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When are devaluations more contractionary? A Quantile VAR estimation for Argentina[1]

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This paper presents empirical evidence on the short- and medium-run contractionary effects of exchange rate shocks and currency devaluations for bimonetary (i. e., highly dollarized) countries. In particular, for Argentina for the period January 2004-December 2018. Using a VAR representation with quantile heterogeneity, it implements a multivariate model with four macroeconomic variables: exchange rate variations, inflation, economic activity and nominal wage growth. The empirical results show a 30% price pass-through effects and a bimodal effect on output, with both positive and negative effects. Wages adjust less than prices with the consequent effect that real wages have a negative elasticity of 0.23 with respect to exchange rate shocks. Further analysis on the multivariate responses show that the negative effect on output is associated with a decline in real wages: a 1% fall in real wages after a currency devaluation produces a 2.3% decline in output.

JEL codes: C13, C14, C22.

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1. Introduction

The coefficient or elasticity of exchange rate pass-through (ERPT) to domestic prices, *pass-through* for short, is the effect of a change in the exchange rate on prices within an economy. For Argentina, a high-inflation economy and where the USD is the main currency of reference (a dollarized or bimonetary economy), the study of the magnitude and persistence of pass-through plays a central role in macroeconomic analysis. Other than prices, the ERPT is also important for its impact on output. Periods of growth generate a high demand of foreign currency (for imports or savings in foreign currency denominated assets), which determines a binding external constraint, a process known as *stop-and-go*.

This paper studies ERPT on prices, output and wages after an initial shock to the exchange rate. Standard models, such as vector autoregressive (VAR) and panel data models cannot appropriately account for the presence of asymmetric and heterogeneous dynamic responses, which are common in the ERPT analysis. See Menon (1995), Aron et al., (2014), Caselli & Roitman (2016) and Jašová et al., (2016) for a comprehensive literature review and empirical applications. Using a novel econometric technique known as vector autoregressive models with directional quantiles (VARQ) developed in Montes Rojas (2017, 2019a) we study the effects of devaluations and provide a characterization of when these have contractionary effects. The results show large heterogeneity in output effects, with both contractionary and expansionary values. Our empirical findings show that the negative effect on output occurs when the real wage deteriorates, thus suggesting a specific mechanism on the effect of devaluations on output.

This paper is organized as follows. Section two presents a succinct literature review on the ERPT effects on output. Section three describes the econometric model. Section four presents the data used for estimation, and Section five shows the empirical results. Section six concludes.

2. Literature Review

2.1. Theoretical Literature

The traditional approach points out that devaluations are expansive in both short and long-run due to the increase in competitiveness (see Laursen & Metzler, 1950; Harberger, 1950; Alexander, 1959). The main effect comes from switching foreign and domestic demand towards home goods which produces an output expansion.

The literature on contractive devaluations formalized different mechanisms through which devaluations can affect the demand and the supply side (see, among others, Lizondo & Montiel, 1989; Agénor, 1991). One of the main mechanisms is the redistributive effect (Díaz-Alejandro, 1963, 1965; Ferrer, 1963; Krugman & Taylor, 1978). If money wages lag behind, price increases, and if the marginal propensity to save from profits is higher than from wages, ex-ante national savings goes up, the demand for goods decrease and therefore also production and employment (Krugman & Taylor, 1978).

Several authors proposed additional considerations on the demand side. The contractionary effects of a devaluation can occur even if the redistributive effect does not operate, and workers and capitalists have a similar propensity to consume. The first case is when the trade balance is initially in deficit (Hirschman, 1949; Cooper, 1971 and Krugman & Taylor, 1978). Moreover, if there are taxes on exports and imports, then a devaluation redistributes income from the private sector to the government, which has a saving propensity of 1 in the short run (Krugman & Taylor, 1978).

Other scholars provided different explanations on the channels which operate affecting aggregate supply. Buffie (1986a, 1986b) incorporates investment goods as output of a composite good produced by combining domestic and imported components in fixed proportions, and concludes that the Marshall-Lerner condition is neither necessary nor sufficient for an expansionary outcome, furthermore under simple and plausible conditions a devaluation may worsen the balance of payments. Due to the nature of imports, devaluations would be contractionary in developing countries. Other contributions have also examined the imported intermediate inputs channels (Shea, 1976; Findlay & Rodriguez, 1977; Dornbusch, 1980).

Chang & Lai (1989) and Lai (1990) explored the role of income taxes and efficiency wages on aggregate supply: a devaluation increases costs and therefore lead to an output contraction. Larraín & Sachs (1986) extended the basic model to incorporate wages and export dynamic to show that the effects which produce contractionary devaluations in the short run can damage long-term growth.

