FACULTAD DE CIENCIAS ECONÓMICAS | UNIVERSIDAD NACIONAL DE LA PLATA

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Documentos de Trabajo

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Documento de Trabajo Nro. 47

Noviembre 2024

ISSN 2618-4400

cefip.econo.unlp.edu.ar/

Serie Documentos de Trabajo del CEFIP

Edición: Centro de Estudios en Finanzas Públicas
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ISSN 2618-4400

Increasing block pricing, household group segmentation and distributional characteristics*

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November 29, 2024

Abstract

The paper models the implementation of increasing block pricing (IBP) coupled with household group segmentation by incomes (high, middle and low) and find necessary conditions for use of progressive block prices and fixed charges based on the distributional characteristics of blocks. It evaluates the recent combination of IBP and group segmentation in residential electricity and natural gas in Argentina using current rate schedules for the Metropolitan Area of Buenos Aires and microdata from the latest Household Expenditure Survey. The findings indicate that those conditions are not validated by the data and estimates and do not justify IBP of fixed charges and marginal prices across blocks within a given household group. Additionally, inconsistencies are observed across groups, with the rate structure (fixed charges for both electricity and natural gas, and block prices for electricity) of the middle-income group being unduly close to that of the low-income group. The analysis provides some justification for the discrimination in natural gas (distribution) prices between Buenos Aires City and Greater Buenos Aires within a given group, due to income disparities between households in both areas. The study suggests a direction of reform towards smaller dispersion of energy prices across groups so as to reduce subsidies and advocate for a shift from IBP to a Two-Part Tariff, incorporating lump sum redistribution across groups.

JEL Codes: D31, H23, L11, L51, L94, L95, L98, Q41, Q48

Keywords: energy block pricing, household segmentation, distributional impact

*Paper written in honor of professor Alberto Porto, submitted for inclusion in the program of the LIX Annual Meeting of the AAEP, Universidad Nacional de Salta, November 21-24, 2024.

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1 Introduction

Increasing block pricing (IBP) is a form of nonlinear pricing that has emerged in some contexts as a response to the concern that regulators and utilities have on affordability or distributional impacts of energy prices. Evaluations of such schemes, as noted by Borenstein (2012), dealt with effects on efficient price signals on the one hand and distributional impacts on the other, pointing to some pitfalls in the use of price differentiation across quantities as an advisable rate design. Energy economists tend to prefer simplified formats based on two-part tariffs with lump sum transfers to households to compensate for distributional impacts, as suggested by Burger et al. (2020) but that practice seems to be difficult to implement for regulators or energy departments who may be tempted towards IBP with utilities passively adapting to, or advocating, such practice. Recent reviews of utility pricing in electricity across the world (Foster & Witte, 2020), detect in some cases IBP as a nuisance for correct tariff design. Global trends in best practices (Faruqui & Tang, 2021), do not show IBP as an emerging feature but rather stress other dimensions of rate design innovations related to the energy transition era. This perspective may vary across regions; in Latin America, for example, several countries have adopted IBP in both the fixed and variable components of household electricity rates. Evidence, as discussed by Navajas (2023), indicates that IBP is not a completely uniform feature in the region, with countries such as Brazil, Chile, and Colombia not displaying block pricing. However, it is rather pervasive in many countries apart from Argentina, such as Bolivia, Costa Rica, El Salvador, Mexico, Paraguay and Uruguay. This includes block pricing of volumetric components and in some cases (Argentina, Bolivia, El Salvador, Peru and Uruguay) of fixed charges. Thus, evaluation of IBP is a relevant task for many countries in the LAC region.

Household group segmentation is the use of observable household characteristics to accommodate either lump transfers or differential prices according to proxies for living means tests. While this is one mechanism that could complement two part tariff pricing in a simplified fashion, that delivers efficient price signals and cost reflectivity principles, there is also a possibility that household group segmentation may be used in contexts where IBP is being used, adding up more complexity to pricing schemes. Here again, beyond discounts for certain household groups, there are not many examples of comprehensive group segmentation across the world. Recent proposals to differentiate fixed charges in electricity to protect low-income households in California (Borenstein *et al.* (2021); Fowlie (2023)) or earlier more comprehensive schemes on utility services in Colombia (Medina & Morales, 2006), are forms of group segmentation.

This paper assesses the recent Argentine implementation of increasing block pricing (IBP) combined with household group segmentation in electricity and natural gas, using the concept of distributional characteristics.[1] In a series of papers written and published about 35 years ago, Alberto Porto led in Argentina an effort to use estimates of distributional characteristics of goods (DCG) using data from household expenditure surveys (HES) for the analysis of indirect tax and utilities rate structures (Porto & Navajas, 1989; Navajas & Porto, 1990, 1994).[2] DCG, defined as the weighted sum of household consumption shares -with weighs given by the social marginal utility of household income- was a concept introduced in contributions by Feldstein (1972b) and Sandmo (1975) in the context of an optimal third-degree price discrimination problem in public services or in indirect taxation under externalities. This so-called Ramsey-Feldstein rule allowed uniform prices of goods and services to be sensitive to DCG along with other relevant parameters used to design and evaluate theory-based public utility prices.

In a related paper on pricing in public utilities, Feldstein (1972a) modeled the distributional impacts of an optimal two-part tariff (2PT) but did not consider the effect of fixed charges on household participation in consumption, a feature later introduced by Ng & Weisser (1974) and Brown & Sibley (1986), although without distributional considerations.[3] Building on this, Navajas & Porto (1990) extended the framework by modeling an optimal 2PT with endogenous participation of heterogeneous households, introducing the distributional characteristics of both consumption and participation to assess electricity and natural gas pricing, using Argentine HES data from 1985. Their analysis moved to evaluate the very progressive IBP scheme which looked quite different from typical schemes with quantity discounts in marginal prices discussed in the literature at that time (e.g., by Willig (1978) in theory, or Phlips (1983) with reference to social or low-user tariff schemes in Belgian electricity tariffs; see also Navajas (2009) on natural gas). Their analysis gave rise to a query on whether the observed increasing marginal price structure had some correspondence, as it should, with estimated DCG parameters. They found an excessive increasing block pricing problem, as the observed price structure could not be explained by the measured structure of DCG cum plausible welfare function weights.

Almost four decades after, the setting on which rate design is discussed has changed dramatically due to objectives, instruments and constraints. A new phase in the history of public utility pricing is begining, where energy transition towards decarbonization, the irruption of new technologies for decentralized energy production and distribution and the pervasive diffusion of

[1]A comprehensive study of public utility pricing across more than 6 decades in Argentina can be found in Cont *et al.* (2021).

[2]See also Navajas (2004); Lozano *et al.* (2021) based on Newbery (1995) on the use of DCG for the assessment of the distributional impact of relative price changes.

[3]See Borenstein & Davis (2012) for an analysis of efficiency and equity effects of two part tariffs in natural gas.

digitalization are changing the scenario. The usually assumed limits on information and instruments available for utility pricing have become less relevant, and the ability to focalize on segments of household types has increased.[4]

However, despite this new landscape in rate design, the issues explored in the earlier studies remain relevant. In Argentina, there has been little to no progress in addressing these new dimensions. Instead, the practice has leaned more heavily on IBP, particularly in relation to fixed charges, in recent years (see Urbiztondo *et al.* (2020) for electricity). Current scenario of pricing structures in both gas and electricity in Argentina look complex for consumers to assess, with several consumption blocks where fixed changes have become much more increasing across consumption levels than variable charges. That is, now the sequence of 2PT faced by households lead to an outlay schedule that is not only non-convex but also discontinuous, with jumps at the end of blocks as the next bock triggers a higher fixed charge in the whole bill.

