Short and long-run effects of devaluations. Evidence from Argentina (1854-2017)

Luciano Campos (CUNEF)
Martín Rapetti (UBA)

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Insights

- What is the impact of devaluations over aggregate activity in developing countries?
- Short-run: expansionary or contractionary?
- Long-run: growth effects or not?
- Do we observe different effects among devaluation episodes?
- Why are there heterogeneous effects?

What do we do?

- Assess the effects of devaluations over the real exchange rate, the current account and output growth.
- Bayesian VAR where structural shocks are identified based on theory using dynamic sign and exclusion restrictions.
- Although the scope of our work is more general, our case study is Argentina:
- More than 160 years of data availability and over 25 devaluation episodes.
- We do a historical analysis of devaluation episodes in light of our estimates.

Our contribution

Two strands of literature:

1. Short-run effects of devaluations: are devaluations expansionary or contractionary?
2. Long-run effects: the real exchange rate-growth channel.

- We design an empirical model to capture both short and long-run effects of devaluations.
- In addition, we contribute to the economic history of Argentina by looking at each devaluation episode along time.
- Why did some devaluations have different effects than others?
- Is there any pattern we can come up with?

What do we find?

1. Devaluations were mostly of the *contractionary* type.
2. *Expansionary* devaluations, as predicted in the traditional theory, cannot be recovered from the DGP.
3. Long-run *real* effects when inflation was low.
4. Long-run *nominal* effects when inflation was high.

Literature

Short-run effects:

- Traditional approach, devaluations are *expansionary*: Laursen & Metzler (1950), Harberger (1950), Alexander (1959), Johnson (1976) and Gylfason & Schmid (1983).
- Puzzling observation in developing countries: devaluations were *contractionary*. Díaz-Alejandro (1963), Sidrauski (1968), Krugman & Taylor (1978) and Edwards (1986).
- VAR evidence in developing countries is mixed. ▸ VAR evidence

Long-run effects:

- Real exchange rate-growth channel. Hausmann et al. (2005), Rodrik (2008), Eichengreen (2008), Frenkel & Rapetti (2008), Razmi et al. (2012), Levy-Yeyati et al. (2012) Habib et al. (2016) and Guzman et al. (2017).

Literature (cont)

Argentinean economic history:

- General: Díaz-Alejandro (1970), Gallo & Cortés-Conde (1972), Rapaport (2000), della Paolera & Taylor (2003), Ferrer (2004) and Gerchunoff & Llach (2018).
- Growth-relative divergence focus: Di-Tella et al. (1967), Taylor (1992), Sanz (2009), Gerchunoff & Llach (2009), Buera et al. (2011), González & Viego (2011), Heymann & Ramos (2012) and Brambilla et al. (2018).
- Monetary and fiscal focus: Dornbusch & de Pablo (1990), Fanelli & Frenkel (1990) and Buera & Nicolini (2018).
- Exchange rate focus: Ferrer (1963), Díaz-Alejandro (1965) and Frenkel & Rapetti (2012).

Short-run effects of devaluations

Model economy based on Díaz-Alejandro (1963):

- Two products: tradables and non-tradables.
- Two sectors: capitalists and workers.

Effect over output:

$$dY = (dY^T + dY^{NT})de$$

Key assumption: inelastic supply of tradables (farming takes time), but elastic for non-tradables (unemployment). Then:

$$dY = dY^{NT} = [\underbrace{m_{nc}(Y_s^T - Y_{dc}^T)}_{i} - \underbrace{m_{nw}(Y_{dw}^T)}_{ii} + \underbrace{Y^{NT}E_{ne}}_{iii}]de$$

i) Income effect for capitalists.

ii) Income effect for workers.

iii) Substitution effect from tradables to non-tradables (expenditure switching effect).

- It makes sense to assume that $|ii| > |i|$. Then, if iii is low, devaluations are contractionary.
- The trade balance increases due to a strong drop in imports. ▸ Trade Balance

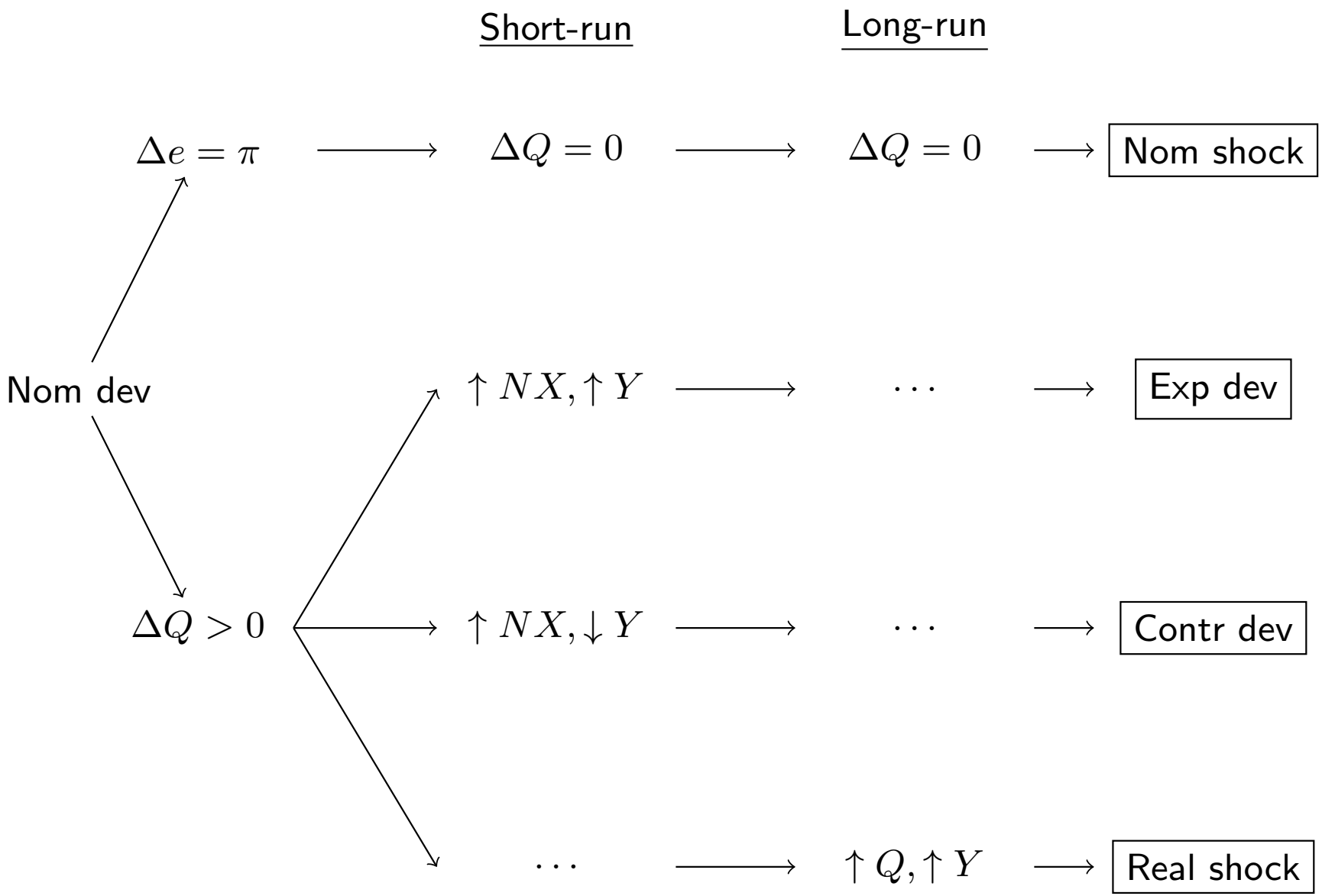
Long-run effects of devaluations

- Traditional view (PPP):

