Conditional Exchange Rate Pass-Through: A DSGE Model Approach

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Rodrigo Gómez Award 2018

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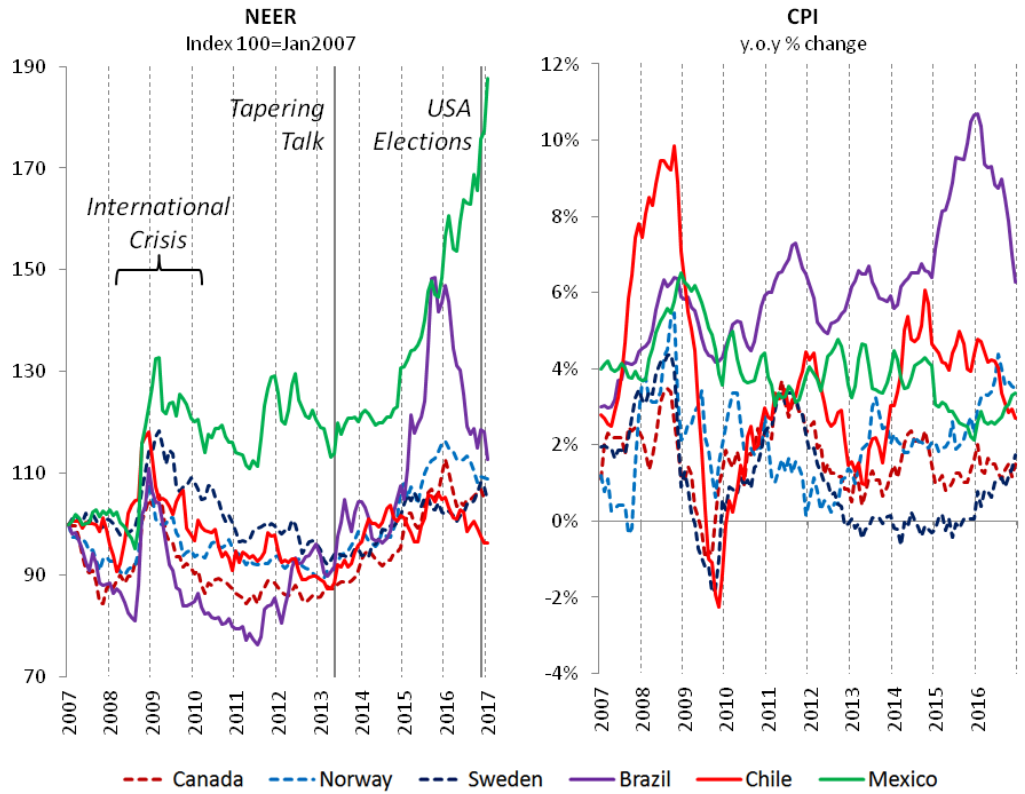
Agenda

Motivation

Different inflationary responses when facing similar fluctuations in exchange rates



Source: Bruegel and International Financial Statistics - (IMF)

Motivation

Usual approach to measure the transfer of the exchange rate to prices (ERPT): Reduced form equations.

Choudrhi and Hakura (2006)

$$\Delta P_t = \gamma_1 + \pi_1(L)\Delta P_{t-1} + \pi_2(L)\Delta S_t + \pi_3(L)\Delta P^*_{t-1} + \epsilon_t$$

$$ERPT = \sum_{\tau=0}^{T-1} \partial P_{t+\tau}/\partial S_t$$

- Weakness 1: Exchange rate movements assumed exogenous
- Weakness 2: Same coeff. independent of underlying shocks.

Goal and Approach

- Goal: Are different ERPT due to different fundamentals or to different distribution of faced shocks?

- Approach:

  1) Estimate a DSGE model for two countries with an *a priori* different pass-through.

  2) Recover conditional ERPT coefficients.

  3) Analyze underlying shocks and compare their distribution.

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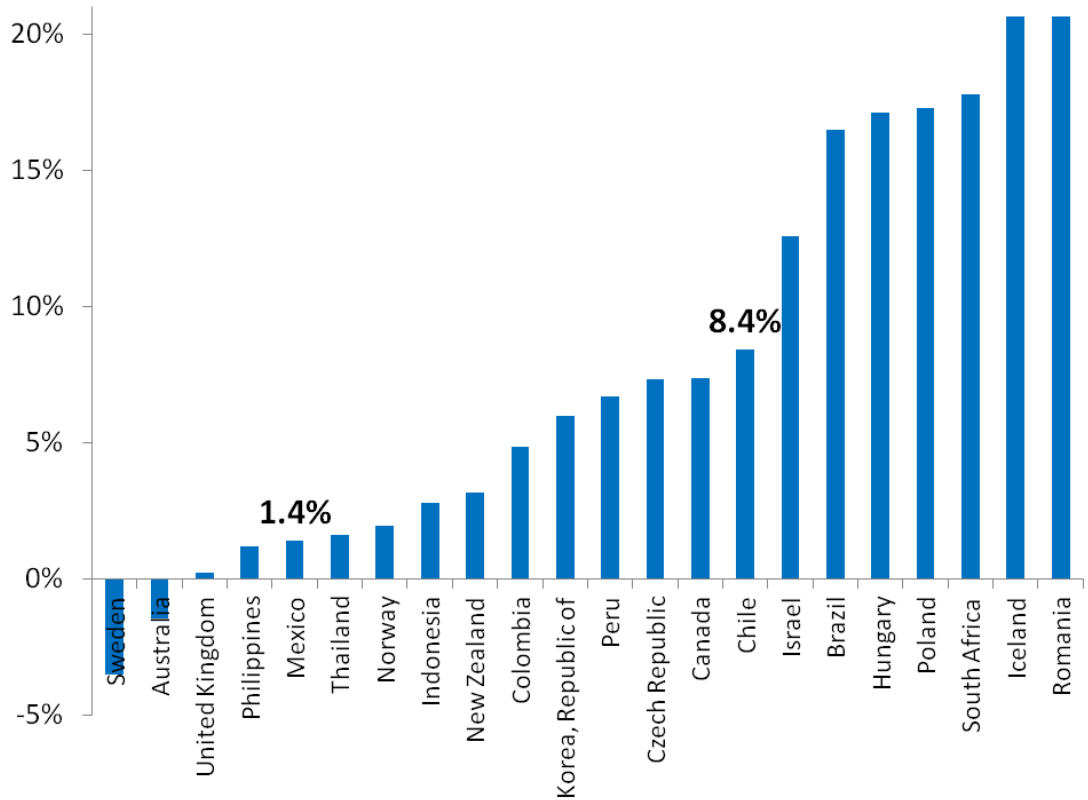
Selection of Countries

A Vector Autoregressive model (VAR) is estimated for 23 IT countries.

- Endogenous: GDP, NEER, CPI, and MPR.
- Exogenous: oil prices, Fed Fund Rate, and foreign CPI.
- Log. diff specification (interest rates included as p.p. differences).
- Optimal lag lengths are chosen as per the Schwarz-Bayesian and Hannan-Quinn information criterion.
- Quarterly data, period 2000q1-2016q2.
- Identification using Cholesky ordering: GDP, NEER, CPI, and MPR.
- $ERPT_{t_4} = (P^i_{t_4} - P^i_{t_0})/(NEER^i_{t_4} - NEER^i_{t_0})$.

Selection of Countries

Nominal effective exchange rate pass through to CPI prices (4q).
Source: Own estimates based on IFS, Bruegel and Federal Reserve Bank of St. Louis.



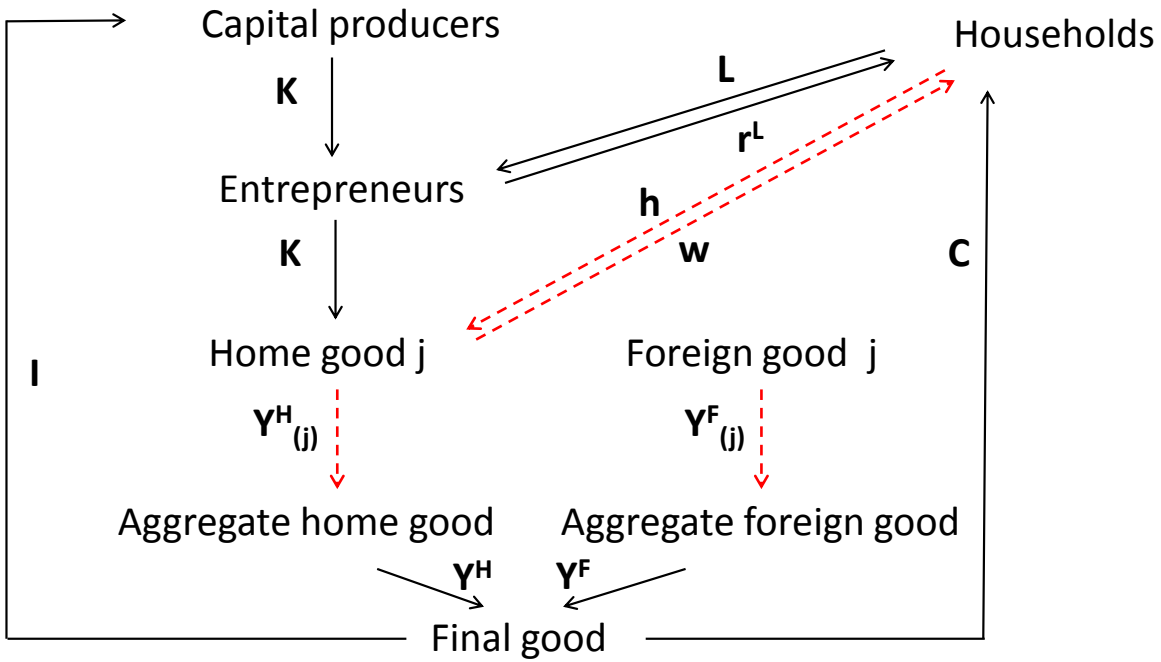
Chile and Mexico are selected: $\neq$ ERPT, data availability, similar features (EME, SOE, Comm Expo.)

