Income inequality and the German export surplus

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The German export surplus has attracted much attention

ECB president Christine Lagarde (2018):

> *"For our part, the IMF has indicated that this surplus is too large—even considering the need to save for retirement in an aging society."*

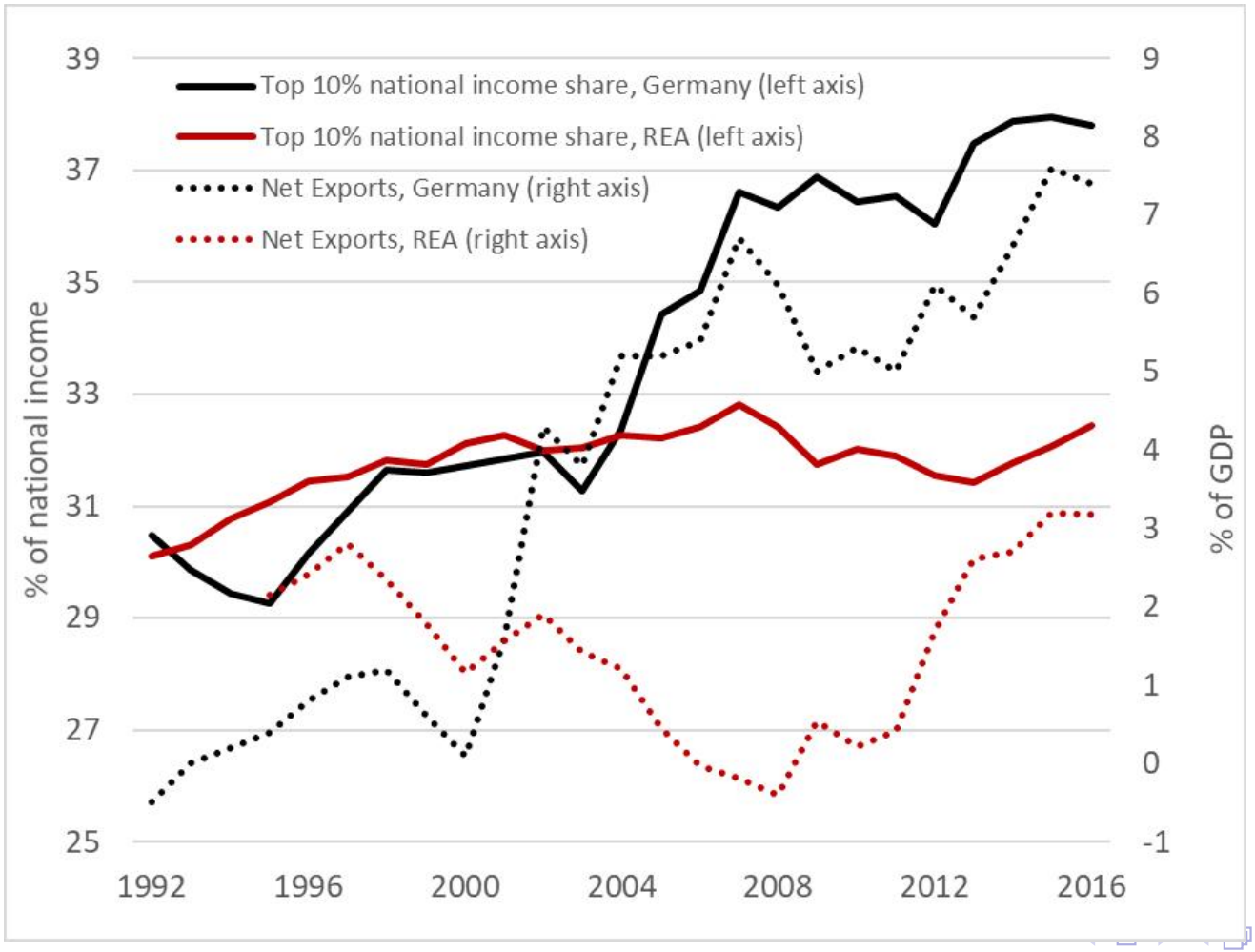
European Commissioner Pierre Moscovici (2017):

> *"not healthy" for Germany and "creates significant economical and political distortion for the whole of the eurozone".*

