Protectionism and the Business Cycle

Alessandro Barattieri
UQAM, Collegio Carlo Alberto

Matteo Cacciatore
HEC Montréal, NBER

Fabio Ghironi
University of Washington
CEPR, EACBN, NBER

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Motivation

- Rising concerns about possible use of trade restrictions
- Debate about costs and benefits of trade policy as a macroeconomic policy tool
  - Boost output, rebalance external accounts, or address distributional effects of trade
  - Influential scholars argued that temporary tariffs may be beneficial in a liquidity trap, thanks to the inflationary effect of higher import costs (e.g., Eichengreen, 2016)
- We study the effects of protectionism on macroeconomic fluctuations both empirically and theoretically

Contribution

1. Estimate effects of temporary trade barriers using country-level and panel VARs
   - Quarterly/monthly data on product-level antidumping investigations (which typically lead to the imposition of tariffs)
   - Annual data on applied tariff rates
2. Transmission of tariff shocks:
   - SOE with key macro/trade ingredients: physical capital, nominal rigidities, endogenous trade structure (firm heterogeneity + sunk/fixed entry costs)
   - Baseline scenario mirrors the empirical analysis: normal times under a flexible exchange rate
   - Model counterfactuals where protectionism advocated as potentially beneficial: (i) liquidity trap and (ii) fixed exchange rate regime

Results

1. Empirical analysis: temporary trade barriers act as a negative supply shock
   - Recessionary, inflationary, with (at best) a small positive effect on the trade balance/GDP
2. Macro and micro dynamics behind the contractionary effects of tariffs
   - Macro level: expenditure switching vs. decline in real income and investment (coupled with contractionary monetary policy response)
   - Micro level: reallocation of market shares towards less efficient domestic producers
3. Protectionism remains contractionary even in a liquidity trap or under a peg

Literature

- Empirical work on the cyclicality of temporary trade barriers
  - Bown (2013) and Bown and Crowley (2013, 2014)
- Earlier theoretical literature on the macro effects of trade policy
  - Mundell's (1961), Krugman (1982), Eichengreen (1981, 1983)
- Border adjustment tax and departures from Lerner's symmetry
  - Farhi, Gopinath, and Itskhoki (2014), Barbiero, Farhi, Gopinath, and Itskhoki (2017), Costinot and Werning (2017), Erceg, Prestipino, and Raffo (2017), Lindé and Pescatori (2017)
- Dynamic consequences of trade integration (permanently lower trade costs)
  - Trefler (2005), Barattieri (2014), Cacciatore (2014) among many others

Empirical Analysis

Temporary Trade Barriers

- Low applied tariffs but frequently changing temporary trade barriers (TTBs)
  - Antidumping duties, global safeguards, and countervailing duties
- Antidumping (AD) duties are the primary policy exceptions to WTO rules
  - Account for $80\% - 90\%$ of all TTBs across countries
- Turkey and India: largest and most active users; Canada among developed SOE
  - Up to 6% of imported products affected by TTBs in Turkey ($\simeq 1\%$ of GDP)
  - 2% in Canada (0.5% of GDP; higher prior to 2001)

Global Antidumping Database

- GAD (Bown, 2016): product-level data on AD investigations and related tariffs
- Possible to build time series for AD policy actions at any time frequency

Opening of AD investigation

- Publicly announced
- Agents can forecast tariff duties

AD tariffs can be retroactive

Petition by industry producers

- Regulation: qualified support + evidence about dumped imports

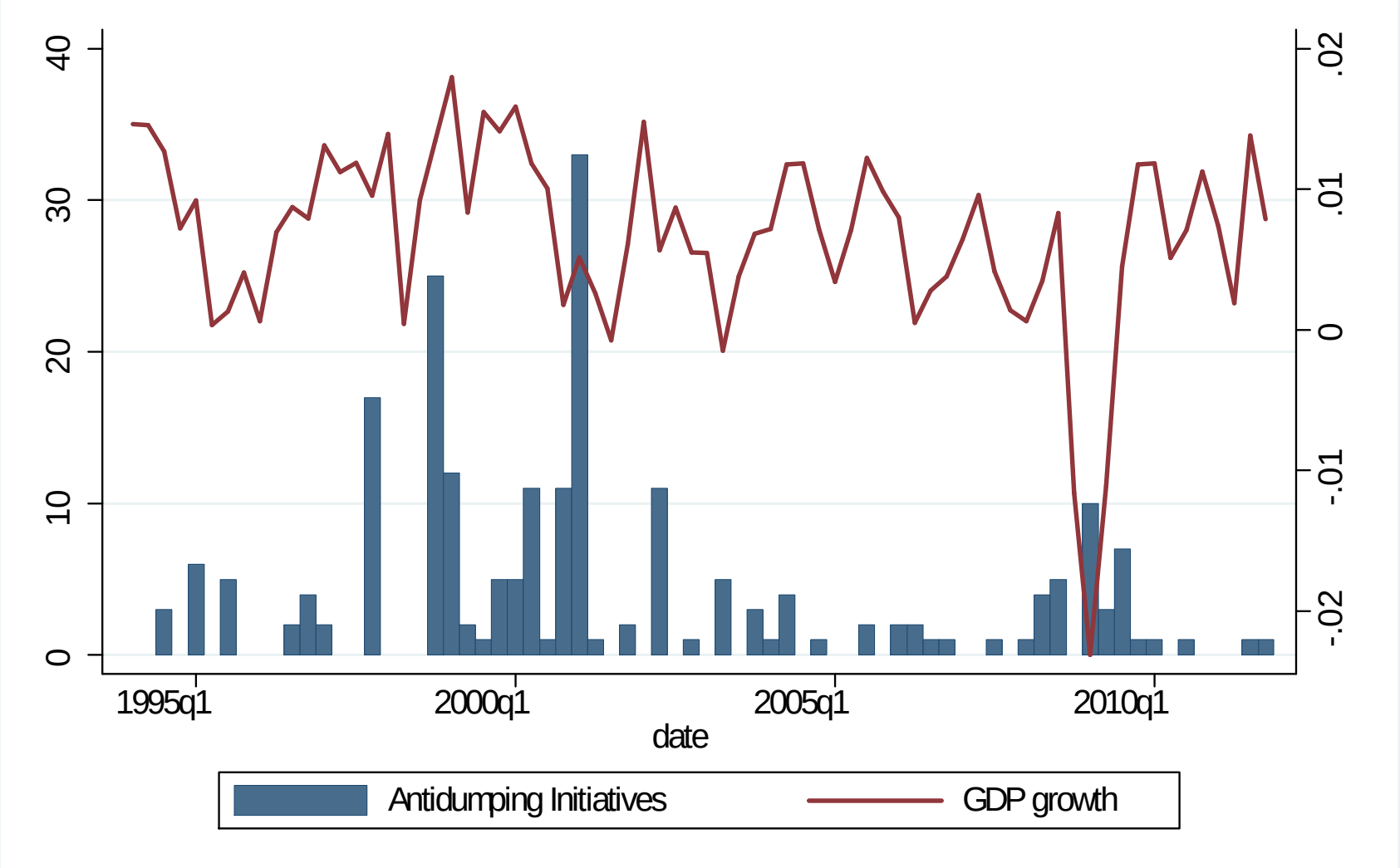
Outcome

- Large majority of investigations end up with tariffs
- Tariffs are proportional to the dumped margins
- Tariffs remain in place for several years

Empirical Strategy

- Quarterly and monthly VARs for Canada and Turkey (India for robustness)
- Baseline trade-policy measure: # of HS-6 digits products for which an AD investigation begins in a given month or quarter
- Standard macro variables:
  - **Quarterly data**: real GDP growth, inflation, and trade balance/GDP
  - **Monthly data**: also include nominal interest rate and nominal exchange rate growth (IP rather than GDP)

Data: New Antidumping Initiatives in Canada



Understanding Magnitudes

- Three peaks of AD initiatives in Canada (1997:Q4, 1999:Q3, 2001:Q1)
- Consider 2001:Q1
  - AD initiatives in the steel sector worth $\simeq 30\%$ of sectoral imports
  - Steel sector output was 1.1% of GDP (including IO linkages)
- All AD initiatives were successful
- Median imposed tariff equal to 56%

Empirical Strategy

- Structural VAR

$$Y_t = \Theta + \sum_{i=1}^{p} \Phi_i Y_{t-i} + A^{-1} u_t$$

$$E\left(u_t u_t'\right) = I_N$$

- p determined with standard information criteria

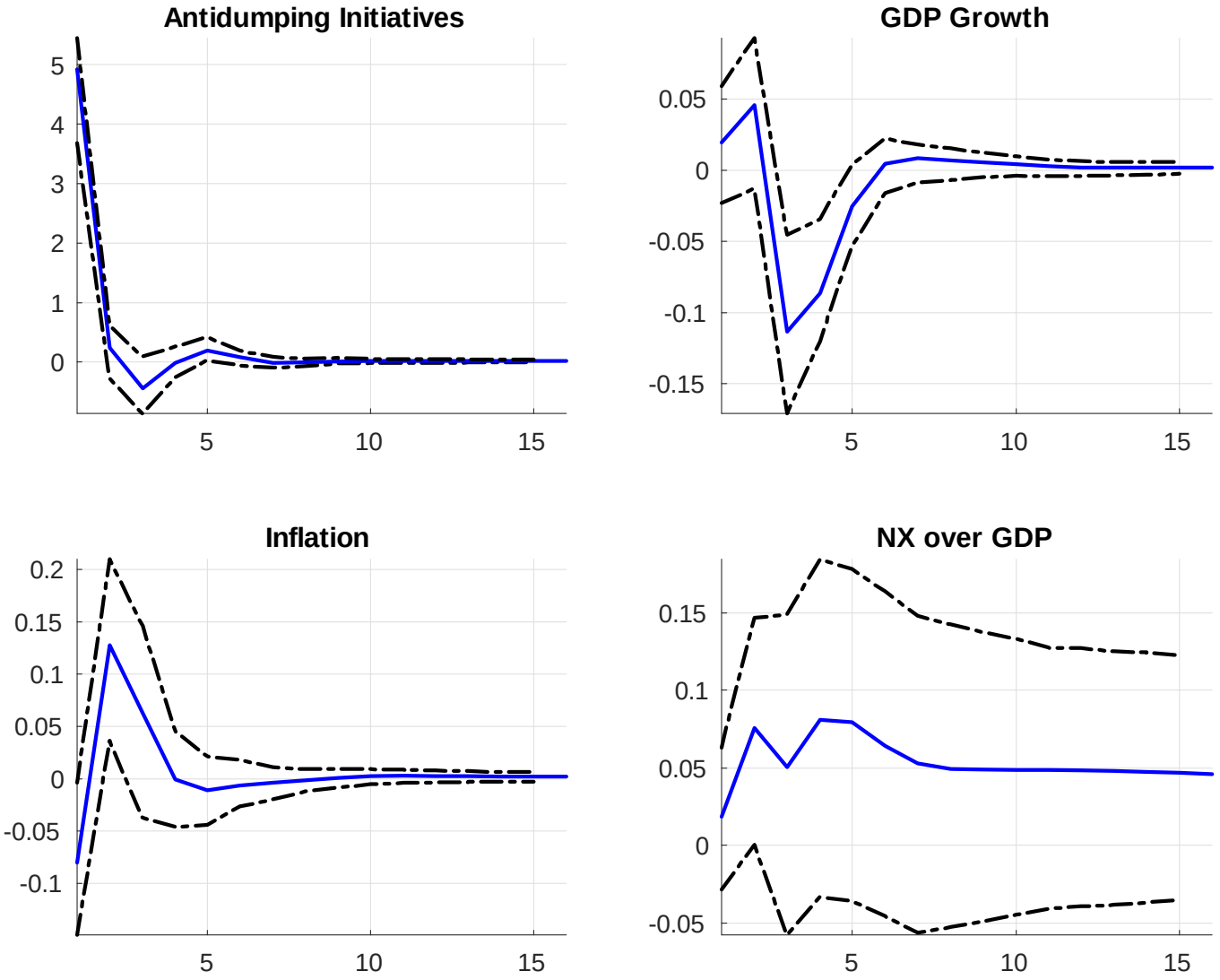
- Identification (matrix A): # of AD investigations is predetermined within a month/quarter
  - Decision lags: coordination issues among producers and regulation
  - AD investigations reflect unfair foreign competition