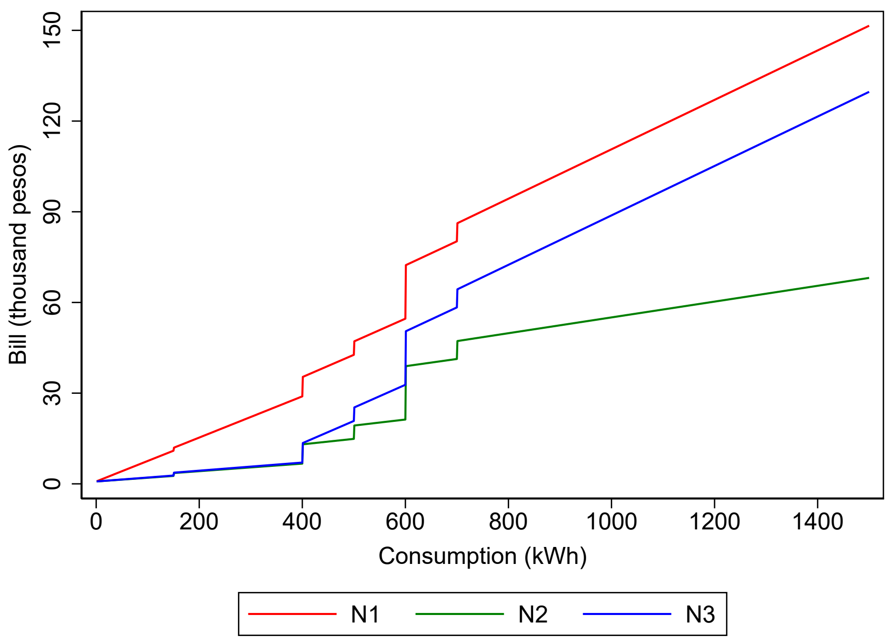
This rise in the number of block prices which now add progressive fixed charges has made tariff evaluation even more complex in practice given regional disparities in both natural gas and electricity, which are escalated by provincial and municipal taxes, sometimes also changing across tariff blocks (Navajas & Olguin, 2024). The more recent and complex addition to tariff design has been the introduction since 2022 of household segmentation on observable or self-declared attributes that have separated three groups of household types (so called N1, N2 and N3) on the basis of attributes related to income, in order to accommodate subsidy free households (N1) from poor households (N2) and from supposedly vulnerable or low middle class households (N3).

This segmentation has further complicated the pricing structure, with boundaries of pricing blocks remaining consistent across all three categories. All three face increasing fixed charges across consumption blocks, which are identical across the three household types for a given block (i.e., the structure of fixed charges depends on consumption levels but not on household types). Additionally,

[4] Even within the framework of efficient 2PT with different fixed charges on households types and a marginal price reflecting social marginal costs, others dimensions have emerged such time of use (TOU) or real time pricing (RTP) within smart grids, making a pricing "trinity" (i.e. lump sum charges, power or capacity charges and energy use prices, see ACER (2021) p.43 Table 13 for a sample of EU countries) a reasonable benchmark upon which distributional issues are dealt, within a non-distortionary fashion, by lump sum transfers that complement fixed charges. In other words, the possibility of implementing lump sum transfers makes Ramsey-Feldstein pricing with DCG unnecessary or Pareto-inferior. Finally, the issue of market participation or access by households, that in the previous models is an endogenous choice which depends on a net surplus condition has currently become more complex as some households can defect one grid (natural gas) towards another (electricity) or they can partially defect the grid for self production to become prosumers (electricity). This makes the design of natural gas and electricity rate design more interdependent than before due to increasing substitutability, apart from the carbon pricing content to be included in social marginal costs (see Borenstein & Bushnell (2021) on this).

marginal prices across blocks are increasing for electricity and vary significantly among household groups, with substantially higher prices for subsidy free N1 households much lower but relatively similar for the other two groups, N2 and N3. This has increased the dimension of prices to be evaluated. For instance, in electricity, the pricing structure in the Buenos Aires Metropolitan Area (AMBA) has expanded from one fixed charge and six block prices, as evaluated by Navajas & Porto (1990), to now include six fixed charges and 18 block prices. Figure 1 illustrates the tariff schedule with IBP and group segmentation for electricity in AMBA Buenos Aires, Argentina,[5] and Appendix A provides the rate schedules for both electricity and natural gas.

Figure 1: IBP tariff schedule for residential electricity by groups. AMBA. June 2024.



Source: National Electricity Regulatory Body (ENRE).

Given this background, the main objective of this paper is to evaluate the observed rate structure in natural gas and electricity by computing DCG across blocks and household groups and asking whether they make sense. In particular, we critically assess the rationale behind uniform (across household groups) and differentiated (across blocks) fixed charges, which seem to be at odds with principles of targeted discrimination where fixed charges should to be tailored per

[5]Monetary values in Figure 1 expressed in the Y-axis are relatively easy to translate into US Dollars as the official exchange rate is close to $1000 per dollar. For modal consumption levels for a typical household (about 300 kwh per month) the bill without taxes vary between about 8 dollars per month for low (N2) and low-to-middle (N3) households and 30 dollars for medium-to-high (N1) households. These levels reveal very low, subsidized values of electricity, particularly for N2 and N3 groups.

household type or group, not across consumption blocks.

The paper is structured as follows: Sections 2 and 3 form the core of the analysis. In Section 2, the paper presents the modeling framework where increasing block pricing is combined with the segmentation of households in a number of groups, leading to an independent tariff schedule for each group. This section evaluates the set of prices and fixed charges across blocks and groups that a social planner would ideally choose, demonstrating the role of distributional characteristics and deriving the necessary conditions for justifying IBP on both fixed and variable components based on distributional criteria. Section 3 then shifts focus to the evaluation of the observed block pricing coupled with household group segmentation implemented in Argentina since 2022, specifically analyzing the current tariff structure in electricity and natural gas in the Metropolitan Area of Buenos Aires (AMBA). This evaluation utilizes the observed tariff schedule and household microdata from the latest Household Expenditure Survey (HES) to compute DCG across the six quantity blocks for electricity and nine for natural gas, as well as for the three administratively selected household groups (N1, N2, N3). By applying the reference model and incorporating some realistic and simplifying assumptions, the paper assesses the consistency of the observed structure of fixed charges and marginal prices across blocks and groups. Section 4 performs a sensitivity analysis of the previous results by isolating the effects that a predetermined definition of blocks i and groups j might have in the results. Section 5 discusses proposed directions for reform based on the findings, while Section 6 briefly explores extensions to consider and concludes with a summary of the main findings.

2 Increasing block pricing with group segmentation

A conventional partial equilibrium setting is assumed for the end-user residential provision of electricity or natural gas, with heterogeneous $h = 1, \dots, H$ households that have been previously segmented by an administrative imperfect procedure in $j = 1, \dots, J$, groups that are obviously heterogenous intra-group. There is only one good provided by a utility firm with constant marginal cost c and fixed common costs F, where the assumption of constant marginal cost and constant common fixed costs across pricing blocks is in our view realistic, simplifies the analysis and, of course, affect conclusions.[6] The utility is subject to efficient regulation, as outlined by Wolak

[6]If marginal costs are increasing across blocks then there would be a reason for IBP regardless of distributional concerns. However, the driver of IBP elsewhere (e.g., Borenstein (2012)) has, to our knowledge, not been increasing marginal costs for individual consumers but rather distributional concerns. Much of final prices comes from energy which is represented by marginal costs and remain constant across blocks. In the case of electricity, capacity or power

(2008), where taxation is excluded from the realm of regulation and is passive in relation to tariff design, thus eliminating pricing/taxation coordination issues, as discussed by Navajas (2018, 2023) and Navajas & Olguin (2024).

