The Macroeconomic Effects of the Exchange Rate Fluctuations in Croatia

Conference: How are Central Banks Dealing with Macroeconomic Consequences of Covid-19 pandemic?

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- The views expressed in this paper are those of authors and do not necessarily reflect the views of the Croatian National Bank.

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Introduction and Motivation

- An extremely high share of loans and deposits in euros in total loans and deposits (high level of euroization/dollarization - ⏩ next)
- Consequence: Implementation of managed-floating exchange rate regime (kuna against euro) - since the anti-inflation program in 1993 to the entry into ERM II
- A decades-long debate:
  - Would depreciation have a positive effect on net exports? (*trade channel*)
  - Would depreciation hurt households consumption and investment? (*balance-sheet channel*)
  - What effect prevails and how to answer such a complex and multidimensional question?
    - Both sides, pro- and anti- depreciation proponents, have legitimate theoretical and (partial) empirical arguments to back up their stance
    - The literature so far gives only partial answers - there is no suitable empirical study of the overall macro effects of depreciation in Croatia within a single analytical framework (research for other countries is not relevant due to credit and deposit euroization)

Introduction and Motivation

- Comprehensive analysis of the possible effects of exchange rate depreciation on the Croatian economy within a single analytical framework, i.e. using the semi-structural macroeconomic model for Croatia (PACMAN)
- Modelling of a large number of individual channels and variables within one model enables us to analyse a complex problem
- The model allows the possibility of nonlinear and asymmetric effects of FX fluctuations on domestic sectors
- Most model equations are estimated, however, some relations are calibrated or estimated using satellite micro or macro models
  - Insufficient exchange rate variability and simultaneous effects of exchange rate fluctuations through different channels are at the core of the estimation problems next

