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Toward a Social Policy for Argentina's Infrastructure Sectors:

Evaluating the Past and Exploring the Future

Vivien Foster
in collaboration with CEER-UADE[1]

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[1] This paper was prepared in collaboration with a team of economists at the Center for the Economic Study of Regulation (CEER) of the Argentine Business University (UADE). The team was led by Diego Petrecolla and Omar Chisari, coordinated by Diego Bondorevsky, and comprised Mariana Marchoni and Maria Victoria Fazio (analysis of household surveys), Gustavo Ferro (water), Carlos Romero (electricity), Esteban Greco (gas), and Javier Cardozo (transport).

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1. INTRODUCTION

1.1 In the early 1990s, Argentina underwent one of the most ambitious infrastructure privatization programs in Latin America. From 1989 onwards, the Federal monopoly, electricity companies, and natural gas monopoly were all restructured and privatized. Over the same period, concessions were awarded for most of the country's railroad network, and about a third of the national road network, as well as several ports and airports. The Provinces rapidly followed suit with about a dozen of them awarding concessions for electricity distribution and water and sewerage services, including those in the Metropolitan Area. Overall, Argentina captured 11 percent of private sector capital flows to developing countries worldwide during the 1990s, more than any other developing country in the world except for Brazil. One of the factors facilitating private participation in the Argentine infrastructure sectors was the Convertibility Law of 1991 which fixed the peso against the dollar at a rate of one to one, so that infrastructure tariffs could effectively be expressed in dollars. The abandonment of the convertibility regime at the end of 2001, led to the Emergency Law 2002 that converted infrastructure tariffs back from dollars into pesos at a rate of one to one, and froze them in nominal terms even as the peso lost 70 percent of its dollar value, and domestic wholesale prices rose by 90 percent. Following the crisis, a renegotiation process was initiated with infrastructure concessionaires, whose final results are not yet known.

1.2 The infrastructure reforms of the 1990s did not fully take into account the sensitive social nature of these services, and hence did not incorporate a comprehensive framework of social policy measures to address these concerns. Although a number of social policy funds were established at the time, they were designed primarily to promote territorial integration rather than poverty alleviation. Examples include the national electricity fund and the Patagonian gas fund. This omission gradually led to a growing number of ad hoc social policy initiatives in the infrastructure sectors, in order to meet the emerging social concerns of the moment. These included a universal access surcharge for water and sanitation in the Metropolitan Area, as well as a wide range of Provincial social tariff initiatives. However, all of these mechanisms are partial in their geographic coverage, so that many jurisdictions lack any kind of social policy instrument. Overall it is estimated that Argentina currently spends around US$200 million per year on social policies for the infrastructure sector, yet in spite of this lacks a coherent social policy framework for these services.

1.3 The absence of a social policy for the infrastructure sectors has become particularly pressing since the onset of a severe economic and social crisis since the late 1990s, that was considerably exacerbated by the collapse of the convertibility regime. GDP has fallen by 20 percent since its last peak in 1998, with 10.9 percent of this decline coming in 2002 alone. Due to a combination of recession and devaluation, GDP per

capita has declined from US$8,210 in 1998 to US$ 2,695 in 2002. As a result, the urban poverty rate that was already at 29% in 1998 had risen to 58% by 2002. Moreover, unemployment has risen from 13 percent in 1998 to 22 percent in 2002. Compared with other major economic crisis of the 1990s, the Argentine crisis is second only to Indonesia in terms of decline in GDP and manufacturing wages, and is the worst in terms of increases in poverty and unemployment rates. Such loss of purchasing power on the part of many families evidently creates difficulties with keeping-up payments for essential infrastructure services. Demand for declined by 10 percent for utility services and 15-20 percent for urban transport services in the immediate aftermath of the crisis. Moreover, survey results indicate that 40% of households were falling behind in the payment of bills, and around 10% had been disconnected from electricity and telephone services.

1.4 In response to the omission, the present study aims to provide the empirical basis for the construction of a more coherent and better-targeted social policy framework for the infrastructure services in Argentina. To this end, the paper evaluates the distributional performance of current social policy instruments and simulates the implementation of potentially better-designed alternatives.

2. EVALUATING THE NEED FOR A SOCIAL POLICY

2.1 There are two basic justifications for social policy intervention in the infrastructure sectors. First, access to basic services is considered essential to achieve a minimum level of household welfare; without adequate sanitation, for example, it is difficult to sustain good health. Second, it is known that access to basic services provides a platform that helps families to escape from poverty; for example, by facilitating labor force participation via improved health or reduced time spent on domestic chores such as collection of water and wood, or by expanding possibilities for household-based micro-enterprises.

2.2 In order to define the priorities of any social policy for the infrastructure sectors, it is important to begin with an empirical analysis to identify the areas of most pressing social need. In many countries, governments set themselves the objective of providing universal access to infrastructure services, often defined as universal service coverage at affordable prices that enable all citizens to cover their basic consumption requirements. To evaluate the extent to which this objective has been met in today's Argentina, the study examines household survey data on coverage and expenditure across the income spectrum.

ACCESS

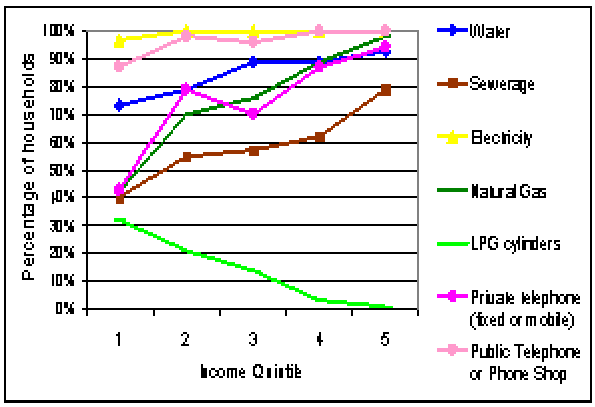
2.3 Household data on service coverage show that access to electricity in Argentina is almost universal, both in the Metropolitan Area and in the provinces (Figure 1). As far as telecommunications are concerned, universal coverage has also been reached, since although only 72% of households have a private telephone, 97% live within 10 blocks of a public telephone service, which is considered to be an adequate substitute.

2.4 A significant coverage deficit, however, still remains for water and sewerage. In the case of water, the deficit is concentrated in the Metropolitan Area where 15% of households currently lack the service, in contrast to the provinces where the service is already virtually universal. In the case of sewerage, 30% of the population nationwide still lack access to this service. Given the importance of these services from a public health perspective, there is a clear justification for making coverage expansion a central element of the country's infrastructure social policy.

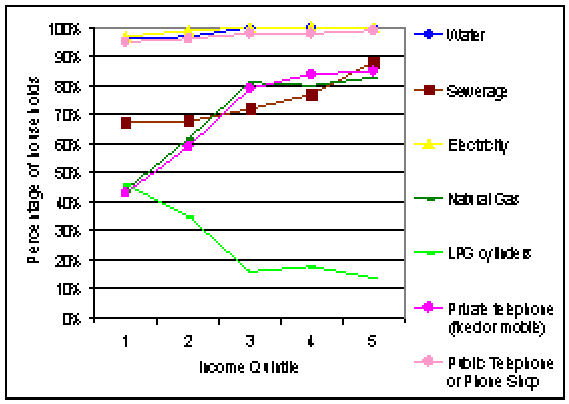
2.5 Finally, the natural gas service also presents a significant coverage deficit with coverage levels of around 70% nationwide. LPG cylinders provide a widely available substitute for this service, however it is five times more expensive than natural gas per equivalent unit of energy. Ironically, its usage is concentrated among the lowest income groups, which are often unable to finance the US$53 connection charge for natural gas, as

well as the US$237-474 conversion costs within the household. There is thus a potential justification for making the expansion of natural gas coverage a second element of any infrastructure social policy for Argentina.

Figure 1: Access to utilities by income quintile in Metropolitan Area and the Provinces



(a) Metropolitan Area



(b)Provinces

Source: OPSM, May 2002

2.6 As regards public transport services in the Metropolitan Area, the household survey revealed that 98% of those interviewed (and 93% of those in the first income quintile) had access to the public transport network within 10 blocks of their home[2]. Furthermore, respondents indicated that 76% of those using public transport are able to reach their workplace with a single public transport journey[3]. Both results confirm the virtual universality of coverage of the public transport network in the Metropolitan Area, and suggest that the high proportion of heads of low income households that commute on foot do so for economic reasons, and not due to lack of physical access to public transportation.

AFFORDABILITY

2.7 Another potential social policy concern for the infrastructure sectors arises where a significant segment of the population cannot afford to pay for a basic subsistence basket of utility services. This assessment is based on the share of the family budget that is devoted to infrastructure services.

2.8 The last official family expenditure survey in Argentina dates back to 1996/97. Although this information is evidently outdated and unrepresentative of current economic conditions, it nonetheless provides a helpful longer-term point of reference under more 'normal' circumstances. According to the 1997 survey, utility services on average

[2] The results for the provinces are plus or minus one percentage point from the results for the Metropolitan Area.
[3] At the national level, this percentage rises to 83%.

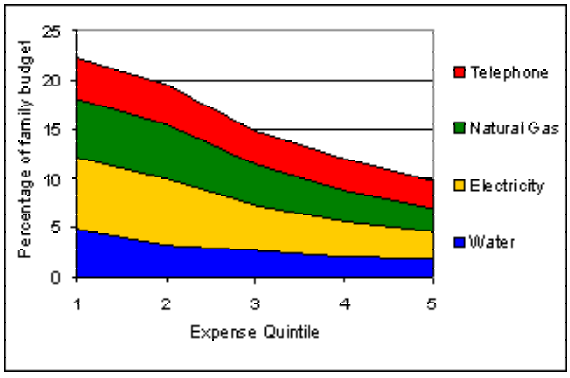
absorbed 6.7% of the family budget, with the share ranging from 11.3% for the bottom quintile to 5.0% for the top quintile (Figure 2(a) and Table A1 from the Annex).[4]

2.9 A household survey commissioned for the present study in November 2002 provides more recent evidence on the structure of household expenditure. Notwithstanding some methodological differences with the earlier family expenditure survey, a comparison between these two sources remains informative. The new survey shows that utility services are currently absorbing 13.4% of family budgets on average, with the share ranging from 16.2% for the bottom quintile and 11.5% for the top quintile. On average, this represents a doubling of the budget shares observed in 1997, although for the bottom quintile the increase is only 40% (Figure 2(b) and Table A1 from the Annex).

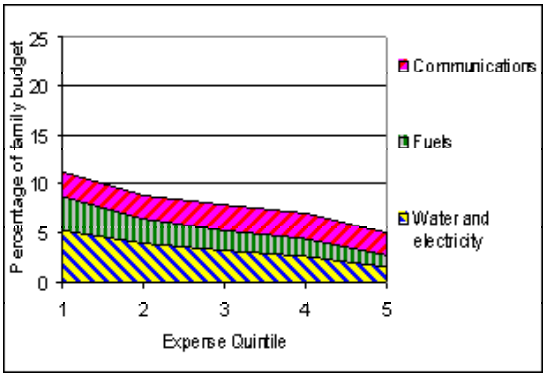
2.10 Furthermore, if current expenditure is expressed as a percentage of average *income* for each quintile, the share absorbed by the utilities changes to 11.4% on average, but as much as 22.1% of income for the bottom quintile and only 6.8% of income for the top quintile (Table A1). These differences between budget share and income share are explained by the fact that low-income households tend to spend considerably more than their monthly income (US$123 versus US$97.2), leading to much higher shares when income is used in the denominator. For higher income households, the opposite is true, with expenditure being substantially lower than income (US$358.2 versus US$559.5).

2.11 Two factors explain the increase in budget share observed between 1997 and 2002. The first is the indexation of utility tariffs to the US CPI, during a period in which US CPI accumulated 10 percentage points of growth as against a two-percentage point fall in the Argentine CPI. The second factor is the recent decline in per capita incomes, which fell by a third in real terms over this period.

Figure 2: Affordability of utility services by quintile nationwide



[4] Throughout the study results will be compared across quintiles of per capita household income



(a) Family Expenditure Survey 1997 **(b)OPSM, 2002**

Source: Family Expenditure Survey, May 1997 and OPSM, November 2002

2.12 Beyond observed expenditure patterns, another helpful point of reference is the cost of a subsistence basket of utility services (see Table A2 of the Annex). The subsistence monthly basket is defined as the minimum unmeasured monthly tariff for water and sewerage, plus the cost of 120 Kwh per month of electricity, a natural gas consumption of 55 cubic meters in summer and between 65 and 295 cubic meters in winter depending on the latitude, and 100 minutes of public telephone calls.

2.13 At current prices, the cost of the subsistence basket comes to US$16.6 per month, which represents on average 7.6% of the family budget or 6.5% of family income nationwide. For households in the bottom quintile, the subsistence basket would absorb 12.5% of the family budget but 17.1% of the family income. For households in the second quintile, the cost of the basket represents 9.1% of the family budget or 9.3% of the family income. Once again this result throws into relief the divergence between income and expenditure for first quintile households, which means that utility expenditure represents a relatively high share when expressed in terms of income. Comparing actual expenditure shares against those associated with the subsistence basket reveals that low-income households are actually spending significantly more on utility services than the subsistence basket would suggest, particularly on gas and electricity.

2.14 While there are no scientific parameters to determine the maximum amount that a household 'should' spend on utility services, international experience suggests that a share of 10%-15% of household income is typical and can be considered 'reasonable'. Hence, a reasonable objective for infrastructure social policy might be to prevent low-income families from needing to spend more than 15% of their incomes to meet subsistence requirements of water, sanitation, electricity and natural gas. The above analysis indicated that first quintile households in Argentina are currently above this level, spending 22.1% of their income, or the equivalent of 17.1% for subsistence needs, and can therefore be considered to present an affordability problem. The situation of second quintile households, on the other hand, is not so critical given that they can meet subsistence requirements with 9.3% of their income, and currently spend 15.7% of their

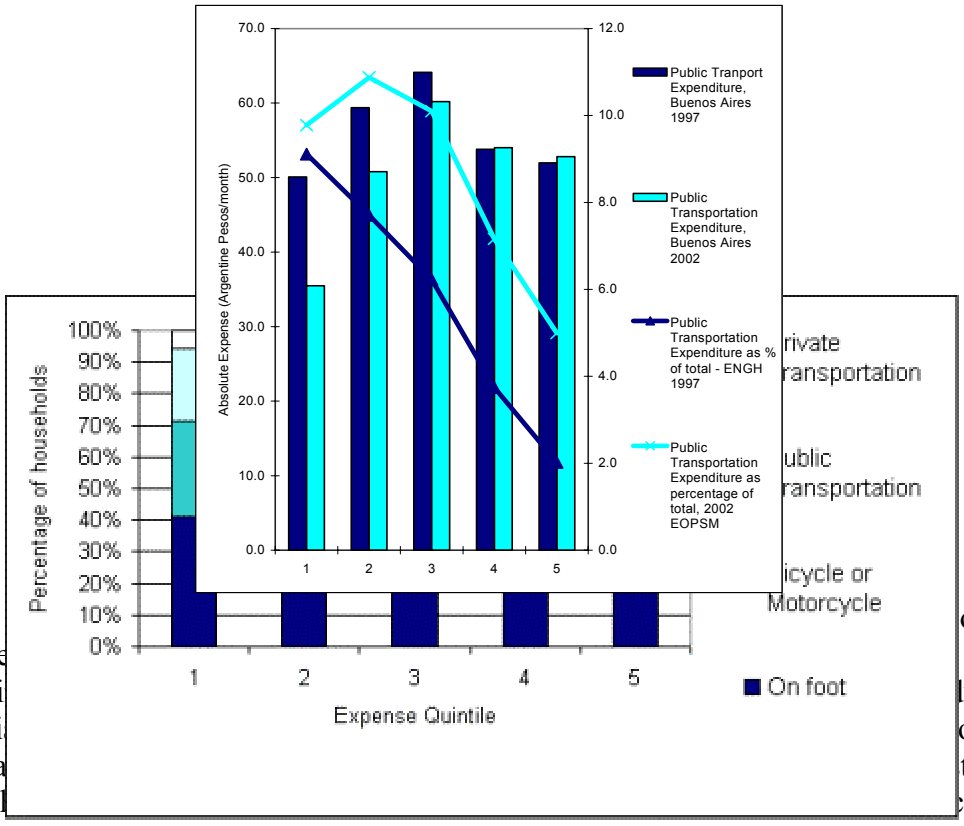
constructed at the national level.

income on the utilities. The implication is that any social policy aimed at subsidizing the cost of a subsistence basket of services need probably only focus on the poorest of the poor.