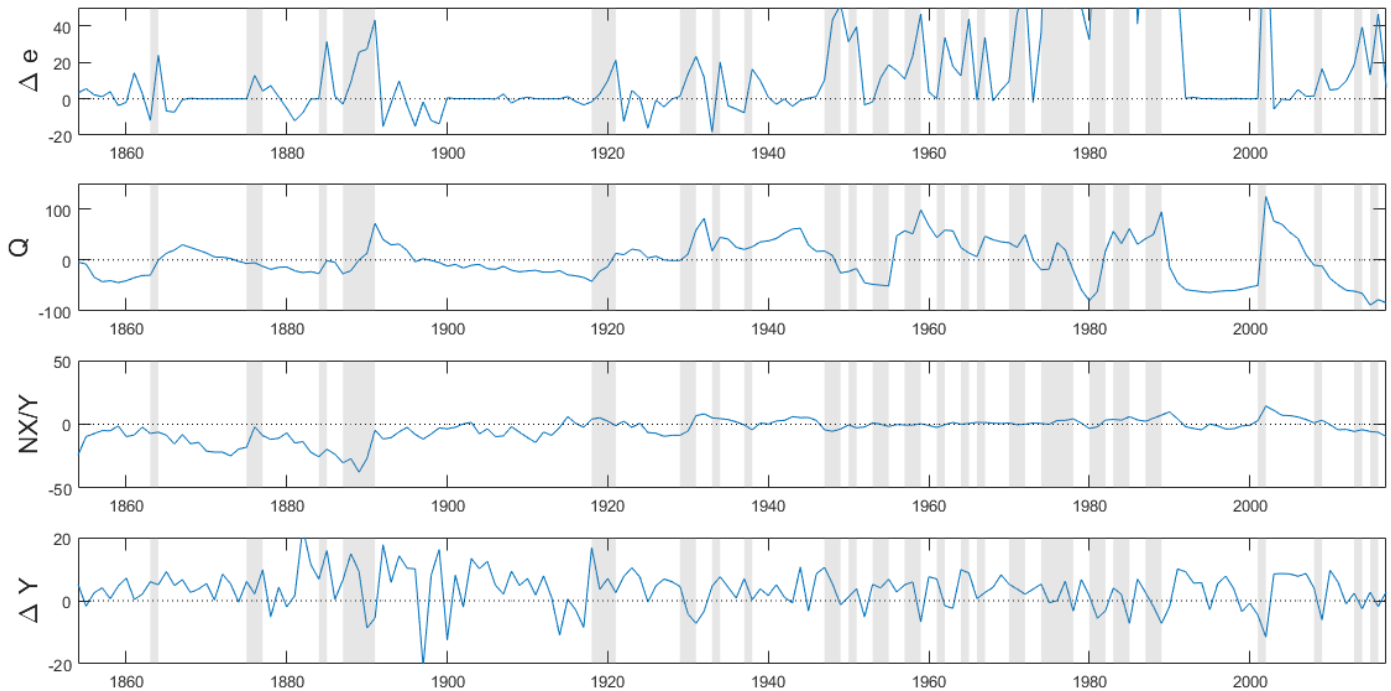
$$\Delta Q = \Delta e - \pi + \pi^*$$

- Alternative approach (Rodrik (2008)):
- In developing countries, devaluations that keep the real exchange high for a long period might foster growth and development.
- This happens because, in this countries, there are market failures that prevents the most efficient resource allocation.
- So, an undervaluation in the real exchange rate is as a second best.

Short and long-run effects of devaluations



Data



- Anual data from 1854 until 2017.
- 27 devaluation episodes.

Structural VAR

1. Structural VAR(p) representation:

$$B_0 y_t = B_1 y_{t-1} + B_2 y_{t-2} + ... + B_p y_{t-p} + w_t \qquad w_t \sim (0, I_K)$$

   where $y_t = (\Delta e_t, Q_t, NX_t/Y_t, \Delta Y_t)'$.

2. Reduced form VAR(p):

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + ... + A_p y_{t-p} + u_t \qquad u_t \sim (0, \Sigma_u)$$

   where $A_i = B_0^{-1} B_i, i = 1, \ldots, p$ and $u_t = B_0^{-1} w_t$.

Estimation

3. Bayesian estimation using Gibbs sampler:

$$g(\theta \mid y) = l(\theta \mid y)g(\theta)$$

where $g(\theta \mid y)$ is the posterior, $l(\theta \mid y)$ is the likelihood function, $g(\theta)$ is the prior and $\theta = (\alpha, \Sigma_u)$ are the parameters' estimates (α are the VAR coefficients).

4. Assume independence of priors α and Σ_u (independent Gaussian-Inverse Wishart Prior):

$$g(\alpha, \Sigma_u) = g_\alpha(\alpha)g_{\Sigma_u}(\Sigma_u)$$

where

$$\alpha \sim \mathcal{N}(\alpha^*, V_\alpha)$$
$$\Sigma_u \sim \mathcal{IW}_K(S_*, n)$$

5. As Q exhibits persistence, we chose a random walk prior for the mean (α^*).
6. Prior variance $V_\alpha = \eta I_K$, we set $\eta = 1$, which reflects our ignorance about the actual value of hyperparameters.
7. 10,000 draws to obtain our estimates of the reduced form VAR parameters $\theta = (\alpha, \Sigma_u)$.

