ASOCIACION ARGENTINA
DE ECONOMIA POLITICA

ANALES | ASOCIACION ARGENTINA DE ECONOMIA POLITICA

XLIV Reunión Anual

Noviembre de 2009

ISSN 1852-0022
ISBN 978-987-99570-7-3

ENERGY POPULISM AND HOUSEHOLD WELFARE.

Cont, Walter
Hancevic, Pedro
Navajas, Fernando

Energy populism and household welfare

Walter Cont [a,b,c] *Pedro Hancevic* [e] *Fernando Navajas* [a,b,c]

a: FIEL ; b: UNLP ; c: UBA ; e: Univ. of Wisconsin

August, 2009

Abstract

We study a cycle of energy prices and estimate its welfare impact on households. A simple framework explains its emergence in terms of the preference of a median household (voter) for receiving transfer gains followed by a future flow of transfer losses. We evaluate actual transfers and welfare effects that a departure of prices of natural gas and electricity generation from opportunity costs since 2003 had on households in the Buenos Aires Metropolitan Region (AMBA) and explore the impact of a way back to opportunity cost pricing.

JEL classifications: D78, H22, Q48

Keywords: energy prices, distortions, subsidies, welfare effects.

1. Introduction

Energy subsidies may be, without apology, transitory or permanent components of actual policy in many countries, both developing and developed. In some cases the decision to subsidize energy may come from an objective to cushion economies from external shocks.[1] In others it may be a byproduct of macroeconomic crises that require some muddling through of domestic prices for a while, such as the case of Argentina in 2002 or in many previous episodes (see Navajas, (2006b)). Yet in other cases, energy price interventions may be part of a non-transitory policy that exploits price departures from opportunity costs in order to make transfers to consumers (voters) at the expense of firms. Shortermism, political opportunism to extract economic quasi-rents and so to set unsustainable transfers through low prices are ingredients of what we label energy populism. The economic view of this policy is usually skeptical, to say the very least. The economy is only transferring to the future the bill of adjustments and the consequences may not just be returning to higher break-even prices but rather jump at higher opportunity cost if production efficiency and policy credibility are damaged. Second, transfers through (usually uniform) energy prices will have a poor distributional incidence as will imply large transfers to the non-poor. This second fact has made populist policies rather puzzling, in terms of the dissonance between discourse and consequences.

Argentina post 2003 seems to perfectly fit in the last case. Within a policy of repressed energy prices in general, even with clear signs of cumulative imbalances in its main energy product –natural gas- and soaring international energy prices,[2] wholesale markets of natural gas and electricity generation (heavily dependant on natural gas) were severely intervened, implying prices that depart from long run sustainable opportunity costs (LRSOC).[3] In particular, the sector could perhaps have sustained production plans with a wellhead price below the import parity (which relevant value is the import price from Bolivia) before the consolidation of the interventionist policies. However, after several years of intervention, sustainable wellhead prices would have to mirror Bolivian import prices. Although the origins and values in this example can be subject to discussion, the important fact for the sake of our argument is their qualitative evolution, i.e., ex-post-intervention LROC is higher than ex-ante-intervention costs.[4] As a consequence, the legacy of energy populism is not only that policies need to be reverted some time in the future but also that economic agents will face a future efficiency loss due to higher ex-post prices, at least, for a number of years until domestic market conditions return to normal.

A great deal of debate in Argentina has looked at energy subsidies in terms of their fiscal short run consequences. But in this paper we look at the role of subsidies from a long run economic viewpoint. The difference is important since fiscal transfers are actual disbursements made by the government to energy producers to account for the difference between costs (or producer prices) and end-user prices. However, this gap will not represent the true resource-cots gap to the economy. Economic subsidies are

---

[1] See for example, Bacon and Kojima (2006), Artana, Catena and Navajas (2007) and Navajas and Artana (2008).

[2] (see Cont and Navajas (2004) and Navajas (2006a).

[3] In the argentine case, we submit that this policy took shape since at least 2003. We give room for year-2002 policies to attend a transitory phenomenon of coping with a severe macroeconomic crisis. The legal tenants to certify (and give a permanent status to) this policy are Presidential Decrees 180 and 181 issued in February 2004 and Resolution 240 issued by the Secretary of Energy in September 2003, for natural gas and electricity generation, respectively.

[4] The case of electricity generation is much similar with the additional fact that the intervention has a "compound" effect on LRSOC. The effect on the price of natural gas on the one hand and increase in capital costs (due to inefficiencies and higher interest rates after interventionism).

the difference between end-user prices and opportunity costs represented by border prices or long run incremental costs in the case of tradable and nontradable goods, respectively.

In this paper we asses the consequences of a U turn in energy prices that fits into a populist policy cycle. Our main concern, developed in section 3 and implemented in section 4 is to adopt a basic analytical framework to provide a measurement of the transfers and welfare consequences for households in the Buenos Aires Metropolitan Region (AMBA) of the fall and rise of natural gas and electricity prices. Before this empirical enquiry, in section 2 we made more precise the setting of the energy populism and explore some requirements for this to arise as equilibrium. Section 5 concludes the paper and comments on further issues that deserve future research.

