Venezuela's Lagged-price Adjustment

Inflationary Pass-through, Consumption and Distributional Impacts, and (Potential) Policy Implications

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DISCUSSION
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Abstract

This work seeks to estimate the impact of the adjustment in the prices of a series of goods and services that have been regulated for 20 years, something that implies high magnitudes. Using Input-Output and Social Accountability matrices, we find that the overall (direct and indirect) effect on the general price level of simultaneous price increases of 10% on fuel, telecommunications and public services could be around 0.67%, whereas a 10% devaluation entails a 2.83% impact. Comparing between lowest and highest income deciles, a simultaneous 10% increase in all the above-mentioned products plus wages and the exchange rate, implies a 5.58% increase in expenditures of the lowest income household (5.56% in the highest), whereas it represents 12.43% of its income (3.6% in the highest). The results from an econometric exercise for the prices of fuel, electricity and broadband controlling for domestic currency, overall liquidity, and direction of the adjustment, reveal pass-through of 0.62%, 0.71% and 0.32%, respectively for each 10% increase on these prices; mostly in line with the input-output matrix approach and still rather low. Thus, no matter how low the pass-through is, given the magnitude of the price adjustment (due to the lags), it has welfare and distributional effects. A strategy to mitigate such impact in the middle of a humanitarian crisis and in a sustainable way is evaluated according to different policy scenarios. Overall, the results from a financial program framework suggest that a gradual approach for adjusting fuel and regulated services prices, together with mitigating measures, although fiscally costlier (but certainly cheaper than the status-quo) may produce outcomes in terms of GDP growth and inflation that are better than those obtained with a strategy of upfront adjustment in prices without mitigating measures.

Keywords: Pass-through, Input-Output Matrix, Price subsidies, Gasoline, Venezuela
JEL classification: E31, E53, F31, H23, H24, J30

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Contents

List of Tables

List of Figures

I Introduction

Venezuela as well as other developing (and oil-exporting) economies, has frequently fixed the local nominal price of oil refined products and public services for extended periods of time, providing the population a generalized subsidy scheme. When coupled to an inflationary environment however, the nominal fixed price generates a subsidy mechanism that increasingly absorbs fiscal resources and deepens distortions in relative prices throughout the economy.

Sooner or later, policymakers are faced with the tough decision of adjusting the local prices of these goods and services. In this decision, a fundamental factor is the potential direct impact of this price adjustment as well as its indirect effects on consumer prices. There is, however, an additional key factor to consider in the case of Venezuela. The ongoing collapse of the Venezuelan economy and its tremendous impact on the standard of living of the population, makes the adjustment of lagged prices an extremely difficult task, both from an economic and political standpoint.

This paper has three main objectives. The first is to use different methodological approaches to produce estimates of the pass-through effects to the Consumer Price Index (CPI) of adjusting lagged prices. The second is to consider welfare and distributive effects of adjusting these lagged prices. The third objective is to introduce the estimation of the pass-through effect in a Financial Programming exercise and assess the macroeconomic impact of different scenarios for the adjustment of lagged prices.

The document is organized in twelve sections including this introduction. Section II presents background and motivation. Section III reviews the relevant literature. Section IV presents the method and results from the input-output matrix approach. Section V does the same for the Social Accountability Matrix approach. Sections VI to VIII present the econometric approach. Section IX discusses the macroeconomic impact of different scenarios for the adjustment of lagged prices. Section X concludes and sections XI and XII contain the references and the annex, respectively.

II Background and Motivation

The economic situation of Venezuela has become critical. At the end of 2019, GDP is estimated to have contracted for the sixth consecutive year, accumulating a drop greater than 65% during this period. Oil production will have contracted 70%, reaching a production of 600.000 barrels per day from 2.300.000 b/d in 2013. Sectors such as construction (-93%), commerce (-79%) and manufacturing (-76%), lead this fall. Similarly, although to a lesser extent, sectors associated with the State such as electricity-water and government services have contracted between 30% and 16%, respectively.

The lack of external resources due to the fall in oil production has generated an abrupt fall in imports, with imports in 2018 being 12% of imports in 2012[1]. This has significantly affected the

[1] According to the latest mirror figures (e.g. reported by business partners) from UN, Comtrade.

provision of goods and services, as the dependence on imports substantially affected in this period[2]. This situation, together with the closing of external financing sources due to the increase in the level of debt, the growing financing needs, and economic sanctions[3], also led to the loss in the level of reserves in the country. In this context, the government has relaxed the exchange rate regime, allowing the adjustment of the exchange rate and the increase in foreign currency transactions, although no substantial improvements in production have been observed.

During the oil price boom, oil export revenues allowed a substantial expansion of spending and public debt. In addition, as the adjustments were postponed and international financing was closed, the government turned to the massive monetary financing of the deficit towards the end of 2017, triggering the hyperinflationary process that affects the country today.

Hyperinflation has shrunk the purchasing power of tax revenues and the inflationary tax during 2018, which inevitably reduced spending and thereby resulted in the loss of public services. In 2019, the government has tried to capture more seigniorage by increasing bank reserves in the BCV at the cost of reducing further bank credit to the private sector, and with scant gains in terms of the provision of public goods[4].

This serious economic meltdown occurs in a context where, in the last 20 years, there has been an increase in the participation of the State in the economy, which has undermined the rule of law, property rights and the incentives to invest in the country. Supported by the oil boom, the government increased its participation and influence in the economy through control policies, both on domestic prices and in the FX market, as well as a long list of expropriations of companies and productive assets. The government used oil resources and foreign public debt to mitigate the impact of these measures on the economy, and oil resources were not saved for future generations. In June 2019, 4 million people are confirmed to have emigrated from Venezuela[5].

Given the great and numerous challenges facing the country today, it is necessary to focus on planning the sequence of interventions to restore a functional market economy, macroeconomic stability and resume economic growth. For the attainment of these goals, it is crucial to perform an adjustment of lagged prices.

III Literature Review

The use of a country's system of national accounts and its applications, such as input-output tables, has been widely used to estimate the impact of input and factor price changes on overall prices and production costs. Thus, an exhaustive literature review goes beyond the scope of this work, but a few key references are worth to be stated.

[2] Imports grew from around 20% of GDP in 1997 to 50% in 2012.

[3] Between 2017 and 2019, following the social and political consequences of the economic crisis, some members of the international community, especially the United States, have implemented economic sanctions on the Venezuelan government and the state oil company, making access to external financing even more complicated.

[4] This year it has registered multiple national blackouts, the water and sanitation service has collapsed in different regions of the country and health and education services are increasingly under provided.

[5] https://www.unhcr.org/en-us/news/press/2019/6/5cfa2a4a4/refugees-migrants-venezuela-top-4-million-unhcr-iom.html

This type of analysis was started by W. Leontief (1936) with an estimation of the price repercussion effect of wages and profit changes in a certain industry on product prices in other industries for the United States economy in the period 1919-1939. Since then, the basic Leontief price model has been modified and developed in various directions[6].

For Latin America, the approach has also been used widely, reason why we will concentrate on mentioning the works that were considered for this analysis. Cervini-Iturre (2002), who applied the model for social price policy analysis and implementation in Colombia and Mexico, published a seminal book based Mexican economy. In 2005, Cepal published a widely used and cited volume on the theory and applications of the model. Also, Lora and Prada (2014) devoted a whole chapter on the applications of the model for the Colombian economy.

In Bolivia, the matrix was also used by Jemio and Cupé (1996) for estimating the impact of changes in wages, gasoline prices, and the exchange rate on the Bolivian economy. More recently, Caicedo and Tique (2012), building on previous work by Sánchez (1993) and others, used the model to estimate the inflationary impact of the new formula for estimating gasoline prices in Colombia. For Venezuela, a recent study by IESA (2019) used a social accountability matrix to estimate the inflationary and welfare impacts of the removal of price subsidies across a number of sectors.

Econometric estimations based on panel data of the pass-through effects to consumer prices of adjusting gasoline prices are not very common in the literature. Most papers focus on the pass-through effect of oil prices to gasoline prices (for example Abdallah and Kpodar, 2016), or on the pass-through from oil prices to the CPI (for example, Gao, Kim, and Saba, 2014). We found, however, several econometric studies that apply time-series techniques to specific countries.

Cervantes, López y Montiel (2011) investigate the economic impact of gasoline prices in Mexico using autoregressive vectors and vector error correction models. The authors use monthly data for the period 2002-2009 of the National Consumer Price Index, the National Price Index for low octane rating gasoline, and the National Price Index for high octane rating gasoline. Their general conclusion is that the prices of neither type of gasoline has a significant impact on the National Consumer Price Index.

Ramírez de León (2013) examines the effect of oil prices on the consumer price index for the Dominican Republic. The author estimates a Vector Autoregressive Model with monthly data for the period 2000-2011. He concludes that a shock of 10% in the real price of oil generates a change of 0.8 percentage points in the non-core CPI. The effect of this shock remains for 8 to 12 months. The author, however, points out that the impact of oil prices on gasoline prices is substantially limited by government regulation, thus the influence of oil prices on consumer prices is weakly related to fluctuations in gasoline prices.

[6] See: Lee et al. (1976), Polenske (1976), Gupta (1977), Melvin (1979), Miller and Blair (1985) and United Nations, several years.

Ozdemir y Akgul (2015) study the effects of sudden changes in oil prices and domestic gasoline prices on inflation in Turkey. They apply Markov-switching vector autoregressive models (MS-VAR) to monthly data from October 2005 to December 2012. They detect two regimes with different effects of changes in crude oil and domestic gasoline prices on consumer prices. They also report that a sudden increase in gasoline price is more important for consumer price inflation than crude oil price shocks. Another finding is the presence of a pass-through effect from oil price and gasoline price to core inflation.

Similar to the case of adjustment in gasoline prices, we did not find specific studies that rely on panel-data econometric methods to examine the impact of changes in electricity prices on consumer inflation. Lozano and Rincón (2010) used the input-output matrix approach employed in the first part of this paper to examine the influence of electricity prices on inflation in Colombia. Two studies, one for Peru and the other for Chile, estimate the effects on inflation of adjusting electricity prices using the Vector Autoregression approach. Tolentino and Zarate (2014) apply a VAR model using quarterly data (2003.1-2013.4) for Peru. They find that a persistent increase in the price of electricity of 20% during eight quarters generates a maximum impact on consumer inflation of 0.87%. García (2012) measures the impact of the price of electricity on the Chilean economy using quarterly data for the period 2000-2011. The econometric estimation based on a VAR model indicates that a permanent rise of 10% in the price of electricity for eight quarters increases inflation by 0.05% during the first two quarters and after that inflation starts to decrease. The author finds that this result is explained by the vigorous reaction of the monetary authority that raises the interest rate to counteract the inflationary pressures of the increase in electricity prices.

We did not find specific literature that uses panel data econometrics to study the impact of changes in prices of broadband services on consumer inflation. Panel data studies in this area are generally focus on the factors that influence the dissemination of the service, particularly regulation, the impact of its development on economic activity, and determinants and differences in the price of the service among countries. For example, Friesenbichler (2016) uses an unbalanced panel of thirty OECD countries for the period 1996-2014 to examine the impact of the broadband penetration rate (fixed broadband subscriptions as a share of the total population) on CPI inflation. Introducing more control variables in the estimation, the author corroborates previous results that indicate that broadband penetration rates reduce inflation.

