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Abstract

We investigate for the case of Germany the positive correlation between the corporate saving glut in the non-financial corporate sector and the current account surplus from a capital account perspective. By employing sign restrictions our findings suggest that mostly labor market, world demand and financial friction shocks account for the joint dynamics of excess corporate saving and the current account surplus. Household saving shocks, in contrast, cannot explain the correlation. We conclude that the corporate saving glut, explained through these factors, is the main driver of the current account surplus.

Keywords: Current account, corporate saving, macro shocks.

JEL codes: E32, F32, F45.

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1 Introduction

The German current account witnessed a rebound from deficits during the 1990s into positive territory in the 2000s and remained above the 6 percent surplus in terms of GDP from 2011 onward, which is, according to the European Commission, a critical threshold that signals macroeconomic imbalances that potentially adversely affects macroeconomic stability.[1] The continued high surplus ignited a heated debate across the Atlantic and within European policy circles, as Germany is continuously blamed to inflict trade deficits on the US and to hinder economic re-balancing within the euro area by the anemic pace of its domestic demand.[2]

In this paper, we study the drivers behind the German current account surplus from a flow of funds perspective. We highlight the role of corporate saving in excess of corporate investment, the so called corporate saving glut.[3] This glut is one suspect behind the weak domestic absorption and thus potentially explains why Germany exports capital at a large scale.

While private households saving in % of GDP slightly declined by 1 percentage point from 1995 onward gross corporate saving in % of GDP in the non-financial sector increased by 6 percentage points from 2000 to 2013 (see Figure 1). At the same time, corporate gross investment expressed as % of GDP declined. Accordingly, the non-financial corporate sector, which has traditionally been a net borrower, has become a net lender, endowed with excess saving, not absorbed by domestic investment or the fiscal deficit.[4] A rise of corporate saving, a well documented fact,

[1] According to the European Commission "'The Macroeconomic Imbalance Procedure aims to identify, prevent and address the emergence of potentially harmful macroeconomic imbalances that could adversely affect economic stability in a particular Member State, the euro area, or the EU as a whole."', see European Commission (2018).

[2] For an early critique from the U.S. Treasury see U.S. Department of the Treasury (2013). Recently, under the Trump administration the conflict escalated and culminated in threats to put import tariffs on car imports from Europe, see CNBC (2018).

[3] See Gruber and Kamin (2015) for details on G7 countries, for OECD countries see Andre et al. (2007).

[4] Note, the net lending position of the government also switched sign from deficit to surplus. This swing is quantitatively important, as deficits accumulated to roughly 3 to 4 percentage points in the early 2000's and become persistently positive from 2013 onward with an average quarterly surplus of 0.76 in % of GDP. Note however, in comparison the surplus in the corporate sector from

see Chen et al. (2017), has taken place in many countries. However, in Germany the increase in corporate saving was quantitatively large enough to proactively enable capital exports, from a flow of funds perspective. Chen et al. (2017) relate the secular trend increase in corporate saving to a decline in the real interest rate, the price of investment, and corporate income taxes. While they succeed to explain the increase in corporate profits and shifts in the sectoral supply of funds their model somewhat counterfactual to the observed data predicts an increase in the investment ratio, although it decline over the last decades.[5]

To our knowledge, we are first to study the German current account from a flow of funds perspective in an open economy VAR framework, focusing on the non-financial corporate sector. The basic idea is that taking a corporate saving glut into account gives additional sign restrictions that are otherwise neglected in related literature.

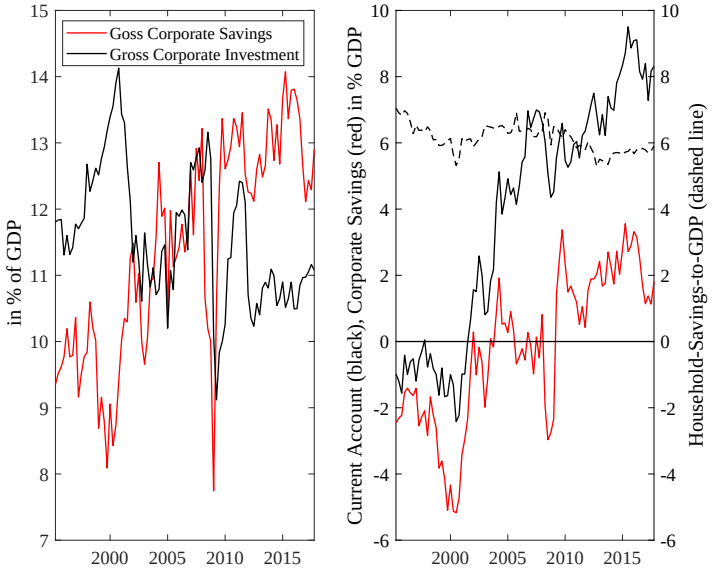


Figure 1: The Corporate Saving Glut and the German Current Account

To state our case we evaluate different hypothesis within an open-economy vector autoregressive (VAR) model. In particular we test which drivers of the business cycle

2013Q2 onward was 3 times larger and accounted for 2.26 in % of GDP.

[5]In particular in France and Italy the non-financial corporate sector still is a net borrower from a flow of funds perspective. In the US in contrast the net lending position of corporates is positive. However, it is more than compensated by the fiscal deficit and the historically low personal saving rate, in particular from 1998 to 2007 (see Gruber and Kamin (2015)).

support a positive correlation between a corporate saving glut and current account surpluses (see Section 2 for details).

To judge the quantitative relevance we apply a sign restriction approach as advocated in Rubio-Ramirez et al. (2010) and Peersman and Straub (2009). We employ a DSGE model to derive robust sign restrictions that explicitly takes financial flows in the non-financial corporate sector into account and gives a role to corporate saving. The model builds on Chen et al. (2017) and Jermann and Quadrini (2012) and features prominently the equity payout and debt repurchase behavior of the corporate sector. Due to tax deductability of capital depreciation and interest expenses the firm is indebted, where the level of corporate debt is tied to a collateral constraint as in Kiyotaki and Moore (1997). This constraint is subject to financial friction shocks that alter the available amount of credit. The model comprises that firms make investment decisions as they own the capital stock. Accordingly, as corporate saving can be used to finance investment, change the amount of outstanding debt or conduct equity operations the model is well suited to highlight the transmission of shocks to corporate saving.[6] The model accommodates business cycle fluctuations of the corporate labor share which enables us to set additional restrictions to disentangle shocks. The labor share responds to the business cycle as firms operate a CES technology and financial frictions distort the distribution of income. As guiding principle we let the data speak for themselves with respect to the ability to support a positive correlation between the corporate-saving-to investment ratio and current account. While we restrict the corporate-saving-to-investment ratio to increase the model remains tacit with respect to the current account. Concretely we identify financial friction shocks, labor supply shocks and world demand shocks. As illustrated in the following section these shocks can be linked to prominent hypothesis that explain the nexus of corporate saving and the current account.

Closest to our paper is Kollmann et al. (2015) who estimate a three region DSGE

[6]Note, in the standard Smets and Wouters (2007) style of model firms do not save as households own the capital stock and all profits are distributed to households that own the firms.

model by using Bayesian techniques.[7] They find that shocks to the German private saving rate, shocks to world demand and and labor market reforms were the main drivers of the current account. However, they do not decompose saving-rates into sectors and thus do not focus on the corporate saving in the non-financial sector. Explicitly taking into account flows in the non-corporate sector and business cycle fluctuations in the corporate labor share allows us to set additional restrictions in our empirical analysis compared to Kollmann et al. (2015). Our findings suggest that labor market shocks likely attached to reforms, world demand shocks linked to the idea that German exporters meet the global demand in an expanding world economy better than other countries and financial frictions connected with the idea of precautionary saving in the non-financial sector contribute to enlighten the nexus of a corporate saving glut and the current account. In sum, these shocks have boosted gross saving in the German non-financial corporate sector without leading to a boom in gross domestic capital formation, which in turn promoted weak domestic demand, and capital exports. Based on our identification strategy we can dismiss a private saving shock as the main driver, which is a popular candidate shock in the literature. Put differently, neglecting restrictions in the corporate sector biases results towards a private saving shock. This is an important finding with respect to policy implications.

[7]Somewhat loosely related to our paper is Tan et al. (2015) who investigate in a cross country panel framework including 66 countries the nexus between corporate saving and current account imbalances. They report that on average in countries with a less developed financial system firms have strong precautionary saving motives which makes these countries to be more likely to run current account surplussed. We implicitly pick up there ideas by analyzing financial friction shocks that might give rise to precautionary saving.

2 Corporate Saving and Current Account Cycles in the Germany Economy

It is a useful exercise to provide two definitions of gross corporate saving, which are two sides of the same coin. Looking at the national account from a *generation of income perspective* gross corporate saving is defined as [8]

$$\begin{aligned}\text{Gross Corporate Saving} = \text{Gross Value Added} - \text{Labor Cost} - \text{Production Taxes} \\ - \text{Net Interest} - \text{Taxes, Rent, and Other} - \text{Net Dividends},\end{aligned} \tag{1}$$

where the gross corporate saving denote the available resources after paying labor services, taxes, net interest and net dividends from gross value added. Looking at corporate saving from a *capital account perspective*, we can identify the following uses of saving

$$\text{Gross Corporate Saving} = \text{Gross Capital Formation} + \text{Net Lending} + \text{Other Uses}, \tag{2}$$

which are investment, net lending and other uses which comprise quantitatively items of minor importance such as changes in inventories. For the empirical analysis we construct a variable that proxies a corporate saving glut based on Equation 2 by dividing both sides of the Equation by gross capital formation.

$$\frac{CS}{CINV} = 100 * \left(\frac{\text{Gross Corporate Saving}}{\text{Gross Capital Formation}}\right) = 100 * \left(1 + \frac{\text{Net Lending} + \text{Other Uses}}{\text{Gross Capital Formation}}\right), \tag{3}$$

where values above 100 indicate that corporates save beyond the capital needs to finance investment, whereas values below 100 imply that corporates are net lenders.

[8] See Data Documentation for data sources.

Increases in corporate saving itself, in contrast, might be investment driven and do not necessarily indicate a saving glut.[9]

Table 1 reports correlations of the gross-corporate-saving-to-investment ratio and corporate saving in % of GDP with the current account in % of GDP and GDP. The statistics are computed with HP filtered data with smoothing factor 1600 so that the latter primarily reflect business cycle fluctuations rather than trends. Correlations between the current account (% of GDP) and corporate saving (% of GDP) are positive and fairly high and consistent with the view that high saving in the corporate sector go alongside with capital exports. Interestingly, the corporate saving-to-investment ratio is negatively correlated with GDP, while corporate saving (% of GDP) are largely uncorrelated. This could be interpreted as being consistent with the idea that a saving glut in the corporate sector dampens domestic activity. Corporate-saving (% of GDP) in contrast is insignificant as it may either measure investment which stimulates economic activity or precautionary savings which dampens economic activity.

Table 1: Business Cycle Properties of Corporate Saving

	Corr($\frac{CS}{CINV}$,Variable)	**Corr($\frac{CS}{GDP}$,Variable)**
GDP	-0.41^{***}	0.11
CA (% of GDP)	0.58^{***}	0.53^{***}

Note: The table reports correlations of the corporate-saving-to-investment ratio and corporate saving with GDP and the current account with quarterly data. All series are HP-filtered prior to measuring correlations. The data range is 1995Q1 to 2017Q4. See data Appendix for details.*** denotes significance at the 1% level.