Pricing is designed to comply with a rate of return target and the tariff structure is chosen from an administrative procedure approved in a regulatory hearing where several blocks related to quantities of energy (kwh) or natural gas (m3) consumed by households define a set of differentiated increasing block pricing for both fixed charges and variable charges. There is no regulatory coordination or comparability between electricity and natural gas pricing, despite possible substitutability from natural gas to electricity in the medium to long term. Therefore, there are $i = 1, \ldots, I$ consumption blocks for the J household groups, with different fixed charges A_{ij} and block prices p_{ij}. Each household h_{ij}, belonging to one of the J groups, consumes within a given block i x_{ij}^h with an outlay

$$T_{ij}^h = A_{ij} + p_{ij}(1+t)x_{ij}^h \tag{1}$$

where t is a constant ad valorem tax. The household h_{ij} has an indirect utility $V_{ij}^h(p_{ij}, A_{ij}, t, Y_{ij}^h)$, where Y_{ij}^h is the income of household h_{ij}.

In this setting, there are therefore $I \times J$ quantities, fixed charges, and prices. As a representation, the specific structure for electricity and natural gas in Argentina's AMBA region is provided in Annex A, where $I = 6$ for electricity (8 for natural gas) and $J = 3$. Prices and fixed charges across blocks and groups are determined by the regulatory process, which may adopt a uniform setting in one dimension (blocks i and/or groups j) that respects cost recovery or reflectivity, or a differentiation that exploits some progressivity with the objective of mitigating distributional impacts. From a welfare perspective, an optimal tariff structure can be derived from a social planner problem, where fixed charges and block prices (A_{ij}, p_{ij}) are instruments used to maximize

costs cannot be efficiently addressed by IBP but rather by power charges that need TOU metering. Fixed charges, as they cover fixed common costs of distribution cannot in principle depend on quantities consumed by individual households. See Borenstein (2016), Borenstein & Bushnell (2021), Pérez-Arriaga *et al.* (2017) and Navajas (2023) on these issues. In the case of Argentina fixed charges have a degree of progressivity not common across best practice or good regulatory environments and seem to accommodate a discrimination of the burden across households. In electricity the practice to differentiate fixed charges across blocks emerged in 2017 and in natural gas later on. Distribution companies in the AMBA area have presented in hearings declarations of rising costs across blocks, accepted by the regulator moving from a regulatory accounting practice during the 1990s when Argentina made reforms towards incentive regulation with independent regulators (Artana *et al.*, 1998). One benign interpretation is a possible change in the cost doctrine to disguise redistributive objectives and to justify, in particular, increasing fixed charges while protecting from imputations of cross subsidization forbidden by the 1990s laws that are still in force.

household welfare subject to a financial constraint. Social welfare is represented by the sum across i, j, and h of the weighted utilities of households h_{ij},

$$\sum_{i}^{I}\sum_{j}^{J}\sum_{h}^{H}\sigma_{ij}^{h}V_{ij}^{h}(p_{ij},A_{ij},Y_{ij}^{h}). \tag{2}$$

The finance constraint is given by the non-negativity of

$$\sum_{i}^{I}\sum_{j}^{J}(A_{ij}+(p_{ij}-c)x_{ij})-F-\hat{\pi}, \tag{3}$$

where $A_{ij}=\sum_{h\in ij}A_{ij}^{h}=n_{ij}A_{ij}^{h}$ is the sum of fixed charges paid by the n_{ij} households located in block i,j, c is the marginal cost, F fixed costs, $x_{ij}=\sum_{h}x_{ij}^{h}$ is the total (across h_{ij} households) consumption of block i for group j, and $\hat{\pi}$ represents the regulatory rate of return constraint.

Maximizing (2) subject to (3) leads to the following rules for the set of instruments p_{ij} and A_{ij}. In the case of prices, the conventional price-cost margins can be written as

$$\frac{(p_{ij}-c)}{p_{ij}}=\frac{\lambda-\sum_{h}\beta_{ij}^{h}\left(\frac{x_{ij}^{h}}{x_{ij}}\right)}{\lambda\eta_{ij}}, \tag{4}$$

where $\beta_{ij}^{h}=\sigma_{ij}^{h}\alpha_{ij}^{h}$ is the social marginal utility of income of household h_{ij}, α_{ij}^{h} is the private marginal utility of income of h_{ij}, $\eta_{ij}=-\frac{\partial x_{ij}}{\partial p_{ij}}\cdot\frac{p_{ij}}{x_{ij}}$ is the price elasticity of block i for group j consumption, and λ is the Lagrange multiplier associated with the finance constraint (3). Rule (4) indicates that the price-cost margin of block i for group j is sensitive to the distributional characteristic of block i for group j, $DC_{ij}=\sum_{h}\beta_{ij}^{h}\left(\frac{x_{ij}^{h}}{x_{ij}}\right)$.

The rule for the choice of fixed charges across blocks i and groups j, A_{ij}, follows a simple rule based on the average social marginal utility of income for all I and j, which is:

$$\frac{1}{n_{ij}}\sum_{h}\beta_{ij}^{h}=\lambda. \tag{5}$$

The average of the social marginal utility of income must be equalized across blocks and groups.

Expressions (4) and (5) indicate a differentiation of instruments across blocks and groups but do not necessarily validate IBP if parameters, in practice, do not justify it. Instead, a necessary condition for IBP, given the constancy of marginal costs and assuming that price elasticities do not increase across blocks, is that distributional characteristics must decrease across blocks. If this condition is not met, progressive prices p_{ij} across blocks cannot be justified. The same principle applies to prices across groups for a given block.

The same caveat that desired IBP will depend on observed parameters, applies to fixed charges. Expression (5) suggests that as we move across blocks for a given group, there needs to be a monotonically decreasing average social marginal utility of household income.[7] This average is the ratio between the sum of social marginal utilities of income for households in that block (independent of the distribution of consumption) and the number of households as blocks increase. Both figures are likely to decrease across blocks, with an indeterminate result. On the other hand, if group segmentation leads to significant income differences across groups, then price differentiation across groups should be reflected in differential fixed charges. In summary, the results depend on observable parameters, making this an empirical issue. The next section employs this framework to assess the observed block pricing practices in electricity and natural gas in Argentina.

Finally, expressions (4) and (5) are defined across "active" households h_{ij}, assuming full participation or service coverage, abstracting from the elasticity of participation studied in the two-part tariff models of Ng & Weisser (1974), Brown & Sibley (1986), and Navajas & Porto (1990). Introducing the possibility of "voluntary" exclusion from provision is a possible extension of the model. However, we believe that in developing countries, it is more relevant that households are involuntarily excluded and unable to access electricity or natural gas due to supply constraints. In such cases, the set of households considered in rules (4) and (5) would focus only on a subset of households with, on average, lower welfare weights than those excluded from provision.