Credit and Deposit Euroization

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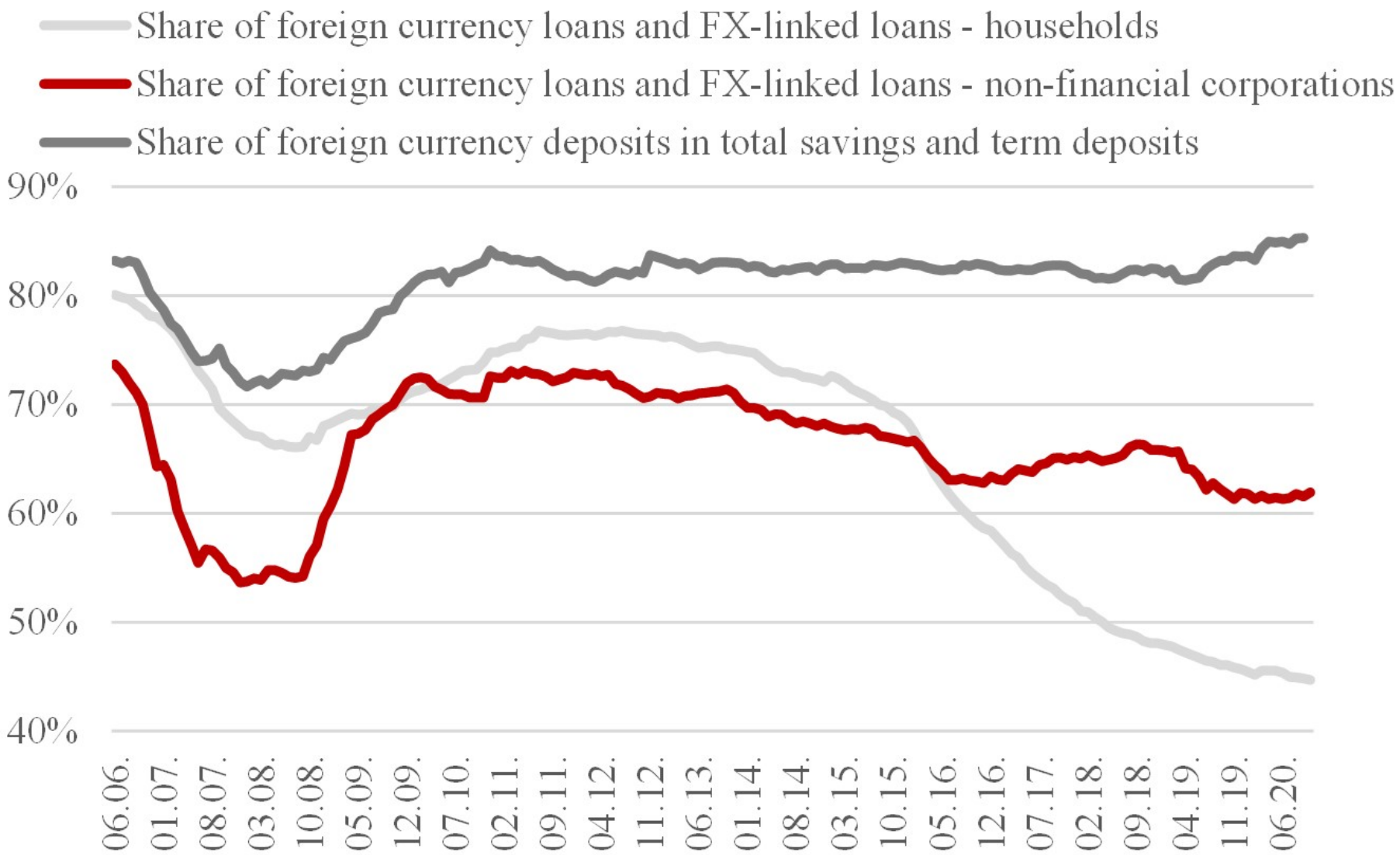
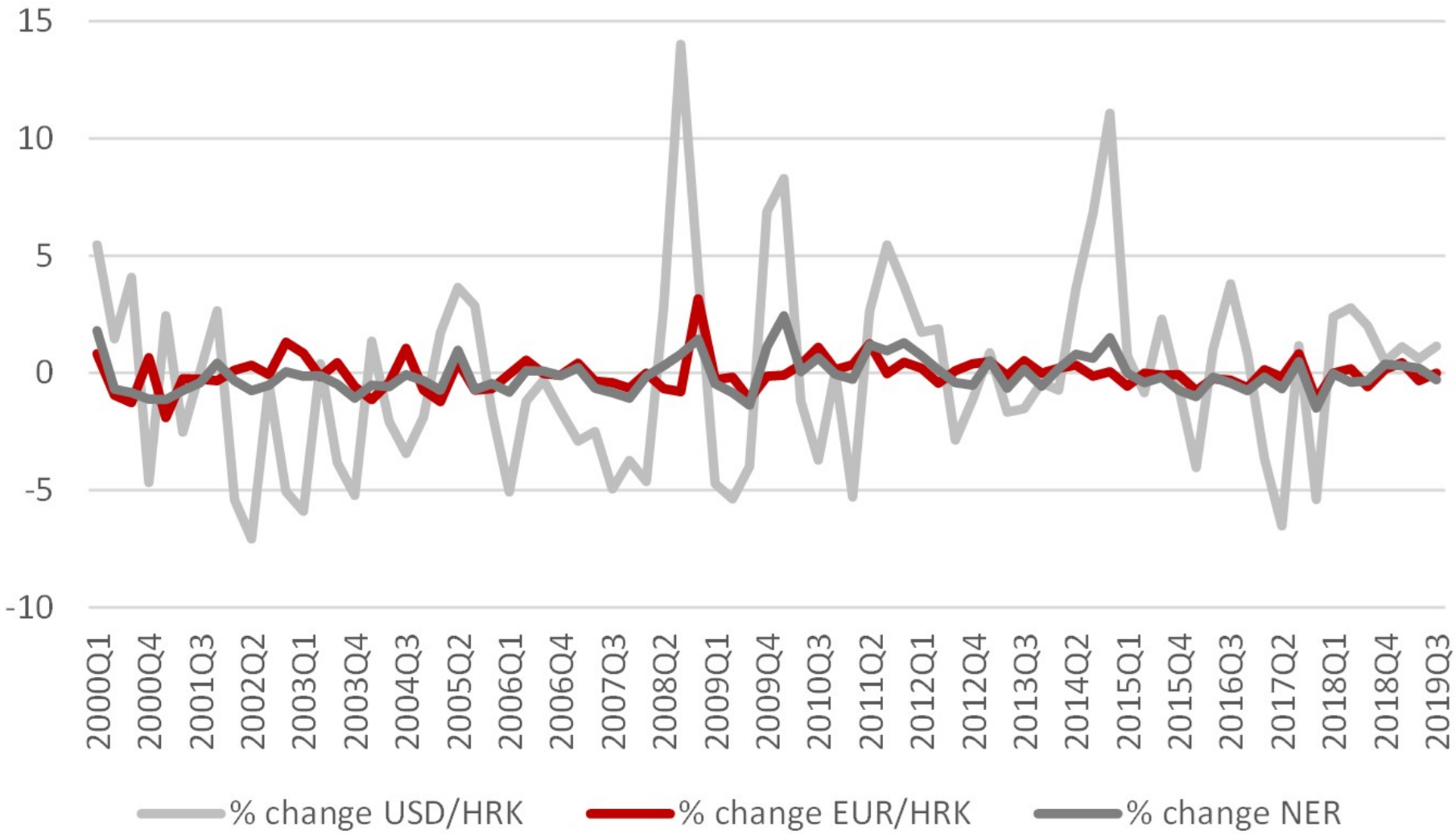