2.15 Regarding expenditure on public transport services, it is important to note that comparisons between the 1997 and 2002 household expenditure surveys are complicated by the fact that the former survey lumps together expenditure on public and private transportation (Figure 3). Nevertheless, since vehicle ownership is concentrated in the upper end of the income distribution, this need not represent a major problem for comparing the expenditure patterns of the poor. A more serious limitation is that the 2002 survey only reports transport expenditure for commuting journeys of the head of household, and thereby represents only a lower bound on public transport spending. A comparison between the two surveys shows that the budget share of public transport services more than doubled between 1997 and 2002. It rose from an average share of 4.3% in the 1997 survey to 8.1% in the 2002 *(even though the latter only includes commuting journeys for the head of household)*. This jump is largely explained by the fact that public transport tariffs rose between 35% and 40% in real terms since 1997, while per capita household income fell by a third over the same period.

Figure 3: Affordability of public transport in the Metropolitan Area

Source: Family Expenditure Survey, May 1997 and OPSM, November 2002



2.16 omewhat differe a fall of 30% i luction is associ of travel, such a t quintile housel cycles or motorcycles (Figure 4).

Figure 4: Modal pattern for commuting journeys in the Metropolitan Area

Source: OPSM, November 2002

2.17 Finally, since the demand for urban transport services is a derived demand for other services such as education, health, shopping and leisure, it is harder to come-up with a meaningful concept of subsistence. Furthermore, since the 2002 survey was not able to collect information on journeys other than those related to head of household commuting, there is no real information base for deriving a subsistence concept. Therefore, the cost of one typical round trip commuting journey per day is used here as a very simple approximation to the subsistence concept. This amounts to US$0.67 per day or US$14.9 per month, which is almost 25% more than what the first quintile heads of household are currently spending, given their observed tendency to switch out of public transport.

SUMMARY

2.18 In summary, this evaluation of social policy needs would appear to provide support for a universal access policy aimed at expanding coverage of water services in the Metropolitan Area sewerage services nationwide, and possibly also natural gas services. This could be achieved via subsidies aimed at reducing connection costs, and/or the cost of complementary investments within the household. This can be regarded as a long-term policy objective, whose justification is independent of the economic crisis that afflicted the country in 2002.

2.19 At the same time, infrastructure services that were reasonably affordable to all back in 1997, have recently become very expensive in relation to the income of households in the first quintile. This changing situation is attributable both to rising prices and falling real incomes. This implies the need to develop social policy mechanisms to maintain the cost of the subsistence basket within an affordable range for the poorest households, particularly given the prospect of upward tariff adjustments to compensate infrastructure service providers for the devaluation of the peso.

3. METHODOLOGICAL FRAMEWORK

3.1 The development of a social policy framework capable of meeting the objectives defined above, requires an empirical evaluation of the efficacy of current social policies as well as the potential for improvement from the adoption of alternative instruments. This analysis will be based on the household survey undertaken specifically for the current study, and will make use of analytical techniques developed in the income distribution literature.

HOUSEHOLD SURVEY

3.2 The empirical analysis will be based on the household survey conducted by OPSM in May 2002. The survey covered 2,505 households distributed across 39 localities nationwide with more than 5,000 inhabitants. The survey is representative of urban areas at the national level, and also at the level of the Metropolitan Area and the five major regions of the interior. The sampling errors is plus or minus 1.96% at the national level, and plus or minus 5.0% at the regional level.

3.3 The most innovative aspect of the survey is the combination of expenditure data and consumption patterns for infrastructure services with data on household income and socioeconomic characteristics. In this sense, the survey can be contrasted both with utility customer databases—that offer extensive information on consumption patterns without any accompanying information on socioeconomic characteristics of the household—and national household surveys—that offer extensive information on socioeconomic characteristics without reporting expenditure patterns on utility services[5].

3.4 In November 2002, OPSM conducted a second household survey with wider poverty measurement objectives, which collected detailed information on the structure of household expenditure, including expenditure on infrastructure services.

MEASURING CONSUMPTION

3.5 The following procedure was adopted to estimate consumption of infrastructure services from the survey data. First, for the 25%-35% of households that were able to provide the interviewer with a copy of their utility bill, the level of consumption could be

[5] The family expenditure survey of 1997 was the last to provide official data for expenditure on utility services. However, even this survey does not present a very detailed breakdown given that expenditures are presented in four broad categories, namely: water and electricity combined, telephone and post combined, fuels and transportation.

read directly from the bill (Table 1). Second, a further 30% of households were unwilling or unable to show their utility bills to the interviewer, but were able to recall the value of their most recent monthly bill. In these cases, the local utility tariff structure was applied to the reported expenditure in order to infer the physical consumption of the service. For the remaining 35% to 45% who neither presented bills nor recalled expenditure, imputation techniques were used to infer expenditure based on household characteristics.

3.6 Some evidence of selectivity effects was found with regard to the sub-sample that provided coherent information on household expenditure. Both for water and electricity, high-income households were more often able to report expenditure. In the case of water, this may simply reflect higher rates of service coverage in the upper income quintiles. However, in the case of electricity, where coverage is practically universal, this explanation is no longer relevant.

Table 1: Summary of data availability on utilities expenditure

	Water	Electricity	Gas	Telephone
Percentage of households that showed bill	27.9	35.4	26.5	23.7
Percentage of households that verbally reported expenditures	29.7	29.8	30.4	28.7
Percentage of households that did neither of the above	42.4	34.8	43.1	47.6
	100.0	100.0	100.0	100.0

Source: OPSM, May 2002

3.7 Nonetheless, these data limitations in practice do not materially circumscribe the conclusions of this analysis. In reality, expenditure data were only used to evaluate the efficacy of existing social policies in the Metropolitan Area (for the cases of water, sewerage, electricity, and public transport) and Patagonia (for the case of natural gas). The analysis of social policies for water and electricity in the provinces is based solely on the socioeconomic characteristics of the households, without reference to expenditure levels. Furthermore, expenditure data were not used at all in the simulations of alternative social policies, which are based entirely on normative criteria for subsistence consumption, or depend solely on the socioeconomic characteristics of the household.

ANALYTICAL TOOLS

3.8 Using data from the 2002 survey, it is possible to identify the beneficiaries of current social policy mechanisms in the infrastructure sectors, and evaluate how well targeted they are. This is done by examining the extent to which they reach households that live under the official poverty (and extreme poverty) lines, which currently stand at US$65.7 (and US$27.7) per adult equivalent per month. In a similar fashion, it is possible to identify the impact of applying alternative social policy instruments, and examine their pattern of incidence.

3.9 The evaluation of the targeting properties of current and potential, future social policy instruments are based on a number of standard indicators adapted from the income

distribution literature. First, a simple graphical representation is made showing what percentage of the total subsidy is captured by each of the income quintiles.

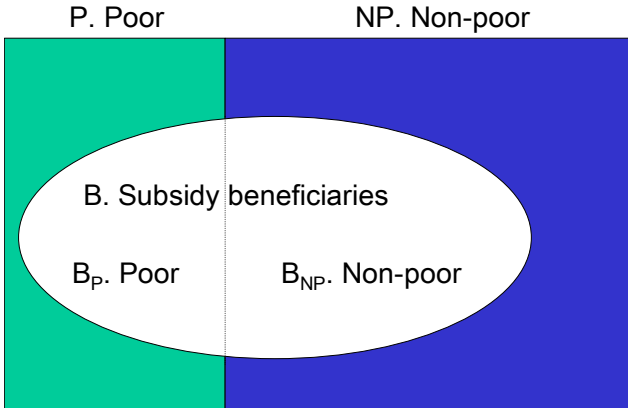
3.10 Second, the errors of inclusion and exclusion are calculated, in order to assess the degree to which the subsidy reaches the target population (see Table 2). The error of inclusion identifies the percentage of subsidy beneficiaries that are not genuinely poor, and hence should not be receiving the subsidy. The error of exclusion identifies the percentage of the poor who do not receive the subsidy, even though they should.

3.11 The third indicator is the quasi Gini coefficient, also known as the concentration coefficient (see Table 3). Similar to the Gini coefficient, the quasi Gini summarizes in a single number the overall progressivity or regressivity of the subsidy distribution. This coefficient is bounded within an interval from negative to positive one. Positive values indicate regressivity, or a pro-rich distribution of the subsidy. Negative values indicate progressivity, or a pro-poor distribution of the subsidy. A zero value indicates a completely egalitarian distribution of the subsidy.

Table 2: Understanding Errors of Inclusion and Exclusion

A key consideration in evaluating the efficacy of subsidies is measuring to what extent they succeed in reaching the poor. Two standard indicators are commonly used for this purpose; known as errors of exclusion and inclusion.

The following diagram helps to illustrate the meaning of these terms. The diagram divides the general population into two groups: poor (P) and non-poor (NP). A subset of this overall population are beneficiaries of a subsidy program (B). Since it is never possible to direct subsidies perfectly towards the target population, some of these beneficiaries are poor (BP), while others are non-poor (BNP).



Errors of exclusion (EE) arise when people who are genuinely poor fail to receive the subsidy. The error is defined as the percentage of the poor who do not receive any subsidy. In terms of the areas drawn in the diagram, this can be expressed as: $EE=1-(B_P/P)$. Errors of exclusion could be regarded as an even more serious problem than errors of inclusion, since they indicate that the subsidy is failing to meet its primary objective of helping the poor.

Errors of inclusion (EI) arise when people who are not poor benefit from the subsidy. The error is defined as the percentage of subsidy beneficiaries who are not poor. In terms of the areas drawn in the diagram, this can be expressed as: EI=BNP /B. Errors of inclusion are essentially a form of inefficiency, because they represent a leakage of subsidy funds towards a subset of the population that doesn't really need them.

Related to the error of inclusion, it is also interesting to calculate the *leakage rate*, which is the percentage of subsidy *resources* that are captured by the non-poor. The leakage rate tends to follow a similar pattern to the errors of inclusion, however if non-poor beneficiaries consume relatively large amounts of water compared to poor beneficiaries, then the leakage rate may be even higher than the error of inclusion.

Finally, it is interesting to note that errors of inclusion and exclusion tend to move in opposite directions. Thus, a subsidy with very high errors of inclusion will typically have relatively low errors of exclusion and vice versa. This happens because it is difficult to identify the poor, so that to be sure of reaching most of them very broad eligibility criteria are required; which in turn brings in a large number of non-poor. The implication is that to be sure of reaching the majority of the poor, it is often inevitable that there is a considerable amount of subsidy resources 'wasted' on the not so poor.

Table 3: An Introduction to Gini Coefficients

In addition to looking at errors of inclusion and exclusion, it is important to understand the overall pattern of subsidy incidence across the full spectrum of rich and poor. A simple way of doing this is to rank the total population from richest to poorest, and then plot a *Lorenz curve* which shows the percentage of subsidy that is captured by the poorest X percent of the population.

Equal distribution. If the distribution of the subsidy was equal across the population, then the poorest 20% of the population would receive 20% of the subsidy, the poorest 50% would receive 50% of the subsidy, and so on so that the Lorenz curve would essentially be equivalent to the 45^0 line shown in the diagram. Such a distribution is neither pro-poor nor pro-rich, since everyone essentially gets the same amount.

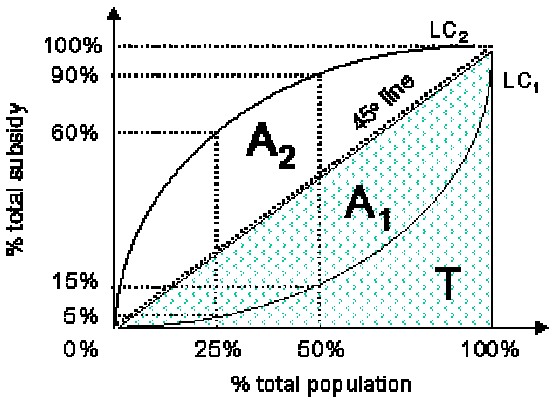
Regressive (or pro-rich) distribution. The first Lorenz curve plotted in the diagram (LC_1) represents a situation where the poorest 20% of the population receives only 5% of the total subsidy, while the poorest 50% receives only 15% of the total subsidy. As a result, the Lorenz curve bows down below the 45^0 line, indicating that the distribution is regressive, or pro-rich.

Progressive (or pro-poor) distribution. The second Lorenz curve plotted in the diagram (LC_2) represents a situation where the poorest 20% of the population receive 60% of the total subsidy, while the poorest 50% receives 90% of the total subsidy. As a result, the Lorenz curve bows up above the 45^0 line, indicating that the distribution is progressive, or pro-poor.

For convenience, it is typical to summarize the shape of the Lorenz curve in a single indicator known as a quasi-Gini coefficient (*QGC*). The quasi-Gini coefficient is defined as the area underneath the 45^0 line down as far as the Lorenz Curve, divided by the whole area of the triangle under the 45^0 line. Thus, for the first Lorenz curve (LC_1) the quasi-Gini coefficient is defined as: $QGC=A_1/T$. When the Lorenz curve bows up above the 45^0 line, the area between the Lorenz curve and the 45^0 line is deemed to be negative. Hence, for the second Lorenz curve (LC_2) the quasi-Gini coefficient is defined as: $QGC=-A_2/T$.

The quasi-Gini coefficient is bounded between –1 and +1, with an intermediate value of zero. A quasi-Gini of zero essentially indicates that the Lorenz curve lies right on top of the 45^0 line. A quasi-Gini close to +1, means that the distribution of the subsidy is very pro-rich, so that the Lorenz curve is bowing out almost to the edges of the triangle and almost 100% of the subsidy is going to the richest few people in the society. On the other hand, a quasi-Gini close to –1, means that the distribution of the subsidy is very pro-poor, so that the Lorenz curve is bowing out to make almost a triangle above the 45^0 line and almost 100% of the subsidy is going to the poorest few people in the society.