More on Identification

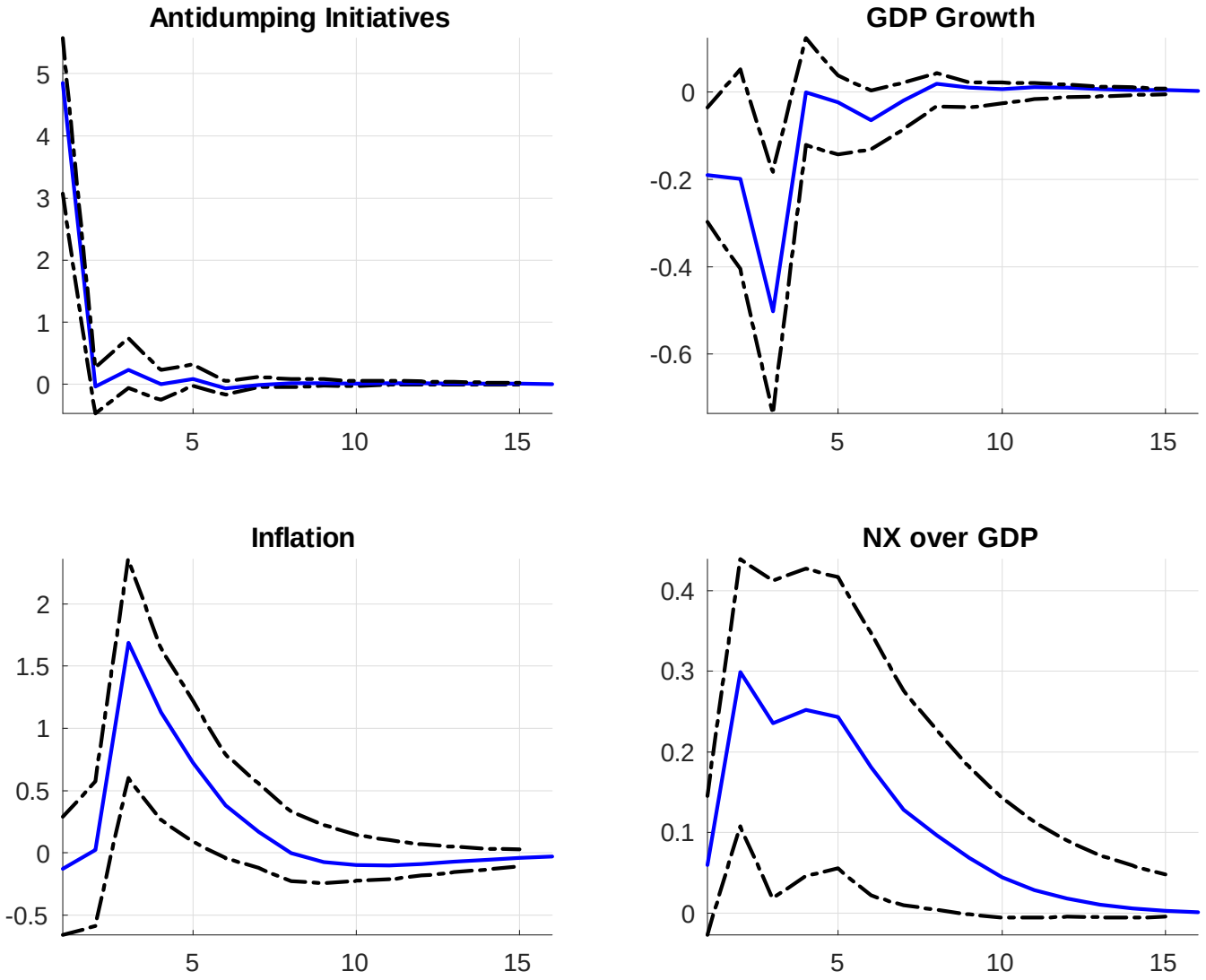
- Bown and Crowley (2013): countercyclical, lagged response of TTBs to macroeconomic shocks (up to 2008)

- Not a challenge for identification:
  1. Analysis at monthly frequencies (decision lags realistically exceed a quarter)
  2. VAR lag structure captures AD response to previous macro shocks
  3. In our samples, $corr\left(\Delta y_t, AD_t\right) \simeq 0$
  4. Reduced-form VAR: very weak covariance between trade-policy and macro shocks
  5. IRFs not consistent with demand/financial shocks (realistic drivers of business cycles in our sample period)

Quarterly VAR: Canada



Quarterly VAR: Turkey



Monthly VAR and Robustness

- Monthly estimates yield similar results
  - Monthly Canada and Monthly Turkey
- Results are also similar when considering India
- Variety of robustness checks
  - Additional controls
  - Focus only on AD investigations that end up with tariffs
  - Different recursive ordering: AD initiatives respond to all macro shocks contemporaneously

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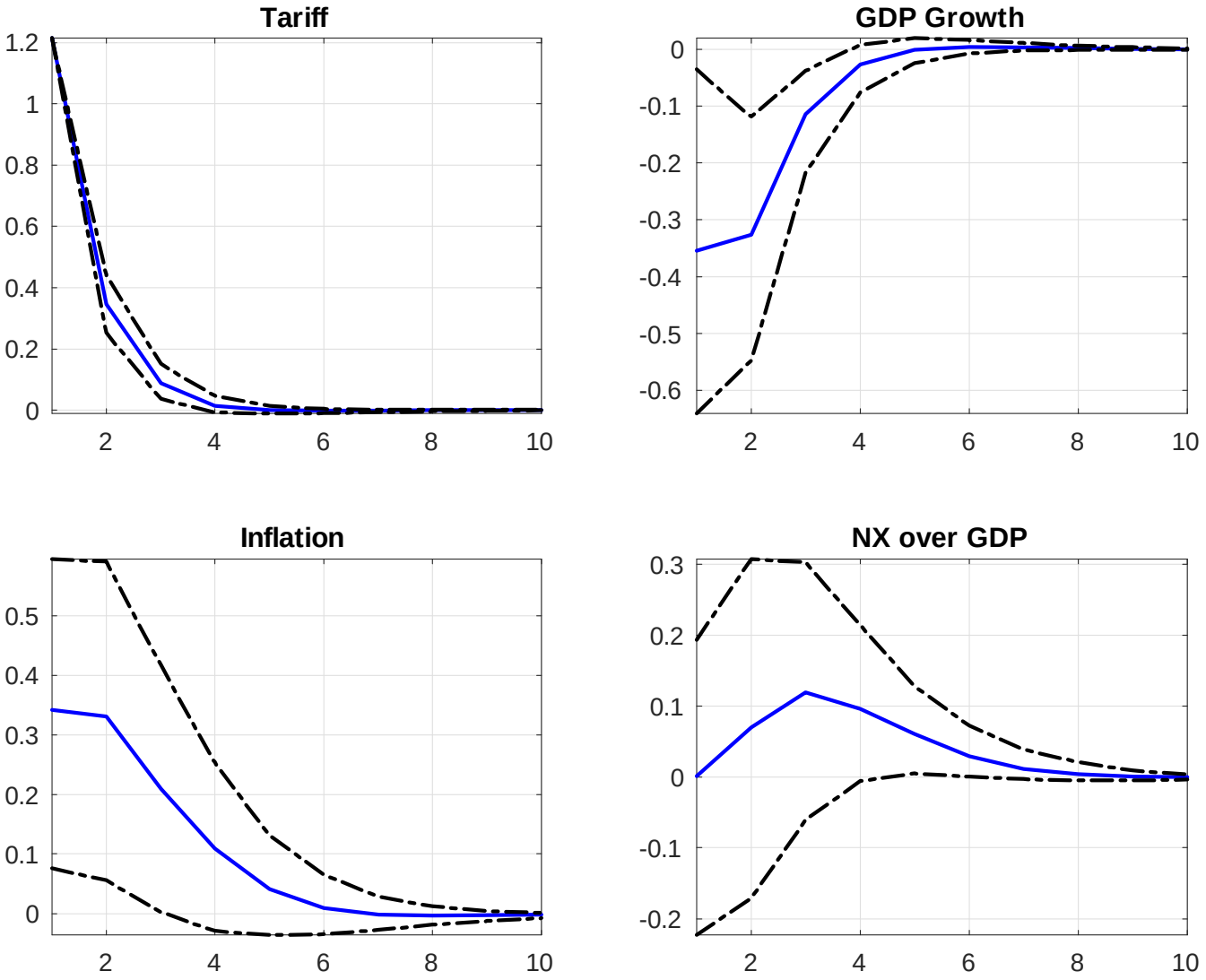
Panel VAR

- AD investigations only apply to a subset of imports
- More comprehensive trade policy measure (only available at annual frequency): import-weighted average of the applied tariff rates
- Panel VAR using harmonized data for fifteen small open economies over the period 1996-2014
  - All the countries had flexible exchange rates and did not hit the ZLB
  - Tariff Data
- Continue to assume that trade policy responds with a one-period delay to macroeconomic shocks

Panel VAR


Tariff
1.2
1
0.8
0.6
0.4
0.2
0
2
4
6
8
10
GDP Growth
0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
2
4
6
8
10
Inflation
0.5
0.4
0.3
0.2
0.1
0
2
4
6
8
10
NX over GDP
0.3
0.2
0.1
0
-0.1
-0.2
2
4
6
8
10