Exchange Rate Volatility



Exchange Rate Transmission Channels

- Exchange rate transmission channels in a small open economy:
  1. The trade channel
  2. The balance-sheet channel (net FX financial wealth of domestic sectors = FX assets - FX liabilities)
  3. Exchange-rate pass-through into import and other prices
- This paper identifies and analyzes both: i) the partial effects of exchange rate depreciation on domestic sectors (via all three transmission mechanisms) as well as ii) the economy-wide effect
- Using the PACMAN model, it is possible to evaluate an overall effect of kuna depreciation by combining the first-round (direct) effects of exchange rate depreciation with the second-round of effects that arise due to endogenous mechanisms of the model and sector interdependence

Exchange Rate Transmission Channels in the PACMAN Model

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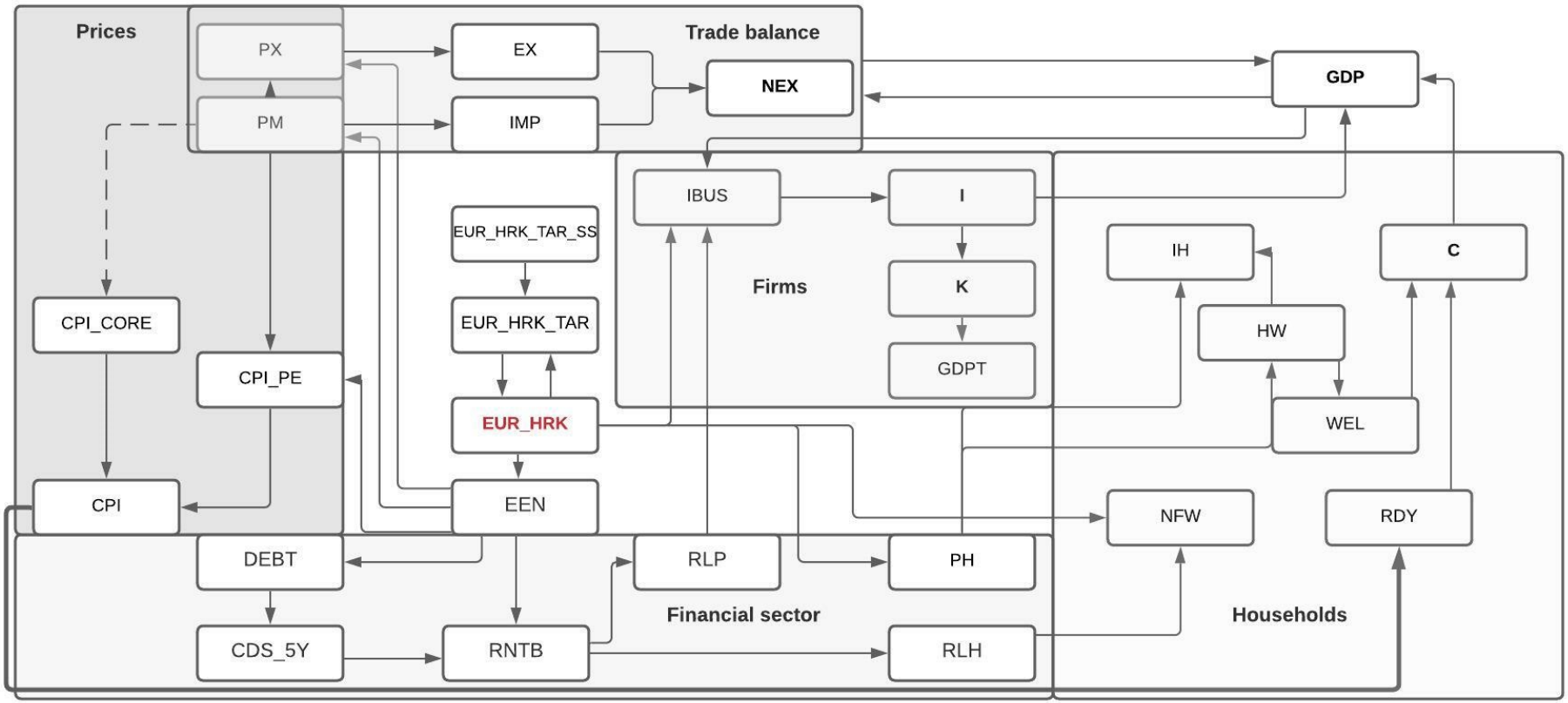


