The transmission of Supply Shocks to inflation: The case of Argentina (2004-2023)

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Abstract

This paper investigates how domestic and external supply shocks influence inflation in Argentina using the Local Projections methodology. We categorise supply shocks into two groups: domestic and external. Domestic supply shocks include the nominal exchange rate and regulated prices. In contrast, external supply shocks include international energy and food prices. The results reveal two main findings: First, both domestic and external supply shocks positively influence inflation. Second, there are significant variations in the magnitude and dynamic of how these supply shocks are transmitted to inflation. These insights offer a comprehensive understanding of how supply shocks influence inflationary processes in developing countries and small open economies, similar to Argentina.

Keywords: Local Projections, Impulse responses, Supply shocks, Inflation, Exchange rate pass-through, Cost-push inflation.

JEL classification codes: C32, E31, F41.

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1. Introduction

Recent events - such as the COVID-19 pandemic, the Russia-Ukraine war, and the global energy and food prices shock - have contributed to the resurgence of inflation in countries where it had been forgotten. These events have highlighted the role that supply shocks play in driving inflationary pressures and the transmission mechanisms through which these shocks influence inflation (Blanchard & Bernanke, 2023; Shapiro, 2022; Tenreyro et al., 2023).

In this paper, our main contribution is to study how domestic and external supply shocks influence inflation in Argentina using the Local Projections methodology. The results reveal two main findings. First, both domestic and external supply shocks positively influence inflation. Second, there are significant variations in the magnitude and dynamic of how these supply shocks are transmitted to inflation. This study allows us to understand the impact of supply shocks on inflation in developing countries and small open economies, similar to Argentina.

Why Argentina is an interesting case to study? Because Argentina has experienced successive currency crises, chronic inflation, and persistent macroeconomic instability over the last two decades. Additional relevant factors that complete this picture include the dual exchange rate system, exchange rate controls periods or better known as "*cepo cambiario*", the transition from a moderate to a high inflation regime, and the intensification of distributional conflicts, which have been intensified by persistent inflation, leading to "*wage price spirals*".

To provide a theoretical foundation, we first derive the augmented triangle model to explain inflation in a small open economy. The augmented triangle model is motivated by the Hybrid New Keynesian Phillips curve for Argentina (D'Amato & Garegnani, 2009), the Triangle Model of inflation (Gordon, 2011) and the Neo-Structuralist Phillips curve (Rapetti, 2024). The augmented Triangle Model distinguishes three dimensions to analyse the factors that influence inflation dynamics: inflation inertia, demand factors, and supply factors. Unlike New Keynesian models, our approach explicitly incorporates the dimension of supply factors to illustrate its direct influence on inflation, as well as its indirect effects through interactions with the other two dimensions across multiple transmission channels. The augmented Triangle Model provides the foundation for the empirical baseline model we have developed to examine the transmission of supply shocks to inflation

We present the empirical baseline model to study the transmission of supply shocks to inflation in Argentina from 2004 to 2023. In our analysis, we categorise supply shocks into two groups: domestic and external. Domestic supply shocks include the nominal exchange rate and regulated prices. In contrast, external supply shocks include international energy and food prices.

We use the Local Projections methodology developed by Jordà (2005) to estimate the impulse response functions of inflation. To examine the dynamics of these supply shocks over a one-year horizon, we present two types of impulse response functions: the differential response and the cumulative response. This approach allows us to understand not only the immediate impact of the shocks but also their persistence over time.

Our results show that both domestic and external supply shocks positively influence inflation after one year: (1) The cumulative response of inflation to an exchange rate shock is 0.751 percentage points; (2) The cumulative response of inflation to a regulated prices shock is 0.421 percentage points; (3) The cumulative response of inflation to an energy prices shock is 0.103 percentage points; and (4) The cumulative response of inflation to a food prices shock is 0.04 percentage points. There are significant variations in the magnitude of their impact and the dynamics of how these supply shocks are transmitted to inflation.

To ensure the robustness of our baseline model, we perform a battery of robustness checks. First, we identify non-linear effects of an exchange rate shock on inflation. Second, we compare the estimated pass-through effect in the baseline model with a subsample that excludes periods of exchange controls in Argentina. This approach enables a more accurate estimation of the exchange rate pass-through to inflation, as it eliminates the distortions associated with dual exchange rate systems or black market for foreign exchange. Third, we use the nominal effective exchange rate rather than the nominal bilateral exchange rate to estimate the exchange rate pass-through to inflation, aligning with the approach used in the recent literature. And finally, we demonstrate that the results for commodity shocks are robust across different indexes.

The structure of the paper is as follows. After this introduction, Section 2 we derive the augmented Triangle Model to explain inflation in a small open economy. Section 3 outlines the empirical methodology used in the baseline model. Section 4 presents the estimation results of the baseline model. Section 5 performs a battery of robustness checks to validate the consistency of the baseline model. Finally, Section 6 concludes.

2. Derivation of the augmented Triangle Model

In this section, we derive the augmented Triangle Model to explain inflation in a small open economy. The model distinguishes three dimensions to analyse the factors that influence inflation dynamics. We offer a conceptual framework to illustrate the multiple channels of transmission of supply shocks to inflation, which will be the focus of our study.[1]

The consumer price index (P_t) is composed of four essential prices that represent all the goods and services marketed in our economy. First, P_X represents the price of exported

[1]This model is motivated by the advanced macroeconomics lecture notes of professor Martín Rapetti and the inflation literature of Roberto Frenkel.

goods. Second, P_M represents the price of imported goods. Third, P_R represents the price of regulated goods and services. Fourth, P_F represents the price of fix goods. The consumer price index is developed using a weighted geometric index, where α_i represents the respective weight of each category of goods and services withing the domestic consumption basket. Accordingly, the consumer price index is given by:

$$P_t = P_{X,t}^{\alpha_X} P_{M,t}^{\alpha_M} P_{R,t}^{\alpha_R} P_{F,t}^{\alpha_F} \tag{1}$$

Our model refers to a small open economy that is a price taker in international markets. Therefore, the prices of exportable (P_X) and importable (P_M) goods are expressed in domestic currency based on the nominal exchange rate (E) and the international prices (P^*). In our economy, the *"law of one price"* applies: the price of the same good is the same in any country in the world when denominated in a common currency, in the absence of trade restrictions and frictions.

$$P_{X,t} = E_t P_{X,t}^{*} \tag{2}$$

$$P_{M,t} = E_t P_{M,t}^{*} \tag{3}$$

The following goods and services are considered regulated: electricity, gas, water, transportation, and communication tariffs. Generally, the prices of these goods and services are fixed or conditioned by the government as part of economic policy decisions. For this reason, we assume them to be exogenous.

$$P_{R,t} = \bar{P_R} \tag{4}$$

Fix goods are differentiated goods, such as manufactured goods, where firms set prices under conditions of imperfect competition. Firms establish their price by applying a percentage profit margin κ over the costs. In a small open economy, the cost structure depends on three inputs: wages, regulated goods and services, and imported inputs. We use a weighted geometric cost index, with the respective weighted θ_i assigned to each input.

$$P_{F,t} = \kappa_t W_t^{\theta_W} P_{R,t}^{\theta_R} P_{M,t}^{\theta_M} \tag{5}$$

We obtain the change in the prices of our economy ($\Delta p_t = p_t - p_{t-1}$), applying the natural logarithm and then the difference operator (Δ) to equation (1). We denote the natural logarithm with lowercase letters.

$$\Delta p_t = p_t - p_{t-1} = \alpha_X \Delta p_{X,t} + \alpha_M \Delta p_{M,t} + \alpha_R \Delta p_{R,t} + \alpha_F \Delta p_{F,t} \tag{6}$$

Performing the same procedure on the remaining numbered equations, we obtain the changes in the four essential prices of our economy. Then, we substitute these equations into equation (6) and substitute all the endogenous relations of the expression. We assume that under normal conditions, the mark-up over the cost is constant, $\Delta\kappa_t$ is equal to 0.[2]

$$\Delta p_t = \alpha_X(\Delta e_t + \Delta p^*_{X,t}) + \alpha_M(\Delta e_t + \Delta p^*_{M,t}) + \alpha_R \Delta p_{R,t} + \alpha_F(\theta_W \Delta w_t + \theta_R \Delta p_{R,t} + \theta_M(\Delta e_t + \Delta p^*_{M,t})) \tag{7}$$

Standard New Keynesian models include wage adjustments as an amplifying mechanism of the effects of a given inflationary shock. The simplest way to represent wage setting is that workers can negotiate their wages at time t considering the previous period's inflation and labour market conditions. The basic logic of this approach is that workers seek to maintain their real purchasing power by adjusting their nominal wages in response to past inflation. Additionally, workers also consider the conditions of the labour market, which reflect the equilibrium between labour supply and demand. In our model, the output gap serves as a proxy for labour market conditions, the real wage rises with the level of activity (Blanchflower & Oswald, 1995) and can be justified by bargaining models and efficiency wages (Akerlof & Yellen, 1990; C. Shapiro & Stiglitz, 1984).

$$\Delta w_t = \gamma_1 \Delta p_{t-1} + \gamma_2(y_t - y_e) \tag{8}$$

In this equation, Δw_t represents the change in wages at time t, Δp_{t-1} denotes the inflation rate in the previous period, and $(y_t - y_e)$ captures the deviation between the actual level of output in an economy and its potential level. The coefficient γ_1 quantifies the sensitivity of wage adjustments to past inflation and γ_2 quantifies the sensitivity of the output gap deviation.