IV Input-Output Matrix Approach

IV.1 Methodological aspects

Under the Input-Output (IO, from now on) Matrix price model[7], the value of gross production of a given economic sector, j, can be represented through the following equation:

$$x_{1j}p_1 + x_{2j}p_2 + x_{3j}p_3 + \cdots + x_{ij}p_i + z_jq_j = x_jp_j \quad (1)$$

[7] For detailed explanations on the theory and applications of the Input-Output tables, see United Nations (2018) and Cepal (2005).

where:

x_{ij} = domestic intermediate goods (volumes)
x_j = output of sector j (volumes)
p_i = price index of product i
z_j = value added to sector j (volumes)
q_j = factor index price for added value in sector j

and given that,

$a_{ij} = \frac{x_{ij}}{x_j}$ = input coefficients for intermediate consumption (also called "technical" coefficients)
$v_j = \frac{z_j}{x_j}$ = input coefficients for value added

then, solving for x_{ij} and z_j above, and substituting these in equation (1), we obtain:

$$a_{1j}x_jp_1 + a_{2j}x_jp_2 + a_{3j}x_jp_3 + \cdots + a_{ij}x_jp_i + v_jx_jq_j = x_jp_j \quad (2)$$

dividing by x_j yields a price equation of the type:

$$a_{1j}p_1 + a_{2j}p_2 + a_{3j}p_3 + \cdots + a_{ij}p_i + v_jq_j = p_j \quad (3)$$

solving for value added, v, we obtain the equation of total (direct and indirect) requirements of intermediate inputs for sector j:

$$(1 - a_{j1})p_1 - a_{j2}p_2 - a_{j3}p_3 - \cdots - a_{ji}p_i = v_jq_j \quad (4)$$

Finally, by adding all the n economic sectors, we can present the IO "price" model in matrix notation:

$$A^Tp + diag(q)v^T = p \quad (5)$$
$$p - A^Tp = diag(q)v^T \quad (6)$$
$$(I - A^T)p = diag(q)v^T \quad (7)$$
$$p = (I - A^T)^{-1}v^T \quad (8)$$

where:

A^T = transposed matrix of input coefficients for intermediate consumption (a_{ij})
$diag(q)$ = diagonal matrix of value added input' prices
I = Identity matrix
$(I - A^T)$ = transposed Leontief matrix

$(I - A^T)^{-1}$ = transposed Leontief inverse[8]
v^T = column vector of input coefficients for added value (v_j)
p = column vector of index prices for products

Equation (8) is the solution to the linear equation system[9]. It says that product prices are a function of basic production inputs (e.g. imports, wages, profit margins, taxes, etc.). The elements of the Leontief inverse matrix are thus multipliers that measure the impact on the prices of the i products when there are changes in basic production costs.

This framework is therefore used to study the impact of changes in primary inputs (input/factor coefficients and prices) on final product prices. When the price model is applied, it is assumed that all conditions of perfect competition are fulfilled: higher prices for primary inputs will cause higher product prices in competitive markets. Thus, it allows one to simulate the impact of cost-driven inflation. In the particular case of this paper, the price model is used to study the impact of an increase in the price of fuels and other utilities on other product prices, the aggregate price level of the economy and the consumption basket.

By construction, equation (8) assumes that the initial technical coefficients have been calculated with an initial price vector of 1 monetary unit (e.g. 1 VES). The model therefore implies that by multiplying price vector $p = 1$ by monetary vectors of gross production (gp), value added (v) and/or consumption basket (cpi), the total *values* of gross production, value added and consumption basket are obtained.

To calculate the total (direct and indirect) impact of an increase in the price of an intermediate input (e.g. electricity) or production factor (e.g. labor) at an aggregated price level, the percentage increase cannot simply be added to the input-output matrix. This, since the initial technical coefficients would be altered. The procedure must assume that they remain constant when an increase in the input/factor price occurs. Therefore, the price increase must be made in a way that does not alter the initial technical coefficients, that is, treating the increase as a tax or surcharge to the input, with the exception of that required for its own production, and adding it to the initial price vector, p.

Thus, from equation (8) we have the initial price vector:

$$p = (I - A^T)^{-1} v^T = 1 \tag{9}$$

then, the new price vector will be:

$$p^* = (I - A^T)^{-1} v^T + (I - A^T)^{-1} (A_{ij} \delta) \tag{10}$$

where:

[8] Matrix of total intermediate requirements (direct and indirect). For properties of this matrix, see: Cepal (2005).
[9] It is assumed that diag(q) is equal to one. That is, the price of value added factors for each economic sector is equal to 1.

A_{ij} = vector of input i requirements for sector j
δ = percent change for input i price

Then, multiplying the new price vector p^* by the vectors of gross production (gp), value added (v) and/or consumption basket (cpi), the after-price-increase *values* of gross production, value added and the consumption basket are obtained. The percentage difference between the values of gross production, value added and consumption basket before and after the increase in the price of the input, measures the total impact of this change in the price level on gross production, value added and the consumption basket, respectively. Or, alternatively, by weighting the variation of the product prices by their corresponding weights in overall production, value added and the consumption basket.

In the case of the consumption basket, the overall impact of the increase is obtained by weighting the product price variation (resulting from the model) by their corresponding weights in the Consumer Price Index (CPI). This matching process (between the j economic activities appearing in the input-output tables, to the k expenditure categories appearing in the CPI representative basket) is done through a correlative matrix[10].

More formally, direct and indirect impacts on product price adjustments in the economy and, consequently, on household's expenditures , can be identified. Regarding direct impacts, these can be identified through the following expression:

$$\frac{dC_{D,i}}{C} = w_i * \frac{dP_i}{P_i} \tag{11}$$

where:

$\frac{dC_{D,i}}{C}$ = direct % impact on household consumption (a proxy of welfare) of adjusting the price of good/service i

w_i = weight of the price-adjusted good/service on the CPI (or household's consumption basket)

$\frac{dP_i}{P_i}$ = % adjustment in the price of i

i = good or service subject to indirect subsidy policy (e.g. i = electricity)

Regarding indirect impacts, these are identified through the following expression:

$$\frac{dC_{I,i}}{C} = w_j * \frac{dP_{j,i}}{P_{i,i}} \tag{12}$$

[10] The CPI used was the National Consumer Price Index. The correlative Matrix is available upon request.

where:

$\frac{dC_{I,i}}{C}$ = indirect % impact on household's consumption (a proxy of welfare) of adjusting the price of good/service i

w_j = weight of the non-adjusted good or service on household's consumption basket

$\frac{dP_{j,i}}{P_{j,i}}$ = % change in the price of the non-adjusted good or service, given the price adjustment on good or service i

j = good or service not subject to adjustment

Aggregating the direct impact of different i products, that is, adding equation (11) for each i, the direct impact of simultaneously adjusting the prices of i products is obtained. By symmetry, the aggregation of the remaining unadjusted sectors' price variation yields the simultaneous indirect effect of simultaneously adjusting the prices of different i products.

Among the advantages of the IO model are that it explicitly considers the purchase and sale relationship between the various economic sectors. However, it should be borne in mind that this type of exercise is completely timeless, since it does not contemplate any adjustment dynamics, being an exercise of comparative static. Nonetheless, it allows to quantify through costs, both, the direct (e.g. the increase in fuel) and the indirect impacts (e.g. the increase in the price of other goods and services caused by the adjustment in the price of fuel).

IV.2 Context, data, and results

Venezuela has a long history of indirect price subsidies and price controls[11]. During the XXI century, prices, especially those related to public services, have been unadjusted by a considerable amount of time. According to IESA (2019), consumer price adjustments on fuel, electricity, water, sanitation, transport, and telecommunications have been lagged by 20 years. Such delay on price adjustments has had the natural consequences of price subsidies: high fiscal burdens[12], lack of investment[13], and the regressivity of the distribution of income[14].

Currently, given hyperinflation, scarcity and the involved opportunity costs in acquiring goods and services at official prices, these are not operating (at least at an aggregated sense). Instead, and in the absence of detailed, official information regarding the prices effectively paid by consumers, survey and anecdotical evidence[15] suggests that there is a *shadow price* that incorporates these

[11] See: Venezuela before Chavez: Anatomy of an Economic Collapse (2014).
[12] See: V. Tanzi (1982). G. Di Bella et al. (2015).
[13] See: Di Bella et al. (2015).
[14] See: IMF (2014).
[15] https://efectococuyo.com/economia/venden-gasolina-en-dolares-tras-nuevo-periodo-de-escasez-en-venezuela/

above-mentioned elements and supply-demand dynamics. Given the long lags on official price adjustments but also the nature of parallel markets[16], *effective* prices (i.e. considering shadow and official prices) are considerably higher than the official ones. Putting together all these elements, it has to be acknowledged that any estimate of an effective price is subject to a high degree of uncertainty.

Table 1. Domestic Prices of Fuel

			Adjustment (%)	
Product	**Unit Price (US$)**		**Production Cost**	**International**
Fuel	Official	$3x10e^{-9}$	$7.33x10e^{+7}$	$1.67x10e^{+8}$
	Effective	0.05	353	900
	Production Cost	0.23		
	International	0.50		

Source: Official Gazettes, and authors' calculations.

As Table 1 above shows, any price adjustment on these *lagged* goods and services will most likely imply prices more than doubling, with a corresponding significant impact on inflation and, in turn, real wages and household expenditures, a measure of welfare. For instance, if we depart from the premise that current prices of fuel, electricity and other utilities are close to zero, any price increase implies a huge percentage variation. However tiny the pass-through effect may be, its impact on inflation will be immense.

Take an adjustment in the price of gasoline from the current official price of US$ $3x10e^{-9}$, up to the estimated production cost per liter of US$ 0.23, it implies a percentage variation of $7.33x10e^{+9}$. With a pass-through coefficient towards consumer prices of 0.03[17] for each percentage point of inflation, the increase in the CPI would be around 2,200,000%. Thus, if we start from prices close to zero, policy makers would have to decide, for example, on the fiscal side, if the implementation of a mitigating or compensatory measure is fiscally feasible or, on the monetary side, what level of price variation they would be willing to accommodate through monetary policy.

Following the method described in the previous section, below are the results of a standard exercise of the price model of the IO matrix that estimates the impact on the overall price level of price increases on electricity, fuel, sanitation, telecommunications, and water sectors. In addition, due to their relevance, two additional prices were included: wages and the nominal exchange rate. For this, Central Bank of Venezuela's (BCV) IO matrix for the year 1997 —the last year with definitive and available information— was used[18]. The IO matrix is used in its extended form of 121 x 121 products and sectors.

Given the uncertainty relying the effective price paid by consumers and the magnitude of the adjustment, three reference price adjustment values were considered for the simulation exercise:

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[16] See Lindauer (1989).
[17] The lowest effect of the estimates in this study.
[18] http://www.bcv.org.ve/estadisticas/matriz-insumo-producto for the matrix. For methodological aspects, see: http://www.bcv.org.ve/estadisticas/cuentas-nacionales-metodologia

1%, 10% and 100%. Table 2 below shows the individual, simultaneous, direct and indirect effects generated by such adjustment scenarios on the CPI and the GDP deflator. It is important to note that the calculated inflationary effects refer to one-time, month-to-month effects to the general price level.

Table 2. Impact of lagged price adjustments – 1997 IO matrix (in percent)

		CPI			GDP deflator		
Adjustment	**Sector**	**Direct**	**Indirect**	**Total**	**Direct**	**Indirect**	**Total**
1%	Fuel	0.01	0.04	0.04	0.04	0.03	0.07
	Electricity	0.01	0.04	0.05	0.02	0.03	0.05
	Water	0.00	0.00	0.01	0.00	0.00	0.01
	Telecommunications	0.05	0.02	0.07	0.02	0.02	0.05
	Sanitation	0.00	0.00	0.01	0.00	0.00	0.01
	Simultaneous, excl. salaries and dev.	**0.07**	**0.11**	**0.18**	**0.05**	**0.13**	**0.18**
	Salaries	-	0.25	0.25	-	0.29	0.29
	Devaluation	-	0.14	0.14	-	0.11	0.11
	Simultaneous, all	**0.07**	**0.50**	**0.57**	**0.05**	**0.54**	**0.59**
10%	Fuel	0.07	0.37	0.43	0.42	0.27	0.69
	Electricity	0.14	0.37	0.51	0.18	0.32	0.50
	Water	0.03	0.04	0.07	0.02	0.04	0.06
	Telecommunications	0.49	0.22	0.72	0.22	0.24	0.46
	Sanitation	0.02	0.05	0.07	0.02	0.04	0.07
	Simultaneous, excl. salaries and dev.	**0.71**	**1.09**	**1.80**	**0.47**	**1.32**	**1.79**
	Salaries	-	2.50	2.50	-	2.94	2.94
	Devaluation	-	1.42	1.42	-	1.15	1.15
	Simultaneous, all	**0.71**	**5.01**	**5.72**	**0.47**	**5.41**	**5.87**
100%	Fuel	0.66	3.66	4.32	4.23	2.69	6.92
	Electricity	1.40	3.72	5.12	1.81	3.18	4.99
	Water	0.30	0.44	0.74	0.19	0.43	0.61
	Telecommunications	4.94	2.24	7.18	2.24	2.42	4.65
	Sanitation	0.17	0.50	0.67	0.25	0.43	0.68
	Simultaneous, excl. salaries and dev.	**7.09**	**10.94**	**18.03**	**4.66**	**13.20**	**17.86**
	Salaries	-	25.03	25.03	-	29.40	29.40
	Devaluation	-	14.17	14.17	-	11.48	11.48
	Simultaneous, all	**7.09**	**50.15**	**57.24**	**4.66**	**54.08**	**58.74**

Source: authors' calculations.
1/ Salaries and devaluation do not pose a breakdown between direct and indirect effects as they enter indirectly in the production function of each j sector.