Van Wijnbergen (1983, 1986) explored three channels via which a devaluation has a contractionary effect on the aggregate supply side: local currency costs of intermediate imports, wage indexing in the presence of food imports and reduced volume of real credit to firms. The author showed that contractionary effects via the supply side are more damaging than Krugman-Taylor effects. Wage indexation channel is also analyzed by other studies (see also Solimano, 1986).

In the last decades, new studies have emerged which focus on the balance sheet effect of devaluations. Céspedes, Chang & Velasco (2004) show that because liabilities are dollarized, a real devaluation has detrimental effects on entrepreneurial net worth, which in turn constrains investment due to financial frictions. These authors developed a simple IS-LM-BP model with balance sheet effects and capital market imperfections and show similar conclusions (Céspedes, Chang & Velasco, 2003). Using a similar approach, Tovar (2005, 2006) estimates a DSGE model that incorporates the balance sheet effect.

Recently, a new body of theorical and empirical studies have emerged based on dominant currency pricing (Gopinath et al., 2010; Boz, Gopinath & Plagborg-Møller, 2018; Gopinath et al., 2020; Cubeddu et al., 2020). Under this approach, firms set export prices in a dominant currency (most often the dollar) and face strategic complementarities in pricing. These models have also incorporated imported inputs in production.

This paradigm has important implications in terms of exchange rate pass-through as point out Gopinath et al., (2020). First, at both short and medium horizons the terms of trade should be insensitive to exchange rate fluctuations. Second, for non US countries, exchange rate pass-through into import prices (in home currency) should be high and driven by the dollar exchange rate as opposed to the bilateral exchange rate. For the United States, on the contrary, pass-through into import prices should be low. Third, for non US countries, import quantities should be driven by the dollar exchange rate as opposed to the bilateral exchange rate. In addition, US import quantities should be less responsive to dollar exchange rate movements as compared to non US countries. Fourth, when the dollar appreciates uniformly against all other currencies, it should lead to a decline in trade between countries in the rest of the world (Gopinath, 2020:678).

2.2. Empirical Literature

The literature on contractionary devaluation has focused primarily on developing countries (see Edwards, 1986; Solimano, 1986; Agénor, 1991; Bahmani-Oskooee & Rhee, 1997; Kamin & Klau, 1997; Kamin &

Rogers, 2000; Acar, 2000). These studies found mixed evidence depending on the time horizon analyzed, econometric specification and the estimation period. Bebczuk et al., (2006) found that devaluations are contractive in highly dollarized economies, but otherwise expansive, while other studies suggest that devaluations are contractive in the short term, but expansive or "neutral" in the long-run (Edwards, 1986; Killick et al., 1992; Kamin & Klau, 1997).

There has been a large empirical literature framed within panel data. One of the first papers was Edwards (1986), who estimated a fixed-effects model using a panel of 12 developing countries over the period 1965-1984 and showed that devaluations have negative effects on output in the short run, but after the first year it has expansionary effects. In the long-run, devaluations have no effect on the product. Agénor (1991) provided a different approach by distinguishing between expected and unexpected devaluations. By using a panel of 23 developing countries for the period 1978-1987, he found that an anticipated depreciation of the real exchange rate has negative effects on economic activity while an unanticipated depreciation has a positive impact. The contractionary effects of early depreciations remain after the first year.

Morley (1992) examined 28 devaluations in developing countries, controlling for terms of trade, export and import growth, money supply, and fiscal balance and found that real exchange rate depreciations tended to reduce output over two years. Christopolous (2004) analyzed 11 Asian economies by using cointegrated panel techniques and showed that depreciations are contractive in the long term in at least five of them and expansive in three. Moreno (1999) noted that real depreciation slowed down economic activity in a panel of East Asian countries. By using a Lucas-type supply function, Sheehey (1986), set up a panel with 16 Latin American countries and the results strongly supported the contractionary impact of the devaluation in Latin America.

On the other hand, Bahmani-Oskooee (1998) by using quarterly data on output and the real and nominal effective exchange rate for 23 developing countries over the period 1973-1988, estimated the long-term relationship between output and exchange rate and noted that devaluations did not have a long term effect on production in developing countries.

Kamin & Klau (1997) examined the impact of the devaluation on 27 countries for the 1970-1996 period, using different methodologies of panel data (fixed effects, 2SLS) and time series (VEC) and found no evidence that devaluations are contractionary in the long run. Controlling for sources of spurious correlation and reverse causality, the effect of devaluation in the short run is reduced, although evidence that this effect exists remains even after these controls are introduced. They found no evidence of significant differences among the regions and neither that this effect is stronger in developing countries than in industrialized countries.