We define the variable p_{int} to represent international prices which includes the international prices of exportable and importable goods. By combining the international prices of exportable and importable goods from equation (7) into a single expression, along with their respective coefficients. we derive the following equation:

$$\delta_{int} \Delta p_{int,t} = \alpha_X \Delta p^*_{X,t} + (\alpha_F \theta_M + \alpha_M) \Delta p^*_{M,t} \tag{9}$$

[2]Normal conditions are discussed in more detail in Frenkel, 1989. As the author indicates, normal conditions imply a more or less known situation, in which the variables (exchange rate, monetary, public tariffs, etc.) that provide additional information on acceleration or deceleration trends and the magnitude of their rates are signals commonly interpreted by most agents.

Substituting equation (8) and equation (9) into equation (7), and rearranging terms yields:

$$\Delta p_t = \alpha_F \theta_W \gamma_1 \Delta p_{t-1} + \alpha_F \theta_W \gamma_2 (y_t - y_e) + (\alpha_F \theta_R + \alpha_R) \Delta p_{R,t} + (\alpha_F \theta_M + \alpha_X + \alpha_M) \Delta e_t + \delta_{int} \Delta p_{int,t}$$

Which can be simplified to the following expression:

$$\Delta p_t = \phi_1 \Delta p_{t-1} + \phi_2 (y_t - y_e) + \phi_3 \Delta e_t + \phi_4 \Delta p_{R,t} + \phi_5 \Delta p_{int,t} \tag{10}$$

Finally, we derive the augmented Triangle Model for a small open economy. This model offers us a conceptual framework to illustrate the multiple channels of transmission of supply shocks to inflation. The augmented Triangle Model is closely related to the Hybrid New Keynesian Phillips Curve for Argentina (D'Amato & Garegnani, 2009), the Triangle Model of inflation (Gordon, 2011) and the Neo-Structuralist Phillips curve (Rapetti, 2024) but presents some differences that we will highlight below. The augmented Triangle Model distinguishes three dimensions to explain inflation:

The first dimension is the inflationary inertia (Δp_{t-1}). When inflation exceeds a certain threshold, economic agents' behaviour changes in response to inflation expectations, leading to qualitative changes in contract negotiation mechanisms (Frenkel, 1989; Heymann & Leijonhufvud, 1995). As a result, contracts often include an indexation clause to minimise contracting costs and reduce the frequency of renegotiations of nominal contracts. (Frenkel, 1988). García-Cicco et al. (2023) provide evidence that inflationary inertia plays a significant role in Argentina's inflationary dynamics.

The second dimension is the influence of demand factors on prices, which is represented by the output gap ($y_t - y_e$). The output gap is a proxy for the influence of the labour market on inflation. This influence is known in the literature as distributional conflict. The influence of this mechanism stems from the disagreement between workers and firms over the relative prices of goods and labour, represented by the real wage (W/P). Firms adjust nominal prices with the aim of achieving a specific W/P ratio. While workers, during wage negotiations, seek a higher W/P ratio. This conflict leads to nominal inflation in both prices and wages, which is known in the literature as "*wage price spiral*" (Blanchard, 1986). This interpretation of the "*wage price spiral*" emphasises that distributional conflict is a potential channel for the transmission of inflationary shocks (Lorenzoni & Werning, 2023a; Rowthorn, 1977).

The third dimension is the influence of supply factors on inflation. We focus on this dimension to illustrate the multiple channels of transmission of supply shocks to inflation in a small open economy. We include three key variables to explain the transmission of supply shocks to inflation.

The first variable is the nominal exchange rate (e_t). Three mechanisms explain the exchange rate pass-through to prices. First, there is an increase in the price of imported inputs. In response to increasing costs, firms seek to preserve their profit margins by transferring these increased costs to prices. This mechanism is known in the literature as cost-push inflation. The second mechanism is the distributional conflict. As prices rise, real wages decline, leading workers to demand higher nominal wages to restore their purchasing power. This conflict results in nominal inflation in both prices and wages, which is known in the literature as "*wage price spiral*" (Lorenzoni & Werning, 2023b). Third, imported consumer goods become more expensive. However, the pass-through of this channel is incomplete because households substitute imported goods with lower-quality goods in the aftermath of large contractionary devaluations (Burstein et al., 2005).

The second variable is the regulated prices ($p_{R,t}$). Regulated prices include tariffs of electricity, gas, water, transportation, and communication. These goods and services are part of the household consumption basket and serve as production inputs for firms. When tariffs increase (or are deregulated), the prices of these goods and services increase, decreasing the purchasing power of households and increasing the costs of firms.

The third variable is the international prices ($p_{int,t}$). We consider the international price of energy (such as oil, gas, etc.) and the international price of food (such as cereals, fruits and vegetables, etc.). We selected this set of goods due to their significant role in international commodity trade. An increase in international prices raises production costs for firms, which then pass these higher costs on to consumer prices. Consequently, households experience a reduction in purchasing power for two reasons. First, the increase in international prices directly affects the household consumption basket. Second, the increase in consumer prices due to the transfer of higher costs from firms. Additionally, fluctuations in international prices impact the trade balance and the exchange rate in a small open economy, which in turn influences domestic variables (such as output).

3. Empirical methodology

We use the Local Projections methodology to estimate the impulse responses of inflation to supply shocks. We first argue the benefits of using Local Projections in our estimation. Next, we show our empirical baseline model adapted to the augmented Triangle Model to study the transmission of supply shocks to inflation. Finally, we make a description of the data for the period 2004 – 2023.

3.1 Local Projections

Local Projections is a methodology developed by Jordà (2005) that estimates the impulse responses of a dependent variable to shocks in independent variables. In recent decades, Local Projections have been used as an alternative to VARs models for estimate impulse responses.

The main advantage of the Local Projections methodology is its flexibility to obtain the impulse response function of the dependent variable to a shock. The effect of a shock on the dependent variable, at a specified forecast horizon (h), is represented by the path of the estimated coefficients of the independent variable across sequential regressions for each value of h. The sequential forward of the dependent variable may induce a serial correlation of error terms. To solve this problem, we use Newey and West (1987) standard errors with lag-length set to the horizon of the Local Projections.

Compared to VARs models, Local Projections highlight four advantages. First, Local Projections are more flexible for model specification, as they do not require the imposition of restriction on the structure of the model (Jordà, 2005). Second, Local Projections do not impose restrictions on the shape of the impulse response functions, making them more robust to misspecification (Olea et al., 2024; Plagborg-Møller & Wolf, 2021). Third, Local Projections estimators have lower bias than VAR estimators (Li et al., 2024). Fourth, they can be estimated using simple regression techniques, as each time horizon is estimated separately using least squares regressions.

Using Local Projections also has its disadvantages. There is a trade-off between bias and variance: Local Projections estimators have lower bias than VAR estimators but substantially higher variance at intermediate and long horizons (Li et al., 2024). This increased variance arises because each time horizon is estimated separately, which can lead to greater instability in the estimates. As a result, Local Projections may be less accurate at longer horizons due to the accumulation of forecast errors, resulting in wider confidence intervals.

To address some of these disadvantages, we include the residual of the $h-1$ horizon estimation as an additional regressor in the estimation for horizon h to improve the inference. There are three reasons for including the residual from the $h-1$ horizon estimate. First, it improves the efficiency of the estimator, the standard errors of the estimates are smaller (Jordà, 2005). Second, it addresses a potential bias identified by Teulings and Zubanov (2014). Third, we obtain narrower confidence intervals (Carriere-Swallow et al., 2021).

3.2 Empirical baseline model

We present the empirical baseline model to study the transmission of supply shocks to inflation in Argentina from 2004 to 2023. We want to estimate the impulse responses of inflation to four supply shocks.

The typical Local projections equation that we estimate takes the following form:

$$p_{t+h-1} - p_{t-1} = \alpha_h + \beta_h \Delta shock_t + \sum_{i=0}^{k} X'_{t-i}\gamma_h + u_{t,h} \tag{11}$$

Local Projections generate estimates for each forecast horizon h by regressing the dependent variable at $t + h - 1$ on the available information set at time t. Here, $t = 1, 2, \ldots, T$ represents the time dimension of the data, while $h = 1, 2, \ldots, 12$ denotes each forecast horizon.

Where p_t denotes the natural logarithm of the price level at time t, such that the dependent variable $p_{t+h-1} - p_{t-1}$ denotes the cumulative change from time $t-1$ to $t+h-1$. α_h is the constant of linear regression. $\Delta shock$ is the log change of the variable to be shocked, alternating between the nominal exchange rate, regulated prices, food prices, and energy prices. X is a vector of control variables with dimension $n \times 1$, $u_{t,h}$ is the error term in each regression of each forecast horizon h and finally the operator Δ denotes a first difference.

The vector of control variables X includes five elements. First, the log change of the rest of the variables that alternate the *shock* variable. Second, k lags of the log change of the price level. Third, k lags of the log change of the shocked variable and k lags of the log change of the variables that alternate the *shock* variable. In the three cases, the number of lags was selected using the Bayesian Information Criterion, resulting in one lag for all control variables. Fourth, we include the output gap as the variable that summarises the full impact of demand factors on inflation. Fifth, the residual of the $h - 1$ horizon estimation.[3]

The coefficient β_h traces the cumulative impulse response of inflation from time $t - 1$ to $t + h - 1$ due to a shock occurring in time t. In this way, we obtain the path of impulse responses as the sequence of the estimated coefficients β_h of the sequential regressions for each horizon h.