Model

García-Cicco, Justel and Kirchner (2014) - baseline

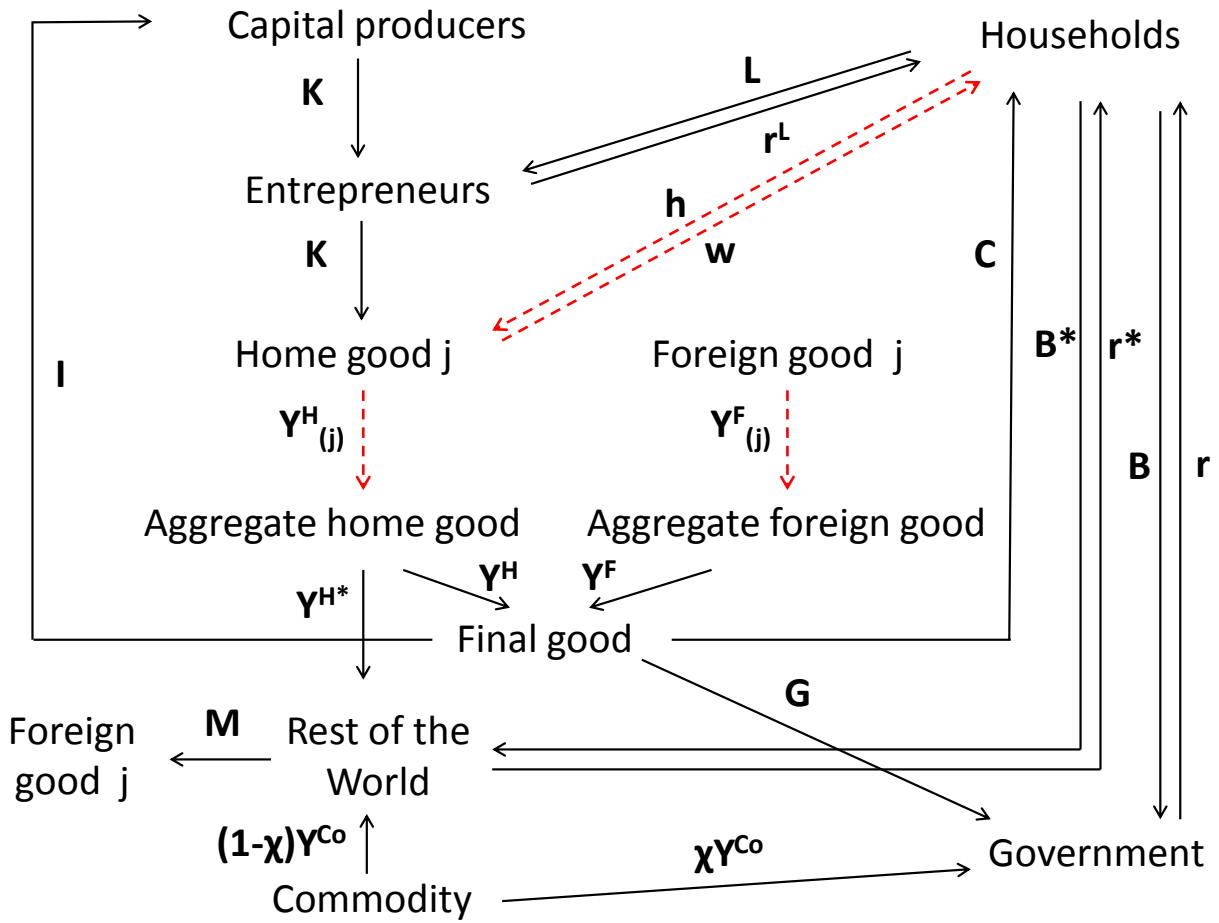
- SOE.
- Calvo pricing with indexation to (π_{t-1} and π^T) in
  - Home goods.
  - Imported goods (LCP).
  - Wages.
- Investment adjustment costs in capital production.
- Commodities sector.
- Monetary policy rule *a la* Taylor.
- 7 domestic shocks: preferences, investment efficiency, permanent technology shock, temporary technology shock, production of commodities, gov. expenditure and monetary policy rate.
- 6 external shocks: country premium, international interest rate, foreign inflation and foreign demand, commodities relative prices and UIP shocks.

Model



Note: Dotted red lines indicate Calvo pricing/waging plus indexation to π_{t-1} and π^T.

Model



Note: Dotted red lines indicate Calvo pricing/waging plus indexation to π_{t-1} and π^T.

Model

- External debt rate

$$r_t^* = R_{t-1}^* \xi_{t-1} \varpi_{t-1} \left(\pi_t^*\right)^{-1}$$

- UIP

$$\widehat{R_t} = \widehat{R_t^*} + \widehat{\xi_t} + \mathbb{E}_t[\widehat{\pi_{t+1}^S}] + \widehat{\varpi_t}$$

where ξ_t is the Country Premium and ϖ_t are UIP shocks.

- Monetary Policy

$$\frac{R_t}{R_{ss}} = \left(\frac{R_{t-1}}{R_{ss}}\right)^{\rho R} \left[\left(\frac{\pi_t}{\pi_{ss}}\right)^{\alpha_\pi} \left(\frac{Y_t/Y_{t-1}}{a_{t-1}}\right)^{\alpha_y}\right]^{1-\rho R} \exp(\varepsilon_t^R)$$

where π_{ss} is the inflation target and ε_t^R captures monetary policy shocks.

Parametrization

- Calibration following previous papers and observable data.
- Parameters solved in steady state.
- Bayesian estimation.

  Same priors were used for both countries.

  14 observable variables.
  Nat. Accounts: GDP (Y), investment (I), consumption (C) gov. expenditure (G).
  Prices: CPI inflation (π), real wages (π^W) main exported commodity price (p^{Co^*}).
  Other domestic: commodity production (Y^{Co}), monetary policy rate (R), EMBI+Country (ξ), nominal effective exchange rate (π^S).
  Foreign: LIBOR rate (R^*), trading partners GDP (Y^*) inflation (π^*).

  Period. Chile: 2001q3–2016q2, Mexico: 2003q1–2016q2.

Parametrization

Selected estimated parameters

		Prior		Posterior Mean	
Param.	Description	Mean	S.E.	Chile	Mexico
α^{π}	π_t weight in MPR	1.5	0.1	1.49	1.55
α^{y}	y_t weight in MPR	0.13	0.05	0.15	0.15
ρ^{R}	R_{t-1} weight in MPR	0.75	0.1	0.84	0.8
θ^{H}	Calvo prob. home good	0.75	0.1	0.50	0.72
ϕ^{H}	π_{t-1} indexation home good	0.5	0.15	0.40	0.27
θ^{F}	Calvo prob.foreign good	0.75	0.1	0.87	0.86
ϕ^{F}	π_{t-1} indexation foreign good	0.5	0.15	0.46	0.36
θ^{W}	Calvo prob wages	0.75	0.1	0.96	0.95
ϕ^{W}	π_{t-1} indexation wages	0.5	0.15	0.41	0.67

- Final good prices: Estimates for Chile indicate a higher probability of periodic price adjustment for home goods, and more indexation to past inflation for both home goods and imported goods.
- Wages: High rigidity is estimated for both countries, albeit more wage indexation to past inflation for Mexico.

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Shocks Selection

Variance Decomposition

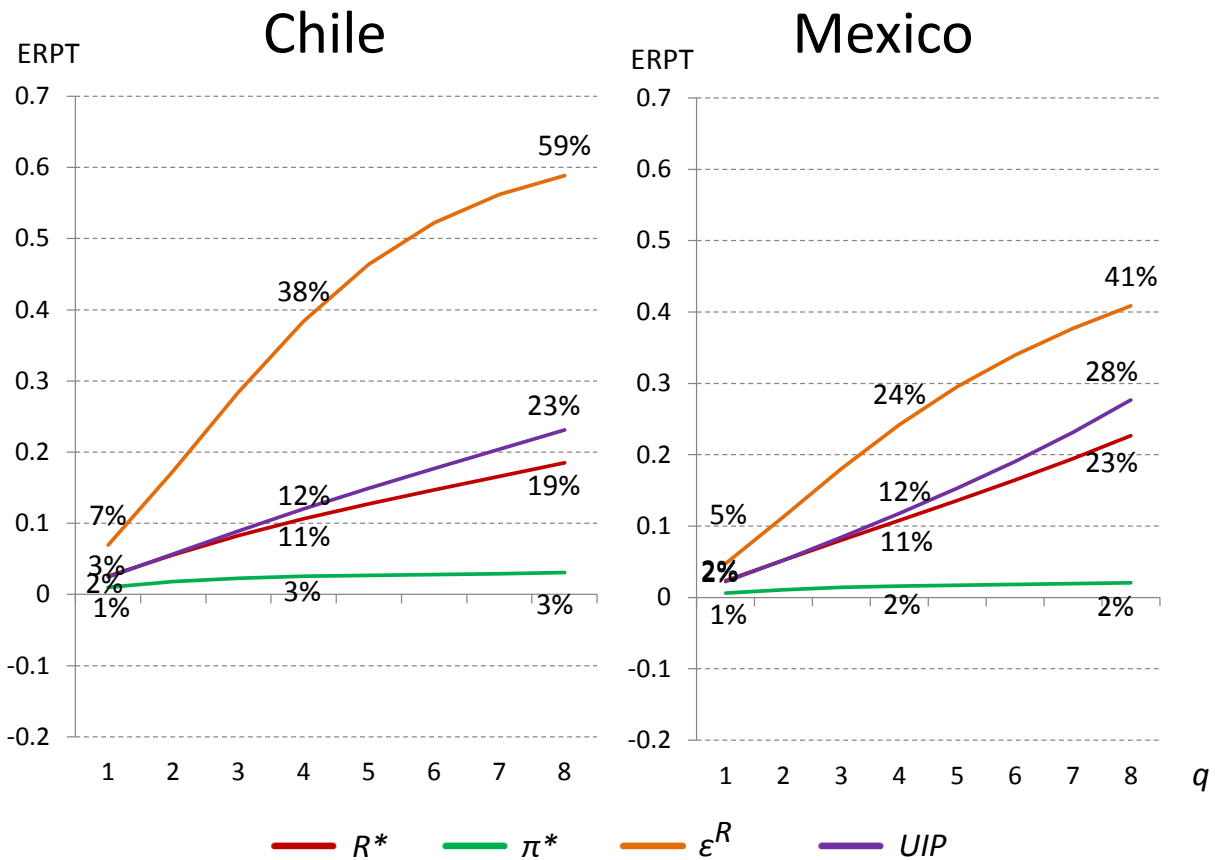
		v	u	z	a	ζ	R^*	π^*	p^{Co*}	y^{Co}	y^*	g	e_R	ϖ
Chile	π	1.17	21.22	56.96	0.97	0.17	6.92	1.04	1.36	0.01	0.23	0.05	5.01	4.9
	π^S	0.1	1.72	0.57	0.32	1.46	17.78	29.23	1.5	0.01	0.1	0	4.87	42.35
Mexico	π	4.5	4.51	70.86	2.82	0.4	3.04	0.01	0.59	0.01	0.32	0.01	5.73	7.2
	π^S	0.65	3.64	3.53	4	3.39	11.97	1.89	1.69	0.02	1.79	0	8.65	58.79

Note: Each column shows the preferences, investment, temporary technology, permanent technology, country premium, international interest rate, international inflation, commodity relative price, commodity production, international aggregate demand, gov. expenditure, monetary policy rate, and UIP deviations shocks.