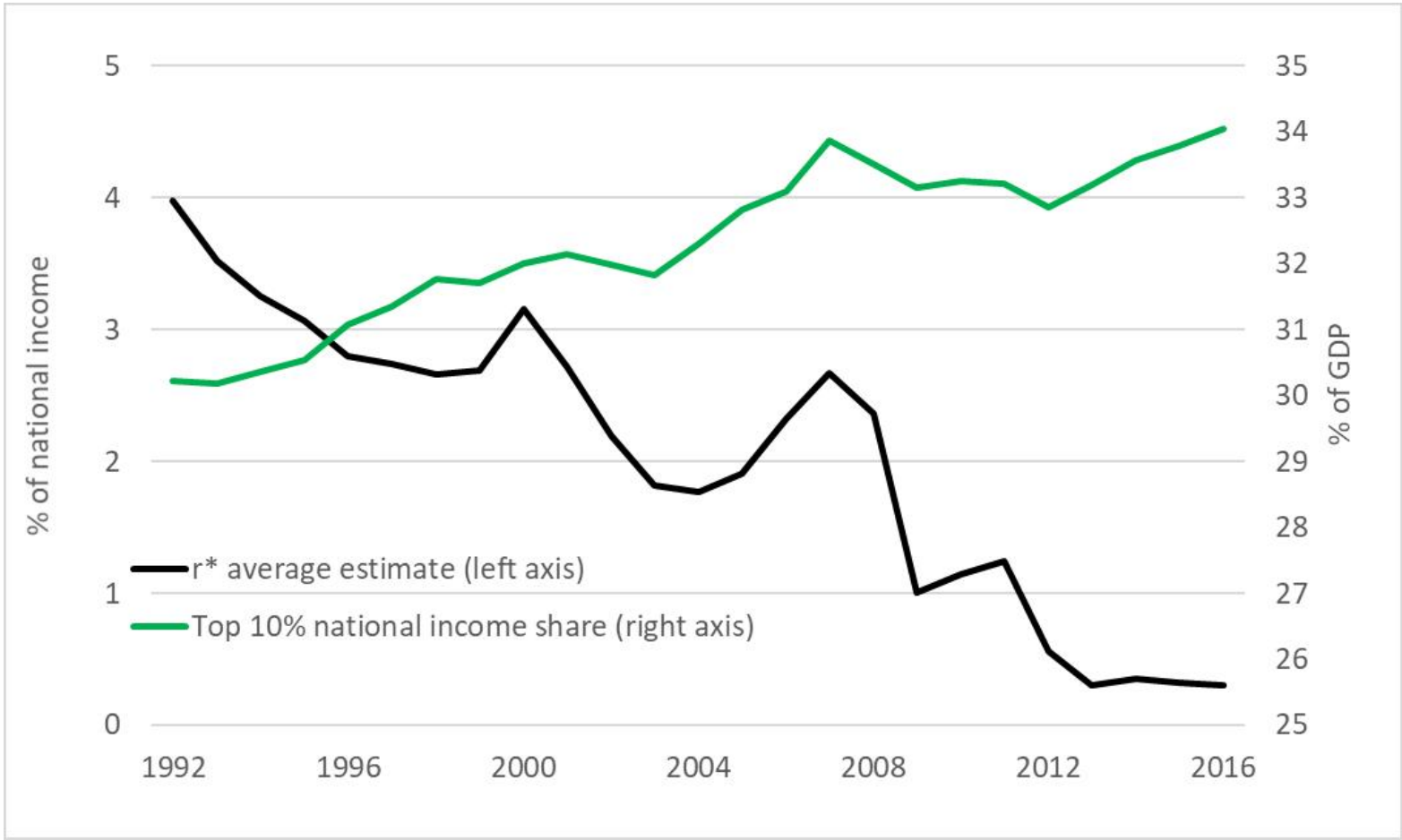
US treasury (2013):

> *"Germany's anemic pace of domestic demand growth and dependence on exports have hampered rebalancing at a time when many other euro-area countries have been under severe pressure to curb demand and compress imports in order to promote adjustment. The net result has been a deflationary bias for the euro area, as well as for the world economy."*

German net exports increase associated with an increase in top-end inequality from mid-1990s to 2010s



Top-end income-inequality in the EA has increased, r* has declined



Our paper connects these trends in an open economy model

- Develop a model of DE, the REA and the Rest Of the World (ROW). Rich households (top 10%) have "Capitalist Spirit" type Preferences (CSP) over their wealth. CSP allow the model to match the empirically observed high Marginal Propensity to Save (MPS) out of permanent income changes of rich households.
- $\rightarrow$Income increase of rich households at the expense of non-rich households raises saving at the macro-level and thus net exports, lowers the Euro Area real interest rate.

Our paper connects these trends in an open economy model (cont'd)

- Feeding the empirically observed increase in income inequality into the model
  - $\Rightarrow$ increase in net exports by about 3% of GDP by 2016.
  - Decline in the real interest rate by about 1 percentage point.
- Builds on the closed economy model of Rannenberg (2023) which links the decline in the US natural interest rate r*, the increase in household indebtedness and house prices to the increase in income inequality. Other contributions linking r* and income inequality using CSP: Straub (2017) and Mian et al. (2020).

Literature on the origin of the German export surplus

- Two papers on role of income distribution. No attempt to quantitatively link the long-run trends of income inequality and the export surplus. No consideration of labor income inequality:
  - Gruening et al. (2015): Effect of rising inequality in DE and UK, using a very stylized Small Open Economy model (exogenous investment, constant employment), where rich HH have CSP.
  - Hoffmann et al. (2021) investigate effects of transitory wage push shocks on DE net exports in an estimated DSGE model of DE, REA and ROW. Marginal contribution to net exports (opposite direction). No CSP, abstract from labor share trend by assumption (demeaned real wage growth).
- Faster aging in DE vs. rest of the world: Schoen and Staehler (2020), Ruppert and Staehler (2022) simulate an open economy OLG model. 1-3 percentage points average net export increase over 2000-2018. But only temporary effect, especially if China's demographic change is incorporated.

Literature on the German export surplus (cont'd)

- Contribution of DE labor market and tax reforms has *mostly* been found to be small or marginal (Hochmuth et al. (2019), Ruppert and Staehler (2022), Gadatsch et al. (2016) and Kollmann et al. (2015)).
- Kollmann et al. (2015): Estimated DSGE model of DE, REA and ROW. "Private saving shock" main driver of the net exports increase. Consistent with our simulation, which generates higher household saving (by the rich) due to rising income inequality. Our simulated increase similar to their "saving shock" contribution both in magnitude and time profile.
- Empirical literature on inequality and the current account: Behringer and van Treeck (2018): Decline in the labor share improves the current account, increase in top 5% *personal* income share worsens it. Kumhof et al. (2022): Effect of increase in top 5% national income share depends on stock market capitalization.

Outline

Outline

Rich households (top 10%)

- Infinitely lived. Earn labor $w_{r,t}^{DE} \tilde{N}_{r,t}^{DE}$ and profit $\tilde{\Xi}_t^{DE}$ income, pay lump sum taxes. Sole owners of firms (see Schroeder et al. (2020)). Invest in dom. assets $\tilde{b}_{r,dom,t}^{DE}$, REA gov. bonds $\tilde{b}_{REA,t}^{DE}$ and ROW gov. bonds $\tilde{b}_{ROW,t}^{DE}$. Rich households from all regions invest in gov bonds of all regions. Results are robust to allowing for physical capital.
- Derive utility from consumption $\tilde{C}_{r,t}^{DE}$ and disutility from labor $\tilde{N}_{r,t}^{DE}$. With "Capitalist Spirit" type Preferences (CSP): Derive utility from their asset holdings. Allows matching the high marginal propensity to save out of permanent income increases of rich households (Dynan et al. (2004), Kumhof et al. (2015)). ▸ utility function
- DE and REA assets perfect substitutes.
- NOCSP model variant: $\chi_{b,r}^{DE} = \chi_{b_{ROW},r}^{DE} = 0$.
- Wage setting: Household unions set wages in a monopolistically competitive labor market, subject to nominal rigidities (Rotemberg (1982)). Analogous for non-rich households.