We present an alternative empirical model to estimate the differential response of the prices (month-by-month). By varying $h = 1, 2 \ldots, 12$, we can observe how the effect of the change in the shock variable at time t manifests itself at different future times. This approach enables us to understand not only the immediate impact of the shock but also its persistence over time.

$$p_{t+h-1} - p_{t+h-2} = \alpha_h + \beta_h \Delta shock_t + \sum_{i=0}^{k} X'_{t-i}\gamma_h + u_{t,h} \tag{12}$$

The only difference with the previous model is the interpretation of the coefficient β_h. The coefficient β_h traces the differential response of the logarithm of prices from time

[3]Local Projections with appropriate control variables allow obtaining approximately the same impulse response as VARs models (Plagborg-Møller & Wolf, 2021).

$t+h-2$ to $t+h-1$ to a shock at time t, for each horizon $h = 1, 2, \ldots, 12$. For $h = 1$, β_1 traces the differential response of the logarithm of prices from time $t-1$ to t to a shock at time t. For $h = 2$, β_2 traces the differential response of the logarithm of prices from time t to $t+1$ to a shock at time t. And so on, we obtain the path of impulse responses as the sequence of the estimated coefficients β_h of the sequential regressions for each horizon h.

3.3 Data description

This section describes the dataset of our empirical analysis for the period 2004 to 2023 and the descriptive statistics of the Argentina time series. Next, we perform multiple stationarity tests in the series.

The baseline model uses monthly data for the period January 2004 to July 2023. The data set includes seven variables:

- For consumer prices (CPI), we used the consumer price index (CPI) from INDEC and CEPED DATA, which compiles information from various sources. We use alternative estimates because the statistics published by National Institute of Statistics and Census (INDEC) for the period 2007-2015 were officially discredited by the agency. For the period 2004 to 2007, we use data publish by INDEC GBA. From 2008 to April 2016, we use an index develop from the CPI of the non-intervened provincial statistical agencies.[4] From there, we use the data by INDEC GBA until December 2016, after which we use the national coverage data published by INDEC.

- For nominal exchange rate (NER), we use the official bilateral exchange rate against the US dollar, published by the Central Bank of Argentina (BCRA), "Comunicación A 3500". The exchange rate is defined in units of domestic currency per unit of foreign currency, therefore a depreciation indicates an increase in units of domestic currency per unit of foreign currency, while an appreciation of the exchange rate indicates a decrease in the nominal exchange rate.

- For regulated prices or public service prices (regulated), we use the regulated prices category of the INDEC consumer price index and the series provided by de la Vega et al. (2024). First, we use the de la Vega et al. (2024) series for the period January 2004 to January 2017 and then we use the INDEC series. Includes fuels for housing, electricity, water and sanitation services, public transport and other public services.

[4]The provincial CPI is a Consumer Price Index (CPI) developed from a weighted average of the CPIs of Chubut (Rawson Trelew), Jujuy, La Pampa (Santa Rosa), Misiones (Posadas), Neuquén, Salta, San Luis, Santa Fe (Santa Fe and Rosario), Tierra del Fuego (Ushuaia) and the City of Buenos Aires, publish by the respective provincial statistics. The weight of each of these indices in the total is determined according to the weight of household consumption expenditure in each province, based on information from the National Household Expenditure Survey (Encuesta Nacional de Gastos de los Hogares-INDEC).

- For energy prices (energy), we use international energy prices corresponding to composite indexes in U.S. dollars reported in the World Bank's Commodity Markets (The Pink Sheet). Includes crude oil (petroleum), natural gas, and coal price indices.
- For food prices (food), we use food prices corresponding to composite indexes in U.S. dollars reported in the World Bank's Commodity Markets (The Pink Sheet). Includes cereals, meals, oils, grains, sugar, fruits, and vegetables.
- We construct the output gap using the seasonally adjusted index of INDEC's monthly economic activity estimator (EMAE) using the Hodrick-Prescott filter.

Table 1. Descriptive Statistics

Variables	Obs.	Mean	Std. dev.	Min.	Max.
Consumer price index	234	.024	.016	.000	.081
Nominal exchange rate	234	.019	.035	-.039	.248
Regulated Prices	234	.019	.029	-.102	.276
Energy prices	234	.004	.086	-0.44	0.244
Food prices	234	.003	.033	-.176	.107
Seasonally Adjusted EMAE	234	.002	.019	-.168	.103

Notes: The variables are expressed in log difference with respect to the previous month for the period January 2024 to July 2023

We use the Dickey-Fuller and Perron tests to analyse the level of integration of the variables. We prefer augmented versions of these tests because they include multiple lags in the model, improving the ability to identify the presence of a unit root. We can see that the results in Table 2 suggest that all the variables are integrated of order 1. That is, the null hypothesis of a unit root in levels is not rejected, but it is rejected in the first difference.

Table 2. Unit Root Tests

Variables	Augmented Dickey-Fuller	Deterministic components	Augmented Perron	Deterministic components
Consumer price index	0.000	Trend and Drift	0.000	Trend
Nominal exchange rate	0.000	Trend and Drift	0.000	Trend
Regulated Prices	0.000	Trend and Drift	0.000	Trend
Energy prices	0.000	None	0.000	None
Food prices	0.000	None	0.000	None
Seasonally Adjusted EMAE	0.000	None	0.000	None

Notes: The table shows the p-values associated with the rejection of the null hypothesis that the series have a unit root. All series have no unit root in first log difference. Variables are expressed in log change with respect to the previous month for the period January 2024 to July 2023.

4. Estimation results

Our results show that domestic and external supply shocks positively influence inflation. There are significant variations in the magnitude of their impact and the dynamics of how these supply shocks are transmitted to inflation. To examine these dynamics over a one-year horizon, we present two types of impulse response functions: the differential response and the cumulative response.

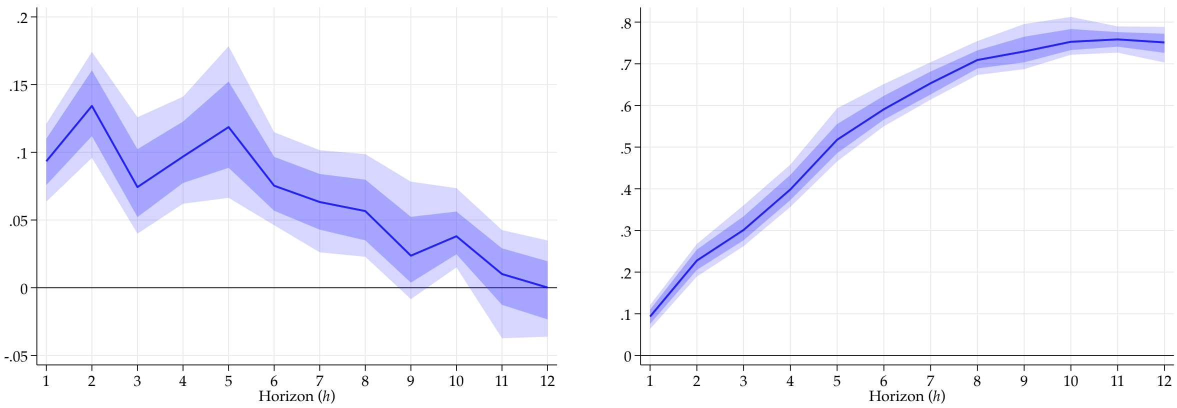
4.1 Impact of a nominal exchange rate shock to inflation

Figure 1 shows the impulse responses of inflation to a 1 pp increase in the nominal exchange rate (in percentage points). The effect of the nominal exchange rate shock to inflation is positive and persistent, remaining positive and significant at all horizons.

Panel (a) reports the differential response of inflation (month-to-month). We can observe an exchange rate pass-through of 0.093 pp at the time of shock. The largest pass-through to prices is observed in the horizon immediately following the impact, reaching 0.134 pp. In the following horizons, the pass-through remains positive but gradually decreases.

Panel (b) reports the cumulative response of inflation. We can observe that the pass-through is positively persistent and significant at all horizons. The exchange rate pass-through to inflation is 0.751 pp after twelve horizons from the initial shock.

Figure 1. Impulse responses of inflation to a nominal exchange rate shock



(a) Differential response (b) Cumulative response

Notes: The panels show impulse responses of inflation to a 1 pp increase in the nominal exchange rate (in percentage points). The solid blue lines show the point estimates β_h for each horizon h. Panel (a) reports the differential response of inflation (month-by-month), estimated from equation (12). Panel (b) reports the cumulative response of inflation, estimated from equation (11). Shaded bands correspond to 90% and 68% confidence intervals obtained from 1000 Bootstrap runs.

Our main result is that the pass-through from the exchange rate to inflation is 0.751 pp after one year. This result is consistent with other studies that use the Local Projections methodology to analyse the exchange rate pass-through to consumer prices. Barberis (2021) estimates a pass-through of the bilateral exchange rate to inflation of 0.82 in one year for Argentina during the period 2004-2019. Carriere-Swallow et al. (2021) find that the pass-through of the nominal effective exchange rate to inflation is 0.60 for thirty emerging market economies and 0.50 for the subsample of Latin American countries after one year during the period 1995-2019.

The exchange rate pass-through to inflation is higher in emerging countries than in developed countries for three reasons well documented in the literature. First, Calvo and Reinhart (2000) postulate that exchange rate volatility and lack of credibility contribute to a higher pass-through from exchange rate fluctuations to inflation in EMs.[5] Countries with greater nominal volatility have a greater exchange rate pass-through (Campa & Goldberg, 2005). Second, volatility in EMs influences the choice of invoice currencies in trade (Gopinath et al., 2020). Third, the lack of monetary policy credibility, with unanchored inflation expectations, increases the exchange rate pass-through to inflation. Caselli and Roitman (2019) and Carriere-Swallow et al. (2021) test Taylor's hypothesis and demonstrate that exchange rate pass-through is consistently lower in countries that implement inflation targeting compared to those that do not.