The Model

Key Features

- Small open economy model (two-country model in which Home is of measure zero relative to Foreign)
- Two vertically integrated production stages
  - Non-tradable intermediate input (Y_t^I) produced with capital (K_t) and labor (L_t)
  - Tradable and non-tradable final consumption sectors (use Y_t^I)
- Firm heterogeneity and endogenous producer entry in the tradable sector (Ghironi and Melitz, 2005)
- Trade policy captured by an ad-valorem import tariff
- Incomplete international asset markets and nominal rigidities

Preferences

- Household $h \in [0,1]$, maximizes

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t(h)^{1-\gamma}}{1-\gamma} - \frac{L_t(h)^{1+\omega}}{1+\omega} \right]$$

$$C_t = \left[(1-\alpha_N)^{\frac{1}{\phi_N}} \left(C_t^T\right)^{\frac{\phi_N - 1}{\phi_N}} + \alpha_N^{\frac{1}{\phi_N}} \left(C_t^N\right)^{\frac{\phi_N - 1}{\phi_N}} \right]^{\frac{\phi_N}{\phi_N - 1}}$$

$$C_t^T = \left[(1-\alpha_X)^{\frac{1}{\phi_T}} \left(C_{D,t}^T\right)^{\frac{\phi_T - 1}{\phi_T}} + \alpha_X^{\frac{1}{\phi_T}} \left(C_{X,t}^{T^*}\right)^{\frac{\phi_T - 1}{\phi_T}} \right]^{\frac{\phi_T}{\phi_T - 1}}$$

- Number of tradable varieties is endogenous

$$C_{D,t}^T = \left[\int_{\omega \in \Omega} \left(C_{D,t}^T(\omega)\right)^{\frac{\theta_T - 1}{\theta_T}} d\omega \right]^{\frac{\theta_T}{\theta_T - 1}} \text{ and } C_{X,t}^{T^*} = \left[\int_{\omega \in \Omega^*} \left[C_{X,t}^{T^*}(\omega)\right]^{\frac{\theta_T - 1}{\theta_T}} d\omega \right]^{\frac{\theta_T}{\theta_T - 1}}$$

- Ad-valorem import tariff

$$P_{X,t}^{T^*} = \left\{ \int_{\omega \in \Omega_t} \left[\left(1 + \tau_t^{IM}\right) P_{X,t}^{T^*}(\omega) \right]^{1-\theta_T} d\omega \right\}^{1/(1-\theta_T)}$$

Intermediate Input Producers

- Homogenous intermediate input:

$$Y_t^I = Z_t K_t^{\alpha} L_t^{1-\alpha}$$

- L_t is a composite of differentiated labor inputs supplied by households:

$$L_t \equiv \left[\int_0^1 \left(L_t \left(h \right) \right)^{(\eta-1)/\eta} dh \right]^{\eta/(\eta-1)}$$

where $L_t \left(h \right) \equiv$ labor hired from household h

- Capital rented in a competitive market

Tradable Sector

- Endogenous # of monopolistically competitive firms ($N_{D,t}$) with heterogenous productivity (z)
  - Time to build: $N_{D,t} = (1-\delta)(N_{D,t-1} + N_{E,t-1})$.
- Sunk entry cost $f_{E,t}$ and per-period fixed export cost $f_{X,t}$
- Flexible prices (we also consider price stickiness, PCP and LCP)
- Standard Melitz-type selection of tradable producers into exporting:
  - Relatively more productive firms export: $z > z_{X,t}$ to cover fixed export costs
  - Number of exporting firms: $N_{X,t} = [1 - G(z_{X,t})] N_{D,t}$
- Free entry condition determines $N_{D,t}$
- Additional Model Details

Households and Monetary Policy

- Households can invest in three assets:
  1. Non-contingent nominal bonds in Home and Foreign currency
  2. Shares in a mutual fund of domestic tradable-sector firms
  3. Physical capital accumulation
- Household sets $w_t^n(h)$ subject to a quadratic wage-adjustment cost:

$$\frac{w_t^n(h)}{P_t} = \mu_t^w(h) \frac{L_t^\omega}{C_t^{-\gamma}}$$

- Nominal interest rate follows a feedback rule

$$1 + i_{t+1} = \max\left\{1 + i^{zlb}, (1+i_t)^{\varrho_i}\left[(1+i)(1+\tilde{\pi}_{Ct})^{\varrho_\pi}\left(\tilde{Y}_{gt}\right)^{\varrho_Y}\right]^{1-\varrho_i}\right\}$$

- Calibrate the model using standard values in the literature

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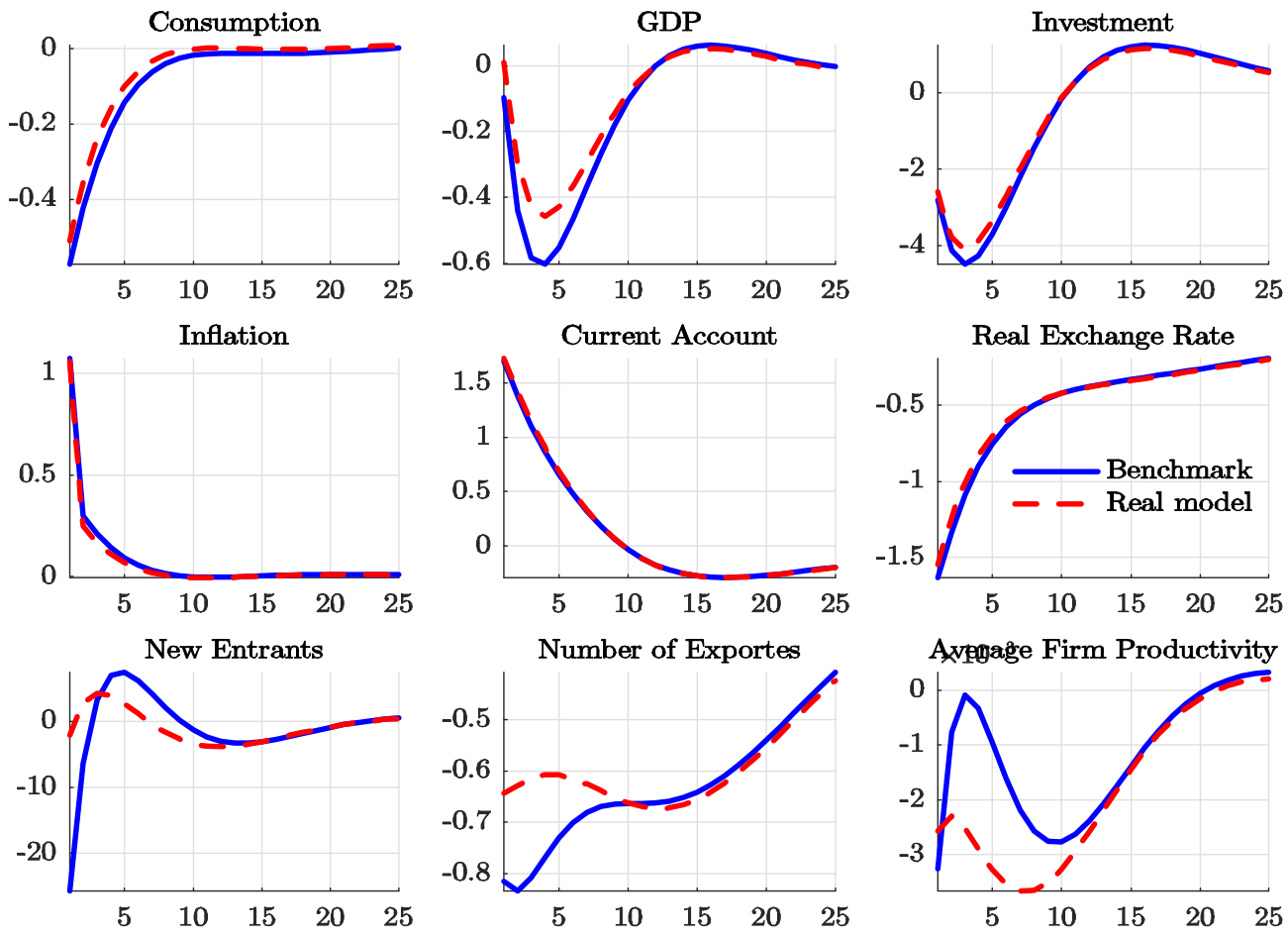
Protectionism in Normal Times

Protectionism in Normal Times

- Temporary increase in $\tau_t^{IM} = 5\%$ ($\rho_{\tau^{IM}} = 0.75$ to match panel-VAR estimates)



Micro and Macro Forces: Intuition

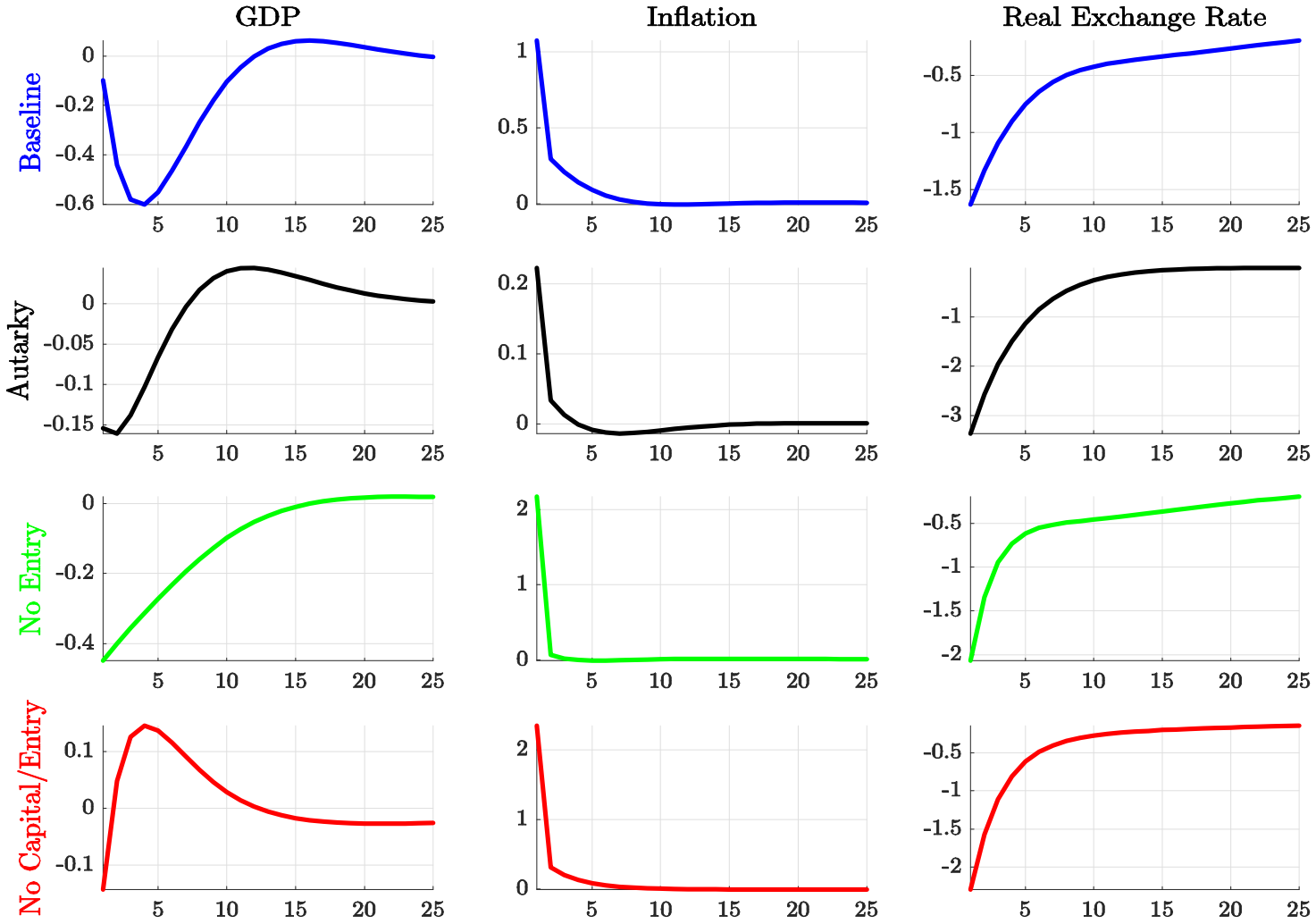
- For a given nominal exchange rate ε_t
  1. Expenditure switching toward Home goods and trade surplus
  2. P_t increases: directly through τ_t^{IM} + reallocation of market shares