Non-rich households (bottom 90%)

- Infinitely lived. Earn only wage income $w_{n,t}^{DE} \tilde{N}_{n,t}^{DE}$, borrow from rich-households via financial intermediaries, at interest rate $R_{L,t}$
- Loan interest rate $R_{L,t}$ positively related to their debt-to-income ratio due to an (ad hoc) financial intermediation cost. May capture default risk and monitoring costs.
- Derive utility from consumption $\tilde{C}_{n,t}^{DE}$ and disutility from labor $\tilde{N}_{n,t}^{DE}$. ▸ utility function

Outline

Four layers of firms

1. Labor assemblers: combines labor of rich and non-rich households to produce a homogeneous labor input $N_t^{DE} = z_{r,t}^{DE} N_{r,t}^{DE} + z_{n,t}^{DE} N_{n,t}^{DE}$. $z_{r,t}^{DE}, z_{n,t}^{DE}$: Labor productivity of rich/ non-rich households. Details We use changes in the relative labor productivity of rich households to generate an increase in in labor income inequality (i.e. increases in the top 10% national income share not associated with a decline in the labor share.)
2. Intermediate goods firms produce domestic output varieties using the homogeneous labor input N_t^{DE}. Operate under monopolistic competition, subject to nominal rigidities (Rotemberg (1982) type price adjustment costs). We use changes in the their market power (price markup) to replicate the decline in the empirical labor share.
3. Goods assemblers produce domestic output good Y_t^{DE} from these varieties, sold at price $P_{H,t}^{DE}$. Some goods sold in REA at price $P_{DE,t}^{REA} = S_{DE,t}^{REA} P_{H,t}^{DE}$, and analogously in ROW (Producer currency pricing).
4. Final goods firms produce final consumption good by combining domestically and foreign produced goods. Gives rise to international trade.

Outline

Government

- One central bank for the EA and one for the ROW.
- Central banks pursues a perfect inflation target (in the EA at the EA level).
  - Assuming a Taylor type interest feedback rule instead does not materially affect our results.
- Fiscal authority passive: Holds government debt- and government demand-to-GDP ratios constant, sets the share of non-rich households in the total tax burden $\frac{T_{n,t}^{DE}}{T_t^{DE}}$ equal to their pre-tax national income share $NIS_{n,t}^{DE}$

