounds on the potential experience of the buyer, billing volume, minimum number of active subscribers, and minimum capital size.

expenditure. In an attempt to set prices right, distribution companies must submit system charges to INE. The latter would review the proposal and allow changes to approved charges only in cases where the general price level or energy costs change. In addition, the law authorizes INE to grant tax exemptions to the importing of machines, equipment, and other materials used in electricity generation, transmission, distribution, and commercialization, as long as these exemptions do not conflict with general tax laws.

In 2001, electricity distribution was privatized; the following year, two generation plants were sold to the private sector. The transmission company, on the other hand, remained state-owned.⁸ It should be noted that electricity is provided under a national interconnected system and other independent systems. Before reforms, INE distributed most, but not all, electricity. The coexistence of the national interconnected system and independent networks continued even after reforms and could be a source of future vertical integration. For example, the law states that economic agents engaged in generation cannot engage in transmission through the national interconnected system; however, they are allowed to engage in secondary transmission. In addition, generation companies are allowed to sign contracts directly with distributors and large users. In distribution, some integration is allowed, since the law allows agents to engage in generation, transmission, and commercialization outside the national interconnected system.

Water and Sewage

Although the water and sewage law of 1998 and subsequent reform in 2001 have paved the way for a concession system, the industry has encountered difficulties implementing it, mostly because the system is obsolete or destroyed.⁹ The 1998 law created a new enterprise to provide water services, Empresa Nicaragüense de Acueductos y Alcantarillados (ENACAL); while the Instituto Nicaragüense de Acueductos y Alcantarillados (INAA), the previously state-held company, was left as the regulatory agency. A concession system has been designed, consisting of production and distribution of potable water and collection and disposal of serviced water. INAA proposes candidates for concession. In the case of private firms, the National Assembly must ratify any concession. Concessions to public firms can be granted directly. In all cases, concessions last 25 years.

8. Generation plants were sold to Coastal Power, while Unión Fenosa, a Spanish company, acquired the two distribution enterprises.

9. In 1998, Hurricane Mitch seriously damaged the water and sewage systems; no estimates to assess the extent of the damage were found.

INAA will undertake public bids for concessions, determine the limits of geographic areas to be given in concession, and set system charges. However, limits to the area of expansion after concession are fixed at the outset.¹⁰ Prices are to be set so that economic, operative, and financial efficiency are attained and users assume the corresponding total cost.¹¹ The law does not immediately eliminate cross-subsidies; temporary cross-subsidization may be allowed for system and basic service users.

The 2001 reform makes clear the authorities' objective: segmenting ENACAL into independent regional enterprises. With this division, investment in obsolete or destroyed systems can be prioritized to minimize the time needed to have enterprises ready for concession. Thus far, this scheme remains at the concept stage.

Fiscal Effects of Privatization

Privatization of SOEs can variously affect a country's fiscal stance.¹² Davis et al. (2000) argue that immediate, direct effects of privatization on fiscal balance depend on the share of privatization proceeds that accrue to the budget. In addition, how proceeds are used and how the privatization process affects macroeconomic aggregates may, in turn, have further fiscal consequences. The relative importance of these factors depends on the actions authorities take before privatization, the sales process, and the regime after privatization (McKenzie 1998).

The fiscal consequences of privatization in Nicaragua, estimated below, are based on major data limitations. We concentrate on the contemporaneous effect of privatization, as well as its effect over time, by studying whether privatization proceeds were accounted for in the national budget, how they were used, and how fiscal and quasi-fiscal variables evolved over the active privatization period.

As table 3.3 shows, the privatization proceeds from CORNAP divestment averaged 2.5 percent of GDP per year during the years of active privatization. Strikingly, the proceeds did not accrue to the budget, nor was there any regulation enacted for proceeds oversight. Presumably, authorities thought that keeping the proceeds off the budget would reduce the possibility of misuse, notwithstanding the lack of transparency in subsequent use of these funds.

10. The limit established by law is no more than 30 percent expansion of the initial concession.

11. In the law, economic efficiency means equality in prices of additional units of the service; financial efficiency means that enough financial resources should be generated to cover operations, management, maintenance, and expansion.

12. For discussion of fiscal and macroeconomic issues related to SOE privatization, see Davis et al. (2000); Gupta, Schiller, and Ma (1999); McKenzie (1998); and Heller and Schiller (1989).

Table 3.3 Nicaragua: Gross and net proceeds of privatization that accrue to the budget^a

Entity	Years of active privatization	Gross proceeds		Net proceeds	
		Millions of US dollars ^d	Percent of GDP ^e	Millions of US dollars ^d	Percent of GDP ^e
CORNAP enterprises ^b	1991–96	242.9	2.5	0.0	0.0
Public utilities	1995–ongoing	167.9	7.2	108.4	4.6
Electricity		167.9	7.2	108.4	4.6
Generation	2002	52.9	2.3	19.4	0.8
Distribution ^c	2000	115.0	4.9	89.0	3.8

a. Proceeds from CORNAP privatization were not registered in the fiscal balances. Electricity generation and distribution were accounted below the line as privatization proceeded. Although telephone services were privatized in 2001, this study did not include these proceeds because of the potential for reversal of the privatization process (due to corruption claims). In 2001, gross proceeds totaled \$83.9 million and net proceeds totaled \$33.9 million.

b. Proceeds from CORNAP privatization were never registered in the fiscal balance.

c. Net proceeds from privatization of electricity distribution equals gross proceeds minus ENEL's commercial debt (US\$26 million).

d. Annual data in national currency converted into US dollars, using annual average exchange rates.

e. Average of annual ratios of privatization proceeds to GDP during active privatization for CORNAP; percent of GDP for public utilities in the year 2000.

Source: Central Bank of Nicaragua.

Since cash proceeds amounted to a yearly average of only 0.6 percent of GDP, gross receipts underestimate the extent of asset divestment under CORNAP. Most CORNAP privatization occurred through credit and liability transfers. Table 3.4 shows that nearly 90 percent of transactions consisted of sales or lease, while the remainder constituted capital increments from restituted assets. No acquisitions or liquidations were recorded.

In the case of electricity distribution, privatization receipts represented close to 5 percent of GDP, of which 80 percent accrued to the budget (table 3.3).¹³ Since, at the time of privatization, Nicaragua was under an adjustment program sponsored by the International Monetary Fund (IMF), the authorities were advised to register the proceeds “below the line,” meaning that the receipts obtained from privatizing public utilities were not deficit determining. The argument for this practice is that, since privatization is an exchange of assets, the proceeds should be differentiated from other government revenue in the design of fiscal policy (McKenzie 1998). A second argument follows that privatization proceeds should not be used

13. Proceeds from telephone privatization were excluded because of the potential, at the time of this writing, for the process to be reversed, resulting from allegations of corruption. If telephone privatization proceeds had been included, gross receipts of public utilities privatization would have amounted to about 7 percent of GDP.

Table 3.4 Nicaragua: CORNAP divestiture procedures and form of payment until 1996 (percent share of total)

Procedure	Form of payment			Total
	Cash	Credit	Liability transfer	
Liquidation	0.0	0.0	0.0	0.0
Merger or acquisition	0.0	0.0	0.0	0.0
Restitution	0.1	2.1	8.2	10.5
Sale or lease	22.3	38.3	28.9	89.5
Total	22.4	40.5	37.1	100.0

Source: CORNAP.

to support the fiscal position permanently, since they may present a misleading view of the deficit.¹⁴

In sum, privatization proceeds did not affect the overall balance of government operations and, therefore, the government's net worth. Contrary to privatization of electricity distribution, the proceeds from divestiture of CORNAP enterprises did not even affect the government's liquidity position.

The lack of transparency and oversight that characterized the privatization of CORNAP enterprises have made it difficult to pin down the use of sales proceeds. A large portion was presumably used to support the bureaucracy in charge of CORNAP. Proceeds from the privatization of electricity distribution and generation were used as a financial cushion (although a significant fraction was used to finance short-term gaps).

Since privatization in Nicaragua occurred as part of a larger set of reforms, it is difficult to assess privatization's fiscal and macroeconomic effects, other than how proceeds were accounted for and used. To this end, we present evidence on the evolution of tax revenue and gross government transfers to SOEs and information on the quasi-fiscal balances of public utilities.