2. Energy populism

Consider an economy that lasts for two periods t_1 and t_2 (in an infinitely-lived-agents-economy, t_1 may cover a number of "present" years, while may cover the remaining "future" years). Each household h (h=1,…,H) has an indirect utility function that is strongly separable in energy goods (e, with en user prices or tariffs $\mathbf{q_e^h}$), non-energy goods (ne, with prices $\mathbf{q_{ne}}$) and monetary income (m^h, which includes all forms of income including government transfers): $V^h = V^h(\mathbf{q_e^h}, \mathbf{q_{ne}}, m^h) = V_e^h(\mathbf{q_e^h}) + V_{ne}^h(\mathbf{q_{ne}}, m^h)$.

Strong separation allows us to neglect the indirect impact of energy prices through the level (and structure) of the rest of prices in the economy. End-user energy tariffs are formed from commodity-energy prices (P_e^h), transmission and distribution margins and taxes. We deal with commodity energy prices (referring to them as energy prices) that may or may not change across households (see section 3 and the Appendix).

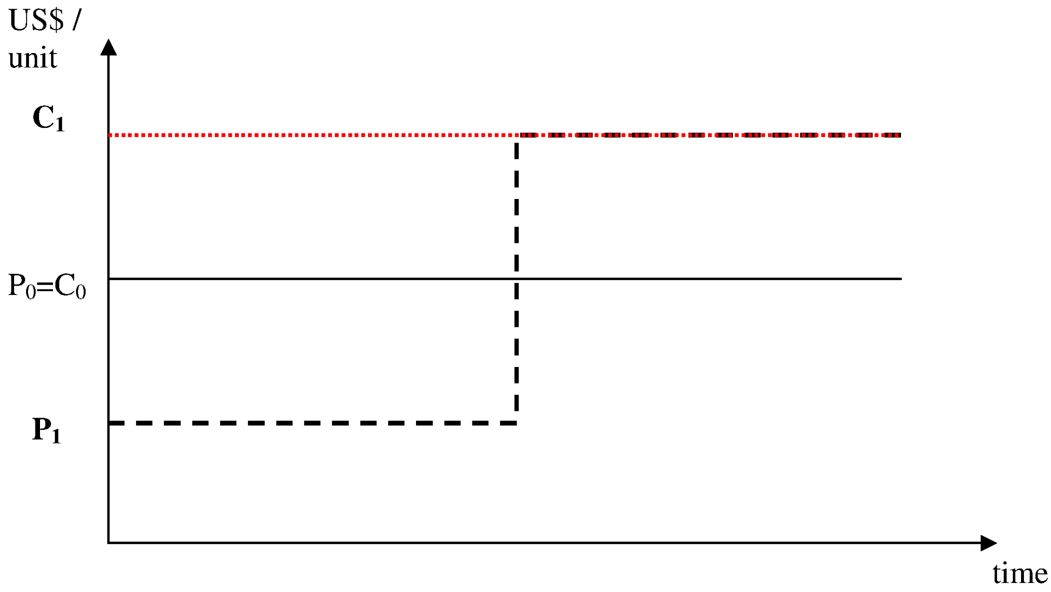
We study a sequence of energy prices (e.g., natural gas as an illustration) that departs from long run sustainable opportunity costs (LROC). The departure comes from the implementation of an unsustainable policy that we label "energy populism" and make more precise below. The basic idea of what we are addressing can be shown with the help of Definition 1.

Definition 1: Throughout the paper we define an "intervention policy" in domestic the energy markets as a reduction in current prices below LROC and a later increase to cover a (higher, due to intervention) future LROC.

At the starting point (before the beginning of t_1) the price of natural gas –P_0, measured in dollars per MMBTU– equals the LROC –C_0–, and is the energy component in residential tariffs (uniform across users). At the beginning of t_1 a policy is implemented so that the price is set at $P_1 < P_0$ (with P_1 presumably above short run marginal cost)[5], exploiting an opportunistic situation to engineer transfers to society. However, this opportunistic policy affects LROC, which increases to C_1 (for example, because it affects the incentives for producers to invest in new production wells, not modeled here), and can be sustained for at most one period, and then reverts to cover LROC at time t_2. So, prices P_2 in t_2 must reflect LROC (i.e., $P_2=C_1$).

Figure 1: Example of evolution of opportunity cost and prices

[5] We do not consider fiscal transfers set to sustain production at prices below short run marginal costs. Empirical evidence in Argentina shows this to be the case for electricity generation since 2004 and also more recently for natural gas.



This policy has income transfers and welfare effects that will impact upon society depending on the actual mechanisms. In economic terms, households face a sequence of prices $\{P_0, P_0\}$ or $\{P_1, P_2\}$. However, during period t_1 society receives transfers that are parametric to the difference between C_1 and P_1, i.e., the monetary transfer after damage is done. We will measure the subsidy amount received by households during period t_1 in this way in the next section, which is the central empirical contribution of this paper. Before this measurement, in this section we explore some strategic decision structure related to the emergence of the subsidy policy (stated in Definition 1) as equilibrium.

Before proceeding further we take an explicit definition of energy populism to avoid the criticism that we are using loose wording to describe a real world phenomenon.

Definition 2: Energy populism is a policy-discourse-action that, while claiming to support "the people" versus "the elites", seeks the support of the median voter to implement unsustainable transfers through lower energy prices, heavily interfering with efficient energy price formation in a non-transitory manner.

An almost canonical vision to analytically deal with problems like the one described above has been to resort to either political opportunism and/or to myopic behavior (i.e. high or hyperbolic discounting). In this vein, decision makers or society prefer (in net present value) transfer gains in period t_1 and value of losses in t_2 than a sequence of equilibrium prices. While we cannot disagree with this view, we prefer to re-phrase the argument looking at more structural-like elements behind the implementation of energy populism as equilibrium.