- UIP shocks, foreign prices shocks, MPR shock and international interest rate shocks together account for 94.2% of variability in the exchange rate in Chile and 81.3% in Mexico.
- Such subset of shocks account for 16/18% of CPI inflation variance.

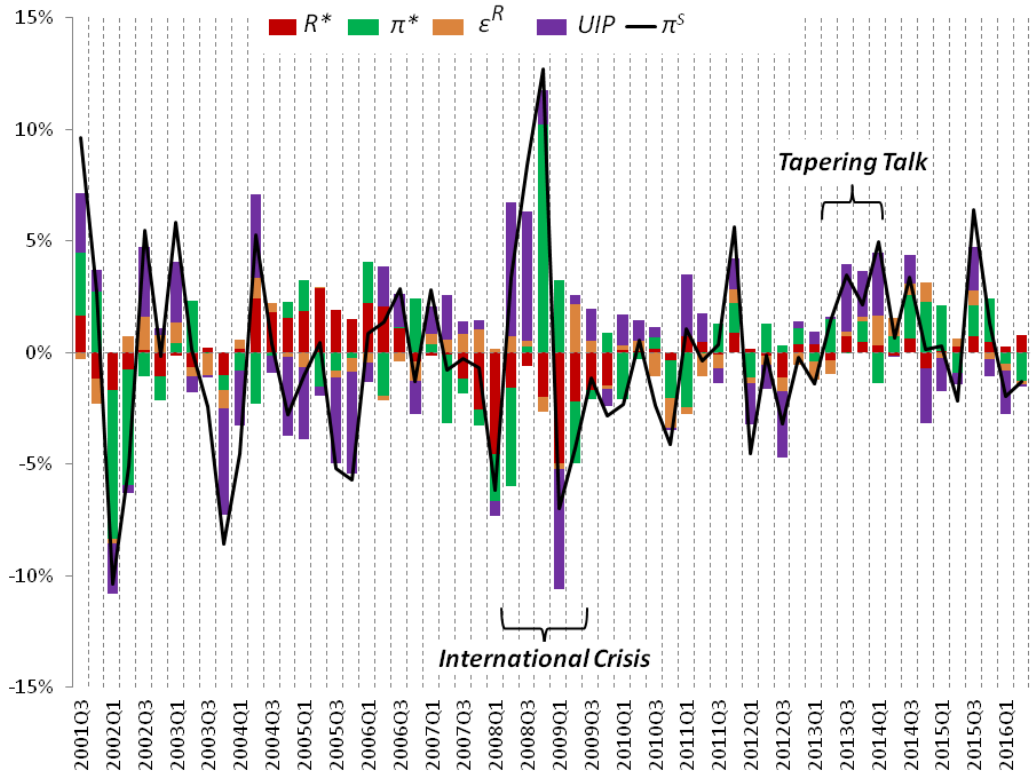
Conditional ERPT Coefficients

$$ERPT_t^i = \sum_{j=1}^{t} IRF_j^{\pi,i} \Big/ \sum_{j=1}^{t} IRF_j^{\pi^S,i}$$



ERPT over time - Chile

Exchange Rate Historical Variance Decomposition



Episode	**Shock**	**Estimated ERPT**
International Crisis	π^*	$t_1 = 1\%,\ t_4 = 3\%,\ t_8 = 3\%$
Tapering Talk	ϵ^R	$t_1 = 7\%,\ t_4 = 38\%,\ t_8 = 59\%$

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Back in VAR

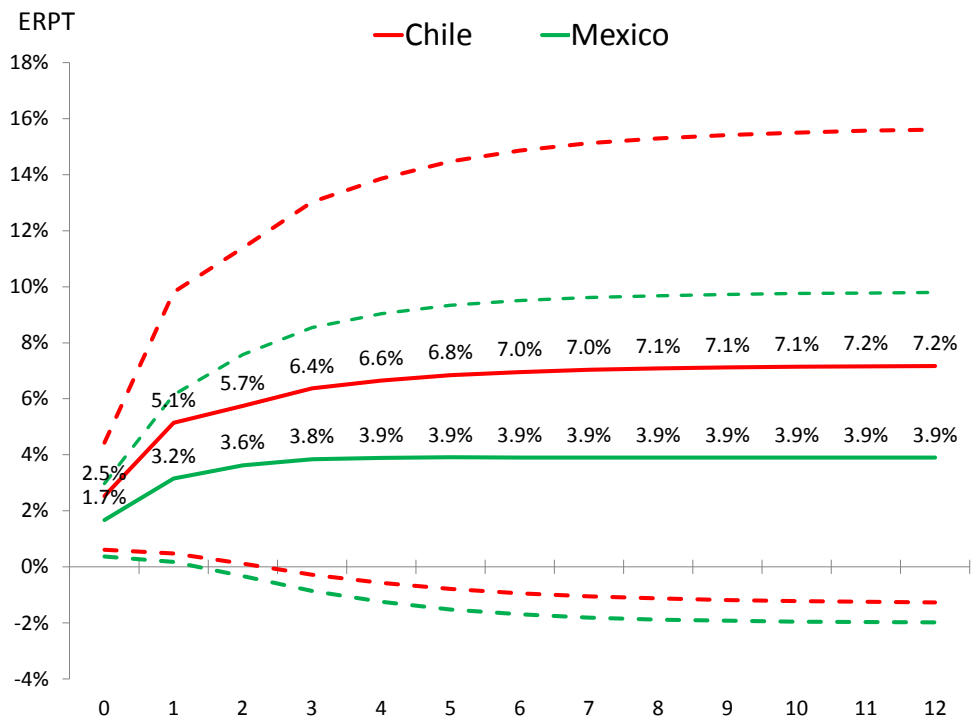
Tackling Weakness 1: Exchange rate movements assumed exogenous.

Idea: use simulated data to estimate VAR models.
$\longrightarrow$ Given that these series are generated using i.i.d shocks, we avoid the aforementioned critique.

- Data: n=5000, t=70.
- Specification: VAR model used in "Selection of Countries" section.

Back in VAR

Unconditional ERPT according to VAR model



Note: Dotted lines represent one standard deviation confidence intervals.

Initial VAR estimates showed a 4q pass-through of 8.4% for Chile and of 1.4% for Mexico.

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Conclusions

- Goal: Are different ERPT due to different fundamentals or to different distribution of faced shocks?

- Approach:

  1) Estimate a DSGE model for two countries with an *a priori* different pass-through.

  2) Recover conditional ERPT coefficients.

  3) Analyze underlying shocks and compare their distribution.

Conclusions

- Different conditional coefficients within country.
- Similar conditional coefficients across countries, except that of monetary policy rate.
- Non homogeneous historical variance decomposition: different inflationary consecuences would be expected after different episodes.
- Simulated data exercise highlight the importance of shocks accounting for cross-section comparisons.
- Policy implications: Policy response need to be shock conditional.

$\longrightarrow$ Evidence suggest that **differences founded in non-conditional estimates are mainly explained by the specific shocks underlying the time series used**.

Questions and comments

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A. Review of ERPT Estimates

Review of ERPT Estimates for Chile

Reference	**Period**	**Methodology**	**ERPT coeff.**
Albagli, Naudon and Vergara (2015)	2000-2015	VAR	4q: 19%
BBVA (2015)	2000-2015	VAR	4q: 14%
IMF (2016)	2000-2015	Single Equation	4q: 6%, 8q:12%
Perez-Ruiz (2016)	2003-2015	VAR	4q: 9%, 8q:11%
Sansone (2016)	2008-2013	Partial Eq.	Cumm.: 9%-20%*

*Coefficients depend on elasticities used.

Review of ERPT Estimates for Mexico

Reference	**Period**	**Methodology**	**ERPT coeff.**
Albagli, Naudon and Vergara (2015)	2000-2015	VAR	4q: 4%
BBVA (2015)	2000-2015	VAR	4q: 4%
Capistrán, Ibarra-Ramirez, Ramos-Francia (2012)	2001-2010	VAR	4q: No sign.
Cortés-Espada (2013)	2001-2012	VAR	4q: No sign.
Lopez-Villavicencio and Mignon (2016)	1994-2015	Single Equation	1q: 1.3%
Peón and Rodriguez Brindis (2014)	2001-2013	VAR	Cumm.: 2.2%

B. Calibrated Parameters - Chile

Parameter	Description	Value	Source
o	Share of foreign good in final good	0.37	M/(C+I+G), 2001q3-2016q2 average
α	Capital share in production	0.33	Medina and Soto (2007)
ϵ_H	E.o.S.in aggregate home good	11	Medina and Soto (2007)
χ	Government share in commodity production	0.55	c+(1-c)*t, c=CODELCO/Tot=0.31
δ	Capital depreciation	0.015	Medina and Soto (2007)
ϵ_F	E.o.S.in aggregate foreign good	11	Medina and Soto (2007)
ϵ_W	E.o.S.in labor demand	11	Medina and Soto (2007)
ρ^{R*}	Auto Corr. R^*	0.966	AR(1) coeff. sample period
$\rho^{\pi*}$	Auto Corr. π^*	0.4411	AR(1) coeff. sample period
$\rho^{p^{Co*}}$	Auto Corr. p^{Co*}	0.9275	AR(1) coeff. sample period
$\rho^{y^{Co}}$	Auto Corr. y^{Co}	0.654	AR(1) coeff. sample period
ρ^{y^*}	Auto Corr. y^*	0.912	AR(1) coeff. sample period
ρ^{y^g}	Auto Corr. g	0.664	AR(1) coeff. sample period
σ^{R*}	Std. Dev. of shock to R^*	0.001	AR(1) S.E. (2001q3-2016q2)
$\sigma^{\pi*}$	Std. Dev. of shock to π^*	0.0117	AR(1) S.E. (2001q3-2016q2)
$\sigma^{p^{Co*}}$	Std. Dev. of shock to p^{Co*}	0.1362	AR(1) S.E. (2001q3-2016q2)
$\sigma^{y^{Co}}$	Std. Dev. of shock to y^{Co}	0.032	AR(1) S.E. (2001q3-2016q2)
σ^{y^*}	Std. Dev. of shock to y^*	0.008	AR(1) S.E. (2001q3-2016q2)
σ^{y^g}	Std. Dev. of shock to g	0.014	AR(1) S.E. (2001q3-2016q2)
ξ	Country Premium in SS	$1.0145^{0.25}$	EMBI+Chile, 2001q3-2016q2 average
a	Long run growth	$1.02538^{0.25}$	y.o.y GDP pc chg, 2001q3-2016q2 avg
R	Monetary policy rate in SS	$1.0394^{0.25}$	MP rate, 2001q3-2016q2 avg.
π	Inflation in SS	$1.03^{0.25}$	Inflation target
R^*	International interest rate in SS	$1.0173^{0.25}$	LIBOR rate, 2001q3-2016q2 average
S^{TB}	Trade balance to GDP in SS	0.042	(X-M)/GDP, 2001q3-2016q2 avg.
S^G	Government exp. to GDP in SS	0.117	G/GDP, 2001q3-2016q2 avg.
$S^{Y^{Co}}$	Commodity prod. to GDP in SS	0.134	Copper prod./GDP, 2001q3-2016q2