3 Empirical assessment

In this section, the evaluation of the observed IBP with group household segmentation adopted by Argentina is conducted, using the current (mid-2024) tariff structure in electricity and natural gas

[7]This can be proved using a direction-of-reform argument (Ahmad & Stern, 1984; Myles, 1995; Navajas, 2004) starting from first order conditions for Aij from the optimization of (1) subject to (2). These conditions can be rewritten as the ratio of the welfare cost per unit of revenues of rising Aij which can all be equal to λ at the optimum and do not hold if the average social marginal utility of income (SMUI) of households are different across blocks. For IBP it is necessary that the average of SMUI be decreasing across blocks.

in the metropolitan area of Buenos Aires (AMBA).[8] In 2022, with the goal of managing energy subsidies (which increased from 1.1% of GDP in 2019 to around 2.0%) the federal government implemented through an Executive Decree[9] an administrative segmentation of households based on socioeconomic factors (mainly income level) into three groups: high income (level N1, 34% of total AMBA households), low income (level N2, 45%), and middle income (level N3, 21%)[10], establishing differentiated prices for electricity and gas tariffs for each group. Households classified as high income face a full unsubsidized tariff, while those classified as middle and low income continue to pay a lower tariff. This regime remains in effect.

In this context, for each of the segmented groups, the energy service distributors present a different tariff schedule that includes six (eight) fixed charges and six (eight) variable charges by consumption blocks for electricity (gas).[11] In mid-2024, a series of executive decrees and resolutions by the Secretary of Energy[12] introduced significant discounts for groups N2 and N3 on the price of energy (electricity and natural gas) paid by group N1, which was targeted to receive no subsidies. At the same time, regarding infrastructure components related to transport and distribution of electricity and natural gas, regulatory bodies (ENRE and ENARGAS) implemented tariff schedules with some noticeable differences based on regulatory hearings held earlier in the year. Fixed charges followed a steep IBP format for both services and did not differ across groups. Variable charges adopted different formats: for natural gas, variable components for distribution pricing were eliminated, and all revenues of distribution firms now come from fixed charges (with variable components for gas and transport having the same values across blocks). For electricity, variable components for distribution were allowed to change following an IBP format.

Thus, according to the model of Section 2, the Secretary of Energy introduced a differentiation of commodity prices (energy), affecting end-user prices across groups j but not across rate blocks

[8]The AMBA includes 4.8 million households. It encompasses all households in the Autonomous City of Buenos Aires (CABA, 30% of the total) and the remaining households in the districts of Greater Buenos Aires (GBA).

[9]Decree 322/2022 from the Federal Government.

[10]See Table A1 for eligibility criteria to classify households into each group.

[11]See the tariff schedules in the Appendix A.

[12]They were Executive Decree 465 and Secretary of Energy Resolutions 90/2024 to 93/2024. The decree established an interim period where the approach to group segmentation for managing energy subsidies was going to be revisited, including a proposal of introducing differential energy consumption baskets for different size of households located in different climatic locations across the country. In the meantime a rule was implemented for introducing discounts for groups N2 and N3 of wholesale energy prices in relation to, in principle, non-subsidized households (N1). On the other hand the resolutions established the precise values and discounts for the pricing of electricity and natural gas.

i, while utility regulation allowed IBP for distribution companies differentiated across blocks i but not across household groups j for variable and fixed charges in electricity, and only for fixed charges in natural gas. Additionally, natural gas regulation introduced a surprising differentiation of fixed charges across areas within AMBA, by setting higher values for all blocks in Buenos Aires City (CABA) compared to the Greater Buenos Aires (GBA) area. Appendix A presents the tariff schedules for electricity and natural gas, represented by the distribution companies EDENOR and METROGAS, respectively.

The observed rate structure represented by the tariff schedules is evaluated using microdata on household consumption and income from the latest National Household Expenditure Survey (ENGHo) for the year 2018. All data used in this paper are subject to open access from official statistics and do not rely on data from private operators. As the ENGHo-reported quantities of electricity (in kWh) and gas (in m^3) are known to have significant measurement errors or under-reporting bias (about 70% of households in AMBA report a consumption of less than or equal to one unit in both services), household consumption quantities are obtained from microdata through a retrieval process (Navajas, 2008, 2009) based on declared household expenditure (which is very reliable as it reports the data from the bill) and using the tariff schedule and tax component of the survey period to estimate consistent physical quantities. Additionally, with the socioeconomic information of households contained in the ENGHo, households are classified in a manner consistent with the characteristics of the corresponding segmentation level stated in Decree 322/2022. This procedure was recently followed by Navajas *et al.* (2023). Finally, the consistency of retrieved quantities with administrative data from distribution companies is evaluated, and differences in group classification based on ENGHo data and the size and distribution of groups across consumption blocks obtained from distribution companies are examined (as in Navajas *et al.* (2023)).

With tariff schedules obtained from observed end-user IBP across blocks i and household groups j, and quantities for households h_{ij} obtained from the ENGHo, the necessary estimates are completed with the empirical estimation of social marginal utility of income parameters β^h_{ij}. Auxiliary assumptions are made regarding the shape of the social welfare and individual utility functions.[13] A simple parameterization (see, for example, Newbery (1995); Navajas (2004); see also Florio (2014)) assumes that the social welfare function is additive in utility levels of households across blocks and groups U_{ij}, i.e., $W = \sum_i \sum_j \sum_h U^h_{ij}$, and that households have isoelastic utilities

[13] An alternative specification that assumes a weighted welfare function of indirect utility functions with weights given by a decreasing function of household income comes to the same results without the need to specify the form of utility functions. The specification (additive W, isoelastic U) adopted in Newbery (1995); Lozano *et al.* (2021) facilitates the computing of percentage welfare changes of price changes. It is also the form adopted in Navajas & Porto (1990) for computing distributional characteristics.

on consumption or real expenditure of the type $U_{ij}^h = \frac{(Y_{ij}^h)^{1-v}}{(1-v)}$ for $v \neq 1$ and $U_{ij}^h = \log(Y_{ij}^h)$ for $v = 1$, where Y_{ij}^h is household expenditure per equivalent adult and v is interpreted as a coefficient of inequality aversion. Under these assumptions, the social marginal utility of income of household h in block i and belonging to group j can be computed by the expression $\beta_{ij}^h = (Y_{ij}^h)^{-v}$, that is, the inverse of household per equivalent adult raised to the coefficient v. The base estimate assumes $v = 1$, which is the same parameter value used in Navajas & Porto (1990).

Tables 1 to 3 present the data and estimates constructed for the evaluation of IBP and group segmentation in electricity and natural gas following the model specification adopted in Section 2. All tables show the structure of fixed charges A_{ij} and block prices p_{ij} across i and j, relative to the first block of the first group $(i, j = 1, 1)$, as numeraire, and include for each block and group (i, j) the distributional characteristic $\sum_h \beta_{ij}^h \frac{x_{ij}^h}{x_{ij}}$, the average social marginal utility of income for households $\frac{1}{n_{ij}} \sum_h \beta_{ij}^h$, block quantities x_{ij}, and the sum of households $\sum_h h_{ij}$. Using the first block of the first group as numeraire allows for evaluating the rate structure across blocks for both a given group and across groups.

The first important result of the assessment of IBP structures in both electricity and natural gas in the AMBA region in Argentina is that distributional characteristics across blocks, for all groups, do not justify, on distributive grounds, the observed increasing block prices. Distributional characteristics are non-monotone across blocks and increase from one extreme to the other in electricity for groups N1 and N2, as well as for some block intervals for N3. In the case of natural gas, they have similar, although milder, variations across blocks due to the different (lower) household access to natural gas (compared to electricity), which includes fewer poor households. While block prices of natural gas are constant across blocks (whereas those of electricity vary from 20% for N1 to about 100% for extreme blocks),[14] the absence of IBP in natural gas seems more reasonable from an evaluation perspective. The reason for distributional characteristics being non-monotone across blocks is due to the heterogeneity of household composition and consumption, in a way that makes the aggregate consumption-income correlation positive but low (a fact found in electricity (Komives *et al.*, 2005)) or Engel curves mildly steep in natural gas (Navajas, 2009). With group segmentation, this feature becomes more significant, affecting the non-monotone non-decreasing estimates of distributional characteristics across blocks found in the sample.[15]

[14]All the progressivity of block prices in electricity comes from variables charges for distribution because energy and transport prices are the same across blocks for a given block (while energy prices differ across groups). Thus the progressivity of the distribution charge is much steeper than the values of final prices *pij* reported in Table 1.