2.1 Wage Moderation and Labor Market Reforms

Germany witnessed from 1995 to 2017 a strong increase in employment by round about 15 percentage points. While from 1995 to 2006 employment remained more

[9]Empirically, the variable stayed permanently above 100 from 2009Q2 while it went through its trough at the early 2000's with a value of 62.

or less at the 1995 level, it took off from 2006 onward (Bundesagentur fur Arbeit (2018)). At the same time labor unit costs plunged down by over 10 percentage points (Berger and Wolff (2017)). Overall the corporate labor share, in particular prior to the Great Recession, sharply dropped by almost 12 percentage points from 63 to 51, before increasing again to 57 in 2017. Already in the mid $90's$ when globalization and skill based technological change kicked in German Trade Union Federation showed willingness to support wage moderation to keep the German industry away from off-shoring production at a large scale to low cost countries.[10] However, the establishment of a global value chain and outsourcing, in particular to Eastern Europe depleted trade unions memberbase and weakened their bargaining power (Dustmann et al. (2014))[11]. Nominal and real wage growth in Germany has been remarkably lower from 1995 onward than in other countries (Berger and Wolff (2017)). The so called "'Hartz IV Reforms"', from 2003 to 2005, that focused on labor market deregulation, also contributed to wage moderation in Germany.

Equation 1 implies that a decline in the labor share increases corporate saving as less funds are diverted from gross value added. Therefore, we state the hypothesis, that wage moderation and labor market reforms contributed to the rise in corporate saving in Germany and lead to a corporate saving glut as domestic corporate investment in % of GDP remained at historically low levels. Basically this hypothesis builds in the notion that the rise in corporate saving and the decline in the corporate labor share are two sides of the same coin.[12]

2.2 Financial Friction Hypothesis

A second prominent hypothesis, which we label as *financial friction hypothesis*, states that frictions in the credit supply provided by the financial sector to corporates play

[10]Early initiatives at the time were labeled "'Alliance for Labor"' (Bündnis für Arbeit).

[11]See Organisation for Economic Co-operation and Development (2013).

[12]The interrelationship between corporate saving and the decline in the labor share is also at the heart of the following papers: Neiman (2014) and Chen et al. (2017).

a key role. In particular, during the Great Recession of 2008/09 corporates had to pay rocket soaring risk premiums reflecting a shortfall of available funds at low rates of interest (Fiore and Uhlig (2015)). Beyond that, additional narrative is that a tightened banking regulation associated with Basel II and Basel III led to a more restrictive credit supply as the banking industry retained funds to strengthen balance sheets. Both arguments reflect the prominent role of the financial sector in shaping the business cycle. Adverse shocks to the available amount of credit, for e.g., a given amount of collateral, are a cause of recessionary shocks, where corporates cut back investment, hours worked, equity payouts and increase corporate saving. Following Jermann and Quadrini (2012) we label these shocks as *financial friction shocks*. In response corporates have a precautionary saving motive and hoard stockpiles of short term assets as a buffer stock to dampen adverse shocks. Corporate saving may have also been fostered by a decline in relative investment prices. It is well documented that the relative price index of investment goods declined since the beginning of the 1980's. The dark side of falling investment prices is that falling prices reduce the collateral value of capital and thus operate like financial friction shocks. The rise of corporates that us at a large scale intangible capital also operates into the same direction as in contrast to tangible capital the financial industry may not accept intangibles as collateral (see Falato et al. (2013)).

Adverse financial friction shocks are recessionary and constitute a negative correlation between GDP and corporate saving, which orthogonalizes financial friction shocks from labor market shocks. Accordingly, we test the hypothesis if financial friction shocks support the positive correlation between a corporate saving glut that goes alongside with capital exports.

2.3 World Demand and Germany's Exports

A third hypothesis, which we label as *booming world demand hypothesis*, states that German exporters meet world demand better with their products than other

countries (see Schuknecht (2014)). In this view Germany's current account surplus reflects primarily the high quality of German products. We test the hypothesis if a booming world economy boosts the corporate-saving-to investment ratio and gives rise to net capital exports. Implicitly this hypothesis rests on the notion that revenues are not absorbed by a higher wage share. This view is supported by the DSGE model that robustly indicates that the wage share declines after a shock to net exports. By focusing on the current account we explicitly view the operation of multinational firms through the lens of national accounts. This implies that production, profits and investment are only relevant for our analysis if operation attached to exports takes place in Germany. This explicitly excludes for example the operation of a German subsidiary in China. However, subsidiaries become relevant as so far as they change the net foreign asset position and are a source of cross boarder income streams.

We can identify net export shocks as they are orthogonal to financial friction shock that imply a negative comovement between GDP and corporate-saving-to investment ratio. It can also be disentangeled from the labor market shock as it is a demand side disturbance whereas labor market shocks are a supply side disturbance predicting a negative correlation of output and prices.

2.4 Other Suspects

There are at least two other hypothesis, which will be addressed in the robustness Section 6.1. Among them the view, which may be labeled as *private saving* or *saving glut hypothesis*. It builds on the idea that the anemic pace of domestic demand is the key to the German current account surplus. Through the lens of a flow of funds perspective slack shocks in Germany, pushed domestic saving against the backdrop of believe of higher returns on investment abroad. This hypothesis is reminiscent of

the idea connected to the so called saving glut.[13] German private investors sought profitable investment opportunities in particular in the European periphery and the US housing market, while investment activity and consumption in Germany was low (see Maas et al. (2018)). This view also encompasses the notion that capital exports may reflect private households retirement savings plans due to Germany's aging population. In contrast to a financial friction shock the slack shock implies a positive correlation between corporate saving and GDP and thus, both shocks can be easily disentangled. Additionally a slack shock implies an increase in the corporate labor share, while a labor market shock predicts a decrease. The same argument applies to a world demand shock (see model section). To foreshadow results, we do not find evidence that private household saving rates were the driver behind Germany's capital exports (see Section 4.3).

Additionally, for reasons of completeness, we also investigate the role of TFP shocks, as they are considered to be one of the main drivers of the business cycle.

3 Model

This section presents the DSGE model we implement to derive robust sign restrictions for the corporate saving-to-investment ratio[14]. Based on these restrictions the quantitative empirical analysis and inferences is performed by a structural VAR. The theoretical model builds on Jermann and Quadrini (2012) augmented by minimalistic open economy features. In particular, an exogenous demand shifter in the resource constraint reflects shocks to net exports. Note, that the theoretical model by construction remains tacit with respect to the response of the current account

[13]Note, the term saving glut shock originally refers to the idea that money was flowing uphill from China to the US, due to a limited amount of financial instruments in China and thus an underdeveloped financial system. Bernanke argued that these flows of fund depressed saving rates in the US as interest rates on capital markets dropped in response to the increased amount of available funds. As consequence US housing and capital markets overheated.

[14]For related literature that also follows a strategy of using robust sign restrictions see for instance: Peersman and Straub (2009) and Enders et al. (2011).

to other shocks. The empirical VAR analysis, however, can explicitly capture the current account response. Accordingly, we let the data speak for themselves to investigate the nexus between a corporate saving glut and the current account.

To describe corporate saving the model tracks corporate investment and debt repurchases (see Chen et al. (2017)). Consistent with empirical evidence equity payouts adjust sluggish to the business cycle as in Jermann and Quadrini (2012). Due to tax deductability of interest expenses, firms prefer debt over equity, however, the volume of debt is tied to a collateral constraint that is subject to financial friction shocks. Financial frictions spillover to labor demand an investment decisions as firms are restricted by intraperiod loan constraints. We also allow for shocks to labor supply in households preferences. These shocks are consistent with an increase in hours worked, while wages evolve below trend. A CES production technology allows explicitly for variations in the corporate labor share. This modeling choice is motivated by the stylized fact, that the labor share was not constant, but rather declined between 1995 and 2018. To control for other shocks that drive the business cycle we also identify technology shocks and private saving shocks. Controlling for these shocks is important as it is well known that linear combinations of omitted structural shocks might distort identified impulse response and forecast error variance decompositions.

3.1 Firms

Building on Chen et al. (2017) there is a continuum of symmetric firms in the [0,1] interval that operate a CES production technology

$$y_t(i) = a_t \left(\alpha_k k_{t-1}(i)^{\frac{\theta-1}{\theta}} + \alpha_n n_t(i)^{\frac{\theta-1}{\theta}} \right)^{\frac{\theta}{\theta-1}}, \tag{4}$$

defining the flow of gross revenues $y_t(i)$. $k_{t-1}(i)$ denotes the capital stock that is operative in period t and $n_t(i)$ denotes hours worked, where households draw income

from renting out labor services to firms.$\theta > 0$ is the elasticity of substitution between capital and labor, and α_k and α_n are free parameters to calibrate in particular the labor share.[15] a_t denotes total factor productivity that is assumed to follow an exogenous AR(1) shock, with $\log(a_t) = (1-\rho_a)\log(\bar{a}) + \rho_a a_{t-1} + \epsilon_{a,t}$ with $\epsilon_{a,t} \sim \mathcal{N}(0, \sigma_a)$ and $\rho_a > 0$. The CES technology implies that the corporate labor share $s_{L,t}(i)$ defined as

$$s_{L,t}(i) = \frac{w_t n_t(i)}{y_t(i)}, \tag{5}$$

is endogenous over the business cycle, where w_t defines the real wage. Firms own the stock of capital that evolves according to

$$k_t(i) = (1-\delta)k_{t-1}(i) + i_t(i) - \frac{\varrho}{2}\left(\frac{i_t(i)}{i_{t-1}(i)} - 1\right)^2 i_t(i), \tag{6}$$

where $i_t(i)$ denotes investment. δ is the quarterly depreciation rate and investment adjustment costs $S = \frac{\varrho}{2}\left(\frac{i_t(i)}{i_{t-1}(i)} - 1\right)^2 i_t(i)$ are modeled as in Christiano et al. (2005). It holds $S() = S'() = 0$, and $S'' > 0$. Firms use equity and debt as sources of funds to finance their business. Debt, $b_t(i)$ is preferred to equity due to tax deductability as in Hennessy and Whited (2005), pecking order theory. The effective gross interest rate R_t for raising long term debt is

$$R_t = 1 + r_t(1-\tau), \tag{7}$$

where τ reflects the marginal tax benefit. We follow Jermann and Quadrini (2012) and assume that the wage bill $w_t n_t(i)$, payments to finance investment $i_t(i)$, equity payouts to shareholders, $d_t(i)$, and net financial flows to bondholders, $b_t(i) - b_{t+1}(i)/R_t(i)$, are settled in advance of production.[16] Accordingly, the firm needs to

[15] See Cantore et al. (2015) for details on the calibration strategies for CES production functions. In the limit, for θ converging towards 1 the Cobb-Douglas function is obtained

[16] Note as the signs of equity operations d_t is not restricted to be strictly positive negative signs denote equity buybacks or the emission of new stocks.

take up intraperiod loans according to

$$l_t(i) = w_t n_t(i) + i_t(i) + b_t(i) - b_{t+1}(i)/R_t + d_t(i), \tag{8}$$

and the flow of funds constraint reads

$$i_t(i) + \varphi\left(d_t(i)\right) + b_t(i) = (1-\tau)(y_t(i) - w_t n_t(i)) + \frac{b_{t+1}(i)}{R_t} + \delta\tau k_{t-1}(i), \tag{9}$$

where investment, equity operations $\varphi\left(d_t(i)\right)$ and debt services are funded with gross operating after tax profits $(1-\tau)(y_t - w_t n_t)$, the tax shield $\delta\tau k_{t-1}$ and fresh debt $\frac{b_{t+1}}{R_t}$. The volume of short term funds, $l_t(i)$, is restricted by a collateral constraint

$$\xi_t \left(k_t(i) - b_{t+1}(i) \left(\frac{1-\tau}{R_t - \tau} \right) \right) \geq l_t(i) = y_t(i). \tag{10}$$