B. Calibrated Parameters - Mexico

Parameter	Description	Value	Source
o	Share of foreign good in final good	0.3	M/(C+IG), 2003q1-2016q2 average
α	Capital share in production	0.34	García-Verdú (2005)
ϵ_H	E.o.S.in aggregate home good	11	Adame, Roldan-Peña, Zerecero (2013)
χ	Government share in commodity production	1	PEMEX
δ	Capital depreciation	0.02	Adame, Roldan-Peña, Zerecero (2013)
ϵ_F	E.o.S.in aggregate foreign good	11	Adame, Roldan-Peña, Zerecero (2013)
ϵ_W	E.o.S.in labor demand	11	Adame, Roldan-Peña, Zerecero (2013)
ρ^{R*}	Auto Corr. R^*	0.979	AR(1) coeff. sample period
$\rho^{\pi*}$	Auto Corr. π^*	0.377	AR(1) coeff. sample period
$\rho^{p^{Co*}}$	Auto Corr. p^{Co*}	0.881	AR(1) coeff. sample period
$\rho^{y^{Co}}$	Auto Corr. y^{Co}	0.887	AR(1) coeff. sample period
ρ^{y^*}	Auto Corr. y^*	0.884	AR(1) coeff. sample period
ρ^{y^g}	Auto Corr. g	0.612	AR(1) coeff. sample period
σ^{R*}	Std. Dev. of shock to R^*	0.001	AR(1) S.E. (2003q1-2016q2)
$\sigma^{\pi*}$	Std. Dev. of shock to π^*	0.003	AR(1) S.E. (2003q1-2016q2)
$\sigma^{p^{Co*}}$	Std. Dev. of shock to p^{Co*}	0.168	AR(1) S.E. (2003q1-2016q2)
$\sigma^{y^{Co}}$	Std. Dev. of shock to y^{Co}	0.016	AR(1) S.E. (2003q1-2016q2)
σ^{y^*}	Std. Dev. of shock to y^*	0.006	AR(1) S.E. (2003q1-2016q2)
σ^{y^g}	Std. Dev. of shock to g	0.008	AR(1) S.E. (2003q1-2016q2)
ξ	Country Premium in SS	$1.0204^{0.25}$	EMBI+Mexico, 2003q1-2016q2 average
a	Long run growth	$1.0048^{0.25}$	y.o.y GDP pc chg, 2003q1-2016q2 avg.
R	Monetary policy rate in SS	$1.0606^{0.25}$	MP rate, 2003q1-2016q2 avg.
π	Inflation in SS	$1.03^{0.25}$	Inflation Target
R^*	International interest rate in SS	$1.017^{0.25}$	LIBOR rate, 2003q1-2016q2 average
S^{TB}	Trade Balance to GDP in SS	0.001	(X-M)/ GDP, 2003q1-2016q2 avg.
S^G	Government exp. to GDP in SS	0.111	G/GDP, 2003q1-2016q2 avg.
$S^{Y^{Co}}$	Commodity prod. to GDP in SS	0.011	PEMEX TB/GDP, 2003q1-2016q2 avg.

C. Variables' Sources and Treatment - Chile

Variable	Source	Original Variable	Treatment
Investment Growth	Central Bank of Chile	Gross Fixed Capital Formation (billions of chained pesos), seasonally adjusted, quarterly	1) PC, 2) Log-Diff, 3) DM
Consumption Growth	Central Bank of Chile	Private Consumption, millions of pesos at 2008 prices, quarterly	1) PC, 2) S.A., 3) Log-Diff, 4) DM
Government Exp.	Central Bank of Chile	Government Consumption, millions of pesos at 2008 prices, quarterly	1) PC, 2) S.A., 3) Ln, 4) DT, DM
GDP Growth	Central Bank of Chile	GDP, millions of chained pesos, seasonally adjusted, quarterly	1) PC, 2) Log-Diff, 3) DM
Inflation	Central Bank of Chile	CPI General Index, monthly	1) Q.A., 2) S.A., 3) Log-Diff, 4) DM
Wage Growth	INE	Remunerations General Index, real, monthly	1) Q.A., 2) S.A., 3) Log-Diff, 4) DM
Commodity Prod.	Central Bank of Chile	Copper mining, chained volume at previous year prices, seasonally adjusted, quarterly	1) Ln, 2) DT, DM
Commodity Rel. Price	Central Bank of Chile	Copper price (USD per pound, LME)	1)Q.A., 2) Deflated by π^*, 3) Ln, 4) DM
Monetary Policy Rat	Central Bank of Chile	Monetary Policy Reference Rate, monthly average	1) Q.A., 2) Q.R., 3) Ln, 4) DM
Country Premium	Central Bank of Chile	Spread - EMBI Chile, monthly average, basis points	1) Q.A., 2) Q.R., 3) Ln, 4) DM
NEER Depreciation	Central Bank of Chile	Multilateral Exchange Rate, monthly average	1) Q.A., 2) Log-Diff, 3) DM
Foreign Interest Rate	St. Louis FRED	LIBOR Rate, monthly average.	1) Q.A., 2) Q.R., 3) Ln, 4) DM
Foreign GDP	IMF -IFS and Central Bank of Chile	Trading Partners real GDP (IFS), REER weights (Banco Central Chile), annual	1) Trading partners real GDP growth weighted by non copper trade flow, 2) S.A., 3) Ln, 4) DT, DM
Foreign Inflation	Central Bank of Chile	External Prices Index (EPI), Observed dollar (pesos/dollar) (OD), Multilateral exchange rate (MER), monthly	1) EPI*OD/MER, 2) Q.A., 3) Log-Diff, 4) DM
Population	U.S. Census Bureau	Population older than 16 years, annual.	Expressed on quarterly basis via linear expansion

Note: PC=per capita, S.A.= X12 seasonally adjusted, Q.A.= quarterly average, Q.R.= Rate expressed on quarterly basis, Ln= natural logarithm, Log-Diff= logarithmic difference between the variable and its one-period lag, DM= deviation from mean, DT= deviation from trend.

C. Variables' Sources and Treatment - Mexico

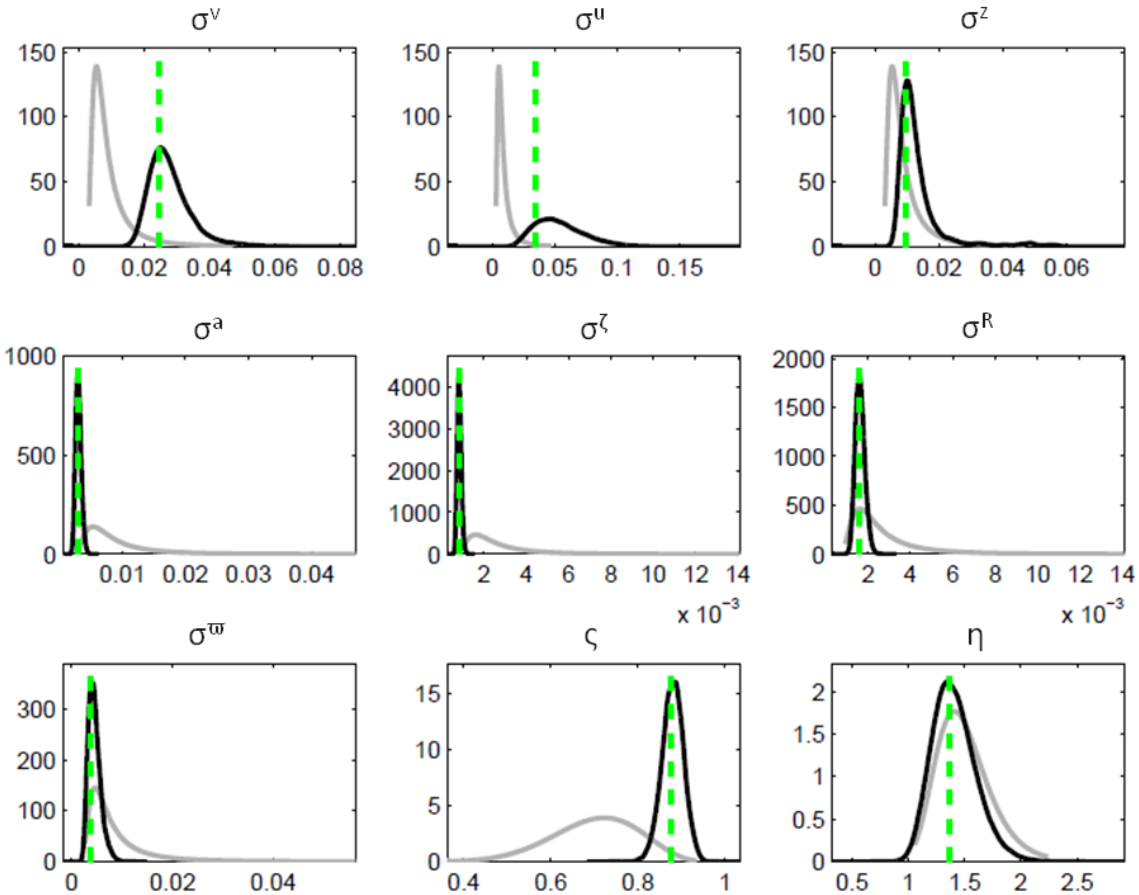
Variable	Source	Original Variable	Treatment
Investment Growth	INEGI	Gross Fixed Capital Formation, millons of pesos at 2008 prices, seasonally adjusted, quarterly	1) PC, 2) Log-Diff, 3) DM
Consumption Growth	INEGI	Private Consumption, millons of pesos at 2008 prices, seasonally adjusted, quarterly	1) PC, 2) Log-Diff, 3) DM
Government Exp.	INEGI	Government Consumption, millons of pesos at 2008 prices, seasonally adjusted, quarterly	1) PC, 2) Ln, 3) DT, DM
GDP	INEGI	GDP, millons of pesos at 2008 prices, seasonally adjusted, quarterly	1) PC, 2) Log-Diff, 3) DM
Inflation	Central Bank of Mexico	CPI General Index, monthly	1) Q.A., 2) S.A., 3) Log-Diff, 4) DM
Wage Growth	INEGI, Central Bank of Mexico, St. Louis FRED	Manufacturing industry remmuneratios in USD per hour (W), monthly. Exchange rate peso/dollar (ER), monthly. CPI General Index (π), monthly	1) W*ER/π, 2) Q.A., 3) S.A., 4) Log-Diff, 5) DM
Commodity Prod.	INEGI	Liquid Hydrocarbons Production, Raw Oil, thousand barrels per day, monthly	1) Q.A., 2) Ln, 3) DT, DM
Commodity Rel. Price	St. Louis FRED	Crude Oil Prices: West Texas Intermediate (WTI) - Cushing, Oklahoma, dollars per barrel, monthly	1)Q.A., 2) Deflated by π^*, 3) Ln, 4) DM
Monetary Policy Rate	Central Bank of Mexico	Interbank Equilibrium Interest Rate (TIIE), at 91 days, annual rate, monthly	1) Q.A., 2) Q.R., 3) Ln, 4) DM
Country Premium	Central Bank of Peru	Spread - EMBIG Mexico (basis points), daily	1) Q.A., 2) Q.R., 3) Ln, 4) DM
NEER Depreciation	Central Bank of Mexico	World, Currency per U.S. Dollar Index (E*), Pesos per U.S. Dollar Index (E), monthly	1) E/E*, 2) Q.A., 3) Log-Diff, 4) DM
Foreign Interest Rate	St. Louis FRED	LIBOR Rate, monthly average.	1) Q.A., 2) Q.R., 3) Ln, 4) DM
Foreign GDP	INEGI, IMF-IFS	Trading Partners real GDP (IFS), Non Oil Exports and Non Oil Imports (INEGI), quarterly	1) Trading partners real GDP growth weighted by non oil trade flow (51 countries), 2) S.A., 3) Ln, 4) DT, DM
Foreign Inflation	Central Bank of Mexico	External Price Index (111 countries), monthly	1) Q.A., 2) S.A., 3) Log-Diff, 4) DM
Population	U.S. Census Bureau	Population older than 16 years, annual.	Expressed on quarterly basis via linear expansion