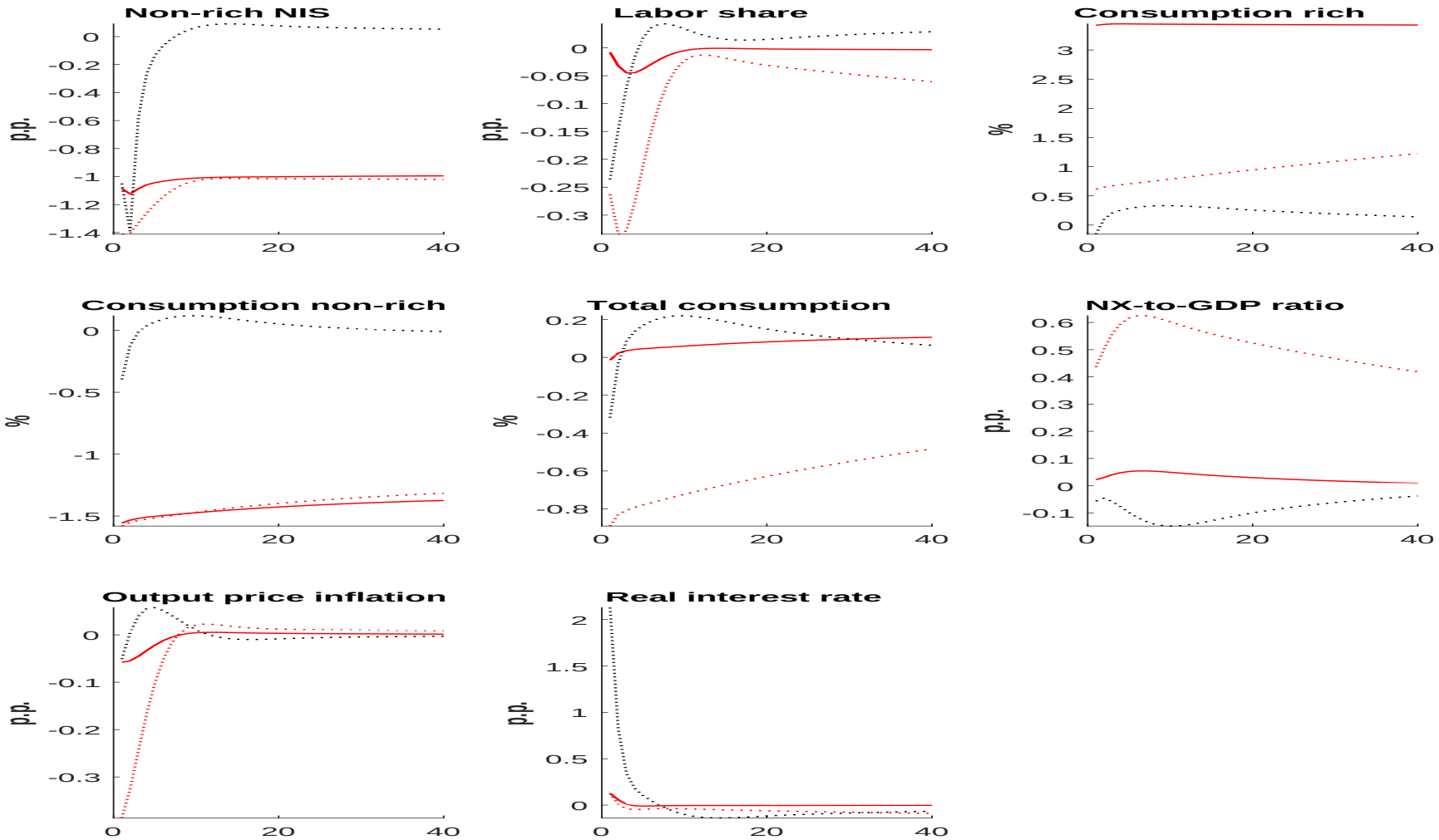
Capitalist spirit preference parameters

- First target: Estimates of the ratio between the interest rate and individual discount rate, specifically for rich households (computed from Pleeter and Warner (2001) and Harrison et al. (2002) see Rannenberg (2019), Rannenberg (2023) for details)⇒utility weight on wealth.
- Second target: Rich household saving behavior
  - DE and REA: Estimate of the MPC out of wealth of the top 10% of households (Garbinti et al. (2020) for Germany, and an average of the estimates for France, Belgium, Spain and Italy by Garbinti et al. (2020) and Arrondel et al. (2019)). Would prefer MPS out of a permanent income increase, but not available to our knowledge
  - ROW: Estimate of US rich household MPS out of a permanent income increase (Dynan et al. (2004), following Kumhof et al. (2015)).

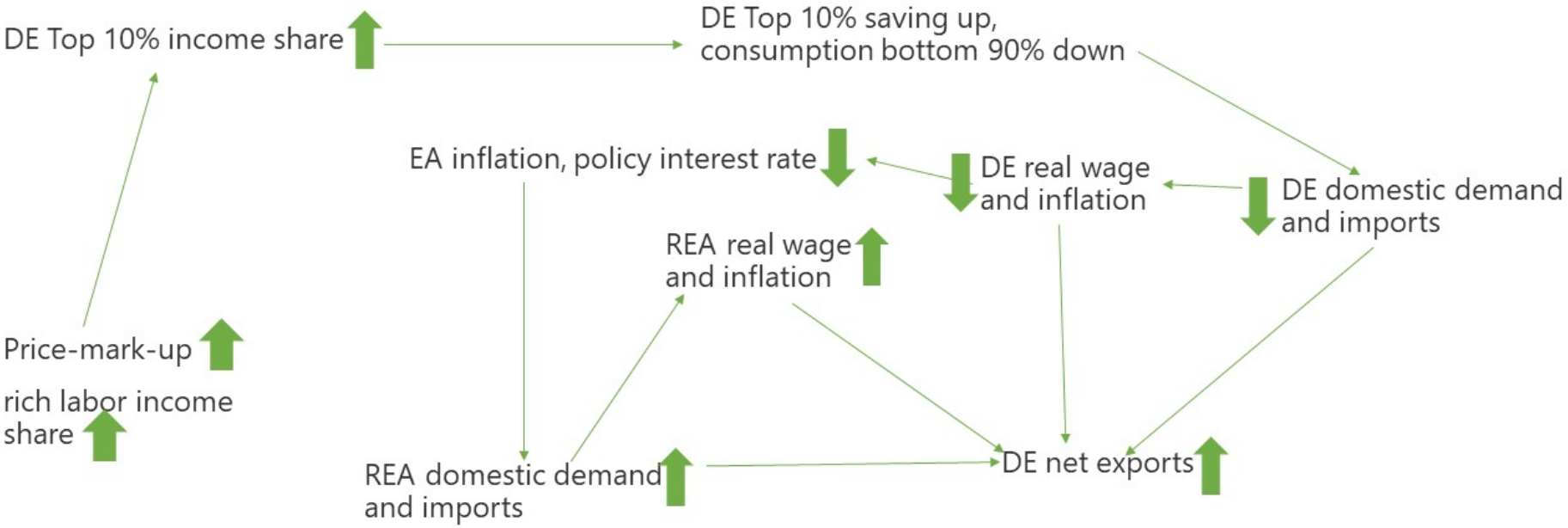
Other parameters

- Most other parameters set such that the steady-state of the model matches empirical target values.
- Parameters affecting only the dynamics of the model calibrated based on the literature and the empirical evidence.