[15]This contrast with the monotonically decreasing DC across blocks found by Navajas & Porto (1990) based on the 1985 ENGHo in a context where there no household group segmentation and the price regime was different. The effect of the price regime on the household consumption-income correlation or Engel curve for natural gas, in the

The second important result concerns block pricing differentials across groups based on distributional grounds. While distributional characteristics of blocks i for a given group j do not justify IBP, the evidence shown for electricity (Table 1) does justify some price differentiation across groups, as distributional characteristics for a given block i are much higher for group N2 compared to N1. However, results show that the proximity of block prices p_{ij} between groups N3 and N2 is not justified on distributive grounds, as the former group is closer in distributional characteristics to the non-subsidized group N1. These observations do not apply to natural gas, where there are no block price differentials across groups.

The third important result is that the observed IBP in fixed charges, which is severely progressive across blocks, is not justified by condition (5) obtained in the previous section. These results are valid for both electricity (Table 1) and natural gas (Tables 2 and 3). The average of social marginal utility of income (average SMUI column in Tables 1 to 3) across blocks i for a given group j behaves non-monotonically and non-decreasingly. As expected, differential fixed charges are justified across groups rather than across blocks, which is the opposite of what is observed in current practice. However, estimates show that even across groups, differences in fixed charges should favor mainly the N2 group instead of N3, since differences in the average social marginal utilities of income between N3 and N1 are relatively minor. Fixed charges for N3 should be closer to those for N1 instead of N2, and all should be the same across blocks.

The fourth and final important result of the evaluation concerns the differentiation of both fixed charges and block prices of natural gas between CABA and GBA, which are adjacent areas where households near the boundaries face significantly different rate schedules, with CABA paying much higher rates. This cannot be justified on the basis of cost differences, as the average density of dwellings is much higher in CABA. This is evaluated by comparing Table 1 with Table 4, which is an adaptation of Table 3 but normalized in relation to CABA to allow for interjurisdictional comparison. Table 4 shows the same non-monotonic properties across blocks for both distributional characteristics and the average social marginal utility of household income, which do not justify IBP of fixed charges and marginal prices on distributive grounds. However, the comparison of parameters across jurisdictions justifies lower fixed charges and marginal prices of natural gas for GBA, for a given group j, as a result of the household income differential with CABA. Since this differential also exists for electricity, an asymmetric or uncoordinated approach to household energy pricing is noted, which tends to distort the relative prices of gas and electricity across neighboring jurisdictions.

direction that lower prices blured consumption-income correlations, was modelled and tested in Navajas (2009) by comparing the relatively low price regime in natural gas as opposed to the high price regime of liquified petroleum gas (LPG) both used in household consumption in Argentina.

Table 1: Electricity rate structure and parameters for evaluation. AMBA Argentina. June 2024. Values relative to i,j=1,1 equal to 1.

Block i	Fixed charge Aij	Block price pij	Distributional Characteristics $\sum \beta_{ijh} \cdot \frac{x_{ijh}}{x_{ij}}$	Average of SMUI $\frac{1}{n_{ij}} \sum \beta_{ijh}$	Block quantity xij	Sum of Households
Group N1 (j = 1)						
1	1.00	1.00	1.00	1.00	1.00	1.00
2	2.13	1.00	1.09	1.08	4.40	1.39
3	7.35	1.07	1.25	1.15	1.32	0.24
4	11.76	1.09	0.94	1.08	1.32	0.19
5	31.00	1.14	1.03	1.13	0.59	0.07
6	36.55	1.17	1.12	1.17	1.61	0.16
Group N2 (j = 2)						
1	1.00	0.38	3.07	3.28	1.26	1.64
2	2.13	0.69	3.14	2.90	5.72	1.83
3	7.35	0.89	3.81	3.31	2.28	0.42
4	11.76	0.69	2.92	2.42	1.93	0.28
5	31.00	0.43	8.94	2.96	0.35	0.04
6	36.55	0.95	7.63	6.32	1.04	0.08
Group N3 (j = 3)						
1	1.00	0.52	1.13	1.24	0.57	0.59
2	2.13	0.55	1.40	1.28	2.37	0.75
3	7.35	0.56	1.24	1.32	1.45	0.11
4	11.76	0.87	1.13	1.33	1.07	0.10
5	31.00	0.58	1.05	1.27	0.52	0.01
6	36.55	1.05	0.99	1.11	0.72	0.08

Source: ENGHo and tariff schedules.

Table 2: Natural gas rate structure and parameters for evaluation. CABA Argentina. June 2024. Values relative to i,j=1,1 equal to 1.

Block i	Fixed charge Aij	Block price pij	Distributional Characteristics $\sum \beta_{ijh} \cdot \frac{x_{ijh}}{x_{ij}}$	Average of SMUI $\frac{1}{n_{ij}} \sum \beta_{ijh}$	Block quantity xij	Sum of Households
			Group N1 (j = 1)			
1	1.00	1.00	1.00	1.00	1.00	1.00
2	2.96	1.00	1.21	1.30	0.43	0.18
3	3.60	1.00	0.94	1.17	0.58	0.20
4	4.55	1.00	1.24	1.36	0.87	0.24
5	5.60	1.00	1.09	1.22	1.00	0.23
6	7.35	1.00	1.54	1.66	0.30	0.05
7	10.03	1.00	0.87	1.10	0.42	0.06
8	23.89	1.00	0.73	0.90	1.23	0.10
			Group N2 (j = 2)			
1	1.00	0.73	2.56	3.06	0.59	0.62
2	2.96	0.73	2.66	3.34	0.28	0.12
3	3.60	0.73	3.19	3.83	0.29	0.10
4	4.55	0.73	2.46	2.78	0.69	0.19
5	5.60	0.73	2.15	2.42	0.79	0.17
6	7.35	0.73	2.10	2.32	0.41	0.07
7	10.03	0.73	1.94	2.81	0.25	0.04
8	23.89	0.73	1.22	1.51	0.33	0.03
			Group N3 (j = 3)			
1	1.00	0.77	1.12	1.21	0.48	0.49
2	2.96	0.77	1.36	1.36	0.36	0.15
3	3.60	0.77	1.17	1.23	0.25	0.09
4	4.55	0.77	1.35	1.46	0.61	0.22
5	5.60	0.77	1.42	1.42	0.52	0.12
6	7.35	0.77	1.40	1.59	0.20	0.04
7	10.03	0.77	1.33	1.37	0.47	0.06
8	23.89	0.77	0.66	1.27	0.11	0.01

Source: ENGHo and tariff schedules.

Table 3: Natural gas rate structure and parameters for evaluation. GBA Argentina. June 2024. Values relative to i,j=1,1 equal to 1.

