Energy regulation and industrial consumption in Argentina, 2002-2011

Esteban Serrani [a] and Leandro Navarro Rocha [a]

[a] Universidad Nacional de San Martín, Argentina.

Email addresses: eserrani@gmail.com and leandronavarro.ln@gmail.com, respectively.

Date received: December 4, 2023. Date of acceptance: May 3, 2024.

Abstract

While specialized literature has discussed the conditions necessary for economic development, such as the role of institutional frameworks, the implementation of an entrepreneurial state and national innovation systems or industrial policies and the creation of markets, less attention has been given to the role of energy and its relationship with the performance of industrial enterprises. This paper analyzes the links between the energy system and industrial policy in Argentina, revealing that the segmentation led to industry paying more for energy than residential users, although well below full cost, resulting in a transfer of tax revenues to industrial businesses.

Keywords: energy regimes; industrial policy; state intervention in the economy; subsidies; post-convertibility.

1. INTRODUCTION

It is possible to affirm that in recent decades, all countries that have managed to reach a certain level of economic development have applied a wide range of industrial, technological and production policies. However, despite some similarities between these trajectories, there is much debate about the approaches and evidence needed to understand the extraordinary diversity of industrial policies applied and the results obtained in the medium term.

On the one hand, literature regarding varieties of capitalism sought to understand the different dynamics followed by the central countries within the capitalist system (Coates, 2005; Hall and Soskice, 2001). The notion of institutional complementarity enabled the incorporation of institutional framework analysis into literature, which in turn allowed for the differentiation of capitalist development models into two typical ideal forms: liberal and coordinated market economies. Meanwhile, literature on the role of the entrepreneurial State and national innovation systems (Mazzucato, 2014; Nelson, 1993; Perez, 2010) emphasizes innovation as the driving force of capitalism. It is understood that the State not only creates economic and social conditions for development but can also act as a great entrepreneur, introducing radical innovations. Likewise, in the context of increasing globalization, literature on global value chains (Gereffi *et al.*, 2005; Gibbon *et al.*, 2008; Timmer *et al.*, 2014) endeavors to comprehend the processes of global integration in those of industrial production, taking into account the new *outsourcing* and *offshoring* processes, which shape the dynamics of major transnational corporations.

Finally, literature attempting to understand the specificities of late industrialization processes in peripheral countries is organized around the concept of the developmental State (Amsden, 1989; Evans, 1995; Johnson, 2007). This tradition examines, in particular, how forms of state intervention, industrial policy planning and the implementation of active macroeconomic policies have created and regulated markets considered strategic. In these markets, the deliberate search to create class alliances conducive to development is used to discipline capital and the labor market in relation to the objectives for the growth of industrial exports.

Indeed, although each in their own way, all of this literature identifies multiple key *drivers* for achieving economic development: financing and investment, institutions, the scientific and innovation system, vertical and horizontal industrial policies, business networks and the efficiency of the industrial production system, competitiveness and growth regarding exports, the training of human capital, the supply of natural resources, and so on. Nevertheless, even though energy is usually considered to be an essential *driver* in the implementation of industrial policies, there has been very little study about its link with the performance of large industrial companies (Beylis and Cunha, 2017; Calí *et al.*, 2023; Elliott *et al.*, 2019; Kilian, 2008; Sato *et al.*, 2019).

This article examines the design of a specific energy policy for large industrial companies in Argentina, its implications for their energy consumption and the subsidies received.

The period of analysis commences in 2002, the first year after the exit from the exchange rate convertibility crisis that marked the 1990s, and concludes in 2011, the year of the conclusion of Cristina Fernández de Kirchner's first presidential term. This cycle is of particular interest because, following the economic crisis of 2001, it initiated a period of robust economic growth (Kulfas, 2016; Porta *et al.*, 2017). This growth was driven in large part by the performance of the industrial sector (Fernández Bugna and Porta, 2007; Lavarello and Sarabia, 2015) and was characterized by a substantial narrative of the period, describing it as one of reindustrialization (Costa *et al.*, 2010; Herrera and Tavosnanka, 2011).

To achieve this objective, two complementary levels of analysis are explored. On the one hand, the transformations of sectoral regulation upon exiting the exchange rate convertibility system are reviewed, in which the regulatory framework based on a system seeking marginalist economic efficiency is dismantled. On the other hand, the pricing policy of both electricity and natural gas for the industrial sector and the consumption of large companies of these widely used inputs is reconstructed.

Based on the combination of these two levels of analysis, the hypothesis to guide our empirical research maintains that the energy regime established during the post-convertibility period managed to avoid the transfer of the effects of the crisis to users. This was accomplished through market segmentation and a specific approach that afforded preferential treatment to residential consumers over large industries. To attain this objective, an

escalating volume of foreign currency and fiscal resources were allocated to subsidize the difference between the local price of energy and international prices, thereby shielding consumers from bearing the entire financial burden of the system.

The article is organized as follows: the second section describes the market reforms in the natural gas and electricity sectors during the 1990s, indicating the changes introduced following the conclusion of the regulatory model under state monopoly. The third section addresses the regulatory and institutional modifications implemented between 2002 and 2011, which gave shape to an energy market for the consumption of large industrial users. The modifications centered on abandoning the marginalist model in place during the previous decade and segmenting prices according to the consumer category. The fourth section presents an analysis of the results of these policies in terms of the evolution of prices paid by consumers, the costs avoided by the industrial sector and the evolution of subsidies for these consumers. Finally, the conclusions of the paper are presented.

2. BACKGROUND: MARKET-BASED ENERGY REFORMS IN THE 1990s

The enactment of Law No. 24,065 in 1992 marked the end of the sectoral regime that had been in place in the electricity sector since 1946, led by vertically integrated state-owned companies (Ascencio and Navarro Rocha, 2022). The reform of the natural gas service implemented that same year by Law No. 24,076 followed a similar structure. The reforms were based on three guiding principles: *i)* to promote the competitiveness of natural gas supply and demand; *ii)* fair and reasonable tariffs for the regulated transportation and distribution sectors; and *iii)* for the industrial sector to ensure that the price of natural gas supply was equivalent to the prices in force internationally in countries with similar resources and conditions. In both cases, and per the English model (Beesley and Littlechild, 1989; Thomas, 2006), the new regulation divided the sector into generation, transportation, and distribution. The former was deregulated and designated as a competitive activity, while the latter two were classified as public services, with their tariffs set by the regulatory bodies of each sector. The new regulation also established the Wholesale Electricity Market (MEM), which provides a platform for generators, distributors and major electricity consumers to participate in energy purchase and sale activities.

In essence, energy commercialization in both markets was shaped by two mechanisms: a contract market (forward market) and an hourly *spot* market within the framework of marginalist logic. In the context of the electricity industry, distributors operating within a zonal market reserve framework sell energy to their customers at a quarterly stabilized price (seasonal price). This price is calculated based on the expected marginal cost of the system and the power reserve required to meet demand. Any differences between the *spot* price at which generators sell and the seasonal price at which distributors purchase are addressed by implementing a stabilization fund specifically designed for this purpose. The entire operation is the responsibility of the agency in charge of dispatch, in the Argentine case, the Compañía Administradora del Mercado Mayorista Eléctrico (CAMMESA). For gas, the price is set by the regulator ENARGAS at the Point of Entry to the Transportation System (PIST). In both cases, both the price of energy and the cost of transportation are passed directly to the final tariff paid by users to the distributors (FIEL, 1999).