The short-run contractionary devaluation hypothesis has also received considerable empirical support in time-series studies, mainly in

Latin American countries. The few exceptions are studies on Asian countries. Bahmani-Oskooee & Rhee (1997) analyzed the effects of depreciation in Korea using quarterly data from 1971-1994 and they found that real depreciation is expansive in the short-run. Bahmani-Oskooee et al., (2002) estimated a VEC for Asian countries and concluded that there are long term relationships between output, real exchange rate and other policy variables, using quarterly data from 1976-1999. They found that while real depreciation is contractionary in the long run for Indonesia and Malaysia, it is expansive for the Philippines and Thailand. For Korea, output growth does not respond significantly to a change in the level of the real exchange rate.

Kim & Ying (2007) developed a six-variable VAR model (capital inflows, real income, relative price, real money supply, current account balance and nominal exchange rate) in 7 East Asian countries using the pre-1997 crisis data and the trade-weighted exchange rate and found no evidence of contractionary devaluation. In fact, currency devaluation appears strongly expansionary in several countries. This is contrasted to the case of Chile and Mexico where the evidence of devaluation is persistent.

Nevertheless, the evidence in Latin America is mostly favorable to the hypothesis of contractionary devaluations. Rogers & Wang (1995) estimated a structural VAR for Mexico using monthly data from January 1977 to June 1990 and suggested that output is influenced primarily by real shocks, but exchange rate shocks are also significant.

Santaella & Vela (1996) estimated a two-variable VAR model for Mexico and found that a reduction in exchange rate depreciation increase output initially, but after it was reversed. By using a VAR model for Uruguay, Hoffmaister and Végh (1996) found that a permanent reduction in the exchange rate depreciation leads to a long-lasting increase in output. Kamin and Rogers (2000) estimated quarterly VAR for Mexico for 1981-1995 period and concluded that even after sources of spurious correlation and reverse causation are controlled for, real devaluation has led to high inflation and economic contraction in Mexico.

Amhed (2003) estimated an annual VAR for Argentina, Brazil, Chile, Colombia and Mexico over 1983-1999 taking real exchange rate, output, inflation and terms of trade, world output and US interest rate as endogenous variables and reported that devaluations have contractionary effects in the short term. Amman and Baer (2003) who analyzed the impact of the devaluation of Brazil in 1999 also found evidence of contractionary effects on output.

An, Kim and Ren (2014) examined 16 countries and found that, unlike Asian countries and non-G3 developed, output generally decreases after real devaluations in Latin American countries. Campos and Rapetti (2018), by using Bayesian VAR for Argentina over the period 1854-2017, found that devaluations were mostly contractionary. Zack, Montané and Libman (2021) by using monthly data for Brazil, Chile, Colombia, Mexico, Argentina and Peru during the 2000s showed that devaluations seem to be contractionary in Brazil and Mexico.

Bertholet (2021) estimated an annual VAR for Argentina, Chile and Colombia over period 1960-2010 and found that devaluations in all countries have contractionary effects in the short run but it is reversed, at least partially in the medium run.

To sum up, most empirical studies show that devaluations have short-run contractionary effects but can be expansionary or neutral when the period of analysis is long enough. Furthermore, the evidence in favor of short-run contractionary devaluation hypothesis is even more favorable when using VAR methodology and focusing on Latin American countries.

3. Econometric model

3.1. VARQ model

This paper uses an extension of the linear vector autoregression (VAR) model to multivariate quantile regression. In particular, we follow the implementation of Montes-Rojas (2019a) that builds on Hallin, Paindaveine and Šiman (2010), Paindaveine Šiman (2011, 2012), Carlier, Chernozhukov & Galichon (2016) and Montes-Rojas (2017) directional quantile models. These models will be defined as VARQ.

Consider a multivariate process of m variables, $\mathbf{Y}_t = (\mathbf{Y}_{1t},\dots,\mathbf{Y}_{mt})' \in \mathbb{R}^m$ and a $k \times 1$ vector of control variables $\mathbf{X}_t$. Consider also the sigma-field generated by $\{\mathbf{Y}_s : s < t\}$ containing all the information available at

t. For the case of VARQ of orden p, $\mathbf{X}_{t-1} = (\mathbf{Y}_{t-1},\ldots,\mathbf{Y}_{t-p})$ with $k = mp$. VARQ models are indexed by the number of lags, VARQ(p).

Let $\boldsymbol{\tau}= (\tau_1,\ldots,\tau_m)$ be a vector of quantile indexes (0,1), where each index correspond to a given endogenous variable. Then the VARQ(1) evaluated at $\boldsymbol{\tau}$ is

$$\mathbf{Q}_{Yt}(\boldsymbol{\tau}| x_{t-1}= X_{t-1}) = B(\boldsymbol{\tau})x_{t-1} + \mathbf{A}(\boldsymbol{\tau}), \quad (1)$$