Identification

8. Draw from the posterior using the algorithm by Arias et al. (2014):

$$\begin{aligned} \text{Impact matrix} \quad & B_0^{-1} = \text{Chol}(\Sigma_u) \\ \text{Long-run matrix} \quad & L_\infty = (I_K - A_1 - \dots A_p)B_0^{-1} \\ \text{Composite matrix} \quad & L = [B_0^{-1} \quad L_\infty]' \end{aligned}$$

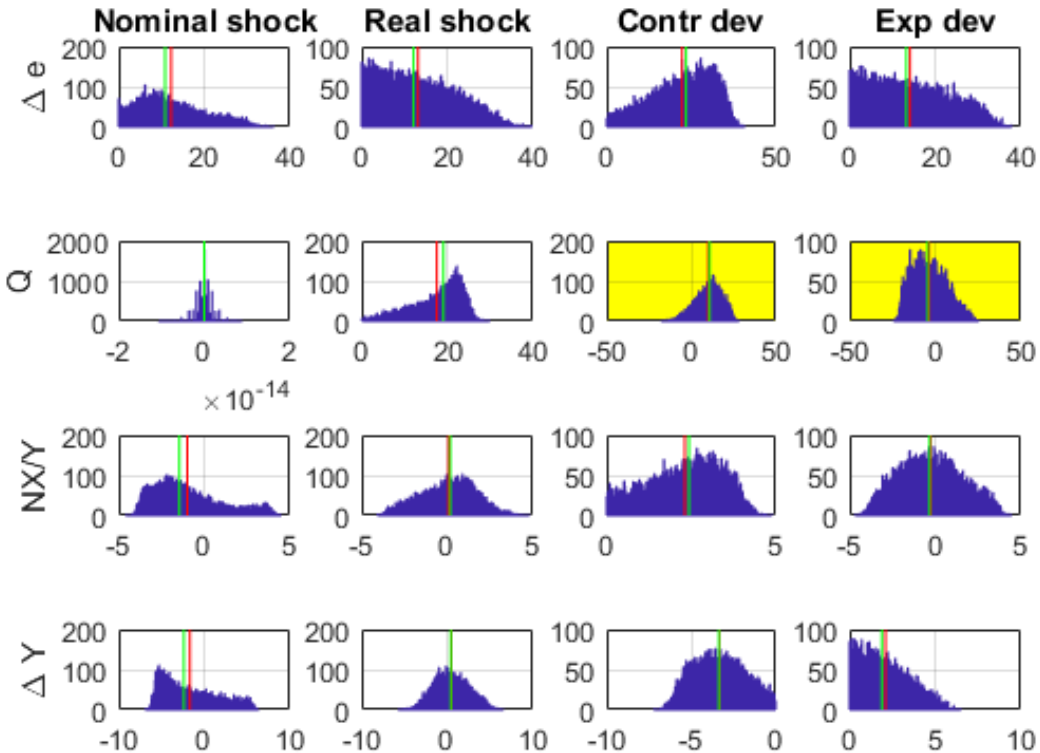
9. Keep candidate L only if:

$$\begin{bmatrix} \Delta e_t \\ Q_t \\ NX_t/Y_t \\ \Delta Y_t \end{bmatrix} = \underbrace{\begin{bmatrix} + & + & + & + \\ 0 & + & \cdot & \cdot \\ \cdot & \cdot & + & \cdot \\ \cdot & \cdot & - & + \end{bmatrix}}_{B_0^{-1}} \begin{bmatrix} w_t^n \\ w_t^r \\ w_t^c \\ w_t^e \end{bmatrix} \qquad (\text{at } t = 0)$$

$$\vdots \qquad = \underbrace{\begin{bmatrix} + & \cdot & \cdot & \cdot \\ 0 & + & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & + & \cdot & \cdot \end{bmatrix}}_{L_\infty} \qquad \vdots \qquad (\text{at } t = \infty)$$

Check

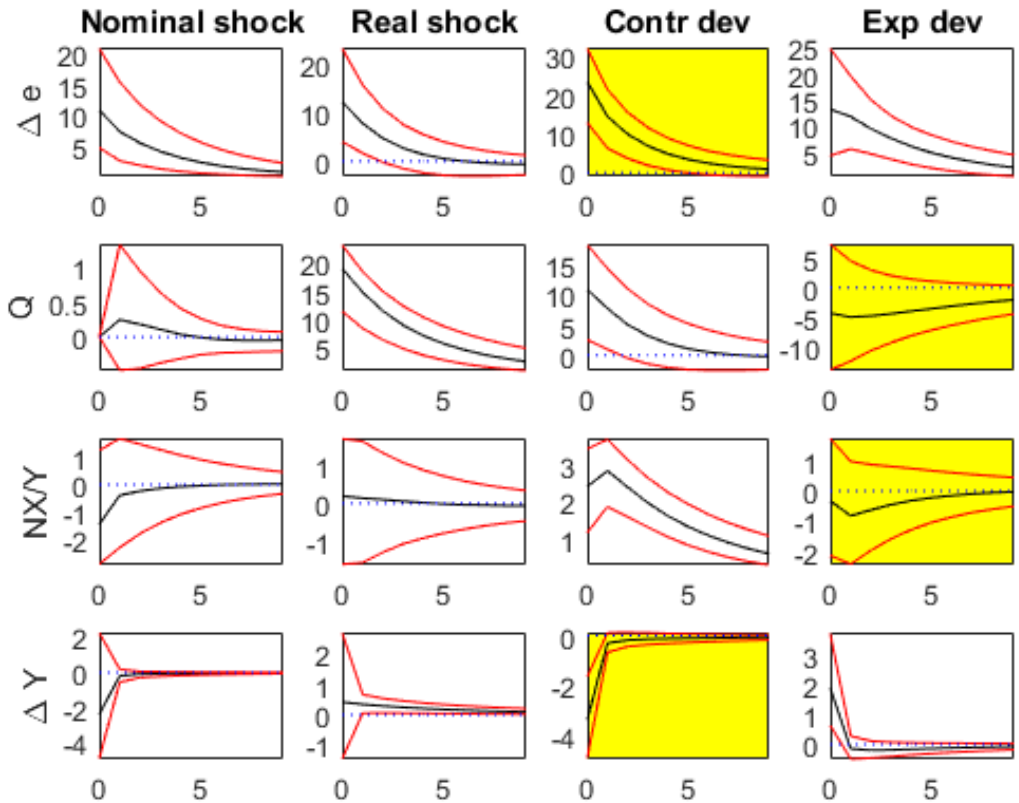
10. Check distribution of B_0^{-1} elements:



- 10,000 B_0^{-1} matrices obtained in 30'.
- All distributions are unimodal.
- In unrestricted elements, means and medians are as expected ...
- except for *expansionary* devaluations.