There is evidence that, at least in the case of large divested firms, tax revenues increased in the period after privatization. For example, three large companies, which together contributed to a yearly average of 1.1 percent of GDP during the 1990s, increased their contribution to an annual average of 2 percent of GDP in the four years following privatization.¹⁵ The same report shows that, in the two fiscal years after CORNAP privatization started, 20 percent of the total revenue large firms contributed came from

14. See Davis et al. (2000) and the references therein.

15. These companies were two bottling enterprises (ENSA and MILKA) and the beer producer Compañía Cervezera Nicaragüense. For details, see Central Bank of Nicaragua (1996).

Table 3.5 Nicaragua: Fiscal balances and net transfers to public utilities (percent of GDP)

Utility	Period	
	1991–95	1996–2000
Electricity (ENEL)		
Fiscal balance ^a	-0.99	-0.78
Net transfers ^b	-0.16	0.00
External and domestic financing ^c	0.58	0.57
Telephone services (ENITEL)		
Fiscal balance ^a	1.55	1.23
Net transfers ^b	0.43	0.21
External and domestic financing ^c	0.47	-0.20
Water and sewage (ENACAL)		
Fiscal balance ^a	-0.41	-1.35
Net transfers ^b	-0.14	-0.17
External and domestic financing ^c	0.20	0.23

a. Average overall deficit before net transfers to the government.

b. Average net transfers to the government.

c. Includes external loans net of payments and net financing from the central bank, financial system, and providers.

Source: Central Bank of Nicaragua.

newly privatized firms. This finding is consistent with Galal et al. (1994), Shaikh and Abdala (1996), and La Porta and López-de-Silanes (1999), who found that privatized firms became significant tax contributors after privatization. In addition, using panel data analysis, Davis et al. (2000) provided evidence that privatization leads to a positive, ongoing increase in tax revenue as a share of GDP in nontransition economies.

In addition, the Central Bank of Nicaragua (1996) reported that, during the 1980s, direct and indirect subsidies to CORNAP enterprises amounted to an average of 11.2 percent of GDP per year. A fraction of this amount corresponded to an implicit subsidy, since CORNAP enterprises enjoyed non-indexed credit from the then state-owned banks (an estimated 7.5 percent of GDP per year during the period). The other fraction was calculated by annualizing the outstanding unpaid debt that CORNAP enterprises acquired during the 1980s from state-owned banks and the Central Bank, which the government absorbed in 1990 before divestment. This amount corresponds to an annualized 3.7 percent of GDP. Elimination of these subsidies suggests a significant lessening of the fiscal burden from these enterprises.

With regard to public utilities, it is difficult to assess the full fiscal effect of reform because their privatization process has not yet ended.

At the firm level, Nicaragua's electricity utility, ENEL (Empresa Nicaraguense de Electricidad), which still controls part of electricity generation and transmission, and ENITEL, the telecommunications company, have improved their fiscal balance positions since reforms started in 1995. Table 3.5 shows that, in the case of ENEL, net transfers to the government

Table 3.6 Nicaragua: Comparison of inequality indexes for real monthly wages (excluding zero-earnings workers), 1993 and 1998

Inequality index	Year		Change	
	1993	1998	Amount	Percent
Gini coefficient	0.5165	0.5418	0.0253	4.9
Generalized entropy	1.0837	1.3645	0.2808	25.9
Between	0.0587	0.0518	-0.0069	-11.8
Within	1.0250	1.3127	0.2877	28.1
By industry				
Agriculture, hunting, forestry, and fishing	1.4484	1.8423	0.3939	27.2
Community, social, and personal services	1.0026	1.4138	0.4112	41.0
Construction	0.4908	1.4542	0.9634	196.3
Electricity, gas, and water	0.3269	0.4621	0.1351	41.3
Financing, insurance, real estate, and business services	0.5545	0.5456	-0.0089	-1.6
Manufacturing	0.6725	0.6725	-0.1992	-29.6
Mining and quarrying	0.8297	0.6350	-0.1946	-23.5
Transportation, storage, and communication	0.6481	1.2021	0.5540	85.5
Wholesale and retail trade, restaurants, and hotels	1.1041	1.0175	-0.0866	-7.8

Source: Authors' calculations, using EMNV-93, EMNV-98, and EIGH-99.

were negative during 1991–95, and neutral during 1996–2000. ENITEL has reduced average external and internal financing, which reflects increased efficiency, presumably stemming from preparation for privatization. In the case of ENACAL, which will not be privatized, the fiscal balance worsened slightly on average, and average net transfers from the government increased after 1995.

Employment and Wage Inequality

We believe that changes in public and private ownership patterns influenced shifts in employment patterns and other labor-market aggregates. Taken alone, however, this factor does not constitute conclusive evidence of a relationship between privatization and inequality. Table 3.6 shows that, after privatization, inequality in Nicaragua increased in certain economic activities, such as agriculture, which had a large share of privatized enterprises. However, inequality also increased in other activities, such as social services, which had little or no privatization. Moreover, inequality decreased in certain activities that had a high proportion of privatized assets, such as mining and quarrying; manufacturing; and financing, insurance, real estate, and business services.

Clearly, overall wage inequality in Nicaragua increased during 1993–98. To determine the extent to which privatization contributed to the rise, we start with this hypothesis: If CORNAP privatization directly affected

inequality, then changes in the fraction of workers employed in the public sector should account for most of the changes in overall wage inequality. However, the CORNAP divestment process may have also affected inequality indirectly, to the extent that it affected collective bargaining practices (e.g., coverage or scope) and government labor-market policy. If so, one must distinguish between sources of inequality arising from changes in worker characteristics (e.g., education, occupation, and gender) and the observed rewards to such characteristics from unobservable changes that might be attributed to the privatization process.

First-Order Assessment: Variance Decomposition

To assess privatization’s distributional effect, one must first determine the sources of change in inequality. We begin with a decomposition of Nicaragua’s overall wage dispersion, which yields a first-order approximation of how privatization affected private- and public-sector inequality. This decomposition is used to study privatization’s role in producing inequality differences among rural and urban workers during 1993–98 and 1993–99, respectively.

The decomposition was carried out as follows: At any date t , $Var(y_t)$ and $Var(y_t^j)$ denote the economywide variance of wages and the variance of wages in sector $j = p, s$, respectively; α_t^s stands for the fraction of individuals working in the public sector; $Var(y_t^j)$ and \bar{y}_t^j are the variance and mean of wages of sector j ; and \bar{y}_t is the overall or economywide average of wage.¹⁶

For any two years, t and $t-l$, the change in overall wage dispersion is:

$$\begin{aligned}
 Var(y_t) - Var(y_{t-l}) = & (\alpha_t^s - \alpha_{t-l}^s) \left[Var(y_t^s) - Var(y_{t-l}^s) + (\bar{y}_t^s - \bar{y}_{t-l}^s)^2 - (\bar{y}_t^p - \bar{y}_{t-l}^p)^2 \right] \\
 & + (1 - \alpha_{t-l}^s) \left[Var(y_t^p) - Var(y_{t-l}^p) \right] \\
 & + \alpha_{t-l}^s \left[Var(y_t^s) - Var(y_{t-l}^s) \right] \\
 & + \alpha_{t-l}^s \left[(\bar{y}_t^s - \bar{y}_t)^2 - (\bar{y}_{t-l}^s - \bar{y}_{t-l})^2 \right] \\
 & + (1 - \alpha_{t-l}^s) \left[(\bar{y}_t^p - \bar{y}_t)^2 - (\bar{y}_{t-l}^p - \bar{y}_{t-l})^2 \right] \tag{3.1}
 \end{aligned}$$

That is, equation 3.1 decomposes the overall change in earnings dispersion between dates t and $t-l$ into five sources: how the change in the fraction of people working in the public sector contributes to the change in overall inequality (the first term on the right-hand side of the equation); how the change in the relative wage dispersion in the public and private

16. Blau and Kahn (1996) use a similar decomposition to assess the role of unionism on US wages and for international comparisons, respectively. Juhn, Murphy, and Pierce (1993) use a similar approach to assess industry’s effect on wage inequality.

sectors contributes to the change in overall inequality (the second and third terms, respectively, on the right-hand side of the equation); and how the mean earnings gap in each sector affects the change in total inequality (the fourth and fifth terms on the right-hand side of the equation).

The decomposition in equation 3.1 is not unique; alternative decompositions can be calculated in which the weights in equation 3.1 may differ. However, it is clear from equation 3.1 that the dispersion of wages may have been affected through various channels. Privatization could have caused a reduction in the share of individuals working in the public sector. The effect of this reduction on inequality would depend on these workers' situation in the absence of SOEs. However, the relative earnings gap in both public and private sectors, as well as initial inequality within each sector, also affected total inequality significantly.