$$P_t^T = \left[\omega_{D,t}^T \left(\tilde{P}_{D,t}^T \right)^{1-\phi_T} + \omega_{X,t}^{T^*} \left(\varepsilon_t \frac{\tilde{P}_D^{T^*}}{\tilde{z}_{X,t}^*} \left(1 + \tau_t^{IM} \right) \right)^{1-\phi_T} \right]^{\frac{1-\phi_N}{1-\phi_T}}$$

- ε_t appreciates but not enough to offset τ_t^{IM}
- Higher P_t:
  - Reduces real income: lower investment and decline in firm entry
  - Contractionary monetary policy response

Micro and Macro Forces

- **Alternative models**: (i) financial autarky; (ii) no firm dynamics; (iii) no capital/no firm dynamics



Counterfactual Scenarios

Counterfactual Scenarios

- Use the model to study scenarios where temporary trade barriers advocated as potentially beneficial
  1. Is protectionism expansionary when countries are in a liquidity trap (ZLB)?
  2. Can protectionism be beneficial under a fixed exchange rate?
- Same trade policy shock considered in normal times

Protectionism in a Liquidity Trap

- Evidence and theoretical analysis suggest that protectionism is inflationary
- Through this channel, τ_t^{IM} may help lift the economy out of a liquidity trap
- We perform the following exercise:

1. At $t = 0$, risk-premium shock $\Lambda_{a,t}$ depresses output and generates deflation (binding ZLB)

$$1 + \Lambda_{at} = (1 + i_{t+1}) E_t \left(\frac{\beta_{t,t+1}}{1 + \pi_{C,t+1}} \right)$$

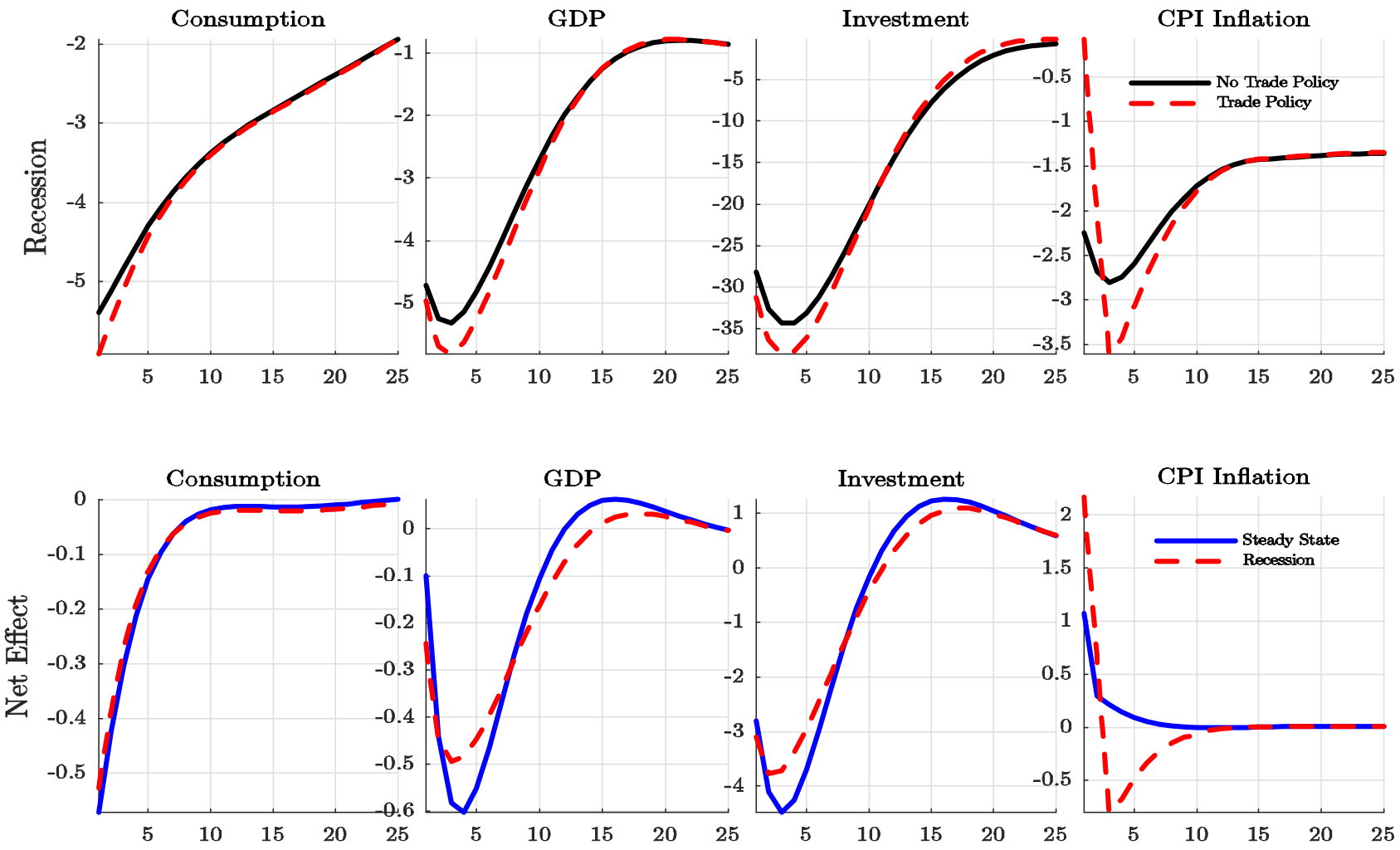
$$1 + \psi a_{*,t+1} + \Lambda_{at} = (1 + i^*_{t+1}) E_t \left(\frac{\beta_{t,t+1}}{1 + \pi^*_{C,t+1}} \frac{Q_{t+1}}{Q_t} \right)$$

   - Interpretation for Λ_{at}: shock to the demand for safe/liquid assets

2. At $t = 1$, unanticipated tariff increase

Protectionism in a Liquidity Trap

- **Temporary increase in $\tau_t^{IM} = 5\%$ at the ZLB**

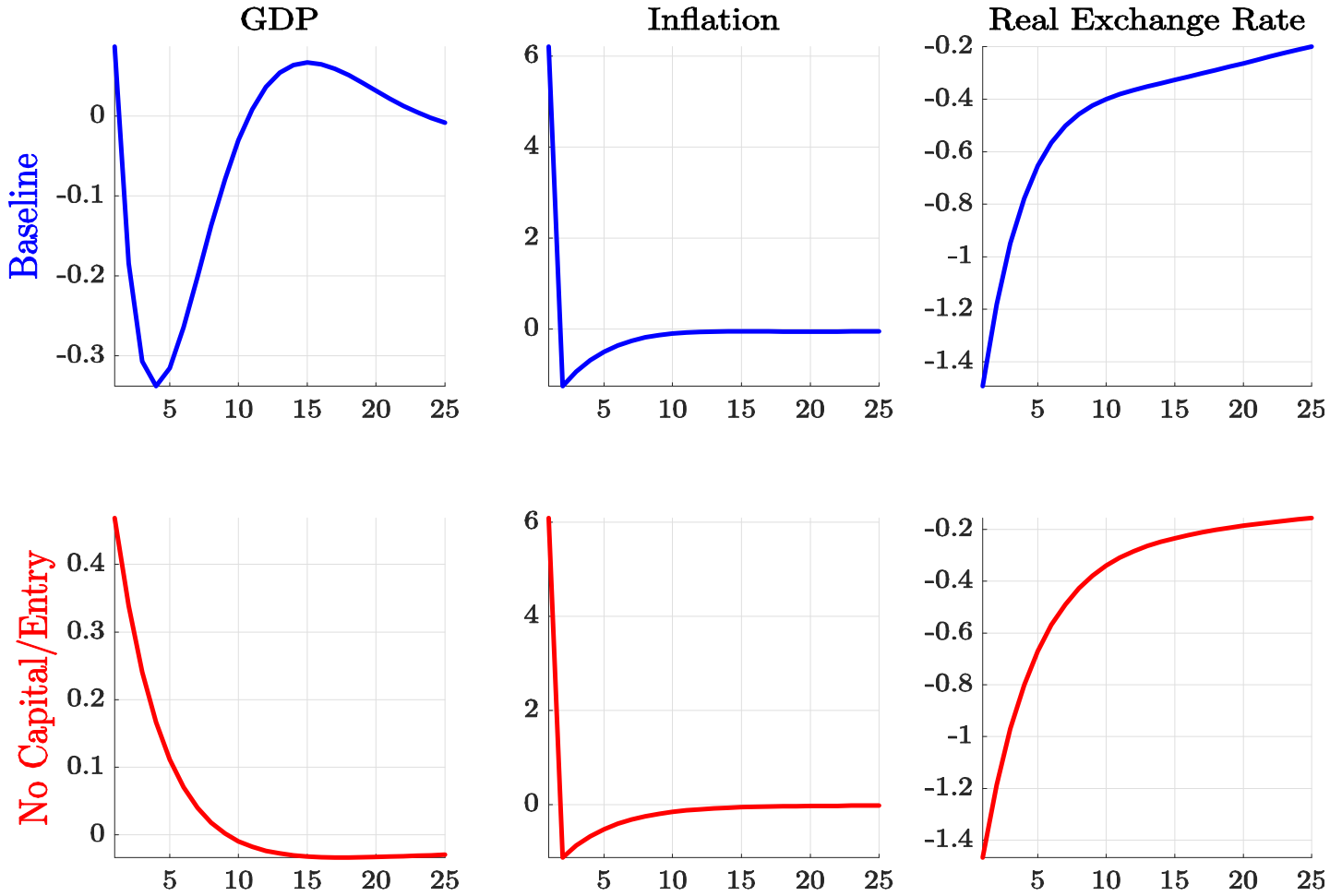


Protectionism under a Fixed Exchange Rate

- Widespread diffusion of pegs, crawling pegs, and very narrow bands (Reinhart and Rogoff, 2004)
- Recent experience of Ecuador (dollarized economy) illustrates the issue
  - Broad range of temporary tariffs in 2015-2016 to fight a balance-of-payments crisis
  - Trade balance effectively improved but real GDP further declined, together with consumption and investment
- In contrast to typical conclusion of textbook models, we find that protectionism remains contractionary under a peg