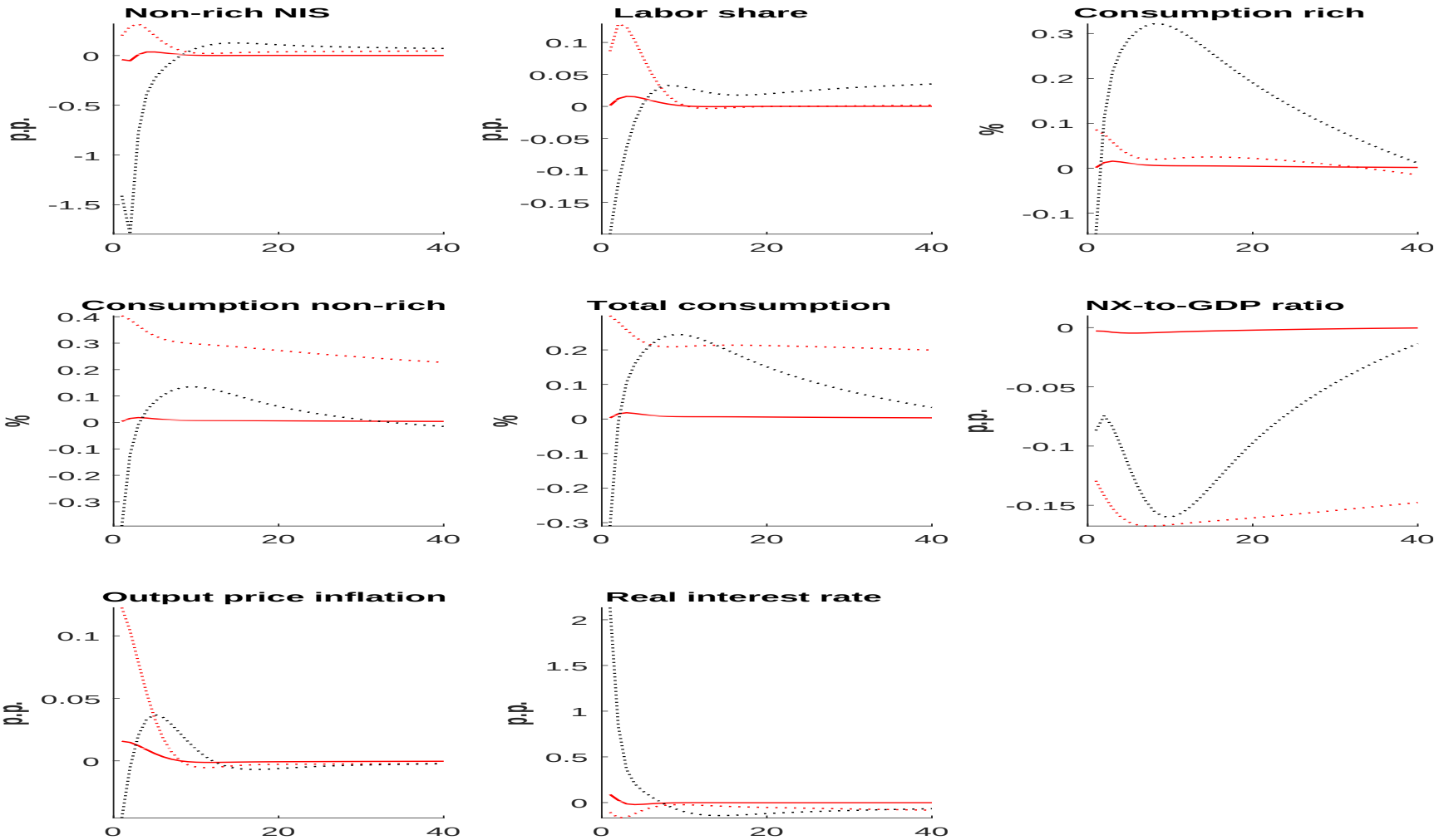
Permanent inequality increase (wage dispersion) - DE



Transmission of an inequality increase with CSP



Permanent inequality increase (wage dispersion) - REA ▸ ROW



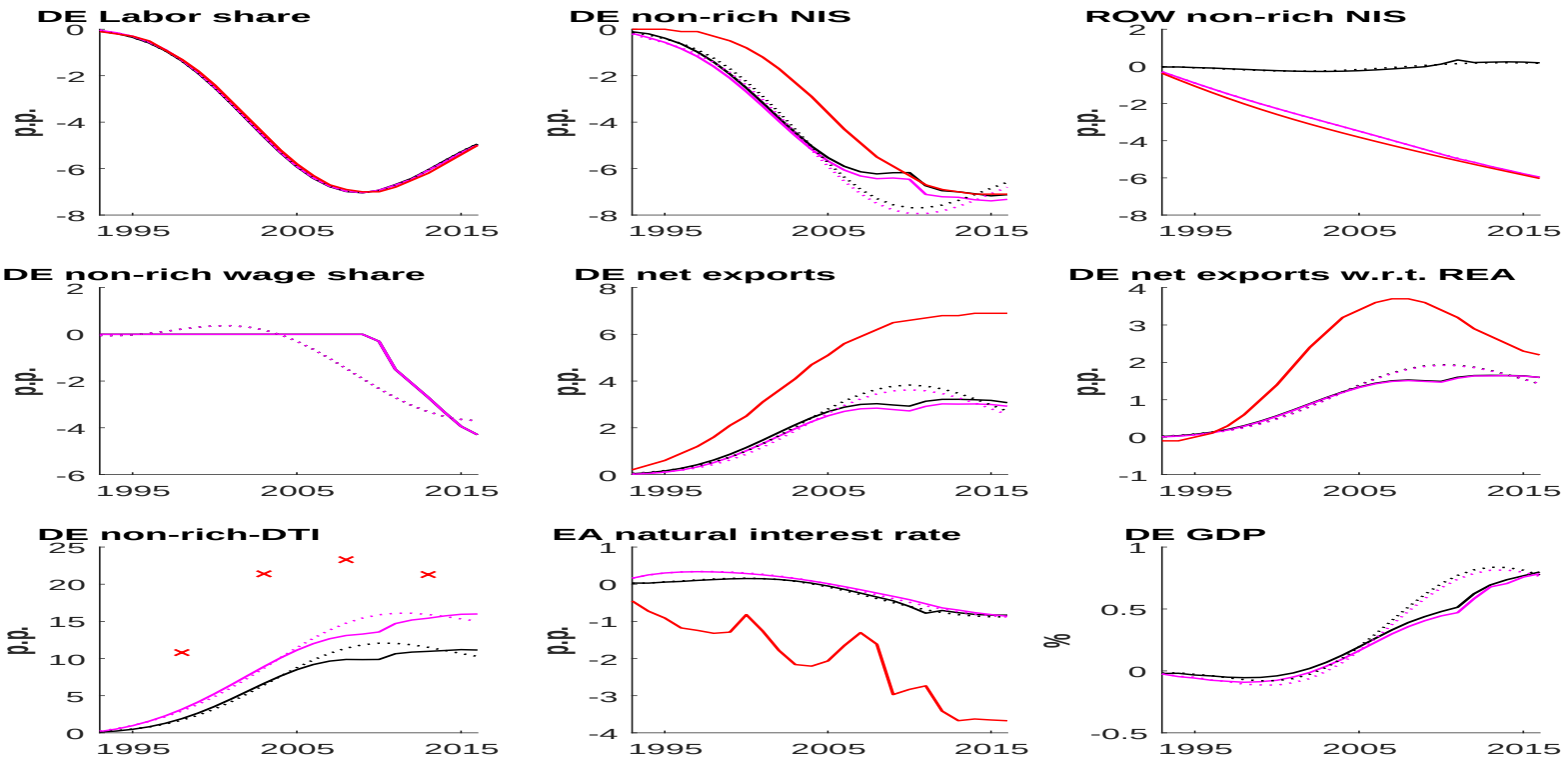
Simulation of historical inequality increase