Table 2 reads the following way: on the second block of adjustments (i.e. when prices are increased by 10%), the fuel row says that a 10% increase in the price of this input causes an

increase of 0.43% on the CPI and 0.69% on the GDP deflator. The row reveals that the total impact of the increase in the price of fuels in the CPI is lower than in the GDP deflator. This is due mainly to two reasons: (i) fuel has a lower direct impact in the consumption basket that, once transformed into different types of transport services (i.e. the indirect impact), increases the total impact of the initial price adjustment; (ii) over the production process, fuels have higher direct and lower indirect impacts than in the CPI, this is logical, as some important activities rely heavily on fuel (e.g. manufacturing, agriculture, mining, etc.).

The prices with the most significant impacts on the CPI are telecommunications and electricity, while fuels and electricity are the most important on the GDP deflator. According to the calculations, a 10% increase in the price of telecommunications entails a 0.72% increase in the CPI. The row simultaneous, excluding salaries and devaluation says that a simultaneous increase of 10% in the price of all these products results in an increase of 1.80% in the CPI and of 1.79% in the GDP deflator. If all prices were to double (a 100% increase), the monthly impact in the CPI will be 18.03%.

Moreover, a 10% rise in wages implies a 2.5% increase on the CPI (2.94% in the GDP deflator), whereas a 10% devaluation yields a 1.42% on the CPI (1.15% in the GDP deflator). A simultaneous 10% increase in all the above mentioned products plus wages and the nominal exchange rate, implies a 5.72% increase on the CPI (5.87% in the GDP deflator). If all these prices are doubled in a single month, inflation will be around 57.2% the month after.

It is important to highlight that, as the Venezuelan economy increased its reliance on imported products (particularly intermediate and final goods), the impact of a devaluation could be much higher on both, the CPI and the GDP deflator. This hypothesis will be explored further in the document.

The results suggest that a simultaneous correction of relative prices in Venezuela could have an important impact on an already accelerated price behavior, continuing the deterioration of the purchasing power of consumers. Therefore, the natural (policy) questions that surge in such situation are those related to asking: (i) how much of a subsidy to maintain and where? (ii) how fast should the adjustment be done, is it tolerable for the population? (iii) is maintaining a subsidy feasible from a fiscal perspective in the middle of humanitarian emergency?

As a representative example of an answer to the first question, given that ground transportation expenses play an important role in consumer expenditures, it will be important to identify the impact of maintaining the gasoline subsidy to the sector (i.e. keeping the price of ground transportation sector unaffected while increasing the price of fuel). Table 3 below shows that keeping the price of transportation constant —while simultaneously increasing all the above-mentioned prices by 10%— will reduce the impact on the CPI by 21 basis points (0.21%), from 1.80% to 1.69%

Table 3. Impact of lagged price adjustments excl. ground transportation (in percent)

		CPI		
Adjustment	**Sector**	**Direct**	**Indirect**	**Total**
1%	Fuel	0.01	0.04	0.04
	Fuel, excl. Transport	0.01	0.03	0.03
	Simultaneous	0.07	0.11	0.18
	Simultaneous, excl. transport	0.07	0.09	0.16
10%	Fuel	0.07	0.36	0.43
	Electricity	0.07	0.26	0.33
	Simultaneous	0.71	1.09	1.80
	Simultaneous, excl. transport	0.71	0.88	1.59
100%	Fuel	0.66	3.63	4.29
	Electricity	0.66	2.63	3.30
	Simultaneous	7.09	10.91	18.00
	Simultaneous, excl. transport	7.09	8.78	15.86

Source: authors' calculations.

The results from Table 3 suggest that, at least in the case of ground transportation and regarding the consumption basket, the impact is not that different from the one that rises prices in this sector as well. The question then poses the burden on the household expenditures and fiscal impacts of such measures, questions that will try to be answered further in the document.

Finally, it is important to highlight that the IO model tends to overestimate the actual impact on prices. This, as the IO analysis is static: when using fixed technical coefficients and weights, it does not consider substitution in production. Fixed coefficients also cancel the possibility of economies (or diseconomies) of scale, imposing the assumption that all firms have the same technology and the same levels of efficiency. Additionally, the model ignores demand aspects (such as the substitution effect) that are decisive for quantifying the true change in the price level.

Despite these important limitations, it should nonetheless be noted that models based on input-output matrices provide very useful information about intersectoral interactions. This way, it is easy to quantify the inflationary impact by identifying the direct information on the structure of the sectorial interrelations and their multiplier effects.

V Social Accountability Matrix Approach

V.1 Methodological aspects

Another analytical framework is the social accountability matrix (SAM, from now on). The SAM incorporates to the IO matrix the inter-relationship between gross value added, final uses and incomes. This way, the SAM shows the entire circular flows of incomes for an economy at any point in time[19].

[19] See United Nations (2018).

The construction of a SAM with any significant degree of disaggregation requires the availability of some key datasets, such as: National Accounts with institutional sector accounts; Supply-Use Tables (SUTs); statistics from household surveys; government budget accounts; trade statistics; and balance of payments statistics.

The SAM is a square matrix in which each account is represented by a row and a column where each cell shows the payment from the account of its column to the account of its row. Thus, the columns of the table represent expenditures while the rows reflect the corresponding revenues. The total for each column should match the total for the corresponding row.

The table helps to verify the allocation of primary income among different institutions. The secondary distribution of income shows how the balance of the primary income of an institutional sector and the total economy's national income are allocated by redistributive transactions such as taxes on income, taxes on wealth, social contributions, social benefits and current transfers. The use of disposable income shows how much is spent by the various institutions on consumption and saving (UN, 2018).

V.2 Context, data, and results

A recent study from IESA (2019), built upon Venezuela's System of National Accounts (SNA) from 2014 and households surveys (e.g. Encuesta de Seguimiento de los Hogares (ESH)) from 2017, to construct a SAM for the country[20]. As in the case of the IO matrix, the authors considered all the economic activities from Venezuela's SUTs, although they used a more broad aggregation. From the ESH, households' consumption was aggregated and distributed by the 13 main categories associated to the CPI.

In this sense, the authors constructed a micro-SAM, as they called it. Such SAM incorporates 196 products, 114 activities, 7 institutional sectors (the household sector being open into deciles) and the rest of the world. Therefore, as explained above, the matrix shows Venezuela's production, generation, allocation and use of income, and the capital and financial accounts for the year 2014.

The SAM constructed in the IESA study represents the latest available information on Venezuela's macroeconomic interrelations and interdependencies. More importantly, and with respect to the 1997 IO tables used in the previous section, it represents a closer "state of affairs" view of Venezuela's distorted economy. While such view could appear more accurate of the current situation, it therefore fails to provide a picture of the behavior of the macroeconomy (or at least of the production process) when conditions are less distorted —as is the case of the 1997 IO matrix— a scenario one would expect to see after distortions begin to be removed. Therefore, in this study, the use of these two matrices seeks to provide a representation of Venezuela's economy with and without major economic distortions, something that provides more light to the quest of understanding the impact of the necessary policy interventions than using one of the matrices alone.

[20] The authors used 2017 households' expenditure structure and adapted it to 2014 levels. For the details of this procedure see, IESA (2019).

The data from the SAM of the IESA study was kindly provided by the authors. Such data is used the same way as in equation (10) to find out the impact on the CPI of adjustments in the prices of goods and services mentioned above (except sanitation) and to investigate how household income is affected, by decile, after considering the inflationary effect. Table 4 below, shows the model results[21].

Table 4. Impact of lagged price adjustments – 2014 SAM (in percent)

		CPI						% of Income	
		Decile 1			Decile 10			Decile	
Adj.	**Sector**	**Direct**	**Indirect**	**Total**	**Direct**	**Indirect**	**Total**	**1**	**10**
1%	Fuel	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.00
	Electricity	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00
	Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Telecommunications	0.04	0.01	0.04	0.04	0.01	0.05	0.10	0.03
	Simultaneous, excl. salaries and dev.	**0.04**	**0.02**	**0.06**	**0.05**	**0.02**	**0.07**	**0.12**	**0.04**
	Salaries		0.21			0.23		0.45	0.15
	Devaluation		0.29			0.26		0.64	0.17
	Simultaneous, all	**0.04**	**0.52**	**0.56**	**0.05**	**0.51**	**0.56**	**1.20**	**0.36**
10%	Fuel	0.00	0.05	0.06	0.00	0.05	0.06	0.12	0.04
	Electricity	0.02	0.04	0.06	0.04	0.04	0.07	0.12	0.05
	Water	0.01	0.01	0.02	0.01	0.01	0.02	0.03	0.01
	Telecommunications	0.39	0.06	0.45	0.44	0.06	0.50	0.97	0.33
	Simultaneous, excl. salaries and dev.	**0.42**	**0.16**	**0.58**	**0.47**	**1.32**	**1.79**	**1.24**	**0.43**
	Salaries		2.07			2.27		4.46	1.48
	Devaluation		2.95			2.65		6.35	1.73
	Simultaneous, all	**0.42**	**5.16**	**5.58**	**0.49**	**5.06**	**5.56**	**12.04**	**3.63**
100%	Fuel	0.04	0.52	0.56	0.04	0.51	0.55	1.20	0.36
	Electricity	0.21	0.36	0.56	0.37	0.37	0.74	1.22	0.48
	Water	0.07	0.09	0.16	0.13	0.09	0.22	0.35	0.14
	Telecommunications	3.89	0.59	4.48	4.40	0.61	5.01	9.66	3.27
	Simultaneous, excl. salaries and dev.	**4.21**	**1.55**	**5.76**	**4.94**	**1.58**	**6.52**	**12.43**	**4.26**
	Salaries		20.66			22.65		44.57	14.81
	Devaluation		29.46			26.48		63.54	17.31
	Simultaneous, all	**4.21**	**51.60**	**55.81**	**4.94**	**50.63**	**55.57**	**120.39**	**36.32**

Source: authors' calculations.

[21] Results by decile are available upon request.

As in the previous section, at the 10% adjustment bracket, the fuel row says that an increase of this magnitude in the price of fuel causes an increase of 0.06% in the consumption basket and that such increase does not vary much across income deciles. Moreover, when measuring the increase on households expenditures as a share of their income, the impact is of 0.12% for the lowest income decile whereas it reduces to 0.04% in the highest income decile.

This result is in line with the literature that emphasizes the regressive character of subsidies[22] (particularly fuel subsidies) as the highest income deciles are those that benefit most from them. Consequently, their removal could imply a greater loss of well-being for the households that receive the subsidy. Paradoxically, when measuring the removal of the subsidy as a proportion of the income generated by each type of household, low income households are the most harmed by their removal. Thus, and particularly in the case of fuel, low income households are less benefited from subsidies, when they are effective and the most harmed, when they are removed.

In line with the 1997 IO matrix exercise, the most significant impacts on the CPI are on telecommunications and electricity. According to the SAM 2014 model (see Table 4), a 10% increase in the price of telecommunications entails a 0.45% increase in the consumption expenditures of the lowest income household and a 0.50% impact on the highest (vs. 0.72% to the average household in 1997). As in the case of fuel, the impact on household income is higher at the lowest income levels (0.97% on decile 1 vs. 0.33% on decile 10). The same happens to water and electricity.

The last row of table 4 says that a simultaneous 10% increase in the price of all these products results in an increase of 0.58% in the consumption expenditures of decile 1 and of 1.79% on decile 10, increasing their expenditures as a share of income by 1.24% and 0.43%, respectively. If all prices were to double (a 100% increase), the monthly impact in the CPI will be around 6.25% to the average household, comprising 12.43% of income at decile 1 and 4.26% of income at decile 10.

Moreover, a 10% rise in wages implies a 2.07% increase in the consumption expenditures of a low income household, whereas a 10% devaluation yields a 2.95% increase. As a share of household income, an increase of wages will imply 4.46% at decile 1 and 1.48% at decile 10, whereas a devaluation will represent 6.35% at decile 1 and 1.73% at decile 10.