[5] In EMs devaluations, or large depreciations for that matter, are contractionary, the adjustments in the current account are far more acute and abrupt. Currency crises become credit crises as sovereign credit ratings often collapse following the currency collapse and access to international credit is lost. Lack of credibility also gives rise to chronic and marked volatility in domestic interest rates (Calvo & Reinhart, 2000).

The main result of our study surpasses those exposed in recent literature that employs different methodologies to estimate the annual pass-through of the exchange rate to consumer prices in Argentina. For example, Montes-Rojas and Toledo (2022) estimates that the exchange rate pass-through is 0.15 to 0.45 using the VAR and quantile VAR methodology for the period 2004-2019. On the other hand, Ito and Sato (2007) find an exchange rate pass-through of 0.28 for the period 1995-2006 using structural VAR. However, Aron et al. (2014) suggests that the estimates of the exchange rate pass-through on inflation obtained from various methodologies may not be directly comparable, as the underlying assumptions differ.

Aron et al. (2014) highlight that single-equation, such as Local Projections, offer both advantages when estimating the exchange rate pass-through to inflation These models, whether specified in levels or differences, are particularly effective at managing structural breaks and asymmetries—an essential factor in the Argentine context. When specified in first differences, single-equation models exhibit resilience to changes in the mean resulting from structural breaks. However, these advantages come with the limitation of assuming the exogeneity of the exchange rate and other determinants, thereby overlooking the feedback effects on domestic costs and import prices through the exchange rate.[6]

4.2 Impact of a regulated prices shock to inflation

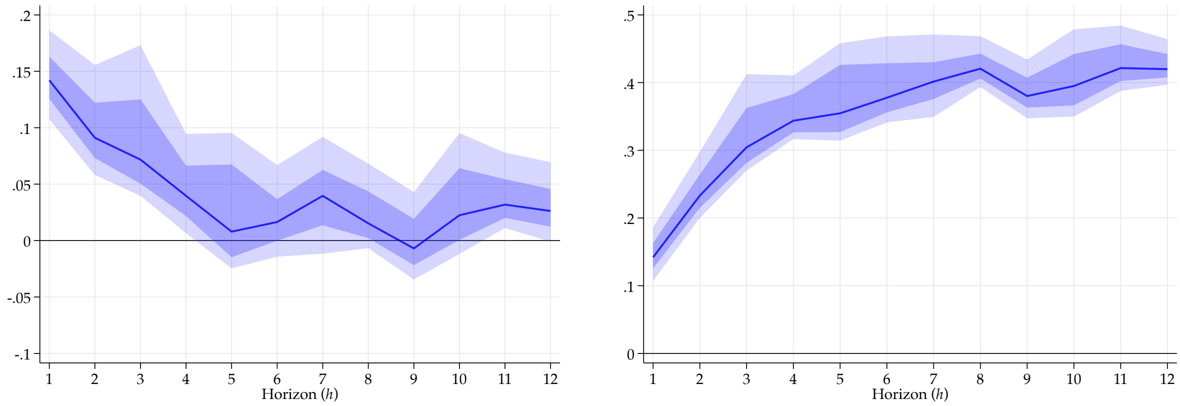
Figure 2 shows the impulse responses of inflation to a 1 pp increase in regulated prices (in percentage points). The effect of a regulated prices shock to inflation is positive and transitory, remaining positive and significant in the first quarter. Then it gradually decreases at all horizons.

Panel (a) reports the differential response of inflation (month-to-month). We can observe the greatest impact of 0.142 pp at the time of the shock. In subsequent horizons the effect is diminishes, with a decrease of 0.091 pp in the second horizon and 0.072 pp in the third horizon, although it remains positive and significant. The results gradually decrease over the following horizons.

Panel (b) reports the cumulative response of inflation. We can observe that the impact is positively persistent and significant on all horizons, with an increasing trend, reaching a maximum of 0.421 pp. The cumulative response of inflation to a regulated prices shock is 0.42 pp after twelve horizons.

[6] See Aron et al. (2014) for more details.

Figure 2. Impulse responses of inflation to a regulated prices shock



(a) Differential response

(b) Cumulative response

Notes: The panels show impulse responses of inflation to a 1 pp increase in regulated prices (in percentage points). The solid blue lines show the point estimates β_h for each horizon h. Panel (a) reports the differential response of inflation (month-by-month), estimated from equation (12). Panel (b) reports the cumulative response of inflation, estimated from equation (11). Shaded bands correspond to 90% and 68% confidence intervals obtained from 1000 Bootstrap runs.

In line with de la Vega et al. (2024) increases in regulated prices are inflationary in the short term, but this effect diminishes over time. Regulated prices have a positive impact in the first quarter but become non-significant from the second quarter onwards with a decreasing trend. Frenkel and Friedheim (2017) estimate an elasticity of regulated prices to inflation of 0.13 for the period 2003-2014 using least squares.

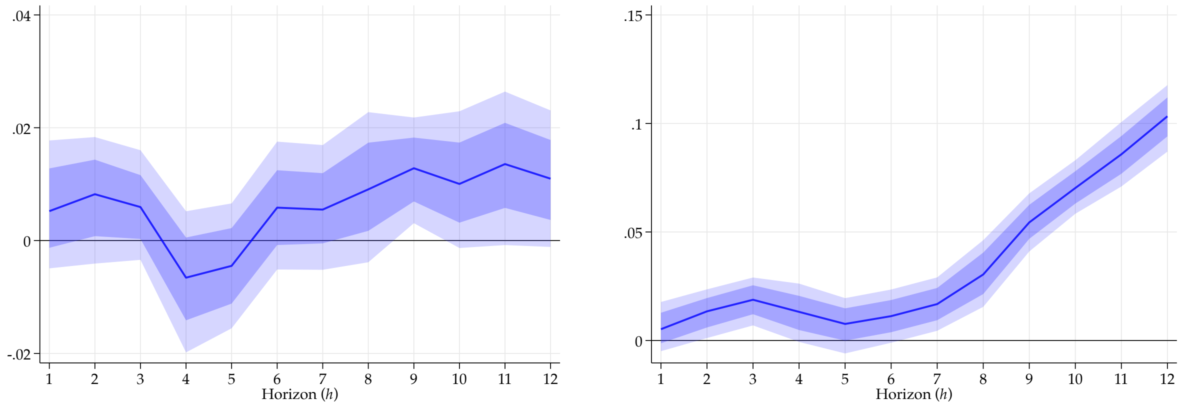
4.3 Impact of an energy prices shock to inflation

Figure 3 shows the impulse responses of inflation to a 1 pp increase in energy prices (in percentage points). The effect of an energy prices shock to inflation is positive and persistent. We observe an inverted U-shaped pattern in the first four horizons, with a positive impact in the first three horizons, followed by an increasing from the fifth horizon onwards.

Panel (a) reports the differential response of inflation (month-to-month). We can see a slight positive impact on the horizon after the shock. This effect gradually diminishes over the next two horizons, after which we observe a resurgence in positive and increasing trends starting from the fifth horizon. The results are significant in the last four horizons, reaching a peak of 0.014 pp.

Panel (b) reports the cumulative response of inflation. We can observe that the impact is long-lasting and significant after the shock, with a rising trend. Over time, this impact continues to increase steadily. After twelve horizons from the initial shock, the cumulative response of inflation to an energy prices shock is 0.103 pp.

Figure 3. Impulse responses of inflation to an energy prices shock



(a) Differential response

(b) Cumulative response

Notes: The panels show impulse responses of inflation to a 1 pp increase in energy prices (in percentage points). The solid blue lines show the point estimates β_h for each horizon h. Panel (a) reports the differential response of inflation (month-by-month), estimated from equation (12). Panel (b) reports the cumulative response of inflation, estimated from equation (11). Shaded bands correspond to 90% and 68% confidence intervals obtained from 1000 Bootstrap runs.

We find that the cumulative response of inflation to an energy prices shocks is 0.103 pp. This result is higher than recent studies for countries with characteristics similar to Argentina. Abdallah and Kpodar (2023) find that emerging and developing countries exhibit a positive and persistent inflation response to an energy prices shock, reaching 0.05 after sixteen months. Cherkasky (2022) finds that the effect of an energy prices shock to inflation in six Latin American countries ranges between 0.04 and 0.08 after one year.

Three transmission channels explain the higher inflationary impact in Argentina compared to other countries in the region. The first channel is the increase in production costs; the direct effect arises from the fact that some energy products are often used by industries as inputs in the production process of other (non-energy) goods and services, thereby increasing their production costs (Abdallah & Kpodar, 2023). The second channel is monetary financing of the fiscal deficit; in countries with high energy subsidies, an increase in energy prices worsens fiscal accounts. As a result, monetary financing of the fiscal deficit serves as an indirect channel for inflationary pressures. The third channel is inflation expectations; the persistence of commodity shocks on domestic inflation is influenced by the degree of anchoring of inflation expectations, which is closely related to the credibility of monetary policy (Reis, 2022). The credibility of monetary policy in Argentina progressively deteriorated over the last two decades as monetary financing of the fiscal deficit increased.