- First simulation: DE inequality increase only
  - DE markup shock: Makes simulation match the trend of the DE labor share.
    - Rannenberg (2023), Farhi and Gourio (2018) and Caballero et al. (2017) do so for the US case.
  - Set DE Wage inequality shock to match the empirical decline of the top 10% national income share occurring on top of the decline already replicated by the price markup increase.
- Second simulation: As first, but adds a series of ROW price markup shocks set to match the path of the ROW bottom 90% national income share.

Simulation historical inequality increase (cont'd)

- Households expect shocks to be permanent once they appear, because they are set to match data trends.
- Repeat the above two simulations for an alternative parameterization of the DE wage inequality shock.
  - Equating shock to the path of (an estimate of the) labor income share of the top 10% of households from the German household survey SOEP (Wagner et al. (2007)).

Simulation historical inequality increase



Conclusion

- We investigate the effect of rising income inequality on the DE export surplus in an open economy model with rich households (the top 10%) and non-rich households .
- Rich households derive utility from their wealth, therefore save part of a permanent income increase.
- Feeding the increase in DE inequality observed over the 1992-2016 period generates an increase of net exports of about three percent of GDP by the end of the simulation period and a decline of the Euro Area real interest rate by about one percentage point.

Utility functions

Return

- Rich household period t utility flow:

$$\frac{\left(pop_r \tilde{C}_{r,t}^{DE}\right)^{\mathbf{1}-\sigma^{DE}}}{1-\sigma^{DE}} - \frac{\chi_{N,r}^{DE}}{1+\eta^{DE}}\left(pop_r \tilde{N}_{r,t}^{DE}\right)^{\mathbf{1}+\eta^{DE}} + \left(\begin{array}{c} \frac{\chi_{b,r}^{DE}}{\mathbf{1}-\sigma_{b,r}^{DE}}\left(pop_r\left(\tilde{b}_{r,dom,t}^{DE} + q_{REA,t}^{DE}\tilde{b}_{REA,t}^{DE}\right)\right)^{\mathbf{1}-\sigma_{b,r}^{DE}} \\ + \frac{\chi_{b_{ROW},r}^{DE}}{\mathbf{1}-\sigma_{b_{ROW},r}^{DE}}\left(pop_r q_{ROW,t}^{DE}\tilde{b}_{ROW,t}^{DE}\right)^{\mathbf{1}-\sigma_{r,b}^{DE}} \end{array} \right)$$

- Non-rich household period t utility flow

$$\frac{\left((1-pop_r)\tilde{C}_{n,t}^{DE}\right)^{1-\sigma^{DE}}}{1-\sigma^{DE}} - \frac{\chi_{N,n}^{DE}}{1+\eta^{DE}}\left((1-pop_r)\tilde{N}_{n,t}^{DE}\right)^{1+\eta}$$

Labor assemblers/ labor income distribution

Return

- Labor assembler combines labor of rich and non-rich households to produce a homogeneous labor input $N_t = z_{n,t} N_{n,t} + z_{r,t} N_{r,t}$. Sell it at real price w_t to intermediate goods firms. Hence real wages of non-rich and rich households are given by

$$w_{n,t} = w_t z_{n,t} \tag{1}$$

$$w_{r,t} = w_t z_{r,t} \tag{2}$$

w_t : cost of the homogeneous labor input. $z_{n,t}$/ $z_{r,t}$: productivity of non-rich/ rich labor, evolve according to

$$\omega_{n,t} = \omega_n + d_{n,t} \tag{3}$$

$$\omega_{n,t} = \frac{w_t z_{n,t} N_{n,t}}{w_t z_{r,t} N_{r,t} + w_t z_{n,t} N_{n,t}} \tag{4}$$