In all, a simultaneous 10% increase in all the above-mentioned products plus wages and the exchange rate, implies a 5.58% increase in the CPI of the lowest income household, whereas it represents 12.43% of its income. If all these prices are doubled in a single month, expenditures of the lowest income household will increase by 55.8% and such increase will represent 120.4% of its income, a complete wipeout. For the highest income household, all prices doubling will consume 36.32% of its income in a single month, close to 1/3 of it.

[22] See Di Bella et al (2015) and IMF(2013).

Compared to the 1997 IO matrix model, not only in the case of fuel but also in electricity and water, the results are quite different as the total impact on the overall price level is lower, see Table 5 below. Firstly, such difference can be explained by issues of sectoral aggregation and rounding, as the SAM is an aggregated 18*18 matrix whereas the IO is a disaggregated 121*121 matrix. Besides computational issues, there are more significant, underlying economic differences such as: (i) changes in the production structure, as imports substituted domestic production over the 1997-2014 period[23] (ii) changes on consumption patterns between 2007 and 2017[24], and (iii) a higher degree of price controls among the whole product chain that could reduce the indirect effect (i.e. prices of other products were not allowed to react).

Table 5. Differences in pass-through coefficients 1997 vs. 2014 (in percent)

		1997			2014 - Difference 1/		
Adjustment	**Sector**	**Direct**	**Indirect**	**Total**	**Direct**	**Indirect**	**Total**
	Fuel	0.07	0.37	0.43	-0.06	-0.32	-0.38
	Electricity	0.14	0.37	0.51	-0.11	-0.34	-0.45
	Water	0.03	0.04	0.07	-0.02	-0.03	-0.05
	Telecommunications	0.49	0.22	0.72	-0.01	-0.16	-0.18
10%	**Simultaneous, excl. salaries and dev.**	**0.71**	**1.09**	**1.80**	**-0.19**	**-0.94**	**-1.13**
	Salaries	-	2.50	2.50	-	-0.38	-0.38
	Devaluation	-	1.42	1.42	-	1.41	1.41
	Simultaneous, salaries and dev. only	**-**	**3.92**	**3.92**	**-**	**1.03**	**1.03**
	Simultaneous, all five	**0.71**	**5.01**	**5.72**	**-0.19**	**0.09**	**-0.10**

Source: authors' calculations.

1/ Difference is for the average of income deciles.

Table 5 above also shows the comparison between the time dimension of the matrices regarding salaries and devaluation. As mentioned in section II, the Venezuelan economy increased its reliance on imported products (particularly intermediate and final goods) dramatically between 1997-2104. One of the of the co-stories of this fact is therefore the increase in the pass-through coefficient of a 10% devaluation (through imports) to prices from 1.42% in 1997 to 2.83% in 2014. Salaries on the other hand, reduced its pass-through slightly, from 2.50% to 2.12%, perhaps also as a consequence of the reliance on imports than on domestic production inputs/factors.

Putting altogether, Table 5 above shows that, if we consider a 10% price increase in all the products plus wages and the nominal exchange rate, there is just a small reduction of the whole pass-through coefficient of -0.1% between 1997 and 2014. This is due as a consequence of the reduction of the indirect effect on fuel, public services and wages by -0.94% and -0.38% percent respectively, and the increase of 1.41% in devaluation.

[23] See: Saboin (2015)

[24] As consumers devoted more resources on food consumption than into other items such as public services (this, given government's capacity to maintain subsidies on public services than into food items).

To us, the main implication of this result is that, in the short-term, as the economy relies excessively on imports (i.e. compared to its historical average), the main impact of lagged price adjustments will come from the exchange rate, whereas in the medium to long terms, as the economy relies less on imports and its productive sector re-develops, it will react more to domestic product price adjustments. Put another way, these results tend to confirm the view that the Venezuelan economy is now more sensitive to movements in the exchange rate, than to movements in the prices of domestic goods.

The other important implication is that a simultaneous adjustment on relative prices could have an important impact on consumer expenditures. For such reason, it is important to consider different alternatives to lagged price adjustments. Among the range of options, it most certainly be considered, as in previous experiences[25], the use of mitigating measures for consumers, particularly to those at lower income levels. The other range of options are those related to the time dimension of the adjustment: should it be done as a onetime increase to international prices? or to production cost prices? should instead be done gradually toward the international price? or gradually toward the production cost price? Moreover, given the magnitude of expenditures to jump-start the Venezuelan economy and address the humanitarian emergency in a sustainable way, it is important to know how costly such mitigating measures are? And how they should be prioritized among the other, so required expenditures? Such questions are going to be tried to answer on section VII.

VI Econometric estimation of the pass-through effect of adjusting gasoline prices

This section presents and discusses the main results from econometric estimations of the pass-through effect toward consumer price inflation of an adjustment in the price of gasoline.

VI.1 Sample and variables

The econometric estimations are based on an unbalanced panel extracted from the database compiled by Ross, Michael L., Chad Hazlett, y Paasha Mahdavi (2017). The database compiled by Ross, Hazlett and Paasha (RHP) contains information of gasoline price in 157 countries on a monthly basis, from 2003.01 to 2015.06. We use a subsample of this database covering 32 countries: Azerbaijan, Bolivia, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Indonesia, Iran, Iraq, Kuwait, Mexico, Nicaragua, Nigeria, Panama, Paraguay, Peru, Poland, Qatar, Rumania, Russia, Saudi Arabia, Serbia, Trinidad & Tobago, United Arab Emirates, Uruguay, Venezuela. This subsample comprises mainly Latin American countries and oil-exporters countries. We excluded all developed countries from the original database.

From the RHP database we take the following variables:

price = gasoline retail price in local currency units per liter

[25] See IMF (2013)

price_usd_2015 = gasoline retail price in constant 2015 U.S. dollars per liter

bmgap2015_adj = net implicit tax (subsidy); estimated as the difference between de local price (price_usd_2015) and the benchmark price (the spot price for conventional refined gasoline at the New York harbor)

pctbmgap2015_adj = alternative measure of net implicit taxes (subsidies); computed as the local price (price_usd_2015) as a percentage of the benchmark price the spot price for conventional refined gasoline at the New York harbor)

fix12m = price fixity; measured as 1 minus the percentage of month-to-month changes in the retail price of gasoline in local currency units within a rolling 12-month interval, lagged by one month

fixtype = price fixity types; RHP categorize countries as: 1-FPS if prices change three or fewer times in the last year; 2-Wobbler if prices change between four and eight times; 3-Market if prices change nine or more times.

To the RHP database, we add the information of the headline Consumer Price Index (CPI) and monetary aggregates obtained from the International Financial Statistics (IFS) of the International Monetary Fund (IMF). The monetary variable included in most of the cases is M1 expressed in local currency or in U.S. dollars for the dollarized economies. In the cases of Iran and Panama, we did not find monetary data, and in the cases of Peru and Trinidad & Tobago, we use values of the monetary base in local currency.

The estimations are obtained using the Fixed Effects model (FE) and in a few cases Pooled Ordinary least Squares (POLS). Some trials using Instrumental Variables for panel data (PIV) did not produced reliable results due to the lack of strong instruments. First stage regressions of the percentage change in gasoline retail prices against lagged values of CPI inflation, lagged values of itself, and lagged year on year changes in the money supply, generated F statistics well below the rule of thumb value of ten.[26]

VI.2 Models using changes in the price of gasoline in local currency

Table 6 contains the output of five models in which the dependent variable is the percentage (logarithmic) change of the headline CPI (ldp_CPI), and the main explanatory variable is the percentage (logarithmic) change in the gasoline retail price in local currency (ldp_price)[27].

Model 1 which adds the net implicit tax (subsidy) variable (bmgap2015_adj) and inflation lagged one period (ldp_CPI_1), indicates that a one percentage point change in the price of gasoline in

[26] In general, we might expect that the price of gasoline and services such as electricity, water supply and internet that are capital intensive may be little influenced by changes in other components of the CPI. Additionally, government intervention in fixing their prices may also weaken the feedback from CPI inflation.
[27] ldp_CPI and ldp_price are stationary according to the Levin, Li &Chu test.

local currency is associated with 0.029 percentage points change in the CPI inflation rate. Model 2 shows that the coefficients of lagged values of ldp_price up to six months, are not statistically significant. In model 3 the introduction of the alternative net tax (subsidy) variable pctbmgap2015_adj, does not alter substantially the coefficient of ldp_price. In model 4, the inclusion of the variable fixtype with a p-value of 0.1063, does not change either the estimation of the coefficient of ldp_price. Thus, in general, these four models indicate that the estimation of the pass-through coefficient is not very sensitive to certain changes in specification.

The introduction of a monetary variable in the model, however, does have a significant impact in the estimation of the pass-through coefficient. In model 5, we add the annual percentage (logarithmic) change of M1/ monetary base (ldpa_M)[28] in t and t-4. In this case, the pass-through coefficient increases to 0.036.

Table 6. Fixed-effects estimates

Dependent variable: ldp_CPI					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
const	0.3964***	0.3843***	0.5204***	0.6062***	0.1833**
	(0.0483)	(0.0504)	(0.0899)	(0.1056)	(0.0883)
ldp_price	0.0289***	0.0285***	0.0283***	0.0282***	0.0361***
	(0.0079)	(0.0083)	(0.0078)	(0.007929)	(0.0083)
bmgap2015adj	-0.3602***	-0.3579***			-0.2222**
	(0.1113)	(0.1063)			(0.1067)
ldp_CPI_1	0.3507***	0.3746***	0.3541***	0.3556***	0.3510***
	(0.0644)	(0.0730)	(0.0631)	(0.0634)	(0.0785)
ldp_price_1		-0.0051			
		(0.0046)			
ldp_price_2		0.0033			
		(0.0022)			
ldp_price_3		0.0015			
		(0.0024)			
ldp_price_4		0.0005			
		(0.0021)			
ldp_price_5		0.0021			
		(0.0016)			
ldp_price_6		0.0002			
		(0.0022)			
pctbmgap2015adj			-0.1481**	-0.1473**	
			(0.0572)	(0.0606)	
fixtype				-0.0414	0.0379**
				(0.0249)	(0.0163)

[28] Ldpa_M is stationary according to the Levin, Li &Chu test.

ldpa_M					0.0034***
					(0.0011)
ldpa_M_4					0.0034**
					(0.0013)
n	4462	4289	4462	4394	3500
Adj. R^2	0.1859	0.1920	0.1825	0.1839	0.2139
lnL	-4420	-4169	-4430	-4380	-3337

Source: author's calculations

Standard errors in parentheses. *significant at the 10 percent level, **significant at the 5 percent level, ***significant at the 1 percent level.

VI.3 Models using changes in the price of gasoline in U.S. dollars of 2015

Table 7 contains the output of four models in which the dependent variable is the percentage (logarithmic) change of the headline CPI (ldp_CPI), and the main explanatory variable is the percentage (logarithmic) change in the gasoline retail price in constant U.S. dollars of 2015 (ldp_price_usd_2015)[29].

The estimations that use as explanatory variable ldp_price_usd_2015, exhibit a pass-through coefficient smaller that the those reported with ldp_price. In the models 1 to 3 the pass-through coefficient is closer to 0.02 versus the 0.029 reported in the previous section for similar specifications. The inclusion of six lags of ldp_price_usd_2015 in model 2 does not alter substantially the results, as only the coefficient of this variable lagged five periods is statistically significant. The introduction in model 3 of the alternative price gap variable pctbmgap2015_adj does not modify either the basic results. With the variable ldp_price_usd_2015 as the main explanatory variable, the variables fix12m and fixtype did not enter significantly in the equations.

Similar to what we observed when the gasoline price is measured in local currency, the addition of a monetary variable increases substantially the pass-through coefficient compared to the equations that do not consider this variable. Model 4 shows a pass-through coefficient significantly higher to those reported in models 1 and 3 (0.025).

Table 7. Fixed-effect estimates II

Dependent variable: ldp_CPI				
	(1)	(2)	(3)	(4)
const	0.4059***	0.3938***	0.5606***	0.1995**
	(0.0484)	(0.0503)	(0.0949)	(0.0892)
ldp_price_usd_2015	0.0205***	0.0218***	0.0199***	0.0252***
	(0.0060)	(0.0066)	(0.0059)	(0.0074)
bmgap2015adj	-0.3708***	-0.3664***		-0.2419**
	(0.1125)	(0.1047)		(0.1079)
ldp_CPI_1	0.3539***	0.3799***	0.3570***	0.3560***

[29] ldp_price_usd_2015 is stationary according to the Levin, Li &Chu test.