Exchange Rate Transmission Channels - *Trade channel*

- According to standard macroeconomic theory, the depreciation of the real exchange rate leads to:
  - Improvements in international competitiveness (domestic goods become relatively cheaper) -> increase in real exports
  - Imported goods prices increase -> decline in real imports
- We can expect J-curve effect - > trade deficit will worsen after currency depreciation before it improves.
- If, in the medium run, the trade deficit (balance) improves -> the Marshall-Lerner condition is satisfied
- All of these mechanisms are included in the model and are estimated econometrically

Exchange Rate Transmission Channels - *Balance-sheet channel*

- Households:
  - Euro-denominated debt repayment increases
  - Euro-denominated savings increase
  - The direct effect of depreciation should be positive (households euro-denominated savings exceed euro-denominated debt)
  - An increase in prices (if the pass-through effect is greater than zero) will decrease the real disposable income
  - The issue of household heterogeneity (results of the household consumption survey: richer households are also those that save more and have higher debt)
  - All these mechanisms are included in the model (estimated econometrically or included through identities)

Exchange Rate Transmission Channels - *Balance-sheet channel*

- Firms:
  - Euro-denominated debt repayment increases
  - The direct effect of depreciation should be negative (firms are net euro-denominated debtors and have open foreign exchange (euro) position)
  - The nominal EUR/HRK exchange rate enters directly into the firms' investment equation
  - However, due to low exchange rate volatility and simultaneity related estimation issues, the macro-level parameter is estimated using microdata and sharp CHF/HRK depreciation episode
  - Therefore, the impact of exchange rate fluctuations on corporate investment was identified and estimated using firm-level data from FINA and CNB - data on corporate loans - MOST v2)

Exchange Rate Transmission Channels - *Balance-sheet channel*

- Public sector:
  - Euro-denominated debt repayment increases
  - The direct effect of depreciation should be negative (public sector is a net euro-denominated debtor and has an open foreign exchange (euro) position)
  - Two channels:
    - i) direct accounting effect that is modelled through identity using the currency structure of public debt and
    - ii) indirect effect on borrowing costs that is estimated econometrically through the effect of higher public debt on the risk premium and (government) interest rates

Exchange Rate Transmission Channels - *Balance-sheet channel*

- Financial sector:
  - Euro-denominated debt repayment increases and affects banks balance sheets -> NPLs rise -> risk premium increases
  - In the absence of explicit modelling of banks' balance sheets, the exchange rate effect on the financial sector is modelled indirectly (increase in NPLs -> increase in risk premium -> increase in interest rates ...)
  - Reference interest rate increases through uncovered interest parity (UIP) too -> also included in the model
  - Transmission chain of interest rates include several equations linking the interbank interest rate and banks' financing costs with domestic short-term and long-term lending rates.