In this general scheme, industrial electricity consumers were divided into three groups: large major consumers (GUMA) and large minor consumers (GUME), which, when differentiated by the amount of contracted power, can contract their demand and pay a toll to the distributor for the use of the network. In the case of GUMAs, they can also purchase their energy on the *spot* market. Meanwhile, a group of industrial users, called large distributor users (GUDI), pay the distribution company the tariff set by the regulator. In the case of natural gas, large industrial users are called large general service users (SG-G), as opposed to businesses and service companies with lower consumption (small general service users, SG-P).

In summary, there is no consensus in specialized literature on the impact of the reforms on the energy market. On the one hand, some authors point out that privatization has promoted improvements in terms of investment, innovation, technical and commercial management compared to the previous model (Dyner *et al.*, 2006; FIEL, 1999; Gerchunoff *et al.*, 2003; Pollitt, 2008). On the other hand, it has been pointed out that there are regulatory and normative shortcomings, such as the setting of price ceilings that guarantee high profit margins, periodic adjustment clauses in contracts with foreign price indexes, as well as a regressive nature of tariffs for residential users for three reasons: higher increases in fixed and variable charges for the remaining categories of users; the elimination of a subsidy included in the initial 1992 tariff schedule; and the weight of energy supply contracts between thermal power plants and distributors, whose values were much higher than the *spot* price (Arceo and Basualdo, 1999; Azpiazu, 2005; Vispo, 1999).[1]

The situation differed for industrial users who were not beholden to the distribution companies. These users benefited from the declining trend in energy prices during the 1990s by being able to contract directly with the MEM and with natural gas producers (Devoto and Cardozo, 2002).[2]

Indeed, as analyzed by Serrani (2019 and 2020), the reforms did not result in increased market competition among the companies that obtained transportation and distribution licenses, as these were granted in geographical areas as natural monopolies. Furthermore, the issue of reasonable profit has been a subject of long-standing debate and analysis (Armstrong *et al.*, 1995), and controversies exist regarding the interpretation of "fair and reasonable tariffs" in the context of Argentine tariff regulation (FIEL, 1999; FLACSO, 1998; Gerchunoff *et al.*, 2003).

Before the 2002 economic crisis, tariffs were calculated in dollars and expressed in convertible pesos in the tariff tables under the provisions of Law 23,928, which resulted in a considerable profit margin for the companies despite the generalized economic crisis (Azpiazu, 2005). The financial crisis of 2001 and the enactment of the Public Emergency and Exchange Rate Reform Law in 2002 resulted in a modification of the functioning of both markets. Following the termination of currency convertibility in 2002, the energy regulatory model shifted its focus towards absorbing price fluctuations and guaranteeing energy supply to residential consumers at a price considerably below its marginal cost and then increasingly to the commercial and industrial sectors. As a result of this decision, the marginalist system that had prevailed during the previous decade, wherein the *spot* price was equivalent to the marginal cost of the system, was effectively interrupted.

3. CREATION OF AN ENERGY MARKET FOR INDUSTRIAL CONSUMPTION, 2002-2011

Electricity for the industrial sector

The regulatory and institutional modifications implemented in 2002 focused on segmenting markets according to types of users, changing price allocation mechanisms and seeking to overcome restrictions with a short-term view. This involved using the electricity market as a redistribution channel

from producers to consumers (Navarro Rocha, 2020). In March, the decision was taken to convert the prices of energy and power into pesos[3] and in August 2003, a maximum *spot* price of ARS$120/MWh was established in the MEM due to the problems registered in the supply of natural gas, which had increased the costs declared by the generators.[4] This regulation was intended to limit the volatility of the seasonal price at the peak of consumption during the winter, thereby altering the marginalist logic.[5]

In addition to these measures, between 2003 and 2005, the seasonal price began to differ according to the user category. Consequently, industrial users started to be charged an energy price above that established for demands such as residential or public lighting. The implemented deregulation criteria was based on contracted power (up to 10 kW for small residential demands, public lighting and general users; between 10 kW and 300 kW and more than 300 kW). They were also obliged to pay a recently created Transitory Charge for Deficit of the Stabilization Fund (CTDF) so that those large demands that remained within the scope of the distributors did not benefit from the tariff freeze established in 2002 and pay the price of the energy of those who contracted supply directly in the wholesale market.[6] The Ministry of Energy (SE) argued that the price path should take into account not only generation costs but also the payment capacity of different user categories following the economic crisis of 2001 (Ente Nacional Regulador de la Electricidad [ENRE], 2004). The seasonal price differentiation according to user category was abandoned in 2005 and was reinstated in 2008.

However, in 2006, the creation of the Energy Plus program significantly modified the sector's operating procedures.[7] In the context of growing energy demand and low levels of private investment (Haselip and Potter, 2010), this measure sought to encourage the installation of new generation capacity by differentiating the prices to be paid by large and small consumers. The regulation established 2005 as the base year for electricity consumption and indicated that all users with energy consumption higher than 300 kW would have to contract their surplus demand from the base year through a supply contract with a generator. These supply contracts were not subject to the limitations mentioned above of the *spot* market.[8] The resolution excluded residential consumers, which directly affected commercial and industrial consumers who, if they did not contract their excess demand, were obliged to pay the real cost, the marginal price, of the energy. Finally, when it was implemented, the latter issue was eventually mitigated, forcing large consumers to pay the *spot* market price and an additional charge, which did not reach the marginal cost.[9]

As a result, energy policy commenced a trajectory of demand segmentation. An initial group comprised of residential, commercial and small industrial consumers, with subsidized electricity rates that were progressively divergent from the actual marginal cost of the system and under the control of the distribution companies. A second group consisted of large industrial users for whom a forward market was to be created, with prices close to the actual cost of production and directly linked to the generating companies.

To address the challenges posed by the electricity system, which was operating at full reserve capacity, the Rational Energy Use Program (PUREE)[10] was introduced. This program established an incentive system whereby users who reduced their energy consumption compared to the previous year would be compensated by users in the same category who did not comply with the savings guidelines. This program was first implemented in 2004 and was subsequently extended in subsequent years, with the minimum savings threshold becoming increasingly stringent.