ξ_t reflects financial friction shocks.[17] It is assumed to follow $log\left(\xi_t\right) = (1-\rho_\xi)\, log\left(\bar{\xi}\right) + \rho_\xi \xi_{t-1} + \epsilon_{\xi,t}$ with $\epsilon_{\xi,t} \sim \mathcal{N}(0, \sigma_\xi)$ and $\rho_\xi > 0$. Corporate dividend policy is guided by dividend smoothing (see Marsh and Merton (1987)). The commitment to shareholders towards stable dividend streams in advance of production given a binding collateral constraint forces firms to adjust expenses for labor, investment and debt in response to business cycle shocks. To formalize the idea of financial rigidities we follow Jermann and Quadrini (2012) and use the following cost function as shortcut

$$\varphi\left(d_t(i)\right) = d_t(i) + \kappa_d \left(d_t(i) - \bar{d}\right)^2, \tag{11}$$

where $\bar{d}$ denotes the steady state of dividends and κ_d scales the dividend adjustment cost. In a broader sense κ_d measures the flexibility of the firm in changing its funding

[17] Literally, following Jermann and Quadrini (2012) ξ_t is the probability ξ_t the lender will be able to seize firm capital in the case of bankruptcy and with probability $1 - \xi_t$ the lender will not be able to recover the loans.

structure in terms of equity versus debt. Accounting profits read

$$\Pi_t(i) = (1-\tau)\left(y_t(i) - w_t n_t(i)\right) - b_t(i)\left(1 - \frac{1}{R_{t-1}}\right) + \delta\tau k_{t-1}(i), \tag{12}$$

where $b_t(i)\left(1 - \frac{1}{R_{t-1}}\right)$ measures the implicit interest rate cost implied by the zero bond. Corporate saving is defined as profits minus dividends $s_t^c(i) = \Pi_t(i) - d_t(i)$. By subtracting Equation (9) from Equation (12) we get

$$s_t^c(i) = i_t(i) + \left(\frac{b_t(i)}{R_{t-1}} - \frac{b_{t+1}(i)}{R_t}\right). \tag{13}$$

Thus, in line with Equation 2 from a capital account perspective corporate saving is used to finance investment, changes in the level of outstanding debt and implicitly equity operations.[18] The optimization program of the firm reads

$$Max_{k_t(i),n_t(i),i_t(i),d_t(i),b_{t+1}(i)} \sum_{k=0}^{\infty} \tilde{\beta}^{t+k} \Delta_{t+k} d_{t+k}(i) \tag{14}$$

subject to the capital accumulation equation 6, the collateral constraint 10 and the flow of funds constraint 9. $\Delta_t = U_{c,t}(j)$ is the marginal utility of households that own the firm sector and $\tilde{\beta}^{t+k} = \zeta_{\beta,t}\beta$. $\zeta_{\beta,t}$ denotes an exogenous shock to the discount factor and logarithmically follows $\log(\zeta_{\beta,t}) = \rho_\beta \log(\zeta_{\beta,t-1}) + \epsilon_{\beta,t}$, with $\epsilon_{\beta,t} \sim \mathcal{N}(0, \sigma_\beta)$ and $\rho_\beta > 0$. $\mu_t^k(i)$ denotes the Lagrange multiplier attached to the capital accumulation equation, $\mu_t^c(i)$ is associated with the flow of funds constraint and $\mu_t^f(i)$ is linked to the enforcement constraint. The first-order conditions for $n_t(i)$, $k_t(i)$, $i_t(i)$, $b_{t+1}(i)$ and $d_t(i)$ are

labor $n_t(i)$

$$\frac{\partial y_t}{\partial n_t} = \frac{w_t}{1 - \frac{\varphi'(d_t)}{1-\tau}\mu_t^c}, \tag{15}$$

[18] Implicitly, in steady state it holds that corporate saving equals corporate investment $\bar{s}^c(i) = \bar{i}$, assuming a stationary corporate debt to GDP ratio.

capital $k_t(i)$

$$Q_t = E_{t+1}\left(m_{t+1}\frac{\varphi'(d_t)}{\varphi'(d_{t+1})}\left((1-\delta)Q_{t+1} + \frac{\partial y_{t+1}}{\partial k_t}\left(1-\tau-\mu^c_{t+1}\varphi'(d_{t+1})\right)+\delta\tau\right)\right) + \varphi'(d_t)\mu^c_t\xi_t \tag{16}$$

investment $i_t(i)$

$$1 = Q_t(1-\varrho\left(\frac{i_t}{i_{t-1}}-1\right)\frac{i_t}{i_{t-1}} - \frac{\varrho}{2}\left(\frac{i_t}{i_{t-1}}-1\right)^2) + E_t\left(m_{t+1}\frac{\varphi'(d_t)}{\varphi'(d_{t+1}}Q_{t+1}\varrho\left(\frac{i_{t+1}}{i_t}-1\right)\left(\frac{i_{t+1}}{i_t}\right)^2\right) \tag{17}$$

bonds $b_{t+1}(i)$

$$R_tE_t\left(m_{t+1}\frac{\varphi'(d_t)}{\varphi'(d_{t+1})}\right) + \xi_t\mu^c_t\varphi'(d_t)\frac{R_t(1-\tau)}{R_t-\tau} = 1, \tag{18}$$

where $\mu^f_t = \frac{1}{\varphi'(d_t)}$ and $m_{t+1} = \beta E_t\left(\frac{\zeta_{\beta,t+1}}{\zeta_{\beta,t}}\frac{\Delta_{t+1}}{\Delta_t}\right)$ is the stochastic discount factor of shareholders. Symmetry holds in the firm sector. In Equation (15) $\frac{\varphi'(d_t)}{1-\tau}\mu^c_t$, measures the distortions due to financial frictions, with $\varphi'(d_t) > 0$, $\mu^c_t > 0$ and tax distortions, $\tau > 0$. The marginal product of capital and labor are $\alpha_k\left(\frac{y}{k}\right)^{1/\theta}$ and $\alpha_n\left(\frac{y_t}{n_t}\right)^{1/\theta}$ respectively. Equation (18) reflects that the collateral constraint tightens when the flexibility between equity and debt financing decreases, with $\varphi'(d_t) > 0$ (see Jermann and Quadrini (2012)). Equation (15) implies for the labor share is

$$\frac{w_tn_t}{y_t} = s_{L,t} = \left(1-\mu_t\frac{\varphi'(d_t)}{1-\tau}\right)\alpha_n\left(\frac{y_t}{n_t}\right)^{\frac{1-\theta}{\theta}}, \tag{19}$$

and reflects that it responds to business cycle fluctuations due to the CES technology and due to financial frictions $\varphi'(d_t) > 0$.

3.2 Households

The household sector consists of infinitely lived households. They own the firm sector and draw income from interest and dividend payments on its accumulated wealth and rent out labor services. The intertemporal utility function reads

$$Max_{c_t(j),s_t(j),b_{t+1}(j),n_t(j)} E_0 \sum_{k=0}^{N} \tilde{\beta}_{t+k}^k \left(\frac{(c_{t+k})^{1-\sigma}}{1-\sigma} - \nu \epsilon_t^\nu \log\left(1 - n_t(j)\right) \right). \tag{20}$$

Consumption $c_t(j)$ increases utility, while labor $n_t(j)$ decreases utility. ϵ_t^ν is a shock to labor disutility, where $\log\left(\epsilon_{\nu_t}\right) = (1-\rho_{\epsilon_\nu})\, log\left(\bar{\epsilon}_\nu\right) + \rho\epsilon_\nu \nu_{t-1} + \epsilon_{\nu,t}$ with $\epsilon_{\nu,t} \sim \mathcal{N}(0, \sigma_\nu)$ and $\rho_\nu > 0$. σ reflects the degree of risk aversion. $\tilde{\beta}_t^k = \zeta_{\beta,t}\beta_t^k$ denotes the discount factor as described beforehand. The budget constraint reads

$$c_t(j) + s_{t+1}(j)p_t(j) + \frac{b_{t+1}(j)}{(1+r_t)} + T_t(j) = w_t n_t(j) + b_t(j) + s_t(j)\left(d_t(j) + p_t(j)\right), \tag{21}$$

where $s_t(j)$ denotes the amount of shares, $p_t(j)$ is the share price, and $T_t(j)$ reflects firm taxes rebated to owners with $T_t(j) = \tau\left(y_t(j) - w_t n_t(j)\right) - \delta\tau k_{t-1}(j)$. Optimization with respect to $b_{t+1}(j)$, $s_{t+1}(j)$, $c_t(j)$ and $n_t(j)$ yields:

bonds $b_{t+1}(j)$

$$1 = E_t\left(m_{t+1}\frac{\zeta_{\beta,t+1}}{\zeta_{\beta,t}}\right)\left(\frac{R_t - \tau}{1-\tau}\right), \tag{22}$$

stocks $s_{t+1}(j)$

$$p_t = E_t\left(m_{t+1}\left(p_{t+1} + d_{t+1}\right)\right), \tag{23}$$

labor $n_t(j)$

$$w_t = \frac{\nu_t}{(1-n_t)} c_t. \tag{24}$$

Due to contingent claims markets symmetry applies in the household sector.

3.3 Market Clearing

The symmetric equilibrium of the economy is characterized by a sequence of prices and quantities such that firms and households optimize their values functions, the government budget constraint holds, and goods, labor, and capital markets clear. The following aggregate resource constraint holds:

$$y_t = c_t + i_t + g_t + nx_t, \tag{25}$$

where nx_t denotes a net export demand shifter that is governed by an exogenous AR(1) shock, with $\log(nx_t) = \rho_{nx} nx_{t-1} + \epsilon_{nx,t}$ with $\epsilon_{nx,t} \sim \mathcal{N}(0, \sigma_{nx})$ and $\rho_{nx} > 0$. The model satisfied a stationary equilibrium in which all (detrended) aggregate variables are constant according to the calibration strategy as outlayed in Section 3.6.

3.4 Generating Sign Restrictions

As in Peersman and Straub (2009) and Enders et al. (2011) we approximate the equilibrium conditions around a deterministic steady state and generate signs restrictions by simulating impulse responses based on 10,000 draws of parameter vectors from uniformly distributed random values within specified intervals. To discriminate shocks at the fist stage at least one common and one opposed impulse response at a specified horizon should robustly prevail from the impulses by pairwise comparison to identify orthogonal shocks in the second stage in the data.

3.5 Exogenous Process

We implement the shock processes as follows.

- The *households saving shock* $\zeta_{\beta,t}$ is modeled as standard as a shock to the stochastic discount factor m_{t+1} (see Sa and Wieladek (2015)). See Equation

(20).

- A *financial friction shock* ξ_t is modeled as in Jermann and Quadrini (2012) as a shock to the collateral constraint (10).
- The *technology shocks* a_t is implemented in the production function, Equation (4).
- The labor *supply shock* ν_t enters Equation (24) and shifts the labor supply curve.
- A *shock to world demand* shifts the aggregate ressource constraint in Equation (25).