Block i	Fixed charge Aij	Block price pij	Distributional Characteristics $\sum \beta_{ijh} \cdot \frac{x_{ijh}}{x_{ij}}$	Average of SMUI $\frac{1}{n_{ij}} \sum \beta_{ijh}$	Block quantity xij	Sum of Households
			Group N1 (j = 1)			
1	1.00	1.00	1.00	1.00	1.00	1.00
2	2.32	1.00	1.27	1.32	0.39	0.20
3	2.85	1.00	0.92	1.07	0.44	0.18
4	3.53	1.00	0.99	1.03	0.57	0.19
5	4.57	1.00	1.04	1.08	1.20	0.34
6	5.43	1.00	1.10	1.10	0.37	0.08
7	6.72	1.00	1.07	1.14	0.63	0.12
8	11.24	1.00	0.95	1.01	1.87	0.20
			Group N2 (j = 2)			
1	1.00	0.73	1.97	2.31	1.07	1.12
2	2.32	0.73	1.88	2.13	0.59	0.30
3	2.85	0.73	2.29	2.48	0.71	0.30
4	3.53	0.73	2.30	2.69	0.93	0.31
5	4.57	0.73	2.03	2.18	1.78	0.50
6	5.43	0.73	2.52	2.92	0.50	0.11
7	6.72	0.73	2.69	2.52	0.73	0.14
8	11.24	0.73	1.57	1.89	1.23	0.15
			Group N3 (j = 3)			
1	1.00	0.77	1.16	1.11	0.39	0.44
2	2.32	0.77	1.41	1.41	0.32	0.16
3	2.85	0.77	1.36	1.25	0.33	0.14
4	3.53	0.77	1.26	1.21	0.71	0.07
5	4.57	0.77	1.06	1.17	0.54	0.15
6	5.43	0.77	1.50	1.47	0.27	0.06
7	6.72	0.77	2.01	1.67	0.67	0.13
8	11.24	0.77	0.87	0.83	0.80	0.08

Source: ENGHo and tariff schedules.

Table 4: Gas rate structure and parameters for evaluation. GBA Argentina June 2024. Values relative to Gas CABA i,j=1,1 equal to 1.

Block i	Fixed charge Aij	Block price pij	Distributional Characteristics $\sum \beta_{ijh} \cdot \frac{x_{ijh}}{x_{ij}}$	Average of SMUI $\frac{1}{n_{ij}} \sum \beta_{ijh}$	Block quantity xij	Sum of Households
			Group N1 (j = 1)			
1	1.15	1.00	4.68	1.68	2.04	1.65
2	2.68	1.00	5.93	2.21	0.79	0.33
3	3.29	1.00	4.31	1.79	0.91	0.30
4	4.08	1.00	4.61	1.80	1.16	0.32
5	5.28	1.00	4.85	1.73	2.45	0.56
6	6.27	1.00	4.66	1.68	0.75	0.13
7	7.76	1.00	5.02	1.92	1.29	0.19
8	12.98	1.00	4.43	1.70	3.81	0.32
			Group N2 (j = 2)			
1	1.15	0.73	9.24	3.88	2.18	1.85
2	2.68	0.73	8.81	3.56	1.20	0.50
3	3.29	0.73	10.71	4.16	1.46	0.49
4	4.08	0.73	10.77	4.50	1.89	0.51
5	5.28	0.73	9.51	3.66	3.64	0.82
6	6.27	0.73	11.81	4.89	1.03	0.18
7	7.76	0.73	12.59	4.22	1.49	0.23
8	12.98	0.73	7.36	3.17	2.51	0.24
			Group N3 (j = 3)			
1	1.15	0.77	5.43	1.86	0.81	0.73
2	2.68	0.77	6.62	2.37	0.66	0.27
3	3.29	0.77	6.36	2.10	0.67	0.23
4	4.08	0.77	6.10	2.43	0.43	0.15
5	5.28	0.77	4.99	1.96	1.11	0.25
6	6.27	0.77	7.03	2.47	0.54	0.10
7	7.76	0.77	9.40	4.80	2.11	0.31
8	12.98	0.77	4.07	1.40	1.62	0.13

Source: ENGHo and tariff schedules.

4 Sensitivity analysis

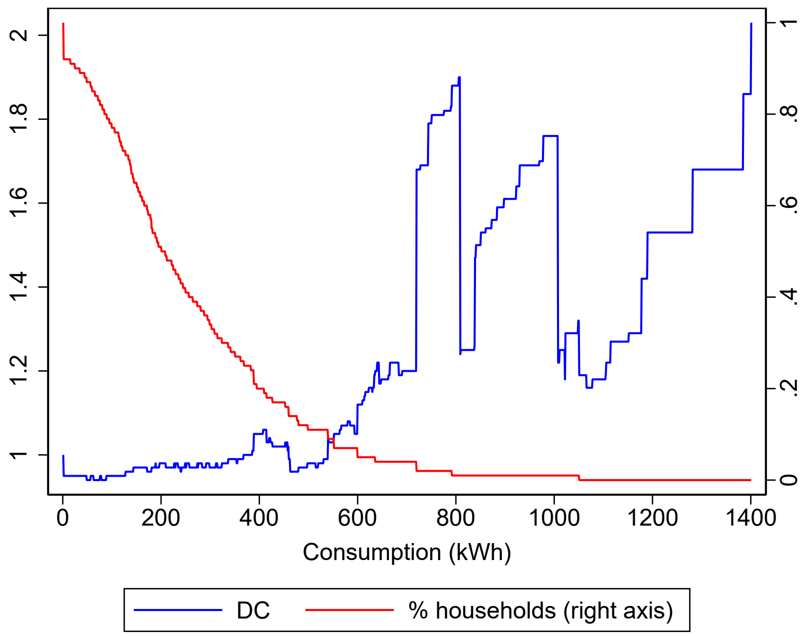
The necessary conditions obtained in Section 2 for the optimal design of IBP, i.e., that distributional characteristics are decreasing across blocks, are not observed in the previous empirical assessment. The absence of decreasing monotonicity of the distributional characteristics (DC) of blocks i for a given group j, as shown in Tables 1 to 3, may perhaps depend on the particular way blocks and groups are defined, which we take as predetermined by the observed design in Argentina. To separate these effects, this section presents an exercise for electricity in which we eliminate predetermined groups ($j = 1, 2, 3$) by working with all households in the ENGHo survey, and also eliminate predetermined ($i = 1, \dots, 6$) blocks by computing a sequence of granular unitary (1 kWh) blocks across the domain of electricity consumption. As a result, j is eliminated and i is redefined across 1,400 blocks of 1 kWh each. When moving across the domain of granular or unitary consumption blocks, it is observed whether the DCs, as shown in Table 1 for electricity, are monotonically decreasing for the entire sample of households. This requires a redefinition of the distributional characteristic of each kWh, whereby

$$\mathrm{DC}_i = \sum_{h \in i} \frac{\beta_i^h x_i^h}{x_i} = \frac{1}{n_i} \sum_{h \in i} \beta_i^h \tag{5}$$

Expression (5) states that the DC_i of a granular block i of 1 kWh collapses into the average marginal social utility of income of those households that are active consumers of that unitary block. This occurs because in any given unitary block of 1 kWh, there will be an aggregate consumption of n_i kWh, with each of the n_i active households consuming 1 kWh. The share of each household in consumption, x_i^h / x_i, will be $1/n_i$, and thus DC_i becomes expression (5).

A simple testing of the monotonicity of DCi across unitary blocks can be performed by differencing (5) in the consumption domain, that is checking the sign of the change in the average (across active households) social marginal utility of income. For strict monotonicity required for IBP across the unitary blocks this sign must be always negative. Weak monotonicity may indicated intervals were conditions for IBP are locally valid and guide for the design of blocks. This section perform and represent this testing by Figure 2, which shows that the results of Table 1 concerning the evolution of DC across blocks is confirmed with granular data of consumption for all households.