Note: PC=per capita, S.A.= X12 seasonally adjusted, Q.A.= quarterly average, Q.R.= Rate expressed on quarterly basis, Ln= natural logarithm, Log-Diff= logarithmic difference between the variable and its one-period lag, DM= deviation from mean, DT= deviation from trend.

D. Estimated Parameters

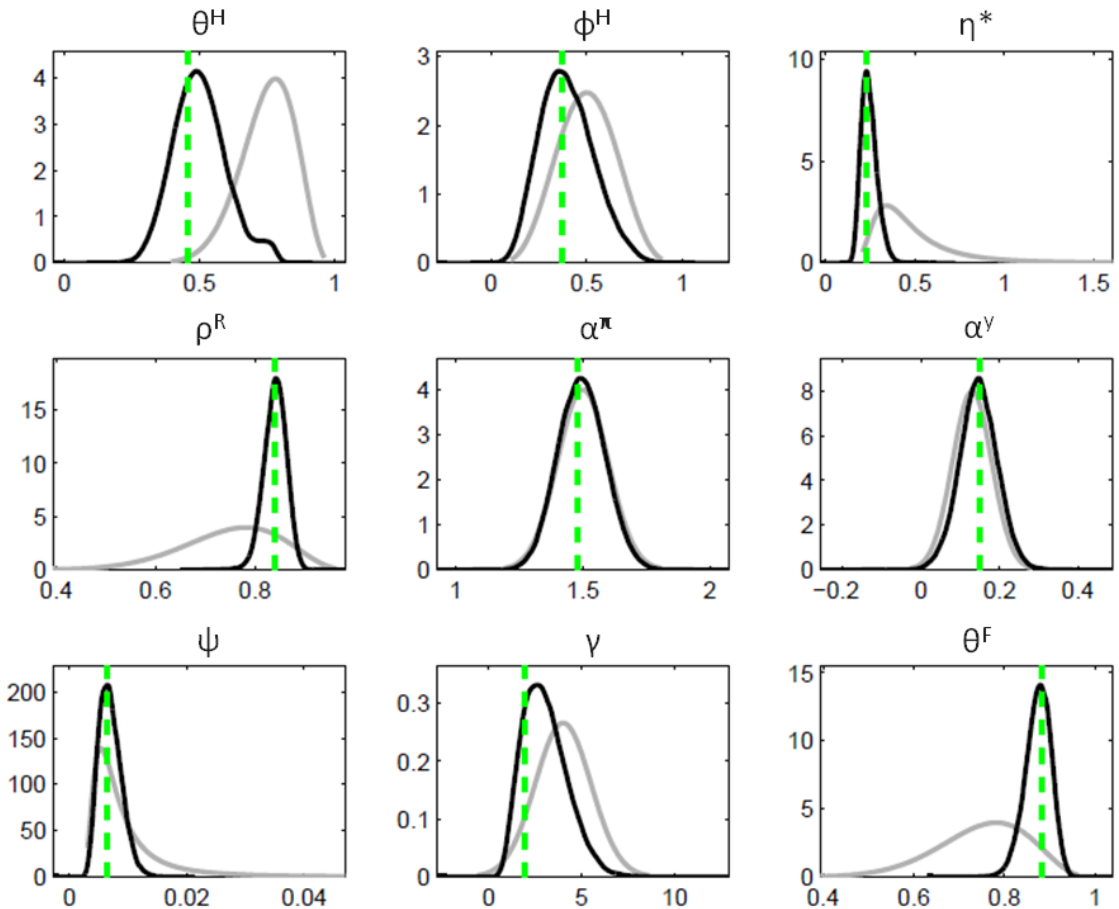
		Prior			Posterior Mean	
Parameter	**Description**	**Distribution**	**Mean**	**S.E.**	**Chile**	**Mexico**
ς	Consumption habits	beta	0.7	0.1	0.88	0.567
η	E.o.S. between x_t^H and x_t^F	inv gamma	1.5	0.25	1.405	1.307
η^*	Demand elasticity for exports	inv gamma	0.5	0.3	0.243	0.197
α^π	Inflation weight in MPR	normal	1.5	0.1	1.494	1.549
α^y	Product weight in MPR	normal	0.13	0.05	0.145	0.148
ρ^R	R_{t-1} weight in MPR	beta	0.75	0.1	0.84	0.8
ψ	Country premium elasticity	inv gamma	0.01	0.013	0.007	0.004
γ	Investment adjustment costs	normal	4	1.5	3.019	2.911
θ^H	Calvo prob. home goods	beta	0.75	0.1	0.501	0.722
ϕ^H	Indexation to π_{t-1} in home goods	beta	0.5	0.15	0.396	0.267
θ^F	Calvo prob. foreign goods	beta	0.75	0.1	0.874	0.865
ϕ^F	Indexation to π_{t-1} in foreign goods	beta	0.5	0.15	0.457	0.36
θ^W	Calvo prob. wages	beta	0.75	0.1	0.963	0.953
ϕ^W	Indexation to π_{t-1} in wages	beta	0.5	0.15	0.411	0.672
ρ^v	Auto Corr. preferences shock	beta	0.75	0.1	0.867	0.692
ρ^u	Auto Corr. investment shock	beta	0.75	0.1	0.703	0.716
ρ^z	Auto Corr. temp. tecn. shock	beta	0.75	0.1	0.762	0.568
ρ^a	Auto Corr. perm. tecn. shock	beta	0.38	0.1	0.344	0.197
ρ^ζ	Auto Corr. country premium shock	beta	0.75	0.1	0.83	0.859
ρ^ϖ	Auto Corr. UIP shock	beta	0.75	0.1	0.829	0.864
σ^v	Std. Dev. preferences shock	inv gamma	0.01	0.013	0.028	0.025
σ^u	Std. Dev. investment shock	inv gamma	0.01	0.013	0.053	0.021
σ^z	Std. Dev. temp. tecn. shock	inv gamma	0.01	0.013	0.013	0.029
σ^a	Std. Dev. perm. tecn. shock	inv gamma	0.01	0.013	0.003	0.008
σ^ζ	Std. Dev. country premium shock	inv gamma	0.003	0.004	0.001	0.001
σ^R	Std. Dev. MPR shock	inv gamma	0.003	0.004	0.002	0.002
σ^ϖ	Std. Dev. UIP shock	inv gamma	0.01	∞	0.005	0.004

E. Priors and Posteriors - Chile



Note: Horizontal and vertical axis represent the prior range distribution and the cumulative density, respectively. The grey , black and green lines indicate the prior density, posterior density, and posterior mode, respectively.