Intervention affects households' utility positively[6] in t_1 given by $\Delta_1 V_e^h = V_e^h(\mathbf{q_e}^h(P_0))$-$V_e^h(\mathbf{q_e}^h(P_1)) > 0$ in t_1. As for (negative) transfers in t_2 we further assume that households may anticipate that the price increase will be shifted to "outsiders" (the "elites" in Definition 2 terminology), represented by large user tariffs (such as industrial customers), intra-marginal producers that will face ricardian rents under P_2, or the government (through taxes or implementing cross subsidization). Let θ^h be the

[6] Recall that end user prices or tariff that enter into the indirect utility depend on energy prices, so the notation q(P).

perceived fraction of cost increase perceived by household h for period 2. Then the differential utility in t_2 after transfers becomes $\Delta_2 V_e^h(\theta^h) = V_e^h(\mathbf{q_e^h}(\theta^h . P_2)) - V_e^h(\mathbf{q_e^h}(P_0))$.

We further posit that $\theta^h \in [P_0/P_2, 1]$ and assume that is an increasing function of household income as high income households will perceive being part of the "outsiders" (as dividend claimers or as tax payers) and that they will have a higher share in paying the bill later on.[7]

A household h prefers the intervention scenario at t_1 if

$$\Delta_1 V_e^h + \delta\, \Delta_2 V_e^h \geq 0 \qquad (1)$$

Given this condition for every h, we define a "critical discount factor" $\delta^{h*} = -\Delta_1 V_e^h / \Delta_2 V_e^h$, if an interior solution for δ (between 0 and 1) exists, or else $\delta^{h*}=1$. It is clear that δ^{h*} is a decreasing function of θ^h (and by assumption a decreasing function of income). We can obtain the following result

Proposition 1: A necessary and sufficient condition for energy populism to arise as equilibrium is that the median household expects to receive higher gains in t_1 than losses in t_2, i.e., $\delta \leq \delta^{m*}(\theta^m)$

Proof: From the condition that $\delta^{m*} > \delta$ is an equilibrium.

This proposition states that if the median household perceives a net benefit of the intervention policy on her utility, the policymaker will have room to implement the interventionist policy.

Thus, beyond discounting, a structural ingredient of energy populism is that half plus one of agents perceive net benefits from the interventionist policy. For this to occur one could imagine a set of transfers heavily focalized to a (incorrectly stated by the government) supporting group that later on are going to be financed by an adjustment that also relies on other (non supporting) agents. In other words, focalization of subsidies to "supporters" cum rebalancing against "other" agents could in principle implement an interventionist policy. However, focalization requires well functioning and efficient institutions on social policy, a fact that cannot be taken for granted (at least in the case of Argentina) in some interventionist environments.

Proposition 1 only provides a requirement for energy populism to arise as equilibrium. A somewhat puzzling fact of energy populism has always been the dissonance between discourse and consequences. This is so, in the first place, because results in the next section indicate that transfers before t_1 suffer from focalization in general, and to the poor or low-income in particular. Secondly, while the evidence suggests that the "exit" from the repressed energy price regime has been based on some differential adjustment across agents, the change observed is far from a well focalized scheme.

3. Household welfare

While the previous discussion motivated the analysis of the trade off faced between present value "gains" and "losses" of the implementation of energy populism as an

[7] This may make θ^h higher than 1 for some households if future policy is based on heavy cross-subsidization.

equilibrium policy, in this section we try to measure and evaluate actual income transfers and welfare effects to households.

In empirical terms, we seek to measure the consequences of a "U" sequence of prices of natural gas and electricity faced by argentine households. Prices of both energy goods decoupled from long run sustainable opportunity costs (LRSOC)[8] since 2003 and are now starting to converge, slowly and for some households. For LRSOC values we take reference prices assuming that in 2003 energy populism has been "consecrated" and that Argentina is since then facing higher opportunity costs of natural gas and electricity. In the case of natural gas, the cost of imports from Bolivia, while for electricity we construct a spot price that is formed from the natural gas price given before.

For this purpose we follow a simple methodology to evaluate aggregate welfare from final outcomes on individual utility assuming some aggregation (social welfare) function. Recall from Section 2 that each household h has an indirect utility function $V^h = V^h(\mathbf{q_e}^{\mathbf{h}}, \mathbf{q_{ne}}\ m^h)$, strongly separable between energy and non-energy goods. Social welfare is represented by an aggregation of individual utilities, that is, $W = W(V^1, \ldots, V^H)$. As explained before, end-user prices depend on energy-commodity prices p_e^h that are the object of change and analysis.

For the empirical implementation we make auxiliary assumptions on the shape of the social welfare and individual utility functions. A simple parametrization (see for example Newbery (1995) and Navajas and Porto (1990))[9] assumes that the social welfare function is additive in utility levels U, that is $W = \sum U^h/H$ and that individual agents have iso-elastic utilities on consumption or real expenditure of the type $U^h \equiv (g^h)^{1-v}/(1-v)$ for $0<v$ and $v\neq1$, or $U^h \equiv \log g^h$ for $v=1$, where g^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 h can be computed by the expression $\beta^h=(g^h)^{-v}$, that is, the inverse of expenditures per equivalent adult raised to the coefficient v. For measurement purposes, the importance of assuming this specification, is the following result (see Newbery, (1995)),

Proposition 2: Under an additive-cum-isoelastic utility specification, i.e.,

$$W= \sum [(g^h)^{1-v}/(1-v)]/H$$

social welfare can be approximated by the (socially) weighted sum of expenditures per equivalent adult, i.e.,

$$\Delta W/W = \sum\beta^h.\Delta g^h/.\sum\beta^h.\ g \qquad (2)$$

Proof: Using the definition of $\beta^h=(g^h)^{-v}$ we obtain $W=(1/H.(1-v))\sum\beta^h\ g^h$. Thus, the percentage variation in welfare is given by $\Delta W/W = \sum\beta^h.\Delta g^h/.\sum\beta^h.\ g^h$.