In computing the decomposition, we were forced to make an identifying assumption (Freije and Rivas 2003). The LSMS-93 allowed one to identify individuals by geographical location (urban or rural) and work sector (public or private), whereas the LSMS-98 allowed one to identify individuals by geographical location (urban or rural) but not by work sector. Conversely, the HIES-99 allows one to disaggregate individuals by sector (public or private); however, since it is an urban survey, no rural-urban sorting is possible.

Thus, we first estimated equation 3.1 for individuals in urban areas, using the LSMS-93 and the HIES-99. We then estimated decomposition using the LSMS-93 and the LSMS-98 for individuals who worked in rural areas, assuming that, by 1998, public-sector employment in rural areas was negligible. This assumption was not restrictive in light of evidence from establishment-level data mentioned earlier. The Survey for Establishments, used by the Ministry of Labor to construct labor-market statistics, indicates that 1993 shares of SOEs in agriculture, fishery, and mining (32.8, 100, and 100 percent, respectively) dropped to 0 percent by 1998. The share of SOEs, including all economic activities, dropped from 60 to 25.4 percent (Freije and Rivas 2003).

Table 3.7 shows that, in the rural areas, the mean log real wage declined in both the public and the private sectors. However, inequality, as measured by the variance, increased only slightly in rural areas. On the other hand, increase in the average log real wage in urban areas—in both public and private sectors—was accompanied by a considerable increase in inequality in the public sector only. In both the rural and urban sectors, the unconditional average log real wage was higher for public-sector workers in 1993, and the difference continued in 1998.¹⁷

17. As shown below, when one controls for worker characteristics, private-sector workers earn higher wages than their public-sector counterparts.

Table 3.7 Nicaragua: Variance decomposition

Factor/sector	Urban sector		Rural sector	
	1999		1998	
Employment share (percent)				
Public	13.6		4.1	
Private	86.4		95.9	
Variances (real hourly wage)				
Public	618.9		16.4	
Private	417.8		38.1	
Total	446.5		37.3	
Means (real hourly wage)				
Public	16.8		5.4	
Private	13.4		3.4	
Total	13.9		3.5	
1993				
Employment share (percent)				
Public	22.9		11.0	
Private	77.1		89.0	
Variances (real hourly wage)				
Public	117.1		80.2	
Private	380.5		74.7	
Total	318.9		75.7	
Means (real hourly wage)				
Public	11.2		8.1	
Private	13.3		6.3	
Total	12.8		6.5	
	Real		Real	
	hourly wage	Percent	hourly wage	Percent
Change in total variance	127.6	100	-38.4	100
Decomposition I				
Public-sector employment share	-19.5	-15	1.2	-3
Public-sector variance	115.0	90	-7.0	18
Private-sector variance	28.7	23	-32.7	85
Public-sector mean gap	1.4	1	0.1	0
Private-sector mean gap	0.0	0	0.0	0
Decomposition II				
Public-sector employment share	24.3	19	-0.5	1
Public-sector variance	68.2	53	-2.6	7
Private-sector variance	32.2	25	-35.2	92
Public-sector mean gap	0.8	1	0.1	0
Private-sector mean gap	0.0	0	0.0	0

Sources: Freije and Rivas (2003, appendix 3.1). The appendix provides a formal explanation of decomposition. Authors' calculations, using LSMS-93, LSMS-98, and HIES-99.

Decomposition of the change in total inequality shows that, for two decomposition methods, the change in public-sector inequality and the mean income gap account for a large share of the change in overall inequality. On the other hand, the change in private-sector inequality caused a decline, instead of a rise, in total inequality. The size of the effect caused by change of employment sector share is not robust to the decomposition method. In

some cases, it has little negative effect, while in others, it has a large positive effect.¹⁸

The data in table 3.7 imply that factors other than reduction in α^s are responsible for increased wage dispersion. Ownership patterns, however, might have affected overall inequality indirectly by affecting inequality within particular sectors. One could argue that state ownership contained wage dispersion in the public sector through wage standardization because of uniform rates among comparable workers across SOEs and ranges of rates for occupational categories within SOEs. After all, unions were more prevalent before privatization; their bargaining power declined considerably during and after privatization. Collective bargaining became more decentralized, with single-firm agreements prevailing over industry or economywide arrangements (Freeman 1980, Blau and Kahn 1996). In addition, government policies that aimed at equalizing pay among similarly skilled workers within establishments could have also contained public-sector wage dispersion.¹⁹ The importance of within private-sector dispersion at the national level could be explained, in part, by the extension of collective bargaining agreements for public-sector workers to the private sector.²⁰

Thus, one must further examine wage dispersion within the public and private sectors. The main problem in comparing public- and private-sector wage dispersion is differentiating the effect of other factors correlated with privatization. One must thus distinguish between (1) the portion of the change in inequality that can be attributed to changes in worker characteristics, (2) the fraction attributable to the market values of such personal characteristics, and (3) the fraction attributable to privatization (to the extent it can be delinked from other reforms).

Changing Attributes and Market Values

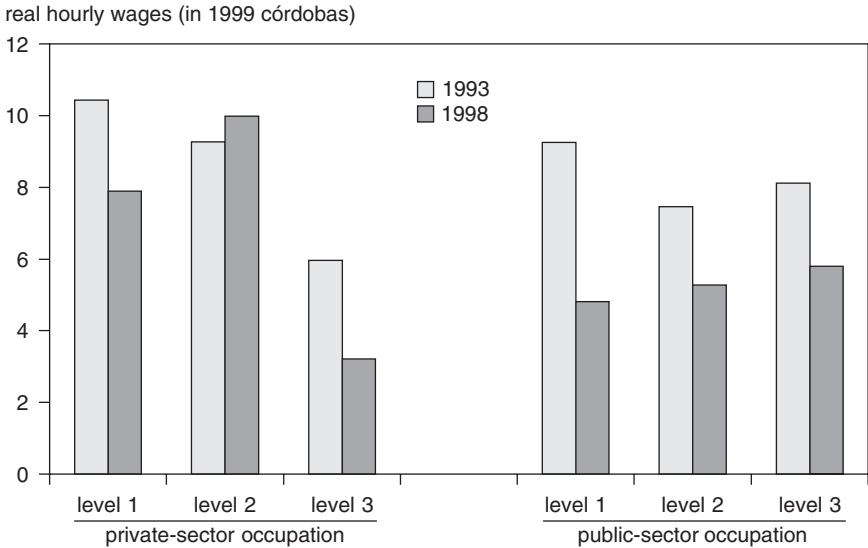
The next step in this exercise is to decompose the change in overall wage inequality in three components: (1) changes in distribution of observed characteristics (e.g., education, occupation, and gender); (2) changes in the

18. Freije and Rivas (2003) show the same decomposition exercise using real hourly wages (instead of its logarithm). Again, changes in public-sector inequality is the main positive factor explaining the change in overall inequality, whereas changes in public-sector employment have no consistent effect across sectors and decomposition methods.

19. These policies were undertaken on the basis of perceived inequality before “statization,” when individuals were paid wages based on management-perceived worker characteristics, rather than position characteristics.

20. This phenomenon is common in socialist countries, where most workers belong to unions and where the state controls wages. See also Rezler (1973).

Figure 3.1 Average rural wage by employment sector and occupation level, 1993 and 1998



Note: Occupations are managers and professionals (level 1); clerical and salespersons (level 2); and craftpersons, operatives, laborers, and service workers (level 3).

Source: Author’s calculations using LSMS-93 and LSMS-98.