Protectionism under a Fixed Exchange Rate

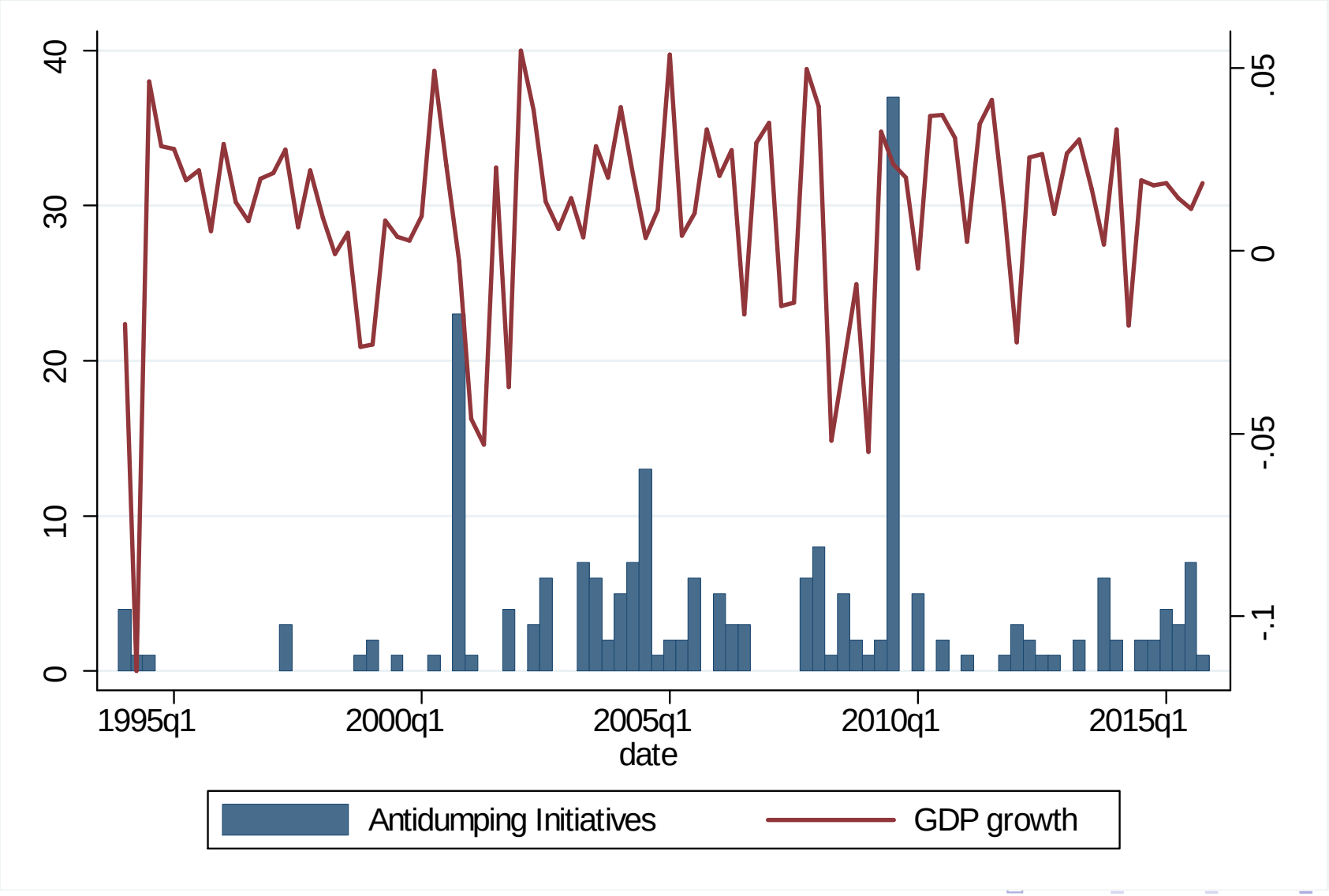
- **Baseline** vs **no capital/no firm dynamics**



Conclusions

1. Structural VARs using trade-policy and macro data at different frequency
   - Temporary trade barriers act as a negative supply shock
   - At best a small positive effect on the trade balance
2. Small-open economy model with key macro/trade ingredients reproduces VAR evidence
   - Both macro and micro dynamics behind the contractionary effects of tariffs
3. Policy takeaway: protectionism remains a bad idea—at least for small open economies
   - Even when in a liquidity trap and regardless of exchange rate arrangements
   - Detrimental economic effects even when abstracting from retaliation from trade partners

Data: Antidumping Investigations in Turkey



Monthly VAR: Canada

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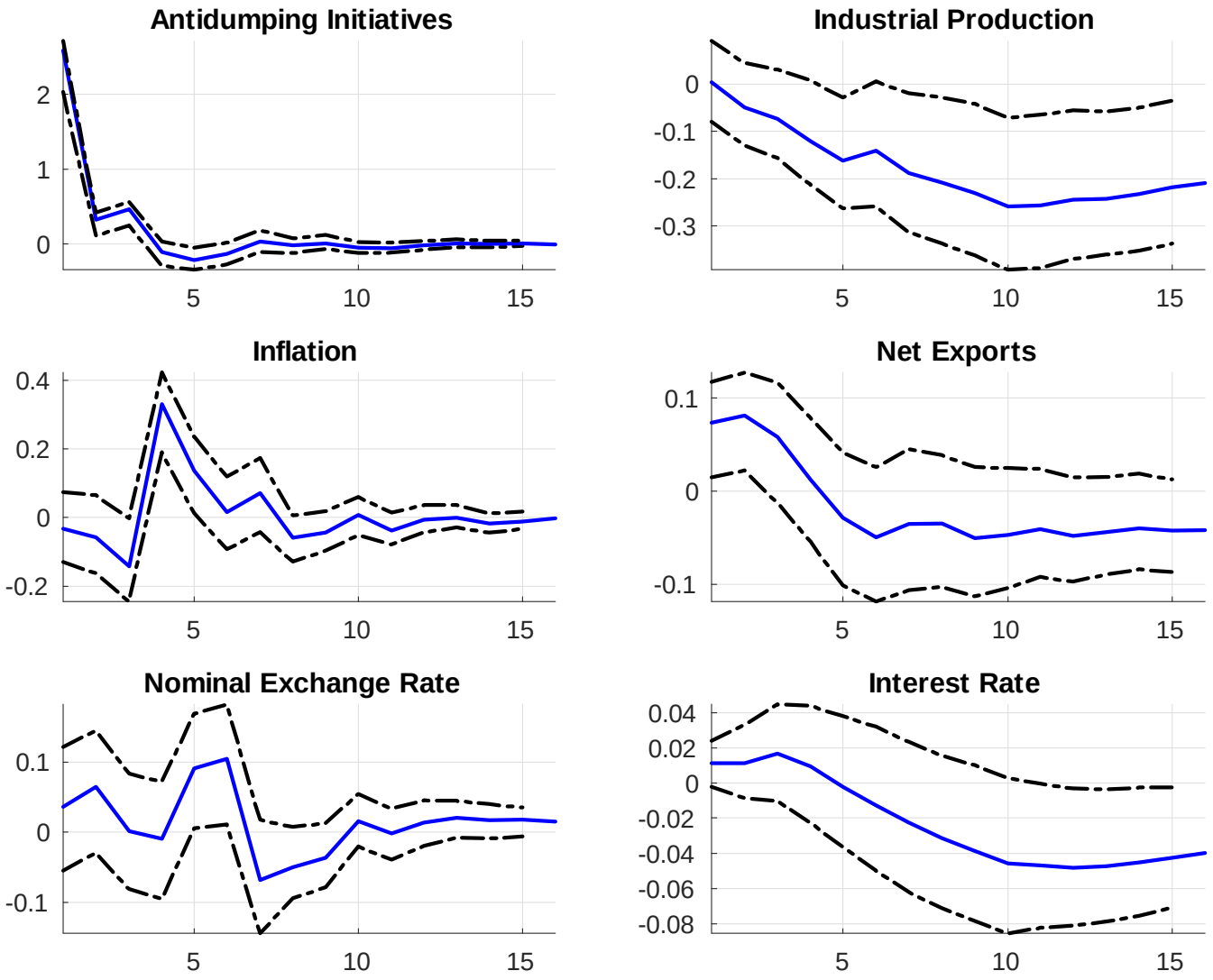