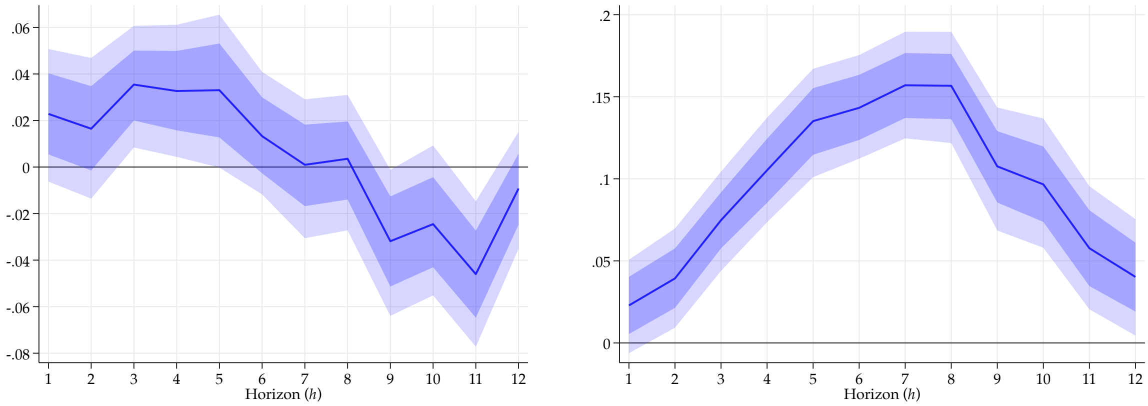
4.4 Impact of a food prices shock to inflation

Figure 4 shows the impulse responses of inflation to a 1 pp increase in food prices (in percentage points). The initial effect of the food prices shock on inflation is transitory positive, remaining positive during the first eight horizons. A gradual decrease is observed over time, accompanied by occasional significant impacts.

Panel (a) reports the differential response of inflation (month-to-month). We observe a positive impact during the first eight horizons. Over time, this impact gradually decreases, eventually leading to negative values.

Panel (b) reports the cumulative response of inflation. The cumulative impact is significant and positive, increasing positively until the eighth horizon. It then gradually decreases, reaching a value of 0.04 pp.

Figure 4. Impulse responses of inflation to a food prices shock



(a) Differential response

(b) Cumulative response

Notes: The panels show impulse responses of inflation to a 1 pp increase in food prices (in percentage points). The solid blue lines show the point estimates β_h for each horizon h. Panel (a) reports the differential response of inflation (month-by-month), estimated from equation (12). Panel (b) reports the cumulative response of inflation, estimated from equation (11). Shaded bands correspond to 90% and 68% confidence intervals obtained from 1000 Bootstrap runs.

The impact of the food prices shock on inflation is initially positive but then gradually decrease. This result is consistent with the evidence of Montes-Rojas and Toledo (2022), who also find that food price shocks exhibit some negative values and greater dispersion in inflation.

5. Robustness check

In this section, we perform a battery of robustness checks to verify the consistency of the baseline model. First, we identify non-linear effects of an exchange rate shock on inflation. Second, we analyse a subsample that excludes periods of exchange controls in Argentina.

This approach enables a more accurate estimation of the exchange rate pass-through to inflation, as it eliminates the distortions associated with dual exchange rate systems or black market for foreign exchange. Third, we use an alternative commodity price index to ensure that the results are not sensitive to the specific index employed. Fourth, we use the nominal effective exchange rate rather than the nominal bilateral exchange rate to estimate the exchange rate pass-through to inflation, aligning with the approach used in the recent literature.

5.1 Non-linear effects: Large Depreciations vs Normal Depreciations

We identify non-linear effects of an exchange rate shock using Local Projections. We find that the effects of exchange rate pass-through to inflation can be different between episodes of large depreciations and normal depreciations.

To define episodes of large depreciations, we follow Laeven and Valencia (2020) definition of currency crises. They define currency crises as periods when the annual nominal depreciation rate of a country's currency against the US dollar is at least 30% and is also at least 10% higher than the depreciation rate of the previous year.[7]

The Local Projections easily accommodate non-linear specifications. We adjust the baseline model by incorporating a dummy variable LD equal to 1 during episodes of large depreciations, along with two interactions terms that capture non-linearities. Additionally, we incorporate further control variables to capture non-linearities more accurately.

The estimate of the cumulative response of inflation takes the following form:

$$p_{t+h-1} - p_{t-1} = \alpha_h + \beta_h^{LD} LD \Delta e_t + \beta_h^{ND}(1 - LD)\Delta e_t + \sum_{i=0}^{k} X'_{t-i}\gamma_h + u_{t,h} \tag{13}$$

Our model provides distinct estimates of exchange rate pass-through depending on the value of LD. The coefficient β_h^{LD} captures the exchange rate pass-through to inflation during episodes of large depreciations when the dummy variable LD is equal to 1. Conversely, the coefficient β_h^{ND} captures the exchange rate pass-through to inflation during normal depreciations when the dummy variable LD is equal to 0.

The vector of control variables X includes four additional elements. First, the dummy variable LD, which is equal to 1 during episodes of large depreciations. Second, the exchange rate gap is calculated as the ratio of the unofficial exchange rate to the official. Third, a dummy variable *supgap*, which is equal to 1 when the exchange rate gap exceeds

[7]A recent paper by Blanco et al. (2024) use Laeven and Valencia (2020) definition of currency crises to identify large nominal exchange rate devaluations and study the distribution of labour income during large devaluations in Argentina.

one and a half standard deviations. Fourth, the interaction between the *supgap* variable and the lagged log change of the official exchange rate (e) and the unofficial exchange rate ($blue$).

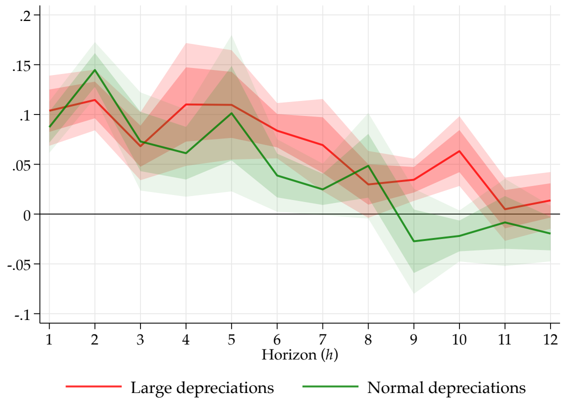
We use this interaction to capture firms' pricing decisions when the exchange rate gap widens significantly. When the exchange rate gap exceeds a certain threshold, firms assign greater weight to the unofficial exchange rate in their pricing decisions. This behaviour reflects firms' expectations that the widening exchange rate gap may lead to a devaluation of the official exchange rate, leading firms to use the unofficial rate as a reference for pricing.

Figure 5 shows the impulse responses of inflation to a 1 pp increase in the nominal exchange rate (in percentage points). The solid red lines show the point estimates of large depreciations β_h^{LD}, while the solid green lines show the point estimates of normal depreciations β_h^{ND} for each horizon h. The results indicate that during episodes of large depreciations, the effect of the nominal exchange rate shock on inflation is positive and more persistent compared to episodes of normal depreciations.

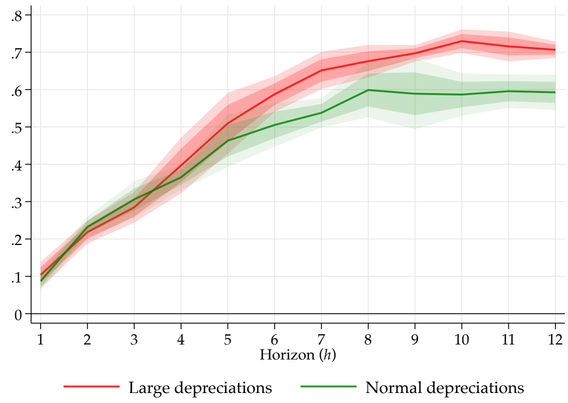
Panel (a) reports the differential responses of inflation (month-to-month). We can observe that the exchange rate pass-through during episodes of large depreciations is 0.104 pp, compared to 0.087 pp during normal depreciations at the time of the shock. The pass-through effect in large depreciation episodes is more persistent, remaining higher than in normal depreciations from the fourth horizon onward.

Panel (b) reports the cumulative responses of inflation. We can observe that the exchange rate pass-through in episodes of large depreciations is 0.707 pp compared to 0.593 pp in normal depreciations.

Figure 5. Impulse responses of inflation to a nominal exchange rate shock



(a) Differential response



(b) Cumulative response

Notes: The panels show impulse responses of inflation to a 1 pp increase in nominal exchange rate change (in percentage points). The solid red lines show the point estimates of large depreciations β_h^{LD} for each horizon h. The solid green lines show the point estimates of normal depreciations β_h^{ND} for each horizon h. Panel (a) reports the differential responses of inflation (month-by-month). Panel (b) reports the cumulative responses of inflation. Shaded bands correspond to 90% and 68% confidence intervals obtained from 1000 Bootstrap runs.

Our results on the non-linear effects of the exchange rate pass-through to inflation align with the existing literature. The higher pass-through of the exchange rate to inflation during episodes of large depreciations can be attributed to two key factors. First, the nominal exchange rate is a variable that reflects expectations about the future, having a fundamental role in the formation of domestic prices (D'Amato & Garegnani, 2009). Second, consistent with the menu cost model proposed by Golosov and Lucas Jr (2007), firms are more inclined to adjust their prices during episodes of large depreciations due to the substantial increase in costs, thereby overcoming price rigidities that may persist during more moderate depreciation episodes.