where $\mathbf{Q}$ is an $m \times 1$ vector corresponding to the conditional quantiles of the m endogenous variables, $\mathbf{B}(\boldsymbol{\tau}) = (\mathbf{B}_1(\boldsymbol{\tau}),\ldots,\mathbf{B}_m(\boldsymbol{\tau}))$ is an $m \times k$ matrix of coefficients $\mathbf{B}_j(\boldsymbol{\tau})$ for each j=1,…,m, vectors of dimension $k \times 1$ with coefficients of each j variable in $\mathbf{Y}$, and $\mathbf{A}(\boldsymbol{\tau})$, an $m \times 1$ vector. Thus, $\mathbf{Q}$ maps the quantile index vector and lags into the domain of the endogenous variables. Model (1) can be estimated using univariate quantile regressions for each $j=1,2,...,m$ endogenous variables with respect to all other $–j$ variables and all lagged values each using the corresponding component in $\boldsymbol{\tau}$.

Conditional quantile models in time-series can be interpreted in terms of the business cycle of each variable (see Koenker & Xiao, 2006; and Galvao, Montes-Rojas & Park, 2013). For instance, a low quantile of output, conditional on the lagged values of all variables, can be interpreted a low performance of output with respect to the expected response given those lagged values. That is, a low quantile means that the variable has a response that is in the low part of the conditional distribution. On the contrary, a high quantile means that output is in the upper part of the conditional distribution of conditional outcomes. In model (1), the same applies to each of the *m* endogenous variables.

The main intuition of this model is that it allows to study the entire distribution of the multivariate model. That is, the standard VAR representation captures the mean effects. However, in the presence of heterogeneous effects there may be a very rich distribution of dynamic effects. By varying across the different quantiles we can obtain this variability.

3.2. Shocks and impulse response functions

Ramey (2016: 52-55) defines a shock as exogenous primitive forces that are not correlated among them that are economically meaningful. Shocks should satisfy the following characteristics: (1) they should be exogenous with respect to the other endogenous variables and lags; (2) they should not be correlated with other shocks; (3) they should represent unanticipated changes. See Ramey (2016) and Stock and Watson (2016) for a literature review.

For multivariate quantiles we consider a shock as the counterfactual effect $\delta \in \mathbb{R}^m$. Thus we compare the conditional models on $\mathbf{x}_t^{\delta} = (\mathbf{y}_t + \delta, \mathbf{y}_{t-1}, \ldots, \mathbf{y}_{t-p})$ with $\mathbf{x}_t = (\mathbf{y}_t, \mathbf{y}_{t-1}, \ldots, \mathbf{y}_{t-p})$.

Define the impulse-response function at $\boldsymbol{\tau_1}$ in t + 1 for a given shock in t, δ, as

$$\mathbf{IRFQ}_1(\boldsymbol{\tau_1}, \delta \mid x_t) = Q_1(\boldsymbol{\tau_1} \mid x_t^{\delta}) - Q_1(\boldsymbol{\tau_1} \mid x_t), \qquad (2)$$

where $\mathbf{Q}_1$ is the one-period ahead prediction using $\boldsymbol{\tau_1}$.

Consider now the prediction at t + 2, using quantiles $\boldsymbol{\tau_2}$. Note that this response depends on that used in t + 1 with $\boldsymbol{\tau_1}$. That is, the effect at t+2 should be evaluated at ($\boldsymbol{\tau_1}$, $\boldsymbol{\tau_2}$), defined as a *quantile path*. Then,

$$\mathbf{IRFQ}_2((\boldsymbol{\tau_1}, \boldsymbol{\tau_2}), \delta \mid x_t) = Q_2((\boldsymbol{\tau_1}, \boldsymbol{\tau_2}) \mid x_t^{\delta}) - Q_2((\boldsymbol{\tau_1}, \boldsymbol{\tau_2}) \mid x_t), \qquad (3)$$

where $\mathbf{Q}_2$ is the two-periods ahead prediction using quantile path ($\boldsymbol{\tau_1}$, $\boldsymbol{\tau_2}$).

This procedure can generalize for *h* periods, ($\boldsymbol{\tau_1}, \boldsymbol{\tau_2}, \ldots, \boldsymbol{\tau_h}$), thus defining

$$\mathbf{IRFQ}_h((\boldsymbol{\tau_1}, \boldsymbol{\tau_2}, \ldots, \boldsymbol{\tau_h}), \delta \mid x_t) = Q_h((\boldsymbol{\tau_1}, \boldsymbol{\tau_2}, \ldots, \boldsymbol{\tau_h}) \mid x_t^{\delta}) - Q_h((\boldsymbol{\tau_1}, \boldsymbol{\tau_2}, \ldots, \boldsymbol{\tau_h}) \mid x_t) \qquad (4)$$

As it is common in time-series we are interested in the accumulated effects, which will be defined as aIRFQ. This is the sum of all effects evaluated at the quantile path ($\boldsymbol{\tau_1}, \boldsymbol{\tau_2}, \ldots, \boldsymbol{\tau_h}$).