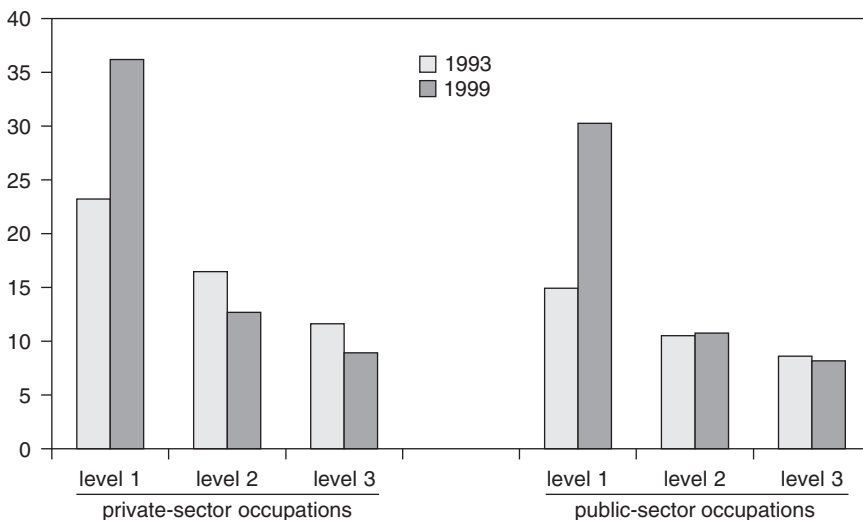
market value of such characteristics; and (3) changes in unobservable attributes and market values, along with any remaining measurement error. In doing so, one follows Juhn, Murphy, and Pierce (1993); we refer to these respective effects as (1) observable characteristics effect, (2) observable market value effect, and (3) residual effect. This technique allows one to decompose the overall change in inequality in four additive components: (1) changes in observable quantities, (2) changes in observable prices, (3) changes in observable prices related to public-sector employment, and (4) changes in distribution of unobservable prices.²¹

From this exercise, one can conclude that occupational categories did not significantly contribute to individual earnings in the rural sector in 1993 or 1998. However, in the urban sector, managers and professionals earned significantly higher wages than workers in any other occupation (including clerks, salespersons, craftpersons, operatives, and service workers). In addition, the wage premia for managers and professionals increased between 1993 and 1999. Public-sector managers and professionals earned

21. For a thorough exposition of the methodology used and the general results, see Freije and Rivas (2003).

Figure 3.2 Average urban wage by employment sector and occupation level, 1993 and 1999

real hourly wages (in 1999 córdobas)



Note: Occupations are managers and professionals (level 1); clerical and salespersons (level 2); and craftspersons, operatives, laborers, and service workers (level 3).

Source: Authors' calculations using LSMS-93 and HIES-99.

significantly more than their private-sector counterparts, with the premium declining over time. Moreover, other occupational categories had a narrower differential with managers and professionals if they worked in the public, rather than private sector, and this differential increased over the period.

Figures 3.1 and 3.2 illustrate the argument, showing the average hourly wages for various occupations in public and private sectors for urban and rural areas. In the public sector, the difference in hourly wages between levels 1 and 3 remained at about 1 córdoba in the rural area but increased to more than 20 córdobas in the urban area. A similar pattern was found in the private sector. This finding is consistent with the story of increasing inequality in the urban public and private sectors and the declining or stagnant inequality in the rural public sector.

Clearly, the demand for skilled labor increased in the urban formal sector, particularly for individuals skilled in operating in the market-oriented economy that emerged from privatization and deregulation, especially in such areas as finance, marketing, and management.

Another key finding is that the rural-sector education premia declined for all education categories. Subsistence-level agriculture probably expanded as cultivable land was given to demobilized soldiers, retired army members, and landless organized peasants. These groups, who by 1993 had benefited

from privatization in manufacturing by forming workers-owned firms, opted for agricultural activities by 1998. At the same time, demand for laborers without formal education may have increased in such labor-intensive activities as coffee gathering (Freije and Rivas 2003). Another possibility is that reversed migration (from the urban to the rural sector) occurred during the period; as the former elite and middle and upper-middle classes returned from abroad, skilled urban-sector labor became relatively more abundant.²²

Finally, the premium that urban public-utilities workers earned decreased (the premium of both urban and rural public-utilities workers was high, at 73.3 percent and 48.8 percent, respectively). It became statistically insignificant over the period—a pattern consistent with the streamlining of public utilities.

As tables 3.8 and 3.9 show, for the urban and rural sectors respectively, inequality in Nicaragua has increased, except for the variance in real hourly wages in rural areas, which has decreased (apparently because of a decline in the fifth to first decile ratio). Inequality increased in all other percentile differentials in both rural and urban sectors. The increase in inequality is robust to the index choice. The Gini coefficient and various generalized entropy and Atkinson indexes also indicate that inequality increased across the board.

We find greater widening at the top of the distribution in both rural and urban sectors. Despite the relatively short time span, one can see that changes in observable characteristics can explain most of the increased inequality in the rural sector, while the market value of such characteristics accounts for greater inequality in the urban sector. We interpret this distinction as the consequence of changes in the composition of rural labor. In fact, the share of agricultural activities rose dramatically in rural Nicaragua, while agricultural wages stagnated over the period (Freije and Rivas 2003). We hypothesize that demographic pressures stemming from the return of refugees, demobilization of war veterans, and internal population growth resulted in a flooded labor supply, which the rural sector could not absorb.²³

In the urban sector, price changes of observable characteristics are key to explaining inequality changes. Over the last decade, resurgence of private banking and telecommunications in urban Nicaragua may have contributed

22. Migration of unskilled labor from the rural sector to neighboring countries also occurred during this period.

23. One datum that hints in this direction is that about 55 percent of the total new employment generated in the rural sector was composed of individuals between the ages of 15 and 19. By contrast, over the same period, only 26 percent of new urban employment was in that age group.

Table 3.8 Nicaragua: Juhn-Murphy-Pierce decomposition for various inequality indices, urban sector
(in 1999 real hourly wages)

Inequality index	Effect						
	1993 (1)	1999 (2)	Difference (3)	Measured characteristics ^a (4)	Wage equation all coefficients ^a (5)	Public-sector coefficients ^{b, c} (6)	Wage equation residuals ^a (7)
Variance of logarithms	.817	.867	.050	.00	.13	.04	33
Variance	318.880	446.510	127.620	248.45	145.41	-70.66	-49
Decile ratio							
Ninth to first	9.61	10.27	.66	-.51	.23	.74	33
Ninth to fifth	3.33	3.82	.49	.04	.67	.30	45
Fifth to first	2.89	2.69	-.20	-.19	.10	-.03	-32
Generalized entropy							
(-1)	.72	.84	.12	-.04	.16	.06	38
(0)	.46	.52	.05	.02	.09	.03	37
(1)	.52	.59	.07	.07	.11	.05	42
(2)	.98	1.16	.18	.36	.28	.16	58
Gini coefficient	.51	.54	.03	.02	.05	.02	36
Atkinson indices							
A(0.5)	.22	.24	.02	.02	.04	.02	38
A(1.0)	.37	.40	.03	.01	.05	.02	36
A(2.0)	.59	.63	.04	-.01	.05	.02	35

a. Percentage of total difference.

b. Refers to the effect due only to changes in the coefficient of public-sector employment (as well as its interaction with occupation) in the wage equation. See Freije and Rivas (2003, appendix 3.1).

c. Percent of all coefficients effect.

Source: Calculated by the authors.

Table 3.9 Nicaragua: Juhn-Murphy-Pierce decomposition for various inequality indices, rural sector
(in 1999 real hourly wages)

Inequality index	Effect						
	1993 (1)	1999 (2)	Difference (3)	Measured characteristics ^a (4)	Wage equation all coefficients ^a (5)	Public-sector coefficients ^{b,c} (6)	Wage equation residuals ^a (7)
Variance of logarithms	.773	.786	.013	.15	1,142	.05	145
Variance	75.700	37.300	-38.400	35.01	-91	-12.65	18
Decile ratio							
Ninth to first	10.29	10.79	.50	.98	194	.08	15
Ninth to fifth	30.04	3.42	.38	2.40	627	-.17	-45
Fifth to first	3.39	3.15	.24	-1.32	561	.08	-36
Generalized entropy							
(-1)	1.15	3.08	1.93	-.37	-19	.01	0
(0)	.49	.53	.05	.09	189	.01	11
(1)	.50	.54	.04	.17	437	-.02	-62
(2)	.90	.97	.07	.43	634	-.16	-229
Gini coefficient	.51	.52	.02	.07	399	.00	5
Atkinson indices							
A(0.5)	.22	.23	.02	.06	354	.00	-14
A(1.0)	.38	.41	.03	.06	184	.00	10
A(2.0)	.70	.86	.16	-.09	-65	.00	1

a. Percentage of total difference.

b. Refers to the effect due only to changes in the coefficient of public-sector employment (as well as its interaction with occupation) in the wage equation. See Freije and Rivas (2003, appendix 3.1).

c. Percentage of all coefficients effect.

Source: Authors' calculations.

to the widening gap at the top of urban distribution. Price differentials related directly to having a public-sector job also contribute significantly to the explanation. These findings are consistent with our previous argument that privatization brings about a new set of industrial relations in both the public and private sectors, where wages will be more in line with productivity patterns and competitive forces than with political conventions, government coordination, or union pressures.