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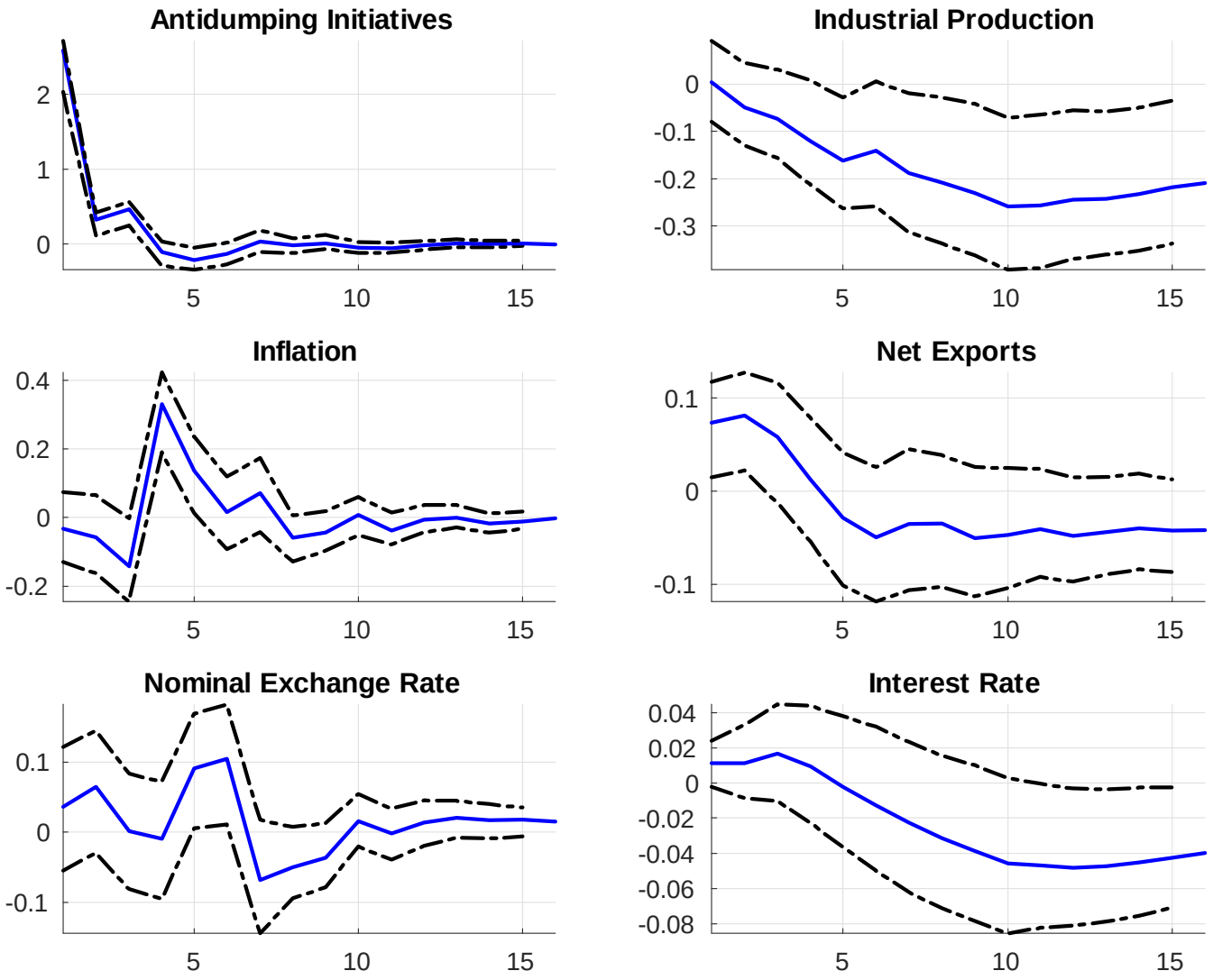

Monthly VAR: Turkey

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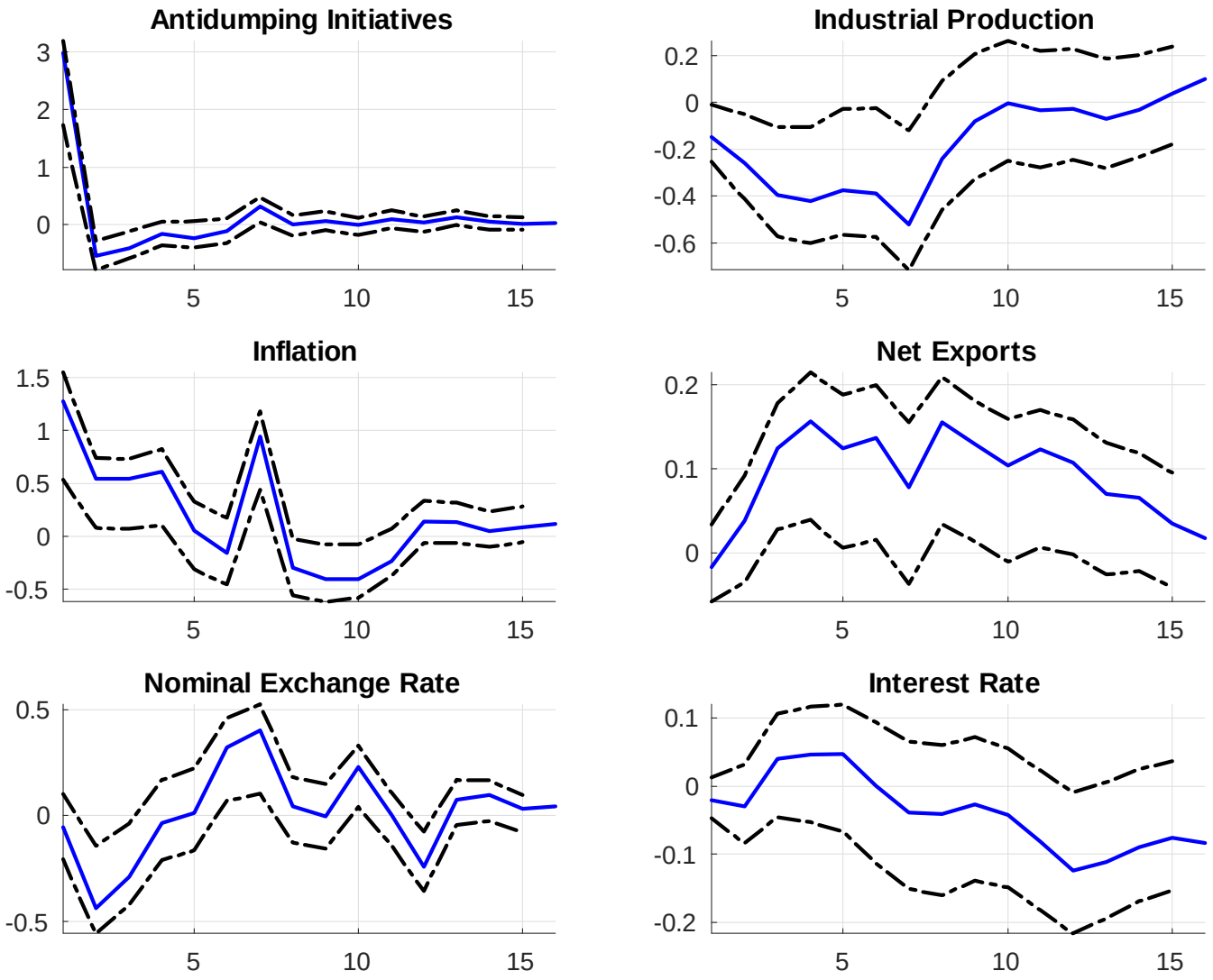

Monthly VAR: Turkey

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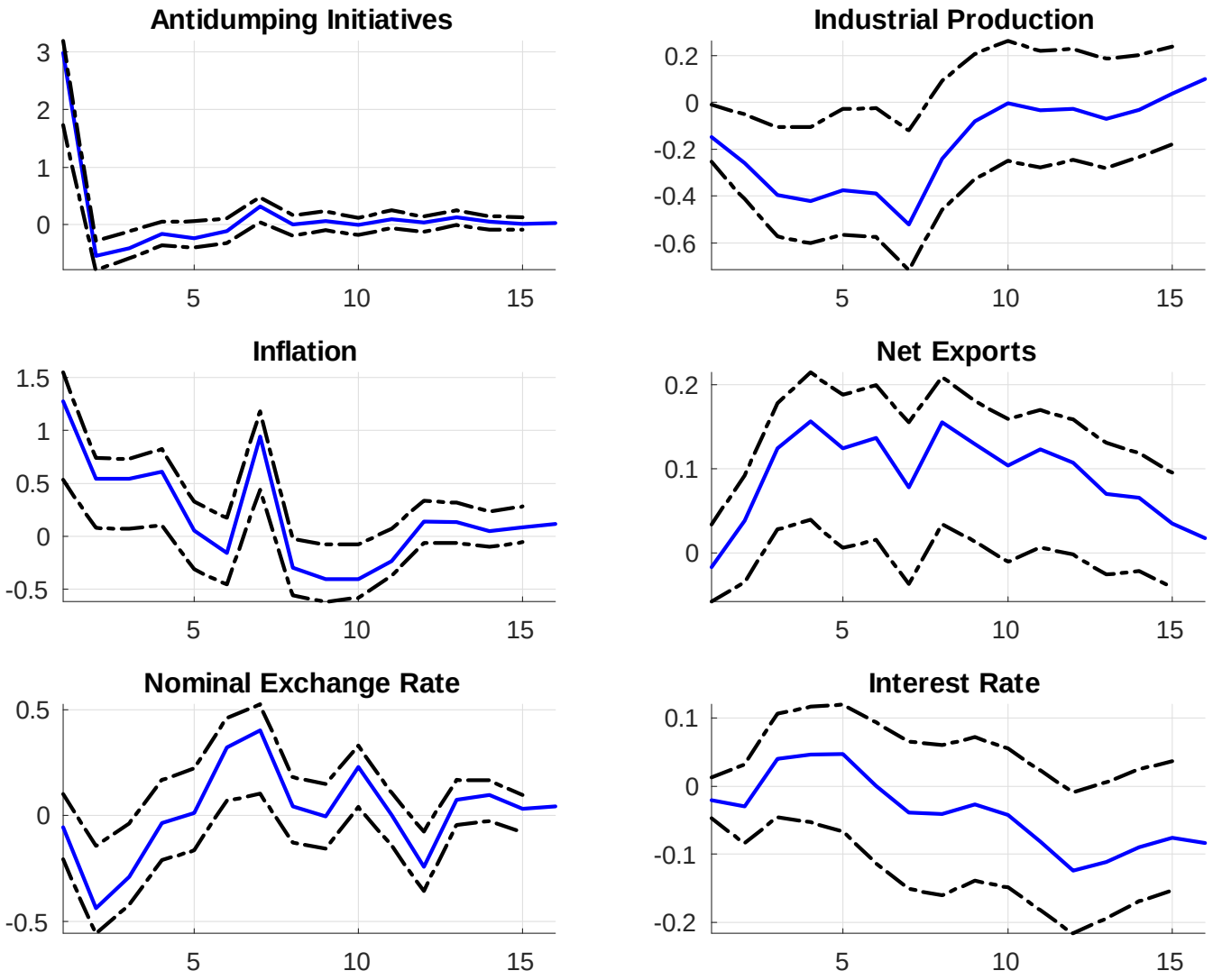