Gini coefficients are also commonly used to measure the distribution of income in a society, and in this case they can only take values between 0 and +1, since it is (by definition) impossible for the poorest 20% of the population to have more than 20% of the income.



4. EVALUATION OF EXISTING SOCIAL POLICIES

4.1 An important starting point is to understand the extent to which existing social policies in the infrastructure sectors succeed in transferring resources to poorer households. Accordingly, this section provides a brief characterization of the existing policies and presents evidence as to their distributional incidence.

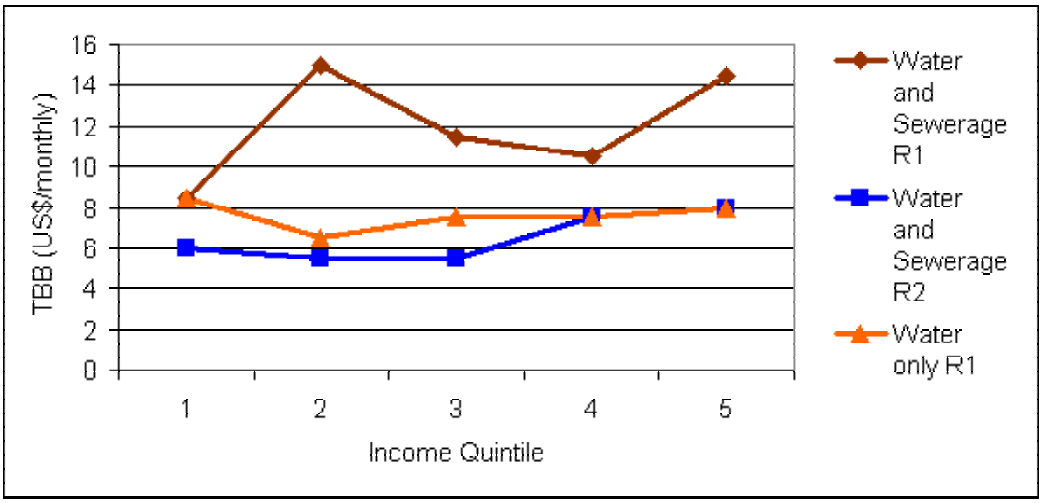
WATER AND SEWERAGE

4.2 There is no national social policy framework for the water and sewerage sector, thus each jurisdiction has developed its own social policy elements.

OSN Formula

4.3 Due to the low coverage of household meters in Argentina, most water utilities make use of an unmeasured tariff formula developed during the period of the former national state monopoly: *Obras Sanitarias de la Nación*. The formula has been adapted to differing degrees by different jurisdictions following the decentralization of the water sector in the 1980s. However, in most cases, it remains a polynomial formula that weights a number of characteristics of the dwelling, such as the size of the plot, the proportion of the plot that is constructed upon, the quality of the construction, and the facilities of the neighborhood. The underlying notion is that these variables serve as proxies both for the socio-economic level of the household and for its likely water consumption.

Figure 5: Correlation between water charge and income level in metro area



Source: OPSM, May 2002

4.4 For the concrete case of *Aguas Argentinas*, the utility serving the Metropolitan Area of Buenos Aires, there were sufficient data points to evaluate the extent to which the corresponding version of the OSN-derived formula is correlated with household income[6]. The data do not reveal any strong relationship between household income and the water tariff paid by different categories of customer, such as those with and without sewerage services, or those living in houses or apartments (R1 versus R2) (Figure 5). Indeed, the simple correlation between the OSN-derived formula and household income is found to be around 33%.

4.5 Nevertheless, a more thorough analysis shows that the variables that make-up the OSN formula themselves contain valuable information about the income level of the household. Statistical techniques can be used to find the weights that provide the closest fit between the variables in the formula and the income level of the household. The result shows that the level of correlation could potentially be increased to 80%, albeit via a rather unintuitive formula combining 27 quadratic terms and interactions between the original variables.

Universal Access Charge

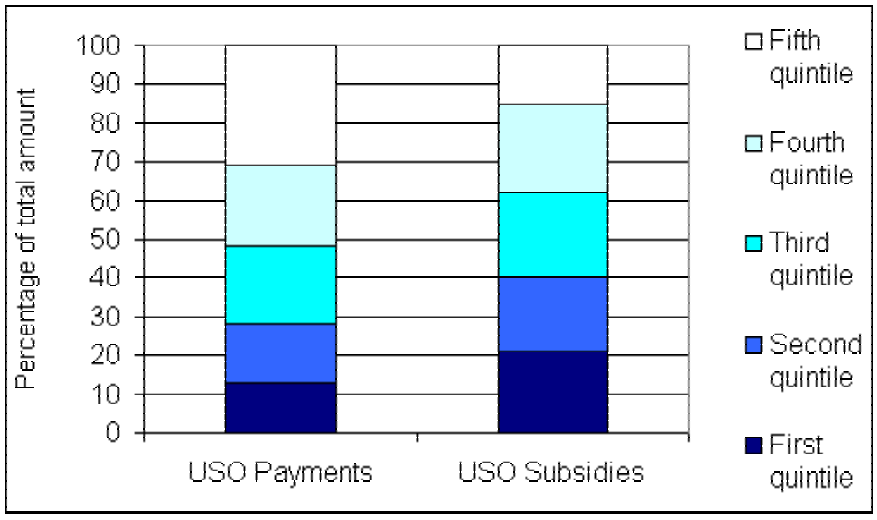
4.6 The water utility in the Metropolitan Area has developed a cross-subsidy scheme designed to finance the expansion of networks towards low-income neighborhoods. This universal service and environmental charge (known as SUMA), arose following a renegotiation of the concession contract in 1997. The idea was to substitute the previously practiced US$600 infrastructure charge for newly connected households, which had proved completely unaffordable for the poorest customers, with a monthly

[6] This analysis is based on data from water bills of 51 households representing 7.5% of the population of the Metropolitan Area.

fixed charge of US$1.65 applied to all the bills of existing customers. The universal access charge thereby introduced a cross subsidy between new and existing customers. At the same time, a proportion of the revenues from the universal access charge was earmarked to finance wastewater treatment. However, the link between the universal access charge revenues and the company's investment program was subsequently broken, so that the new charge simply became an additional component of the utility's income stream with no specific application.

4.7 Nonetheless, it is interesting to evaluate the distributional incidence of the universal access charge under the original concept of a social policy designed to finance new connections. This is done by means of a five-year simulation during which the proportion of the universal access charge relating to universal access is applied to the general customer base, and the resulting revenues are used to finance a subsidy to water and sewerage connections. The simulation takes into account the fact that the low-income households newly incorporated into the customer base at the outset of the period must themselves pay the universal access charge thereafter.

Figure 6: Distributional incidence of universal access charge



Source: OPSM, May 2002

4.8 The results show that the incidence of the universal access charge is slightly skewed towards richer households, with a concentration coefficient of +0.15. On the other hand, the distribution of connection subsidies for the water service is skewed towards poorer households, with a concentration coefficient of –0.20, reflecting the fact that households without water connections are concentrated among the lowest income groups. However, the distribution of connection subsidies for the sewerage service is relatively egalitarian, with a concentration coefficient of –0.07, due to the fact that households lacking the sewerage service are more broadly distributed across the income spectrum.

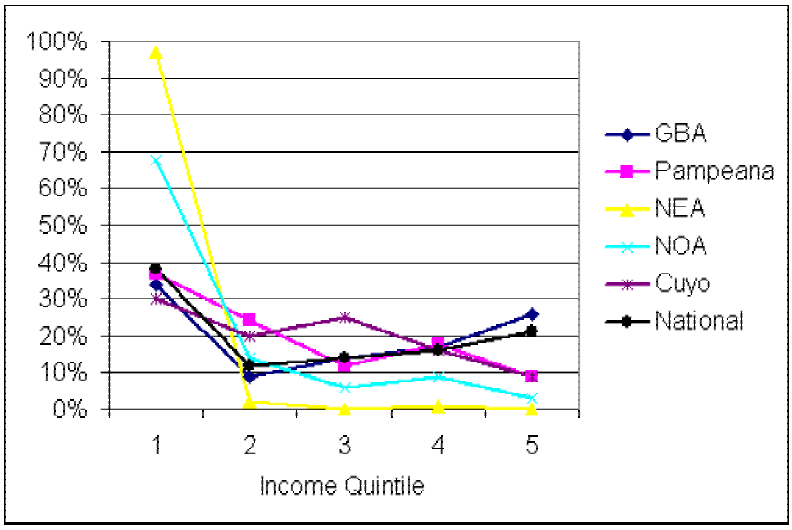
Social Tariffs

4.9 A number of Argentina provinces, and most recently the Metropolitan Area, have experimented with the introduction of various forms of social tariffs. These amount to some 10 cases in all. A brief description of the mechanics of each of these schemes is provided in Table A3 of the Appendix but most of them identify beneficiaries based on a range of characteristics such as income, housing, location, and assets.

4.10 The OPSM survey included a special question designed to identify the beneficiaries of these schemes, and found that barely 2% of households surveyed claimed to be beneficiaries. This result is consistent with what is known about the relatively small scope of these schemes, which are estimated to reach no more than 100,000 households nationwide. The small number of observations that appear in the survey do not make it possible to evaluate the incidence of these schemes directly. However, what can be done is to simulate the application of the eligibility criteria for each scheme to the sample of the population from the corresponding jurisdiction, in order to assess the extent to which these are successful in targeting resources towards the poor. This simulation proves to be rather artificial, given that most of these programs use household income as an eligibility criteria, and that this is accurately observed in the survey, but may not be so accurately measured by these schemes in practice. Consequently, the results obtained should be regarded as an optimistic upper bound on the targeting performance of these social tariff programs.

4.11 The results indicate that the eligibility criteria used in the social tariff schemes appear to be quite effective at targeting resources towards the poor. In particular, the criteria used in the northeastern and northwestern provinces of Argentina (namely, Chaco, Formosa, Salta y Tucumán) perform particularly well. Assuming that they are able to measure household income as precisely as is done in the survey, the simulation suggests that 70% to 90% of the beneficiaries belong to the bottom income quintile (Figure 7).

Figure 7: Simulated distributional incidence of social tariffs for water



Source: OPSM, May 2002

4.12 At the national level, these programs register a concentration coefficient of –0.15, indicating a relatively progressive distribution of subsidy. Nonetheless, this average conceals a wide variation in performance, ranging from concentration coefficients of –0.80 in the northerly province of Formosa to +0.28 in the Metropolitan Area. One reason for this may be that poverty in the north of the country tends to be more structural in nature, and is thus more closely linked to objectively observable characteristics of the household. Whereas, around the metropolitan axis, there is a greater prevalence of impoverished middle class households that do not exhibit many of the traditional characteristics of poverty, making it more difficult to design successful eligibility criteria. In most jurisdictions, the errors of exclusion are above 50%, reaching 73% at the national level. However, the errors of inclusion are relatively low, falling generally below 40% (Table 4).

4.13 Another interesting result from the simulations is that the number of households that comply with the eligibility criteria is very much higher than the number of households that actually receive the social tariff in the corresponding jurisdictions (Table 4). Indeed, it would currently cost US$46 million per year to provide the social tariff to all of the households that appear to meet the eligibility criteria, which is six times more than is currently spent on these subsidies. In general, these programs are run on the basis of an annual spending ceiling and subsidies are allocated to eligible households on a first-come first-served basis. In this sense, there would appear to be some rationing going on, or alternatively only a small proportion of potentially eligible households are sufficiently well informed or capable of demanding the corresponding benefit.

Table 4: Simulation of social tariffs for water

	Reality		Simulation		Error of inclusion	Error of exclusion	Concentration coefficient
	No. of beneficiaries	Total value of subsidy	No. of beneficiaries	Total value of subsidy			
Metro area	10,000	4,000,000*	—	—	—	—	—
Federal District	—	—	794,579	19,074,216	73%	0%	+0.28
Buenos Aires	—	—	369,916	11,239,721	10%	68%	-0.63
Mendoza	26,000	1,400,000	153,839	3,692,136	40%	48%	-0.18
Santa Fe	—	—	147,965	6,214,530	40%	7%	-0.18
Chaco	7,000	41,500	69,244	2,077,320	1%	49%	-0.78
Salta	20,000	1,200,000	56,223	2,039,892	3%	57%	-0.68
Santiago	9,500	50,000	20,546	289,970	10%	73%	-0.38
Formosa	7,300	240,000	10,410	348,526	0%	81%	-0.80
Tucumán	9,500	250,000	8,879	594,277	29%	96%	-0.14
Total	**89,300****	**7,181,500****	**1,638,209**	**46,884,000**	**44%**	**73%**	**-0.15**

Notes: *Not yet fully utilized; **Excludes Santa Fe

Source: OPSM, May 2002

ELECTRICITY

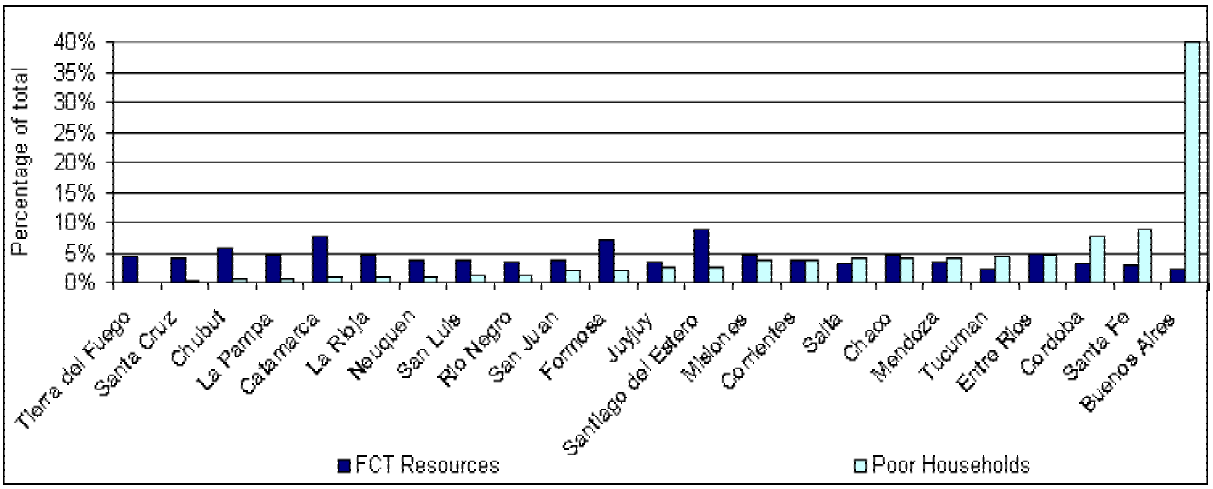
Provinces

4.14 A national Tariff Compensation Fund has been established for some years in the electricity sector. It is financed from 60% of the revenues generated by a surcharge of US$0.024/Kwh on all electricity traded through the national wholesale market, which amounted to US$98 million in 2002. The Federal Electricity Council distributes these resources to the provinces on the basis of a formula that seeks to compensate for differences in the cost of electricity production across jurisdictions. The underlying principle is hence one of horizontal equity, which seeks to equalize the electricity tariff across the country.