In the subsequent years, while undergoing some modifications, the SE maintained these pricing policies, attempting to circumvent the transfer of increases to users with lower consumption and implementing various regulations so that large industrial users would pay a price increasingly closer to the marginal cost. Consequently, three mechanisms were implemented to reinforce the supply structure for industries: *i)* surcharges were increased for non-compliance with energy savings; *ii)* an effort was made to persuade major industries within the orbit of the distributors to purchase their energy directly from the MEM; and *iii)* the seasonal price increase for industry was once again differentiated.[11]

With the declared aim of ensuring a fair distribution of subsidies according to the ability of different types of users to pay, two seasonal prices were introduced in November 2011: with and without subsidies. The latter category included several activities, such as oil and gas extraction, financial services, agrochemicals and telecommunications services, which paid the actual cost of electricity supply.[12] These prices included the additional cost of imports from Brazil to reduce the import bill with the neighboring country and the additional cost of supply contracts with the MEM. These contracts aimed to pay part of the demand for the system's costs since 2007, when CAMMESA, to encourage new investments, entered into 15-year *Power Purchase Agreements* (PPA) with the generators, payable in dollars.[13]

Natural gas for the industrial sector

Although there is extensive literature analyzing the impact of regulatory changes on residential tariffs, little is known or has been written about the supply of natural gas to large industrial users. Until 2004, large industries were supplied by distributors under the P3 full-service format (the tariff was lower the higher the monthly consumption threshold), or they contracted directly with a natural gas producer (forward market). With the interruption of the public service contracts, the conversion to pesos and the tariff freeze, a new regulatory framework for the supply of natural gas to all end users was designed in 2004, with three main changes: *i)* Decree 180 created the Mercado Electrónico de Gas Sociedad Anónima (MEGSA), which permitted the coordination of *spot* purchases and sales of gas; *ii)* Decree 181 aimed to regulate prices and allow the SE to enter into incremental price agreements with natural gas producers; *iii)* the same decree instructed the creation of a deregulated market, in particular for large industrial companies not supplied by distribution companies, to agree on natural gas prices directly with producers.

These changes were reflected in the First Agreement for the Implementation of the Natural Gas Price Normalization Scheme in PIST, which was significant for three reasons.[14] The first was the creation of a new market. Large industrial users began to purchase natural gas directly from producers, replacing the natural gas supply they previously received from distribution companies. Second, price increases. Between July 2004 and July 2005, a trajectory of price increases for large industrial users was established, ranging from 33% to 50%, depending on the basin. These administrated increases ended in January 2006, when the industries executed price and volume agreements directly with the natural gas producers. The third effect was the de-dollarization of domestic prices. As of the signing of the Agreement, natural gas prices were set in pesos, and, at the same time, producers undertook not to file any new lawsuits or patrimonial claims against the distributors for the conversion of prices into pesos.[15]

The normalization also sought to resolve the interruption of natural gas exports ordered by the SE in 2004 (Kozulj, 2005), a year in which three processes converged that would significantly increase in the following years: the decrease in local gas production, the increase in domestic consumption, and the increase in international prices (Fanelli, 2012).

Meanwhile, within the context of the period of validity of the normalization, the transfer of industrial supply, which until that time had been from distributors to producers, was permitted, thereby strengthening the contracting of industrial demand,[16] a process informally known as *unbundling*.[17] At the same time, the distributors were prevented from entering into long-term supply contracts with large industrial consumers, who could only be supplied through agreements with producers at fixed prices or on the MEGSA *spot* market at export parity prices[18] set by the SE.

Indeed, the newly proposed regulatory framework aimed to establish three distinct market sectors, each representing one-third of total consumption:

1) For Priority Demand: Residential, commercial and small industrial consumers supplied by distributors, where gas prices and transportation and distribution tariffs were heavily regulated. This sector paid the lowest price of all consumers.
2) Natural gas for electricity power plants: Since natural gas accounts for almost half of the electricity generation and, in addition, it works counter-seasonally to residential gas consumption in winter, the SE managed the prices with subsidies in order not to transfer the increases in natural gas prices, both local and international, to the electricity tariffs. The sales price for this segment varied.
3) Large industries. Deregulation of prices by promoting the contractualization of industrial demand with producers, creating an *unbundling* market outside the operation of distribution companies. This segment ended up paying the highest price among all domestic demands.

Following the conclusion of the first Agreement in 2006, a new Agreement with Natural Gas Producers was signed the following year, covering the period from 2007 to 2011. The new elements of this Agreement were the fixing of supply volumes for different needs, which, for the first time, explicitly established a dispatch priority between the different consumer sectors. The fact is that the systematic decline in gas production was becoming increasingly evident, making it difficult to supply all segments.[19] In this way, after priority demand had been met, the remainder was allocated first to the needs of the power plants for electricity generation and then to the industrial sector.[20] Similarly, in the Supplementary Agreement Act[21] of October 2007,[22] it was decided that the tariffs of residential consumers would be subject to "a slower process of normalization" (Art. 2). In other words, with the decline in local production, the regulatory transformations of the market would seek to ensure the priority demand and electricity power plants to the detriment of large industries.

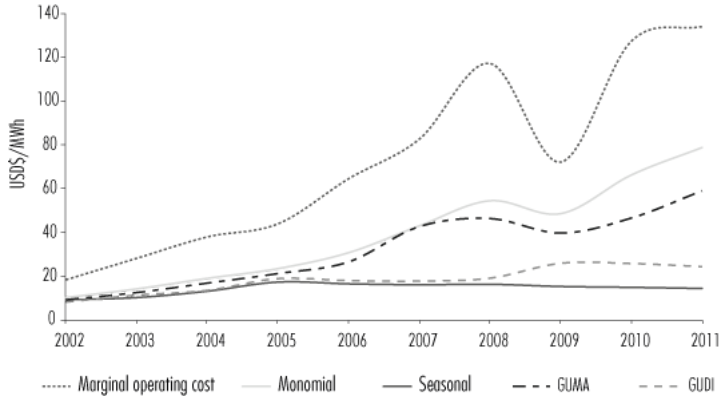
At the same time, the aim was to slow down the increase in residential tariffs for *unbundled* consumers. In this context, in 2008, in response to the pressure from producers for higher price updates —which was manifested in the decline in investments, such as production and reserves—, the government launched the Gas Plus program, which was intended to create incentives for producers to invest in new gas projects. Producers presented projects, the SE had to approve them, and the projects contemplated under this modality were guaranteed free commercialization of the "new gas". In other words, the natural gas produced under the Gas Plus program was not considered part of the volumes of the Agreement with Producers, so its commercialization price could be higher than that regulated by the SE, and most of it was destined to satisfy *unbundled* industrial demand (although not exclusively).

Thus, the transformation of the *unbundled* market for large industrial companies was complemented, distributors stopped publishing the gas prices paid to these industries, and an unclear stage began with regard to the management of prices for almost a third of the natural gas consumed in the country.

4. RESULTS. MARKET SEGMENTATION AND AVOIDED COSTS

The evolution of electricity prices between 2002 and 2011 by type of user (see Figure 1) shows, first of all, the growing dispersion between the marginal cost of the system, the average (monomial) cost and the prices actually paid by the different types of users. This is a consequence of the segmentation of the electricity market carried out by the energy policy, particularly from 2005/2006, which sought to differentiate between categories of users (in particular between residential and industrial users) based on the various mechanisms already described: special seasonal prices, penalties for non-compliance or contractualization mechanisms for the demand of large users.

Figure 1. Electricity prices. Argentina, 2002-2011



Source: prepared by the authors based on CAMMESA.