IRFs

Figure: IRFs: median (—) and 68% CI(—)



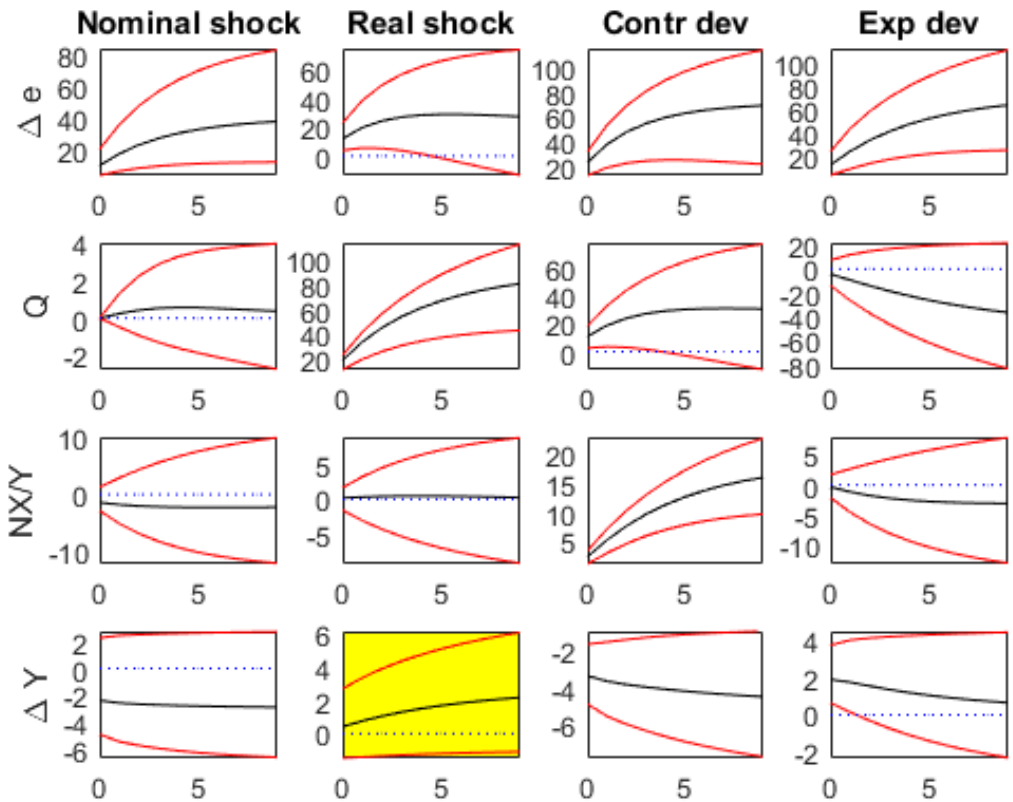
Δe *Contractionary* devaluations had the strongest effect → *large* devaluations.

ΔY *Contractionary* devaluations hit strong: 10% dev → -1.3 % contraction.

Q *Expansionary* devaluations appreciate the RER.

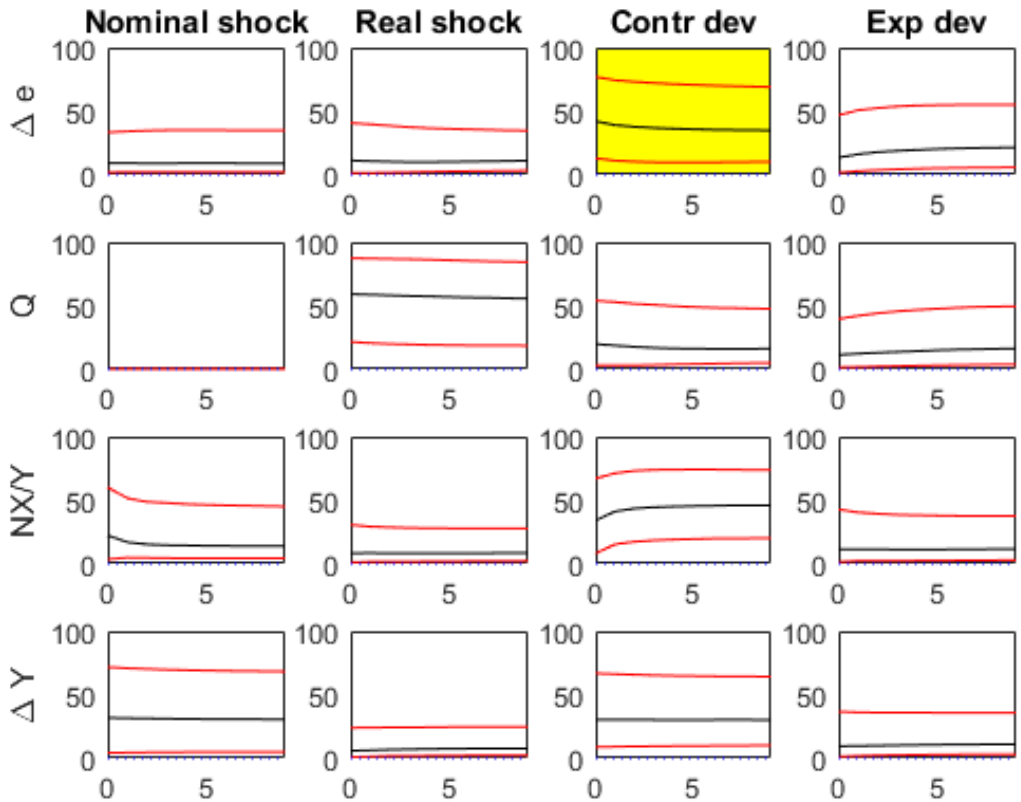
NX *Expansionary* devaluations produce a J-curve, but never get positive.

Accumulated responses



ΔY Impact of the *real* shock on output variations can be interpreted as a long-term effect on its level.