4.15 Notwithstanding substantial divergence in income levels around the country, the fund is not designed to compensate for differences in ability to pay across provinces. It is therefore not surprising to find that the proportion of funds transferred to each province bares little relationship with the proportion of the country's poor resident in each province (Figure 8). The majority of smaller provinces receive a much higher proportion of transfers than would be warranted with the extent of poverty in their jurisdictions. On the other hand, the three largest provinces receive scant resources in comparison with the extent of poverty that they contain. The most striking example is that of Buenos Aires

province, which receives 2% of the resources from the fund, but has 40% of the country's poor.

Figure 8: Distribution of resources from the national fund against distribution of poor



Source: OPSM, May 2002

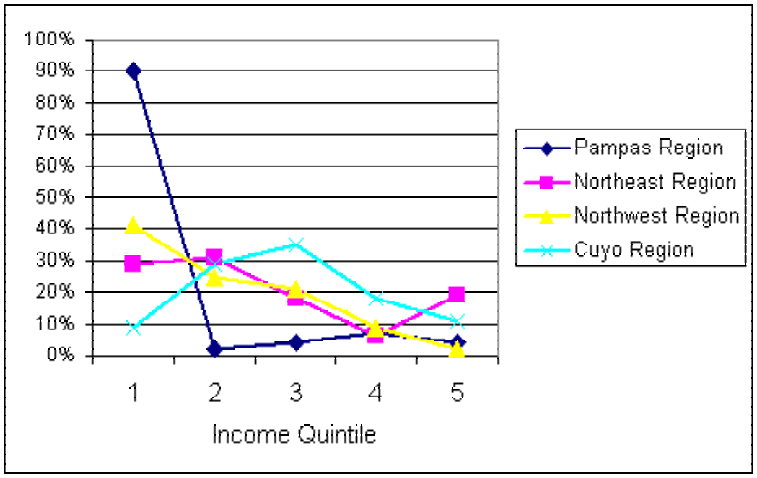
4.16 Provinces enjoy considerable discretion in the use of these resources. While no detailed accounts are kept of how each province employs these transfers, they are in the majority of cases used either to subsidize isolated systems, or to compensate industrial customers for seasonal price fluctuations, or to finance a variety of social tariff schemes (similar to those discussed above for the water sector). A brief summary of the design characteristics of these social tariff schemes is provided in Table A4 of the Appendix, they typically use consumption levels and poverty indicators to identify eligible beneficiaries.

4.17 Unfortunately, there is not enough detailed information available about the distribution of the resources from the tariff compensation fund to permit an evaluation of its distributional incidence. However, given that an unknown portion of these resources are used to finance social tariff schemes, it is possible to simulate the distributional incidence of these schemes, applying a similar methodology to that developed for the water sector. As before this constitutes an optimistic upper bound for the targeting performance of these schemes, given that household income is more accurately observed in the survey than it probably would be in the practical application of the relevant eligibility criteria.

4.18 The results, as for the water case, show a relatively good targeting performance (Figure 9), with an overall average concentration coefficient of –0.37, ranging from +0.07 in the province of Formosa to –0.80 in the province of Salta (Table 5). On the basis of the simulation, it is estimated that some 400,000 families nationwide would comply with the eligibility criteria for the social tariff in their respective jurisdictions, which would entail a national cost of US$18 million per year. As in the case of water, this number probably far exceeds the actual number of beneficiaries, however no information is available on

the current numbers. Finally, it is important to note that the estimated annual cost is barely 20% of the resources raised through the national Tariff Compensation Fund in the year 2000.

Figure 9: Simulated distributional incidence of social tariffs for electricity



Source: OPSM, May 2002

Table 5: Simulation of social tariffs for electricity

	Reality No. of beneficiaries	Total value of subsidy	**Simulation** No. of beneficiaries	Total value of subsidy	**Transfer from national fund**	**Error of inclusion**	**Error of exclusion**	**Concentration coefficient**
Córdoba	—	—	62,894	5,503,731	3,579,100	0%	84%	-0.80
Catamar	—	—	30,362	601,167	6,047,157	45%	0%	-0.23
Chaco	—	—	43,209	2,592,540	2,594,925	19%	75%	-0.43
Formosa	—	—	31,820	2,688,153	5,643,196	45%	65%	+0.07
Entre	—	—	31,762	133,400	3,853,880	32%	83%	-0.42
Jujuy	—	—	38,378	1,586,400	2,702,808	22%	66%	-0.43
La Rioja	—	—	11,184	1,124,237	3,680,017	60%	51%	-0.16
Mendoza	—	—	22,892	1,301,951	2,654,816	77%	97%	-0.03
Misiones	—	—	3,618	108,540	3,723,654	47%	97%	-0.42
Río	—	—	1,476	106,272	2,717,131	100%	100%	0.00
Salta	—	—	12,909	656,353	2,597,224	0%	90%	-0.80
San Juan	—	—	6,038	144,912	2,868,409	100%	100%	0.00
San Luis	—	—	22,303	441,599	2,886,601	39%	63%	-0.01
Santa Fe	—	—	76,046	1,387,078	1,172,555	74%	93%	+0.12
Total	**—**	**—**	**394,891**	**18,376,338**	**46,721,473**	**39%**	**93%**	**-0.37**

Source: OPSM, May 2002

GAS

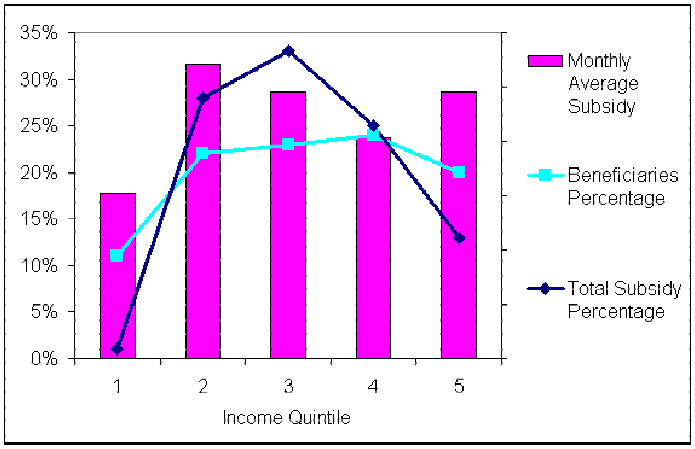
4.19 The only social policy practiced in the gas sector is the Patagonian subsidy, which is designed to compensate households in the country's coldest region for the relatively high heating costs that they face. This is achieved via a discount of around 75% on an initial 'subsistence' block of natural gas or LPG consumption, that is regionally differentiated to reflect climatic conditions, and varies from 62.5 to 1,250 cubic meters monthly. This subsidy is financed by a national surcharge of US$0.004 per cubic meter of gas sold from the wellhead, which generated US$100 million of revenues in the year 2002.

4.20 In common with the national Tariff Compensation Fund for electricity, the Patagonian subsidy is based on a principle of horizontal equity across regions, and takes no account of ability to pay. In fact, the poverty rate in Patagonia is among the lowest in the country. In November 2002, it stood at 37% as against 46% at the national level. Moreover, due to this relatively low poverty rate and to its small population, Patagonia contains barely 3% of Argentina's poor households.

4.21 The distributional incidence of the Patagonian subsidy can be estimated on the basis of survey data on natural gas and LPG expenditure in that region (Figure 10)[7]. The figure illustrates that a relatively small proportion of the beneficiaries and of the benefits accrue to the bottom income quintile, but are instead concentrated in the middle quintiles of the income distribution. The Patagonian subsidy has an associated error of inclusion of around 70%. The error of exclusion is 4% with respect to the total poor resident in the Patagonian region. The concentration coefficient is estimated at +0.08, indicating a broadly egalitarian but mildly regressive distribution.

[7] This exercise is based on expenditure reported by 70 Patagonian households in the OPSM survey, which account for 45% of the households surveyed in that region. An important limitation is the fact that the survey was undertaken during the summer period. Given that higher income households probably spend more on winter heating than lower income households, the distributional incidence for the winter period could be significantly more regressive.

Figure 10: Distributional incidence of the Patagonian gas subsidy



Source: OPSM, May 2002

SUBSIDIES TO PENSIONERS

4.22 Argentina has a long tradition of subsidizing energy tariffs for low-income pensioners, a practice which was preserved through the privatization process of the early 1990s. Until 1997, this subsidy took the form of a 50% discount on the fixed charge and volumetric charge for consumption of up to 210 Kwh per month of electricity in the Metropolitan Area. In the case of natural gas, there was an 80% discount on the fixed charge and a tapered subsidy up to a consumption of 250 cubic meters per month, which was overall equivalent to a 50% subsidy on the consumption of a typical pensioner household in the Metropolitan Area. Eligibility for these subsidies was confined to low-income pensioners whose energy consumption did not exceed certain threshold levels[8]. A direct government transfer to the respective utilities covered the cost of these discounts.

4.23 As a result of Decree 319/97, these discounts were phased out and replaced by a monthly transfer of US$13.50 to low income pensioners, or of US$24 for pensioners using natural gas in the Patagonian region. This policy is still in force today, even though the cadastre of beneficiaries of this subsidy has not been updated since 1997. It is estimated that these subsidies are mildly progressive, with a concentration coefficient of –0.13.

METROPOLITAN PUBLIC TRANSPORT

4.24 Argentina has a longstanding tradition of public subsidies to rail transport in the Metropolitan Area. These were preserved, but significantly reduced, following the awarding of concessions for these services in 1994. These are effectively supply-side subsidies, which ultimately benefit customers through below cost tariffs, but make no

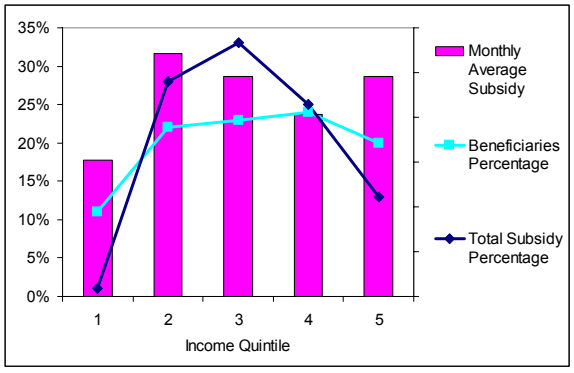
[8] Low income pensioners are defined as those who receive a monthly pension of less than US$67.7 per month, and whose other sources of income do not exceed US$16.9 per month.

attempt to target subsidy resources to specific customer groups. Although interrupted in 2001, following the economic crisis, they were reinstated and substantially increased during 2002.

4.25 Moreover, in May 2002, the government introduced a new supply-side subsidy for metropolitan bus services. This is controversial given the substantial excess capacity that exists in this sector, as a result of a sustained decline in the demand for these services during the last decade. These new subsidies are financed via a surcharge of 18.5% on the net price of diesel nationwide. The total cost is estimated at US$91.6 million, and translates into an implicit subsidy per passenger-trip of US$0.038 for the bus service, US$0.097 for the train service, and US$0.051 for the metro service.

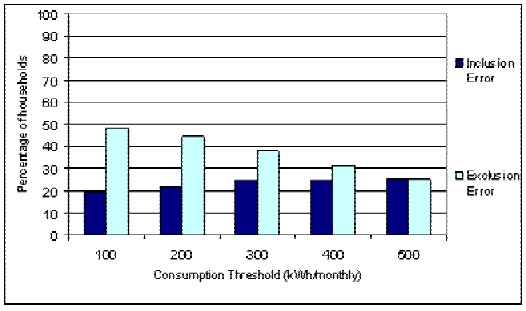
4.26 Based on the pattern of commuting journeys for heads of household in the Metropolitan Area obtained from the OPSM survey, it is estimated that each commuter receives an implicit average weekly subsidy of US$0.64. Crossing commuting patterns against income, it becomes evident that the absolute value of the subsidy is highest for the middle-income quintiles, and for those using the suburban rail network. The concentration coefficients show a regressive distribution, and range from +0.36 for metro rail, +0.16 for the buses, and +0.09 for suburban rail (Figure 12 and Table 6).

Figure 11: Distributional incidence of metropolitan public transport subsidy



Source: OPSM, May 2002

Figure 12: Distributional incidence by mode of public transport in the Metropolitan Area



Source: OPSM, May 2002

SUMMARY

4.27 In conclusion, it is clear that current social policies for the infrastructure sectors have a mildly regressive distributional incidence, with concentration coefficients clustered in the interval from –0.10 to +0.10. The most regressive subsidies are those destined to finance metro rail and bus services in the Metropolitan Area, while the most progressive appear to be the social tariffs for water and electricity practiced by some of the provinces achieving concentration coefficients below –0.10[9]. The errors of inclusion of these subsidies are uniformly high, ranging from 40% to 70%. Furthermore, the subsidies appear to exclude between 60% and 90% of the total poor nationwide.

Table 6: Summary of targeting performance for existing social policies

	Error of inclusion	**Error of exclusion**		**Concentration coefficient**
		Target population	Nationwide	
Water Metropolitan Area (TBB)	57%	14%	—	+0.07
Water Metropolitan Area (Universal Access Charge)	40%	0%	78%	-0.03
Water Provinces (Social Tariffs)	44%	73%	76%	-0.15
Electricity (Social Tariffs)	39%	94%	93%	-0.37
Gas (Patagonian subsidy)	70%	64%	98%	+0.08
Energy (Pensioners subsidy)	52%	27%	92%	-0.13
Public transport (Metropolitan Area)	59%	0%	64%	+0.16
Rail	57%	0%	91%	+0.09
Bus	59%	0%	70%	+0.16
Metro rail	73%	0%	97%	+0.36

Source: OPSM, May 2002

4.28 Finally, it is important to put these results in broader international perspective, by observing that it is not unusual for utility social policies to present high errors of inclusion and exclusion. For example, a recent study of water sector subsidies in Chile and Colombia found errors of inclusion in the 60-80% range, and errors of exclusion of around 80% in Chile and 30% in Colombia[10]. Furthermore, a number of studies on

[9] Given that the Gini coefficient for per capita income amounts to 0.44, it is evident that the distribution of subsidies—although regressive in absolute terms—is much less regressive than the distribution of income in the country.

[10] Gomez-Lobo, A., and Contreras, D., 'Subsidy Policy for the Utility Industries: A Comparison of the Chilean and Colombian Water Subsidy Schemes', University of Chile, August 2000.

electricity subsidies in a variety of countries find that barely 10-35% of subsidy resources are captured by low-income households[11].

[11] These studies include (a) World Bank (2000) *Maintaining Utility Services for the Poor: Policies and Practices in Central and Eastern Europe and the Former Soviet Union*, The World Bank Group, Washington DC; (b) *India Power Sector Reform and the Poor*, Mimeo, South Asia Region, The World Bank Group, Washington DC ; (c) Foster, V. and Araujo, C. (2001) *Does Infrastructure Reform Work for the Poor? A Case Study from Guatemala,* Mimeo, Latin America and Caribbean Region, The World Bank Group, Washington DC.