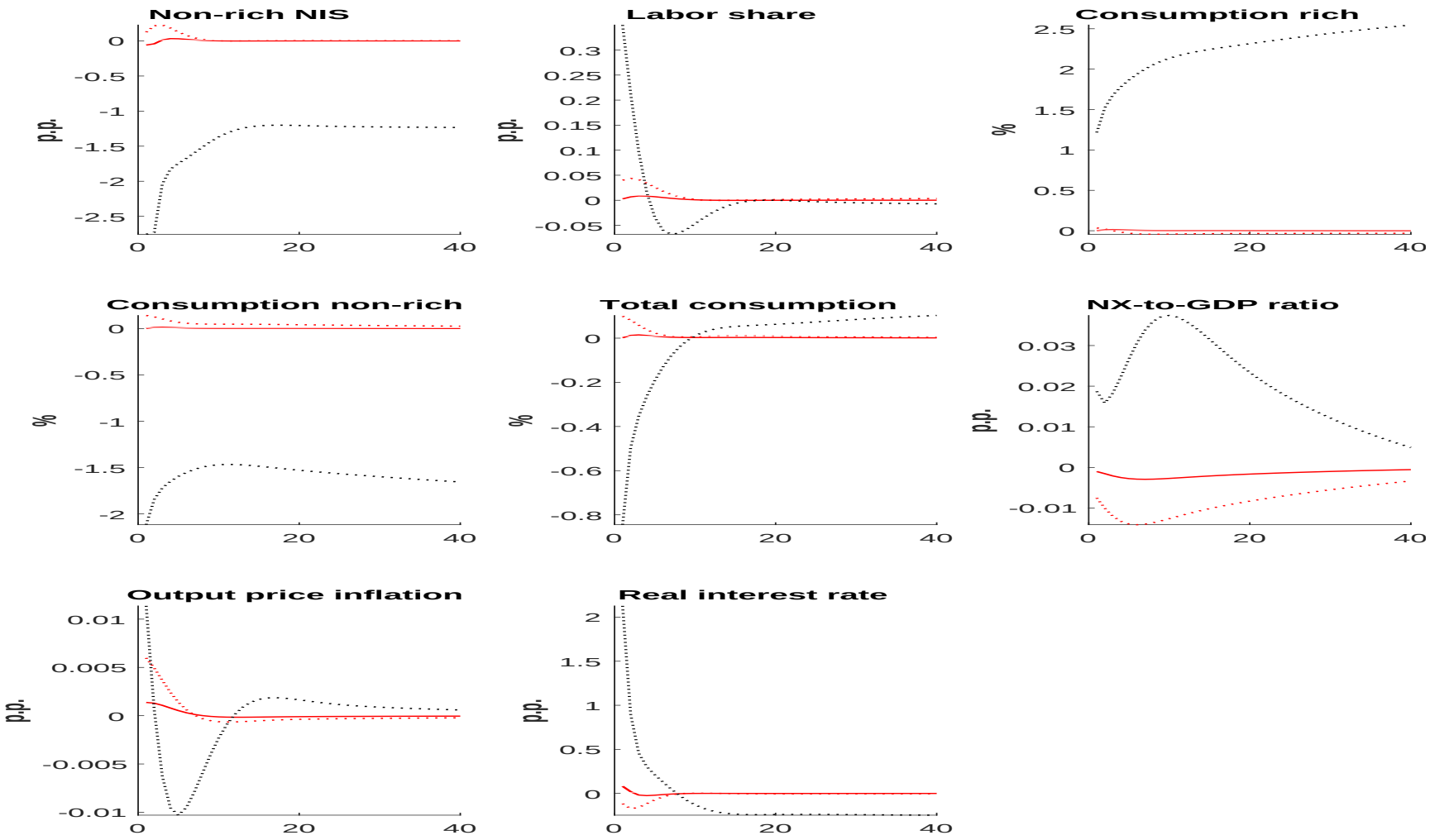
$$1 = \frac{z_{n,t} N_{n,t} + z_{r,t} N_{r,t}}{N_{r,t} + N_{n,t}} \tag{5}$$

- $\omega_{n,t}$: Non-rich share in total labor income.
- Use $d_{n,t}$ to match increases in the top 10% national income share not associated with a decline in the labor share.