Despite these observations, we conclude that unobservable characteristics and prices, as well as measurement error, contributed to increased inequality to a much lesser degree. Indeed, most of the values in the far-right columns of tables 3.8 and 3.9 are negative; that is, they contributed to a reduction in inequality, indicating that privatization was not the only factor explaining inequality. In the urban sector, privatization may have been the largest contributing factor one can single out; however, in the rural sector, one can argue that demobilization of war veterans, together with the small redistribution of land held by CORNAP, indirectly influenced the widening of inequality.

Welfare Effects of Utilities: Prices, Access, and Quality

To assess the welfare effects of reforms and participation of private firms in providing electricity and telecommunications, one must examine the reforms' effects on these services' pricing, access, and quality. By observing expenditure decisions, one can infer the underlying changes in indirect utility functions, which can then be used to estimate the welfare effects. Because of data limitations, the focus of our analysis, described below, is electricity.²⁴

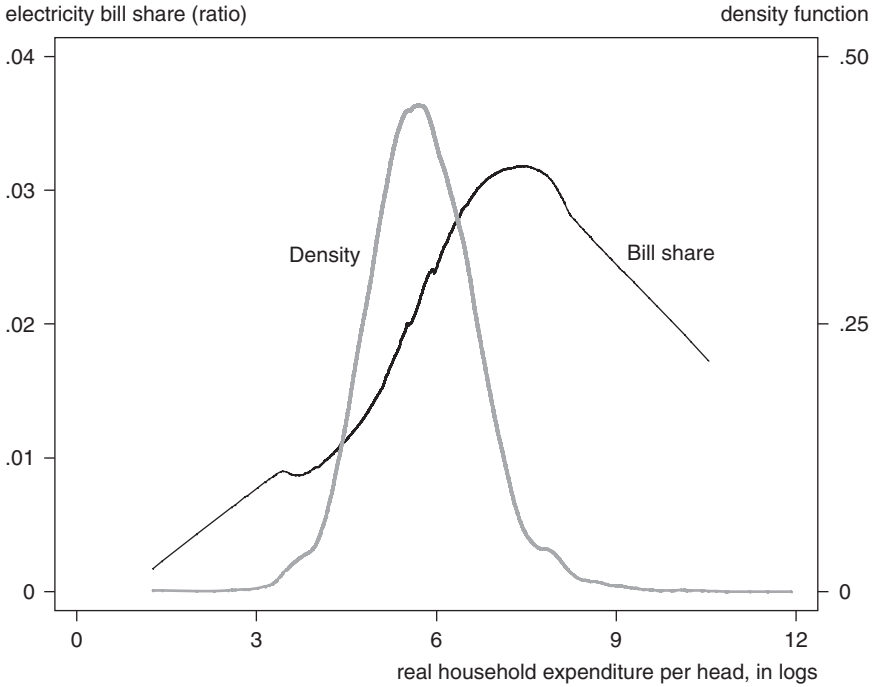
Distributional Effect of Price Changes

The first step is to examine the effect of electricity prices on the distribution of real incomes across different households, using simple nonparametric techniques to uncover the shape of the Engel curves and estimate kernel densities.²⁵ These methods describe the average welfare effects of price

24. Although the telecommunications sector allowed private participation earlier than did electricity, private provision consisted exclusively of cellular services, and household surveys lacked information on their share of expenditure.

25. Deaton (1989) provides both a theoretical motivation for the use of nonparametric techniques for assessing the welfare effect of small price changes, as well as the nonparametric analysis adapted by us. See also McKenzie and Mookherjee (2003).

Figure 3.3 Electricity bill within total expenditures, 1993



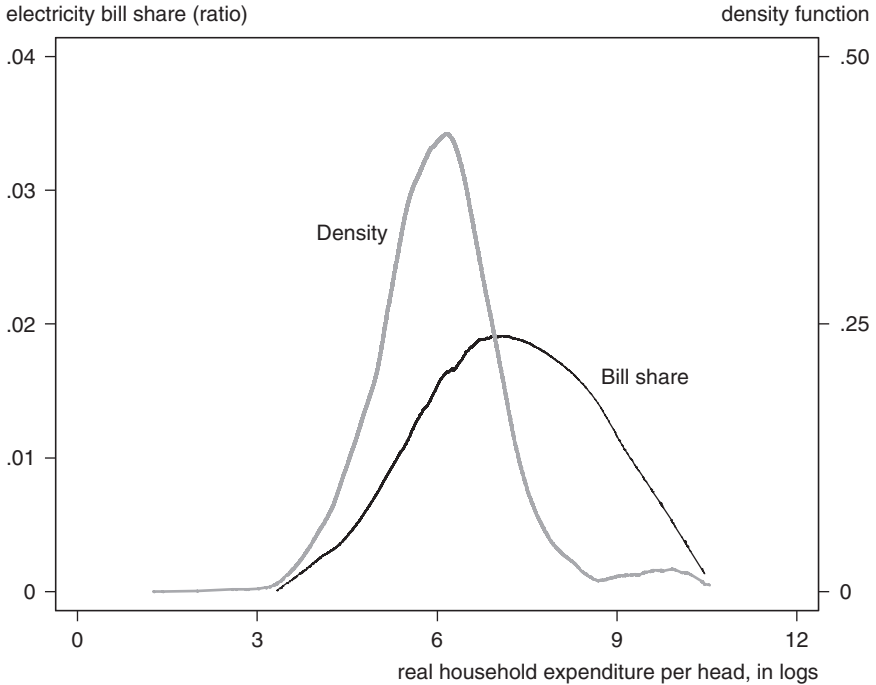
Source: Authors' calculations.

changes that operate through consumption. The next step focuses on alternative analyses of welfare, estimating consumer surpluses and accounting for changes in access to electricity.

During 1993–98, the price of electricity increased 24.2 percent.²⁶ Most of the increase was concentrated during 1995–98, the years of active reform. How does one account for the distributional consequences of such price increases? Since nearly all surveyed households did not produce electricity services, one alternative is to describe consumption patterns for electricity in relation to consumers' living standards. These data provide an estimate of the first-order welfare effect of the price increase (Deaton 1989). This procedure is done by taking expenditure shares of electricity services at various points along the total expenditure, per capita distribution. The logic is simple: A price increase has the greatest effect on consumers who devote a larger share of their budget to electricity.

26. In constant Nicaraguan córdobas, electricity increased from 0.95 per kWh in 1993 to 1.18 per kWh in 1998; these prices are reported according to the consumer price index elaborated by the Central Bank of Nicaragua.

Figure 3.4 Electricity bill within total expenditures, 1998



Source: Authors' calculations.

Implicitly, we take total expenditure per capita as their measure of household living standard. Per capita monthly expenditure is calculated by taking the total monthly expenditure on all items that the household consumes (reported in the surveys), and dividing this amount by the number of household members.²⁷

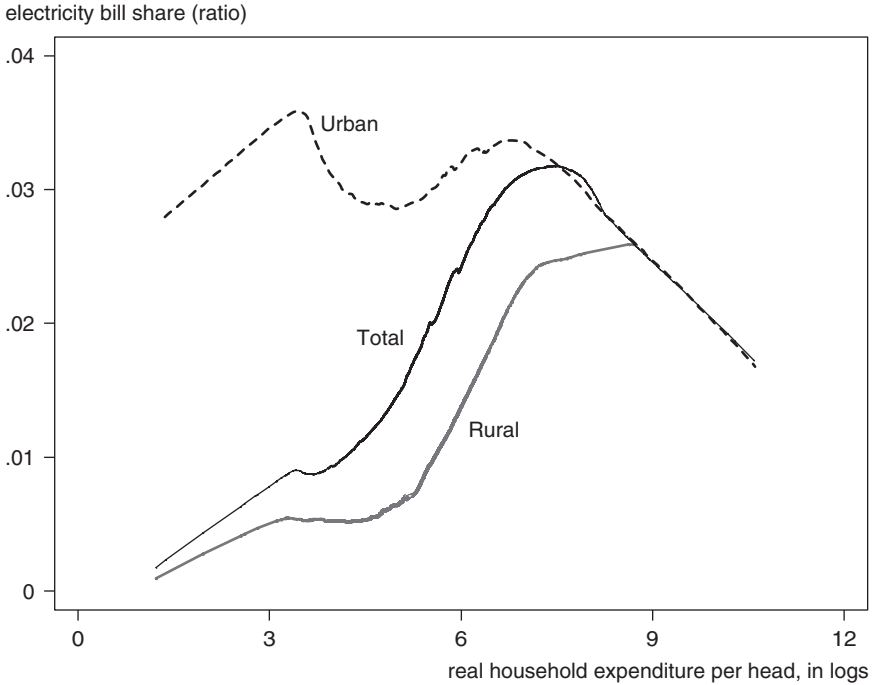
Figures 3.3 and 3.4 present nonparametric regressions of the electricity expenditure share on the logarithm of total expenditure per capita for years 1993 and 1998, respectively. The estimation is performed with kernel smoothing.²⁸ At any given value of total expenditure per capita, excluding the extreme 5 percent of observations (2.5 at each extreme of the distribution), the graphs show the values of electricity expenditure share for observations nearby (within the kernel). In addition, they show the density function.