3.6 Calibration Strategy

The calibration strategy targets to reflect the corporate debt to GDP ratio, where 3.67 denotes the sample average in the non-financial corporate sector in Germany. Based on Equation 10 for each draw ξ is determined numerically such that Equation 26 holds.[19]

$$3.67 - \left(\frac{\xi}{1+r} / y \right) = 0, \tag{26}$$

Parameters that describe the household sector are centered around the baseline values as reported in Jermann and Quadrini (2012). The discount factor is set to 0.9825. σ that reflects the degree of risk aversion ranges between 1.00 to 4.00. The time budget allocated to work is $n = 0.3$, where the preference parameter ν adjusts such that the target holds.

In the firm sector, consistent with Cantore et al. (2015) we calibrate the CES production function such that variations in the elasticity of substitution parameter

[19] Details of the steady state calibration are explained in Appendix: Steady State Solution Strategy using a CES Technology.

Table 2: Calibration

Param.	Description	Range
θ	CES: Elasticity of Substitution prod. function	[1.15, 1.45]
σ	Risk aversion	[1.00, 4.00]
ϱ	Investment adjustment cost	[3.00, 5.00]
κ_d	Payout Cost parameter	[0.10, 0.50]
α_k	Production Technology: Capital	[0.225, 0.30]
ρ_a	AR(1) technology shock	[0.95, 0.99]
ρ_ξ	AR(1) enforcement constraint	[0.95, 0.99]
ρ_{q^i}	AR(1) inv. price shock	[0.90, 0.98]
ρ_β	AR(1) Saving glut shock	[0.90, 0.99]
ρ_ν	AR(1) Labor supply shock	[0.90, 0.99]
B/Y	Corporate Debt to GDP ratio	3.67
β	Discount factor	0.9825
$\bar{s}_{Lss}$	Steady State labor share	0.68
δ	Depreciation rate of capital	0.025
τ	Corporate tax rate	0.30
$\bar{n}$	Steady state work load	0.30

Note: The table displays the calibrated values and the parameter ranges employed to simulate the model. Range denotes interval from which parameter values are drawn for each simulation of the model.

θ do not shift the labor share. We set the steady state labor share $\bar{s}_L$ to 0.68, which is the sample average. The elasticity of substitution θ ranges between 1.15 to 1.45, that well comprises the value of 1.25 used in Chen et al. (2017). Output is normalized to one in the steady state. We let the steady state TFP adjust such that the production function holds. The free parameter α_n adjusts such that θ is consistent with the targeted labor share. For parameters related to the capital share and the depreciation rate we proceed as follows. We set the quarterly depreciation rate to $\delta = 0.025$ (see Christiano et al. (2005)). The parameter α_k ranges from 0.225 to 0.30 scaling the capital to output ratio and implicitly the rate of return on capital. As the model does not comprise the notion of rental markets for capital, the implicit return on capital can be determined as $R^k = (1 - \bar{s}_L)\frac{y}{k})$. Consistent with Christiano et al. (2005) we set the range of the investment adjustment cost parameter from 3 to 5. The equity payout cost parameter ranges from 0.1 to 0.50 (see Jermann and Quadrini (2012)). τ, the corporate tax rate, is set to 0.30 that is the sample average in Germany (see Spengel et al. (2007)). Table 2 summarizes the parameter values employed to simulate the impulses.

3.7 Shock Propagation

Figure 2 displays the baseline impulse responses to five structural shocks. For easy comparison across shocks, we require that each shock triggers an increase in the corporate-saving-to-investment ratio. The exercise comprises a financial friction shock, a labor supply shock, a world demand shock, a private saving glut shock and a TFP shock. The basic idea is that each disturbance can be disentangled from all other shocks by pairwise comparison of the impulse response functions in terms of signs.

The first column in Figure 2 reflects the adjustment to a financial friction shock. Financial friction shocks move the corporate-saving-to-investment ratio and GDP into opposite directions. The emergence of a corporate saving glut goes alongside

with a recession. A negative financial shock tightens the flow of funds constraint and firms downscale their operating business. Due to a drop in collateral value long term debt declines and firms partially attenuate the shortfall in funds by cutting equity payouts (see Jermann and Quadrini (2012)). The countercyclical pattern of GDP and the corporate-saving-to-investment ratio allows the financial friction shock to be disentangled from other shocks that predict a positive comovement. We leave it to the structural VAR to reveal the current account response.

The second column displays the adjustment path of the economy in response to a labor supply shock. Typically the boom in the economy goes alongside with an increase in hours and a decrease in the real wage. The model predicts a decline in the labor share along the adjustment path. In contrast to a financial friction shock the labor supply shock implies a positive correlation between GDP and the corporate-saving-to-investment ratio.

The third column displays the impulses in response to a shock to net exports. The boom in the domestic economy leads firms to retain earnings and the wage share decreases. Excess funds are used to buyback outstanding debt, which leads to a decline in the corporate debt-to-GDP ratio. As a shock to net exports is a demand side disturbance it can easily be disentangled from supply side shocks. In contrast to a financial friction shock it predicts a positive comovement between GDP and the corporate-saving-to-investment ratio.

The fourth panel in Figure 2 displays a private saving glut shock. Essentially a saving glut shock predicts a positive comovement of GDP and the corporate-saving-to investment ratio. The panel displays the characteristic pattern that the corporate sector deleverages and that equity payout evolves sluggish compared to the evolution of GDP. The shock can be identified by pairwise comparison as it predicts an increase in the labor share.

The last columns of Figure 2 displays that a positive TFP shock leads to a comovement between corporate saving-to-investment and GDP. Thus alongside the

expansion corporates accumulate profits. In line with Jermann and Quadrini (2012) the model predicts that hours move counter-cyclical to GDP, which helps to identify the shock by pairwise comparison from a labor supply shock. Obviously financial friction hinders GDP from expanding at a pace that fosters a positive gap in hours in the light of enhanced productivity. Due to the sluggish evolution of equity payouts alongside the expansion corporate saving increase companies deleverage. The model implies that the labor share declines, which is consistent with results reported in Cantore et al. (2015).

The identified sign restrictions are summarized in Table 3. For the baseline scenario, that comprises financial friction shocks, labor supply shocks and world demand shocks we impose sign restrictions for three quarters on the macrovariables, two quarters on the debt repurchase ratio and just one quarter on the corporate-saving-to-investment ratio, consistent with the derived theoretical impulses.[20] As additional information, taken from outside the model, we draw on the general wisdom that for demand side disturbances inflation and output move in the same direction while for supply shocks inflation and output move in opposite directions. We need to impose this additional restriction to disentangle the world demand shock from the two supply side shocks, namely the labor supply shock and the technology shock.

4 Empirical Methodology

In this section, we empirically analyze the effects of aggregate shocks on the corporate saving-to-investment ratio in Germany and their ability to support a positive correlation with the current account. We begin with a description of the data and the estimation strategy that is performed using Bayesian techniques. Then we present the identification of structural shocks via sign restrictions as proposed in

[20]Note that the acceptance ratio, defined as the number of models that fulfill the restrictions, divided by the number of considered models, is 27.3% for the baseline.

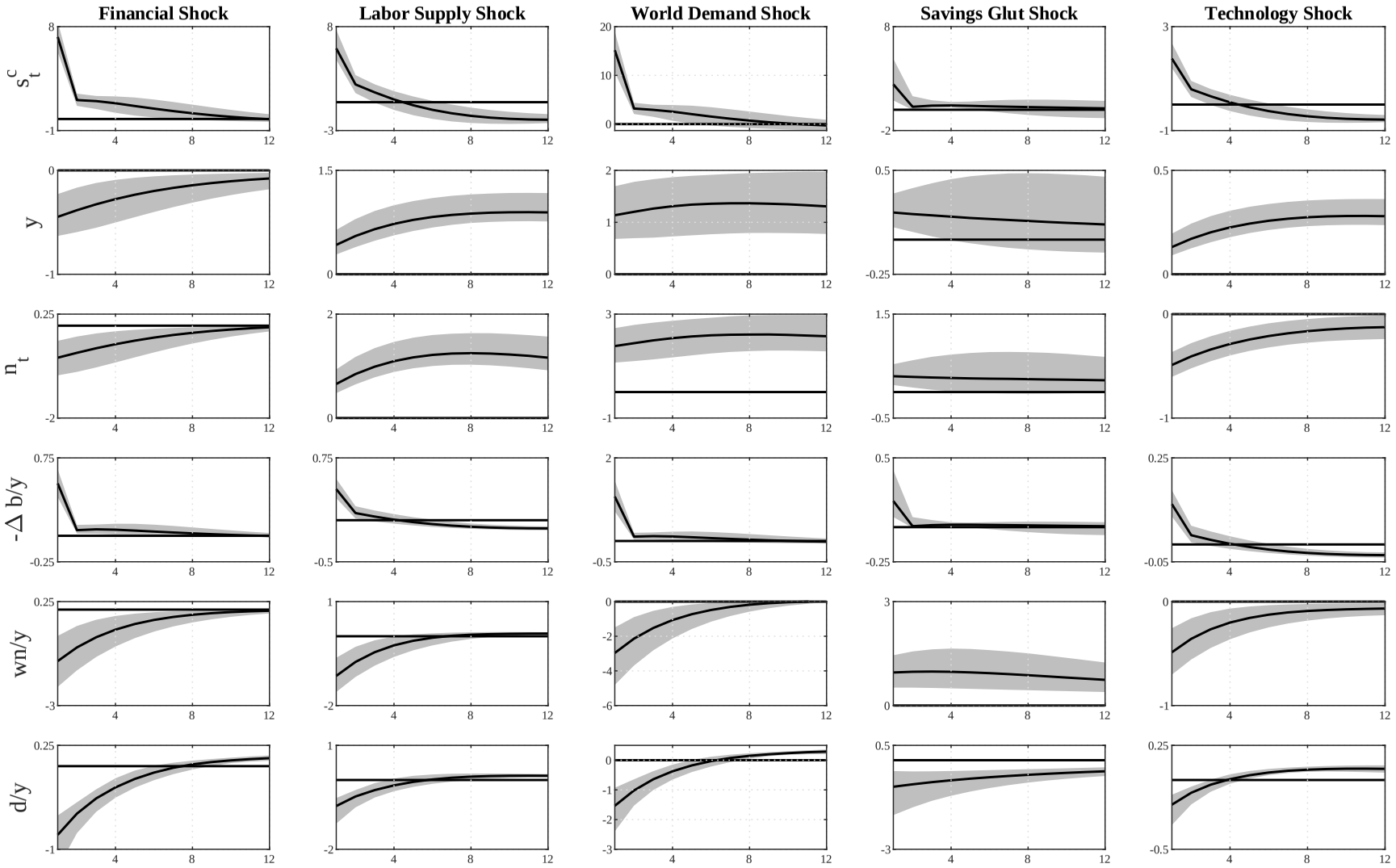


Figure 2: Impulse Responses

Notes: The x-axis is in quarters. The y-axis measures percent deviations from steady state. The solid line represents the median impulse response. Shaded areas display 10% and 90% percentiles of the simulated impulse responses.