Suppose now that a policy gives rise to a change in the vector price of energy price $\mathbf{q_e}^{\mathbf{h}}$ that in turn has welfare marginal impact given by the partial derivative

$$\partial W/\partial q_e^h=\sum_h(\partial W/\partial V^h).(\partial V^h/\partial q_e^h) = -\sum_h \beta^h.x_e^h \qquad (3)$$

[8] The term sustainable refers to the fact that there is an expansion of supply (natural gas and electricity generation capacity) to sustain. This applies in particular to natural gas where reserves to production have been falling and require a dynamic response. In other words, LRSOC are signals that will assure a sustainable supply of energy.

[9] An alternative specification that assumes a weighted welfare function of indirect utility functions comes to the same results without need to specify the form of utility functions. The adopted specification facilitates the computing of percentage welfare changes from household expenditures.

where $\beta = (\partial W/\partial V_h).(\partial V_h/\partial m^h)$ is the marginal social utility of h-household income; x_e^h is the quantity of electricity or natural gas consumed by household h and Roy's identity has been used. Welfare impacts of discrete changes in energy prices can be approximated by[10]

$$\Delta W = -\sum_h \beta^h.x_e^h.(p_1^h-p_0^h) \quad (4)$$

Thus we approximate the total transfer received by household h by $x_e^h.(p_1^h-p_0^h)$, the percentage of the transfer in terms of total income as $x_e^h.(p_1^h-p_0^h)/g^h$, the total welfare by (4) and the percentage welfare change, using Proposition 5, as

$$\Delta W/W = -\sum_h \beta^h.x_e^h.(p_1^h-p_0^h) \ / \ \sum_h \beta^h.g^h \quad (5)$$

This expression can be computed for alternative values of income inequality aversion (v) giving rise to different results.

4. Measurement

We use different data from several sources and make assumptions and estimates. The basic ingredients relate to prices and quantities.

Prices

Concerning energy prices actually paid by households we use prices of the commodity (energy) component (i.e. not to be mistaken with end-user tariffs that include transmission and distribution costs as well as ad-valorem taxes) for natural gas and electricity. Natural gas prices were taken from ENARGAS data for the companies (Metrogas and Gas Ban) that serve in the AMBA region.[11] Electricity prices are seasonal monomic prices for residential demand and for companies serving the area (EDENOR and EDESUR)[12].

As for long run sustainable opportunity costs, i.e. prices that can sustain an expansion of supply so as to meet demand, we make different but related assumptions for natural gas and electricity. In the case of natural gas we take border prices with Bolivia as reference wellhead prices that would sustain an expanding natural gas supply. These values were checked from different sources such as unitary import prices implicit in the Secretary of Energy data set (which has some problems concerning these values) and reference values from public and private Bolivian sources. In the case of electricity we

[10] In expression (4) x_e^h can be approximated, from a Taylor series expansion, by $x_e^h(p_0).[1+\eta_{x,p}.(p_1^h-p_0^h)/p_0^h]$, where $\eta_{x,p}$ is the direct price-elasticity of demand (for electricity or natural gas). In the empirical evaluation below we do not exploit this loop given that the magnitude of the jumps in prices are very large and would imply large quantity corrections even with very low elasticity values (as those reported for natural gas and electricity in various papers).

[11] We take the cost of gas embedded in the final tariff as presented by ENARGAS in its resolutions for Metrogas and Gas Ban. This component has been differentiated since 2008 as residential tariff categories were opened in various blocks. Further we include in the cost of gas the charge created by Decree 2067/09 and applied to different tariff blocks through resolution 566/09 of ENARGAS. We consider that this charge should be taken as part of the price of gas, since it was created to finance the imports of natural gas. The formal (legal) way it was introduced has led many critics to refer to it as a tax, but in our view this is not a correct economic interpretation.

[12] The source here is the wholesale electricity market operator CAMMESA. Until Resolution 1169/08 of Secretary of Energy (that began to unfreeze electricity generation prices for households with adjustments unevenly distributed across households according the quantities consumed) electricity generation prices were uniform for all households. After that Resolution (and Resolution 356/2008 of ENRE) there has been big differences in generation prices paid by households (leading to a nine-part tariff) to accommodate the increasing use of liquids in generation. We estimate prices for each tariff block from CAMMESA data (sanctioned prices and the declaration of transactions of distribution companies).

assume a generation cost of a combined-cycle plant that has variable costs related to the cost of natural gas from Bolivia and high fixed costs related with a high discount rate.[13]

Tables A.1 and A.2 in the Appendix show the series of estimated opportunity costs, actual prices and estimated subsidies of natural gas (cost of gas) and electricity generation paid by households in the AMBA region from 2003 to 2009. The implicit subsidy in natural gas has started in 1.3 dollar per MMBTU in 2003 to a range from 3 to almost 6 dollars (according to the tariff block) per MMBTU in 2009. In 2003, the price actually embedded in natural gas tariffs was about 27% of the assumed opportunity cost, while in 2009 this figured had moved down to less than 10% for households that faced no increases (about 60% of households and representing 29% of total consumption) and to about 50% for the households with the largest increases. In the case of electricity, the implicit subsidy has moved from 20% of opportunity costs in 2003 to a mere 10% in 2009 for household with frozen tariffs (71% of total households) and to 54% for households with the largest increases.