The Engel curves are nonmonotonic. In 1993, the budget share spent on electricity declined as living standards rose for the wealthiest; however, it

27. In the surveys, frequency of expenditure for certain goods varied from weekly to annually; thus, we homogenized all expenditure to the monthly frequency.

28. For a detailed explanation of the technique, see Deaton (1989) and the references therein.

Figure 3.5 Electricity bill share, rural and urban, 1993



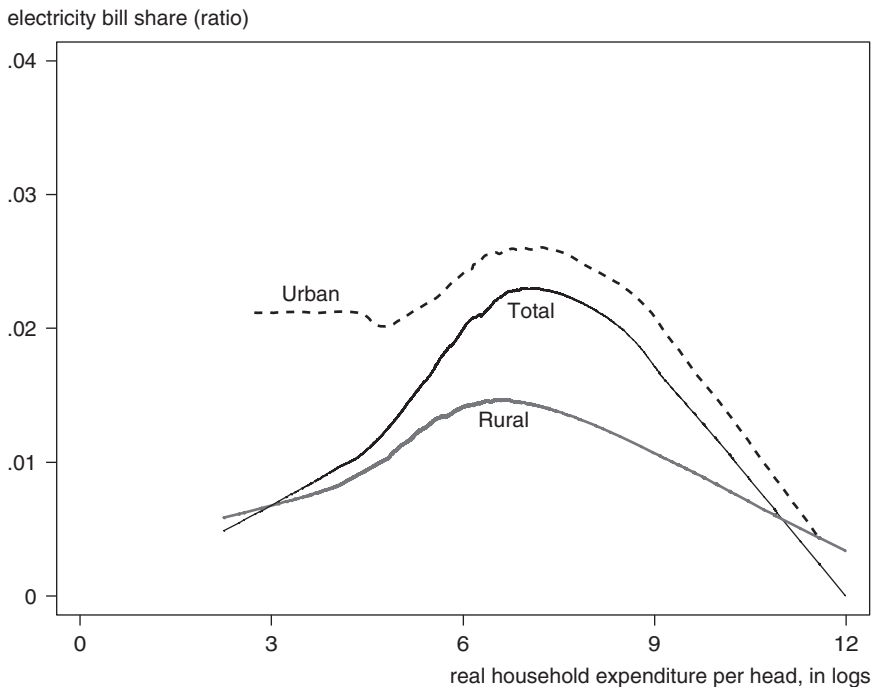
Source: Authors' calculations.

increased for the middle range of the distribution, where most households were concentrated (greater mass). In 1998, households with expenditure below 2 in logarithmic scale spent nothing on electricity, suggesting that the poorest households may have been priced out. Consumers spent less on electricity in 1998 than in 1993, even when controlling for budget size. Clearly, in both 1993 and 1998, for a large range of expenditure distribution, the budget share spent on electricity increased. Moreover, at all expenditure levels, households spent less on electricity in 1998 than in 1993.

Figures 3.5 and 3.6 show the same regressions of the electricity expenditure share, separating rural from urban areas. The increasing section of the curve stems mainly from rural-sector behavior. Electricity bill shares strongly increase for rural households with expenditures below 7 (in logarithms), while shares are less sloped for the urban sector.

Clearly, the nonparametric approach described above has its limitations. Nonetheless, it provides considerable information on the evolution of access to electricity between 1993 and 1998. The approach also helps to set a boundary on the distributional effect of the price increase.

Figure 3.6 Electricity bill share, rural and urban, 1998



Source: Authors' calculations using LSMS-93 and LSMS-98.

First- and Second-Order Approximations to Consumer Surplus

The approach that Deaton (1989) outlines is best suited for small price changes, and does not account for quantity adjustment. Banks, Blundell, and Lewbel (1996) suggest that first-order approximations, like the one described above, may display systematic bias and that second-order approximations work better; however, second-order approximations require more information, meaning that first-order approximations to welfare measures do not require knowledge of substitution effects, as do second-order approximations. In fact, second-order approximations depend on distribution of substitution elasticities and therefore require estimates of derivatives of the demand functions (McKenzie and Mookherjee 2003).²⁹

29. A more standard approach to examining the distributional effect of price changes is to construct cost-of-living indexes and observe whether the living costs of poor households are disproportionately affected. See Levinsohn, Berry, and Friedman (1995).

One can assume that each household receives an equal social weight, temporarily ignoring access issues. Under this assumption, the first-order approximation of the change in utility for an individual between any two dates, t and $t-1$, $\Delta u = (u_t - u_{t-1})$, is given by:³⁰

$$\Delta u = -(q_{t-1} \Delta p) \quad (3.2)$$

where q denotes the quantity of electricity consumed and $\Delta p = (p_t - p_{t-1})$ represents the change in electricity price.

Clearly, equation 3.2 overestimates the welfare effect of the price increase since it does not allow consumers to change the quantity consumed in response to the price change. Banks, Blundell, and Lewbel (1996) show that it is better to use the second-order approach:

$$\Delta u = -q_{t-1} \Delta p \left(1 + \frac{\Delta p}{2p_{t-1}} \frac{\partial \log q}{\partial \log p} \right) \quad (3.3)$$

where the partial derivative is evaluated at 1993 prices. Equation 3.3 shows that the second-order correction depends on the own price elasticity. Since the own price elasticity is generally negative, the second-order approximation allows for some quantity response to the price change.

To estimate the first- and second-order approximations empirically, it is convenient to work with log prices and budget shares, w , instead of level prices and quantities. In this case, equation 3.3 becomes

$$\Delta u = -(\Delta \log p) w_{t-1} \quad (3.4)$$

and equation 3.4 becomes

$$\Delta u = -w_{t-1} (\Delta \log p) \left(1 + \frac{\Delta \log p}{2} \frac{\partial \log w}{\partial \log p} \right) \quad (3.5)$$

Assuming that households only consume, and do not produce, electricity (a relatively nonrestrictive assumption), total income does not change with variations in electricity price. Once the first- and second-order approximations are cast in terms of log prices and expenditure shares, the electricity share regressions of the previous subsection provide an estimation of the distributional effect of the price change that is equivalent to the first-order approximation in equation 3.5.

30. Banks, Blundell, and Lewbel (1996) show that, with no income effects, the change in utility equals a money metric measure of the change in welfare.

In order to compute equation 3.6, one must first estimate the elasticity $\frac{\delta \log w}{\delta \log q}$. We estimated the Engel equation parametrically, using the Almost Ideal Demand System (AIDS) model (Deaton and Mullbauer 1980) for household h and good j , as follows:

$$w_{hj} = \alpha_j + \sum_{i=1}^k \gamma_{ij} \log p_i + \beta_j \left(\log \frac{x_h}{n_h} \right) + \phi_j \left(\log \frac{x_h}{n_h} \right)^2 + \lambda_j' Z_h \quad (3.6)$$

where n_h equals the number of households with h members, x_h is total real expenditure of household h , and Z_h contains other household characteristics. For robustness, we estimated the equation by ordinary least squares, including all data and excluding extreme observations and households with zero electricity expenditure. Moreover, we fit a model correcting for electricity access; therefore, we reestimated the Engel equation using a two-stage auto-selection correction. We did not include the price of kerosene, the only approximate substitute, because it was not significant in every case. Data on quality were unavailable and were therefore not included.³¹ On the other hand, an interaction between electricity price and having a refrigerator was included. Because the coefficients for electricity price are robust across estimation methods, only the results for the second procedure are presented (table 3.10).³²

The average coefficient is about -0.03 in the urban sector, ranging from -0.01 for those without a refrigerator to -0.08 for those with one. The coefficient for the rural sector is -0.01 , ranging from 0.0 to -0.06 . These coefficients allow one to estimate the expected elasticity for every household, which, in turn, makes it possible to compute welfare changes as expressed in equation 3.6. Thus, as expected, households with electrical appliances are more price elastic than households without them. Table 3.11 shows the average price elasticity by expenditure deciles in Nicaragua. Elasticity is increasing in expenditure so that households up to the sixth deciles are inelastic to price changes, whereas households in the top three deciles have elastic demand for electricity.