5. SIMULATION OF ALTERNATIVE SOCIAL POLICIES

5.1 The serious targeting deficiencies observed in existing social policies motivate the search for alternative targeting mechanisms that might be more effective in channeling resources to the poor. The basic presumption is that any alternative mechanism should be based on an accurate targeting device and be limited to subsistence consumption levels. On this basis, a variety of alternative social policy mechanisms can be conceived, each of which is designed to remain within the current budget envelope for infrastructure subsidies. Both use of service subsidies and connections subsidies (where applicable) are considered in the simulation exercise.

TARGETING MECHANISMS

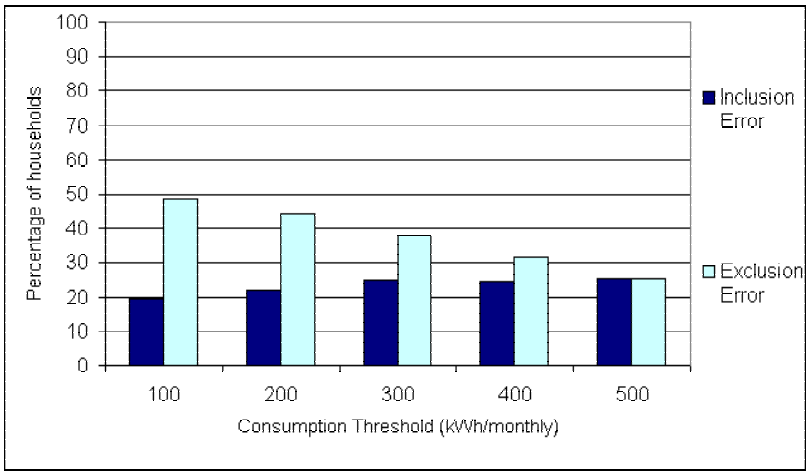
5.2 In order to improve the targeting of subsidies, it is necessary to develop an accurate poverty proxy that can be used to identify low-income households. In Argentina, a number of potential targeting mechanisms have been publicly debated, including the use of consumption levels as a targeting device, as well as the allocation of utility subsidies to households that are already beneficiaries of other social programs (such as the Heads of Household program[12]). Furthermore, provincial experience illustrates the possibility of developing multi-dimensional poverty proxies based on aggregating a number of different indicators of structural poverty. Each of these are now considered in turn.

Consumption

5.3 In order to evaluate the hypothesis that physical consumption might be a good poverty indicator, a simulation was conducted using data on household electricity consumption in the Metropolitan Area, since this was the only service and geographical area for which there were sufficient reliable data points on household consumption. The simulation explores the possibility of allocating subsidies only to those households that consume (successively) less than 50, 100, 150, 200, 250 kilowatt-hours per month (Figure 13).

[12] The Heads of Household program is a major welfare program introduced to attenuate the impacts of the severe 2002 economic crisis. The program makes a monthly payment of US$67.7 to unemployed heads of household that participate in approved workfare schemes.

Figure 13: Targeting electricity subsidies based on household consumption in Metropolitan Area



Source: OPSM Survey May 2002

5.4 The results indicate that a targeting mechanism of this kind presents very high errors of exclusion, since about half of low income households consume above even the highest threshold of 250 kilowatt-hours per month. This is in spite of the fact that the data relate to the summer period, when electricity consumption is relatively low. The errors of exclusion could therefore be expected to rise during the winter period, particularly considering that about 20% of households in the Metropolitan Area (typically poor households that lack access to natural gas) use electricity for heating purposes. The errors of inclusion are also high, rising gradually from 40% to 50% as the consumption threshold increases. Given that higher income households are more likely to use natural gas for heating, these errors of inclusion are unlikely to improve during the winter period. Thus, overall, electricity consumption does not appear to be a very reliable indicator of poverty.

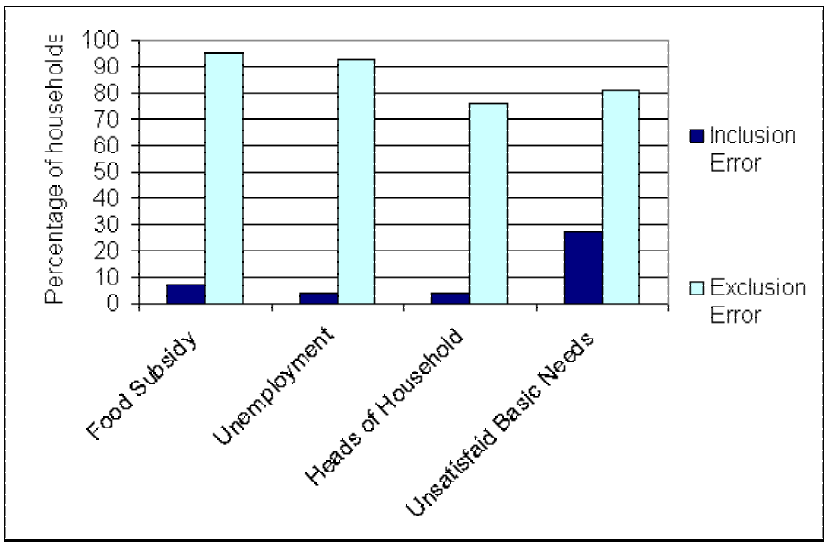
Social programs

5.5 In order to evaluate the hypothesis that utility social tariffs could be allocated to households already registered as beneficiaries of other major social benefit schemes (such as the Heads of Household program), the targeting properties of those schemes are evaluated (Figure 14). The results indicate that these schemes have very low errors of inclusion, typically well below 10%, and thereby succeed in targeting almost all of their resources to the poor. Nevertheless, the programs are relatively small in scope, and consequently bypass some 70-90% of low-income households nationwide[13]. Given the

[13] For the Heads of Household program targeting is evaluated based on the results of the November 2002 OPSM Survey, given that at the date of the earlier May 2002 OPSM Survey the program was still at an early stage in its development. Indeed, the number of program beneficiaries increased from 533,000 in May 2002 to 847,000 in November 2002. However, these figures do not reflect further increases in the scale of the Heads of Household program after November 2002.

fundamental importance of minimizing errors of exclusion, existing social programs do not appear to offer an adequate basis for targeting utility social tariffs.

Figure 14: Targeting of existing social programs



Source: OPSM Survey May 2002 and November 2002

Multi-dimensional proxies

5.6 A third alternative is to develop a multi-dimensional poverty proxy. This is done very much along the lines of what is currently practiced in a number of Argentine provinces, with the key difference that income level is not used due to the serious measurement difficulties that it poses. For the purposes of this study, a purely illustrative multi-dimensional poverty proxy is developed simply as a device for demonstrating the potential contribution of this approach to improving the targeting of utility subsidies (Table 7).

5.7 The use of poverty proxies presents both advantages and disadvantages. On the one hand, they offer the possibility of reducing errors of inclusion and exclusion, as long as they are backed by administrative systems that are sufficiently competent and transparent to apply the proxy in a reliable manner. On the other hand, the use of such instruments can create perverse incentives for households not to improve their situation in order to avoid losing subsidy benefits, this phenomenon is known as the 'poverty trap'. Another risk is that the use of such criteria might create 'stigma effects' that discourage eligible households from taking-up the associated benefits. Furthermore, the creation of the administrative apparatus needed to implement poverty proxies can become costly, unless a single targeting scheme can be used for multiple social programs thereby defraying the associated costs.

Table 7: Development of a multi-dimensional poverty proxy

The creation of the poverty proxy is based on the search for objective and readily verifiable indicators that show a strong statistical correlation with household income. In order to minimize administrative costs, the search was limited to variables that are already collected is the Argentine SISFAM (Unique Identification and Registration System for Beneficiaries of Social Programs), many of which also appear in the commonly used index of Unsatisfied Basic Needs.

The multi-dimensional poverty proxy aims to capture per capita family income, based on a weighted index of the following five variables, selected on the basis of being simple, objective and easily verifiable.

Overcrowding (*O*) – More than three persons per room in the family dwelling.
Inappropriate housing (*H*) – Housing in workplace, guesthouse, or shantytown.
Unsanitary conditions (*S*) – Housing without bathroom, latrine, or sewerage.
Presence of infants (*I*) – Presence of children under the age of five in the household.
Head of household education (*E*) – Head did not complete primary education.

$Proxy = \beta_0 + \beta_1 O + \beta_2 H + \beta_3 S + \beta_4 I + \beta_5 E$

The weighting factors used to calculate the proxy are determined by a statistical estimation that maximizes the correlation between per capita household income and the five variables indicated. Different models are estimated for each geographic region, with results reported in Table A5 of the Annex. In order to determine whether a household qualifies for subsidy based on this indicator, the household's score on the multi-dimensional poverty proxy is compared to the official poverty (or extreme poverty) line. Those below the line are eligible, while those above the line are ineligible.

5.8 However, a recent international study on the issue of targeting social programs concludes that programs that make use of targeting devices are able to transfer, on average, 25% more resources to low income households than those that do not[14]. Moreover, in the case of better-designed programs the difference increases to 200% or even 400%. Nevertheless, the efficacy of targeting mechanisms differs substantially according to the details of implementation in each case.

5.9 One possible means of reducing the problems associated with individual targeting is to target geographically, based on zones or neighborhoods that present high aggregate poverty indices. This approach substantially reduces the administrative costs associated with targeting, however its efficacy is contingent on the extent to which poor households are indeed clustered in particular geographical areas, which varies considerably according to the urbanization patterns of different cities. Without considerable spatial clustering of poor households, a geographic approach is likely to lead to very higher errors of inclusion and exclusion.

[14] Coady, D., Grosh, M., and Hoddinot, J., 2003. *Targeting of Transfers in Developing Countries: Review of Experiences and Lessons*, Social Protection Discussion Paper Series forthcoming, World Bank, Washington DC.

5.10 The multi-dimensional poverty proxy used for illustrative purposes in this study is based on a weighting of five variables demonstrated to have a strong correlation with poverty, namely: overcrowding; inappropriate housing; unsanitary conditions; presence of infants; and head of household education (Table 7). This proxy is used to estimate per capita household income and hence to predict whether a particular household is above or below the poverty (or extreme poverty) line.

5.11 The results of using this device indicate that errors of exclusion for the poverty proxy weighting all five indicators are substantially lower than the errors of exclusion associated with any one of the five indicators individually. Nevertheless, the poverty proxy performs substantially better at predicting poverty that at predicting extreme poverty, illustrating that this smaller second group is much more difficult to identify.

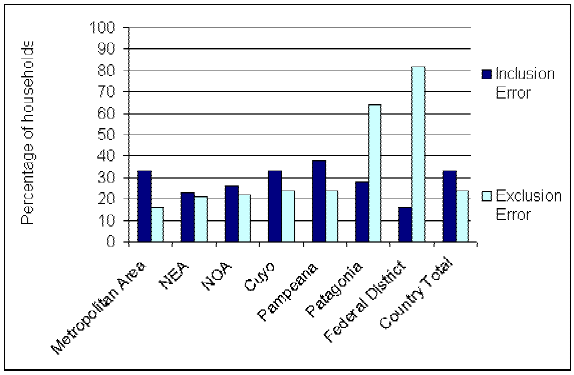
Table 8: Targeting performance of the multi-dimensional poverty proxy

%	Overcrowding	Inappropriate housing	Unsanitary conditions	Presence of infants	Head of household education	Multi-dimensional proxy
Poverty						
Error of inclusion	19.6	27.1	10.5	32.7	39.8	39.7
Error of exclusion	90.7	96.1	91.1	67.2	85.1	36.3
Extreme poverty						
Error of inclusion	42.2	77.0	42.1	73.3	65.7	36.2
Error of exclusion	82.7	95.6	85.1	83.0	56.9	76.3

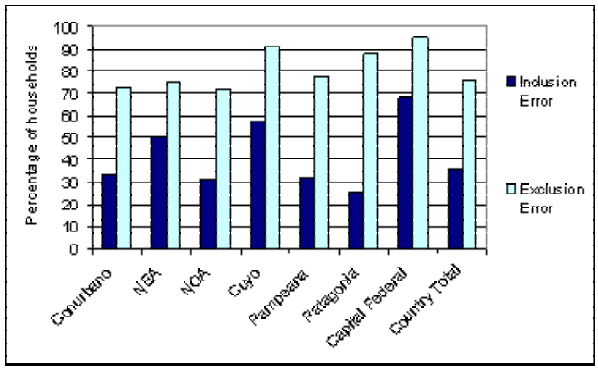
Source: OPSM, May 2002

5.12 Furthermore, the performance of the multi-dimensional poverty proxy varies significantly by geographic region (Figure 15). As far as poverty is concerned, the best targeting results are obtained in the Northeast and Northwest Regions, where poverty tends to be long term and structural in nature, and therefore well aligned with the variables used in the multi-dimensional proxy. In these cases, both errors of inclusion and exclusion are as low as 20%. The proxy also performs quite well in the greater Metropolitan Area as well as the Pampeana and Cuyo Regions. However, it does not perform very well for Patagonia or the Federal District, where the errors of exclusion climb to the 60-80% range. In the case of the Federal District, this could be explained by the phenomenon of the 'new poor' that have been created as a result of the recent economic crisis in Argentina. These are people who suffer from low incomes but do not exhibit the emblems of structural poverty (poor housing and education). The results obtained for targeting extreme poverty are much less satisfactory across all geographical areas, particularly with respect to errors of exclusion that in all cases exceed 70%.

Figure 15: Regional targeting performance of the multi-dimensional poverty proxy



(a) Poverty



(b) Extreme poverty

Source: OPSM and EPH Surveys, May 2002

DEFINITION OF SUBSISTENCE CONSUMPTION

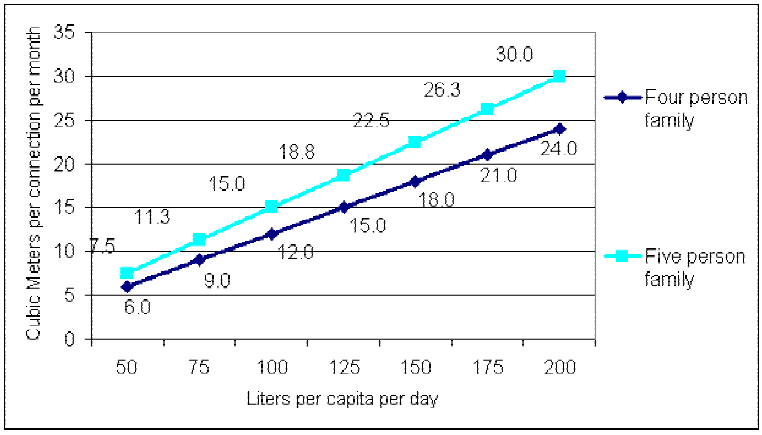
5.13 The other issue that needs to be tied down for the simulation exercise is the threshold to be used for subsistence consumption, since this defines the maximum amount of subsidy to be received by any particular eligible household.

Water

5.14 The subsistence consumption concept is least relevant for the water sector in Argentina, given that no more than 25% of households are metered. Nevertheless, some jurisdictions have achieved substantial levels of meter coverage, most notably the Province of Corrientes where penetration of 90% has been achieved. In these cases, it is relevant to ask what might be a theoretically defensible level of subsistence consumption.