Figure 2: Distributional caracteristics of unitary (1 kWh) blocks in electricity. Normalized (relative) to DC of initial block equal to 1. AMBA. June 2024.

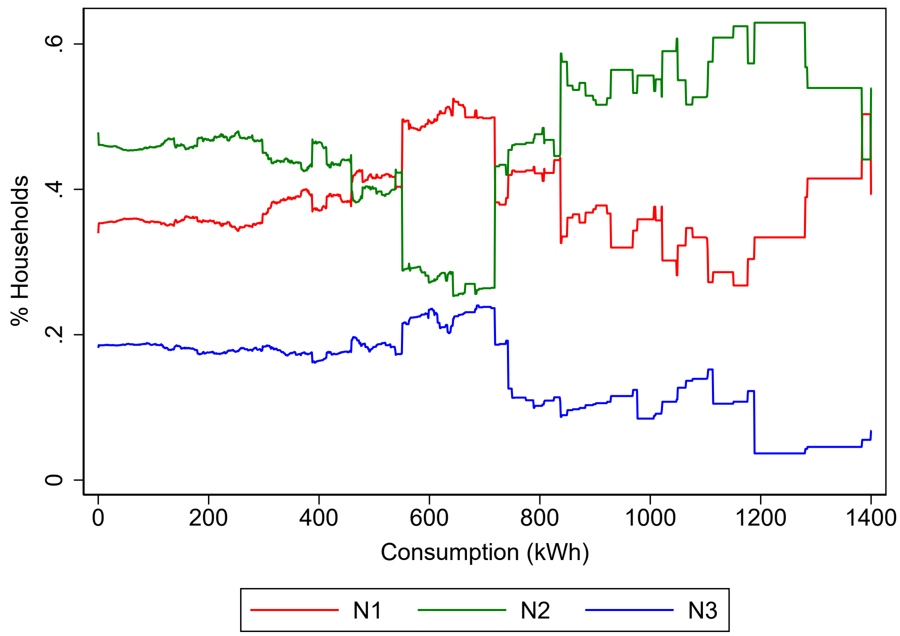


Source: ENGHo.

The DC are weakly increasing across unitary blocks for the whole sample of households. It is increasing for the interval up to 500 kWh per month, where 90% of households are located (Figure 2)[16], and then it increases with jumps for higher consumption levels. Thus, for this latter group, it must be the case that low-income households are still present in the higher consumption blocks. To address this point, Figure 3 shows the share of each group j (N_1, N_2, and N_3) in the total number of households in each unitary block. The data reveals that N_2 households are a majority in higher blocks, making DC higher and reversing the necessary conditions for IBP. This holds for the entire sample as well as for the group itself, as shown in Table 1.

[16]The median household is located in a unitary block of 203 kwh, with the 75 and 95 percentiles located in 379 kwh and 619 kwh respectively. This distribution by itself reveals an excessive use of blocks for higher consumption levels.

Figure 3: Shares of household segmentation groups in unitary blocks in electricity. Percentage of households by group.



Source: ENGHo.

5 Implications for direction of reform

Some consensus among experts and policymakers, backed by multilateral institutions, has emerged in Argentina on the need to control fiscal subsidies for energy. However, there is less agreement on the normalization of wholesale market pricing mechanisms and on the design of rate structures for households. These two aspects are worrisome because the recent administration inherited years of price controls, the dismantling of efficient wholesale market pricing (particularly in electricity), and the consolidation of excessive price discrimination and distortions across quantities, household groups, and regions. These remain pending reforms within the necessary reduction of energy subsidies, while priorities on inflation control have recently slowed the pace of change, presumably in a transitory manner. Despite some reduction in the number of blocks (from 9 to 6) in electricity, the policy outlook concerning rate design appears to have accepted the use of IBP, with a new shift—nonexistent in the regulatory practice of the country before 2017 for electricity and 2022 for natural gas—towards strongly differentiated fixed charges (as shown in Tables 1 to 3).

In this context, the results of this paper are useful as they demonstrate why the current status quo of rate design and IBP is neither efficient nor equitable and, at the same time, suggest a direction of reform that operates across groups j and across blocks i. Reform across groups j is, first and foremost, a reform of N3 pricing, given that the parameters in Tables 1 to 3 show that both fixed charges and block prices are unduly close to those faced by the low-income group N2. This reform can be accommodated within a transition to lower energy subsidies. On the other hand, reform across blocks i means a movement from IBP towards a two-part tariff (2PT), as IBP for both fixed charges in electricity and natural gas, and for marginal prices in the case of electricity, are not justifiable on distributional grounds and distort signals associated with efficient pricing. Natural gas is closer to the 2PT format than electricity, and, at the same time, the differences in prices p_{ij} across groups—with respect to non-subsidized households—are smaller than in the case of electricity (less than 30% for all blocks in the case of gas, compared to between 50% and 60% in the case of electricity for lower blocks). However, the differentiation of fixed charges between CABA and PBA for natural gas needs to be examined. Given the transition to a 2PT, the tariff schedules shown in Figure 1 would be replaced by a pair still differentiated across groups (A_j, p_j) or even by a unique pair (A, p) for all households. In any case, there will be impacts on all households as the current pair (A_{ij}, p_{ij}) is replaced by these new values. This will produce a redistribution that may need to be attenuated by lump-sum transfers, as suggested in the literature (see, for example, Burger et al. (2020); Navajas (2023)). These transfers are similar to fixed charges in that they are lump-sum, but they are a different instrument insofar as they are a fiscal instrument and are therefore beyond the aim and scope or mandate of regulatory bodies. The implementation of this compensatory transfer scheme is not trivial and depends on transaction costs and the organization and decentralization of the sector, which in Argentina is different in electricity and natural gas. It is believed that the type of adjustments that require these lump-sum transfers are more related to pricing adjustments across groups (which relate to wholesale values of electricity and natural gas) than across blocks (where differences are related to IBP).

While this direction of reform across groups and blocks, supported by lump-sum instruments, seems robust according to the modeling approach, the evaluation strategy may differ depending on the objectives of the analysis. In a study by FIEL (Navajas *et al.*, 2023), for example, a reform from IBP towards 2PT was assumed to be appropriate (instead of being derived from an explicit modeling exercise like the one in Section 2), and the size of compensatory lump-sum transfers for groups N2 and N3 was calibrated based on a target budget for controlling or limiting subsidies, given the overriding objective of fiscal consolidation for the incoming administration. As a consequence, the distributional impact of such reform was rather endogenous to the chosen compensation, and the strategy in the FIEL study was to proceed to show red/yellow/green lights of impacts of different transition paths following an energy poverty criterion.

A different approach, which is more related to welfare stabilization, would require a criterion for welfare impact tolerance for households in the N2 and N3 groups. As the rebalancing from (A_{ij}, p_{ij}) towards (A_j, p_j) or (A, p) creates an impact on households, lump-sum transfers may be chosen to significantly reduce the burden for N2 group households and adopt milder transfers for N3 group households. This exercise can be framed in terms of welfare impacts across all households and also take into account the fact that heterogeneity within groups (given imperfect administrative selection of households into groups) may render a uniform transfer for all households in all groups somewhat problematic in welfare impact terms. The view here is that the more uniform pricing is across households, the more differentiation mechanisms may be required across groups and across regions to manage appropriate compensatory transfers.