Table 3.12 presents the welfare effect of the change in electricity prices between 1993 and 1998, using equations 3.4 and 3.5, once equation 3.6 was estimated. The top panel presents the first- and second-order approximations in constant córdobas, while the bottom panel presents the approximations as a percentage of real household expenditure per capita. One computes the mean change in utility by expenditure deciles, assuming equal social utility weights within groups, and distinguishing total rural

31. Data on service quality (i.e., number, duration, and source of blackouts) is available only after 1998, when the regulatory agency began operations.

32. For a thorough explanation of the procedure and results for both estimations, see Freije and Rivas (2003).

Table 3.10 Nicaragua: Engel equation estimations with Heckman's selection correction, 1993–98

Factor	Urban sector		Rural sector	
	All observations	Excluding households ^a	All observations	Excluding households ^a
Total observations	4,702	4,539	3,709	3,471
Censored	541	972	2,536	2,545
Uncensored	4,161	3,567	1,173	926
Pseudo R-squared	.039	.053	.111	.154
Wald $\times 2$	603.700	587.870	150.530	111.520

Dependent variable	Urban sector		Rural sector	
	Coefficient	Standard error	Coefficient	Standard error
Electricity budget share				
Electricity price	-.032 ^c	.005	-.011 ^b	.006
Real household expenditure per head	-.011 ^c	.004	-.032 ^c	.008
Real household expenditure per head, squared	.000	.000	.002 ^c	.001
Refrigerator	.025 ^c	.001	.028 ^c	.001
Refrigerator \times electricity price			-.070 ^c	.011
Constant	.085 ^c	.014	.158 ^c	.025
Access to electricity service				
Real household expenditure per head	.352 ^c	.033	.321 ^c	.030
Shanty dwelling	-.690 ^c	.115	-1.013 ^c	.109
Access to piped water	1.244 ^c	.056	.790 ^c	.050
Constant	-1.710 ^c	.201	-1.715 ^c	.180
Rho	-.164 ^c	.045	-.160 ^c	.047
Mill's ratio	-.005 ^c	.001	-.005 ^c	.002
			-.003 ^c	.002
			.070 ^c	.019
			.231 ^c	.022
			-.815 ^c	.079
			1.207 ^c	.056
			-1.940 ^c	.126
			-.115 ^c	.062
			-.078 ^c	.080
			-.002 ^c	.002
			.000	.010
			-.018	.012
			.001	.001
			.028 ^c	.003
			-0.058 ^c	.023
			.104 ^c	.038
			.008	.008
			-.021 ^c	.008
			-.009	.006
			.000	.000
			.026 ^c	.002
			-.026 ^c	.002
			.070 ^c	.019
			.231 ^c	.022
			-.815 ^c	.079
			1.207 ^c	.056
			-1.940 ^c	.126
			-.115 ^c	.062
			-.078 ^c	.080
			-.002 ^c	.002

a. Excludes households without access and households with access but electricity bill equal to zero; also excludes households in the top and bottom 2.5 percent household expenditure per head.

b. Significantly differs from zero with 90 percent confidence.

c. Significantly differs from zero with 95 percent confidence.

Source: Calculated by the authors.

Table 3.11 Nicaragua: Elasticity and virtual price for approximations to consumer surplus

Decile	Price elasticity (of elasticity budget share)	Virtual price (in real córdobas)
1 (lowest)	-.013	2163.0
2	-.042	480.4
3	-.102	104.4
4	-.237	35.3
5	-.475	11.3
6	-.601	9.1
7	-.831	4.3
8	-1.400	4.4
9	-2.726	3.1
10 (highest)	-3.921	3.4

Source: Authors' data.

and urban areas. The results in table 3.12 ignore any change in access to electricity services, an issue incorporated below.

Although the first-order approximation shows that the increase in electricity price reduced welfare at all expenditure deciles, the estimation shows that the effect was stronger at the top of the distribution. This finding suggests that the price effect was at least nonregressive. Both in monetary and percentage terms, the loss is smaller in the bottom deciles than in the top deciles (with the exception of the bottom decile in percentage terms). When adjustments in the quantity of electricity are allowed (second-order approximations), the negative welfare effect is slightly less severe; the nonregressiveness is still present in monetary terms, but less so in percentage terms.

Incorporating Changes in Access

The calculations of welfare changes in table 3.12 exclude the fact that certain households who lacked access to electricity before the reforms might have obtained access by 1998. One can modify the approach used in the previous subsection to incorporate changes in access in calculating the welfare effects that resulted from increased electricity price. A necessary assumption is that those households who had access in 1993 continued to have it in 1998. Such an assumption does not preclude the possibility that some households who had access in 1993 were priced out by 1998. Conceivably, extremely poor households with access to electricity who demanded electricity services in 1993 demanded zero electricity by 1998 because of price increases.

In computing welfare changes, we divided households into three groups: (1) those with access in 1993 and 1998, (2) those without access in 1993 and 1998, and (3) those without access in 1993 but with access in

Table 3.12 Nicaragua: Effect of change in electricity price on welfare (not accounting for change in access), 1993–98/99

Decile	First-order approximation			Second-order approximation		
	Total	Urban	Rural	Total	Urban	Rural
In real (1998 = 100) córdobas						
1 (lowest)	-.079	-.041	-.375	-.077	-.040	-.368
2	-.260	-.178	-.537	-.254	-.176	-.519
3	-.532	-.469	-.658	-.521	-.467	-.627
4	-.793	-.468	-1.192	-.759	-.463	-1.120
5	-1.190	-.678	-1.618	-1.112	-.664	-1.486
6	-1.909	-1.216	-2.395	-1.772	-1.156	-2.203
7	-2.207	-1.290	-2.635	-1.994	-1.225	-2.353
8	-3.530	-1.533	-4.132	-3.050	-1.332	-3.568
9	-5.234	-3.789	-5.526	-4.223	-3.437	-4.382
10 (highest)	-13.935	-4.706	-16.323	-7.332	-2.069	-8.694
As a percent of real household expenditure, per capita						
1 (lowest)	-.090	-.040	-.430	-.080	-.040	-.420
2	-.160	-.110	-.330	-.160	-.110	-.320
3	-.240	-.210	-.300	-.230	-.210	-.280
4	-.270	.160	-.410	-.260	-.160	-.380
5	-.320	-.180	-.430	-.300	-.180	-.390
6	-.410	-.260	-.510	-.380	-.250	-.470
7	-.370	-.220	-.440	-.330	-.210	-.390
8	-.450	-.190	-.530	-.390	-.170	-.460
9	-.450	-.300	-.480	-.360	-.270	-.380
10 (highest)	-.400	-.190	-.460	-.290	-.160	-.330

Source: Calculated by the authors.

1998.³³ For the first group, one can proceed as in the previous subsection. For the second group, for whom welfare changes could have arisen only through induced variations in the price of electricity substitutes, one can also use the methods outlined in the previous subsection. The third group cannot be handled in the same manner as the first two groups. The problem involves how one handles the price of electricity that this group faced in 1993. For these consumers, the 1993 price can be thought of as the lowest price, such that consumers demand zero electricity if it were offered to them at that price. This virtual price is calculated as the lowest price, such that the expenditure share on electricity is zero. In practice, one recovers this price from the estimated Engel equation 3.6, by finding the price, such that the estimated expenditure share, w_{it} , is zero.³⁴

33. Certain complications with the first group may have been ignored because the surveys (1) provided information on individual use of electricity, but not on whether consumers had the option of access in 1993, and (2) did not ask consumers how long they had had access.

34. This virtual price differs by household, according to total expenditure and demographic information. See McKenzie and Mookherjee (chapter 2).

Households with access in both 1993 and in 1998 experienced a loss in welfare across all deciles. In monetary terms, the losses were monotonically increasing from bottom to top deciles; however, in contrast to the results obtained, when the issue of access was ignored, the welfare losses in percentage terms were nearly monotonically decreasing in the urban area and U-shaped in the rural area. That is, percentage welfare losses were larger for poorer households than wealthier ones because poorer households are less elastic to electricity price changes and must allocate a larger share of household expenditure to electricity (particularly those in urban areas).

As expected, households without access in 1993 and 1998 obtained welfare gains, but they were negligible. In effect, these households' welfare remained unchanged.