Finally, the distribution of potential accumulated effects can be simulated using uniform random variables, where the indexes ($\boldsymbol{\tau_1}, \boldsymbol{\tau_2}, \ldots, \boldsymbol{\tau_h}$) are replaced by independent U(0,1) random variables.

4. Data and simulation of aIRFQ

The empirical model has 4 macroeconomic variables on a monthly basis: nominal official exchange rate (ER, in first-differences of logarithms),[4] consumer price index (inflation, in first-differences of logarithms)[5], economic activity (output, in logs, seasonally adjusted and using the cyclical HP component)[6] and nominal wages (wages, in first-differences of logarithms, seasonally adjusted)[7] for the period January 2004-December 2018.

The main effect of interest is a unit shock in the nominal ER. This can be interpreted as doubling the ER, i.e. a 100% increment in the rate of devaluation shock. Note that since the model is linear, the shocks will be interpreted in terms of elasticities independently of the size of the shock, and therefore we will consider a 1% shock and evaluate the percentage response on all other variables. The effect on the variables will be called pass-through.

Shock identification is based on a standard Cholesky decomposition. We will assume that ER adjust first and it is

[4] Monthly average official Exchange rate, US dollar/pesos, source: BCRA (http://www.bcra.gov.ar/pdfs/operaciones/com3500.xls).

[5] Several sources. The official INDEC (Instituto Nacional de Estadísticas y Censos) series has been discredited for the period 2007-2015. We thus use the INDEC series from January 2004 to December 2006, then City of Buenos Aires index from January 2007 to May 2016, and then INDEC back again.

[6] Estimador Mensual de Actividad Económica (EMAE).

[7] Registered formal salaried wages, SIPA.

contemporaneously affected by all other variables, then prices adjust based on output and wages, but not ER, then output and finally wages. Both Akaike and Bayesian information criteria suggests using one lag, thus the model is a VARQ(1) with m=4. For a given shock, we will consider 1000 simulated quantile paths for h=1,2,…12 horizons of this VARQ(1) model.

5. Empirical results

5.1 Univariate effects

From the quantile paths we can evaluate the dynamics of pass-through by studying the distributions of accumulated impulse-response functions effects (aIRF hereafter).

Figures 1 to 4 plot the kernel density estimation for the aIRF for single variables and for different horizons, h=3,6,9,12. These graphs allow us to evaluate the heterogeneity in the short and medium run effects, up to 12 month effects.

Prices pass-through (Figure 1) has an increasing effect across h. It has an h=12 effect of an average of 0.29 with a 95% confidence interval (CI95) of [.15,.45]. Wages pass-through (Figure 2) has an h=12 effect of an average of .062 with a CI95 of [0,0.13]. Taking both effects together we observe that an ER shock of 1% produces a real wage fall of 0.23% with a CI95 that lies entirely on the negative domain, [-0.33%,-0.12%].

For the latter, the real wage effect is calculated by taking the difference of the wage and price effects for the same quantile path.

Output pass-through (Figure 3) has no clear sign effect, containing both positive and negative effects. This is compatible with the bimodal effect found in Montes-Rojas (2019b), where expansionary and contractionary devaluations were equally probable. Overall, it has an average effect of .045 with CI95 of [-.37,.41].

Finally, the ER shock also generates some persistence on itself, producing an overall effect of double the initial shock (Figure 4).

5.2 Joint effects

Figures 5, 6 and 7 produce kernel estimates of bivariate densities using different pairs of aIRF variables at the h=12 horizon: output-inflation, inflation-wages and output-wages. This analysis let us study the association between different types of effects.

Figure 5 shows the joint distribution of the output and price effects. Overall, this shows that a higher price pass-through is positively correlated with a higher output pass-through, although this is a weak effect (R^2=0.055). This association suggest a price rigidity hypothesis, where the positive (or less negative) effects of a devaluation requires prices to accommodate to the new exchange rate.

Figure 6 shows a positive relation between price and wage effects (R^2=0.632). Note that as analyzed in the univariate density estimates, this prices are always above wages, producing a negative effect on real wages. The results show that after a 1% increment in inflation that follows an ER shock, wages increase only ⅓%.

Finally, Figure 7 produces the output and wages joint effects distributions (R^2=0.107).

A linear regression between the output and wage and price aIRFs, determine that only wages are statistically significant to explain output. These results suggest that after a 1% real wage reduction that follows an ER shock, output reduces 2.3%. How can this result be interpreted? ER devaluations are followed by relative price changes and distributive conflicts (Montes-Rojas & Toledo, 2021; Bastian & Setterfield, 2020). Salaried workers with non-indexed nominal wages are probably the ones that suffer the most and the ones whose wage adjustment takes the longest. Real wage reductions may affect output performance, which seems to be the channel producing the main effect. The main result is then that devaluations are more contractionary when they are followed by a greater real wage adjustment.