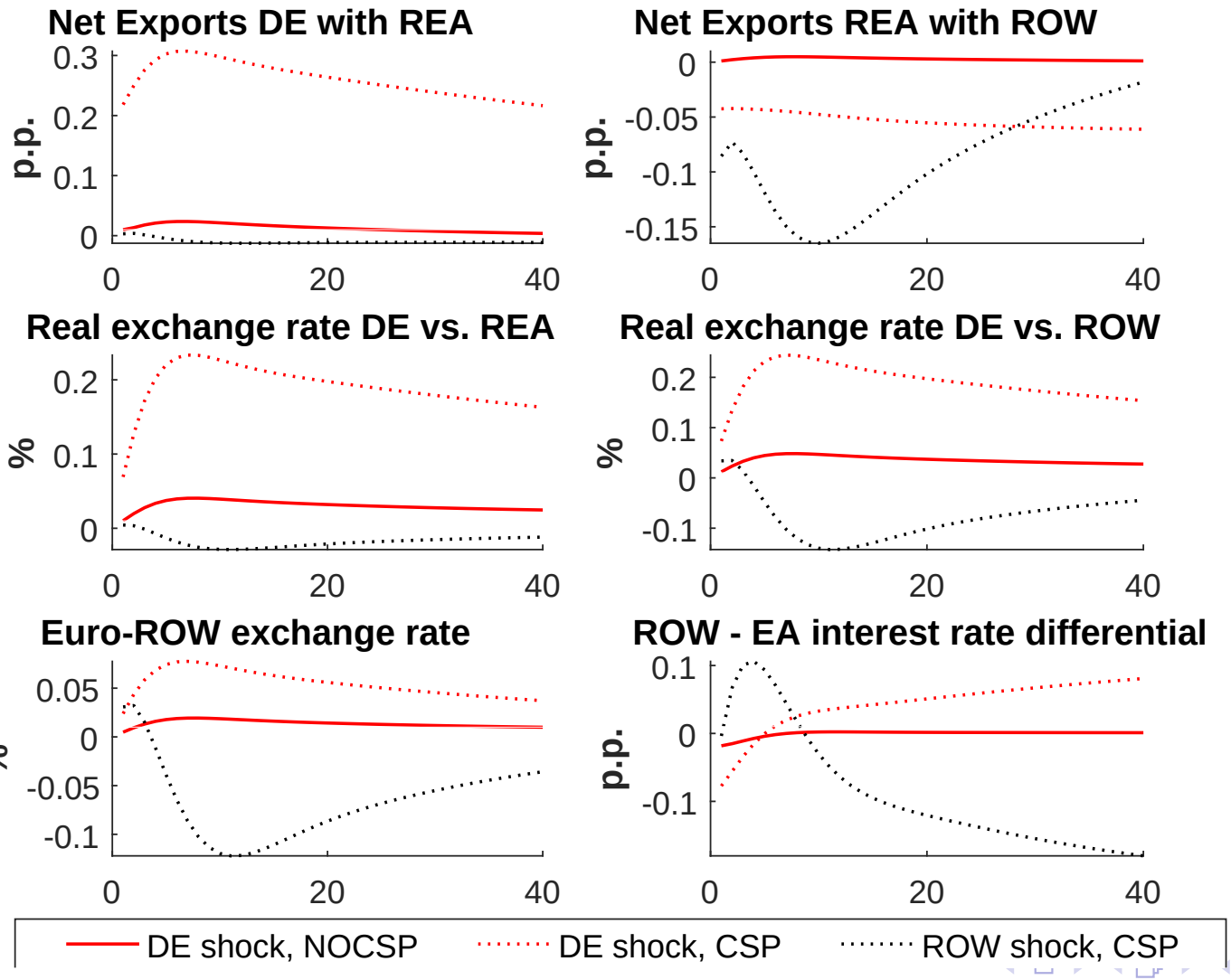
ROW inequality increase intuition

Return

- Effect of ROW inequality increase on DE net exports much smaller and less persistent than the impact of a DE inequality increase on DE net exports.
- Reason: ROW inequality increase causes stronger decline of the local real interest rate due to independent monetary policy and inflation target$\rightarrow$
  - Decline of ROW total consumption and imports only transitory.
  - ROW inflation constant.
- Effect of the arising large and persistent ROW-DE interest rate differential on the Euro-ROW exchange rate neutralized by a large percentage change in the foreign currency asset holdings of all three regions (by contrast: DE inequality increase has a large effect only on the DE rich HH portfolio composition). With CSP: rich households have a preference for the initial share of foreign currency assets in their portfolio.


Non-rich NIS
p.p.
Labor share
p.p.
Consumption rich
%
Consumption non-rich
%
Total consumption
%
NX-to-GDP ratio
p.p.
Output price inflation
p.p.
Real interest rate
p.p.
DE shock, NOCSP
DE shock, CSP
ROW shock, CSP

Permanent inequality increase (wage dispersion) - int. variables



Arrondel, L., Lamarche, P., and Savignac, F. (2019). Does inequality matter for the consumption-wealth channel? empirical evidence. *European Economic Review*, 111:139–165.

Behringer, J. and van Treeck, T. (2018). Income distribution and the current account. *Journal of International Economics*, 114(C):238–254.

Caballero, R. J., Farhi, E., and Gourinchas, P.-O. (2017). Rents, Technical Change, and Risk Premia Accounting for Secular Trends in Interest Rates, Returns on Capital, Earning Yields, and Factor Shares. *American Economic Review*, 107(5):614–620.

Dynan, K. E., Skinner, J., and Zeldes, S. P. (2004). Do the Rich Save More? *Journal of Political Economy*, 112(2):397–444.

Farhi, E. and Gourio, F. (2018). Accounting for Macro-Finance Trends: Market Power, Intangibles, and Risk Premia. *Brookings Papers on Economic Activity*, 49(2 (Fall)):147–250.

Gadatsch, N., Staehler, N., and Weigert, B. (2016). German labor market and fiscal reforms 1999-2008: Can they be blamed for intra-euro area imbalances? *Journal of Macroeconomics*, 50:307–324.

Garbinti, B., Lamarche, P., Savignac, F., and Lecanu, C. (2020). Wealth effect on consumption during the sovereign debt crisis: households heterogeneity in the euro area. Working Paper Series 2357, European Central Bank.

Gruening, P., Theobald, T., and van Treeck, T. (2015). Income inequality and Germanys current account surplus. IMK Working Paper 147-2015, IMK at the Hans Boeckler Foundation, Macroeconomic Policy Institute.

Harrison, G. W., Lau, M. I., and Williams, M. B. (2002). Estimating Individual Discount Rates in Denmark: A Field Experiment. *American Economic Review*, 92(5):1606–1617.

Hochmuth, B., Moyen, S., and Staehler, N. (2019). Labor market reforms, precautionary savings, and global imbalances. Discussion Papers 13/2019, Deutsche Bundesbank.

Hoffmann, M., Kliem, M., Krause, M., Moyen, S., and Å auer, R. (2021). Rebalancing the euro area: Is wage adjustment in germany the answer? *Journal of International Money and Finance*, 119:102497.

Kollmann, R., Ratto, M., Roeger, W., in't Veld, J., and Vogel, L. (2015). What drives the German current account? And how does it affect other EU Member States? *Economic Policy*, 30(81):47–93.

Kumhof, M., Ranciere, R., and Winant, E. O. P. (2022). Income inequality and the current account.

Kumhof, M., Ranciere, R., and Winant, P. (2015). Inequality, leverage, and crises. *American Economic Review*, 105(3):1217–45.

Mian, A. R., Straub, L., and Sufi, A. (2020). Indebted Demand. NBER Working Papers 26940, National Bureau of Economic Research, Inc.

Pleeter, S. and Warner, J. T. (2001). The Personal Discount Rate: Evidence from Military Downsizing Programs. *American Economic Review*, 91(1):33–53.

Rannenberg, A. (2019). Forward guidance with preferences over safe assets. Working Paper 364, National Bank of Belgium.

Rannenberg, A. (2023). The rise in inequality, the decline in the natural interest rate and the increase in household debt. *The International Journal of Central Banking*.

Rotemberg, J. J. (1982). Monopolistic Price Adjustment and Aggregate Output. *Review of Economic Studies*, 49(4):517–531.

Ruppert, K. and Staehler, N. (2022). What drives the german current account? household savings, capital investments and public policies. *Economic Modelling*, 108:105769.

Schoen, M. and Staehler, N. (2020). When old meets young? germany's population ageing and the current account. *Economic Modelling*, 89:315–336.

Schroeder, C., Bartels, C., Goebler, K., Grabka, M. M., and Konig, J. (2020). MillionaerInnen unter dem Mikroskop: Datenluecke bei sehr hohen Vermoegen geschlossen - Konzentration hoeher als bisher ausgewiesen. *DIW Wochenbericht*, 87(29):511–521.

Straub, L. (2017). Consumption, Savings and the Distribution of Permanent Income. Technical report, Harvard University.

Wagner, G. G., Frick, J. R., Schupp, J., et al. (2007). The german socio-economic panel study (soep)–scope, evolution and enhancements. *Schmollers Jahrbuch: Journal of Applied Social Science Studies/Zeitschrift für Wirtschafts-und Sozialwissenschaften*, 127(1):139–169.