Table 3: DSGE Sign Restrictions

	World GDP Shock	Financial Shock	Labor Market Shock	Saving Glut Shock	Tech. Shock
CS/CINV	↑	↑	↑	↑	↑
GDP	↑	↓	↑	↑	↑
Hours			↑		↓
DebtRep/GDP	↑	↑	↑	↑	
World GDP	↑				
Prices	↑		↓	↑	↓
Labor Share	↓		↓	↑	↓
CA					

Note: The table reports sign restrictions based on the DSGE model. Note that ↑ and ↓ denotes, that the restriction was explicitly set. The restriction horizon is derives from the DSGE model. We take impact plus two quarters for the macro variables and two quarters for the corporate-saving-to-investment ratio.

Uhlig (2005) and summarize the empirical findings.[21]

4.1 Estimation and Data

Consider a reduced form VAR model

$$x_t = c + \sum_{j=1}^{P} A_j x_{t-j} + \varepsilon_t, \text{ where } \mathbb{E}[\varepsilon_t] = 0 \text{ and } \mathbb{E}[\varepsilon_t \varepsilon_t{}'] = \Sigma_\varepsilon. \tag{27}$$

where x_t is the vector of n endogenous variables and c is a $n \times 1$ vector of intercepts. A_j is a $n \times n$ matrix comprising the AR-coefficients at lag $j = 1, ..., P$, Σ_ε is a $n \times n$ matrix of reduced form residuals ε_t, and X_t comprises the following n endogenous variables

$$\boldsymbol{X}_t = \left[\frac{CS_t}{CINV_t} \text{ GDP}_t \text{ GDP}_t^* \text{ CA}_t \text{ REER}_t \frac{-\Delta b_t}{4y_t} \text{ GDPDEF}_t \text{ LS}_t \text{ HOURS}_t \right]'. \tag{28}$$

An open-economy VAR framework is employed to reflect spillover effects from foreign country shocks into domestic aggregates (see, e.g., Fratzscher et al., 2010; Sa and

[21] We thank Breitenlechner and Geiger (2018) for providing their codes and helpful suggestions.

Wieladek, 2015). Accordingly, we combine German data and measures of global activity. GDP_t denotes the log level of the Real Gross Domestic Product deflated by the GDP deflator. $\frac{CS_t}{CINV_t}$ is the ratio of corporate-saving-to-investment. Due to data limitations we back cast corporate saving from 1998:4 to 1995:1. GDP_t^* is a measure of global economic activity as provided by Kilian (2018). CA_t measures the current account (% of GDP). $REER_t$ denotes the log-level of the real exchange rate vis-a-vis the main trading partners. Debt repurchase $\frac{-\Delta b_t}{4y}$ denotes the QoQ change in corporate-debt-to-GDP ratio. $GDPDEF_t$ measures the log-level of the GDP deflator. LS_t denotes the labor share. $HOURS_t$ is the log-level of total hours worked. We estimate the VAR on quarterly data ranging from $1995Q1$ to $2017Q4$.[22] We perform the estimation and inference using Bayesian techniques, which is a natural approach to implement sign restrictions on impulse response functions (see, e.g., Granziera et al., 2011; Uhlig, 2005), and allows us to take parameter uncertainty into account. We use a Normal-Wishart prior distribution as an uninformative prior density for the reduced form coefficients. Accordingly, the posterior density of the reduced form coefficients is therefore Normal-Wishart. We estimate the VAR at P = 2 lags, however, results are robust with respect to lag length.

4.2 Identification of Structural Shocks

We impose sign restrictions on the impulse responses to identify structural shocks (see, e.g., Arias et al., 2014; Rubio-Ramirez et al., 2010; Faust, 1998; Canova and de Nicolo, 2002; Peersman, 2005; Uhlig, 2005). The structural shocks, η_t, and the reduced form residuals, ε_t, are related through the linear mapping

$$\eta_t = B^{-1}\varepsilon_t, \text{ with } \mathbb{E}[\eta_t] = 0 \text{ and } \mathbb{E}[\eta_t\eta_t'] = \Sigma_\eta, \tag{29}$$

[22]See Appendix *Data Documentation* for a detailed description of the variables including sources and data codes.

where $B = U\Sigma_\eta^{1/2}Q$. $U\Sigma_\eta^{1/2}$ is one Cholesky factor from the Bayesian estimation exercise, and $\mathbb{E}$ denotes the expectation operator. Since Σ_η is a diagonal matrix, we obtain mutually orthogonal structural shocks. Identification through sign restrictions consists of finding random matrices Q, such that candidate shocks, η_t, produce impulse response functions, $\phi_{j,t+k} = A(L)^{-1}B_j\eta_t$, which satisfy imposed restrictions, where L denotes the lag operator. Drawing from a standard-normal density, $\mathcal{N}(0,1)$, delivers a random matrix Z and applying the QR decomposition to Z generates an ortho-normal matrix Q, such that $QQ' = I$. Thus we obtain a variety of matrices B for each Bayesian draw and therefore a different structural model for each Q. Specifically, we keep drawing Q matrices until either a permissible transformation is found or at a maximum of 500 draws of the matrix Q is reached without retaining a permissible model. Note, for the baseline, we find in most cases a sufficient ratio of permissible models for the draws from the posterior distribution of the reduced form models, which is reassuring in terms of the empirical plausibility of the imposed sign restrictions (see Giacomini and Kitagawa (2014)).[23]

4.3 Results

Figures 3 to 5 reports the propagation of the identified shocks through the variables in $\boldsymbol{x}_t$. The shaded area denotes, as customary, the 68-percent credible set from the Bayesian estimation (Dedola et al. (2017)). The dashed line represents the piecewise median model (Fry and Pagan (2011)). We report the dynamics for 20 quarters. Recall, we restrict the corporate-saving-to investment ratio to increase for 1 quarters, while we let the data speak for themselves for the current account, which is left unrestricted.

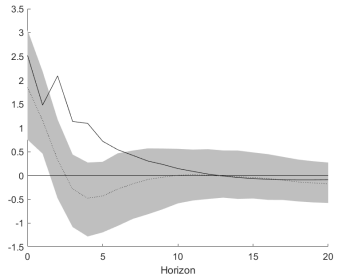
After a labor market shock, the unrestricted current account is significantly posi-

[23]Since the system is set-identified, the prior is only flat over the reduced form coefficients but not necessarily over the structural coefficients as the decomposition of the variance-covariance matrix Σ using random orthogonal matrices Q (where $Q'Q = I$) incorporates an implicit prior distribution(Baumeister and Hamilton (2014)).

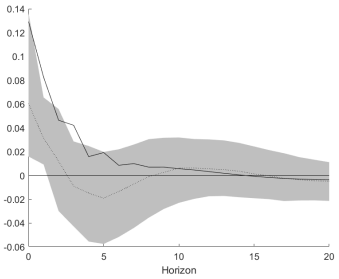
tive for four quarters, with median impulse responses being positive over eight quarters (see Figure 3). Accordingly, the results support a positive correlation between the current account and the corporate-saving-to-investment ratio. GDP and hours increase in response to the shock. Interestingly the model predicts a current account surplus, although the domestic economy booms which hints towards an increased competitiveness of the German economy. Alongside the expansion the labor share declines. Figure 3 illustrates that firms deleverage in response to the shock.

Figure 4 displays adjustment to a financial friction shock. The corporate-saving-to-investment ratio remains significantly positive for six quarters, well beyond the restriction horizon, which is two quarters. The current-account in % of GDP increases for one quarters significantly, with the median response being above zero for 13 quarters. The significant increase in debt-repurchases is consistent with the view that firms increase precautionary savings. GDP and hours are significantly negative. Interestingly, inflation is marginally positive which might be due to cost channel effects in the light of higher refinancing costs.

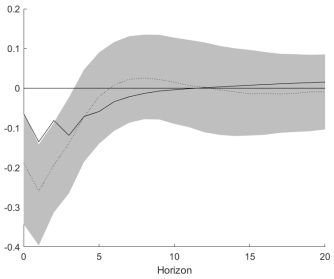
The world demand shock (see Figure 5) pushes the unrestricted current account to positive territory for 7 quarters, while the median response remains positive over the whole forecast horizon. Interestingly, the shock implies a persistent decline in the labor share of six quarters. The impulse responses display a typical demand shock pattern with a positive comovement of GDP and inflation alongside the expansion. To sum up, we find that all three shocks are consistent with the view that a corporate-saving-glut goes alongside with capital exports. As common theme, we can report, that in response to all three shocks the labor share declines. Therefore, according to equation Equation (2) one main driver behind the increase in corporate saving is a decline in the corporate labor share. Finally, we evaluate the importance of each shock with a forecast error variance decomposition, which indicates how much of the error variance in each variable can be attributed to the respective shock