Table 1. OLS regression estimates using aIRF

Output	=	Wages	+	Inflation	+	Const.
		2.31**		-.172		-.050*
R^2=.1089		(.299)		(.126)		(.026)

Notes: ** significant at 1%, * significant at 5%. Standard errors in parenthesis.

Consider a now a principal component analysis of the aIRF estimates using the 4 endogenous variables. The analysis reports only one factor with eigenvalue greater than 1 that explains 85% of the variance, followed by a second factor with eigenvalue of 0.422 and explaining the remaining 15%. The first factor corresponds mostly to a price channel, explained first by inflation, next wages and then ER, but output appears with a much lower factor loading. The second factor, however, is the one that has output and wages on the same foot, also ER persistence. The main object of this paper then corresponds to this second factor. In other words, there is a distinctive effect of devaluations with a characteristic negative association between output growth and wage rate variations.

Table 2. Principal component factor analysis of aIRF estimates

Factor	**Eigenvalue**	**Difference**	**Proportion**
Factor 1	2.33287	1.91045	.8467
Factor 2	.42242	.42242	.1533
Factor 3	.00019	.00039	.0001
Factor 4	-.00020	-	-
	Factor 1	**Factor 2**	
Output	.2545	.3223	
Inflation	1.0039	-.0611	
Wages	.8147	.3724	
ER	.7723	-.4197	

Notes: Iterated principal component analysis, retaining two factors.

6. Conclusion

This paper proposes a characterization of ERPT effects and contractionary devaluations. The negative output effect of a devaluation is larger when it has a negative impact on real wages. The estimates suggest that after a shock on the exchange rate, a 1% real wage reduction reduces output by 2.3%.

These results can be extended in several directions. First, further characterization of exchange rate shocks may illustrate the different channels through which output is affected by external imbalances. We use here a Cholesky decomposition that is common in the empirical literature. However, different exchange rate shocks identification can be implemented. Second, changes in domestic demand components can be studied separately to identify specific pass-through effects. The wage effect is only one component of a multivariate array to characterize distributional effects.

The results have important implications for economic policy. Currency devaluations are common in emerging economies with balance of payments crises, with considerable negative social effects. The empirical results for Argentina highlights that devaluations that are not associated with distributive conflicts are in general less contractionary. As such, the exchange-rate policy followed by a Central Bank should avoid exchange-rates devaluations that are produced to resolve or trigger distributive conflicts.

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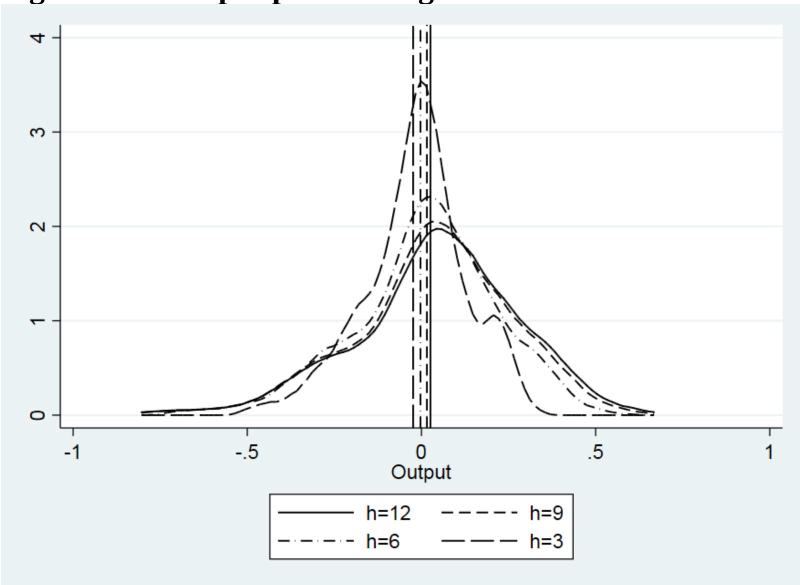
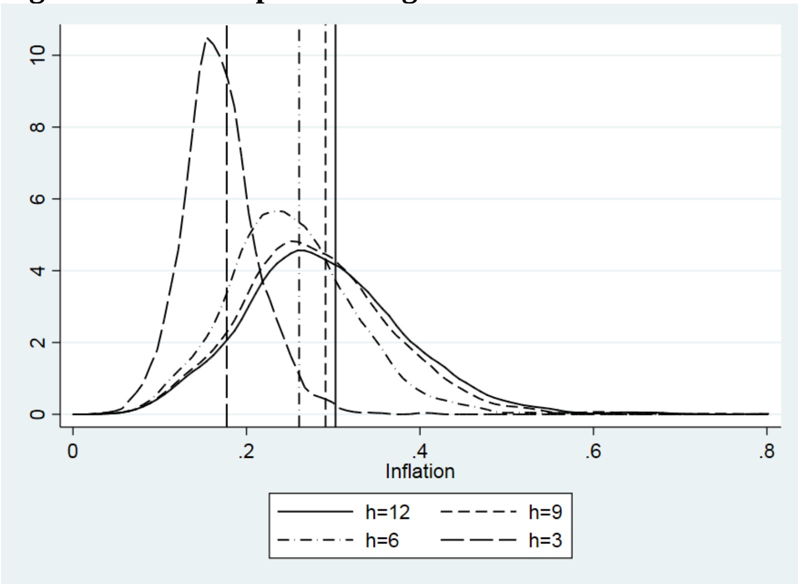
Figure 1. Output pass-through