Exchange Rate Transmission Channels - *Balance-sheet channel*

- Other effects:
  - Real estate prices in Croatia are usually expressed in euros and paid in kunas according to the official EUR / HRK exchange rate on the day of the transaction (exchange rate included in the real estate price equation - estimated parameter slightly lower than 1)
    - However, we exclude this effect in the case of relatively large exchange rate fluctuations

Exchange Rate Transmission Channels - *Exchange-rate pass-through*

- The reaction of the domestic prices to the exchange rate changes
- Impact through pass-through on import prices and subsequent transmission to consumer prices (two-step transmission)
- Research shows that during "normal" times in most countries (as well as in Croatia) pass-through effect on both import and consumer prices is significantly lower than 1 (reasons: menu cost, price adjustment costs, the basket of consumer goods includes non-imported goods, etc.)
- Available empirical research (both econometric and survey-based) confirm that in Croatia there is a *threshold* above which the *pass-through* effect becomes significantly stronger
  - These nonlinear effects are modelled in PACMAN through calibration of the exchange-rate pass-through in 2 regimes: regime 1 - moderate and regime 2 - significant exchange rate change

Exchange Rate Transmission Channels - *Exchange-rate pass-through*

- How to include this nonlinearity in the PACMAN model?
- Main questions:
  1. Where is the threshold and how to assess it?
  2. What is the value of the pass-through parameter in the regime of significant exchange rate changes?

Exchange Rate Transmission Channels - *Exchange-rate Pass-through*

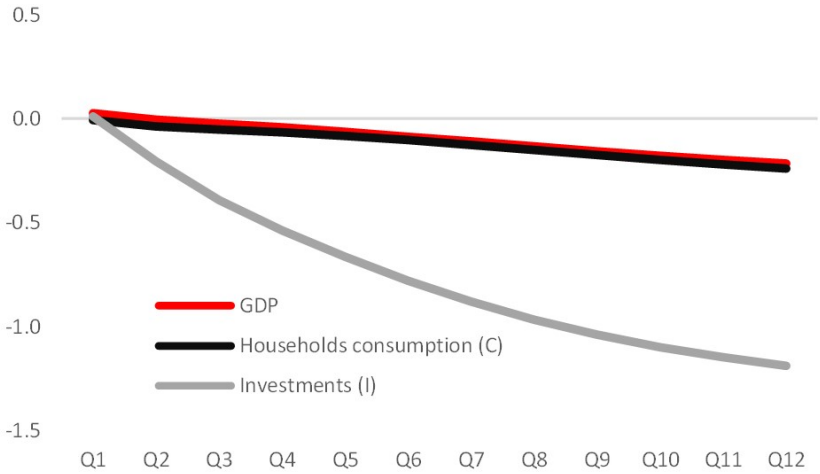
- Based on the firms survey data evidence threshold of 4 % was selected, i.e. regimes are defined as i) regime 1: moderate exchange rate changes (up to 4% yoy); ii) regime 2: significant exchange rate changes (above 4% yoy)
- The nonlinearity in the PACMAN model is included in both, import and consumer, price equations:
  1. The exchange rate pass-through to import prices is equal to the estimated parameter (0.42) in regime 1 and is calibrated in the range of 0.5-1.0 in regime 2
  2. The import prices pass-through to CPI components is equal to i) food prices (regime 1: the estimated parameter (0.17), regime 2: calibrated in the range of 0.5-1.0); ii) core inflation (regime 1: the estimated parameter (0), regime 2: calibrated in the range of 0.5-1.0)