Quantities

Aggregate annual quantities (2003-2008) of natural gas consumed by households in the AMBA are taken from ENARGAS, and refer to cubic meters sold to residential customers in the Metrogas and Gas Ban areas. Aggregate annual quantities (2003-08) of electricity consumed by households in the AMBA are taken from the Secretary of Energy. Quantities consumed for 2009-2012 were estimated according to the expected evolution of residential customers. Adjustment in quantities in response to increases in prices after 2008 were not estimated with a price-elasticity of demand but rather assumed as a sensitivity analysis for different cases (see below).

Quantities used for the evaluation of incidence and welfare impact of household transfers were taken from the National Household Expenditure Survey 2004-05 for the AMBA. Following a method used in Navajas (2008, 2009) we were able to "retrieve" the quantities of natural gas and electricity consumed by each household in the survey. We are therefore able to implement the formulas of the previous section from observed quantities. We also use the distribution of consumptions across households (4825 for natural gas and 6200 for electricity) along with household data on income and total expenditure that allow us to compute the social marginal income utility of each household so as to implement welfare weights $\beta^h=(g^h)^{-v}$ of the previous section.

Household transfers

Subsidies received by households during 2003-2009 are measured by $x_e^h.(p_1^h-p_0^h)$ in the expressions of the previous section, where x_e^h is the quantity of natural gas or electricity consumed by household h and $(p_1^h-p_0^h)$ is the unit subsidy (the difference between actual prices and opportunity costs) estimated in Tables A.1 and A.2 commented before.

Tables 1 and 2 show the estimates of household transfers for natural gas and electricity. Numbers are expressed in millions of dollars per year, for each decile of income (arranged according per capita household income) and separated in the periods of full freeze (2003-2007), partial adjustment (2008-09) and an assumed return

[13] We assume generation costs of is 80 dollars per MWh with the price of natural gas at 4 dollars per MMBTU. We move 50% of this value in proportion of the fluctuation of the price of natural gas from Bolivia. Thus, we are assuming a fixed cost of 40 dollars per MWh (a very large figure explained by a large discount rate on investment).

to full cost pricing (2010-2012) under two assumptions of no demand correction (i.e. valuated at the same quantities) and a 20% demand correction. The difference between the subsidy periods (2003-2007 and 2008-2009) and the full adjustment period is that while the former are actual estimates for a given period the later is an estimation of an annual flow in the future.

Table 1

Natural Gas: Estimated Annual Transfers to Households in the AMBA				
Millions of US dollars				
			Without Demand Correction	20% Demand Correction
Decile	2003-07	2008-09	2010-12	2010-12
1	10.4	28.0	-22.9	-18.3
2	17.9	45.9	-36.2	-29.0
3	21.9	55.9	-43.8	-35.1
4	26.2	66.2	-51.4	-41.1
5	31.7	78.6	-60.3	-48.3
6	37.8	92.9	-70.9	-56.8
7	41.1	97.5	-72.4	-57.9
8	44.8	106.8	-79.8	-63.8
9	45.3	106.7	-79.7	-63.8
10	44.3	101.7	-76.0	-60.8
Total	321.4	780.2	-593.4	-474.8

Source: own elaboration based on ENGH 2004-05

Table 2

Electricity: Estimated Annual Transfers to Households in the AMBA				
Millions of US dollars				
			Without Demand Correction	20% Demand Correction
Decile	2003-07	2008-09	2010-12	2010-12
1	46.4	88.8	-81.3	-65.0
2	56.2	108.4	-99.8	-79.8
3	67.4	128.3	-116.6	-93.3
4	65.5	126.5	-116.1	-92.9
5	68.3	130.5	-118.4	-94.7
6	72.9	141.1	-129.2	-103.3
7	74.2	143.7	-131.2	-105.0
8	75.3	144.5	-130.9	-104.7
9	80.1	154.0	-139.0	-111.2
10	92.4	176.3	-156.8	-125.4
Total	698.7	1,342.0	-1,219.1	-975.3

Source: ow n elaboration based on ENGH 2004-05

Transfers to households in the AMBA amounted to 9.3 billion dollars between 2003 and 2009. About two thirds of this figure was due to under-pricing of electricity generation and a third to under-pricing of natural gas. Despite the correction in 2008 to some households, actual subsidies went up due to a significant rise in opportunity costs that are related to international energy prices. On average, every household in the AMBA received an equivalent annual subsidy of about 2,500 dollars. But the distribution of the subsidies, given uniform prices until mid-2008, was not pro-poor or pro-low income households but rather benefit relatively more the higher deciles of income distribution (see Table 3). This is unsurprising given the fact that subsidies were uniform and proportional to consumption until mid-2008. In the case of natural gas, the unfair distribution against low income households is compounded by the fact that many of them (about 25% of total households, but close to 50% in the three lower deciles) do not receive a subsidy at all given that they are not connected to the natural gas network and use LPG at opportunity costs values.[14] Hence, the 4 to 1 ratio in 2003-07 subsidies received by the 10th decile compared to the 1st decile can be explained by a 1.5 to 1 ratio in average consumption and a 3 to 1 ratio in access to the network.