	(0.0643)	(0.0710)	(0.0630)	(0.0785)
ldp_price_usd_2015_1		-0.0062		
		(0.0042)		
ldp_price_usd_2015_2		0.0016		
		(0.0019)		
ldp_price_usd_2015_3		0.0002		
		(0.0022)		
ldp_price_usd_2015_4		0.0000		
		(0.0019)		
ldp_price_usd_2015_5		0.0026**		
		(0.0012)		
ldp_price_usd_2015_6		-0.0004		
		(0.0018)		
pctbmgap2015adj			-0.1732***	
			(0.0610)	
ldpa_M				0.0034***
				(0.0011)
ldpa_M_4				0.0031**
				(0.0012)
fixtype				0.0379**
				(0.0184)
n	4462	4289	4462	3500
Adj. R^2	0.1723	0.1820	0.1694	0.1964
lnL	-4457	-4196	-4465	-3376

Source: author's calculations

Standard errors in parentheses. *significant at the 10 percent level, **significant at the 5 percent level, ***significant at the 1 percent level.

VI.4 Models that include only observations in which gasoline prices increase

Specifications that use only data for which gasoline prices increase (ldp_price>0, ldp_price_usd_2015>0), reduce the number of observations available and are only run using Ordinary Least Square (OLS).

Table 8 shows four equations with specifications similar to those discussed previously. In model 1 with the price of gasoline measured in local currency, the pass-through coefficient is around 0.038, which is larger than those presented in section V.2 for comparable models. Equation 2 with the price of gasoline measured in U.S. dollars of 2015, the pass-through coefficient is 0.029, which is larger than those presented in section 2 for comparable models. In model 3 which measures the price of gasoline in local currency and adds the monetary variable ldpa_M, the pass-through coefficient is 0.058, which is the largest obtained in the study. In model 4 which includes the price

of gasoline in U.S. dollars of 2015 and the monetary variable, the pass-through coefficient is 0.044, well above the 0.025 reported in model 4 of table 7.

Table 8. OLS estimates

Dependent variable: ldp_CPI				
	(1)	(2)	(3)	(4)
const	0.7512***	0.8859***	0.3071***	0.3919***
	(0.1780)	(0.1613)	(0.0561)	(0.0540)
ldp_price	0.0382***		0.0583***	
	(0.0120)		(0.0121)	
bmgap2015adj	-0.1375**	-0.1773***	-0.1411**	-0.1972***
	(0.0582)	(0.0610)	(0.0635)	(0.0683)
fixtype	-0.0917*	-0.1200**		
	(0.0542)	(0.0516)		
ldp_price_usd_2015		0.0295***		0.0443**
		(0.0090)		(0.0108)
ldpa_M			0.0078***	0.0080***
			(0.0024)	(0.0026)
n	1490	1490	1261	1261
Adj. R^2	0.1245	0.0977	0.1794	0.1401
lnL	-1509	-1531	-1174	-1204

Source: author's calculations

Standard errors in parentheses. *significant at the 10 percent level, **significant at the 5 percent level, ***significant at the 1 percent level.

VI.5 Zooming in on the econometric models results

From the results obtained in the different models estimated, there are certain points that can be highlighted:

In the nine models that use the complete sample (with positive and negative changes in the price of gasoline) the pass-through coefficient is in the range between 0.02-0.036. The upper limit of the range is obtained in the models in which the gasoline price is measured in local currency and the monetary variable is included. Models that measured the gasoline price in constant 2015 U.S. dollars and exclude the monetary variable, generate the lower limit of the range.

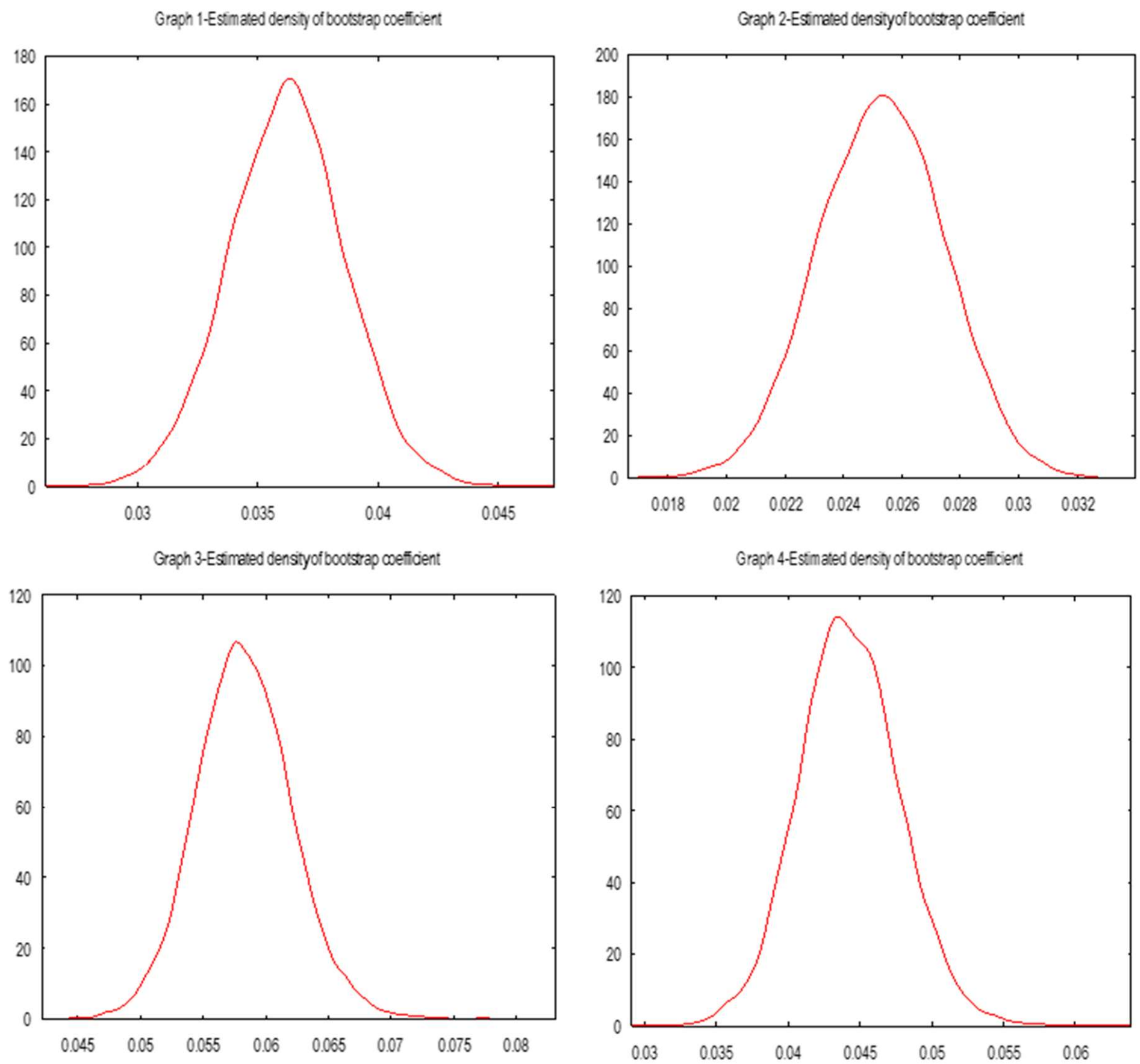
In the four models that limit the sample to positive changes in the gasoline price, the pass-through coefficient is in the range between 0.029-0.058.

As in the case of the models run with the complete sample, the upper limit of the range is found in the models with gasoline prices measured in local currency and the monetary variable included. The lower limit of the range is generated in the models with gasoline prices measured in constant 2015 U.S. dollars and the monetary variable excluded.

The addition of up to six lags in the changes of gasoline prices indicates a very low persistence over time of the effects of these price variations on the inflation rate.

Graphs 1 to 4 show the density distribution of the pass-through coefficients derived from bootstrapping exercises. In graphs 1 and 2, the bootstrapping exercises were run using 10,000 replications of the residuals of OLS models with country-dummy variables added. These equations were specified to approximate the results showed in model 5 (Table 6) with gasoline prices in domestic currency, and model 4 (Table 7) with gasoline prices in constant 2015 U.S. dollars. In graphs 3 and 4, the bootstrapping exercises were run using 10,000 replications of the residuals of model 3 (Table 8) with gasoline prices in domestic currency, and model 4 (Table 8) with gasoline prices in constant 2015 U.S. dollars. In all cases, we observe that the coefficients of the models are very close to the mean (median) values of their density distributions.

Figure 1. Model comparison



To narrow somehow the search for the magnitude of the pass-through coefficient, table 9 shows calculations of simple and weighted averages of the pass-through coefficients found in the models that exhibit more differentiated estimations of this factor. Weighted averages were calculated using the inverse of the variance of the estimated coefficients as weights. For the models based on the domestic currency price of gasoline, the simple average of the pass-through coefficients is 0.04 and the weighted average 0.037. For the models based on the constant 2015 US dollar price of gasoline, the simple average of the pass-through coefficients is 0.03 and the weighted average 0.026. The simple average of the pass-through coefficient for all models considered in table 4 is 0.035. The weighted average of the pass-through coefficient for all models considered in table 4 is 0.031.

Table 9. Summary of results

	ldp_price coef.	**1/var coef.**
Model 1 (Table 6)	0.0289	16045.8137
Model 5 (Table 6)	0.0361	14527.4796
Model 1 (Table 8)	0.0382	6939.3547
Model 3 (Table 8)	0.0583	6837.7048
Sum 1/var		44350.3527
1.a.-Simple average	**0.0404**	
1.b.-Weighted average	**0.0372**	
	ldp_price_usd_2015 coef.	**1/var coef.**
Model 1 (Table 7)	0.0205	27915.6034
Model 4 (Table 7)	0.0252	18151.0084
Model 2 (Table 8)	0.0294	12393.1681
Model 4 (Table 8)	0.0443	8510.2327
Sum 1/var		66970.0126
2.a.-Simple average	0.0299	
2.b.-Weighted average	0.0265	
Simple average all models	**0.0351**	
Weighted average all models	**0.0308**	

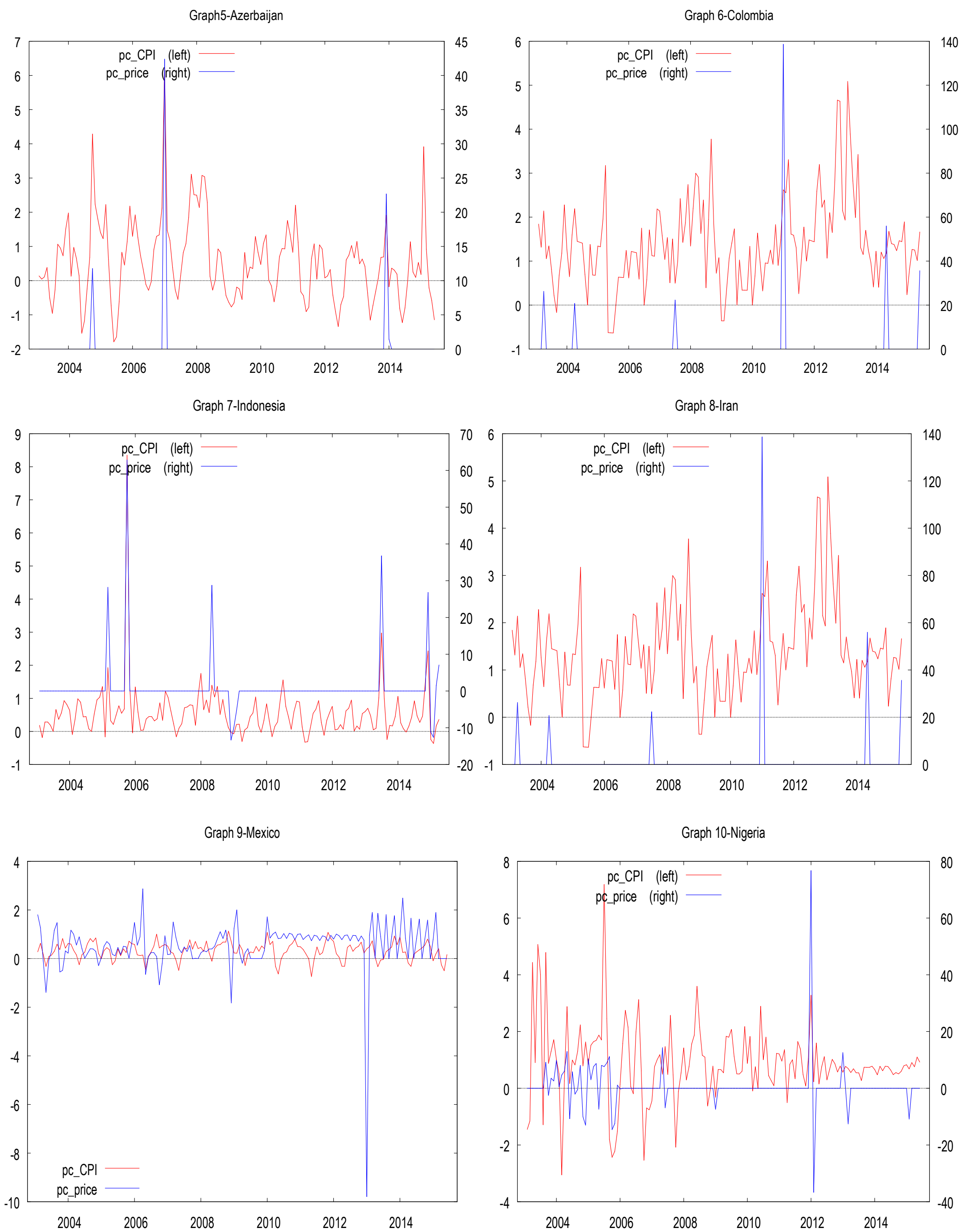
Source: authors' calculations.