5.15 International practice varies widely from a threshold of six cubic meters used in South Africa's free water policy, to 15 cubic meters in Chile's water subsidy program, to a typical 20 (or even 30) cubic meters used in many Increasing Block Tariff structures throughout Latin America. The choice of threshold depends both on the typical size of low-income households, and on the per capita daily consumption considered necessary given local climatic conditions and social expectations (Figure 16). Thus, 50 liters per capita day (equivalent to 7.50 cubic meters per month for a family of five) is often considered to be an absolute minimum for survival. Whereas, 125 liters per capita per day (equivalent to 18.75 cubic meters per month for a family of five) is typically considered to provide an adequate level of comfort relative to the expectations of modern urban societies. Thus, a subsistence threshold of around 15 cubic meters per month would appear to be reasonable (Figure 16).

Figure 16: Determination of subsistence consumption threshold for water



Source: Own elaboration

Electricity

5.16 For the electricity sector, the subsistence consumption threshold needs to take into account the portfolio of energy consuming appliances considered necessary for social participation in any given locality (Table 9). In the case of Argentina, this approach suggests a threshold of 120 kilowatt-hours per month in summer, rising to 225 kilowatt-hours per month in winter for households that use electric stoves for heating. Based on the household survey undertaken for this study, it can be inferred that in Argentina about 20% of households use electricity for heating, because they live in temperate climatic zones and do not appear to have access either to natural gas or LPG. Since this proportion is relatively low, it appears to make more sense to base the subsistence consumption threshold on summer usage patterns, and concentrate public resources on subsidizing access to natural gas and LPG, which are far more efficient for household heating than electricity. On this basis, a subsistence threshold of 120 kilowatt-hours per month is proposed for Argentina. This level of consumption turns out to be very consistent with the actual consumption decision of low-income households that formed part of a pilot program for pre-payment meters in Metropolitan Area.

Table 9: Estimation of subsistence consumption threshold for electricity

	Capacity (W)	Weekly hours of use		Consumption (kWh/mo.)	
		Summer	Winter	Summer	Winter
Radio	60	5	5	1.2	2.4
Small color television (20")	70	20	20	5.6	5.6
Standard fan	90	30	0	10.8	—
Light bulbs	120	40	80	19.2	38.4
Small fridge	150	120	120	72.0	72
Semi-automatic washing machine	200	2	2	1.6	1.6
Hair dryer	500	1	1	2	2.0
Iron	1,000	2	2	8	8.0
Small electric stove	1,200	0	20	—	96.0
Total	**—**	**—**	**—**	**120.4**	**224.8**

Gas

5.17 For the gas sector, a similar approach is used based on the typical portfolio of gas-consuming appliances, namely a cooking stove, a water heater, and a space heater. The first step is to calculate the basic monthly consumption for each of these appliances across summer and winter periods in the Metropolitan Area, resulting in a baseline subsistence consumption of 500 cubic meters per year (Table 10a). Thereafter, regional consumption variations are analyzed using one of three possible methods (Table 10b). The first approach (Method A) estimates variations in heating needs based on climatic differences across regions. The second approach (Method B) adjusts the subsistence consumption threshold for the Metropolitan Area based on historically observed differences in average consumption levels across geographical regions. The third approach (Regulatory Reference) is based on the stipulations of Resolution 2787/03 of the gas regulator, that establishes its own subsistence thresholds for each region. The results of these three methods turn out to be fairly consistent (Table 10b). Thus, the subsistence threshold adopted for this study is taken from the middle of the range established by the three methods. The only exception is the case of Patagonia where the most conservative threshold is adopted, due to the fact that current consumption levels are distorted by the relatively generous subsidy policy that is currently practiced in the region.

Table 10: Derivation of subsistence consumption threshold for natural gas

(a) Metropolitan Area baseline

	Capacity (Kcal/h)	Daily use (m3)		Monthly consumption (m^3/mo.)			Annual Consumption (m^3)
		Winter	Summer	Winter	Summer	Average	
Cooking	3,000	1.2	0.8	9	9	9	110
Water heating	12,000	0.8	0.4	25	16	20	235
Space heating	3,000	4.0	0.0	32	0	13	157
Total	**—**	**—**	**—**	**66**	**25**	**42**	**502**

(b) Regional Adjustments

	Annual Consumption			Annual Subsistence Consumption			
Region	**Historic average**	**Non-temperature related**	**Temperature related**	**Method A**	**Method B**	**Regulatory Reference**	**Adopted Values**
Metropolitan Area	1,000	401	599	502	500	500	500
Central	1,000	360	640	468	500	500	500
Pampeana	1,145	437	708	557	573	550	550
Coastal	900	352	548	445	450	500	450
Entre Ríos	950	346	604	448	475	450	450
Northwest	700	455	245	496	350	450	425
Cuyo	1,200	447	753	575	600	600	600
Patagonia							
Neuquen	3,000	1,001	1,999	1,340	1,500	1,700	1,400
Chubut	4,300	1,838	2,462	2,256	2,150	2,200	2,200

Public transport in the Metropolitan Area

5.19 As already indicated, the OPSM Survey only covers head of household commuter journeys in the Metropolitan area. The survey does not include any information on other journeys undertaken by the head of household, nor any journeys undertaken by other household members. Moreover, given the deep recession in Argentina, some heads of household did not report any commuting journeys due to being unemployed. Therefore, for the purposes of this study, a very simple definition of subsistence consumption is used, equivalent to 22 return journeys to work per month for the head of household. This level of subsistence consumption could be guaranteed by providing some kind of free or subsidized bus pass, that based on current fare structures would need to take a value of around US$14.91 per month.

RESULTS OF SIMULATIONS

5.20 Based on the multi-dimensional poverty proxy and subsistence consumption thresholds developed above, it is possible to simulate a series of alternative social policies in each sector. In all cases, these simulations respect the current budget envelope for social expenditures on infrastructure services, and hence would require a fiscally neutral reallocation of existing expenditures. Two types of simulations are performed for use of service and connection subsidies respectively. In the case of use of service subsidies, it is assumed that all the resources would be spent on subsidizing the subsistence consumption of those households classified as eligible by the multi-dimensional poverty proxy, adjusting the percentage subsidy given to ensure that the overall budget constraint is met. In the case of connection subsidies, it is assumed that all the resources would be spent on a one-time fixed subsidy to unserved households classified as eligible by the multi-dimensional poverty proxy, adjusting the number of beneficiaries each year to ensure that the overall budget constraint is met.

Water

5.21 In contrast to the other services, the water sector does not currently have any national financing mechanism for social policies that would allow for some degree of geographical redistribution of resources across jurisdictions. Nonetheless, a draft Federal Water Law developed in 1999 proposed the creation of such a national social fund for the water sector based on a 3% surcharge on water bills that could be credited against the sector's VAT liability. Although this draft law was never sanctioned, this possibility continues to be debated within the water sector. Therefore, for purely illustrative purposes, the simulations presented in this study will limit themselves to the budget envelope associated with this proposal, which amounts to US$21.3 million per year. Two alternative uses of these hypothetical funds will be considered.

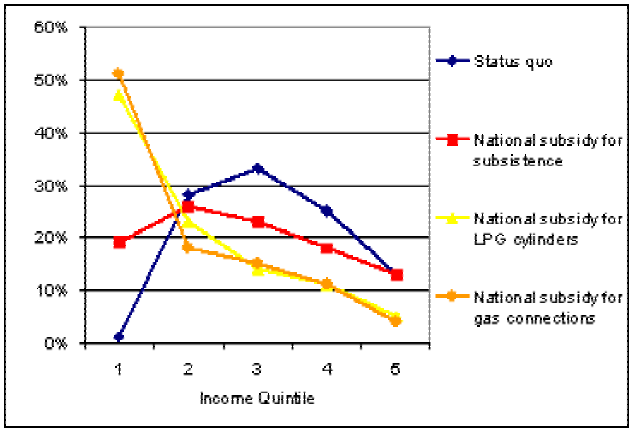
5.22 The first is the introduction of a national social tariff that offers a discount against the minimum unmeasured water tariff for all households that qualify according to the

multi-dimensional poverty proxy. Given the budgetary constraint established, it would only be possible to finance a 10% discount on this minimum tariff.

5.23 The second alternative is to use the resources to provide first-time connection subsidies for either water or sewerage services. In both cases, subsidies are limited to those households that qualify as eligible on the basis of the multi-dimensional poverty proxy. A subsidy of US$135.5 per connection is considered for water and US$203.3 per connection for sewerage.

5.24 The distributional incidence of these two social policies can be compared with current social tariff policies practiced by a number of provinces. Although existing social tariff policies appear to perform relatively well in distributional terms, the proposed water connection subsidy performs even better, with a concentration coefficient of –0.28, as against –0.16 for the simulated national water social tariff, and –0.15 for the current provincial social tariff programs. The sewerage connection subsidy is less progressive than the water connection subsidy given that overall coverage levels of sewerage are lower and affect a broader socio-economic range of households, leading to a concentration coefficient of –0.16, which is the same result as for the simulated national water social tariff.

Figure 17: Simulation of alternative social policies for water and sewerage



Source: OPSM, May 2002

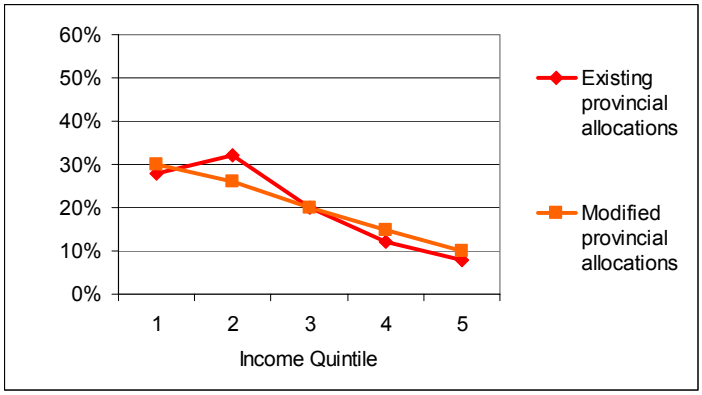
Electricity

5.25 For the electricity sectors, simulations are performed within the budgetary envelope of the existing Tariff Compensation Fund that provides around US$98 million per year. Since electricity coverage is virtually universal in urban areas of Argentina, simulations focus on use of service subsidies for the 120 kilowatt-hours of subsistence consumption of those households identified as eligible by the multi-dimensional poverty proxy. Two different variations of this subsidy are considered (Figure 18).

5.26 In the first variation, the existing provincial allocations of resources under the Tariff Compensation Fund are respected. However, all of the resources are devoted to financing the subsistence consumption of those households identified as eligible by the multi-dimensional poverty proxy. The resulting concentration coefficient is –0.22 indicating a reasonably progressive outcome. The errors of inclusion and exclusion come to 41% and 31% respectively. Nevertheless, the fact that the existing pattern of resource allocation does not reflect the geographical distribution of the poor in Argentina, means that the percentage discount that could be financed under this simulation varies dramatically across jurisdictions, ranging from 2% (Buenos Aires Province) to 389% (in some of the smaller provinces such as Rio Negro), with a provincial average of 74%.

5.27 In the second variation, the current provincial allocations of Tariff Compensation Fund resources are adjusted to make them proportional to the number of poor households in each Province (recall Figure 8). This adjustment barely affects the concentration coefficient associated with the simulation, since exactly the same poor households are benefiting in each case. However, it serves to reduce the variation in the percentage discount that can be offered across jurisdictions. Thus, poor households in the Buenos Aires Province would receive a discount of 14%, while those in the smaller provinces of the interior would receive a discount of 11%. At a national level, the average discount across provinces comes to 25%. Therefore, the overall effect of this change is to redistribute resources from the long-standing poor of the interior to the 'new poor' in the Metropolitan Area. A more detailed analysis of the effects of this geographical redistribution of resources can be found in Table A6 of the Annex.

Figure 18: Simulation of alternative social policies for electricity



Source: OPSM Survey, May 2002

Gas

5.28 In the case of the gas sector, three alternative uses are considered for the US$100 million collected by the Patagonian gas fund.

5.29 The first of these consists in the introduction of a national social tariff that provides a discount on subsistence consumption of gas to all households that qualify

based on the multi-dimensional poverty proxy. The existing budgetary resources would allow for a 40% discount to be financed.

5.30 However, given that almost half low-income households lack access to natural gas, it is difficult to justify a use of service subsidy for this service. In particular, when one considers that 80% of these households depend on LPG cylinders that historically have been two or three times as expensive per unit of effective energy as natural gas, and which are currently four to five times as expensive per unit of effective energy as natural gas. The reason for this is that the natural gas tariff has been frozen since the devaluation in local currency, whereas the price of LPG has increased by 60% reflecting the lower value of local currency. Furthermore, the 20% of low-income households that lack access to LPG must rely on electricity for heating purposes, which is almost twice as expensive per unit of effective energy as natural gas.

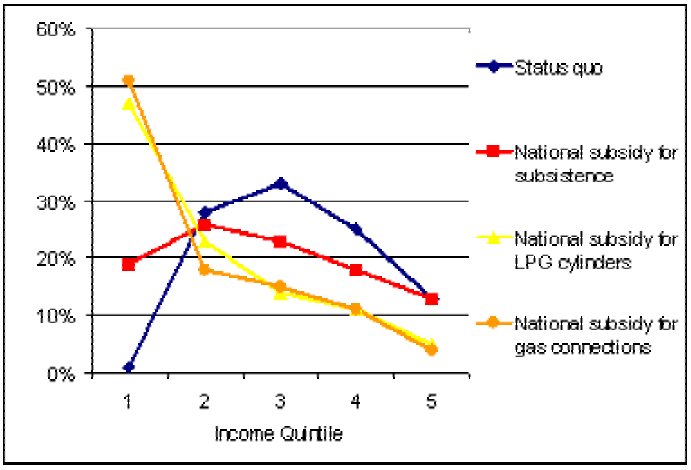
5.31 Consequently, the second alternative considered is to subsidize subsistence consumption of LPG cylinders for those households qualifying as eligible in terms of the multi-dimensional poverty proxy, using the same subsistence thresholds established for natural gas with minor adjustments to reflect differential efficiencies of use. The available resources would allow for a 10% discount in the price of an LPG cylinder. Although this policy would appear to have a stronger social justification than the preceding one, it would not appear to make much economic sense to subsidize an imperfect substitute for natural gas, when households have the possibility of connecting to this superior service. Furthermore, on an administrative level, the subsidization of a portable commodity (such as LPG cylinders) increases the probability of subsidy leakage towards unintended groups.

5.32 Therefore, the third alternative considered is to subsidize connection to the natural gas network in urban areas, wherever a household's geographical location makes this possible. Such a policy could make a substantial contribution to raising natural gas coverage, given that the capital costs of connection and household conversion are high in relation with the payment capacity or credit access of low-income households, and hence tend to become a significant barrier to wider penetration of the service. Another substantial advantage of subsidizing natural gas connections as opposed to subsistence consumption of LPG is that the latter leads to a lower present value subsidy liability for the government, in the sense that it represents a one-time subsidy as opposed to an on-going subsidy commitment. For example, using a discount rate of 15%, the present value of the connection subsidy would be no more than a third to a half of the present value of an LPG consumption subsidy (see Table A7 of the Annex).