Table 3

Distribution of natural gas and electricity subsidies accross households 2003-2009

Decile	Natural Gas	Electricity	Total
1	3.5%	6.6%	5.5%
2	5.8%	8.1%	7.3%
3	7.1%	9.6%	8.7%
4	8.4%	9.4%	9.1%
5	10.0%	9.7%	9.8%
6	11.9%	10.5%	11.0%
7	12.6%	10.7%	11.3%
8	13.8%	10.8%	11.8%
9	13.8%	11.5%	12.3%
10	13.3%	13.2%	13.2%

Source: Tables 1 and 2

A return to opportunity cost is a reversion of subsidies that will imply transfers in opposite directions to those observed in 2003-2009. Annual transfers will depend on demand correction but will surely be of a magnitude of about 1,500 millions of dollars per year (or about 0.5% of GDP, a large figure considering that we are measuring only households and in the AMBA, which means about 25% percent of total consumption of natural gas and electricity). Unlike the transfers in 2003-2009, they will imply a permanent flow with a correspondingly large amount in relation to the “floor” (or rather “underground”) in which prices were at the end of the subsidy era. For instance a discount rate of 5% means a flow about three times the amount of subsidies transferred to households in 2003-2009, a figure that is also affected by the uprising of energy costs throughout the world.

While it is clear that the energy-bill for the household sector in Argentina will rise substantially, the proper “excess cost” borne by households is the “premium” that Argentina had before embarking into energy populism, such as enjoying a competitive up-stream natural gas sector that could sustain supply with prices below border prices. For example, assuming that this gap is only 20% of the computed jump from current prices to opportunity cost values, and a discount rate of 5%, the present value of the excess cost borne by households in the AMBA can be estimated in about 6000 millions dollars or 2% of GDP.

[14] This result is unsurprising in view of previous papers that assess the distributive incidence of subsidies in Argentina (see for example Marchionni, Sosa Escudero and Alejo (2008)). In their terminology (see also Angel-Urdinola and Wodon, 2005, and Cont, Hancevic and Navajas, (2008)) the subsidy policy of natural gas and electricity is regressive when the ratio of the subsidies received by a target group (the poor or low income families) to the average subsidies is lower than one. In our estimates the “lower half” of households arranged by per capita income received a transfer of about 2,000 dollars for the period 2003-2009, while the average transfer was 2,500 dollars.

Welfare impacts

Tables 4 and 5 present the estimated percentage welfare changes (expression (5)) estimated for the different sub-periods and for different degrees of inequality aversion (v=0.5, 1 and 2), assuming a 10% correction (to average those shown in Tables 1 and 2) in demand after price changes towards opportunity costs in 2010-2012. The results show significant changes in welfare for households, but in particular for low income ones. As the impact of household transfers on utility (welfare) depends on the income or expenditure level of each household (along with the degree of inequality aversion), they are, as expected, decreasing in income. Thus the distribution of welfare gains has a higher impact on the poor, a fact that is only seemingly contradictory to the evidence that a large amount of subsidies go to the non-poor. The reason is that large subsidies to the well being are not as significant due to their high income levels, relatively to the poor.

One important element of the results shown in Tables 4 and 5 is that (by the very same reason that percentage welfare impacts to the poor are large) the variability of the impacts is correspondingly huge. As subsidies are replaced by tariff hikes, the richest 10% only sees a variability in welfare of a relatively small magnitude, while the poorest 10% suffers a large swing in utility and welfare.

Table 4

Natural Gas: Estimated Percentage Welfare Changes

	Aversion coeficient (*v = 0.5*)			**Aversion coeficient (*v = 1*)**			**Aversion coeficient (*v = 2*)**		
Decile	2003-07	2008-09	2010-12	2003-07	2008-09	2010-12	2003-07	2008-09	2010-12
1	27.5%	63.2%	-49.1%	20.8%	46.5%	-37.2%	7.7%	18.0%	-15.2%
2	16.5%	35.7%	-26.8%	6.3%	12.6%	-9.7%	0.2%	0.5%	-0.5%
3	12.5%	26.8%	-20.1%	7.0%	14.3%	-11.2%	0.3%	0.7%	-0.6%
4	11.3%	24.0%	-17.7%	9.1%	18.6%	-14.4%	5.8%	12.6%	-10.5%
5	9.2%	19.0%	-13.9%	6.9%	13.6%	-10.3%	2.6%	5.5%	-4.5%
6	7.5%	15.2%	-11.0%	4.2%	7.9%	-5.9%	0.2%	0.5%	-0.4%
7	6.7%	13.3%	-9.5%	4.8%	8.9%	-6.8%	0.8%	1.6%	-1.4%
8	4.9%	9.6%	-6.9%	3.5%	6.5%	-4.9%	0.9%	1.7%	-1.4%
9	3.4%	6.6%	-4.7%	2.2%	3.9%	-3.0%	0.1%	0.3%	-0.2%
10	1.6%	3.0%	-2.2%	0.9%	1.6%	-1.2%	0.0%	0.1%	-0.1%
Total	5.0%	10.1%	-7.5%	3.4%	6.4%	-5.0%	0.2%	0.5%	-0.4%