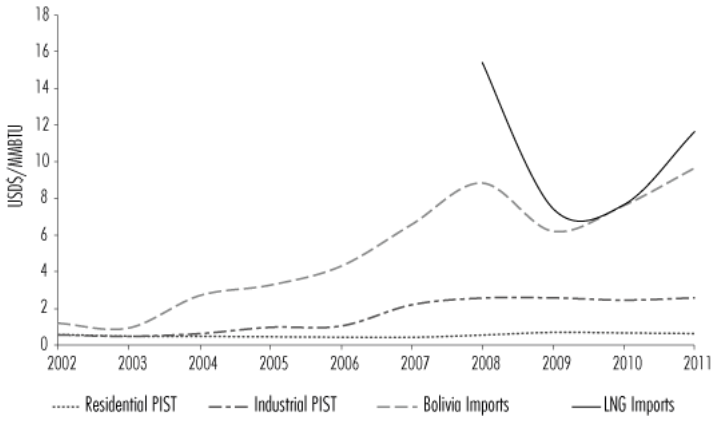
This meant that by 2011, industrial consumers were paying 314% more than households, whereas at the beginning of the period, in 2002, this difference was practically zero. The difference between the prices paid by large industrial consumers and those consumers in this sector that continued to be supplied by distributors (GUDIs) was smaller but also significant. In this case, the price paid by GUMAs was 143% higher, although on average, it was around 66% higher than the price paid to GUDIs throughout the period. Finally, the difference between the price paid by large users of distributors and that paid by residential consumers remained around 8% in the first years after conversion, diverging around 2011, when the price paid by the former was 70% higher than that paid by the latter.

As in the electricity market, and as a legacy of the marginalist organization of the previous decade, until 2002 there was no difference in the price of natural gas paid by industrial and residential consumers (see Figure 2). This made sense, given that both segments were supplied mainly by distributors, with prices regulated by the Ministry for National Energy. It was not until 2004 that the first decoupling of industry prices took place, reaching a difference of 34%, driven in that year by Decrees 180 and 181, which gave impetus to the configuration of two differentiated markets in the determination of prices and the signing of the first Agreement for the normalization of prices.

From that year until 2007, the segmentation of the gas market was consolidated: on the one hand, regulated and frozen prices and prices converted into pesos for residential users and, on the other hand, a trajectory of increasing prices for industrial *unbundled* users, which aimed to create a deregulated market outside the regulated supply of distributors and to restore the income of natural gas producers.

By the end of the Price Agreement in 2007, the difference between the two prices was 413%: USD$2.20 per million British thermal units (MMBTU) for industry versus an average of USD$0.43 for residential consumers (see Figure 2). The signing of the second price agreement for 2007-2011, although it managed to increase prices in dollars during the four years of implementation, it did so slightly below the increase in dollars of residential prices. During that period, the price paid by industry was 312% higher than that paid by residential consumers, with 2008 being the year with the most significant difference: 2.57 versus USD$0.54 per MMBTU (373%).

Figure 2. Natural gas prices. Argentina, 2002-2011



Source: prepared by the authors based on ENARGAS (2012), Ministry of Energy (n.d.) and MEGSA (n.d.).

Indeed, during the entire period, the price for residential consumers was "stepped on" and a market was created with an incremental price paid by the *unbundling* industrial sector, which tried to rebuild the income of the natural gas producers.

However, the analysis of electricity prices would be incomplete if it did not include an examination of system costs for the period, both marginal operating prices and the opportunity cost of energy imports.

In the electricity sector (see Figure 1), the energy policy choices made resulted in the regulatory model tending towards an increasing separation between the operating marginal cost and the average (monomial) cost with respect to the price for the different categories of users. The differences between the monomial price and the price for large industrial users (or system coverage) tended to remain stable until 2008, with demand paying almost 90% of the energy price on average. By 2011, there was a decrease, with system coverage at 75%. The opposite was the case for residential consumers, whose coverage went from 90% in 2002 to barely 18% in 2011, which shows the design and objectives of the segmentation established by the energy policy. The difference between the electricity prices paid by the different users and the average cost of the system was covered by subsidies, which amounted to 1.2% of GDP in 2011 (Secretaría de Gobierno de Energía, 2019). The increase in the cost of the electricity sector was due to the lack of investment in the expansion of thermal power plants following the break with the marginalist model from 2002, which attempted to be compensated by supply contracts and public investment (Haselip and Potter, 2010; Navarro Rocha, 2021) and to problems upstream in the energy chain due to the decline in local extraction of natural gas (Serrani and Barrera, 2018), a key fuel since 60% of the electricity supply originates from thermal sources.

At the same time, the systematic decline in investment in hydrocarbon exploration under the privatization model, which began in 1996 and continued with nuances and ups and downs until 2012 (Barrera *et al.*, 2012), resulted in a significant decline in domestic supply of natural gas from 2004 to 2015 (Kulfas, 2016). This double process of declining investment and domestic supply of natural gas created a gap between local supply and domestic consumption, which was covered mainly by imports: starting in 2006 from Bolivia through the cross-border gas pipeline, which took place continuously between 1972 and 1999 (Sabbatella and Serrani, 2021), and from 2008, increasing imports of liquefied natural gas (LNG) were added at two regasification ports in the province of Buenos Aires, close to the urban centers of consumption (Fanelli, 2012). This process is strongly correlated with the increase in energy subsidies (Muras *et al.*, 2015; Puig and Salinardi, 2015; Serrani and Barrera, 2018), mainly due to the decision not to transfer

import costs to the final tariff. In this respect, Figure 2 shows that, even though the PIST price for industry increased by 349% between 2002 and 2011, for residential consumers, it increased by only 8%, while the import price of gas from Bolivia was almost three times higher than the price increase for large industry, with an increase of 1,024% over the same period. In other words, if in 2002 the industry price was USD$0.57 and the gas imported from Bolivia cost USD$0.83, in 2011 local industries were paying USD$2.58, while importing from Bolivia implied an expenditure of USD$9.33 per MMBTU, even though the gas coming from the neighboring country was 25% cheaper than the cost of gas imported by ship, which amounted to USD$11.64 in 2011.

Indeed, although residential users were the primary beneficiaries of the regulatory policies implemented by the governments of Néstor Kirchner between 2003 and 2007 and Cristina Fernández de Kirchner between 2007 and 2011, it is no less accurate that industry also benefited from the low relative prices of energy compared to the marginal costs of the system during these years. In other words, although in relative terms, a larger share of the dollar increase in energy prices was passed on to industrial users than to residential users, the former did not bear the full costs of the energy system. This is confirmed by a report published in 2014 by economists from the Argentine Industrial Union (UIA),[23] in which they argue that, among the different components of the industrial cost structure, energy was the one whose price increased the least during the period, compared to other costs such as raw materials, imported inputs, logistics costs, and industrial wages (Coatz *et al.*, 2014).[24]

In summary, the decision of the national government to segment the energy market between residential and industrial users and not to transfer the marginal costs of the system to local actors had a significant external and fiscal impact on the country, as already mentioned and recently analyzed in specialized literature. However, to date, there has been no detailed research on how much of these assumed costs have been passed on to the country's large industrial companies. To shed light on this issue, an initial estimate was made. For this purpose, the evolution of the total consumption of natural gas and electricity in the industrial sector was analyzed, and the theoretical difference that these companies should have paid if the marginalist system, as established in the 1992 regulatory framework, had remained in force was calculated.