5.33 The results demonstrate that any of these three policies is much more progressive in impact than the existing Patagonian gas subsidy (Figure 19). The distributional incidence of the LPG subsidy and the natural gas connection subsidy is actually very similar, given that both policies affect the same target population. The connection subsidy presents the best concentration coefficient of –0.41, compared with a value of only –0.07 for the simulated national social tariff scheme for natural gas, which is (however) still substantially better than the value of +0.08 for the existing Patagonian gas subsidy. Furthermore, the connection subsidy presents errors of inclusion and exclusion around 20%, compared with 40-60% for the use of service subsidy.

Figure 19: Simulation of alternative social policies for gas

Source: Simulations based on OPSM Survey, May 2002

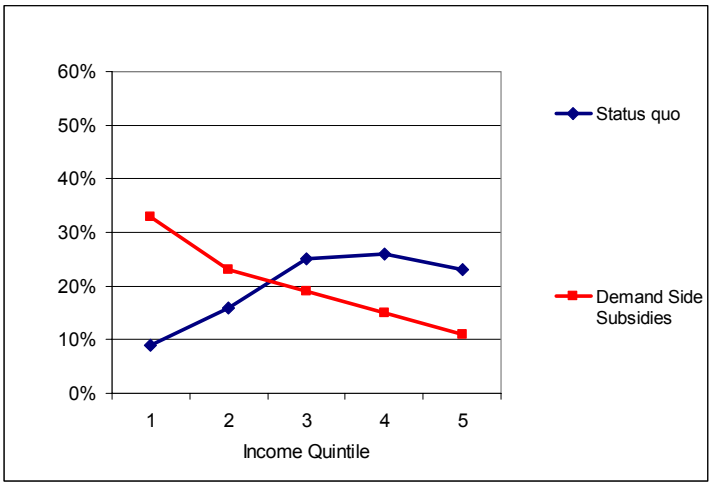


Public transport in the Metropolitan Area

5.34 In the case of public transport, the simulation concerns the replacement of the current US$60 million per year supply-side subsidy to bus, train and metro operators with a subsidized bus pass scheme. Given that the multi-dimensional poverty proxy is not so relevant for a non-household based service, the simulation considers giving these passes to all those enrolled in the current Heads of Household program.

5.35 The results show that such a policy change would significantly improve the distributional incidence of subsidies to this sector, lowering the concentration coefficient from +0.16 to –0.21 (Figure 20). At the same time, the errors of inclusion and exclusion would fall from around 60% to around 35%.

Figure 20: Simulation of alternative social policies for public transport in Metropolitan Area



Source: Simulations based on OPSM Survey, May 2002

SUMMARY

5.36 In conclusion, the diverse range of simulations has served to illustrate the potential for substantially improving the distributional incidence of existing social policies based on some simple changes of design. It is important to emphasize that the multi-dimensional poverty proxy that has been used is purely illustrative, and that more effective targeting mechanisms may well exist. Furthermore, the simulations report the theoretical maximum performance of this poverty proxy, without taking into account the deficiencies that are likely to be introduced once any such scheme is operationalized. In this sense, the results represent an upper bound on the potential targeting performance of the poverty proxy that has been used.

5.37 In general, existing social policies present concentration coefficients that range from –0.15 to +0.15, whereas the simulated social tariff schemes based on the application of the multi-dimensional poverty proxy reach concentration coefficients of around –0.20, representing a significant improvement in some cases. However, the simulated connection subsidy schemes are by far the most successful in terms of targeting performance, with concentration coefficients in the range –0.30 to –0.40. In addition, these connection subsidy schemes present errors of inclusion and exclusion in the 20-40% range compared with the 40-60% range for existing social policies. Similarly, the errors of exclusion with respect to the target population are reduced to the 15-45% range, compared with the 60-90% range for existing social policies. Moreover, the errors of exclusion with respect to the total population are reduced to the 30-70% range, compared with the 65-95% range for existing social policies. Of all the sectors considered, the gas sector is the one where the largest potential targeting gains could be achieved based on the alternatives simulated.

Table 11: Summary of targeting performance for simulated alternative social policies

	Error of inclusion	**Error of exclusion**		**Concentration coefficient**
		Target population	Total population	
Water status quo (provincial social tariffs)	44%	73%	76%	-0.15
Simulated alternatives				
National discount on minimum unmeasured tariff*	43%	38%	56%	-0.15
National sewerage connection subsidy	42%	0%	60%	-0.16
National water connection subsidy	28%	0%	90%	-0.28
Electricity status quo (provincial social tariffs)	39%	93%	94%	-0.37
Simulated alternatives				
National social tariff scheme (reallocation of Tariff Compensation Fund)*	41%	31%	36%	-0.21
National social tariff scheme (current allocation of Tariff Compensation Fund)*	41%	31%	36%	-0.24
Gas status quo (Patagonian subsidy scheme)	70%	64%	98%	+0.08
Simulated alternatives				

Table 11: Summary of targeting performance for simulated alternative social policies

	Error of inclusion	Error of exclusion		Concentration coefficient
		Target population	Total population	
National social tariff scheme for natural gas*	52%	44%	69%	-0.07
National social tariff scheme for LPG cylinders*	24%	19%	67%	-0.41
National natural gas connection subsidy	24%	0%	19%	-0.40
Public transport status quo (supply-side subsidy in the Metropolitan Area)	59%	0%	64%	+0.16
Simulated alternative				
Demand-side subsidy in the Metropolitan Area (free passes)	36%	0%	35%	–0.21

*Subsidy targeting based on use of multi-dimensional poverty proxy limited to subsistence consumption threshold

Source: OPSM, May 2002

6. THE COST OF A SOCIAL POLICY

6.1 All the simulations presented thus far have respected the current envelope of budgetary resources devoted to infrastructure social policies, without questioning whether or not the current allocation is an appropriate one. The only objective has been to redistribute existing resources in the most equitable way possible. However, there has been no attempt to evaluate whether the resulting tariff discounts were large enough to resolve the affordability issue.

6.2 In this final section, therefore, the opposite approach is taken. This begins with the estimation of the absolute subsidy requirement necessary to overcome concerns about affordability, and goes on to calculate the cost of implementing such a policy. Although there is no scientific method for defining an affordable level of expenditure on infrastructure services, the empirical analysis presented at the beginning of this paper, together with some international benchmarks, suggest that a threshold of 15% of income for expenditure on subsistence levels of water and energy is a reasonable point of reference. For want of a better assumption, it is supposed that this overall limit is equally distributed across the three services (water, electricity and gas). Thus, it is possible to calculate the size of the tariff discount required to ensure that no household living under the poverty line spends more than 5% of its income on subsistence consumption of each of these three services. On this basis, the total cost of the social policy can be estimated and compared with current expenditure levels.

6.3 Furthermore—given that the services under consideration are in the process of renegotiating their concession contracts—it becomes relevant to consider not only affordability at current tariff levels, but also affordability in the face of potential tariff increases. Therefore, the effect of 10% and 30% tariff increases on the total cost of meeting the specified social policy objective is also calculated.

Table 12: Cost of meeting social objectives for affordability of services

$m	**Subsidy to households in extreme poverty assuming tariff increase of**			**Subsidy to households in poverty assuming tariff increase of**		
	0%	10%	30%	0%	10%	30%
Water	23	29	40	49	86	156
Electricity	39	35	47	228	251	298
Gas	6	7	10	30	49	105
Total	**58**	**71**	**97**	**307**	**386**	**559**

Source: Own elaboration

6.4 Finally, a social policy of this kind could provide subsidies to all poor households, or only those in extreme poverty. The analysis presented at the beginning of the paper suggests that the justification for subsidizing services is much stronger in the case of the population facing extreme poverty, than in the case of the poor population as a whole. Nevertheless, it was also found that the multi-dimensional poverty proxy was much more successful in targeting poverty as a whole, as opposed to the narrower group of those in extreme poverty. This suggests that it may be necessary to subsidize the entire population in poverty, simply to be sure of reaching the entire population in extreme poverty.

6.5 The costs of such a social policy are estimated for each of the utility services under the diverse assumptions specified above. This makes it possible to examine the sensitivity of the overall cost of the social policy to each these different assumptions. One thing that becomes immediately apparent is that a policy targeting all poor households costs four or five times as much as a policy targeting only households in extreme poverty.

6.6 For the water sector, if there really did exist a national social policy fund capturing 3% of sector turnover equivalent to US$21.3 million per year, there would be ample resources to finance a social tariff for those in extreme poverty, even if water tariffs were to increase in the range explored. However, if a social tariff scheme was designed to benefit all households living under the poverty line, this hypothetical budget envelope would yield sufficient resources at current tariff levels, but would rapidly become inadequate if tariffs were to increase.

6.7 For the electricity sector, similarly, the US$33.8 million per year available under the Tariff Compensation Fund would be more than adequate to finance a social tariff scheme targeted at the population in extreme poverty, even supposing significant tariff increases. However, they would fall well short of the amount required to finance a social tariff scheme for all poor households, even at current tariff levels.

6.8 For the gas sector, the social objective defined is not very costly to achieve in relation to the US$33.8 million per year available through the Patagonian gas fund, even if all poor households were to be targeted, and tariffs were to be raised by 30%. The reason for this is that relatively few poor households are connected to the gas service, and the price of natural gas is currently very low by regional standards due to the freezing of the tariff after devaluation in 2002. Indeed, the few poor households that currently devote more than 5% of their income to natural gas reside in Patagonia. The implication is that, except in the case of a broad poverty definition and high tariff increases, there would be significant resources left over from the Patagonian fund to finance connection subsidies for natural gas.

6.9 Finally, it is equally important to simulate the cost of reaching universal access to water, sewerage and natural gas services. For these purposes, it is assumed that a subsidy of US$169.4 would be paid to each poor household connecting to the service. The total cost of meeting the objective would reach almost US$900 million for the sewerage and natural gas services (Table 13).

Table 13: Cost of meeting universal access objectives (US$)

	Total cost of meeting objective	No. of years delay with existing resources	Annual cost of meeting universal access objective in		
			5 years	10 years	15 years
Water	87.4	4*	17.7	9.0	6.1
Sewerage	429.3	20*	86.1	43.2	28.9
Gas	383.2	11	76.9	38.6	25.8
Total	**899.9**	**—**	**180.7**	**90.8**	**60.8**

Note: Based on a hypothetical national fund that collects 3% of sector turnover

6.10 For the case of natural gas, resources currently available through the Patagonian gas fund would be sufficient to meet the universal access objective within an 11-year period. In practice, there are a couple of factors that could affect this estimate. First, this cost estimate only considers the cost of household connections and interior conversions, but does not consider the potential need to extend or expand the main distribution network. Second, the cost may be somewhat lower given that it is not feasible to install the service in houses that are very precariously built, which limits the extent of service expansion.

6.11 In the case of water and sewerage, the resources needed to meet universal access are very high in relation to what might be collected through a hypothetical national fund based on 3% of sector turnover, so that it would take as long as 24 years to meet this objective. On the other hand, if only 50% of connection costs were subsidized (that is US$84.7 per connection), the resources of they hypothetical fund would go a lot further, allowing the objective to be reached within a 12 year period.

6.12 Turning to public transport, it is estimated that the cost of assigning a US$0.67 subsidy per day (which is approximately equal to the cost of a return commuting journey) to each head of household that qualifies according to the multi-dimensional poverty proxy, would be US$207 million per year. This is equivalent to 150% of the cost of the current supply-side subsidy to bus, train and metro operators. However, if this policy were limited to households facing extreme poverty (which is to say the bottom quintile of the income distribution), the associated cost would be broadly similar to that of the current supply-side subsidy.

7. CONCLUSIONS

7.1 Due to their public service characteristics, the infrastructure sectors are inescapably social in nature, a factor that cannot be forgotten in the design of sector policies. In the Argentine case, an analysis of social issues facing the infrastructure sectors reveals that the attainment of universal access objectives remains a significant challenge. About 30% of the urban population lack access to sewerage and natural gas, while 15% of the metropolitan population lack access to water. The high capital costs associated with connecting to these services and installing the complementary household equipment presents a substantial economic barrier for low-income households without savings or significant access to credit.

7.2 In addition, the recent Argentine economic crisis has substantially worsened the affordability of water and energy services, which currently absorb more than 20% of the income of low-income households, a proportion that could increase further if expected tariff increases are approved. This situation indicates the importance of developing a social tariff policy that safeguards the most vulnerable households from likely tariff increases, and preserves the affordability of services. The analysis suggests that such a social tariff scheme is particularly necessary for households facing extreme poverty, defined as the bottom quintile of the income distribution, but less necessary for poor households in general, defined as the first two quintiles of the income distribution. Argentina already dedicates a substantial sum of money to financing infrastructure social policies, currently in excess of US$203.3 million per year. However, it does not have a comprehensive and coherent social policy framework within which such a social tariff scheme might be accommodated.

7.3 Indeed, the analysis reveals that current social policies are highly ineffective at channeling resources towards low-income households. In general, they present concentration coefficients in the –0.10 to +0.10 range, which suggests a broadly neutral impact on the distribution of income. Moreover, they present relatively high errors of inclusion in the range 40-70%, as well as high errors of exclusion that leave out 65-95% of the poor. These results can be explained in terms of the tendency to allocate social policy resources to all households resident in a particular geographical area, based in considerations of territorial integration without any regard to their specific socio-economic status.

7.4 The best targeted of the existing policies are the social tariffs for water and electricity practiced in a number of the provinces, and this is precisely because they are explicitly allocated on the basis of objective poverty criteria. These mechanisms present relatively progressive concentration coefficients, generally below –0.15. However, although they have relatively moderate errors of inclusion, around 40%, their errors of

exclusion remain very high at around 70%. Furthermore, this evaluation is itself an upper bound on the potential targeting performance of these schemes, because many of them are based on highly problematic income measurement procedures, whose deficiencies could not be readily reflected in the analysis.

7.5 All of the above suggests the need to work towards improving the targeting performance of infrastructure social policies. One possible way of doing so is to develop a multi-dimensional poverty proxy based on objective and readily verifiable housing and household characteristics that are proven to have a strong statistical correlation with income poverty. This study develops an illustrative poverty proxy, and demonstrates the extent of potential targeting improvements with this type of instrument, which serves to reduce errors of inclusion and exclusion to around 30%. Nevertheless, it is important to be aware that targeting instruments of this kind also bring certain disadvantages of their own. These include the associated administrative costs, and potential stigma effects, as well as the creation of poverty traps. All of these factors may significantly limit their targeting performance in practice, when compared to what is possible in theory. The sharing of targeting instruments across social programs may help to reduce administrative costs.