Data: Applied Tariff Rates

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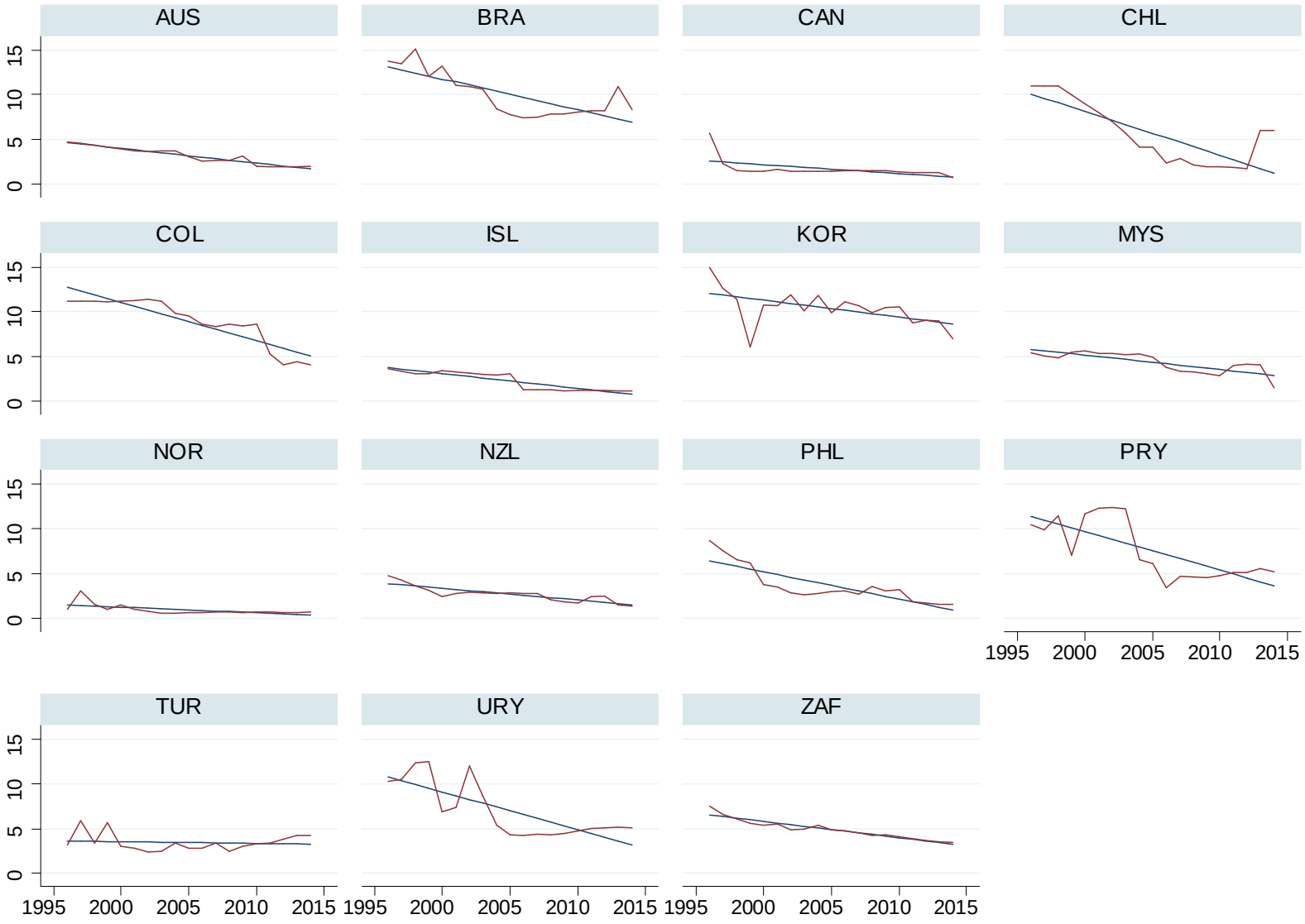

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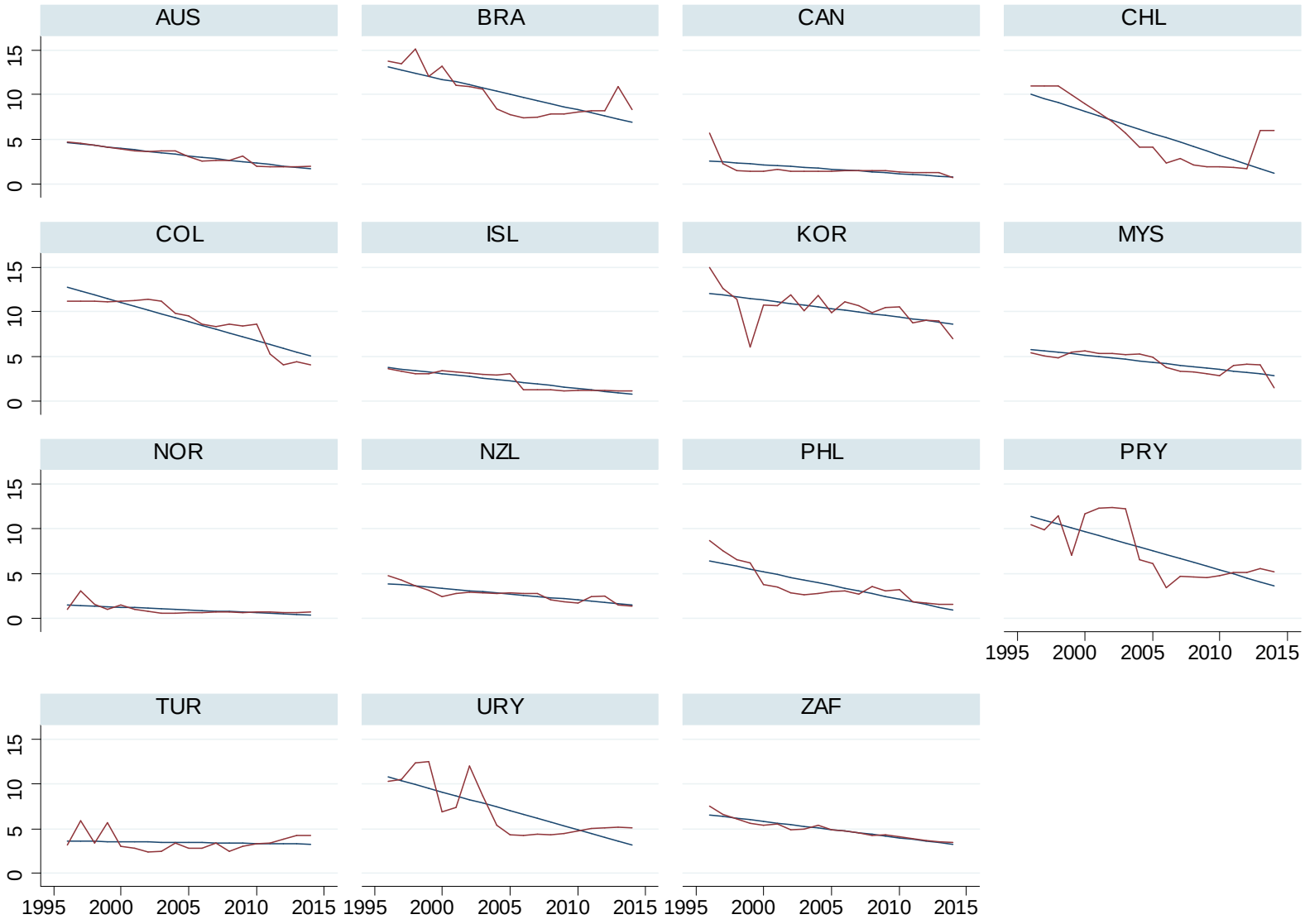
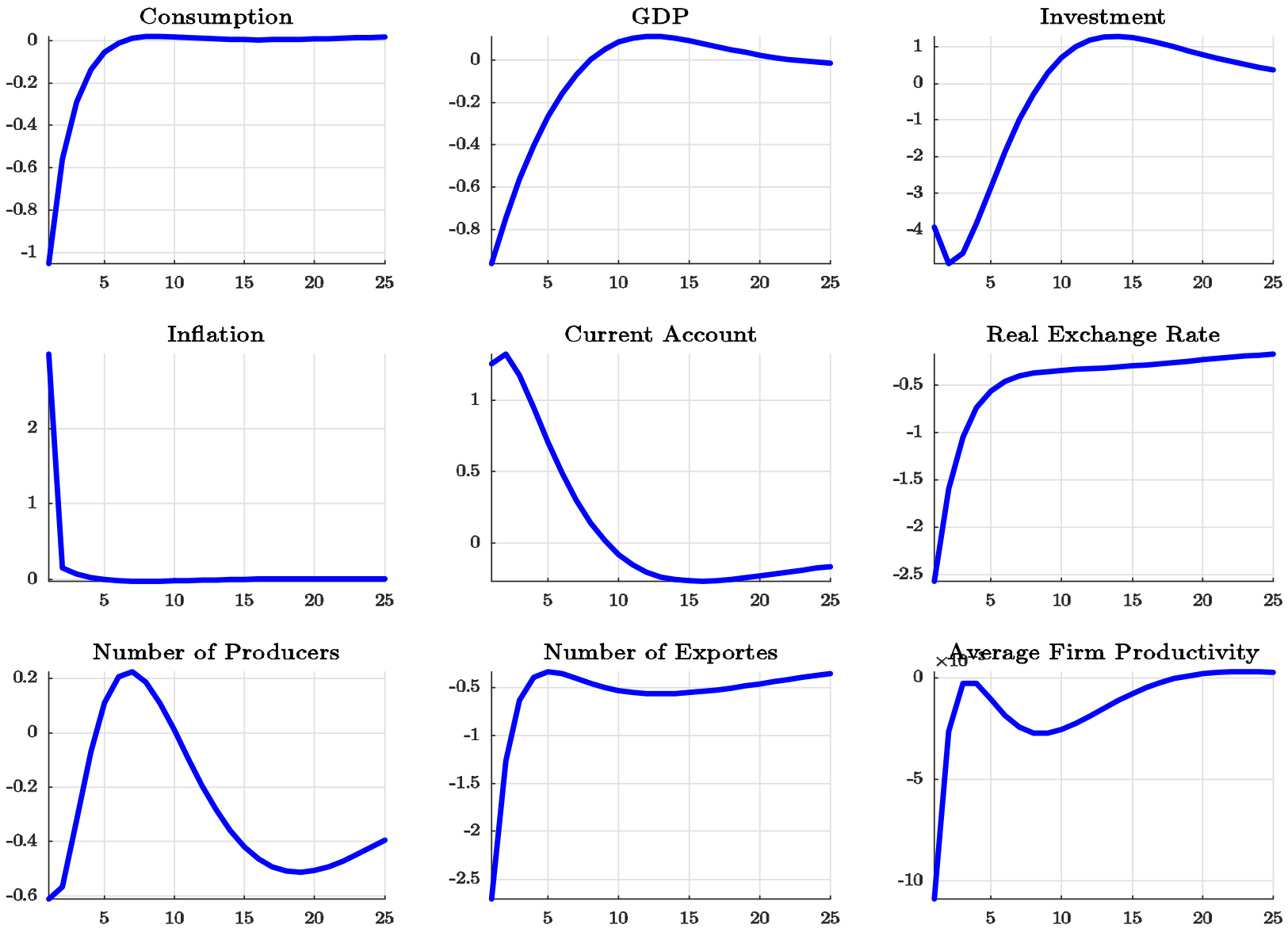


Producer Currency Pricing



Tradable Sector (cont.)