E. Priors and Posteriors - Chile



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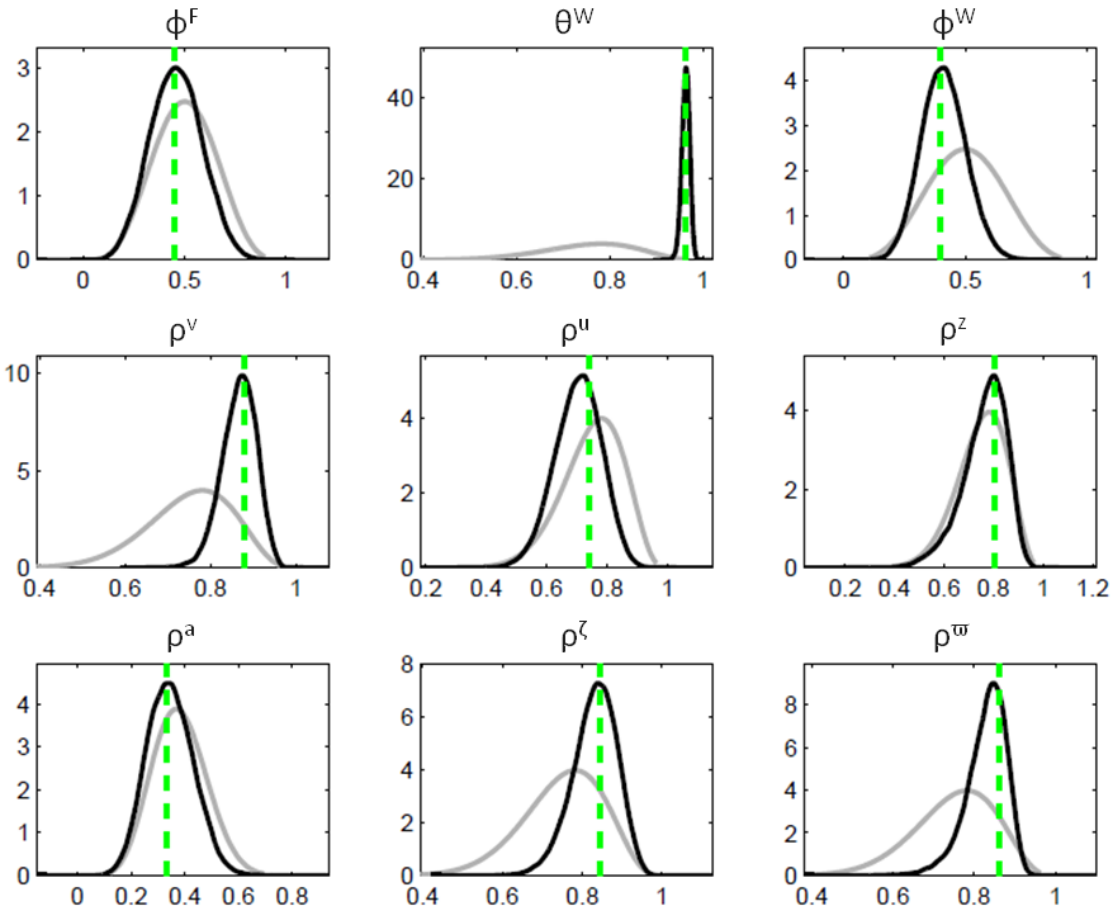
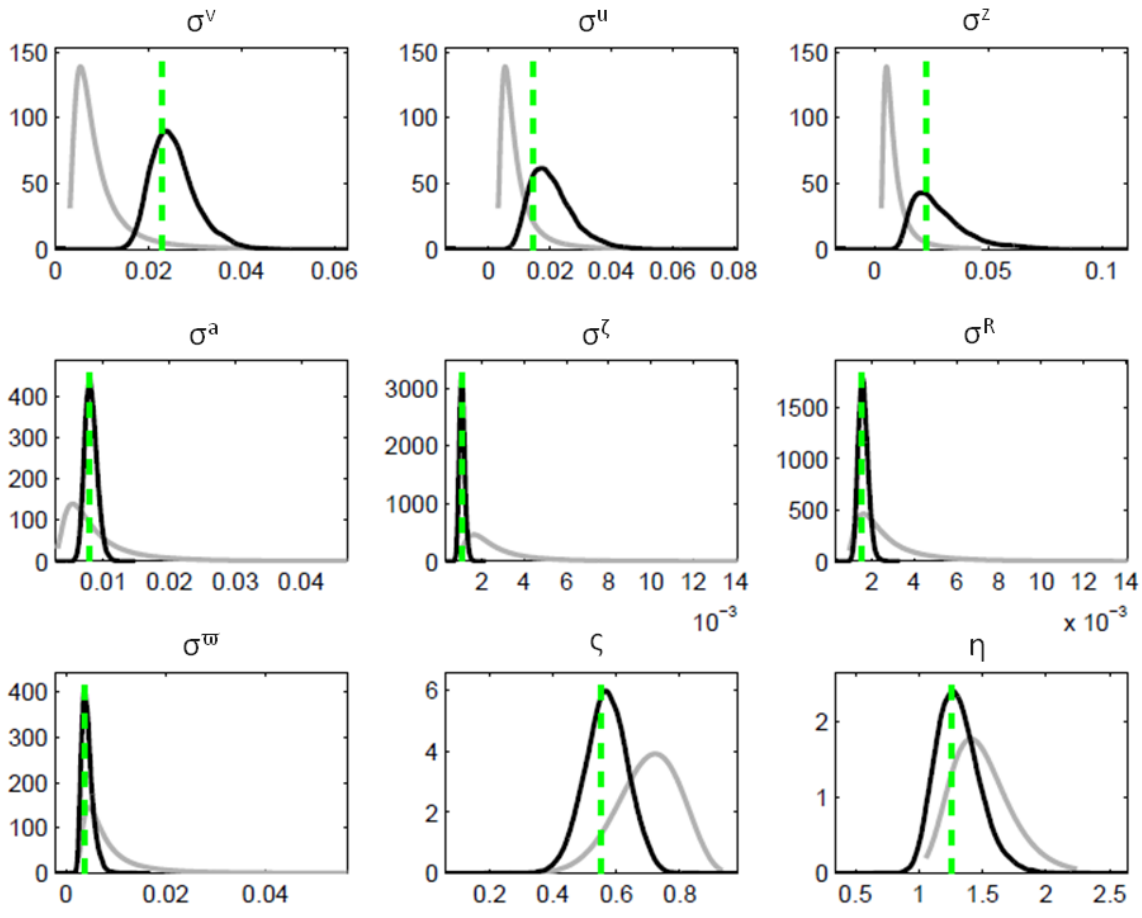
E. Priors and Posteriors - Chile



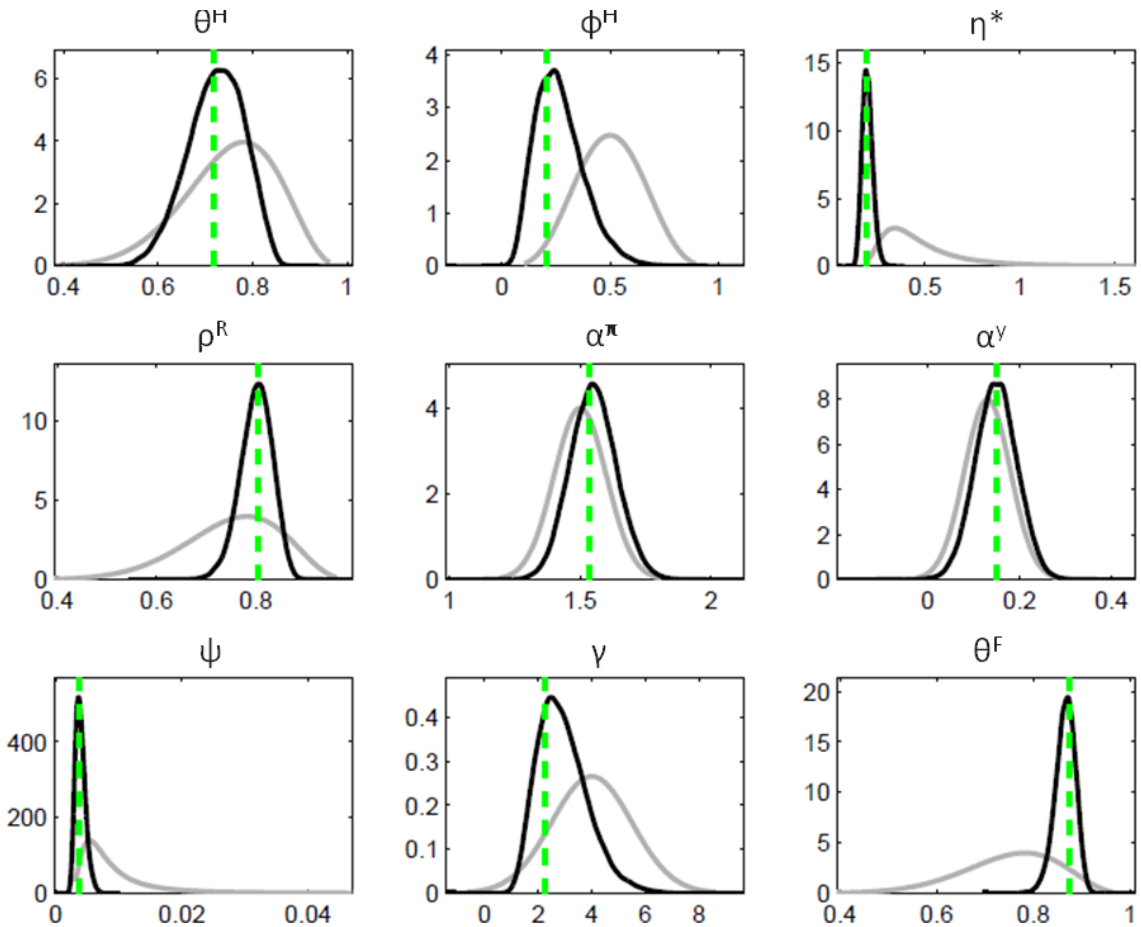
Note: Horizontal and vertical axis represent the prior range distribution and the cumulative density, respectively. The grey , black and green lines indicate the prior density, posterior density, and posterior mode, respectively.

E. Priors and Posteriors - Mexico



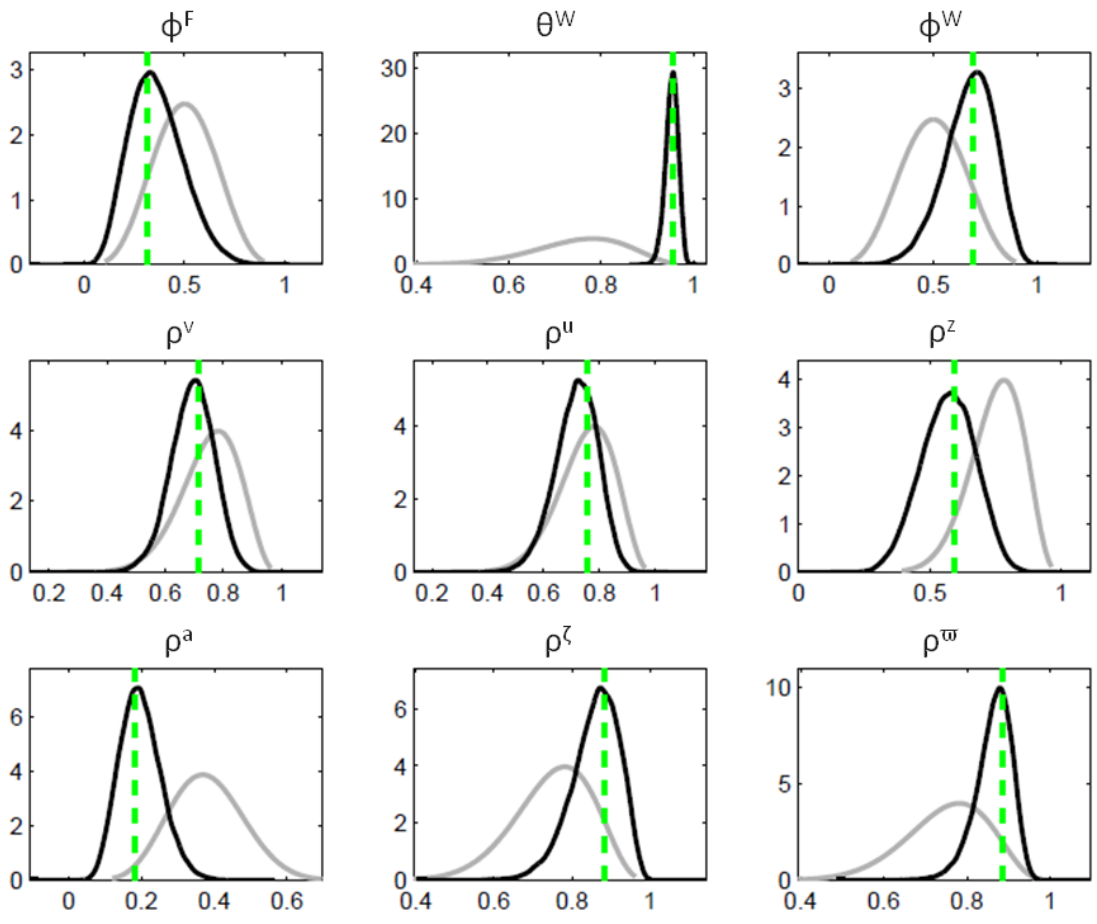
Note: Horizontal and vertical axis represent the prior range distribution and the cumulative density, respectively. The grey , black and green lines indicate the prior density, posterior density, and posterior mode, respectively.