VI.6 Data from specific countries

To illustrate the results found in the econometric estimations, we take some countries of the panel and examine graphically the behavior of the month-to-month percentage changes in gasoline prices in local currency and the month-to-month inflation rate in the period 2003.02- 2015.06. We

do this for the following countries in graphs 5-10: Azerbaijan, Colombia, Indonesia Iran, Mexico, and Nigeria. We observe, in general, that large increases in the price of gasoline are associated with a rather moderate rise in inflation in the same month, and not noticeable effects in the following months. Only in the cases of Colombia and Iran, we observe large increases in the gasoline price with an effect on CPI inflation that last a few months.

Figure 2. Evidence from selected countries



VI.7 Takeaways from this exercise

In this section we estimated thirteen econometric models using panel data for 32 countries for the period 2003.01-2015.06. The results suggest a relatively low pass-through effect of gasoline prices to prices of goods and services recorded in the CPI. The pass-through coefficient obtained by averaging the results of the models that exhibit more distinct estimates, indicate that a one percentage point increase in the price of gasoline is associated with a 0.031 to 0.035 percentage points rise in inflation measured by the CPI. Another interesting result of the study is that gasoline price adjustments do not have persistent effects on the CPI. Their effects are concentrated in the month in which the adjustment occur.

Though averaging is a convenient way of summarizing the main results of the different models estimated, it may hide other important aspects that in some way are captured in the individual equations. First, for most economic agents the price in local currency may be the most direct indicator of changes in gasoline prices. Second, controlling for the impact of money is important as it is a fundamental driver of inflation and improves the statistical fit of the models. Third, there seems to be an asymmetric effect that indicates that gasoline price increases have a larger impact that price reductions. A model that captures these three elements (model 4 in table 8), suggests a pass-through coefficient of 0.058, almost twice the average, but still rather low.

The evidence that the pass-through coefficient of an adjustment in gasoline prices toward consumer prices is relatively low and exhibit little persistence, may be puzzling given the strong reactions from society that these price adjustments generates in most countries. A possible explanation is that these reactions may be more related to the magnitude of the adjustments necessary to set gasoline prices at levels closer to international benchmarks, than to the pass-through effects per-se.

VII Econometric estimation of the pass-through effect of adjusting electricity prices

This section presents and discusses the main results from econometric estimations of the pass-through effect toward consumer price inflation of adjustments in the price of electricity.

VII.1 Sample and variables

The econometric estimations are based on an unbalanced panel derived from a database compiled by the Interamerican Development Bank (IADB) to analyze electricity taxes/subsidies in several countries of Central America and the Caribbean. The database contains annual information of electricity prices from 2008 to 2014 of eleven countries: Bahamas, Barbados, Belize, Costa Rica, Guatemala, Guyana, Jamaica, Nicaragua, Panama, Surinam, Trinidad-Tobago.

The variables considered in the models are the following:

epl = final price of electricity in local currency/Kwh. (weighted average of residential, commercial, industrial and government tariffs).

ep = final price of electricity in US$/Kwh (weighted average of residential, commercial, industrial and government tariffs).

The IADB database is complemented with the information of the headline Consumer Price Index (CPI) and monetary aggregates (m) obtained from the International Financial Statistics (IFS) of the International Monetary Fund (IMF). The monetary variable included in most cases is M1 expressed in local currency. Due to limitations in the information available, monetary base data is employed in the cases of Barbados, Panama, and Trinidad-Tobago. All models are estimated using logarithmic percentage changes of the variables previously described (ldp_x).

VII.2 Models using changes in the price of electricity in local currency

Table 10 contains the output of three models estimated using fixed-effects, in which the dependent variable is the percentage (logarithmic) change of the headline CPI (ldp_CPI), and the main explanatory variable is the percentage (logarithmic) change in the price of electricity in local currency (ldp_epl).

Model 1 which only includes ldp_epl as explanatory variable, indicates that one percentage point change in the price of electricity in local currency is associated to a 0.062 percentage points change in the CPI inflation rate. Model 2 adds the percentage change in the restricted money supply variable (ldp_m). The coefficient of ldp_m, however, is only statistically relevant at an 18% level of significance and the coefficient of ldp_epl is practically the same to the one estimated in model 1. Model 3 adds one lag of ldp_m to model 2 (ldp_m_1). Although the coefficient of ldp_m_1 has only a p-value of 0.28, in this model the coefficient of ldp_m exhibits a p-value of 0.0021 and the overall fit of the model doubles the one obtained in models 1 and 2. In this case, the pass-through coefficient of a change in electricity prices to CPI inflation increases to 0.072.

VII.3 Models using changes in the price of electricity in current US dollars

Model 4 in table 10 shows the results when the main explanatory variable is the percentage (logarithmic) change in the electricity price measured in current US dollars. In this case, the pass-through effect is almost half of that estimated with the models in which the price of electricity is measured in local currency. This equation exhibits, however, the poorest fit among the four models estimated, and changes in the monetary variable either contemporaneous or lagged is not statistically significative.

Table 10. Fixed-effects estimates

Dependent variable: ldp_CPI				
	(1)	(2)	(3)	(4)
const	4.5280***	4.3230***	3.2090***	4.6990***
	(0.1166)	(0.2041)	(0.9219)	(0.0399)
ldp_epl	0.0620**	0.0632**	0.0716*	
	(0.0261)	(0.0258)	(0.0358)	
ldp_m		0.01966	0.0471**	
		(0.0145)	(0.0153)	
ldp_m_1			0.0892	
			(0.0821)	
ldp_ep				0.03726**
				(0.0141)
n	61	61	51	61
Adj. R^2	0.1106	0.1169	0.2299	0.0442
lnL	-130.5	-130.3	-103.1	-132.7

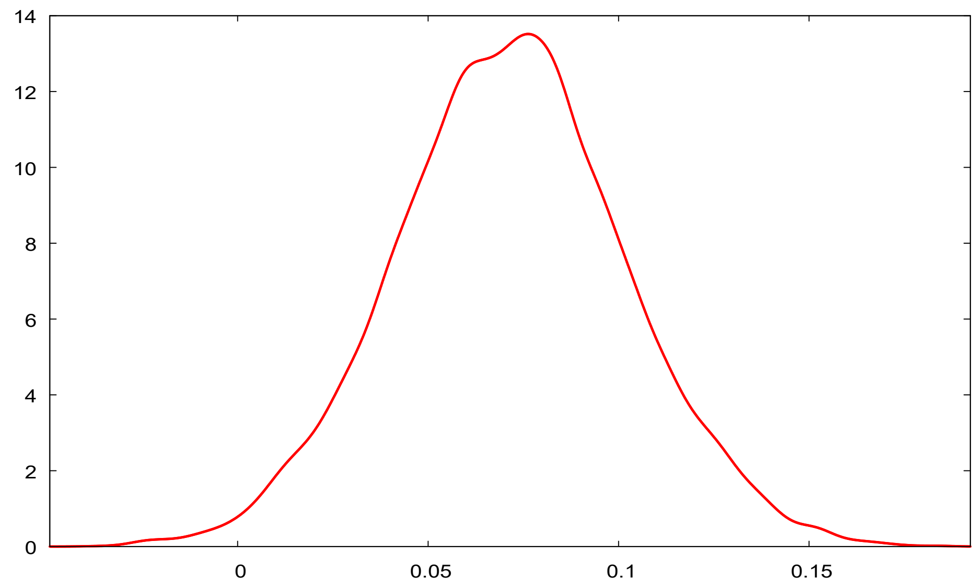
Source: author's calculations

Standard errors in parentheses. *significant at the 10 percent level, **significant at the 5 percent level, ***significant at the 1 percent level.

VII.4 Takeaways from this exercise

The results obtained from this econometric exercise suggests that the pass-through effect from an increase in the price of electricity to consumer price inflation may be somewhat higher than those estimated for an increase in the price of gasoline, but still they seem relatively moderate. As in the case of gasoline prices, models based on prices in local currency tend to show a substantially larger pass-through effect on consumer prices than those estimated using prices in US$. These results, however, should be taken with care, as they are derived from a relatively small sample, particularly on the time dimension. To reinforce the analysis, graph 11 shows the density function of the pass-through coefficient estimated from a bootstrapping exercise with 10,000 replications based on model 3 in table 10. Although zero appears as a possible value in the estimated density function, it is outside the 95% confidence interval.

Figure 3. Bootstrapped coefficients



VIII Econometric estimation of the pass-through effect of adjusting fixed broadband service prices

This section presents and discusses the main results from econometric estimations of the pass-through effect toward consumer price inflation of adjustments in the price of fixed broadband service.

VIII.1 Sample and variables

The econometric estimations are based on an unbalanced panel derived from a database compiled by International Telecommunications Union - ITU (www.ITU.int). The sample used contains annual information of fixed broadband service prices from 2008 to 2017 of seventeen Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Honduras, Guatemala, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay. The price information for Venezuela was excluded as it seems to be calculated based on the overvalued official exchange rate.

The variables considered in the models are the following:

pfbusd = price fixed broadband services at current US$.

pfbppp = price fixed broadband services at PPP US$.

pfbloc = price fixed broadband services at local prices (authors calculations, average exchange rate local currency/US$).

The ITU database is supplemented with the information of the headline Consumer Price Index (CPI) and monetary aggregates (m) obtained from the International Financial Statistics (IFS) of the International Monetary Fund (IMF). The monetary variable included is M1 expressed in local currency (except in the cases of the dollarized economies). All models are estimated using logarithmic percentage changes of the variables previously described (ldp_x).

VIII.2 Models that include all observations of the sample

The output of the fixed-effects models estimated using the whole sample available for the different measures of prices are shown in table 11. In all cases we observe that the coefficients of the percentage change in the price variables are negative. When fixed broadband prices are measured in PPP US$ or in local currency, the coefficients of the price change are not significantly different from zero, but when fixed broadband prices are measured in current US$, the coefficient of the price change is statistically different from zero. This coefficient, however, is very small (-0.013). Thus, in general, when the complete sample is considered, the results suggest that changes in prices of fixed broadband services do not have a relevant impact on consumer price inflation.

Table 11. Fixed-effects estimates

Dependent variable: ldp_cpi			
	(1)	**(2)**	**(3)**
const	2.166***	2.2290***	2.2150***
	(0.4579)	(0.4560)	(0.4586)
ldp_pfbusd	-0.0132**		
	(0.0055)		
ldp_m1_1	0.0430*	0.0435*	0.0457*
	(0.0232)	(0.0231)	(0.0244)
ldp_cpi_1	0.3744***	0.3593***	0.3623***
	(0.1047)	(0.1019)	(0.1003)
ldp_pfbppp		-0.0111	
		(0.0068)	
ldp_pfbloc			-0.0095
			(0.0069)
n	106	106	106
R^2	0.5809	0.5757	0.5720
lnL	-187	-187.6	-188.1

Source: author's calculations

Standard errors in parentheses. *significant at the 10 percent level, **significant at the 5 percent level, ***significant at the 1 percent level.