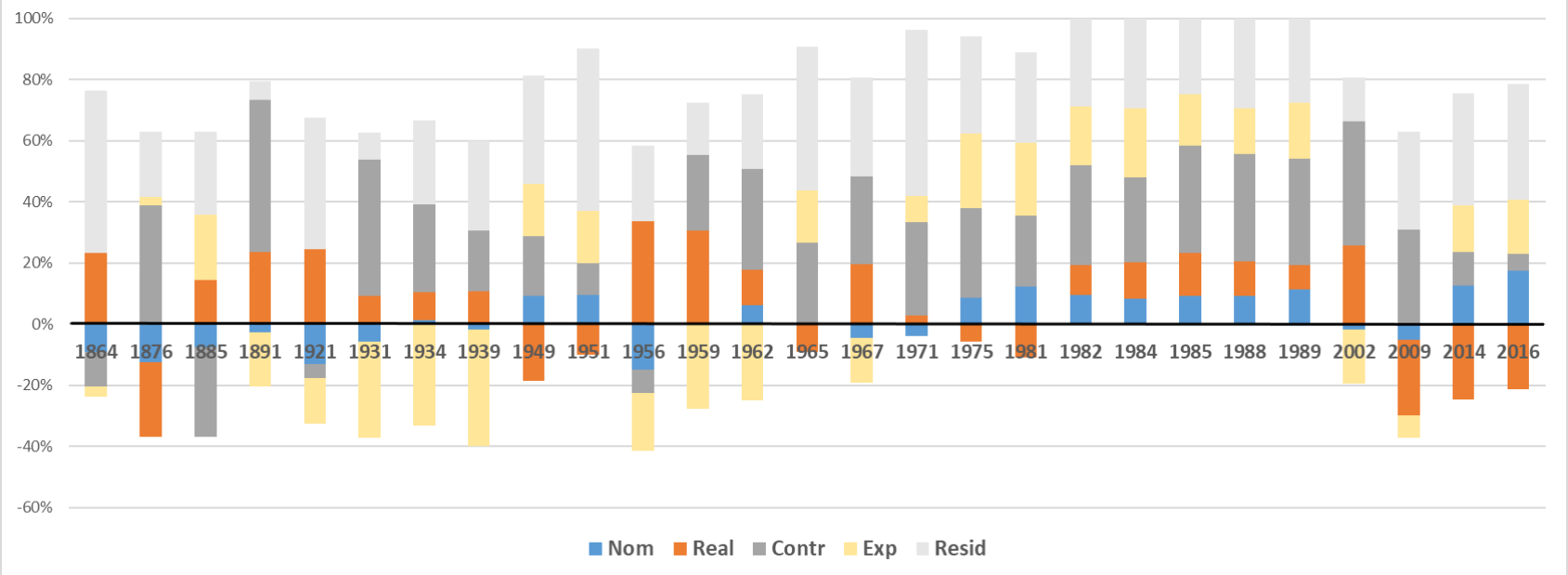
Variance decomposition



Δe *Contractionary* devaluation is the main source of volatility.

- However, other shocks affected specific episodes ...

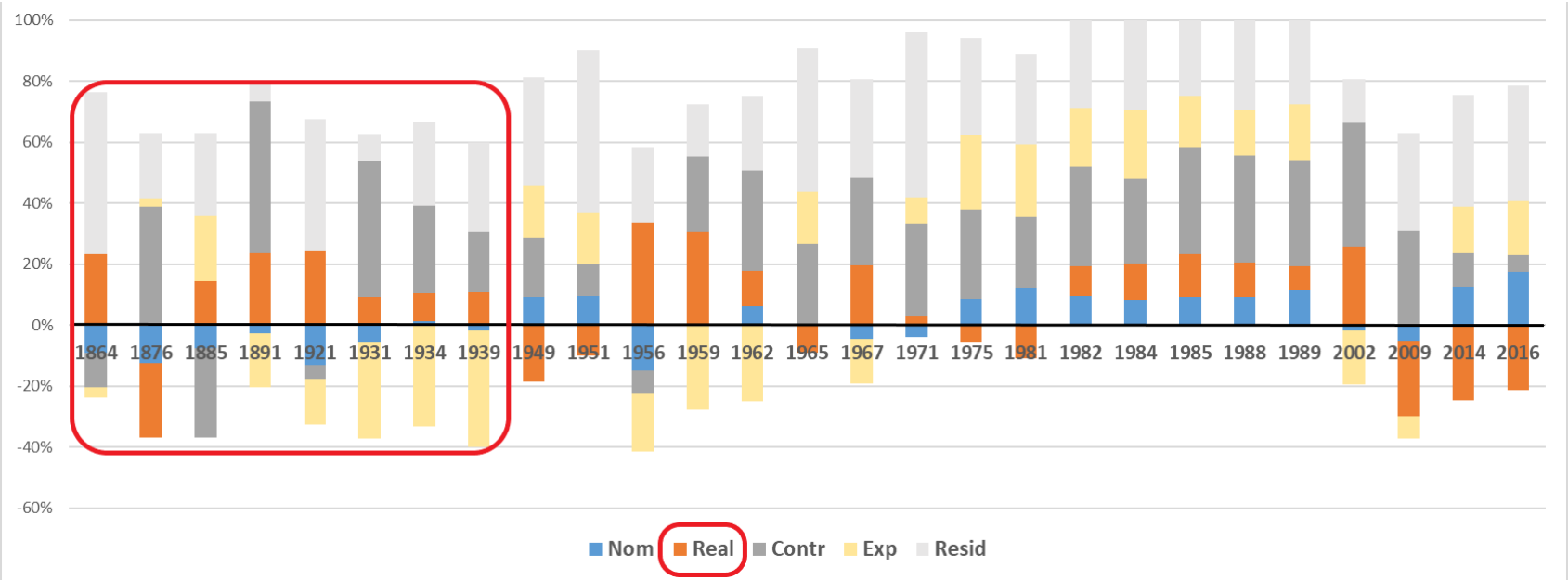
Shock's contribution to each devaluation episode



- Although, devaluations were mainly *contractionary*, other shocks also contributed to some devaluations episodes.

▸ Historical Decomposition

From 1855 to 1940

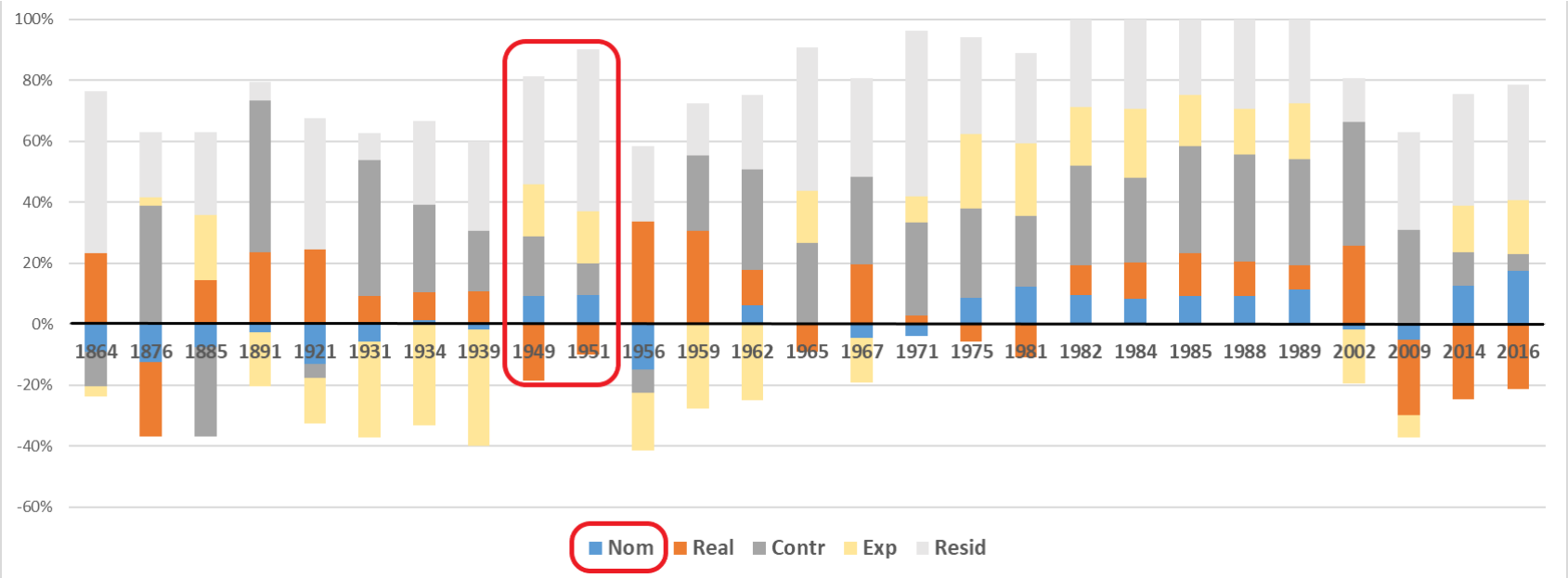


- *Real* shocks influence.
- Strong integration with the ROW.
- Devaluations typically occurring after World Crisis: 1873, 1884, 1890, WWI, 1929, 1937.
- Mostly endogenous NER...?