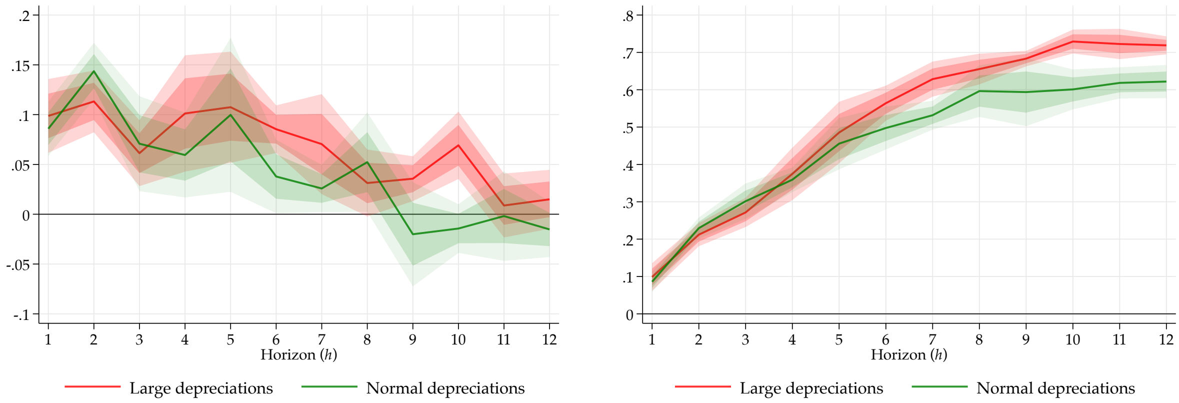
We present a second model to estimate the non-linear effects of an exchange rate shock. The difference with the first model is the vector of control variables X. The vector of control variables of the second model includes two additional elements. First, the dummy variable LD, which is equal to 1 during episodes of large depreciations. Second, the exchange rate gap is calculated as the ratio of the unofficial exchange rate to the official.

Figure 6 shows the impulse responses of inflation to a 1 pp increase in the nominal exchange rate. The solid red lines show the point estimates of large depreciations β_h^{LD}, while the solid green lines show the point estimates of normal depreciations β_h^{ND} for each horizon h. In line with the estimates of the first model, the results of the second model indicate that during episodes of large depreciations the effect of the nominal exchange rate shock on inflation is positive and more persistent compared to episodes of normal depreciations.

Panel (a) reports the differential responses of inflation (month-to-month). We can observe that the exchange rate pass-through during episodes of large depreciations is 0.099 pp, compared to 0.086 pp during normal depreciations at the time of the shock. The pass-through effect in large depreciation episodes is more persistent, remaining higher than in normal depreciations from the fourth horizon onward.

Panel (b) reports the cumulative responses of inflation. We can see that the exchange rate pass-through in episodes of large depreciations is 0.719 pp compared to 0.622 pp in normal depreciations.

Figure 6. Impulse responses of inflation to a nominal exchange rate shock



(a) Differential response

(b) Cumulative response

Notes: The panels show impulse responses of inflation to a 1 pp increase in nominal exchange rate change (in percentage points). The solid red lines show the point estimates of large depreciations β_h^{LD} for each horizon h. The solid green lines show the point estimates of normal depreciations β_h^{ND} for each horizon h. Panel (a) reports the differential responses of inflation (month-by-month). Panel (b) reports the cumulative responses of inflation. Shaded bands correspond to 90% and 68% confidence intervals obtained from 1000 Bootstrap runs.

5.2 Excluding the periods of exchange rate controls or "*cepo cambiario*"

In October 2011, in response to growing capital flight, the Central Bank implemented restrictions and controls on the foreign exchange market, commonly known as the "*cepo cambiario*". In December 2015, following the presidential elections, the end of these foreign exchange restrictions was announced; however, this measure lasted only a few years. By October 2019, restrictions on the foreign exchange market were gradually reintroduced and remain in place to this day. We use a subsample that excludes the periods of exchange rate controls in Argentina. This approach enables a more accurate estimation of the exchange rate pass-through to inflation, as it eliminates the distortions associated with dual exchange rate systems or black market for foreign exchange.

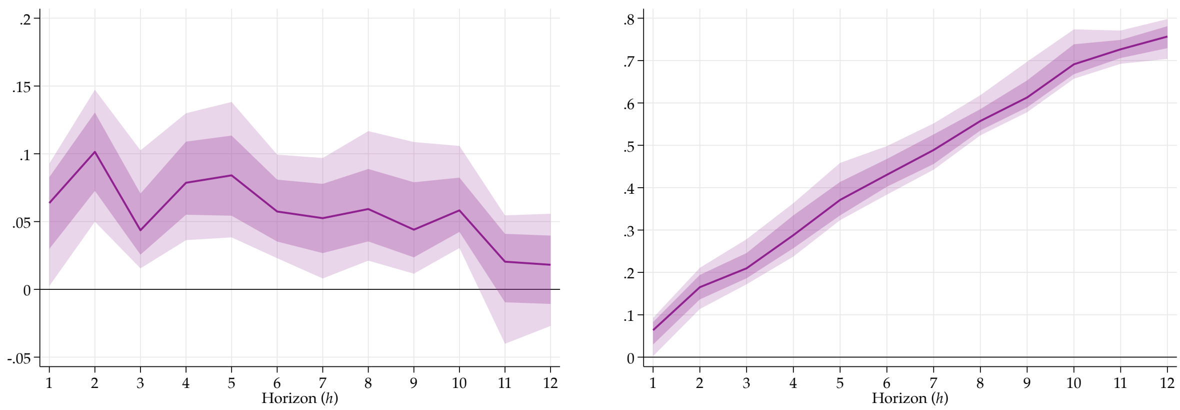
We estimate the impulse response of inflation using a subsample that excludes the periods from October 2011 to December 2015 and from September 2019 to July 2023. The exclusion of exchange controls from the sample enables a more precise estimation of the exchange rate pass-through to inflation for two key reasons. The first reason is that economic agents can freely access the exchange market, eliminating incentives to arbitrate between different dollar rates. The second reason is that agents' expectations are closely aligned with the free exchange rate and economic fundamentals.

Figure 7 shows the impulse responses of inflation to a 1 pp increase in the nominal exchange rate (in percentage points). The effect of the nominal exchange rate shock to inflation is positive and persistent, remaining positive and significant at all horizons.

Panel (a) reports the differential response of inflation (month-to-month). The exchange rate pass-through is 0.064 pp at the time of shock. The largest pass-through to prices is observed in the horizon following the impact at 0.101 pp. In the following horizons, the result remains positive, but gradually decreases over the horizons.

Panel (b) reports the cumulative response of inflation. The pass-through is persistent and significant at all horizons, remaining positive. After twelve horizons, the cumulative exchange rate pass-through to inflation reaches 0.757 pp.

Figure 7. Impulse responses of inflation to a nominal exchange rate shock



(a) Differential response

(b) Cumulative response

Notes: The panels show impulse responses of inflation to a 1 pp increase in the nominal exchange rate (in percentage points). The solid purple lines show the point estimates β_h for each horizon h. Panel (a) reports the differential response of inflation (month-by-month). Panel (b) reports the cumulative response of inflation. Shaded bands correspond to 90% and 68% confidence intervals obtained from 1000 Bootstrap runs.

We observe a greater pass-through of the exchange rate to inflation in the subsample compared to the baseline model estimate, although this difference is not substantial. In our baseline model, the exchange rate pass-through is 0.751 pp after one year. In contrast, for the subsample that excludes periods of exchange rate controls, the exchange rate pass-through is 0.757 pp after one year.

5.3 Using IMF primary commodity price index

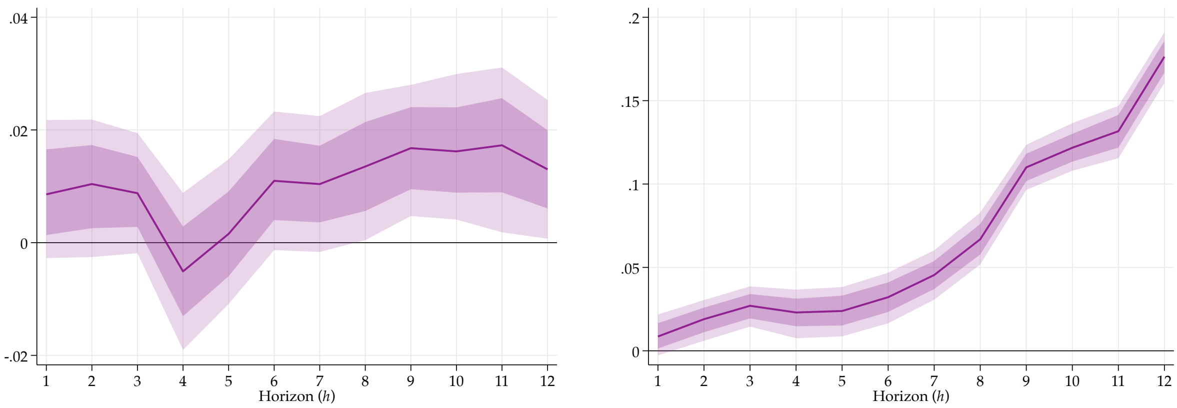
We examine the impact of shocks in energy and food prices to inflation using the IMF commodity price index. The results are consistent with those of the baseline model, although the response of inflation is more pronounced.

Figure 8 shows the impulse responses of inflation to a 1 pp increase in energy prices (in percentage points). The effect of an energy prices shock to inflation is positive and persistent. We observe an inverted U-shaped pattern in the first four horizons, with a positive impact in the first three horizons, followed by an increasing trend from the fifth horizon onwards.

Panel (a) reports the differential response of inflation (month-to-month). We can see a slight positive impact on the horizon after the shock. This effect gradually diminishes over the next two horizons, after which we observe a resurgence in positive and increasing trends starting from the fifth horizon. The results are significant in the last four horizons, reaching a peak of 0.017 pp.

Panel (b) reports the cumulative response of inflation. We can observe that the impact is long-lasting and significant after the shock, with a rising trend. Over time, the impact steadily increases. After twelve horizons from the initial shock, the cumulative response of inflation to an energy prices shock is 0.176 pp.