The cost avoided by the industry was estimated as the difference between the domestic price actually paid and the annual average marginal operating cost for electricity, as well as the opportunity cost for the gas sector. The opportunity cost is defined as the import parity based on the Bolivian price. However, it is important to note that these estimates underestimate the transfer since they do not consider LNG imports, which were the highest in the system throughout the period in question. In the absence of public information identifying the final recipients of energy subsidies, these estimates are used as a *proxy* to quantify the impact of decisions taken in the energy system on the industrial sector.

Table 1 shows the estimated and theoretical evolution of the costs that would have been avoided by industry for energy if the marginalist system had remained in force. First, we can observe a delay in the evolution of domestic natural gas prices in dollars with respect to the opportunity cost. In 2003, these prices covered 88% of the opportunity cost, but in 2011 they covered only 28%. In the case of electricity, the industrial price covered about half of the marginal cost of the system throughout the period, except in 2010, when it covered just over a third of the cost. Second, assuming that all large industrial companies paid for energy at the average annual marginal cost, the discrepancy between this price and actual payments meant that the avoided costs for the industrial sector grew steadily over time, reaching almost USD $5 billion in 2011. In other words, the design of the energy pricing policy implemented by the national government resulted in a significant transfer of tax revenues to large industrial companies.

Table 1. Industrial consumption, avoided cost and energy subsidies. Argentina, 2002-2011

Year	Natural Gas			Electricity			Totals		
	Industrial consumption (M of m³)	Avoided cost (millions of USD$) 1	Coverage of the opportunity cost %	Industrial consumption (MWh)	Avoided cost (millions of USD$) 2	Coverage of the marginal operating cost %	Avoided cost (millions of USD$) 3 (1+2)	Energy subsidies (millions of USD$) 4	Avoided cost/ subsidies 5 (3/4) %
2002	9 797 259	68	69	12 421 419	118	49	186	-	-
2003	10 682 871	20	88	13 891 108	222	44	242	550	44
2004	11 226 085	515	27	14 537 840	312	44	827	1 003	82
2005	11 672 016	611	34	16 373 506	378	48	988	1 545	64
2006	12 900 745	1 011	27	17 735 097	680	41	1 691	1 732	98
2007	12 376 783	1 352	35	19 328 337	779	51	2 131	2 845	75
2008	12 635 074	2 037	30	20 256 187	1 441	39	3 478	4 333	80
2009	12 140 015	1 085	44	18 080 135	592	55	1 678	2 626	64
2010	12 037 781	1 572	34	19 056 044	1 545	36	3 117	4 765	65
2011	12 511 707	2 288	28	20 194 132	1 522	44	3 810	9 413	40

Source: prepared by the authors based on ENARGAS, CAMMESA, SE, INDEC, MEGSA, Muras et al. (2015), Serrani and Barrera (2018).

For the sole purpose of providing an approximate estimate of the magnitude of the income transfer that actually took place from the national State to the country's large industrial companies, as opposed to the marginalist model, the energy subsidies paid by Argentina during the period in question are presented. It is important to note that, due to the lack of a breakdown in the official information on the type of energy consumed by the various users (domestically produced or extracted and imported), the energy subsidies actually paid include not only industrial users but the entire energy system. The estimated avoided cost information presented in Table 1 allows us to visualize the magnitude of the revenue transfer over the period. On average, the avoided costs on the part of industrial companies, compared to their expenditure to cover the price of energy, represent 68% of the energy subsidies

actually paid (with the sole exception of 2011, when the percentage ratio was 40%). This last case is primarily explained by the increased international commodity prices following the 2007-2008 financial crisis.

CONCLUSIONS

With the end of currency convertibility, Argentina underwent a series of fundamental changes in the functioning of the economy and public utilities. One of them was the change in the orientation of state intervention, which modified the regulatory framework of the energy sector as a result of the neoliberal reforms. Within this framework, the article aims to analyze the design of a specific energy policy aimed at the demand of large industrial enterprises.

In summary, during the 1990s, large industrial users paid lower energy prices than residential users, who were a captive audience for distributors who could take advantage of lower generation costs and the ability to contract their demand. This situation changed over the following decade. State policy focused on preventing the effects of the economic crisis from being passed on to users. In the context of growing restrictions due to the reduced availability of natural gas, which led to its replacement by less efficient and more expensive alternative fuels, and low levels of investment in expanding local supply, tools were designed to segment the market and prices between different types of users. Once the conditions that had ensured the operation of a marginal system during the previous decade had changed, the implemented policies sought to secure energy supply at affordable prices, favoring residential, commercial and industrial consumers in that order of importance.

The convergence between the interruption of the marginalist model and the segmentation of the market between different types of users resulted in industrial users paying an increasingly higher price for energy than residential users. However, it was confirmed that this incremental price was significantly lower than the marginal operating cost of the system or the import cost in the case of natural gas. This allowed the national government to maintain an unstable balance between the different actors: residential users (whose income was to be protected), industrial users (who paid an incremental price) and natural gas producers (who were only slightly recovering their income in a rising gas market following the conversion to pesos in 2002). The instability of the balance was due to the acceleration of the external restriction as a result of the growing imports of fuels, with substantial impacts on the macroeconomy due to the decoupling between international and local sales prices.

In an environment of rising international energy prices, this article shows that the unstable balance of energy policy has allowed the weight of energy in the cost structure of large industrial companies to be relatively controlled. Given the characteristics of the national energy matrix, the integrated energy system does not permit differentiation between the types of users who consume locally produced energy compared with those who consume imported energy. The estimation made in this paper allows us to verify, at least theoretically, that the interruption of the marginalist model for the industrial sector implied a transfer of income from natural gas producers and the national government (through subsidies) to large industrial users of an average of approximately USD$1.8 billion per year between 2002 and 2011.

It is important to highlight the fact that 87% of the total subsidies consolidated from 2002 were used to compensate for the difference between the price paid by demand and the average cost of the system, as well as to import gas and liquid fuels for thermal generation. These funds were channeled through CAMMESA and ENARSA, companies under state control (Muras *et al.*, 2015). Although the compensation was directed to the electricity generating companies, the final beneficiaries were the users, who avoided paying the full prices on their bills.[25] Although some studies (Apud *et al.*, 2009 and 2011; Navajas, 2017; García Zanotti *et al.*, 2017; Goldstein *et al.*, 2016) argued that the reduced tariffs led to an irrational increase in consumption, this is not fully supported. As Serrani and Barrera (2018) demonstrate, the expansion rate per user did not grow significantly in the case of natural gas and was even lower than in the previous phase, when dollarized tariffs were applied and users paid full prices for electricity. Indeed, if, as affirmed by specialized literature, the energy sector ended up accelerating the external restriction of the economy around 2011, what this paper shows is that if the marginalist price system had not been modified, the energy sector would have reduced its pressure on the external strangulation of the economy, but at the cost of substantially altering the cost structure of the country's large industrial companies, depriving the sector of productive dynamism. However, this hypothesis deserves to be further investigated in future work.

Finally, this study contributes lessons and policy implications to literature by arguing that mitigating the effects of subsidies on the economic structure requires a comprehensive approach from energy policy, combining short- and long-term tools.