Policy innovations

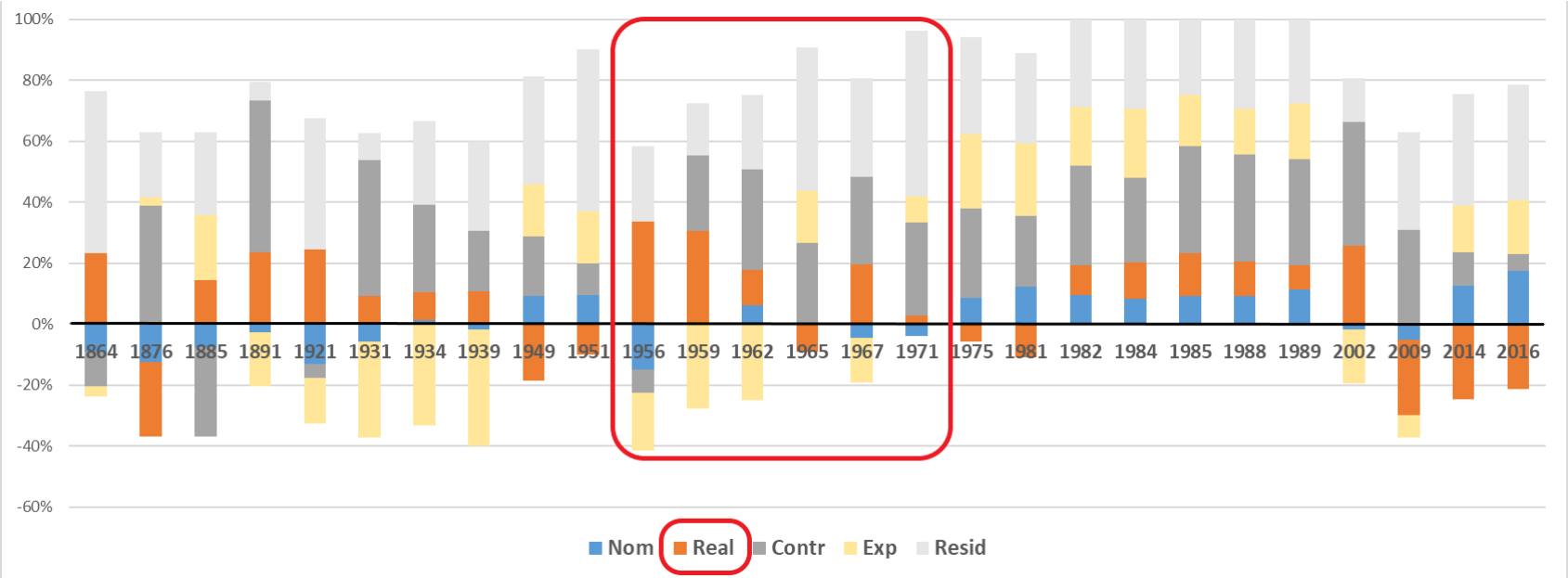
- From openness to autarky.
- CB in 1935.
- **Export taxes** by Yrigoyen:
  anti-inflationary, anti-redistributive, fiscal income.
- **Exchange rate controls** by Uriburu:
  anti-inflationary, anti-redistributive, reduce reserves loss.

Stop and go cycles



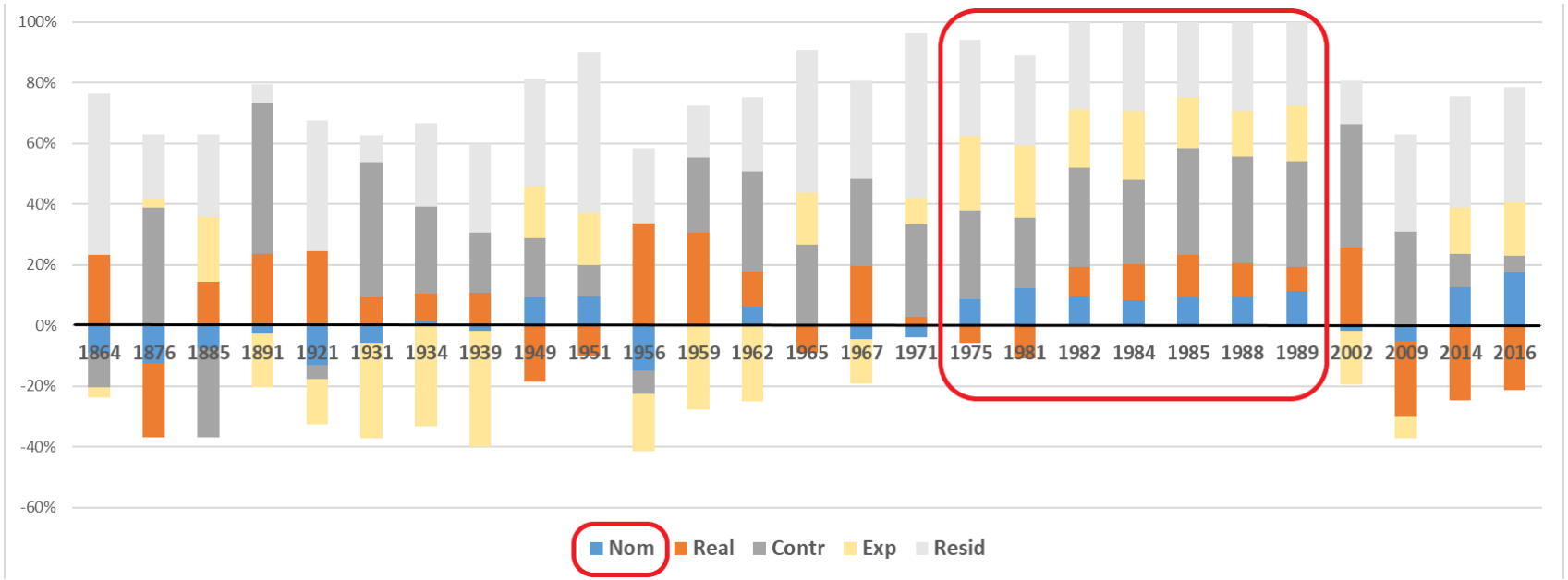
- *Nominal* shocks influence.
- Foreign currency reserve requirements dropped $\rightarrow$ money expansion.
- Discretionary credit expansion at negative real interest rates.
- **Wage-price spiral** and **external constraint**.
- Systematic inflation decoupled from international one.