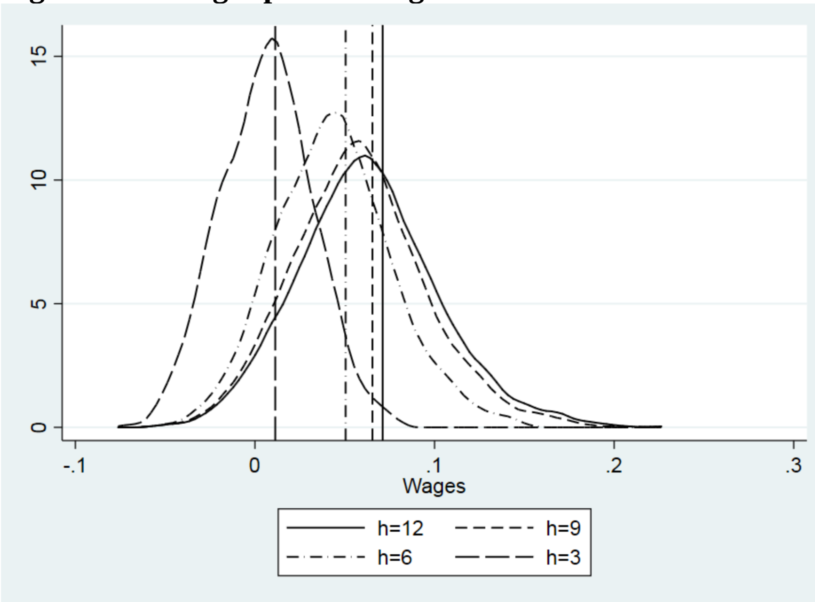
Notes: Kernel density estimation of aIFRQ effects for h=3,6,9,12 months ahead. Vertical lines correspond to the VAR-OLS effect.

Figure 2. Prices pass-through



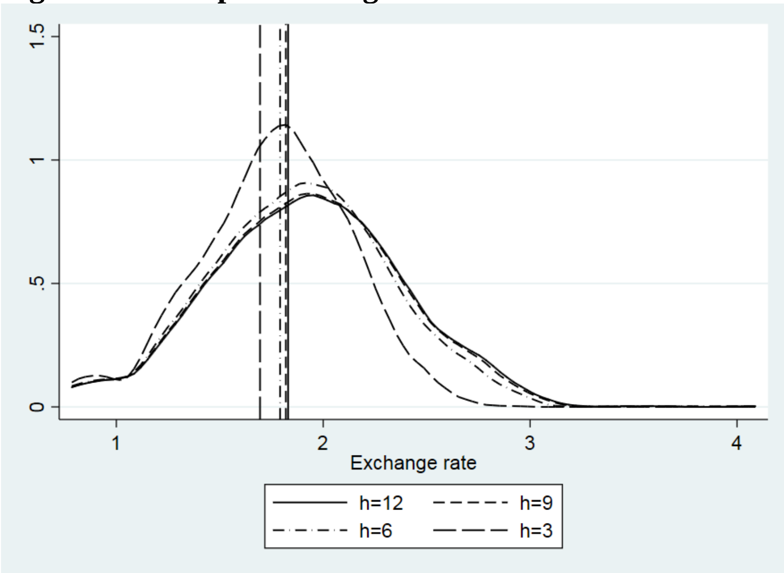
Notes: See notes to Figure 1.