On the demand side, the reorientation of subsidies to reduce their impact on the external constraint implies the creation of a trajectory of gradual reduction that allows households to afford to pay the cost of generation. However, this process must be compatible with a consistent macroeconomic framework and with an inversely proportional evolution of wages. It is not sustainable to eliminate subsidies on energy tariffs in the context of exchange rate instability and loss of purchasing power of salary since it is socially unfeasible in the short term, even if fiscal accounts improve.

As far as supply is concerned, first, a profound institutional transformation of the system is required, including reorganizing and centralizing the agencies in charge of designing and implementing energy policy, especially between jurisdictions such as the national and provincial levels. Furthermore, the regulatory frameworks for electricity and natural gas need to be revised, which were designed in an institutional environment such as that of Convertibility, which has not existed in Argentine society for more than 20 years. Second, to make progress regarding the increased requirements for contractualization of the demand of large industrial consumers towards low-emission demand, deepening the guidelines conceived in the Term Market for Electricity from Renewable Sources (MATER) sanctioned in 2017. Finally, it is crucial to promote the development of electricity and natural gas transportation works that permit an increase in the grid's capacity, promoting local energy production and eliminating bottlenecks in consumption peaks. These create instability in the energy management system and public finances due to the volatility of international prices in the context of chronic foreign exchange restrictions.

Bibliography

Amsden, A. H. (1989). *Asia's next giant: South Korea and late industrialization.* Oxford University Press. https://doi.org/10.1093/0195076036.001.0001

Apud, E., Aráoz, J. C., Devoto, E., Echarte, R., Guadagni, A., Lapeña, J., Olocco, R. and Montamat, D. (2009). *Propuesta de una política de Estado para el sector energético argentino.* Instituto Argentino de la Energía.

_____ , Aráoz, J. C., Devoto, E., Echarte, R., Guadagni, A., Lapeña, J., Olocco, R. and Montamat, D. (2011). *La caída de las reservas de hidrocarburos. El problema más importante del sector energético argentino.* Instituto Argentino de la Energía.

Arceo, N. (2018). Las modificaciones tarifarias en la cadena del gas natural en Argentina. *Apuntes del cenes, 37(66).* https://doi.org/10.19053/01203053.v37.n66.2019.7636

Arceo, E. and Basualdo, E. (1999). Las tendencias a la centralización del capital y la concentración del ingreso en la economía argentina durante la década del noventa. *Cuadernos del Sur, 29.* https://cuadernosdelsur.org/wp-content/uploads/2017/07/cuadernossurnro29_ocr.pdf

Armstrong, M., Cowan, S. and Vickers, J. (1995). *Regulatory reform: Economic analysis and British experience* (2nd printing). MIT Press.

Ascencio, D. and Navarro Rocha, L. (2022). Auge y declive de las empresas públicas argentinas en el sector eléctrico. Un estudio a partir de las firmas Agua y Energía Eléctrica, SEGBA e Hidronor (1943-1983). *Revista de Gestión Pública, 11(1).* https://doi.org/10.22370/rgp.2022.11.1.3582

Azpiazu, D. (2005). *Las privatizadas I: ayer, hoy y mañana*. Capital Intelectual.

Barrera, M., Sabbatella, I. and Serrani, E. (2012). *Historia de una privatización. Cómo y por qué se perdió YPF.* Capital Intelectual.

_____ (2021). El complejo energético argentino y los impactos estructurales sobre el sector externo. *Ensayos de Economía, 31(59).* https://doi.org/10.15446/ede.v31n59.90320

Beesley, M. E. and Littlechild, S. C. (1989). The regulation of privatized monopolies in the United Kingdom. *The RAND Journal of Economics, 20(3).* https://www.jstor.org/stable/2555582

Beylis, G. and Cunha, B. (2017). Energy pricing policies for inclusive growth in Latin America and the Caribbean. World Bank Group. https://doi.org/10.1596/978-1-4648-1111-1

Calí, M., Cantore, N., Marin, G., Mazzanti, M., Nicolli, F. and Presidente, G. (2023). Energy prices and the economic performance of firms in emerging countries. *Structural Change and Economic Dynamics, 66.* https://doi.org/10.1016/j.strueco.2023.04.019

Canitrot, A. (1975). La experiencia populista de redistribución de ingresos. *Desarrollo Económico, 15(59).* https://doi.org/10.2307/3466477

Coates, D. (ed.) (2005). *Varieties of capitalism, varieties of approaches.* Palgrave Macmillan. https://doi.org/10.1057/9780230522725

Coatz, D., Dragún, P. and Sarabia, M. (2014). Rentabilidad en la industria argentina a 12 años de la crisis de la convertibilidad: mitos y realidades. Costos y precios en la industria manufacturera argentina (343; Boletín informativo Techint). Techint. https://cdi.mecon.gob.ar/bases/doc/techint/boletin/343.pdf

Compañía Administradora del Mercado Mayorista Eléctrico (CAMMESA) (2003). Programación estacional de agosto 2003.

Congreso de la Nación Argentina (1991, March 27). Ley 23.928 de 1991. *Convertibilidad del austral.* https://servicios.infoleg.gob.ar/infolegInternet/anexos/0-4999/328/norma.htm

_____ (1992, January 16). *Ley 24.065 de 1992. Régimen de la energía eléctrica.* https://servicios.infoleg.gob.ar/infolegInternet/anexos/0-4999/464/texact.htm

_____ (1992, May 20). *Ley 24.076 de 1992. Marco Regulatorio de la Actividad. Privatización de Gas del Estado Sociedad del Estado.* https://servicios.infoleg.gob.ar/infolegInternet/anexos/0-4999/475/norma.htm

_____ (2002, January 6). *Ley 25.561. Emergencia pública y reforma del régimen cambiario.* https://servicios.infoleg.gob.ar/infolegInternet/anexos/70000-74999/71477/norma.htm

Cont, W., Navajas, F. H., Pizzi, F. and Porto, A. (2021). *Precios y tarifas y política económica. Argentina 1945-2019.* Facultad de Ciencias Económicas (UNLP).

Costa, A., Álvarez Agís, E., Arceo, N. M., Bianco, C., Campos, L. and Wahlberg, F. (2010). *La anatomía del nuevo patrón de crecimiento y la encrucijada actual: la economía argentina en el período 2002-2010*. Atuel.

Devoto, A. E. and Cardozo, J. (2002). *La tarifa de distribución antes y después de la reestructuración del sector eléctrico* (Texto de Discusión 39; p. 40). Centro de Estudios de Economía de la Regulación (CEER).

Díaz Alejandro, C. F. (1975). *Ensayos sobre la historia económica argentina*. Amorrortu.

Dyner, I., Arango, S. and Larsen, E. R. (2006). Understanding the Argentinean and Colombian electricity markets. *Electricity Market Reform* (pp. 595616). https://doi.org/10.1016/B978-008045030-8/50019-9

Elliott, R., Sun, P. and Zhu, T. (2019). Electricity prices and industry switching: Evidence from Chinese manufacturing firms. *Energy Economics, 78.* https://doi.org/10.1016/j.eneco.2018.11.029

Ente Nacional Regulador de la Electricidad (ENRE) (2004). *Informe anual.* https://www.argentina.gob.ar/sites/default/files/ia_2004.pdf

Ente Nacional Regulador del Gas (ENARGAS) (2012). *Informe anual*. https:// www.enargas.gob.ar/secciones/publicaciones/informes-anuales-de-balance-y-gestion/informe-anual.php?ano=informe-anual-2012

Evans, P.B. (1995). *Embedded autonomy: States and industrial transformation*. Princeton University Press.