Developmentalism



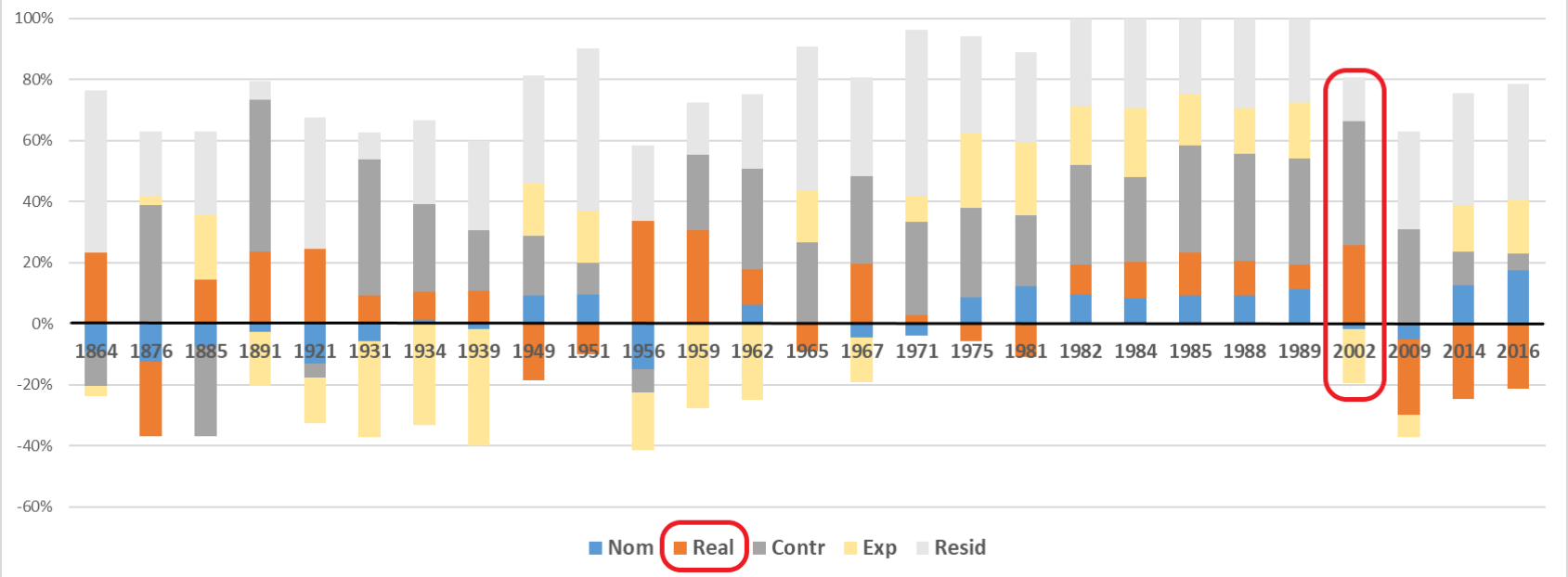
- *Real* shocks influence.
- Vigorous expansion but with high inflation $\rightarrow$ **crawling peg**.
- Heterodox stabilization plans: *income policy* + *fiscal consolidation*.
- Mostly exogenous NER...?

Hyperdevaluations and hyperinflation



- *Nominal* shocks influence.
- Failure of both orthodox and unorthodox stabilization plans.
- External shocks: oil shocks, Volcker's disinflation, LATAM debt crisis.
- In 1983, debt interests and capital raised to 10% of GDP.

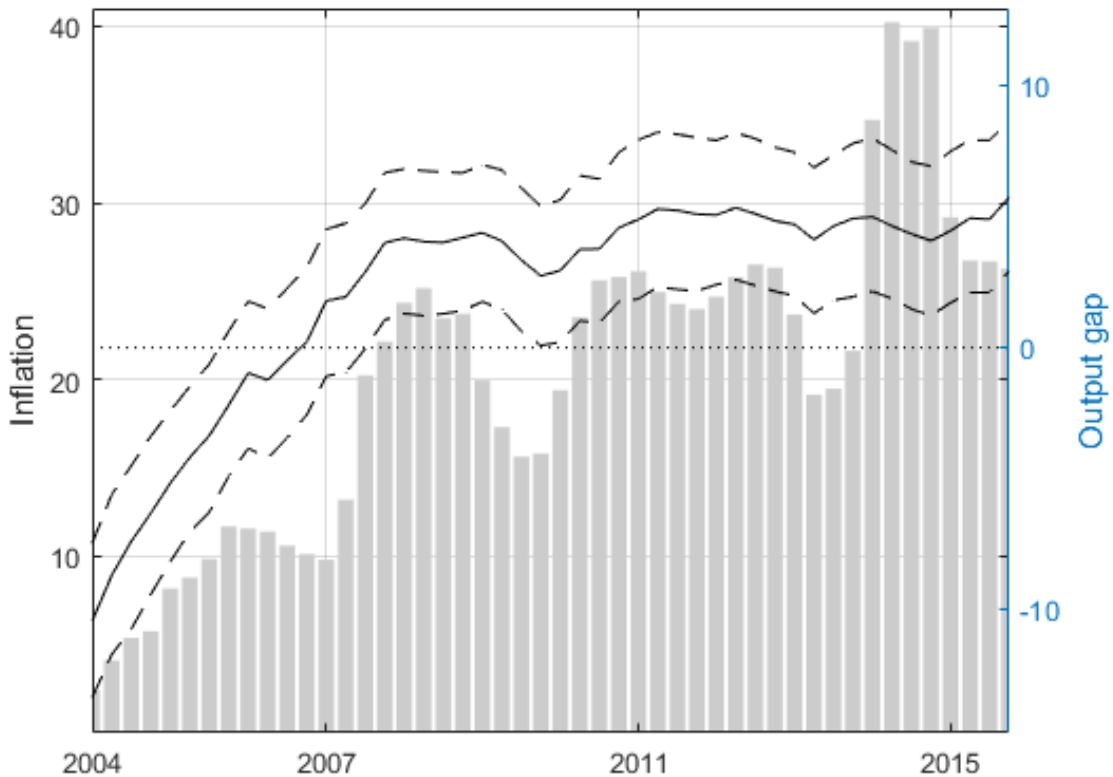
From default to boom



- *Convertibility plan*: low inflation + unemployment.
- Low inflation expectations and deeply negative output gap.
- In 2002 highest real devaluation in Argentinean history: *real* shock influence.
- Balance sheet effect was reduced thanks to debt restructuring.
- Negative income effects were reduced with export taxes.
- Commodity boom since 2004 improved ToT.