At the same time, households without access in 1993 who obtained access by 1998 experienced substantial gains in welfare. Among these households, the poorest obtained the largest welfare gains in percentage terms. For these same households, quantity adjustments (second-order approximations) enhanced the welfare gains obtained from gaining access. Again, households at the bottom of the expenditure distribution benefited most as a result of two opposing factors. On the one hand, households in the poorer deciles had a lower expansion of electricity access, compared to wealthier households. Growth in electricity access was higher in urban, rather than rural, areas and faster in the top five, as opposed to the bottom five, deciles. On the other hand, virtual prices were higher in the poorer, rather than wealthier, deciles (table 3.11). Therefore, poorer households had larger gains in welfare not only because they gained access to electricity, but also because they valued that access more than did other households.³⁵

The final step is to sum all households and compute the total welfare effect. As table 3.13 shows, the welfare effect was negative in monetary terms for most deciles in urban areas but positive for the bottom six deciles in rural areas. In both rural and urban areas, as well as the country overall, welfare changes were progressive; that is, poorer deciles had either welfare gains or smaller losses than those experienced by wealthier deciles. When considering welfare changes in percentage terms, no gains were registered for first-order approximation in rural areas.

The conclusions from monetary and percentage welfare calculations are the same: The welfare changes of electricity reforms in Nicaragua were progressive. That is, positive welfare changes were larger for the bottom than for the top deciles.

To estimate the effect of these welfare changes on total welfare in Nicaragua, we used the money-metric welfare changes reported above and assumed a class of social welfare functions (Freije and Rivas 2003, appendix

35. For a full account of the welfare gain of these groups, see Freije and Rivas (2003).

Table 3.13 Nicaragua: Effect of electricity price change on welfare (accounting for access change for all households)

Decile	First-order approximation			Second-order approximation		
	Total	Urban	Rural	Total	Urban	Rural
In real (1998 = 100) córdobas						
1 (lowest)	-.038	.004	-.371	-.037	.004	-.364
2	.804	1.027	.050	.844	1.014	.269
3	.925	1.517	-.248	.998	1.506	-.009
4	-.008	.482	-.608	.160	.476	-.228
5	.483	.915	.122	.805	.915	.713
6	-.179	.631	-.747	.258	.698	-.051
7	-.972	-.933	-.990	-.345	-.858	-.106
8	-1.693	-.550	-2.038	-.837	-.376	-.976
9	-2.870	-2.366	-2.972	-1.372	-2.013	-1.243
10 (highest)	-12.199	-4.124	-14.288	-3.405	-2.209	-3.715
As a percent of real household expenditure, per head						
1 (lowest)	-.09	-.04	-.43	-.05	.00	-.42
2	-.16	-.11	-.33	.58	.69	.22
3	-.24	-.21	-.30	.47	.71	-.01
4	-.27	-.16	-.41	.07	.19	-.08
5	-.32	-.18	-.43	.22	.27	.18
6	-.41	-.26	-.51	.04	.13	-.02
7	-.37	-.22	-.44	-.07	-.15	-.03
8	-.45	-.19	-.53	-.10	-.05	-.12
9	-.45	-.30	-.48	-.11	-.14	-.11
10 (highest)	-.40	-.19	-.46	-.19	-.15	-.20

Source: Calculated by the authors.

3.3). Table 3.14 shows the results for various areas, databases, and approximation methods. In nearly all cases, a small loss in total welfare was reported. The estimates range from a maximum welfare gain of 0.01 percent to a welfare loss of 0.07 percent in rural areas.

To determine the effect of these welfare changes on inequality and poverty in Nicaragua, we used the estimated money-metric welfare changes, added them to the 1998 household expenditure data, and computed poverty and inequality indexes with and without the welfare change to evaluate changes in expenditure distribution. Table 3.15 shows the results of these simulations for various areas, databases, and approximation methods. That no effect on poverty or inequality was found is not surprising, given the small size of the monetary changes reported above and the limited scope of the privatization considered (i.e., partial privatization of electricity generation).

Conclusion and Comments

Privatization in Nicaragua differs from most Latin American countries because it did not merely transfer ownership or management of several

Table 3.14 Percent change in welfare due to changes in electricity price (including access changes)

Value	First-order approximation			Second-order approximation		
	Total	Urban	Rural	Total	Urban	Rural
$\sigma = 0.5$	-.04	-.05	.01	-.01	-.03	.01
$\sigma = 1.0$.00	-.01	.01	.00	-.01	.01
$\sigma = 2.0^a$	-.04	.02	-.07	-.06	.01	-.07

a. A negative percentage change for this social-welfare function means a less negative social welfare; that is, the society is better off.

Source: Freije and Rivas (2003, appendix 3).

Table 3.15 Nicaragua: Poverty and inequality with and without welfare effect (including access changes), 1998

Index	Sector			First-order approximation ^a			Second-order approximation ^b		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Poverty									
FGT									
(0)	.359	.193	.578	.358	.192	.578	.352	.193	.578
(1)	.148	.060	.263	.149	.060	.265	.146	.061	.265
(2)	.085	.028	.155	.083	.028	.156	.082	.028	.156
Inequality									
Gini coefficient									
	.556	.496	.589	.557	.496	.590	.557	.497	.590
Atkinson indices									
A(0.5)	.265	.203	.320	.266	.208	.321	.266	.208	.321
A(1)	.428	.346	.470	.430	.346	.471	.430	.347	.471
A(2)	.634	.531	.537	.636	.532	.539	.636	.532	.539

FGT = Foster-Greer-Thorbecke poverty index

a. Indices computed using 1998 consumption minus first-order approximation of welfare change.

b. Indices computed using 1998 consumption, minus second-order approximation of welfare change.

Source: Calculated by the authors.

SOEs to the private sector. Rather, Nicaraguan privatization was a transition from a socialist to a market economy. In assessing the consequences of privatization on distribution—through its effects on fiscal balance, labor markets, and consumer prices—we identified two phases: 1993–98 (privatization of SOEs under CORNAP) and 1998–present (privatization of public utilities). The first stage was characterized by lack of transparency. Because allocation of proceeds from privatization was not fully recorded in fiscal records, it is difficult to ascertain the distributional effect of this process. Nonetheless, its visible characteristics (i.e., large asset restitutions and a

few transfers to workers and war veterans) suggest nonprogressive distributive effects. The second stage has a more complete public record of procedures and proceeds, and evidence shows that utilities have improved their balance positions since the reforms begun in 1995.

In the case of Nicaraguan labor markets, a large reallocation of labor occurred as a consequence of transition, accounting for nearly 15 percent of the labor force. This process was accompanied by increased wage dispersion within the public sector, stable wage dispersion in the private sector, and an unchanged mean wage gap between public and private sectors. Consequently, wage dispersion in Nicaragua increased for the period under study. Increasing dispersion in public-sector wages cannot be attributable solely to a simple transfer of assets; however, it appears to result from the increased market pressures that a transition economy faces. We thus acknowledge that privatization was a large, but not the sole, cause of increasing inequality in Nicaragua. Depending on the inequality measure used, changes in the compensated wage differential between public- and private-sector occupations can account for up to one-third of total inequality change.

Finally, the welfare effect of privatization is measured through estimates of first- and second-order approximations to changes in indirect utility functions. We found that the change in electricity prices, observed during 1993–98, produced welfare losses for all households across all deciles of expenditure distribution. However, losses were larger for wealthier households. When accounting for changes in access to electricity, household gains were concentrated in deciles 2 through 6. Summing up all of the effects (i.e., prices and access), the welfare effect of reforms in the Nicaraguan electricity sector was slightly progressive over the period studied. However, simulations of the monetary effect of this welfare effect on indexes of poverty and inequality were negligible.

Several limitations must be overcome in future research. First, privatization of public utilities is still ongoing, and the data available for this chapter do not register the ultimate consequences of the process. Privatization of telecommunications and electricity distribution and generation in 2001 and 2002, as well as the eventual divestment of water and sewage, will undoubtedly have effects in subsequent years. Evaluating this process will require additional household data that will eventually be available. Second, the effect on ownership has been mentioned only cursorily. Privatization is mainly a process about ownership changes. No formal evaluation of asset and wealth distribution has been conducted. Such a study will require data on distribution of agricultural land, housing, and corporate assets. Third, intergenerational distributive issues—mainly related to privatization's effects on the environment—have not been addressed. Such a study will require evaluating changes in farming methods, public expenditure on conservation, and regulation of polluting industries.

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