Back

- Producer z faces domestic and export demand:

$$Y_{D,t}^{T}(z) = \left(\frac{P_{D,t}^{T}(z)}{P_{D,t}^{T}}\right)^{-\theta_T} Y_{D,t}^{T}$$

$$Y_{X,t}^{T}(z) = \left[\left(1+\tau_t^{IM^*}\right)\frac{P_{X,t}^{T}(z)}{P_{X,t}^{T}}\right]^{-\theta_T} Y_{X,t}^{T^*}$$

- Prices: constant markups over marginal cost

$$\frac{P_{D,t}^{T}(z)}{P_{D,t}^{T}} = \frac{\theta_T}{(\theta_T - 1)}\frac{\varphi_t}{z} \quad \text{and} \quad \frac{P_{X,t}^{T}(z)}{P_{X,t}^{T}} = (1+\tau_t)\frac{\rho_{D,t}^{T}(z)}{Q_t}$$

- Firm exports if

$$d_{X,t}^{T}(z) \equiv \left[Q_t\rho_{X,t}^{T}(z) - (1+\tau_t)\frac{\varphi_t}{z}\right] Y_{X,t}^{T}(z) - \varphi_t f_{X,t} > 0$$

- Number of exporting firms:

$$N_{X,t} = \left[1 - G\left(z_{X,t}\right)\right] N_{D,t},$$

$$z_{X,t} = \inf\{z : d_{X,t}^{T}(z) > 0\}$$

Back

Tradable Sector (cont.)

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Back

Household's Budget Constraint

Back

- The representative Home household's period budget constraint is:

$$A_{t+1}(h) + \varepsilon_t A_{*,t+1}(h) + \frac{\psi}{2}\varepsilon_t P_t^* \left(\frac{A_{*,t+1}(h)}{P_t^*}\right)^2 + P_t C_t(h) + P_t I_{K,t}(h) + \tilde{e}_t (N_{D,t} + N_{E,t}) x_{t+1}(h) =$$

$$(1+i_t)A_t(h) + (1+i_t^*)A_{*,t}(h)\varepsilon_t + \left[1 - \frac{\nu_w}{2}\left(\frac{w_t^n(h)}{w_{t-1}^n(h)} - 1\right)^2\right] w_t^n(h) L_t(h) +$$

$$+ P_t r_{K,t} K_t(h) + (\tilde{d}_t^T + \tilde{e}_t) N_{D,t} x_t(h) + T_t(h),$$

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$$(1+i_t)A_t(h) + (1+i_t^*)A_{*,t}(h)\varepsilon_t + \left[1 - \frac{\nu_w}{2}\left(\frac{w_t^n(h)}{w_{t-1}^n(h)} - 1\right)^2\right] w_t^n(h) L_t(h) +$$

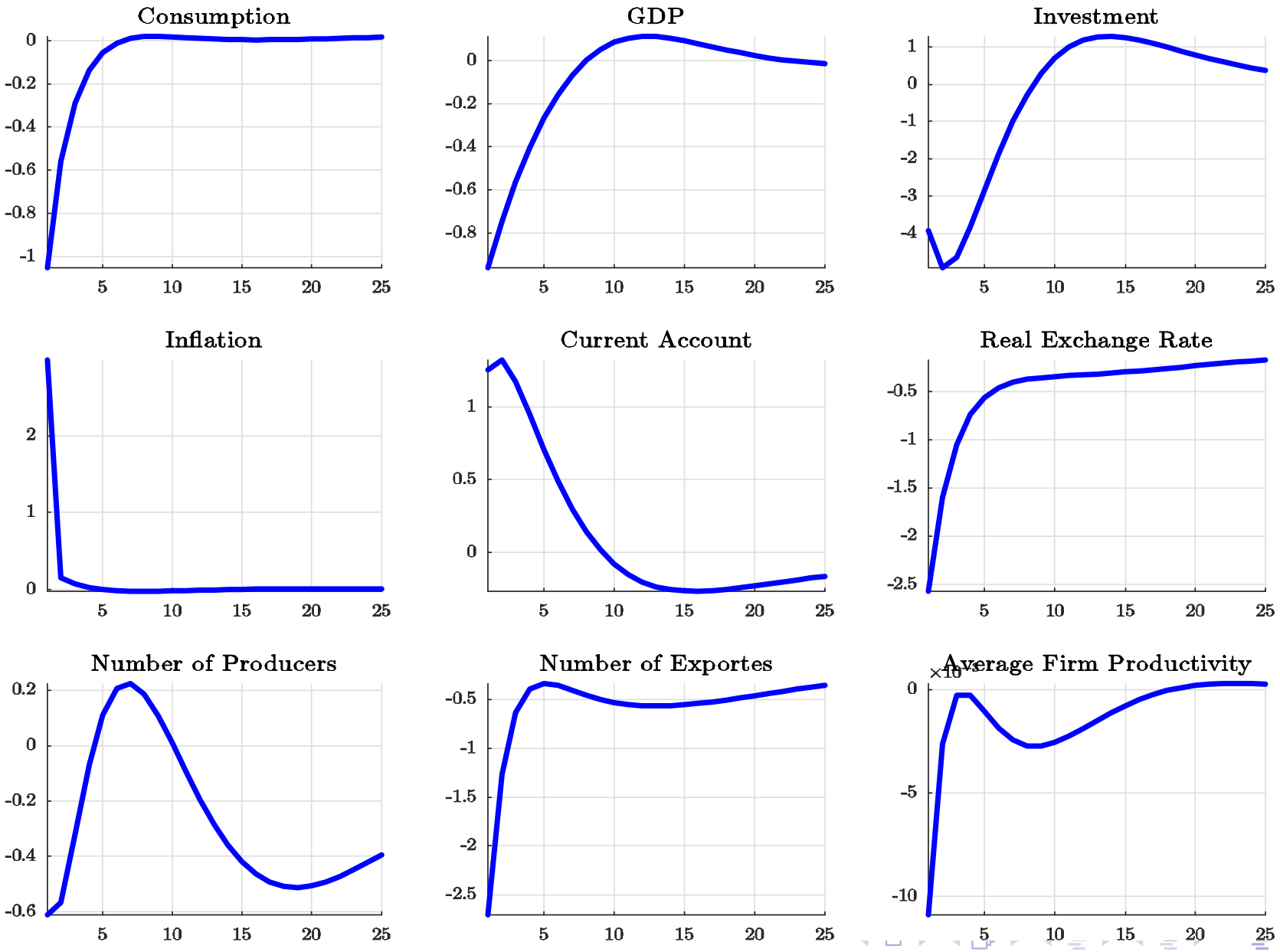
$$+ P_t r_{K,t} K_t(h) + (\tilde{d}_t^T + \tilde{e}_t) N_{D,t} x_t(h) + T_t(h),$$

Calibration

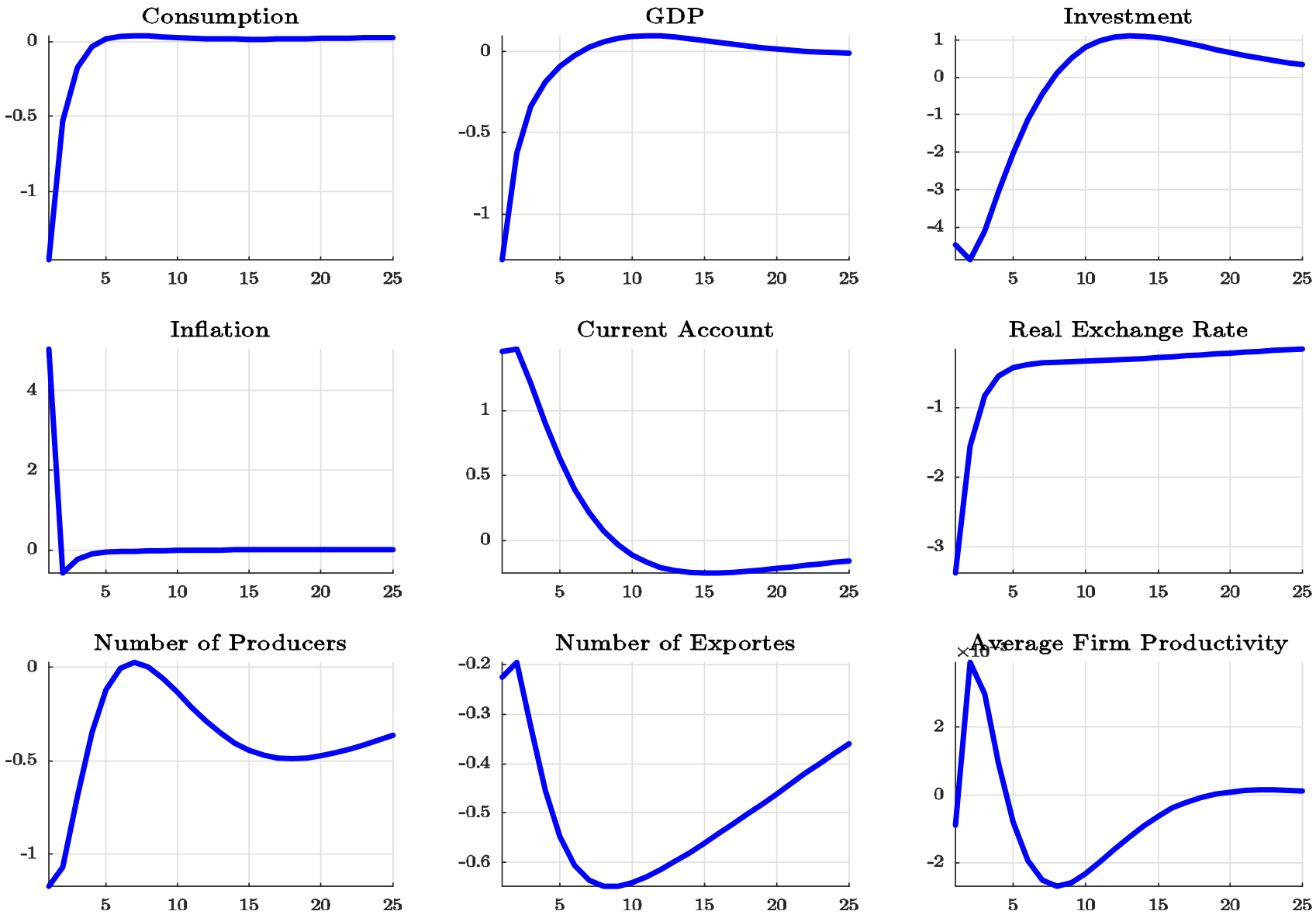
- Symmetric calibration with standard values in the literature
- Set parameters that directly affect trade volumes and monetary policy to match Canadian/U.S. data
  - Home bias: $\alpha_N \implies$ trade-to-GDP $= 50\%$
  - Size of the tradable sector: $\alpha_T \implies$ manufacturing output share $= 30\%$
  - Iceberg trade costs: $\tau = \tau^* = 0.3$
  - Average import tariffs: $\tau^{IM} = \tau^{IM^*} = 0.02$
- Interest rate rule using estimates in Kichian (2015): $\varrho_i = 0.5$, $\varrho_\pi = 2.80$, $\varrho_Y = 0$

Back

Producer Currency Pricing



Local Currency Pricing



Protectionism under a Fixed Exchange Rate

- **Alternative models**: (i) financial autarky; (ii) no firm dynamics; (iii) no capital/no firm dynamics