Figure 8. Impulse response of inflation to an energy prices shock



(a) Differential response (b) Cumulative response

Notes: The panels show impulse responses of inflation to a 1 pp increase in energy prices (in percentage points). The solid purple lines show the point estimates β_h for each horizon h. Panel (a) reports the differential response of inflation (month-by-month). Panel (b) reports the cumulative response of inflation. Shaded bands correspond to 90% and 68% confidence intervals obtained from 1000 Bootstrap runs.

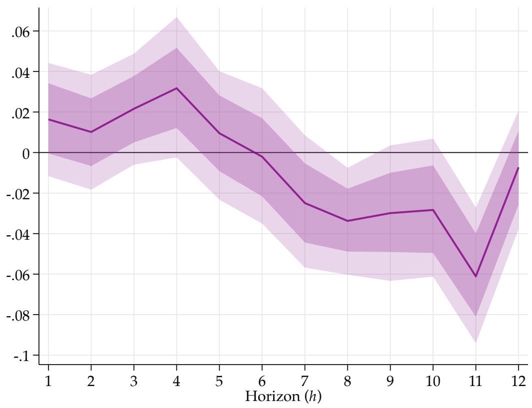
We can see a higher cumulative response of inflation when using the IMF energy price index compared to the baseline model estimate that uses the World Bank energy price index. In our baseline model, the cumulative response is 0103. pp after one year. In contrast, for the robustness exercise that uses the World Bank energy price index, the cumulative response is 0.176 pp after one year.

Figure 9 shows the impulse responses of inflation to a 1 pp increase in food prices (in percentage points). The initial effect of the food prices shock on inflation is transitory positive, remaining positive but not significant during the first five horizons. A gradual decrease is observed over time, accompanied by sporadic significant impacts.

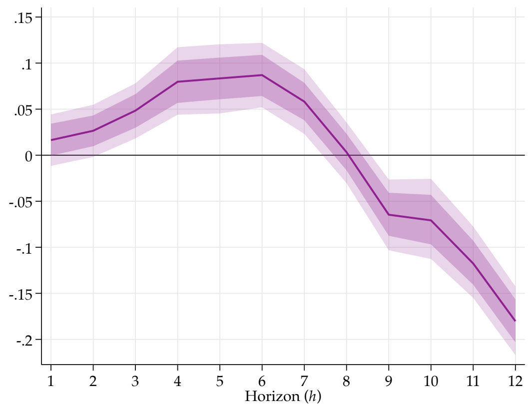
Panel (a) reports the differential response of inflation (month-to-month). We observe a positive impact during the first five periods, although it is not statistically significant. This effect gradually diminishes, eventually leading to negative results and occasional significant impacts.

Panel (b) reports the cumulative response of inflation. The cumulative response is positive at the beginning, but then it is negative. The impact is statistically significant from the eighth horizon onwards, remaining modestly positive until the eighth horizon. Next, it turns negative, reaching a minimum value of -0.18 pp.

Figure 9. Impulse responses of inflation to a food prices shock



(a) Differential response



(b) Cumulative response

Notes: The panels show impulse responses of inflation to a 1 pp increase in food prices (in percentage points). The solid purple lines show the point estimates β_h for each horizon h. Panel (a) reports the differential response of inflation (month-by-month). Panel (b) reports the cumulative response of inflation. Shaded bands correspond to 90% and 68% confidence intervals obtained from 1000 Bootstrap runs.

We can see a lower cumulative response of inflation when using the IMF food price index compared to the baseline model estimate that uses the World Bank food price index. In our baseline model, the cumulative response is 0.04 pp after one year. In contrast, for the robustness exercise that uses the World Bank energy price index, the cumulative response is -0.18 pp after one year.

5.4 Using nominal effective exchange rate

We replace the bilateral exchange rate with the nominal effective exchange rate (NEER) in the baseline model. As Caselli and Roitman (2019) argues, the nominal effective exchange rate is used because it captures the complete set of relative price adjustments that are expected to affect the consumer price index.

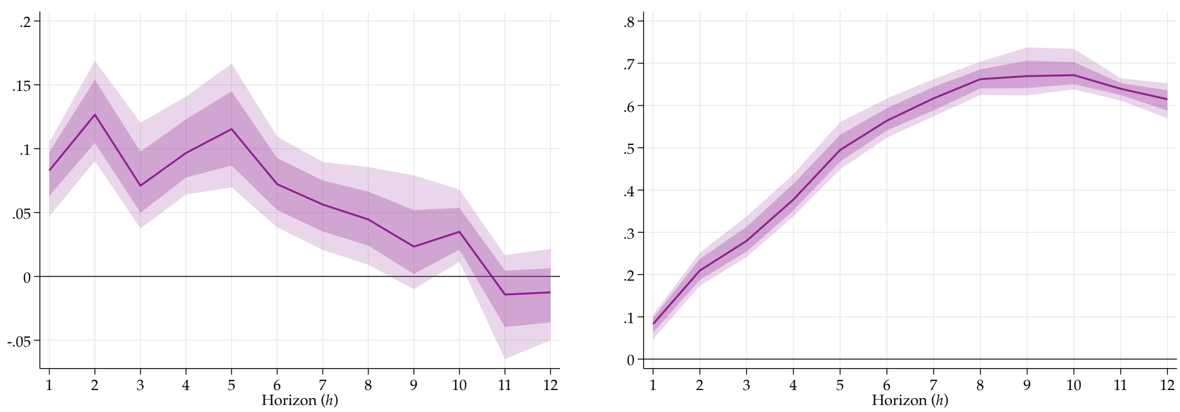
In this exercise, we use the nominal effective exchange rate index from Argentina's central bank. This index measures the nominal evolution of the Argentine peso against the currencies of the country's twelve main trading partners.

Figure 10 shows the impulse responses of inflation to a 1 pp increase in the nominal effective exchange rate (in percentage points). The impact of the nominal effective exchange rate shock to inflation is positive and persistent, remaining positive and significant within ten horizons.

Panel (a) reports the differential response of inflation (month-to-month). We can observe an exchange rate pass-through of 0.083 pp at the time of shock. The largest pass-through to prices is observed in the horizon following the impact at 0.127 pp. In the following horizons, the result remains positive, but decreases over the horizons until it reaches negative values.

Panel (b) reports the cumulative response of inflation. We can observe that the pass-through is persistent and significant at all horizons, remaining positive. The exchange rate pass-through to inflation is 0.615 pp after twelve horizons from the initial shock.

Figure 10. Impulse responses of inflation to a nominal effective exchange rate shock



(a) Differential response

(b) Cumulative response

Notes: The panels show impulse responses of inflation to a 1% increase in the nominal effective exchange rate (in percentage points). The solid purple lines show the point estimates β_h for each horizon h. Panel (a) reports the differential response of inflation (month-by-month). Panel (b) reports the cumulative response of inflation. Shaded bands correspond to 90% and 68% confidence intervals obtained from 1000 Bootstrap runs.

The cumulative response of inflation is 0.615 pp, which is lower compared to the 0.751 pp cumulative response of the baseline model that uses the bilateral exchange rate. This result aligns with the findings of Carriere-Swallow et al. (2021) for Latin American countries for the period 1995-2019. They find that the exchange rate pass-through to inflation is 0.5 within one year.

We observe a lower exchange rate pass-through to inflation when using the nominal effective exchange rate compared to the baseline model estimate that employs the bilateral exchange rate against the US dollar. In our baseline model, the exchange rate pass-through is 0.751 pp after one year. In contrast, for the robustness exercise that uses the nominal effective exchange rate, the exchange rate pass-through is 0.615 pp after one year.

6. Conclusion

In this paper, we study how domestic and external supply shocks influence inflation in Argentina. Our results show that both domestic and external supply shocks positively influence inflation. There are significant variations in the magnitude of their impact and the dynamics of how these supply shocks are transmitted to inflation.

Our empirical baseline model shows four main results. First, the nominal exchange rate shock has a positive and persistent impact on inflation, with a pass-through rate of 0.751 pp after one year. Second, increases in regulated prices are inflationary in the short term, but this effect diminishes over time. The cumulative response of inflation to a regulated prices shock is 0.421 pp after one year. Third, we can observe that an energy prices shocks exhibit a long-lasting and significant influence on inflation. The cumulative response of inflation to an energy prices shock is 0.103 pp after one year. Finally, the impact of the food prices shock on inflation is initially positive but then gradually decreases, reaching a value of 0.04 pp.

These results highlight the complex and heterogeneous nature of supply shocks to inflation. We provide a theoretical framework for understanding the transmission channels of these shocks and present empirical evidence that illustrates the dynamic response of inflation to various types of supply shocks in Argentina. This contribution provides new evidence for policymakers to manage inflationary pressures in developing countries and small open economies in the face of future supply shocks.

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Appendix

Appendix A: Estimation results of the empirical baseline model

Table 3. Estimation results of the differential response of inflation

h	1	2	3	4	5	6	7	8	9	10	11	12
NER	.093***	.134***	.074***	.097***	.119***	.075***	.063***	.057***	.024	.038***	.010	.000
	(.014)	(.015)	(.019)	(.018)	(.026)	(.016)	(.023)	(.022)	(.021)	(.014)	(.019)	(.013)
Regulated	.142***	.091***	.072***	.040**	.008	.016	.040**	.015	-.007	.022	.032***	.026***
	(.015)	(.021)	(.021)	(.020)	(.027)	(.012)	(.018)	(.015)	(.011)	(.023)	(.012)	(.008)
Energy	.005	.008	.006	-.007	-.004	.006	.005	.009	.013***	.010	.014**	.011*
	(.006)	(.007)	(.005)	(.008)	(.006)	(.007)	(.006)	(.009)	(.004)	(.007)	(.007)	(.006)
Food	.023	.016	.035**	.033*	.033*	.013	.001	.004	-.032	-.025	-.046***	-.009
	(.018)	(.018)	(.015)	(.017)	(.019)	(.017)	(.017)	(.016)	(.019)	(.024)	(.016)	(.016)
Obs.	234	233	232	231	230	229	228	227	226	225	224	223

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Standard errors in parentheses.