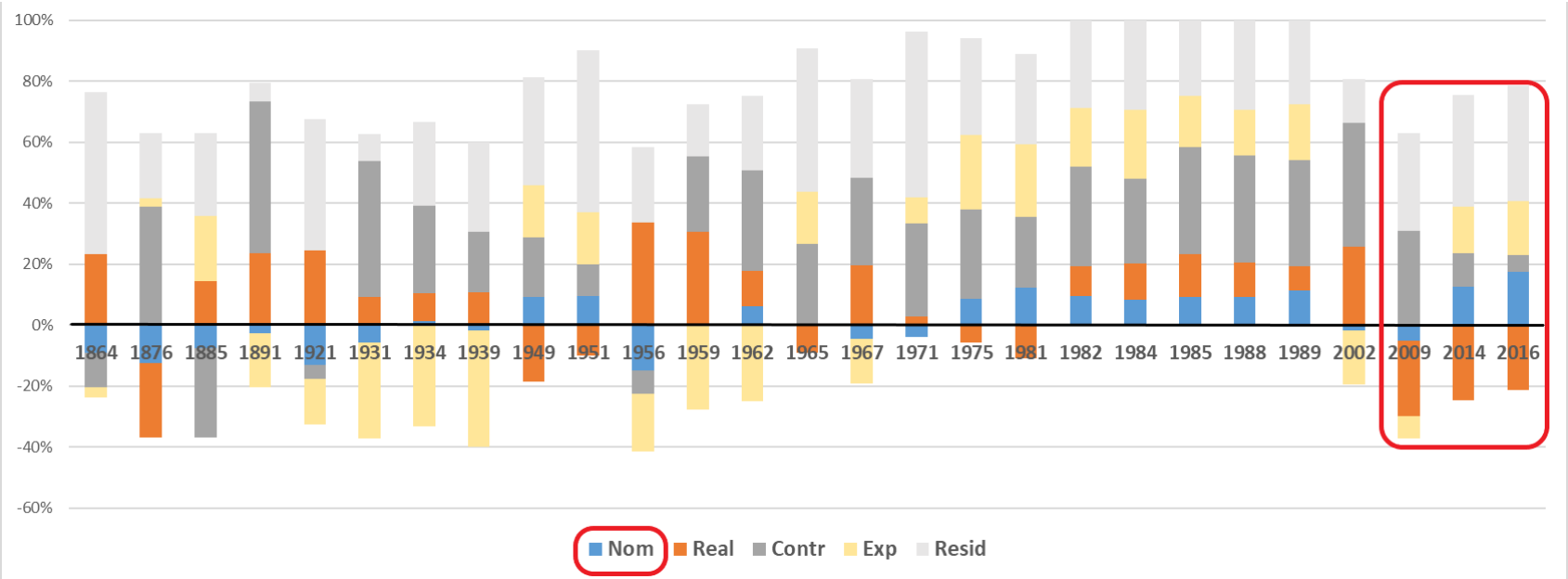
Overheating and monetization

- Signs of overheating since 2007:



- Institutional weakness and debt monetization since 2010.

Back to stagflation



- High inflation caused real appreciation.
- CA deficit in 2010 $\rightarrow$ **external constraint** $\rightarrow$ **ER controls**.
- *Stop and go* since 2011.
- *Nominal* shocks influence.

Conclusions

- Short and long-run effects of devaluations in developing countries.
- Case study is Argentina: long time series and many devaluations episodes.

BVAR with four structural shocks:

- *expansionary* devaluation of the traditional type.
- *contractionary* devaluation *à la* Díaz Alejandro.
- *nominal* shock.
- *real* shock *à la* Rodrik.

Findings:

- Although devaluations were mostly *contractionary* ...
- *nominal* shocks were important when inflation was high,
- *real* shocks were important when inflation was low,
- *expansionary* devaluations cannot be recovered from the DGP.
- Brief historical analysis enriched with our results.

Thank you !!!

VAR evidence

Short-run effect, VAR evidence in developing countries:

- *Expansionary*: Odusola & Akinlo (2001) for Nigeria.
- *Contractionary*: Kamin & Rogers (2000) for Mexico, Berument & Pasaogullari (2003) for Turkey, Hsing (2004) for Argentina.
- No effect: Tang (2015) for China.

Back

Short-run effects of devaluations (cont)

Effect over the trade balance:

$$dTB = dY_s^T - dY_d^T$$

Assume inelastic supply of tradables $dY_s^T = 0$. Then, the result in the TB after a devaluation will be the opposite of:

$$dY_d^T = [\underbrace{m_{nc}(Y_s^T - Y_{dc}^T)}_{\text{inc eff cap}} - \underbrace{m_{nw}(Y_{dw}^T)}_{\text{inc eff wor}} - \underbrace{Y^{NT}E_{ne}}_{\text{subs eff}}]de$$

$$= [\underbrace{(s_w - s_c)Y_{dw}^T}_{\text{i}} + \underbrace{(m_{nw} - m_{nc})Y_{dw}^T}_{\text{ii}} - \underbrace{Y^{NT}E_{ne}}_{\text{iii}}]de$$

If $|i| > ii - iii$, then $dY_D^T \downarrow \rightarrow dTB \uparrow$.

Back

Historical decomposition

- Historical decomposition of shock j to variable k for period i:

$$\hat{y}_{kt}^{j} = \sum_{i=0}^{t-1} \Theta_{kj,i} w_{j,t-i}$$

where $\Theta_i = (J\mathbf{A}^i J')B_0^{-1}$ and $\mathbf{A}$ is the companion form of the reduced form VAR.

- Use median of $\Theta_{kj,i}$, to get contribution of each shock to the variations in NER:

$$\delta_{et}^{j} = \frac{\hat{y}_{et}^{j}}{\Delta e_t} * 100$$

- and the the residual:

$$\varepsilon_{et}^{j} = \frac{\Delta e_t - \sum_{j=1}^{J} \hat{y}_{et}^{j}}{\Delta e_t} * 100$$

- Focus on devaluations occurred at years $t = \tau$ and rescale:

$$\frac{\delta_{e\tau}^{j}}{\sum_{j=1}^{J} |\delta_{e\tau}^{j}| + \varepsilon_{e\tau}^{j}} \quad ; \quad \frac{\varepsilon_{e\tau}^{j}}{\sum_{j=1}^{J} |\delta_{e\tau}^{j}| + \varepsilon_{e\tau}^{j}}$$

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