Note: Asumes 10% uniform consumption correction

Table 5

Electricity: Estimated Percentage Welfare Changes

	Aversion coeficient (*v = 0.5*)			**Aversion coeficient (*v = 1*)**			**Aversion coeficient (*v = 2*)**		
Decile	2003-07	2008-09	2010-12	2003-07	2008-09	2010-12	2003-07	2008-09	2010-12
1	49.1%	88.6%	-79.1%	26.0%	47.5%	-42.8%	0.8%	1.5%	-1.4%
2	32.2%	58.4%	-52.1%	23.9%	43.5%	-39.1%	8.7%	16.3%	-15.0%
3	26.2%	46.9%	-41.5%	20.7%	37.5%	-33.6%	12.3%	23.0%	-21.1%
4	20.1%	36.4%	-32.4%	14.7%	26.7%	-23.9%	4.1%	7.5%	-6.9%
5	16.3%	29.2%	-25.9%	12.6%	22.7%	-20.3%	5.3%	9.8%	-8.9%
6	13.9%	25.3%	-22.5%	11.1%	20.3%	-18.2%	4.5%	8.6%	-7.9%
7	11.2%	20.5%	-18.1%	9.2%	16.9%	-15.0%	5.2%	9.7%	-8.9%
8	8.4%	15.2%	-13.4%	6.9%	12.6%	-11.2%	4.2%	7.9%	-7.2%
9	6.2%	11.1%	-9.7%	3.8%	6.9%	-6.1%	0.1%	0.2%	-0.2%
10	3.5%	6.3%	-5.4%	2.8%	5.0%	-4.3%	1.4%	2.5%	-2.3%
Total	10.9%	19.9%	-17.7%	9.3%	17.1%	-15.3%	0.9%	1.7%	-1.6%

Note: Asumes 10% uniform consumption correction

5. Conclusions

In the current decade Argentina embarked on an interventionist energy policy, particularly concerning wholesale natural gas and electricity markets. This interventionism led to what is perhaps the largest tariff freeze in history (during almost 8 years) particularly for households in the Buenos Aires Metropolitan Region (AMBA). If prices were below opportunity costs at the beginning of the freeze in 2002, they became astonishingly divorced since 2003 as international energy prices soared. The presence of visible imbalances did not trigger policy response. On the contrary, energy policy in Argentina became stubbornly committed to the freeze until imbalances became unsustainable in 2008.

In section 2 we label this policy “energy populism” and provide a simple analytical framework for explaining its emergence in terms of the preference of a median household (voter) for receiving transfer gains followed by a stream of transfer losses. This depends on a critical discount factor that in turn depends on a perception that the transfer losses will be shifted away. A suggested line of future research is to polish the strategic behavior of society concerning the acceptance of energy populism. In particularly exploring the inconsistencies for choosing the populist path given that consequences may end up being quite different from discourse. Nevertheless the discussion of section 2 anticipates that the consequences of energy populism, given the required expost overshooting of prices, may have implications for the way society solves the undoing of the subsidies, in particular given that at the new energy prices a larger proportion of agents will have serious difficulties in coping with the energy price shock.

Evaluating long run sustainable opportunity costs at what we believe are reasonable scarcity values for Argentina, we found that about 4 million households in the AMBA received almost 10 billion dollars in subsidies between 2003 and 2009, or about 4% of the (average) GDP of that period. Annual transfers peaked in 2008 and reached 2,500 million dollars or about 0.8% of GDP, which is a very large figure considering we are dealing with 40% of the population and about 25% of total energy demand. The distributive incidence of these transfer gains are very weak, particularly for the case of natural gas, as lack access to the network means that 40% of the poorest 50% of households do not have natural gas and buy LPG at opportunity costs. For both natural gas and electricity, the poorest 50% households receive on average about 80% of the corresponding transfer gains received by the richest 50% households. In line with this, the computing of percentage welfare gains shows as expected that the welfare impact of these transfer gains are reduced as the welfare criteria becomes more averse to income inequality. As expected, percentage welfare gains for the poorest households are considerable compared to the equivalent gains for the well being, due to the large differences in income.

We do not elaborate on the transition from subsidized prices to a new equilibrium. This move has already began, albeit slowly and with pitfalls and rejections from society. We rather make a simple calculation of transfer losses on the assumption that the gap is closed and every household pays opportunity costs. We compute impacts across households as we did on transfer gains. The return to opportunity costs would imply annual transfers equivalent to 1,500 million dollars or 0.5% of GDP per year. These are distributed in a similar fashion as transfer gains, given the assumed proportional (to consumption) adjustment for all households. However, the same is true with percentage welfare losses, that is, the poor receives the largest negative impacts.

From the previous result it is clear that one drawback of following interventionist policies is the transmission of income and welfare instability to society and in particular the poor. What else can we say, based on our measurement on AMBA households subsidies, about the costs of energy populism? The answer depends on auxiliary assumptions, in particular on what can be judged as the magnitude and duration of excess costs to be borne as a consequence of interventionism. A crude estimate from our data set would suggest a cost in the order of 2% of GDP for the households in AMBA. This is of course a fraction of the total costs to society, which may be several times higher, and close to the order of magnitude of the losses of macro-financial crisis. Another suggested line of future research is to improve on these estimates and to integrate them with the society's decision to endorse interventionism.

References

Angel-Urdinola, D., and Q. Wodon (2005), "Do Utility Subsidies Reach the Poor? Framework and Evidence for Cape Verde, Sao Tome, and Rwanda", Mimeo, World Bank, Washington, DC.

Artana D., M. Catena and F. Navajas (2007), "El Shock de los Precios del Petróleo en América Central: Implicancias Fiscales y Energéticas", Working Paper WP 624, Research Department, Inter-America Development Bank , Washington

Bacon, R. and M. Kojima, (2006) M. "Coping with Higher Oil Prices". ESMAP Report 323/06. The World Bank, August.