E. Priors and Posteriors - Mexico



Note: Horizontal and vertical axis represent the prior range distribution and the cumulative density, respectively. The grey , black and green lines indicate the prior density, posterior density, and posterior mode, respectively.

E. Priors and Posteriors - Mexico



Note: Horizontal and vertical axis represent the prior range distribution and the cumulative density, respectively. The grey , black and green lines indicate the prior density, posterior density, and posterior mode, respectively.

F. Estimation Fit

Selected Second Order Moments

		Chile				Mexico			
		S.E.		Autocorr. Coeff.		S.E.		Autocorr. Coeff.	
		Model	Data	Model	Data	Model	Data	Model	Data
MPR	R	0.55	0.41	0.92	0.88	0.44	0.48	0.88	0.95
Country Premium	ξ	0.26	0.15	0.93	0.83	0.54	0.17	0.97	0.78
Inflation	π	0.69	0.70	0.67	0.57	0.55	0.33	0.62	0.08
International Rate	R^*	0.39	0.43	0.97	0.97	0.48	0.44	0.98	0.98
Foreign Inflation	π^*	1.30	1.30	0.44	0.44	0.37	0.37	0.38	0.38
Commodity Rel. P	p^{C0*}	36.43	45.44	0.93	0.95	35.37	35.14	0.88	0.88
Commodity Prod.	Y^{Co}	4.22	4.27	0.65	0.66	3.56	3.83	0.89	0.9
Foreign GDP	Y^*	1.98	1.45	0.91	0.83	1.27	1.49	0.88	0.91
Gov. Expenditure	G	1.89	1.92	0.66	0.67	1.01	0.99	0.61	0.61
NEER Depreciation	π^S	4.93	4.27	-0.04	0.15	4.51	4.37	-0.05	0.04
GDP Growth	g^Y	1.12	1.04	0.33	0.19	0.94	0.97	0.43	0.47
C Growth	g^C	0.60	0.75	0.79	0.93	1.25	1.30	0.37	0.44
I Growth	g^I	4.60	4.03	0.62	0.21	2.47	1.82	0.72	0.51
W Growth	g^G	0.61	0.6	0.39	0.31	0.89	0.99	0.18	-0.40

Note: Unconditional moments computed at the posterior mean. Standard deviations are presented as percentage points.

G. Model Dynamics

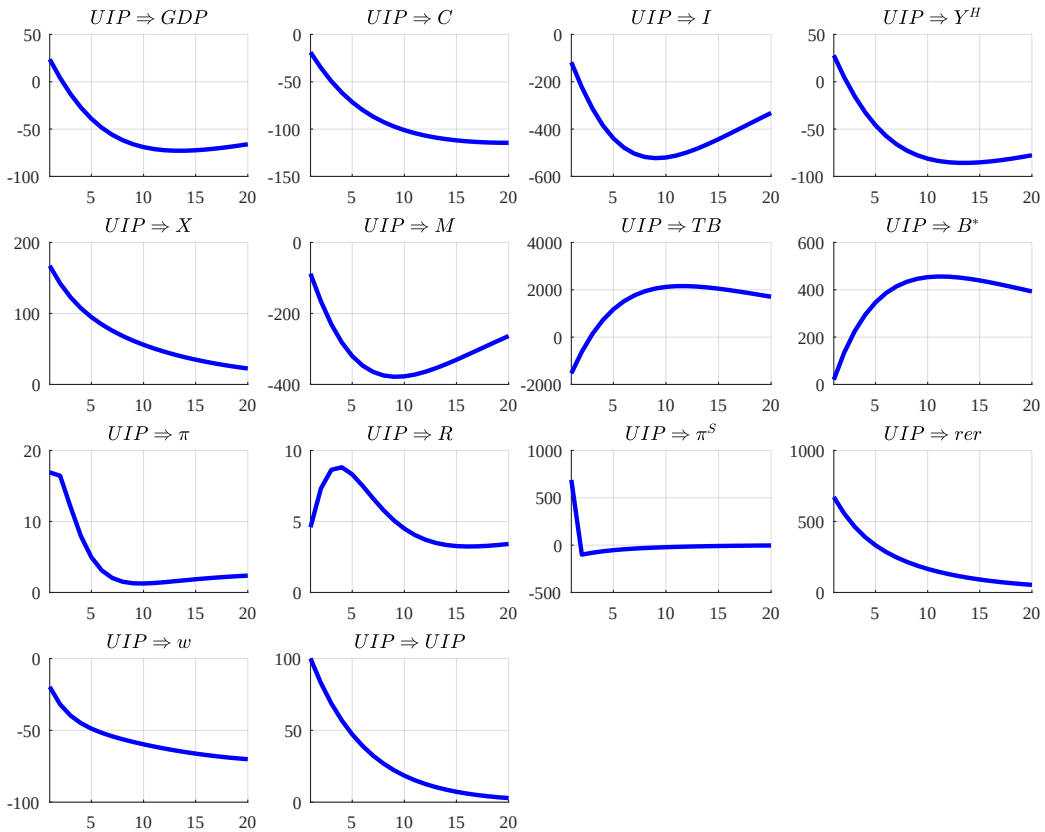
UIP shock:

- Exchange rate depreciates
  - Real exchange rate depreciates, which rises the price of both imports and exports.
  - Positive effect over GDP.
    $\longrightarrow$ Positive effect over inflation.
- Internal and external financing cost rise.
  - Negative income effect (net debt) and negative substitution effect (present consumption and investment are translated to the future), both implying negative effect over GDP.
    $\longrightarrow$ Negative effect over inflation.

The first effect dominates, hence we have a positive ERPT.

G. Model Dynamics

UIP shock - Impulse Response Function



The shock was normalized to represent a 1 p.p. deviation, and responses of the variables are expressed in percentage deviations (basis points) in relation to their steady state. Impulse-response functions shown herein correspond to the Chilean case; however, the dynamics are similar for Mexico.

G. Model Dynamics

Foreign price shock

- Incremento en los costos marginales de la industria importadora

  $\longrightarrow$ Efecto contractivo e impacto positivo sobre la inflación.

- Incremento en la demanda de exportaciones

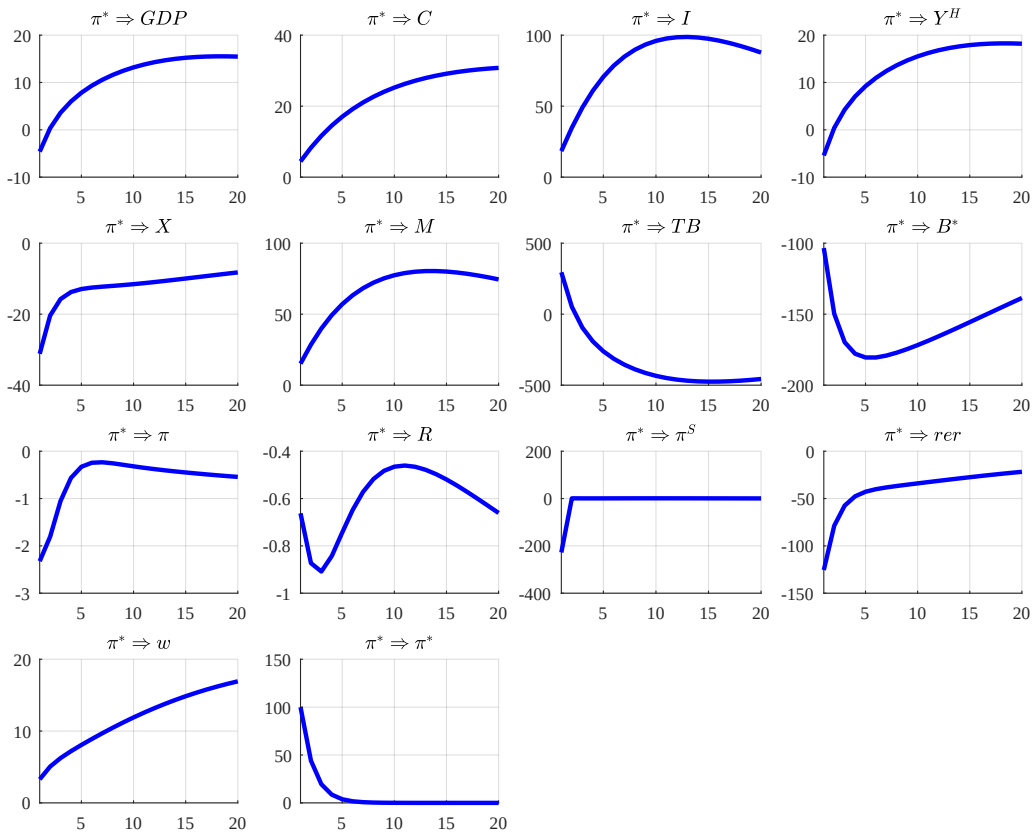
  $\longrightarrow$ Efecto expansivo e impacto positivo sobre la inflación.

- Reducción del costo de financiamiento externo y reducción del stock de deuda extranjera.
  - Reducción en el *country premium* y apreciación nominal
    $\widehat{R_t} = \widehat{R_t^*} + \widehat{\xi_t} + \mathbb{E}_t[\widehat{\pi_{t+1}^S}] + \widehat{\varpi_t}$
    $\longrightarrow$ Efecto expansivo e impacto negativo sobre la inflación.