Table 4. Estimation results of the cumulative response of inflation

h	1	2	3	4	5	6	7	8	9	10	11	12
NER	.093***	.228***	.301***	.398***	.518***	.591***	.653***	.709***	.730***	.753***	.759***	.751***
	(.014)	(.015)	(.019)	(.022)	(.034)	(.022)	(.023)	(.026)	(.028)	(.019)	(.015)	(.011)
Regulated	.142***	.233***	.304***	.344***	.355***	.378***	.402***	.421***	.380***	.395***	.421***	.420***
	(.015)	(.021)	(.021)	(.018)	(.030)	(.019)	(.018)	(.015)	(.014)	(.023)	(.018)	(.010)
Energy	.005	.013*	.019***	.013	.008	.011	.017**	.030***	.054***	.070***	.086***	.103***
	(.006)	(.007)	(.006)	(.009)	(.007)	(.008)	(.008)	(.009)	(.007)	(.006)	(.008)	(.007)
Food	.023	.039**	.075***	.105***	.135***	.143***	.157***	.157***	.108***	.097***	.058**	.040**
	(.018)	(.018)	(.017)	(.018)	(.018)	(.021)	(.020)	(.019)	(.022)	(.023)	(.023)	(.020)
Obs.	234	233	232	231	230	229	228	227	226	225	224	223

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Standard errors in parentheses.

Appendix B: Estimation results of the robustness checks

1. Non-linear Effects: Large Depreciations vs Normal Depreciations

Table 5. Estimation results of the differential response of inflation (first model)

h	1	2	3	4	5	6	7	8	9	10	11	12
Large depreciations	.104***	.115***	.068***	.110***	.110***	.084***	.069**	.030	.034***	.063***	.005	.014
	(.021)	(.019)	(.021)	(.037)	(.033)	(.017)	(.028)	(.020)	(.013)	(.021)	(.019)	(.017)
Normal depreciations	.087***	.145***	.073**	.061**	.101**	.039*	.025	.049	-.027	-.022	-.008	-.020
	(.016)	(.017)	(.030)	(.027)	(.048)	(.022)	(.016)	(.032)	(.032)	(.016)	(.027)	(.017)
Obs.	209	208	207	206	205	204	203	202	201	200	199	198

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Standard errors in parentheses.

Table 6. Estimation results of the cumulative response of inflation (first model)

h	1	2	3	4	5	6	7	8	9	10	11	12
Large depreciations	.104***	.218***	.285***	.397***	.510***	.588***	.651***	.676***	.697***	.730***	.716***	.707***
	(.021)	(.019)	(.025)	(.045)	(.049)	(.029)	(.030)	(.027)	(.013)	(.019)	(.024)	(.014)
Normal depreciations	.087***	.232***	.306***	.365***	.463***	.505***	.538***	.599***	.589***	.587***	.596***	.593***
	(.016)	(.017)	(.030)	(.020)	(.043)	(.036)	(.024)	(.044)	(.058)	(.034)	(.027)	(.028)
Obs.	209	208	207	206	205	204	203	202	201	200	199	198

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Standard errors in parentheses.

Table 7. Estimation results of the differential response of inflation (second model)

h	1	2	3	4	5	6	7	8	9	10	11	12
Large depreciations	.099***	.113***	.061***	.101***	.107***	.085***	.070**	.031	.036***	.069***	.009	.015
	(.022)	(.019)	(.020)	(.036)	(.034)	(.015)	(.031)	(.020)	(.014)	(.021)	(.020)	(.018)
Normal depreciations	.086***	.144***	.071**	.059**	.100**	.038*	.026*	.052*	-.020	-.014	-.002	-.015
	(.017)	(.017)	(.029)	(.026)	(.047)	(.022)	(.014)	(.030)	(.032)	(.015)	(.027)	(.017)
Obs.	209	208	207	206	205	204	203	202	201	200	199	198

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Standard errors in parentheses.

Table 8. Estimation results of the cumulative response of inflation (second model)

h	1	2	3	4	5	6	7	8	9	10	11	12
Large depreciations	.099***	.212***	.272***	.375***	.485***	.564***	.628***	.655***	.683***	.729***	.723***	.719***
	(.022)	(.019)	(.024)	(.043)	(.050)	(.029)	(.029)	(.025)	(.013)	(.020)	(.025)	(.015)
Normal depreciations	.086***	.230***	.302***	.359***	.456***	.498***	.532***	.596***	.594***	.601***	.618***	.622***
	(.017)	(.017)	(.029)	(.020)	(.042)	(.035)	(.023)	(.042)	(.055)	(.033)	(.025)	(.027)
Obs.	209	208	207	206	205	204	203	202	201	200	199	198

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Standard errors in parentheses.

2. Excluding the periods of exchange rate controls or "*cepo cambiario*"

Table 9. Estimation results of the differential response of inflation

h	1	2	3	4	5	6	7	8	9	10	11	12
NER	.064***	.101***	.044**	.079***	.084***	.057***	.053**	.059**	.044*	.058***	.020	.018
	(.021)	(.019)	(.018)	(.024)	(.023)	(.016)	(.023)	(.023)	(.024)	(.015)	(.020)	(.012)
Obs.	234	233	232	231	230	229	228	227	226	225	224	223

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Standard errors in parentheses.

Table 10. Estimation results of the cumulative response of inflation

h	1	2	3	4	5	6	7	8	9	10	11	12
NER	.064***	.165***	.210***	.288***	.371***	.430***	.489***	.557***	.613***	.691***	.727***	.757***
	(.021)	(.019)	(.019)	(.030)	(.034)	(.023)	(.023)	(.021)	(.021)	(.022)	(.017)	(.011)
Obs.	234	233	232	231	230	229	228	227	226	225	224	223

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Standard errors in parentheses.

3. Using IMF primary commodity price index

Table 11. Estimation results of the differential response of inflation

h	1	2	3	4	5	6	7	8	9	10	11	12
Energy	.009	.010	.009	-.005	.002	.011	.010	.014*	.017**	.016*	.017**	.013**
	(.007)	(.008)	(.006)	(.008)	(.007)	(.007)	(.007)	(.008)	(.007)	(.009)	(.008)	(.006)
Food	.016	.010	.022	.032*	.010	-.002	-.025	-.034**	-.030	-.028	-.061***	-.007
	(.017)	(.019)	(.018)	(.018)	(.018)	(.022)	(.020)	(.016)	(.021)	(.022)	(.021)	(.026)
Obs.	234	233	232	231	230	229	228	227	226	225	224	223

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Standard errors in parentheses.

Table 12. Estimation results of the cumulative response of inflation

h	1	2	3	4	5	6	7	8	9	10	11	12
Energy	.009	.019**	.027***	.023**	.024***	.032***	.045***	.067***	.110***	.122***	.132***	.176***
	(.007)	(.008)	(.007)	(.009)	(.008)	(.009)	(.010)	(.008)	(.007)	(.008)	(.010)	(.008)
Food	.016	.027	.048**	.080***	.083***	.087***	.058**	.003	-.065***	-.071***	-.118***	-.180***
	(.017)	(.019)	(.020)	(.018)	(.020)	(.025)	(.023)	(.016)	(.020)	(.025)	(.027)	(.024)
Obs.	234	233	232	231	230	229	228	227	226	225	224	223

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Standard errors in parentheses.

4. Using nominal effective exchange rate

Table 13. Estimation results of the differential response of inflation

h	1	2	3	4	5	6	7	8	9	10	11	12
NEER	.083***	.127***	.071***	.097***	.115***	.072***	.056***	.045**	.023	.035**	-.014	-.012
	(.016)	(.017)	(.019)	(.018)	(.023)	(.016)	(.022)	(.022)	(.022)	(.014)	(.018)	(.014)
Obs.	234	233	232	231	230	229	228	227	226	225	224	223

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Standard errors in parentheses.

Table 14. Estimation results of the cumulative response of inflation

h	1	2	3	4	5	6	7	8	9	10	11	12
NEER	.083***	.210***	.280***	.377***	.495***	.564***	.617***	.662***	.670***	.672***	.640***	.615***
	(.016)	(.017)	(.020)	(.024)	(.032)	(.021)	(.021)	(.027)	(.032)	(.022)	(.013)	(.012)
Obs.	234	233	232	231	230	229	228	227	226	225	224	223

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Standard errors in parentheses.

Appendix C: Data description and sources of information

Table 3. Data description and sources of information

Variables	Data description	Sources of information
Consumer price index	Consumer price index (Jan. 2004=100)	INDEC and Provincial Statistics institutes
Nominal exchange rate	Official bilateral exchange rate against the US dollar "Comunicación A 3500"	BCRA
Nominal effective exchange rate	Nominal effective exchange rate index (Jan. 2004=100)	BCRA
Regulated Prices	Regulated Price Index (Jan. 2004=100)	IIEP (UBA), IPCBA, INDEC
Energy prices (WB)	Energy Price Index (Jan. 2004=100)	World Bank Commodities Price Data (The Pink Sheet)
Energy prices (IMF)	Energy Price Index (Jan. 2004=100)	IMF (IMF Primary Commodity Prices)
Food prices (WB)	Food Price Index (Jan. 2004=100)	World Bank Commodities Price Data (The Pink Sheet)
Food prices (IMF)	Food Price Index (Jan. 2004=100)	IMF (IMF Primary Commodity Prices)
Seasonally Adjusted EMAE	Seasonally adjusted index of monthly economic activity estimator (Jan. 2004=100)	INDEC