Figure 3. Wages pass-through



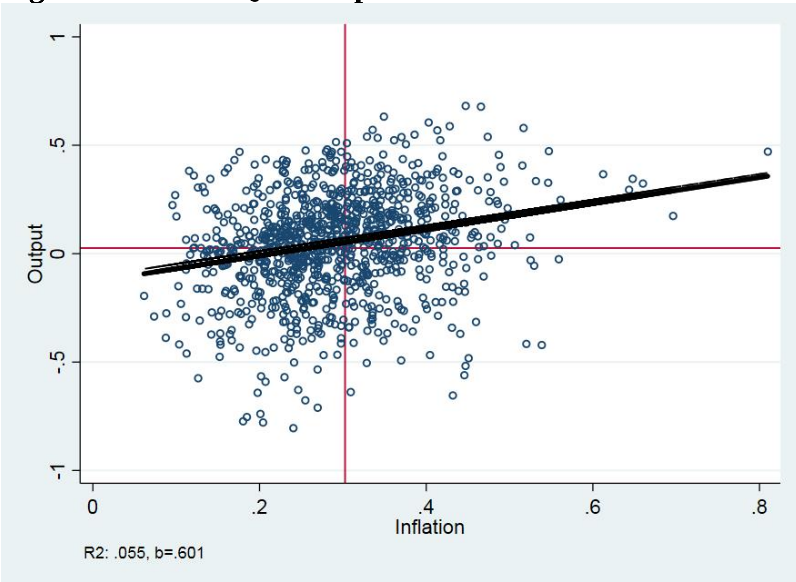
Notes: See notes to Figure 1.

Figure 4. ER pass-through



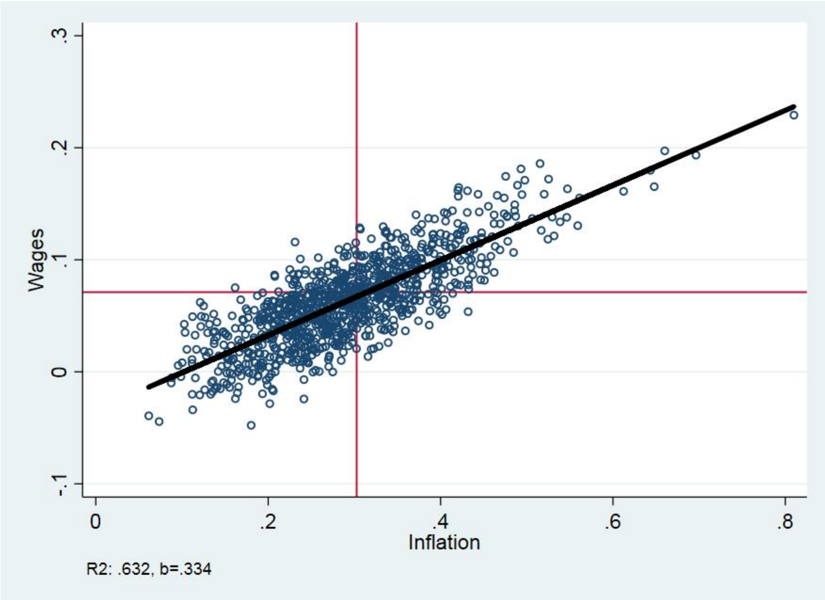
Notes: See notes to Figure 1.

Figure 5. aIRFQ on output and inflation



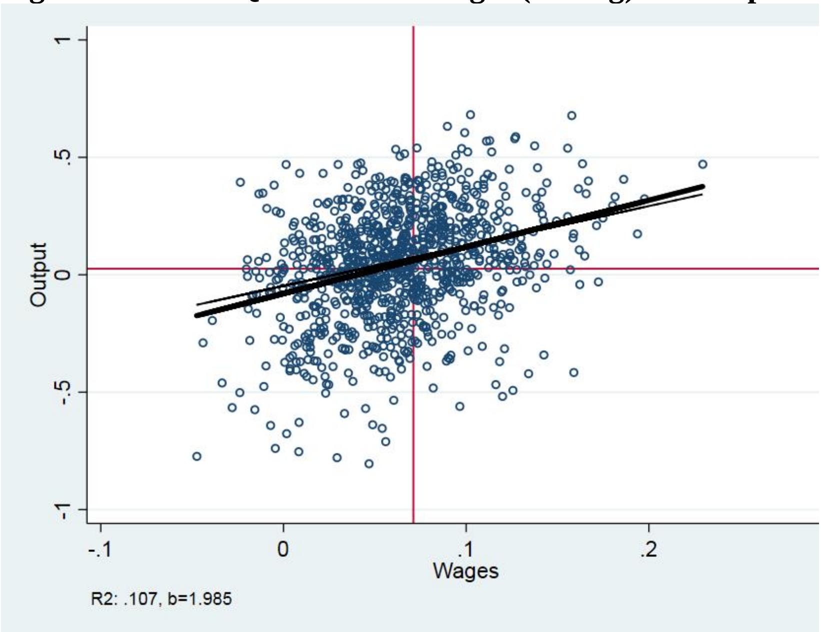
Notes: Bivariate model of IRFQ for 1000 quantile paths. Mean (solid) and median (thin) regression lines are imposed.

Figure 6. aIRFQ on nominal wages (dif. log) and inflation



Notes: See notes to Figure 5.

Figure 7. aIRFQ on nominal wages (dif. log) and output



Notes: See notes to Figure 5.