Cont W., P. Hancevic and F. Navajas (2008), "Infraestructura y aspectos distributivos en la tarificación de los servicios públicos: ámbito y posibilidades de la tarifa social en la Argentina", Perspectivas, (Corporación Andina de Fomento), 6(2), pp.65-90

Cont W. and F. Navajas (2004), "La Anatomía Simple de la Crisis Energética en la Argentina" (con W. Cont), Documento de Trabajo Nº82, FIEL, Buenos Aires, Septiembre 2004.

Marchionni M., W. Sosa Escudero and J. Alejo (2008), "Efectos distributivos de esquemas alternativos de tarifas sociales: una exploración cuantitativa", Capítulo 2 en Navajas F. (editor) op.cit.

Navajas F. (2006), "Energo-Crunch Argentino 2002-20XX", Documento de Trabajo de FIEL Nº89, Octubre.

Navajas F. (2006b), "Estructuras Tarifarias Bajo Stress", Económica (La Plata), Año LII, Nº1-2 Enero-Diciembre, 2006, pp. 77-102.

Navajas F. (editor) (2008), La Tarifa Social en los Sectores de Infraestructura en la Argentina. Buenos Aires: Ed. TEMAS.

Navajas F. (2009), "Engel Curves, Household Characteristics and Low-User Tariff Schemes in Natural Gas", Energy Economics, vol.31, 1,pp. 162-168.

Navajas F. and D. Artana (2008), "Análisis y rediseño de los subsidios a la energía en El Salvador", FUSADES, El Salvador.

Navajas and Porto, (1990), "La Tarifa en Dos Partes Cuasi-Optima: Eficiencia, Equidad y Financiamiento", (con A. Porto), El Trimestre Económico (México), Nº228, octubre de 1990.

Newbery D. (1995), "The distributional impact of price changes in Hungary and the United Kingdom", Economic Journal,vol. 105, pp.847-63.

APPENDIX

Table A.1

Residential Natural Gas: Commodity Gas Price (USD / MMBTU)						
Year	m3 / year	Oportunity cost	Price included in tariff		Implicit Subsidy	
			Bs As City	Greater Bs As	Bs As City	Greater Bs As
2003	all users	1.78	0.465	0.487	1.315	1.293
2004	all users	1.78	0.444	0.474	1.336	1.306
2005	all users	2.81	0.378	0.436	2.428	2.371
2006	all users	3.87	0.360	0.414	3.515	3.460
2007	all users	5.16	0.355	0.409	4.808	4.754
2008	0 - 500	8.54	0.350	0.403	8.190	8.137
	501 - 650	8.54	0.350	0.403	8.190	8.137
	651 - 800	8.54	0.350	0.403	8.190	8.137
	801 - 1000	8.54	0.386	0.430	8.154	8.110
	1001 - 1250	8.54	0.523	0.570	8.017	7.970
	1251 - 1500	8.54	0.645	0.691	7.895	7.849
	1501 - 1800	8.54	0.800	0.850	7.740	7.690
	1801 - more	8.54	0.915	0.964	7.625	7.576
2009	0 - 500	6.21	0.301	0.347	5.909	5.863
	501 - 650	6.21	0.301	0.347	5.909	5.863
	651 - 800	6.21	0.301	0.347	5.909	5.863
	801 - 1000	6.21	0.394	0.416	5.816	5.794
	1001 - 1250	6.21	1.048	1.080	5.162	5.130
	1251 - 1500	6.21	1.675	1.707	4.535	4.503
	1501 - 1800	6.21	2.427	2.475	3.783	3.735
	1801 - more	6.21	3.018	3.065	3.192	3.145

Source: Own elaboration as explained in the taxt. Data from ENARGAS and Secretary of Energy and CBDH for Bolivian gas.

Table A.2

Residential Electricity Prices in Generation Sector (USD / MWh)				
Year	kWh / two-month	Oportunity cost	Price included in tariff	Implicit Subsidy
2003	0 - 300	57.80	11.18	46.62
	301 - more	57.80	11.94	45.86
2004	0 - 300	57.80	11.20	46.60
	301 - more	57.80	11.96	45.84
2005	0 - 300	68.06	11.27	56.79
	301 - more	68.06	12.04	56.02
2006	0 - 300	78.74	10.72	68.02
	301 - more	78.74	11.45	67.29
2007	0 - 300	91.63	10.58	81.05
	301 - more	91.63	11.30	80.33
2008	0 - 300	125.40	10.42	114.98
	301 - 650	125.40	11.11	114.29
	651 - 800	125.40	11.11	114.29
	801 - 900	125.40	11.11	114.29
	901 - 1000	125.40	11.11	114.29
	1001 - 1200	125.40	14.63	110.77
	1201 - 1400	125.40	14.63	110.77
	1401 - 2800	125.40	17.81	107.59
	2801 - more	125.40	24.39	101.01
2009	0 - 300	102.10	8.96	93.14
	301 - 650	102.10	9.53	92.57
	651 - 800	102.10	9.53	92.57
	801 - 900	102.10	9.53	92.57
	901 - 1000	102.10	9.53	92.57
	1001 - 1200	102.10	21.63	80.47
	1201 - 1400	102.10	21.63	80.47
	1401 - 2800	102.10	32.59	69.51
	2801 - more	102.10	55.26	46.84

Source: Own elaboration as explained in the text. Data from CAMMESA for actual prices.