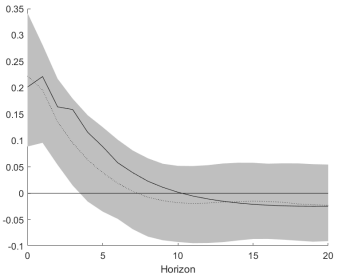
(a) CS/CINV



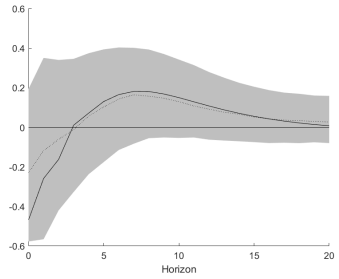
(b) Debt-Repurchase-Ratio



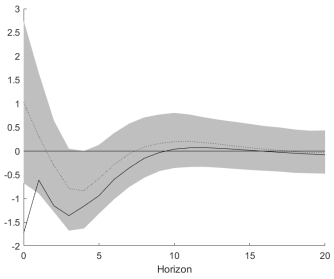
(c) Labor Share



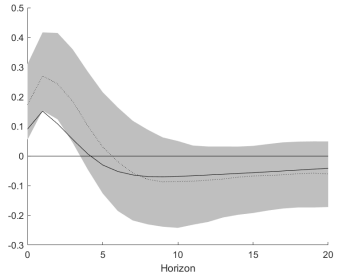
(d) CA/GDP



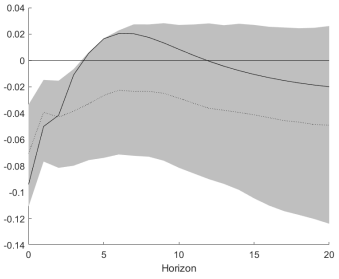
(e) Real Exchange Rate



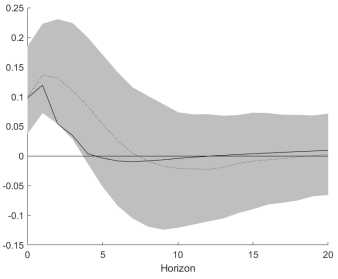
(f) World Activity



(g) GDP

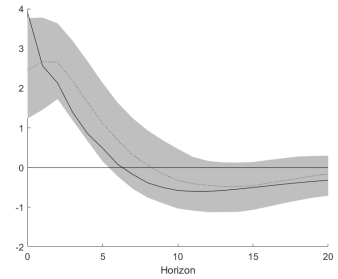


(h) Prices

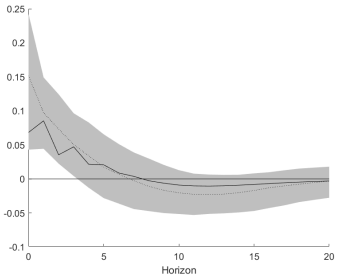


(i) Hours

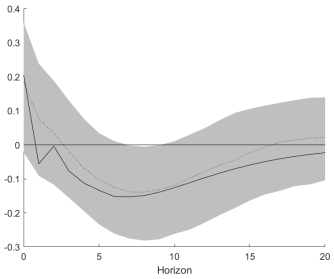
Figure 3: Labor Market Shock



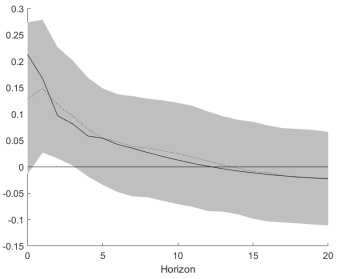
(a) CS/INV



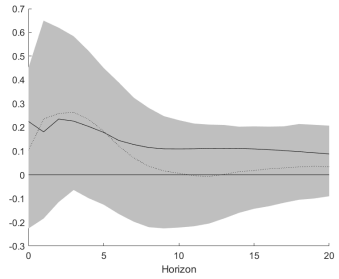
(b) Debt-Repurchase-Ratio



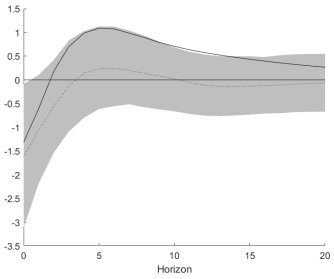
(c) Labor Share



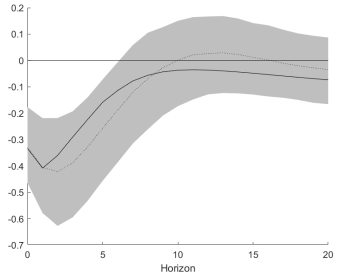
(d) CA/GDP



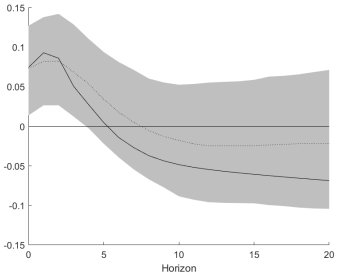
(e) Real Exchange Rate



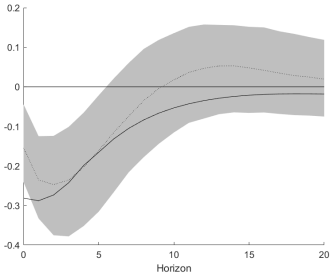
(f) World Activity



(g) GDP

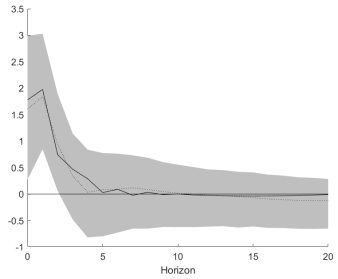


(h) Prices

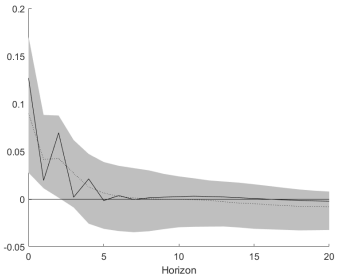


(i) Hours

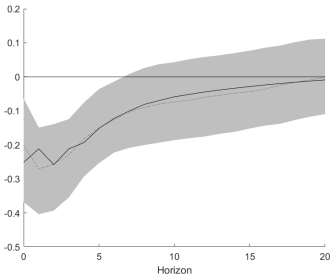
Figure 4: Financial Friction Shock



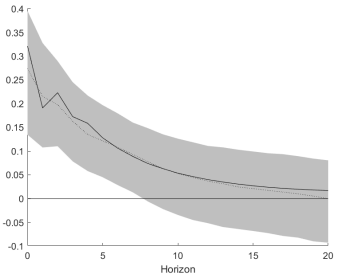
(a) CS/INV



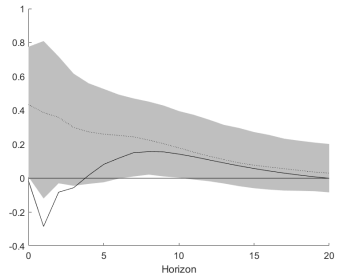
(b) Debt-Repurchase-Ratio



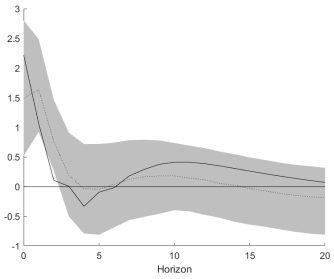
(c) Labor Share



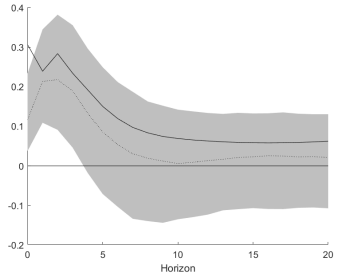
(d) CA/GDP



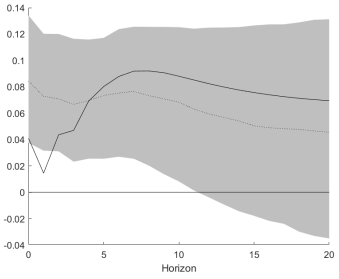
(e) Real Exchange Rate



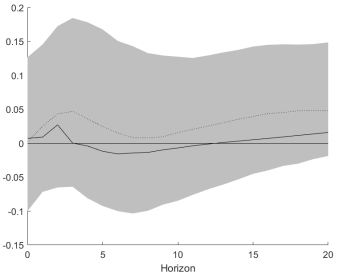
(f) World Activity



(g) GDP



(h) Prices



(i) Hours

Figure 5: World Demand Shock

Table 4: Forecast Error Variance Decomposition

	Horizon	CA/GDP	CS/CINV	GDP
Labor Market Shock	Impact	12.96	8.87	6.52
		(2.21, 29.80)	(1.52, 25.24)	(0.71, 21.20)
	1 Year	12.78	6.21	7.68
		(3.84, 25.33)	(2.23, 14.85)	(2.30, 19.01)
	4 Years	10.11	6.66	8.49
		(4.46, 18.58)	(2.88, 13.56)	(3.58, 16.60)
Financial Friction Shock	Impact	5.04	16.39	24.02
		(0.41, 19.76)	(3.87, 36.95)	(7.08, 46.72)
	1 Year	7.82	26.26	22.57
		(1.90, 22.13)	(13.46, 41.87)	(7.10, 44.07)
	4 Years	9.70	22.58	18.17
		(3.65, 20.58)	(12.64, 35.18)	(7.46, 34.10)
World Demand Shock	Impact	19.54	6.80	3.06
		(4.94, 40.69)	(0.52, 22.82)	(0.30, 11.95)
	1 Year	19.88	7.76	5.61
		(7.02, 37.20)	(2.50, 20.34)	(1.46, 14.94)
	4 Years	17.15	7.80	6.32
		(7.28, 29.98)	(3.18, 15.75)	(2.45, 14.50)

Note: Results are in % and we report 68% credible sets in brackets.

over a specified time horizon (see Table 4).[24] In total at a one year horizon the three baseline shocks explain roughly 40% of the variation in the current-account in % GDP and the corporate-saving-to-investment ratio. In relative terms, we find that the labor market shock and the world demand shock have larger explanatory power than the financial friction shock for the current account. On impact, the labor supply shock is of equal size as the world demand shock for the current account, whereas the explanatory power of the financial friction shock is lower at short horizons. The financial friction shock, in turn, has a larger explanatory power for the corporate-investment-to GDP ratio.

5 Historical decomposition

Figure 6 shows a panel of historical compositions of the fluctuation in the measures for corporate net lending, current account, GDP and the labor share. The corpo-

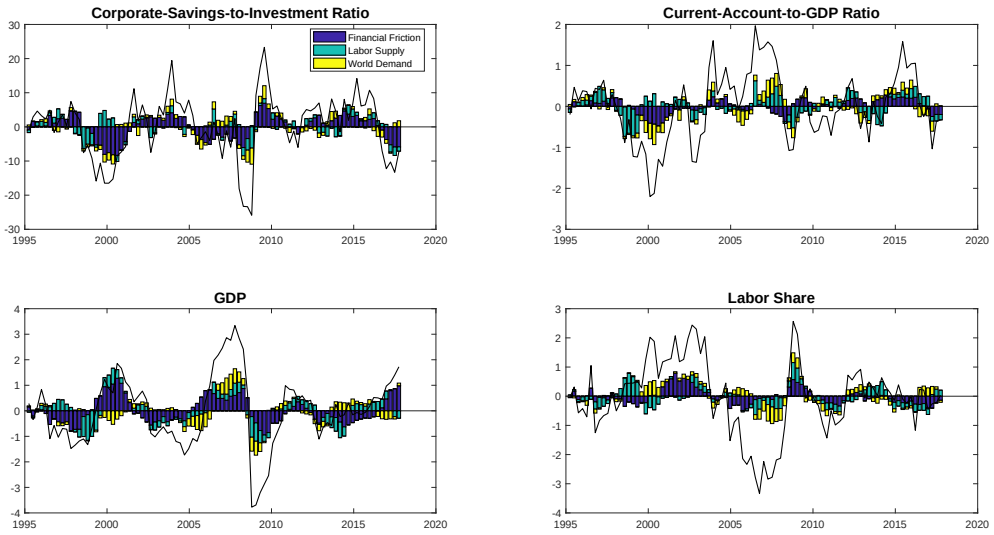


Figure 6: Historical Decomposition

rate net lending variation is explained mainly through the three identified shocks (FFS, LSS, WDS which reach around 40%) with some deviation during the global financial crisis 2008-2010, which compensated each other. The explanatory power

[24] All k-step-ahead forecast revisions are based on the median draw with 68 percent credible sets.

for the current account variation through these three shocks reaches also around 40%. Labor supply shocks and world demand shocks explain mostly the positive variation, while financial friction shocks predominantly explain negative variations for both measures.

6 Robustness checks

We perform robustness checks for the main specification by adding other shocks (technology and household saving), adding the corporate wage share as a non-core, explanatory variable in the VAR, and manipulating the lag horizon. We find evidence for structural validity of our approach.

6.1 Other Shocks and Adding Corporate Wage Share

The patterns for the FEVD in case of including identified productivity shocks and identified household saving shocks are similar. Adding these shocks mostly leaves the error variances of the three main shocks on the same level. We conclude, that our model is stable with regard to the marginal contributions as it does not change when adding or deleting other potential explanatory variables.

Interestingly the analysis indicates that household saving shocks do not contribute in a quantitative important way to explain the current account (in % of GDP).

6.2 Relevance of Shocks in G7

We have performed the same analysis for major advanced economies. The impulse responses show a different pattern according to country. We conclude, that very specific circumstances in Germany have allowed these three shocks to lift both current account and corporate net lending. We have performed the same analysis for

Table 5: FEVD: Technology Shocks

	Horizon	CA/GDP	CS/CINV	GDP
Labor Market Shock	Impact	9.88	5.85	7.24
		(1.37, 26.02)	(0.56, 20.45)	(0.87, 23.99)
	1 Year	9.96	5.09	8.33
		(2.64, 23.12)	(1.83, 12.78)	(2.32, 20.01)
	4 Years	9.03	5.88	8.83
		(3.81, 17.60)	(2.88, 12.55)	(3.72, 17.60)
Financial Friction Shock	Impact	5.02	18.47	24.90
		(0.56, 16.82)	(5.32, 38.88)	(8.92, 47.72)
	1 Year	7.18	28.12	24.62
		(1.95, 22.55)	(14.77, 43.21)	(9.14, 46.69)
	4 Years	9.56	24.02	20.00
		(3.51, 19.93)	(13.72, 36.00)	(8.84, 36.03)
World Demand Shock	Impact	19.37	6.26	3.44
		(4.92, 40.71)	(0.82, 21.26)	(0.36, 13.26)
	1 Year	20.18	8.41	6.82
		(6.66, 38.65)	(2.96, 20.27)	(1.86, 17.21)
	4 Years	15.53	7.91	7.22
		(7.25, 28.33)	(3.64, 15.99)	(2.81, 16.05)

Note: Results are in % and we report 68% credible sets in brackets.