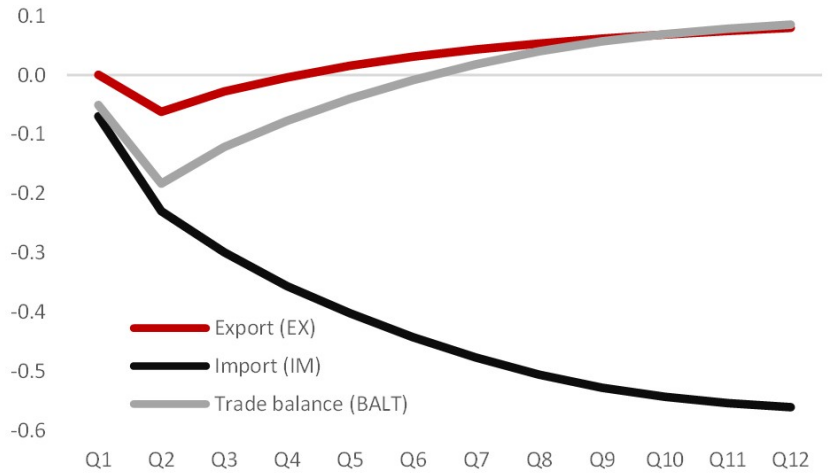
Emprical setting

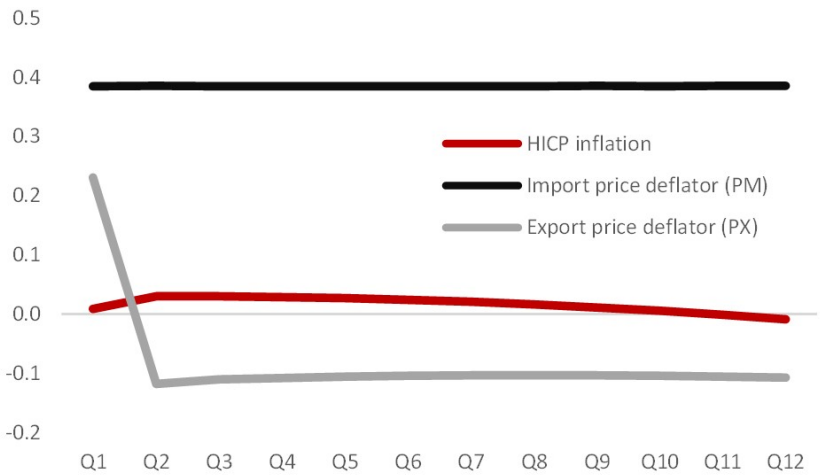
- FX shock simulation (generalized IRFs)
- Simulation of depreciation in regime 1 ("normal" depreciation of 1%) and regime 2 (sharp depreciation 10%)
- Comparison of the key domestic variables IRFs to "normal" and sharp depreciation
- The results are evaluated for several parameterizations/calibrations

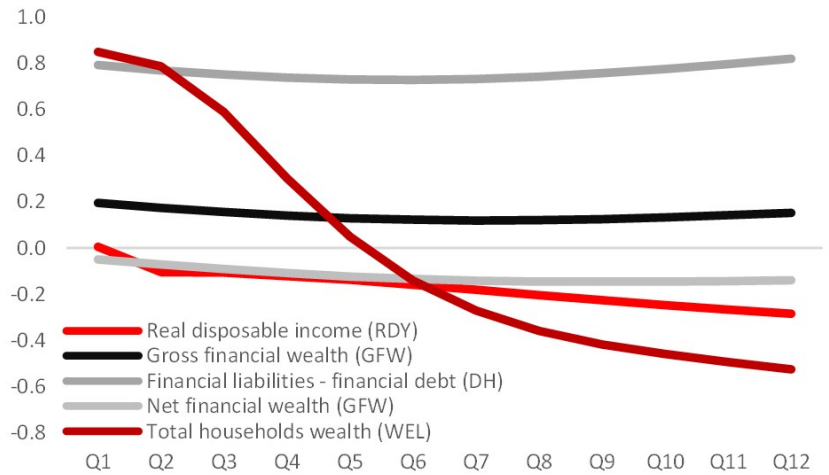
Results

IRFs in regime 1: "normal" depreciation (FX shock = +1% yoy)