6 Conclusions and extensions

In this paper, increasing block pricing (IBP) is addressed in conjunction with household group segmentation, identifying the necessary conditions that might justify the use of progressive block prices and fixed charges based on distributive grounds. Two relatively novel components of the model in Section 2 are group segmentation, where pricing can vary across predetermined segmented household groups, and the extension of IBP to fixed charges. In all cases, IBP and group segmentation pricing are related to the distributional characteristics of blocks and groups. The model is used to evaluate the recent combination of IBP and group segmentation in residential electricity and natural gas in Argentina, using current rate schedules for the Metropolitan Area of Buenos Aires and microdata from the latest Household Expenditure Survey.

The findings indicate that the conditions derived from the model, which require monotonically decreasing distributional characteristics across blocks and groups, are not validated by the estimates across blocks for a given household group. Additionally, inconsistencies are identified across groups, as the rate structure (fixed charges for both electricity and natural gas and block prices for electricity) of the middle-income group (N3) is unduly close to that of the low-income group (N2). There is some justification for the differentiation of natural gas (distribution) prices between Buenos Aires City and Greater Buenos Aires for a given group, due to household income differentials between CABA and GBA. However, as this feature is also applicable to electricity, a lack of coordination in household energy pricing is noted, leading to distorted relative prices between electricity and natural gas.

The modeling suggests a direction of reform towards a smaller dispersion of rates across groups to reduce subsidies, and a transition from IBP to a Two-Part Tariff (2PT) with lump-sum redistribution across groups, introducing a new instrument to rate design in addition to fixed charges and volumetric pricing. In other words, the direction of reform suggested by the analysis points to a convergence of energy prices, reducing the differences across groups (j) and rebalancing IBP towards a 2PT for distribution charges, with lump-sum transfers to currently subsidized low- and middle-income households to cushion impacts while simultaneously reducing fiscal subsidies.

The analysis also provides motivation for extensions in three directions. First, the coordination problems detected between tariff formats and spatial differences in electricity and natural gas suggest a broader issue of energy pricing coordination for the energy transition. This could involve regulatory coordination or even merging regulatory bodies in Argentina, necessitating a re-specification of the model in Section 2 to account for demand substitutability between electricity and gas. These issues of pricing coordination and substitutability lead to a second extension that may include voluntary household participation in consumption, namely grid defection. This is already occurring in practice, particularly in CABA, where households are shifting from natural gas to electricity, which may explain why distributors and regulators are moving rapidly towards fixed-charge-only pricing. A second form of grid defection is the move away from the electricity network due to distributed resource generation, which depends on metering development and prosumer pricing.

Finally, the third extension involves the trade-off believed to arise when moving from IBP to subsidy-free prices, which necessitates better-tailored lump-sum compensations (reducing i requires increasing j). The practical complexity of this issue, especially in a country with heterogeneous household sizes and characteristics and varying climate conditions, lies in the fact that households differ in their energy consumption structures and have diverse consumption baskets. Determining these baskets is crucial to accommodate group differentials and establish basic baskets for subsidization, thereby tailoring transfers and limiting the social tariff program budget (Navajas, 2008). However, the complexity of this issue is that it depends on a large database. Authorities in Argentina have begun to move in this direction, but this first requires simplifying pricing by moving away from IBP and subsidized energy prices. Otherwise, it risks unnecessarily increasing the scope of price distortions.

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A Appendix

Table A1: Eligibility Criteria by Household Group

Group (j)	Eligibility Criteria
1	Households that declare meeting one or more of the following conditions, considering all cohabitants: 1) Total monthly household income equivalent to or greater than 3.5 basic baskets for a type 2 household according to INDEC. 2) Owning 3 or more vehicles less than 5 years old. 3) Owning 3 or more properties. 4) Owning a luxury boat, aircraft, or being the holder of corporate assets that demonstrate full economic capacity.
2	Households that, considering all members of the household together, meet one or more of the following conditions: 1) Net income less than 1 basic basket for a type 2 household according to INDEC. Exception: For households with a cohabitant holding a Unique Disability Certificate (CUD), total monthly income for this segment must be less than 1.5 basic baskets for a type 2 household according to INDEC. 2) Owning up to 1 property. 3) Not owning a vehicle less than 3 years old. Exception: households with a cohabitant holding a Unique Disability Certificate (CUD) may own up to 1 vehicle less than 3 years old to be part of the lower income segment.
3	Households that are not within the higher income segment and meet one or more of the following conditions: 1) Total monthly household income between 1 and 3.5 basic baskets for a type 2 household according to INDEC. Exception: for households with a cohabitant holding a Unique Disability Certificate (CUD), total monthly income for this segment may vary between 1.5 and 3.5 basic baskets for a type 2 household according to INDEC. 2) Owning up to 2 properties. 3) Owning up to 1 vehicle less than 3 years old. Exception: households with a cohabitant holding a Unique Disability Certificate (CUD) may own up to 1 vehicle less than 3 years old to be part of the middle income segment.

Source: Federal Government Decree 322/2022.

Table A2: Electricity tariff schedule. AMBA Argentina. June 2024. Argentine pesos.

Block i	N1 (j = 1)	N2 (j = 2)	N3 (j = 3)	N1 (j = 1)	N2 (j = 2)	N3 (j = 3)
	Fixed charge			Block price		
1	791.27	791.27	791.27	83.64	31.59	43.16
2	1687.65	1687.65	1687.65	83.94	32.21	45.97
3	5818.97	5818.97	5818.97	89.54	48.73	66.87
4	9309.04	9309.04	9309.04	91.37	58.01	72.83
5	24526.03	24526.03	24526.03	95.40	67.22	79.74
6	28923.74	28923.74	28923.74	97.55	79.30	87.41

Source: National Electricity Regulatory Body (ENRE).

Table A3: Gas tariff schedule. CABA Argentina. June 2024. Argentine pesos.

Block i	N1 (j = 1)	N2 (j = 2)	N3 (j = 3)	N1 (j = 1)	N2 (j = 2)	N3 (j = 3)
	Fixed charge			Block price		
1	2212.22	2212.22	2212.22	176.45	128.50	135.24
2	6558.67	6558.67	6558.67	176.45	128.50	135.24
3	7955.95	7955.95	7955.95	176.45	128.50	135.24
4	10057.72	10057.72	10057.72	176.45	128.50	135.24
5	12390.85	12390.85	12390.85	176.45	128.50	135.24
6	16253.92	16253.92	16253.92	176.45	128.50	135.24
7	22198.39	22198.39	22198.39	176.45	128.50	135.24
8	52852.51	52852.51	52852.51	176.45	128.50	135.24

Source: National Gas Regulatory Body (ENARGAS).

Table A4: Gas tariff schedule. GBA Argentina. June 2024. Argentine pesos.

Block i	**N1 (j = 1)**	**N2 (j = 2)**	**N3 (j = 3)**	**N1 (j = 1)**	**N2 (j = 2)**	**N3 (j = 3)**
		Fixed charge			**Block price**	
1	2554.77	2554.77	2554.77	176.45	128.50	135.24
2	5934.42	5934.42	5934.42	176.45	128.50	135.24
3	7277.72	7277.72	7277.72	176.45	128.50	135.24
4	9016.14	9016.14	9016.14	176.45	128.50	135.24
5	11674.88	11674.88	11674.88	176.45	128.50	135.24
6	13863.16	13863.16	13863.16	176.45	128.50	135.24
7	17157.61	17157.61	17157.61	176.45	128.50	135.24
8	28722.14	28722.14	28722.14	176.45	128.50	135.24

Source: National Gas Regulatory Body (ENARGAS).