Table 6: FEVD: Household Savings Glut Shock

	Horizon	CA/GDP	CS/CINV	GDP
Labor Market Shock	Impact	9.97	5.80	7.35
		(1.22, 29.85)	(0.76, 19.65)	(1.26, 25.22)
	1 Year	9.79	5.03	8.38
		(2.64, 24.65)	(1.66, 12.91)	(2.39, 21.15)
	4 Years	8.90	5.96	8.80
		(3.74, 18.02)	(2.65, 12.13)	(3.59, 18.02)
Financial Friction Shock	Impact	4.22	13.24	26.04
		(0.40, 18.30)	(2.14, 33.53)	(8.53, 47.77)
	1 Year	6.72	23.14	25.19
		(1.59, 20.88)	(10.47, 38.24)	(7.95, 45.91)
	4 Years	8.81	20.71	19.09
		(2.99, 18.50)	(11.17, 32.32)	(7.52, 35.51)
World Demand Shock	Impact	22.21	6.94	2.41
		(6.46, 47.41)	(0.81, 21.06)	(0.20, 9.46)
	1 Year	23.27	9.36	5.79
		(6.68, 43.20)	(2.87, 20.58)	(1.53, 16.70)
	4 Years	18.59	8.61	6.94
		(7.20, 33.14)	(3.68, 16.63)	(2.22, 15.68)

Note: Results are in % and we report 68% credible sets in brackets.

Table 7: FEVD Corporate Wage Share

	Horizon	CA/GDP	CS/CINV	GDP
Labor Market Shock	Impact	10.11	6.58	7.84
		(1.36, 29.48)	(0.90, 21.10)	(1.02, 24.71)
	1 Year	10.11	5.14	8.73
		(2.17, 25.57)	(1.69, 12.40)	(2.64, 21.48)
	4 Years	9.03	6.00	9.50
		(3.05, 18.00)	(2.67, 12.68)	(3.90, 18.01)
Financial Friction Shock	Impact	6.12	17.07	24.41
		(0.59, 20.28)	(3.69, 37.98)	(7.55, 46.57)
	1 Year	8.62	27.23	23.68
		(2.14, 22.99)	(11.79, 42.99)	(8.07, 45.55)
	4 Years	9.51	22.02	17.94
		(3.25, 20.47)	(10.39, 33.90)	(7.34, 33.06)
World Demand Shock	Impact	14.77	8.43	3.29
		(2.54, 39.18)	(1.20, 27.55)	(0.37, 14.17)
	1 Year	15.96	9.56	5.78
		(5.01, 34.73)	(2.78, 21.99)	(1.54, 15.83)
	4 Years	16.16	8.83	6.81
		(6.55, 29.10)	(3.61, 17.32)	(2.60, 15.88)

Note: Results are in % and we report 68% credible sets in brackets.

major advanced economies to see if impulses are country specific or reveal a common pattern.

For the US, we find that a financial friction shock does not push corporate net lending into positive territory after the restricted period. This is in line with the idea that during a financial crisis trade develerates and the external position improves for the US (see Appendix Figure 1). The world demand shock generates a positive response for corporate net lending, but a negative response to the US current account, in stark contrast to the German example. The labor supply shock generates a negative response in both corporate net lending and the current account.

In case of the UK financial friction shocks seem to be insignificant for both the current account and the corporate net lending development. Also world demand shocks play a minor role, but have the same direction of response as in the German case. Labor supply shocks have only a visible impact on the current account (see Figure Appendix 2).

France seems to be an economy where the nexus between corporate saving and the current account did not play a major role. The identified shocks are not generating significant impulse responses (see Appendix Figure 3).

Italy shows a similar response for the financial friction shock, which lifts corporate net lending and the current account with a large variation around the best model. Italy underwent improvements in the current account following the global financial crisis and the European debt crisis. World demand shocks show a negative response for both measures, reflecting Italy's falling competitiveness. Labor supply shocks generate negative responses for both measures reflecting again the competitive position of Italian firms (see Appendix Figure 4).

The Canadian economy shows similar patterns as the US development, where the labor supply shock generates a visible positive response of net lending and a strong positive response in the current account (see Appendix Figure 5).

6.3 Lag Horizon

We have run the simulations also with a variation of lag horizons. There is no visible change in the responses. We conclude that our results are therefore robust with respect to lag length.

Table 8: FEVD: Robustness Lag Length: 3-Lags

	Horizon	CA/GDP	CS/CINV	GDP
Labor Market Shock	Impact	23.68	9.88	4.34
		(9.04, 41.14)	(1.63, 27.56)	(0.46, 15.72)
	1 Year	19.03	6.80	6.38
		(8.89, 32.59)	(2.70, 15.81)	(2.08, 15.88)
	4 Years	14.51	7.80	9.45
		(8.17, 22.88)	(4.01, 13.03)	(4.30, 17.92)
Financial Friction Shock	Impact	4.93	9.08	22.15
		(0.36, 17.73)	(0.84, 26.17)	(6.62, 46.68)
	1 Year	7.75	20.23	21.88
		(1.79, 19.24)	(10.26, 34.78)	(6.73, 41.59)
	4 Years	9.62	18.99	18.72
		(3.85, 17.95)	(10.47, 28.39)	(8.66, 31.82)
World Demand Shock	Impact	16.71	6.15	4.61
		(3.01, 39.62)	(0.66, 20.29)	(0.45, 13.69)
	1 Year	17.76	8.06	8.72
		(6.17, 36.29)	(3.05, 16.76)	(2.15, 20.74)
	4 Years	15.26	7.99	8.21
		(7.17, 26.82)	(3.94, 14.24)	(3.91, 17.46)

Note: Results are in % and we report 68% credible sets in brackets.

7 Conclusion and Policy Implications

Since the early 2000s Germany's current account witnessed a massive rebound in positive territory and is increasingly at the center of policy debates as it is blamed to inflict deficits on other trading partners, such as the US. To our knowledge, we are the first to investigate the nexus of a corporate saving glut and the current

account through the lens of an open-economy VAR. Labor market, world demand, and financial friction shocks can trigger a built up in corporate saving in excess of corporate investment and thus generate the capital exports outside Germany. In contrast, household saving shocks do not seem to make a difference with respect to the current account. Given that private households saving in % of GDP mildly declined this result may not come as a surprise.

In general, we find that for a world demand, a financial friction and a labor supply shock increases in the corporate-saving-to investment ratio goes alongside with a decline in the labor share. Our analysis strongly suggests that wage moderation and a domestic investment deficiency are core to understand the issue.

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APPENDIX

Steady State Solution Strategy Using a CES Technology

The calibration strategy targets to reflect corporate debt to GDP ratio:

$$3.67 - \left(\frac{\chi b}{1+r} / y \right) = 0 \tag{30}$$

which always holds by definition. To specify a well defined steady state we propose the following quasi recursive algorithm. Propose an initial

$$\xi = \bar{\xi} \tag{31}$$

and

$$R^k = \bar{R}^k. \tag{32}$$

The time budget allocated to work is $n = 0.30$ and output is fixed to $y = 1$. Given the CES production technology it proofed usefull to fix y/n for reasons of comparability between different parametrization, in particular for the limit, when θ approaches 1, the Cobb-Douglas case.

$$R = 1 + r(1 - \tau), \tag{33}$$

The Lagrangian multiplier attatched to the enforcement constraint is

$$\mu^c = (1 - R\beta) / \left(\xi R \frac{(1-\tau)}{(R-\tau)} \right), \tag{34}$$

Scale parameter α_n is set in line with the steady state labor share.

$$\alpha_n = \frac{\bar{s}_L}{\left(1 - \frac{\mu}{1-\tau}\right) \left(\frac{y}{n}\right)^{\frac{1-\theta}{\theta}}}; \tag{35}$$

Capital is defined as

$$k = y / \left(\frac{(1 - \beta(1 - \delta + \delta\tau) - \xi\mu)}{\alpha_k \beta (1 - \tau\mu)))} \right)^{\theta}, \tag{36}$$

Investment reads

$$i = \delta k \tag{37}$$

Wages are

$$w = \alpha_n \left(\frac{y}{n} \right)^{1/\theta} \left(1 - \frac{\mu}{1-\tau} \right), \tag{38}$$

Corporate debt is

$$b = \left(\frac{y}{\xi} - k \right) \frac{(\tau - R)}{(1-\tau)} \tag{39}$$

Dividends are

$$d = -i + (1-\tau)(y - wn) - b + b/R + \delta\tau k \tag{40}$$

Taxes read

$$T = \tau(y - wn) - \delta\tau k; \tag{41}$$

Financial fees are

$$M = 0 \tag{42}$$

Households constraint

$$c = wn + b - \frac{b}{(1+r)} + d + \mathbf{T} \tag{43}$$

Utility weight in consumption

$$\iota = \frac{w(1-n)}{(c^w)^\sigma}. \tag{44}$$

Total factor productivity is

$$z = \frac{y}{\left(\alpha_k k^{\frac{\theta-1}{\theta}} + \alpha_n n^{\frac{\theta-1}{\theta}}\right)^{\frac{\theta}{\theta-1}}} \tag{45}$$

Equity price, numerically solved

$$0 = p(\beta - 1) + \beta\frac{d}{\chi} + \frac{\varphi_0}{\Delta}(\chi p)^{-\eta_0} \tag{46}$$

The labor share reads

$$s_L = \frac{1-\mu}{1-\tau}\alpha_n \left(\frac{y}{n}\right)^{\frac{1-\theta}{\theta}}; \tag{47}$$

Corporate saving

$$s^c = i \tag{48}$$

Corporate accounting profits

$$\Pi_t = (1-\tau)(y - wn) + \tau\delta k + \tau b\left(1 - \frac{1}{R}\right); \tag{49}$$

Accounting profit share

$$s_\Pi = \frac{\Pi}{y} \tag{50}$$

The cost of capital can be defined as

$$R^k = (1 - s_L)\frac{y}{k} \tag{51}$$

Note, as we do not have the usual rental market assumption, we do not have a rental rate of capital that measures the cost of capital at the margin, but just R^k

that measures the average cost of financing the capital stock owned by the firm.