VIII.3 Models that include only observations in which fixed broadband service prices increase

Given the results obtained using the complete sample, we try, as in the gasoline price analysis, to estimate models that only include price increases (ldp_pfbusd>0, ldp_pfbppp>0, ldp_pfbloc>0). Table 12 shows the output of three models estimated using pooled OLS. In these models the coefficients of price changes in fixed broadband service are always positive, but only statistically different from zero when prices are measured in PPP US$ and local currency. With prices measured in PPP US$ (ldp_pfbppp), the pass-through effect to consumer inflation is about 0.031 percentage points for each percentage point change in fixed broadband price. With prices measured in local currency (ldp_pfbloc), the pass-through effect to consumer inflation is about 0.027 percentage points for each percentage point change in fixed broadband price.

Table 12. OLS estimates

	Dependent variable: ldp_cpi		
	(1)	**(2)**	**(3)**
const	3.4870***	2.6430***	3.3430***
	(0.5214)	(0.4173)	(0.4075)
ldp_pfbusd	0.0154		
	(0.0147)		
ldp_pfbppp		0.0313*	
		(0.0161)	
ldp_pfbloc			0.0273*
			(0.0157)
N	56	49	61
Adj. R^2	-0.0106	0.0558	0.0095
lnL	-144.2	-105.5	-156.4

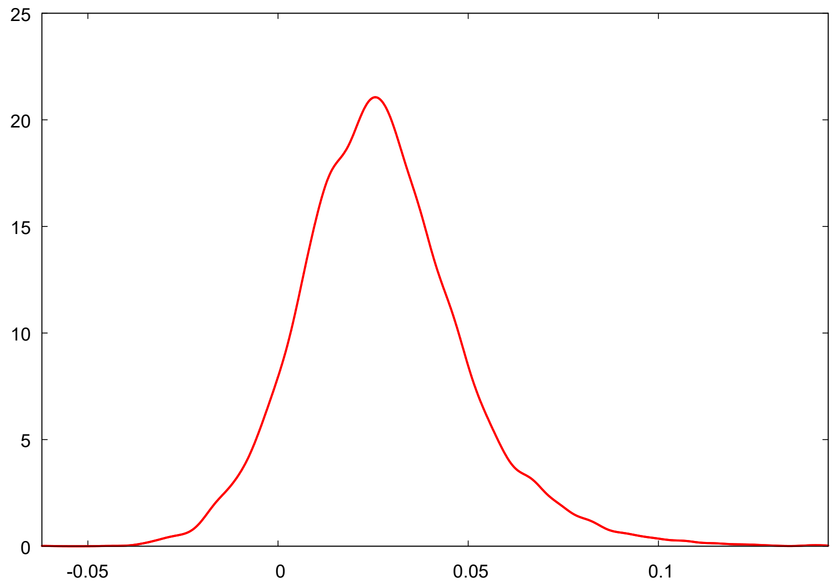
Source: author's calculations

Standard errors in parentheses. *significant at the 10 percent level, **significant at the 5 percent level, ***significant at the 1 percent level.

VIII.4 Takeaways from this exercise

The results derived from this econometric exercise indicates that the pass-through effect from an increase in the price of fixed broadband service to consumer price inflation might be considerably more modest than those estimated for an increase in the price of gasoline and the price of electricity. These results, however, should be taken with care, as they are derived from a relatively small sample, particularly on the time dimension, and models without other control variables such as changes in the money supply. Graph 12 shows the density function of the pass-through coefficient estimated from a bootstrapping exercise with 10,000 replications based on model 3 in table 12. In this case, zero appears as a possible value in the estimated density function and it is inside the 95% confidence interval.

Figure 4. Bootstrapped coefficients



IX Potential Policy Implications

This section examines the potential macroeconomic impacts on the Venezuelan economy of adjusting a set of key prices that have been fixed in local currency for an extended period of time, under extreme inflationary conditions. The evaluation covers an increase in the price of gasoline/diesel products, electricity, telecommunications, and water supply services. The evidence obtained in the previous sections regarding the pass-through coefficients of increasing the prices of these products and services is introduced in a financial program framework for Venezuela that follows the guidelines of the International Monetary Fund (Croce, Da Costa, and Juan-Ramón, 2002 and Greene, 2017). See Annex I for a detailed explanation of the model.

The exercise presents projections of key macroeconomic variables for a four-period horizon (from T to T+3) of a Benchmark case and three basic scenarios: Gradual Adjustment, Semi-Gradual Adjustment, Upfront Adjustment.

1. The Benchmark case assumes that gasoline and regulated services prices are not adjusted.

2. The Gradual Adjustment scenario sets a steady path of adjustment of gasoline and regulated services prices that starts in T+1 and is expected to reach international reference prices around T+5.

3. The Semi-Gradual adjustment scenario assumes that gasoline and regulated services prices are adjusted in period T toward levels close to production and operating costs, and then a slower adjustment toward international reference prices in T+3.

4. The Upfront Adjustment scenario assumes that the price of gasoline and regulated services are adjusted to international reference levels immediately in period T.

For each of the three price adjustment scenarios, two alternatives are examined: (i) adjusting prices without introducing measures to mitigate their impact on the income of the population (no mitigation), (ii) adjusting prices and giving the population a cash transfer to mitigate the impact (mitigation). The mitigation scheme introduced in the financial program consists of cash transfers to the families for the whole amount of the resources raised through the tax applied to gasoline sales (30%).

To make the calculation of the price increases that are introduced in the financial program feasible , it is assumed that the initial price of gasoline and the regulated services is not zero, but some notional (low) value that could capture the cost to economic agents of the scarcity of the goods and services and their poor overall quality (Annex II).

All the scenarios under analysis (including the Benchmark case), maintain the same basic guidelines for fiscal policy, oil sector assumptions, and monetary policy. Government expenditures includes cash transfers to families, emergency programs to recover the electric and water supply infrastructure, and a special health program. Monetary policy is assumed to pursue a gradual downward path in the rate of growth of the monetary base. The nominal exchange receives a relatively high devaluation in T and then adjust with core inflation from T+1 on.

The different price adjustment schemes considered in the scenarios, however, affect the fiscal result of the public sector and its financing, which in turn is transmitted to the balance of payments. Additionally, it is assumed that the monetary authority adjusts the rate of growth of the monetary base to accommodate the price adjustments that are deemed to have a one-off effect on the price level.

Another important element introduced to differentiate the scenarios is a downward adjustment in non-oil private imports associated to the price increases. The implementation of more rapid price increase schemes is assumed to reduce more the disposable income of the population, driving down imports of final goods. The Upfront Adjustment scenario adopts a reduction of 3 percentage points of GDP of non-oil imports with respect to the Benchmark case. In the Semi-Gradual Adjustment scenario, the reduction of imports compared to the Benchmark case is 1 percentage point. In the scenarios with no mitigating measures, imports are reduced by an extra 2 percentage points. It is additionally assumed that each 1 percentage point drop in imports is associated with a decrease in non-oil output growth of one-half percentage point[30].

Table 10 below shows the output of the financial program for some key macroeconomic variables. In principle, the Benchmark case (with no price adjustments) produces good results in terms of output growth and the lowest values of inflation, but these results should not be taken literally. This scenario implies very large deficits that could only be reduced by high and sustained output growth. The Benchmark case is then an illustrative exercise that would only be possible in an

[30]Econometric evidence based on annual data for the period 1972-2018 shows there is a negative relation between changes in gasoline prices and the rate of growth of non-oil GDP, and in turn, a positive relationship between changes in the rate of growth of non-oil GDP and the non-oil imports to GDP ratio.

ideal world in which the country could receive for an extended time period unlimited grants to finance the large and sustained fiscal deficit associated to it. In practice, a setting like this could only be financed by very high money creation and inflation with their damaging consequences on output growth, as shown by the recent experience of Venezuela.

Thus, the more interesting cases are those examined in the other scenarios, which attempt to integrate a set of coordinated policies (including the adjustment in the price of gasoline and regulated services) to bring about macroeconomic stabilization. Starting with the scenarios with no mitigating measures, the Gradual Adjustment scenario exhibits the lower inflationary impact and the highest output growth among the three basic situations. These results come however at a cost: a markedly higher primary deficit of the public sector. The Semi-gradual and Upfront adjustment scenarios yield results that in general look similar, with a little less inflation in the Upfront case and better output growth in the Semi-Gradual, although, this latter advantage comes at the price of a higher fiscal deficit.

Adding mitigating measures to the scenarios and comparing with their equivalent no mitigation cases, shows an improvement in the evolution of GDP without generating inflationary pressures. This result is partly explained by the fact that the financial program assumes that the additional financing required to implement the mitigating measures is provided by external sources and this in turn, increases international reserves, reduces the exchange rate pressure index and thus inflation. It is important to keep in mind, however, that the mitigating scheme adds another factor that puts pressure in an already large primary fiscal deficit of the public sector.

Overall, the results from the financial program suggest that a Gradual approach for adjusting gasoline and regulated services prices together with mitigating measures, may produce outcomes in terms of GDP growth and inflation that are notably better than those obtained with a strategy of Upfront adjustment in prices without mitigating measures. The fiscal primary deficit of the gradual - mitigation strategy, however, almost double the one observed in the Upfront-no mitigation scenario. Thus, the improvement in macroeconomic terms of the Gradual-mitigation alternative is only feasible if it could be financed using external resources, and if economic agents believe that the government will be able in some reasonable time horizon to adjust fiscal policy to a sustainable path. Even if these two favorable conditions are met, other challenges remain. For example, a gradual adjustment in gasoline prices makes more difficult the recovery of the oil industry that is crucial for the sustainability of the external accounts and the overall performance of the Venezuelan economy. Also, the strong impact on the fiscal deficit of the Gradual adjustment plus mitigating measures strategy may complicate further the already demanding task of the monetary authority of putting in place a credible and effective anti-inflationary policy.

In general, the financial program exercise exhibits a typical trade-off discussed in many studies regarding the choice between a gradual approach to stabilization and structural reform versus a shock adjustment (Agénor, 2004). A gradual adjustment that is generally considered more viable from a political and social standpoint, prolong certain imbalances that could reduce the possibility of a durable stabilization, while a rapid adjustment that could contribute to a robust stabilization may be politically and socially unachievable.

Table 13. Financial programing model results

1. Benchmark	T-1	T	T+1	T+2	T+3	T-T+3
Primary balance Public Sector % GDP	-2.6%	-20.6%	-26.8%	-25.3%	-21.7%	-94.3%
GDP % Change	-38.3%	16.9%	6.7%	7.7%	11.1%	49.3%
Inflation rate headline	50,594%	147.8%	37.9%	16.1%	8.6%	330.9%
Inflation rate core	50,594%	147.8%	37.9%	16.1%	8.6%	330.9%
GDP US$ Mill.	60,714	70,955	75,738	81,565	90,650	318,908
Change Net Int. Reserves US$ Mill.		6,550	9,070	7,789	7,705	31114

2. Gradual adjustment	No mitigation						Mitigation					
	T-1	T	T+1	T+2	T+3	T-T+3	T-1	T	T+1	T+2	T+3	T-T+3
Primary balance Public Sector % GDP	-2.6%	-20.6%	-23.7%	-20.4%	-13.9%	-78.5%	-2.6%	-20.6%	-24.4%	-21.4%	-15.7%	-82.1%
GDP % Change	-38.3%	16.9%	7.7%	7.2%	10.4%	48.9%	-38.3%	16.9%	8.5%	8.0%	11.1%	52.1%
Inflation rate headline	50,594%	147.8%	144.3%	35.7%	22.8%	909.2%	50,594%	147.8%	144.9%	36.0%	22.9%	914.5%
Inflation rate core	50,594%	147.8%	56.3%	23.7%	14.0%	446.3%	50,594%	147.8%	56.9%	24.0%	14.1%	450.0%
GDP US$ Mill.	60,714	70,955	76,411	81,933	90,432	319,731	60,714	70,955	76,954	83,120	92,369	323,398
Mitigation transfer US$ Mill.								0	561	963	1,708	3,233
Change Net Int. Reserves US$ Mill.		6,550	7,987	5,139	2,113	21,789		6,550	7,189	4,547	1,997	20,282