Facultad Latinoamericana de Ciencias Sociales (FLACSO) (1998). *Privatizaciones en la Argentina. Marcos regulatorios tarifarios y evolución de los precios relativos durante la convertibilidad* (Documento de trabajo 4; Privatización y regulación en la economía argentina, p. 111). http://publicacioneseconomia.flacso.org.ar/images/pdf/196.pdf

Fanelli, J. M. (2012). *La Argentina y el desarrollo económico en el siglo XXI: ¿cómo pensarlo? ¿qué tenemos? ¿qué necesitamos?* Siglo XXI Editores.

Fernández Bugna, C. and Porta, F. (2007). El crecimiento reciente de la industria argentina. Nuevo régimen sin cambio estructural. Crisis, recuperación y nuevos dilemas. La economía argentina, 2002-2007-LC/W.165-2007-p. 63-105.

Fundación de Investigaciones Económicas Latinoamericanas (FIEL) (1999). *La regulación de la competencia y de los servicios públicos: teoría y experiencia argentina reciente*. Fundación de Investigaciones Económicas Latinoamericanas. http://www.fiel.org/publicaciones/Libros/regulacion.pdf

García Zanotti, G., Kofman, M. and López Crespo, F. (2017). *Ganadores y perdedores en la Argentina de los hidrocarburos no convencionales*. EJES, OPSUR, Taller Ecologista. https://ejes.org.ar/wp-content/uploads/2022/04/Ganadores_y_perdedores_completoA42.pdf

Gerchunoff, P., Greco, E. and Bondorevsky, D. (2003). Comienzos diversos, distintas trayectorias y final abierto: más de una década de privatizaciones en Argentina, 1990-2002. ILPES. https://repositorio.cepal.org/server/api/core/bitstreams/d05d3cf3-7d90-4ec0-aacc-afe7036405d2/content

Gereffi, G., Humphrey, J. and Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy, 12(1).* https://doi.org/10.1080/09692290500049805

Gibbon, P., Bair, J. and Ponte, S. (2008). Governing global value chains: An introduction. *Economy and Society, 37(3).* https://doi.org/10.1080/03085140802172656

Goldstein, E., Kulfas, M., Margulis, D. and Zack, G. (2016). Efectos macroeconómicos del sector energético en la Argentina en el periodo 2003-2014. *Realidad Económica, 298(2-2016).* https://www.iade.org.ar/system/files/ediciones/re_298-.pdf

Hall, P. A. and Soskice, D. W. (eds.) (2001). *Varieties of capitalism: The institutional foundations of comparative advantage*. Oxford University Press. https://doi.org/10.1093/0199247757.001.0001

Haselip, J. and Potter, C. (2010). Post-neoliberal electricity market "re-reforms" in Argentina: Diverging from market prescriptions? *Energy Policy, 38(2).* https://doi.org/10.1016/j.enpol.2009.11.007

Herrera, G. and Tavosnanka, A. (2011). La industria argentina a comienzos del siglo XXI. *Revista CEPAL, 104.* https://repositorio.cepal.org/server/api/core/bitstreams/2dd7f5ca-7e3b-43fa-9dfb-294b332be7ce/content

Johnson, C. A. (2007). MITI and the Japanese miracle: The growth of industrial policy, 1925-1975 (Reprinted). Stanford University Press.

Kilian, L. (2008). The economic effects of energy price shocks. *Journal of Economic Literature, 46(4).* https://doi.org/10.1257/jel.46.4.871

Kozulj, R. (2005). La crisis energética de la Argentina: orígenes y perspectivas. *Fundación Bariloche idee paper, 7*.

_____ (2015). *El sector energético argentino. Un análisis integrado de sus problemas, impactos y desafíos macroeconómicos*. Editorial UNRN. http://rid.unrn.edu.ar:8080/bitstream/20.500.12049/62/1/kozulj.pdf

Kulfas, M. (2016). *Los tres kirchnerismos: una historia de la economía argentina, 2003-2015.* Siglo XXI Editores.

Lavarello, P. and Sarabia, M. (2015). *La política industrial en la Argentina durante la década de 2000* (45; Estudios y perspectivas). CEPAL. https://repositorio.cepal.org/server/api/core/bitstreams/95f7edfc-a4f5-461b-88f9-182efdefb313/content

Mallon, R. and Sourrouille, J. V. (1973). *La política económica en una sociedad conflictiva.* Amorrortu.

Mazzucato, M. (2014). *El Estado emprendedor: mitos del sector público frente al privado*. RBA Libros.

Mercado Electrónico de Gas (MEGSA) (s.f.). *Series históricas.* https://negociacion.megsa.ar/Usuario/Estadisticas/SeriesHistoricas.aspx

Ministerio de Planificación Federal, Inversión Pública y Servicios (2004, April 21). Resolución 208. Acuerdo para la Implementación del Esquema de Normalización de los Precios del Gas Natural en Punto de Ingreso al Sistema de Transporte. https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-208-2004-94405

Ministry of Energy (SE) (2002, March 14). *Resolución 2. Valores estacionales de invierno.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-2-2002-72979

_____ (2003, August 14). *Resolución 240. Fijación de precios –metodología.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-240-2003-87732

_____ (2004, January 26). *Resolución 93. Reprogramación trimestral de verano.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-93-2004-92689

_____ (2004, May 28). *Resolución 552. Programa de uso racional de la energía.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-552-2004-95378

_____ (2004, August 25). *Resolución 842. Reprogramación trimestral.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-842-2004-97790

_____ (2004, December 7). *Resolución 1434. Programación estacional de verano.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-1434-2004-101798

_____ (2005, May 9). *Resolución 745. Programa de uso racional de la energía eléctrica – modificación.* https://servicios.infoleg.gob.ar/infolegInternet/anexos/105000-109999/106157/norma.htm

_____ (2005, May 12). *Resolución 752. Normalización precios–acuerdo.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-752-2005-106449

_____ (2005, September 9). *Resolución 1063. Programa de uso racional de la energía eléctrica –modificación.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-1063-2005-109592

_____ (2006, September 5). *Resolución 1281. Comercialización en el mercado spot.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-1281-2006-119455/texto

_____ (2007, January 18). *Resolución 220. Habilitase la realización de Con- tratos de Abastecimiento entre el Mercado Eléctrico Mayorista (MEM).* https://servicios.infoleg.gob.ar/infolegInternet/anexos/120000124999/124456/ norma.htm

_____ (2008, September 19). *Resolución 1070. Régimen regulatorio de la industria y comercialización de gas licuado de petróleo.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-1070-2008-145200

_____ (2008, October 31). Resolución 1169. *Reprogramación Trimestral de Invierno 2008 y Programación Estacional de Verano.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-1169-2008-146829

_____ (2009, March 16). *Resolución 200. Habilitación para la realización de contratos de abastecimiento.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-200-2009-151503