  En conjunto, el efecto de la apreciación nominal sobre el tipo de cambio real sobrepasa el incremento en precios foráneos. Se reducen los precios y el ERPT es positivo.

G. Model Dynamics

Foreign price shock - Impuls Response Function



The shock was normalized to represent a 1 p.p. deviation, and responses of the variables are expressed in percentage deviations (basis points) in relation to their steady state. Impulse-response functions shown herein correspond to the Chilean case; however, the dynamics are similar for Mexico.

G. Model Dynamics

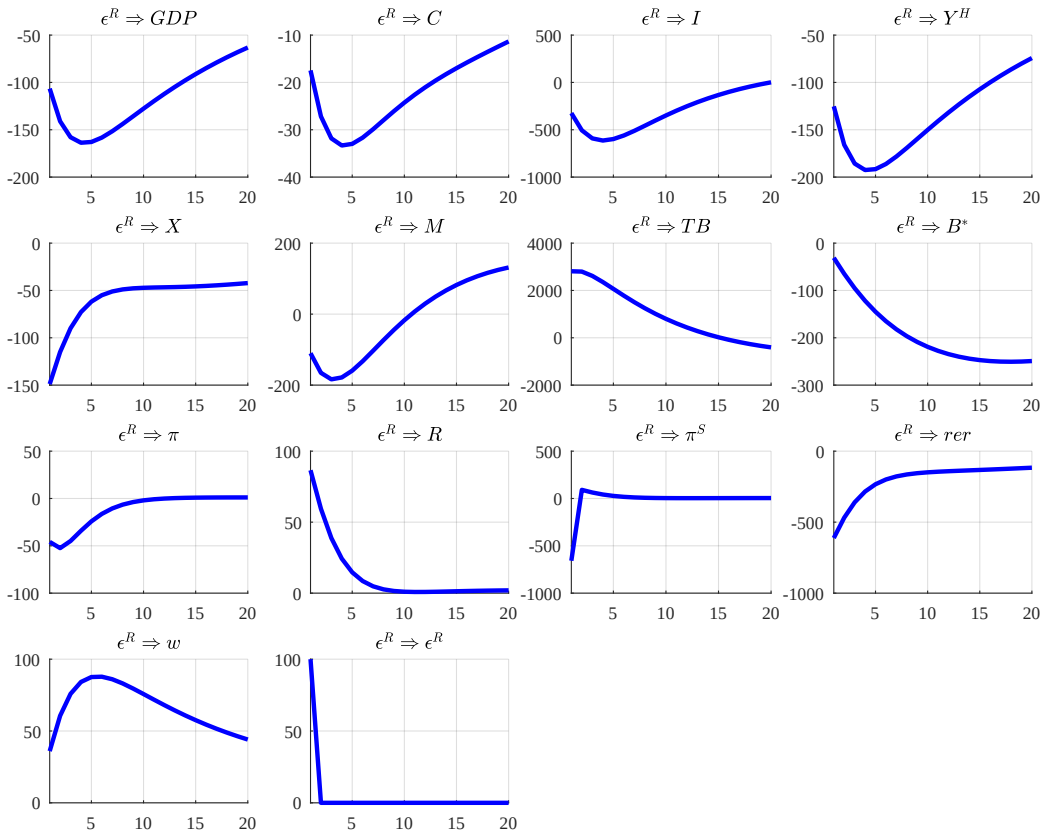
Monetary policy rate shock

- Incremento en el costo de financiamiento interno.
  - Efecto ingreso negativo y traslado de consumo e inversión hacia el futuro, ambos con efectos contractivos.
    $\longrightarrow$ Impacto negativo sobre la inflación.
- Desbalance de la UIP, lo cual implica una apreciación en el tipo de cambio nomoinal

  Tipo de cambio y precios en el mismo sentido: ERPT positivo.

G. Model Dynamics

Monetary policy rate shock - Impulse Response Function



The shock was normalized to represent a 1 p.p. deviation, and responses of the variables are expressed in percentage deviations (basis points) in relation to their steady state. Impulse-response functions shown herein correspond to the Chilean case; however, the dynamics are similar for Mexico.

G. Model Dynamics

R^* shock

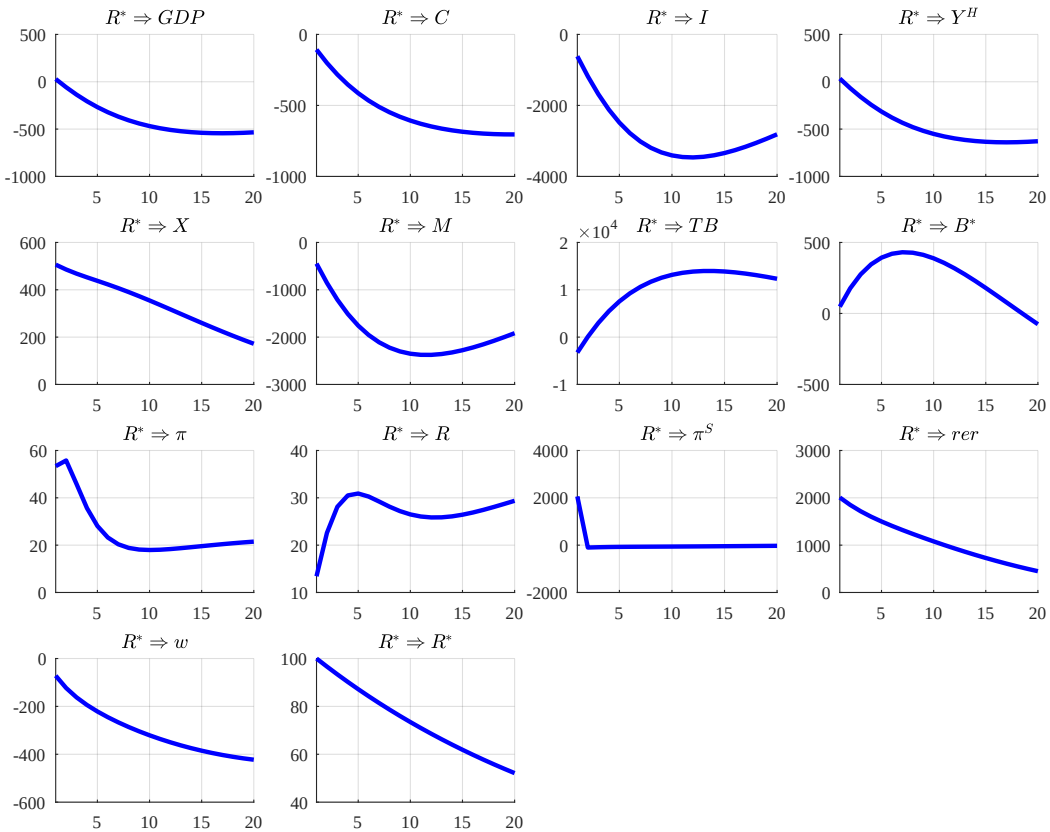
Mismos efectos cualitativos que shock a la *UIP*

- Incremento en el costo de financiamiento.
  - Efecto ingreso negativo (deudor neto) y traslado de consumo e inversión hacia el futuro, ambos con efectos contractivos.
    $\longrightarrow$ Impacto negativo sobre la inflación.
- Incremento en el tipo de cambio.
  - Incremento del tipo de cambio real, el cual impulsa el precio de las importaciones y de las exportaciones
  - Efecto expansivo sobre el producto
    $\longrightarrow$ Impacto positivo sobre la inflación.

  En conjunto, el segundo efecto prepondera sobre la dinámica de precios: ERPT positivo.

G. Model Dynamics

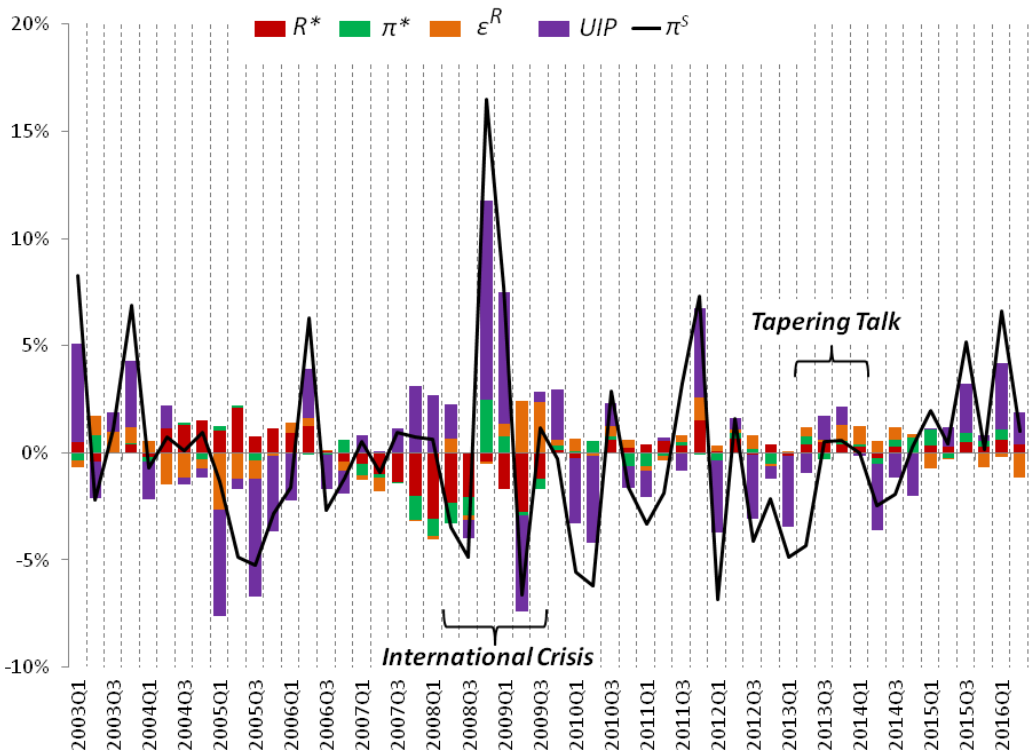
R^* shock - Impulse Response Function



The shock was normalized to represent a 1 p.p. deviation, and responses of the variables are expressed in percentage deviations (basis points) in relation to their steady state. Impulse-response functions shown herein correspond to the Chilean case; however, the dynamics are similar for Mexico.

H. ERPT over time - México

Exchange Rate Historical Variance Decomposition



Episode	**Shock**	**Estiamted ERPT**
International Crisis	π^*	$t_1 = 1\%,\ t_4 = 2\%,\ t_8 = 2\%$
Tapering Talk	ϵ^R	$t_1 = 5\%,\ t_4 = 24\%,\ t_8 = 41\%$