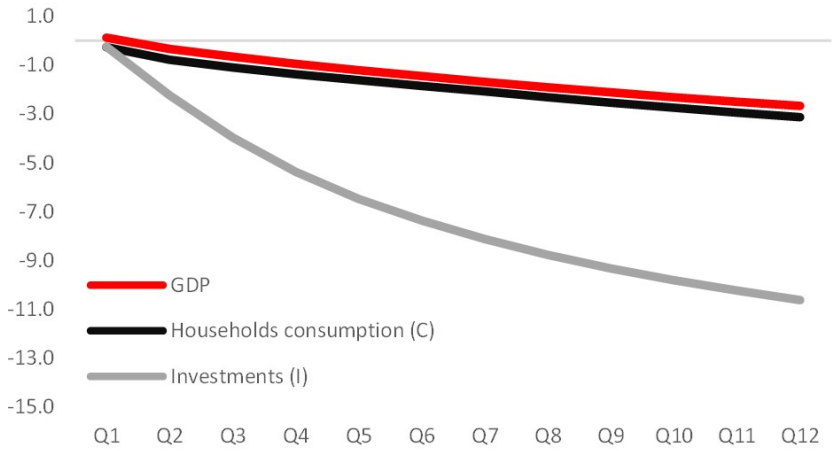


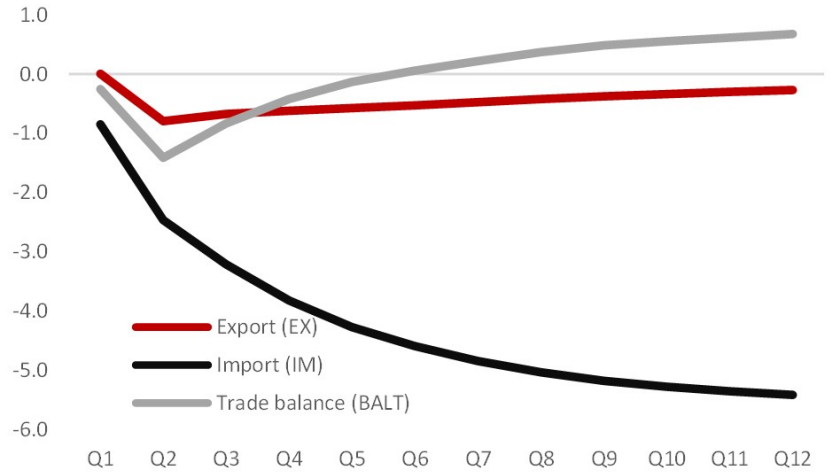


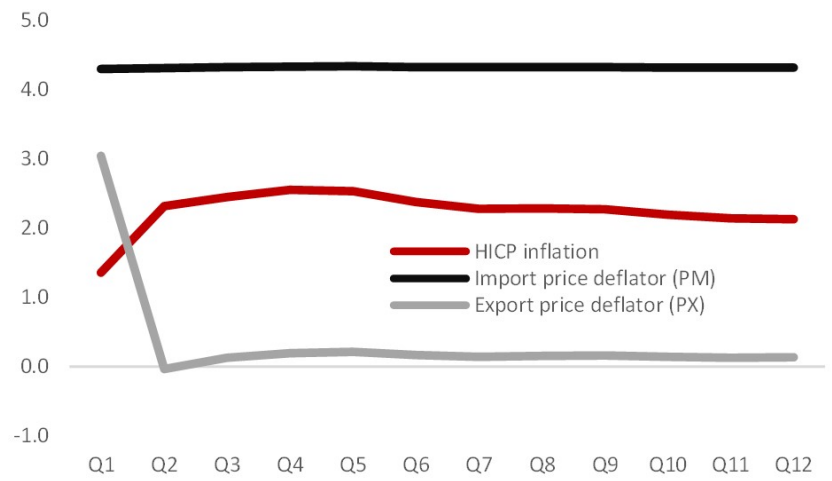


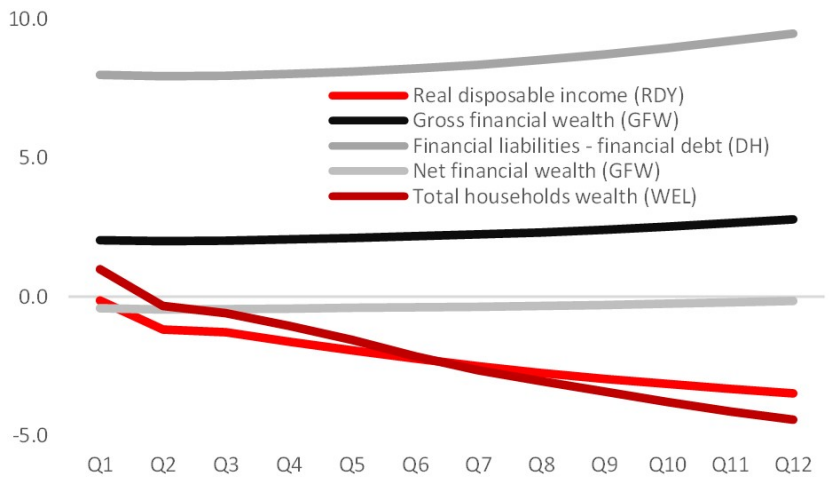
Results

IRFs in regime 2: sharp depreciation (FX shock = +10% yoy, $dPH = 0$, $ERPT = 0.5$)



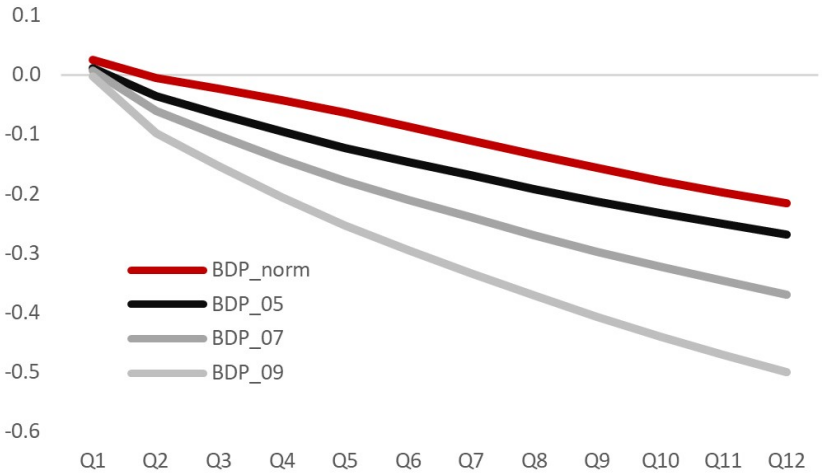


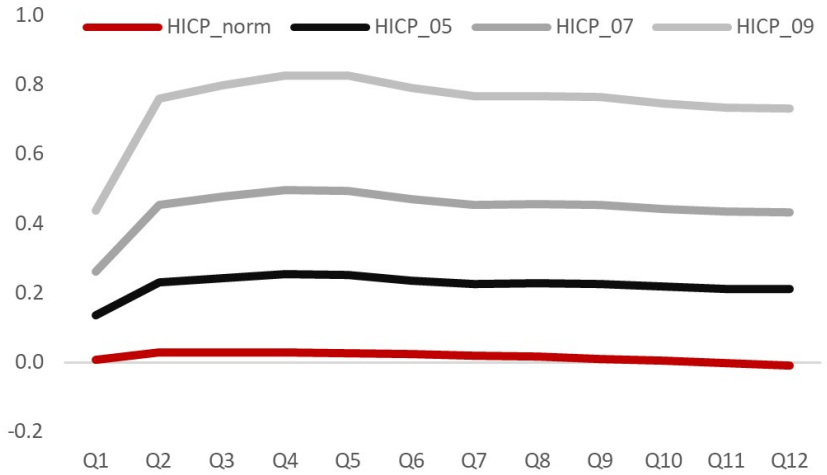




Results

Scaled IRFs - alternative parameterizations/calibrations





Conclusions

- Although the final GDP response (i.e. net effect) depends on selected parameterization and a large number of assumptions, all simulations carried out in this paper point to the same normative conclusion which suggests that in Croatia overall (*first-* i *second-round* effects) reaction of GDP to positive FX shock (depreciation) is negative, i.e. we find that:
  - the negative balance-sheet effect
  - outweighs the positive trade effect of the depreciation
- The methodological approach that can be applied in other countries to analyse the effects of the exchange rate fluctuations in the dollarized economy within a single analytical framework
- **Limitations**: household heterogeneity might still be an issue, the PACMAN model is backwards-looking, FX expectations are stable, and possible de-anchoring issues (de-anchoring of exchange rate expectations - *self fulfilling prophecy* is not modelled) not considered, financial sector balance sheets not modelled explicitly

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