_____ (2009, October 9). *Resolución 712. Habilitación para la realización de contratos de abastecimiento.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-712-2009158789

_____ (2009, November 5). *Resolución 762. Programa nacional de obras hidroeléctricas.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-762-2009-159941

_____ (2011, March 29). *Resolución 108. Habilitación para la realización de contratos de abastecimiento.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-108-2011-181099

_____ (2011, September 13). *Resolución 932. Complejo Hidroeléctrico Condor Cliff y La Barrancosa.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3%B3n-932-2011-187204

_____ (2011, November 7). *Resolución 1301. Programación Estacional de Verano.* https://www.argentina.gob.ar/normativa/nacional/resoluci%C3% B3n-1301-2011-189605

_____ (s.f.). *Precios de gas natural.* https://apps.energia.gob.ar/viz_3/pgas.php

Miñana, H. N. and Porto, A. (1982). Inflación y tarifas públicas: Argentina, 1945-1980. *Desarrollo Económico*. https://doi.org/10.2307/3466610

Muras, R., Melamud, A., Ortolani, N., Martínez de Vedia, R. and Einstoss, A. (2015). *Los subsidios energéticos en Argentina.* IAE, ASAP. https://asap.org.ar/img_publicaciones/12191500_InformeSubsidiosenergticosASAPIAE2015.pdf

National Executive Power (2002, February 13). *Decree 214/2002. Reordenamiento del sistema financiero.* https://servicios.infoleg.gob.ar/infolegInternet/anexos/70000-74999/72017/norma.htm

_____ (2004, February 13). *Decree 180/2004. Régimen de Inversiones de Infraestructura Básica de Gas durante el Proceso de Normalización del Servicio Público. Creación del Mercado Electrónico de Gas. Funcionamiento y obligaciones asociadas a dicho mercado. Medidas para mejorar la eficiencia asignativa en la industria del gas. Disposiciones complementarias. Condiciones especiales.* https://servicios.infoleg.gob.ar/infolegInternet/anexos/90000-94999/92678/norma.htm

_____ (2004, February 13). *Decree 181/2004. Facultase a la Secretaría de Energía para realizar acuerdos con los productores de gas natural a fin de establecer un ajuste del precio en el Punto de Ingreso al Sistema de Transporte adquirido por las prestadoras del servicio de distribución de gas por redes y la implementación de mecanismos de protección en beneficio de aquellos usuarios de esas prestadoras que inicien la adquisición directa de gas natural a los productores signatarios de esos acuerdos. Umbrales de consumo de las categorías del servicio residencial R1, R2 y R3.* https://servicios.infoleg.gob.ar/infolegInternet/anexos/90000-94999/92679/norma.htm

Navajas, F. (2015). *Subsidios a la energía, devaluación y precios* (Working paper 122; p. 40). Fundación de Investigaciones Económicas Latinoamericanas (FIEL). http://www.fiel.org/publicaciones/Documentos/DOC_TRAB_1431636145020.pdf

_____ (2017, January 18). Exportaciones de gas: ¿por qué tanto apuro? *El Cronista.* http://www.cronista.com/columnistas/Exportaciones-de-gas-Por-que-tanto-apuro-20170118-0023.html

Navarro Rocha, L. (2020). Las empresas de energía eléctrica entre las reformas de mercado y la posconvertibilidad. *Realidad Económica, 50(334).* https://ojs.iade.org.ar/index.php/re/article/view/119/79

_____ (2021). Grandes empresas en la Argentina de la posconvertibilidad. El caso del grupo Pampa Energía (2004-2015). *H-industri@: Revista de historia de la industria, los servicios y las empresas en América Latina, 0(29).* https://doi.org/10.56503/H-Industria/n.29(15)pp.71-99

Nelson, R. R. (ed.) (1993). *National innovation systems: A comparative analysis.* Oxford University Press.

Perez, C. (2010). Technological revolutions and techno-economic paradigms. *Cambridge Journal of Economics, 34(1).* https://doi.org/10.1093/cje/ bep051

Pistonesi, H. (2001). *Desempeño de las industrias de electricidad y gas natural después de las reformas: el caso de Argentina.* ILPES. https://repositorio.cepal.org/server/api/core/bitstreams/81bb5792-e2b5-4da6-891f-e5802980e582/ content

Pollitt, M. (2008). Electricity reform in Argentina: Lessons for developing countries. *Energy Economics, 30(4).* https://doi.org/10.1016/j.eneco.2007.12.012

Porta, F., Santarcángelo, J. and Schteingart, D. (2017). Un proyecto político con objetivos económicos. Los límites de la estrategia kirchnerista. In A. Pucciarelli and A. Castellani (eds.). *Los años del kirchnerismo. La disputa hegemónica tras la crisis del orden neoliberal* (pp. 99-143). Siglo XXI Editores.

Puig, J. P. and Salinardi, L. H. A. (2015). *Argentina y los subsidios a los servicios públicos: un estudio de incidencia distributiva* (Documento de trabajo 183). Centro de Estudios Distributivos, Laborales y Sociales (CEDLAS). http://sedici.unlp.edu.ar/bitstream/handle/10915/51280/Documento_completo .pdf?sequence=1&isAllowed=y

Sabbatella, I. and Serrani, E. (2021). Integración gasífera entre Argentina y Bolivia. *Estudios Internacionales, 53(199),* Article 199. https://doi.org/10.5354/0719-3769.2021.60093

Sato, M., Singer, G., Dussaux, D. and Lovo, S. (2019). International and sectoral variation in industrial energy prices 1995-2015. *Energy Economics, 78.* https://doi.org/10.1016/j.eneco.2018.11.008

Secretaría de Gobierno de Energía (2019). Balance de gestión en energía 2016-2019. https://www.energia.gob.ar/contenidos/archivos/Reorganizacion/sintesis_balance/2019-12-09_Balance_de_Gestion_en_Energia_2016-2019_final_y_anexo_pub_.pdf

Serrani, E. (2019). Regulación tarifaria del gas natural en la posconvertibilidad. Análisis de sus efectos sobre los ingresos y el desempeño de las empresas. *Cuadernos de Economía Crítica, 5(10).* https://cec.sociedadeconomiacritica.org/index.php/cec/article/view/152/360

_____ (2020). Modelos de regulación de servicios públicos de gas natural en Argentina, 1967-2017. *América Latina en la Historia Económica, 27(2).* https://doi.org/10.18232/alhe.1062

Serrani, E. and Barrera, M. (2018). Efectos estructurales de la política energética en la economía argentina, 1989-2014. *Sociedad y Economía, 34.* http://dx.doi.org/10.25100/sye.v0i34.6482

Thomas, S. (2006). The British model in Britain: failing slowly. *Energy Policy, 34(5).* https://doi.org/10.1016/j.enpol.2005.11.013

Timmer, M. P., Erumban, A. A., Los, B., Stehrer, R. and De Vries, G. J. (2014). Slicing up global value chains. *Journal of Economic Perspectives, 28(2).* https://doi.org/10.1257/jep.28.2.99

Vispo, A. (1999). *Los entes de regulación: problemas de diseño y contexto: aportes para un urgente debate en la Argentina.* Grupo Editorial Norma.