3. Semi-gradual adjustment	No mitigation						Mitigation					
	T-1	T	T+1	T+2	T+3	T-T+3	T-1	T	T+1	T+2	T+3	T-T+3
Primary balance Public Sector % GDP	-2.6%	-17.5%	-16.2%	-12.3%	-7.5%	-53.6%	-2.6%	-18.5%	-18.8%	-15.5%	-11.1%	-63.8%
GDP % Change	-38.3%	15.1%	6.2%	6.2%	9.6%	42.3%	-38.3%	16.1%	7.1%	7.1%	10.4%	47.0%
Inflation rate headline	50,594%	414.5%	76.2%	27.9%	18.9%	1,278.4%	50,594%	415.7%	75.6%	26.9%	17.4%	1,249.1%
Inflation rate core	50,594%	174.0%	51.4%	24.0%	16.0%	496.6%	50,594%	175.2%	50.9%	23.0%	14.4%	484.5%
GDP US$ Mill.	60,714	69,855	74,194	78,826	86,369	309,245	60,714	70,479	75,454	80,827	89,246	316,005
Mitigation transfer US$ Mill.						0		728	1,965	2,567	3,075	8,335
Change Net Int. Reserves US$ Mill.		5,863	2,996	-635	-2,562	5,661		5,297	3,547	355	-1,312	7,888

4. Upfront adjustment	No mitigation						Mitigation					
	T-1	T	T+1	T+2	T+3	T-T+3	T-1	T	T+1	T+2	T+3	T-T+3
Primary balance Public Sector % GDP	-2.6%	-15.8%	-13.1%	-10.6%	-7.4%	-46.8%	-2.6%	-17.3%	-16.4%	-14.2%	-11.0%	-59.0%
GDP % Change	-38.3%	14.5%	5.3%	5.3%	8.9%	38.3%	-38.3%	16.0%	6.2%	6.2%	9.7%	43.4%
Inflation rate headline	50,594%	593.1%	67.1%	22.9%	13.3%	1,512.9%	50,594%	594.2%	66.4%	21.9%	12.2%	1,479.6%
Inflation rate core	50,594%	177.6%	51.3%	22.9%	13.3%	484.6%	50,594%	178.7%	50.5%	21.9%	12.2%	473.7%
GDP US$ Mill.	60,714	69,526	73,231	77,136	83,992	303,885	60,714	70,399	74,761	79,403	87,087	311,650
Mitigation transfer US$ Mill.						0		1,130	2,526	2,888	3,075	9,619
Change Net Int. Reserves US$ Mill.		10,286	1,992	-507	-873	10,898		9,468	3,119	849	455	13,891

Source: author’s calculations.

X Conclusions

The present work estimated the impact of the adjustment in the prices of a series of goods and services that have been lagging for 20 years. The study considered the inflationary impact (pass-through), household expenditure and distributive effects and finally observed the policy implications according to different policy options scenarios.

The results of the I-O matrix suggest that a simultaneous correction of relative prices in Venezuela could have an important impact on an already accelerated price behavior (the prices with the most significant impacts on the CPI are telecommunications and electricity, while fuels and electricity are the most important on the GDP deflator), continuing the deterioration of the purchasing power of consumers.

To assess this impact on consumers, a Social Accountability Matrix for the year 2014 was used. In line with the 1997 IO matrix exercise, the most significant impacts on the CPI are on telecommunications and electricity. The comparison between the time dimension of the matrices reveals there is just a small reduction of the whole pass-through coefficient of -0.1% between 1997 and 2014, when prices are increase10%. This is a consequence of the reduction of the indirect effect on public services (e.g. fuel, electricity, water, and telecommunications) and wages by -0.94% and -0.38% percent respectively, and the increase of 1.41% in devaluation. In all, the overall effect of simultaneous prices increases of 10% on fuel, telecommunications and public services is 0.67%, whereas a 10% devaluation entails a 2.83% impact.

The main implication of this result is that in the short-term, as the economy relies excessively on imports (i.e. compared to its historical average), the main impact of lagged price adjustments will come from the exchange rate, whereas in the medium to long terms, as the economy relies less on imports and its productive sector re-develops, it will react more to domestic product price adjustments. Put another way, these results tend to confirm the view that the Venezuelan economy is now more sensitive to movements in the exchange rate, than to movements in the prices of domestic goods. An expected result.

Comparing between lowest and highest income deciles, a simultaneous 10% increase in all the above-mentioned products plus wages and the exchange rate, implies a 5.58% increase in the CPI of the lowest income household, whereas it represents 12.43% of its income. If all these prices are doubled in a single month, expenditures of the lowest income household will increase by 55.8% and such increase will represent 120.4% of its income, a complete wipeout. For the highest income household, all prices doubling will consume 36.32% of its income in a single month, close to 1/3 of it.

If we fast forward this result to the year 2020, our prior is that the impact on consumer expenditures will be much larger, as real incomes have decreased substantially.

The results from the econometric exercise suggest a relatively low pass-through effect of gasoline prices to prices of goods and services recorded in the CPI. The pass-through coefficient obtained

by averaging the results of the models that exhibit more distinct estimates, indicate that a one percentage point increase in the price of gasoline is associated with a 0.031 to 0.035 percentage points rise in inflation measured by the CPI. Another interesting result of the study is that gasoline price adjustments do not have persistent effects on the CPI. Their effects are concentrated in the month in which the adjustment occur.

Though averaging is a convenient way of summarizing the main results of the different models estimated, it may hide other important aspects that in some way are captured in the individual equations. First, for most economic agents the price in local currency may be the most direct indicator of changes in gasoline prices. Second, controlling for the impact of money is important as it is a fundamental driver of inflation and improves the statistical fit of the models. Third, there seems to be an asymmetric effect that indicates that gasoline price increases have a larger impact that price reductions. A model that captures these three elements, suggests a pass-through coefficient of 0.058, almost twice the average, and still rather low.

For electricity prices, the results suggests that the pass-through effect from an increase in the price of electricity to consumer price inflation may be somewhat higher than those estimated for an increase in the price of gasoline, but still they seem relatively moderate. As in the case of gasoline prices, models based on prices in local currency tend to show a substantially larger pass-through effect on consumer prices than those estimated using prices in US$. These results, however, should be taken with care, as they are derived from a relatively small sample, particularly on the time dimension.

The results finally indicate that the pass-through effect from an increase in the price of fixed broadband service to consumer price inflation might be considerably more modest than those estimated for an increase in the price of gasoline and the price of electricity. This results should again be taken with care, as they are derived from a relatively small sample, particularly on the time dimension, and models without other control variables such as changes in the money supply.

With all these results, the potential macroeconomic impacts on the Venezuelan economy of adjusting a set of key prices was examined. The evidence obtained in the previous sections regarding the pass-through coefficients of increasing the prices of these products and services is introduced in a financial program framework for the Venezuelan economy. The exercise delivered projections of key macroeconomic variables for a four-period horizon (from T to T+3) of a Benchmark case (no adjustment) and three basic scenarios: Gradual Adjustment, Semi-Gradual Adjustment, Upfront Adjustment.

For each of the three price adjustment scenarios, two alternatives are examined: (i) adjusting prices without introducing measures to mitigate their impact on the income of the population (no mitigation), (ii) adjusting prices and giving the population a cash transfer to mitigate the impact (mitigation). The mitigation scheme introduced in the financial program consists of cash transfers to the families for the whole amount of the resources raised through the tax applied to gasoline sales (30%).

Overall, the results from the financial program suggest that a Gradual approach for adjusting gasoline and regulated services prices together with mitigating measures, may produce outcomes in terms of GDP growth and inflation that are notably better than those obtained with a strategy of Upfront adjustment in prices without mitigating measures. The fiscal primary deficit of the gradual - mitigation strategy, however, almost double the one observed in the Upfront-no mitigation scenario. Thus, the improvement in macroeconomic terms of the Gradual-mitigation alternative is only feasible if it could be financed using external resources, and if economic agents believe that the government will be able in some reasonable time horizon to adjust fiscal policy to a sustainable path. Even if these two favorable conditions are met, other challenges remain. For example, a gradual adjustment in gasoline prices makes more difficult the recovery of the oil industry that is crucial for the sustainability of the external accounts and the overall performance of the Venezuelan economy. Also, the strong impact on the fiscal deficit of the Gradual adjustment plus mitigating measures strategy may complicate further the already demanding task of the monetary authority of putting in place a credible and effective anti-inflationary policy.

In general, the financial program exercise exhibits a typical trade-off discussed in many studies regarding the choice between a gradual approach to stabilization and structural reform versus a shock adjustment. A gradual adjustment that is generally considered more viable from a political and social standpoint, prolong certain imbalances that could reduce the possibility of a durable stabilization, while a rapid adjustment that could contribute to a robust stabilization may be politically and socially unachievable.

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XII Annex

XII.1 Description of the financial programing model

This financial program is structured in four sectors: Fiscal Sector, External Sector, Real Sector and Prices, and the Monetary Sector. In the Fiscal Sector (composed by the General Government and PDVSA), the adjustment variable is the external financing entry. The General Government comprises the Central Government, the Social Security system, transfers to local governments (states and municipalities), and transfers to non-financial public enterprises.

In the external sector, the balance of payments projections captures the oil and government sectors foreign transactions including the external financing needs of the Fiscal Sector, plus the activities of private agents with the rest of the world. The adjustment variable in the External Sector is the change in the international reserve assets of the central bank.

The Real Sector and Prices projects non-oil GDP changes and price inflation based on simple models that include changes in the monetary base as an exogenous variable. In addition to the growth rate of the monetary base, inflation is affected by the contemporaneous growth rate of non-oil GDP and its value lagged one period, inflation in t-1, and a simple index of foreign exchange pressure (percentage change of the nominal exchange rate – percentage change of the stock of central bank international reserves). The growth rate of non-oil GDP is estimated using in addition to the growth rate of the monetary base, its own value lagged one period and the contemporaneous rate of inflation. An adjustment factor is added to the inflation and non-oil GDP growth equations to capture influences not explicitly included in the model. Oil GDP is estimated based on the assumptions used to construct the PDVSA account.

The Monetary Sector is centered on a projection of the monetary base and its components on the assets side that incorporates the stock of net international reserves derived from the balance of payments. The adjustment variable in the Monetary Sector is the central bank intervention in the monetary market to achieve a reference value of the monetary base.

XII.2 Gasoline/Diesel and Regulated Services Price Adjustment Schemes

1. Gradual Adjustment

	T-1	T	T+1	T+2	T+3
Gasoline & Diesel USD/Liter	0.01	0.01	0.13	0.20	0.33
Electricity residential USD/kWh	0.01	0.01	0.04	0.08	0.12
Electricity commercial USD/kWh	0.00	0.00	0.07	0.11	0.15
Electricity industrial USD/kWh	0.00	0.00	0.06	0.10	0.14
Water supply cost of 15 cubic meters USD	1.00	1.00	4.00	6.00	8.00
Internet services broadband USD/month	5.00	5.00	10.00	15.00	20.00
Pass-through effect on CPI	0.00%	0.00%	88.00%	12.00%	8.83%

2. Semi-Gradual Adjustment

	T-1	T	T+1	T+2	T+3
Gasoline & Diesel USD/Liter	0.01	0.19	0.46	0.52	0.59
Electricity residential USD/kWh	0.01	0.05	0.12	0.14	0.16
Electricity commercial USD/kWh	0.00	0.00	0.15	0.17	0.19
Electricity industrial USD/kWh	0.00	0.00	0.14	0.16	0.18
Water supply cost of 15 cubic meters USD	1.00	3.00	7.00	9.00	10.00
Internet services broadband USD/month	5.00	10.00	20.00	25.00	30.00
Pass-through effect on CPI	0.00%	240.50%	24.76%	3.87%	2.96%

3. Upfront Adjustment

	T-1	T	T+1	T+2	T+3
Gasoline & Diesel USD/Liter	0.01	0.30	0.59	0.59	0.59
Electricity residential USD/kWh	0.01	0.09	0.16	0.16	0.16
Electricity commercial USD/kWh	0.00	0.00	0.19	0.19	0.19
Electricity industrial USD/kWh	0.00	0.00	0.18	0.18	0.18
Water supply cost of 15 cubic meters USD	1.00	5.50	10.00	10.00	10.00
Internet services broadband USD/month	5.00	17.50	30.00	30.00	30.00
Pass-through effect on CPI	0.00%	415.50%	15.88%	0.00%	0.00%