Data Documentation

Definition of the variables

corporate saving-to-investment ratio	= (CS/CINV)* 100
output	= LN(GDP)
global activity	= GDP*
current account-to-output ratio	= (CA/GDP)*100
real exchange rate	= LN(REER)
$\frac{-\Delta b}{4y}$	= ((DEBT(-1)-DEBT)/4*GDP)*100
price level	= LN(GDPDEF)*100
wage share	= (LABINCOME/NATINCOME)*100
hours	= LN(N)

Source of the original data

GDP: Real Gross Domestic Product, Millions of 2010 Euros, Seasonally Adjusted. Source: Eurostat, datacode: NAMQ-10-GDP; B1GQ

GDPDEF: Gross Domestic Product - Implicit Price Deflator 2010=100, Seasonally Adjusted. Source: Eurostat, datacode: NAMQ-10-GDP; PD10-NAC

GDP*: Global Economic Activity. Source: `http://www-personal.umich.edu/~lkilian/kilian_correction.pdf`

CS: Real Corporate Saving, Millions of Euros. Source: Eurostat, datacode: NASQ-10-NF-TR, B8G Treatment: Back casting was done with full specified Tramos technique from 1998:4 - 1995:1

REER: = Real Exchange rate vis-a-vis the main trading partners. Source: Eurostat, datacode ERT-EFF-IC-M REER-IC42-CPI

CA: = Current Account, Millions of Dollars, Seasonally Adjusted. Source: Eurostat, datacode P6, P7, IN1, IN2

DEBT = Debt, Millions of Euros, Seasonally Adjusted. Source: Eurostat, datacode S11, financial statement, F2 Treatment: Back casting was done with full specified Tramos technique from 1998:4 - 1995:1

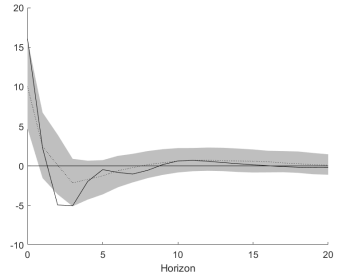
NATINCOME = National Income, Billions of Euros, Seasonally Adjusted. Source: Bundesbank, Eurostat, datacode: BBNZ1.Q.DE.S.G.0025.A; D1.

LABINCOME = Labor Income, Millions of Euros, Seasonally Adjusted. Source: Eurostat, datacode: A.D1.

COMPEMPL = Compensation of employees, Billions of Euros, Seasonally Adjusted. Source: Bundesbank, datacode: BBNZ1.Q.DE.S.G.0025.A; D1.

N = hours, thousands of hours, Seasonally Adjusted. Source: Eurostat, datacode: $NAMA_10_a10_e$; EMP_DC

Appendix: Robustness Major Economies



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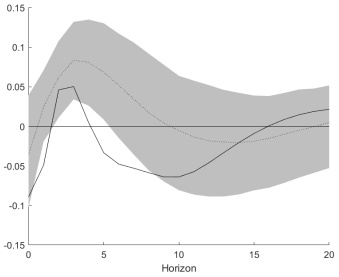

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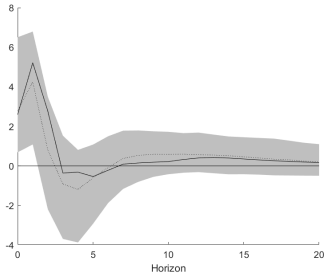

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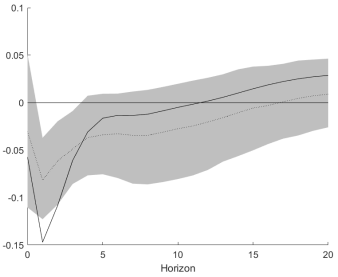

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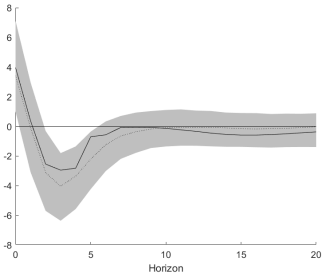

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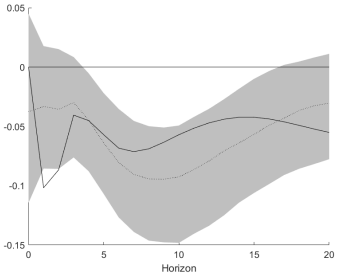
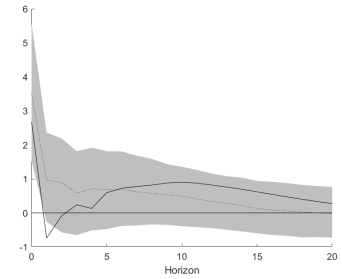


(f) LSS-CA

Figure 1: USA



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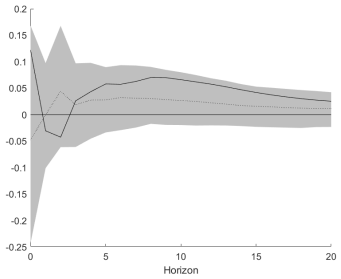

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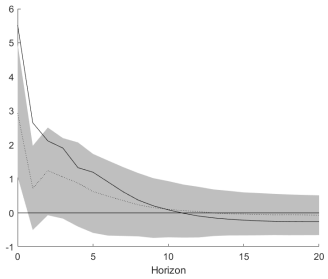

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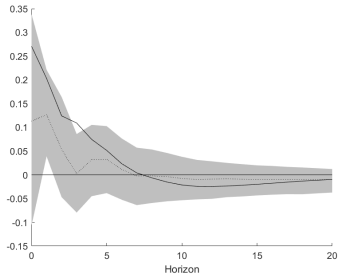

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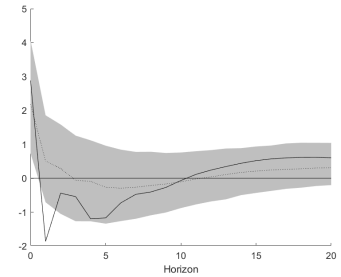

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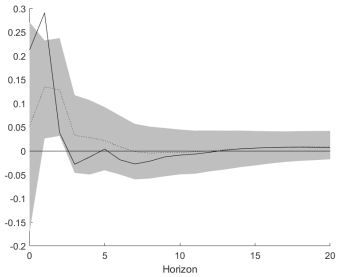
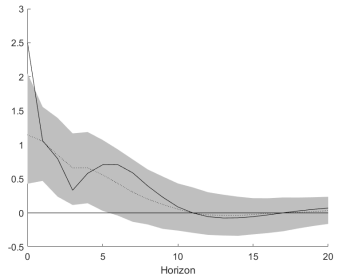


(f) LSS-CA

Figure 2: UK



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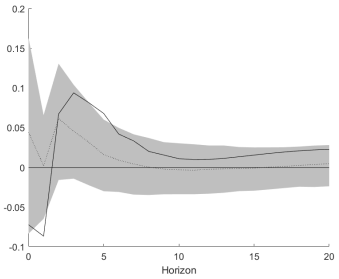

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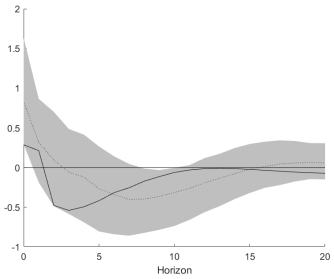

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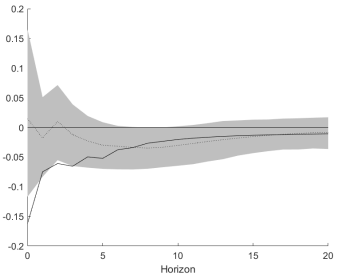

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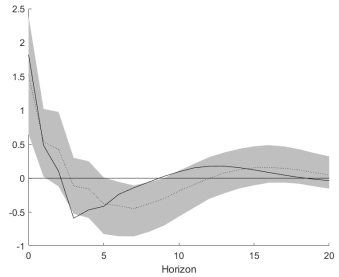

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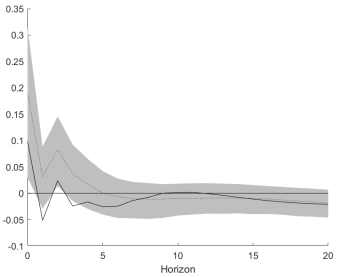
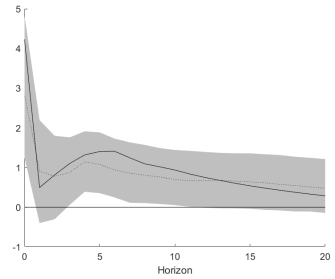


(f) LSS-CA

Figure 3: France



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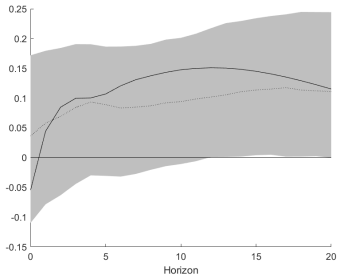

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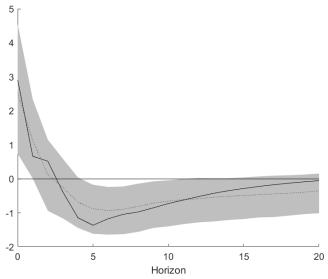

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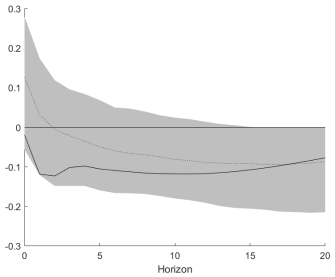

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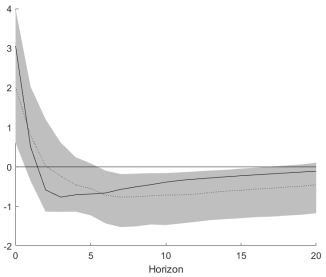

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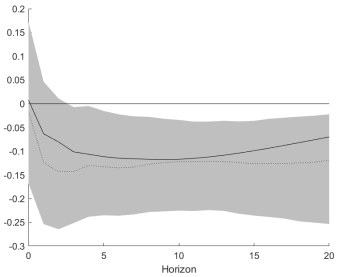
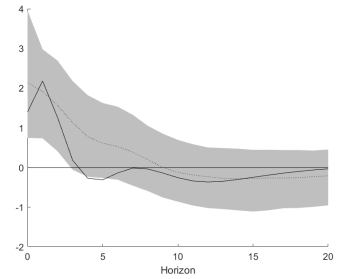


(f) LSS-CA

Figure 4: Italy



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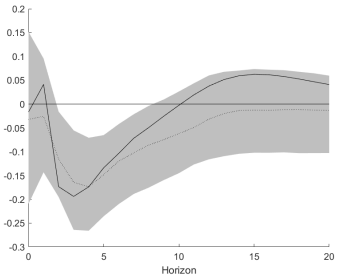

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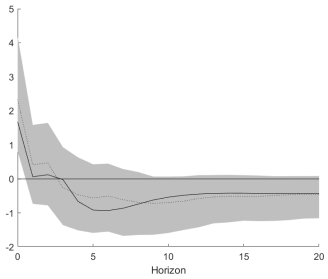

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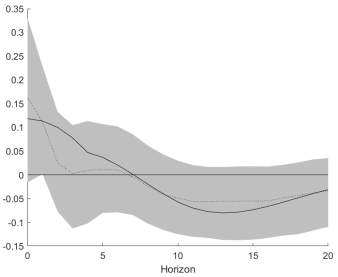

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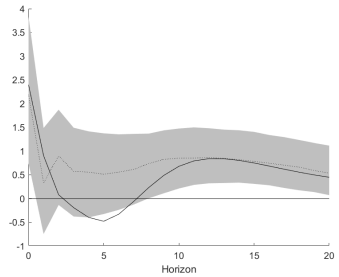

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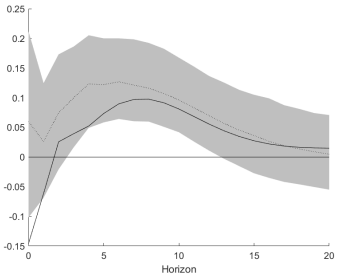

(f) LSS-CA

Figure 5: Canada