7.6 With a view to demonstrating potential improvements in targeting performance relative to existing social policies, a series of social tariff simulations are performed based on the use of the multi-dimensional poverty proxy to identify subsidy beneficiaries. All of the social tariffs considered limit subsidies to a subsistence consumption threshold that is carefully defined in relation to basic household needs. Another important characteristic of all these simulations is that they respect the existing budgetary envelope for infrastructure social policies, with the exception of the water sector where no existing national budget exists. The results indicate that using the illustrative poverty proxy, it is possible to reduce errors of exclusion from 60-90% to 30-40% and to achieve progressive concentration coefficients below –0.15.

7.7 As well as simulating social tariff policies, the possibility of reallocating existing social policy resources towards connection subsidy programs (for water, sewerage and natural gas) is also considered. The results show that connection subsidies are by far the most successful in targeting resources to the poor, presenting concentration coefficients in the –0.30 to –0.40 range, with errors of inclusion and exclusion in the 20-30% range. A further advantage of connection subsidies is that they are only given once, and thereby reduce administrative costs and avoid the creation of subsidy dependency.

7.8 It is also important to evaluate whether the volume of resources currently allocated to infrastructure social policies is commensurate with the genuine social needs to secure access and affordability of these services. In order to do this, it is assumed that no poor household should have to spend more than 5% of income to secure subsistence consumption of water or electricity or gas, leading to a 15% overall affordability threshold for the three services combined. The results show that this objective could be amply met based on the existing resource envelope, as long as subsidies are confined to households living in extreme poverty; even if tariffs were to increase significantly as a result of the on-going contract renegotiation process. However, if the social tariff were extend to all households living in poverty, the overall cost would increase four or

fivefold, amply exceeding existing budgetary resources (particularly in the case of electricity).

7.9 Finally, the potential cost of a policy of providing a US$169.4 connection subsidy for new connections to water, sewerage and natural gas services by low-income households now estimated. The results indicate that the cost of reaching universal access on this basis would reach almost US$900 million for sewerage and natural gas services, and amount to around US$84.7 million for water. Based on the resources currently assigned to social policies in these sectors, this would mean a delay of 11 years in reaching universal access to the natural gas service. However, in the case of the water and sewerage services, even assuming the eventual creation of a national fund collecting 3% of sector revenues, this objective would take 24 years to achieve.

Annexes

Table A1 : Analysis of expenditure on infrastructure services (2002 versus 1997) in US$

	Quintiles					Total
	1st	2nd	3rd	4th	5th	
November 2002 (OPSM)						
Household resources						
Average household expenditure	123	158	201	255	358	218
Average household income	97	178	237	312	559	256
Average expenditure on infrastructure services	21.4	28	28.2	29.2	37.9	29.1
Water and sewerage	4.67	5.1	5.7	5.4	6.8	5.5
Electricity	8.2	11.0	10.0	9.6	11.2	9.95
Fuels	6.5	7.3	7.9	8.1	8.9	7.8
Telecommunications	1.9	4.4	4.4	5.9	10.9	5.79
Public transport (Metropolitan Area Head of Household commuting only)	12.0	17.2	20.4	18.3	17.8	17.7
Average household expenditure share for infrastructure (%)	16.2	15.4	13.9	12.6	11.5	13.4
Water and sewerage	3.5	2.8	2.8	2.3	2.1	2.6
Electricity	6.2	6.1	5.0	4.2	3.4	4.6
Fuels	5.0	4.0	3.9	3.5	2.7	3.6
Telecommunications	1.5	2.4	2.2	2.6	3.3	2.7
Public transport (Metropolitan Area Head of Household commuting only)	9.8	10.9	10.1	7.2	5.0	8.1
Average household income share for infrastructure (%)	22.1	15.7	11.9	9.3	6.8	11.4
Water and sewerage	4.8	2.9	2.4	1.7	1.2	2.2
Electricity	8.5	6.2	4.2	3.1	2.0	3.9
Fuels	6.8	4.1	3.3	2.6	1.6	3.1
Telecommunications	2.0	2.5	1.9	1.9	1.9	2.3
Public transport (Metropolitan Area Head of Household commuting only)	12.4	9.6	8.6	5.9	3.2	6.9
May 1997 (EPH)						
Average household expenditure	110	187	268	390	750	341
Average expenditure on infrastructure services	12.5	16.6	21.3	27.1	37.6	23.0
Water, sewerage and electricity	5.7	7.4	8.4	10.1	12.2	8.8
Fuels	2.7	4.7	7.1	10.1	16.9	8.4
Telecommunications and post	3.7	4.7	5.7	6.7	8.1	5.7
Public transport (Metropolitan Area households that declare journeys)	16.9	20.1	21.7	18.2	17.6	19.0
Average household expenditure share for infrastructure (%)	11.3	8.9	7.9	7.0	5.0	6.7
Water, sewerage and electricity	5.3	3.9	3.2	2.6	1.6	2.6
Fuels	3.4	2.5	2.1	1.8	1.1	1.7
Telecommunications and post	2.6	2.5	2.6	2.6	2.3	2.4
Public transport (Metropolitan Area households that declare journeys)	9.1	7.7	6.2	3.7	2.0	4.3

Source: OPSM and EPH Surveys, May 1997 and November 2002

Table A2 : Analysis of subsistence basket of infrastructure services

	Quintiles					Total
	1st	2nd	3rd	4th	5th	
Cost of subsistence basket						58
Water and sewerage (minimum unmeasured charge)	—	—	—	—	—	13
Electricity (120kWh/month)	—	—	—	—	—	13
Natural gas (42m^3/month)	—	—	—	—	—	20
Telephone (100 mins/month)	—	—	—	—	—	12
Public transport (one return commuting journey per day)	—	—	—	—	—	44
Average expenditure share for subsistence basket (%, OPSM)	12.5	9.1	8.2	7.2	5.0	7.6
Water and sewerage	2.8	2.0	1.8	1.6	1.1	1.7
Electricity	3.8	2.8	2.5	2.2	1.5	2.3
Natural gas	2.8	2.0	1.8	1.6	1.1	1.7
Telephony	3.1	2.2	2.0	1.8	1.2	1.9
Public transport (Metropolitan Area head of household commuting)	12.1	9.4	7.4	5.8	4.2	6.8
Average income share for subsistence basket (%, OPSM)	17.1	9.3	7.0	5.3	3.0	6.5
Water and sewerage	3.8	2.1	1.6	1.2	0.7	1.5
Electricity	5.2	2.8	2.1	1.6	0.9	2.0
Natural gas	3.8	2.1	1.6	1.2	0.7	1.5
Telephony	4.2	2.3	1.7	1.3	0.7	1.6
Public transport (Metropolitan Area head of household commuting)	15.3	8.3	6.3	4.8	2.7	5.8

Source: OPSM Survey, November 2002

Table A3 : Summary of eligibility criteria for provincial water social tariff schemes

Area	Eligibility	Benefit	Implementation
Metropolitan Area	Eligible households have Income below poverty line (<US$172.8) No more than three months payment backlog	Fixed sum discount, debt and disconnection amnesty	Resources are allocated to municipalities, who are responsible for identifying beneficiaries
Chaco	Eligible households are Poor households led by children, pensioners or disabled Pensioners with incomes <US$33.8/month	50% discount on the minimum charge	Beneficiaries receive the AIPO voucher that can be used to pay water or electricity bills
Formosa	Concessionaire applies subsidy to low income neighborhoods	—	—
Mendoza	Eligible households have Small dwellings <60m^2 Live in shanty towns Score Level 8 or 9 in health register Appropriate social development classification Furthermore If unmetered, pay minimum charge If metered, consume <15m^3	50% discount on the minimum charge	—
Salta	According to ENRESP score based on Per capita income Type of housing Overcrowding Geographic area Educational attainment But disqualifying if Monthly bill >$10 Electricity consumption >20kWh/person/mo. Possess more than one dwelling Possess a motor vehicle Receive TV cable service Receive telephone service	Variable according to ENRESP score	A database was created based on national health system (APS) and social benefits system (SISFAM) databases
Santa Fe	Eligible households are Low income pensioners Lacking telephone service	70% discount on bill	Interested candidates must apply to the authorities
Santiago del Estero	Eligible households Lack sewerage service Lack telephone service Have incomes <US$101.6/mo. Live in deprived zones (0.9<Z<1.0) Have unsatisfied basic needs	50% discount on bill	Concessionaire responsible for identifying beneficiaries
Tucumán	Pensioners who Are family breadwinners Possess a single dwelling Receive income US$94.8/mo.	50% discount on bill	—

Table A4: Summary of eligibility criteria for provincial electricity social tariff schemes

Utility	Eligibility	Discount on fixed charge	Discount on variable charge	Included in bill?
EDENOR	None			NO
EDESUR	None			NO
EDELAP	None			NO
EDEN	Individual application	Up to 40%	Up to 40%	NO
EDES	Individual application	Up to 40%	Up to 40%	NO
EDEA	Individual application	Up to 40%	Up to 40%	NO
EDECAT	Consumption of up to 190 KWH/mo	-USD1.1	-	NO
EPEC	Shanty towns (0-120 kwh/mo)	-100%	-30%	YES
	Shanty towns (0-120 kwh/mo)	-US$3.47	-60%	YES
	Extreme poverty (0-100 kwh/mo)	-100%	-100%	YES
	Extreme poverty (101-150 kwh/mo)	-100%	-30%	YES
	Extreme poverty (>151 kwh/mo)	-US$4.6	-60%	YES
	Extreme poverty (unmeasured)	-US$3.8	-100%	YES
DPEC				NO
SECHEEP	Special Residential (0-200 kwh/mo used)	-75%	-100%	YES
	Special Residential (201-+++ kwh/mo used)	-75%	-75%	YES
	Individual (AIPO coupon)	Variable credit	Variable credit	NO
DGSPCH	Pensioners	-50%	-40%	YES
EDEERSA	Consumption of 1 up to 50 kwh/mo	-US$0.2	-	YES
EDEFOR	Pensioners and social tariff (0-100 kwh/mo)	-US$4.77	-	NO
	Pensioners and social tariff (101-200 kwh/mo)	-US$4.77	-US$0.005	NO
	Pensioners and social tariff (201-300 kwh/mo)	-US$6.7	-	NO
	Provinces (consumption 0-150 kwh/mo)	-US$1.9	-	NO
EJESA	Pensioners (0-125 kwh/mo)	-50%	-50%	NO
	Residential Puna Area	-50%	-50%	NO
	Unemployed	-100%	-100%	NO
	Low-income families	-43%	-43%	NO
	Low-income families	-45%	-45%	NO
	Low-income families	-35%	-35%	NO
APELP		N/A	N/A	NO
EDELAR	Low-income families (1-150 kwh/mo)	-100%	-100%	SI
	Low-income families (151-250 kwh/mo)	-100%	-	SI
	Pensioners (1-150 kwh/mo)	-75%	-75%	SI
	Pensioners (151-250 kwh/mo)	-75%	-	SI
EDEMSA-EDESTESA	Pensioners (income US$61.3-US$67.7)	-20%	-20%	NO
	Pensioners (income US$54.5-US$61.0)	-25%	-25%	NO
	Pensioners (income US$47.7-US$54.2)	-30%	-30%	NO
	Pensioners (income US$41.0-US$47.4)	-35%	-35%	NO
	Pensioners (income US$34.2-US$40.6)	-40%	-40%	NO
	Residential – Rural (0-157.5 kwh/mo)	-20%	-20%	NO
	Residential – Malargue area (0-37.5 kwh/mo)	-20%	-20%	NO
	Residential – Malargue area (37.6-175 kwh/mo)	-30%	-30%	NO
	Residential – Malargue area (176-300 kwh/mo)	-21%	-21%	NO
	Residential – Malargue area (301-649.5 kwh/mo)	-39%	-39%	NO

Table A5 : Estimation of log-linear models of income for calibration of poverty proxy

	Federal District	**Greater Metropolitan Area**	**Pampas Region**	**Northeast Region**	**Northwest Region**	**Cuyo Region**	**Patagonian**
Overcrowding	-1.394 (6.25)**	-0.523 (5.85)**	-0.602 (10.61)**	-0.544 (7.41)**	-0.473 (8.04)**	-0.558 (5.71)**	-0.588 (6.12)**
Inappropriate housing	-0.441 (1.94)	0.070 (0.39)	-0.281 (3.74)**	-0.106 (1.18)	-0.176 (1.91)	-0.229 (1.99)**	-0.500 (5.00)**
Insanitary conditions	-0.597 (2.33)**	-0.797 (14.69)**	-0.602 (13.15)**	-0.496 (9.35)**	-0.691 (17.27)**	-0.590 (7.97)**	0.513 (5.72)**
Presence of infants	-0.394 (7.00)**	-0.406 (13.65)**	-0.475 (26.41)**	-0.385 (14.68)**	-0.333 (18.41)**	-0.381 (13.49)**	-0.394 (15.34)**
Head of household completes primary education	-0.587 (8.72)**	-0.386 (9.67)**	-0.490 (20.85)**	-0.435 (10.94)**	-0.438 (14.73)**	-0.426 (10.82)**	-0.416 (11.88)**
Constant	6.423 (185.85)**	5.693 (182.75)**	5.707 (338.88)**	5.362 (187.41)**	5.504 (269.29)**	5.532 (195.98)**	6.028 (244.76)**
Observations	843	2040	5693	2263	4017	2158	2648
R squared	0.21	0.32	0.29	0.29	0.30	0.23	0.21

Table A6 : Tariff Compensation Fund (FTC) resources and feasible social tariff discounts by province

	Resources allocated ($m)		**Discount on subsistence consumption (%)**	
	Original FTC	Adjusted FTC	Original FTC	Adjusted FTC
Buenos Aires	1.76	5.03	2%	6%
Conurbano	—	2.36	—	14%
Catamarca	3.88	0.35	100%	9%
Federal District	—	2.91	—	100%
Chaco	3.58	3.09	16%	14%
Chubut	1.53	0.97	100%	63%
Córdoba	2.59	8.26	3%	10%
Corrientes	3.04	2.90	15%	15%
Entre Ríos	3.85	3.15	23%	19%
Formosa	5.64	1.14	60%	12%
Jujuy	2.70	2.04	15%	11%
La Pampa	3.64	0.19	100%	5%
La Rioja	1.32	0.19	100%	15%
Mendoza	2.65	3.73	10%	15%
Misiones	3.72	1.52	25%	10%
Neuquen	2.96	1.34	51%	23%
Rio Negro	0.70	0.51	390%	72%
Salta	2.60	2.69	11%	12%
San Juan	2.87	2.07	16%	12%
San Luis	2.89	0.77	41%	11%
Santa Fé	2.17	6.36	3%	10%
Santiago del Estero	4.46	1.43	100%	32%
Tucumán	1.83	3.19	20%	35%
Total	**60.36**	**60.36**	**52%**	**23%**

Table A7 : Comparison of present value of alternative gas subsidies

	Natural Gas	**LPG**
Annual subsistence consumption (kcal)	4,650,000 (equivalente a 500m^3)	4,650,000 (equivalente a 391 kg)
Price before tax (A$)	0.153/m^3	1.68/kg
Annual expenditure (A$)	$123	$658
PV of annual expenditure (A$)	$937	$5,006
Connection costs (A$)	$1,326-$2,026	—
PV of subsidy (A$)	$1,326-$2,026	$4,069

Note: PV- present value at 15% discount rate