Analysis

Bank lending to Dutch non-financial corporations: drivers and dynamics

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Bank lending to Dutch non-financial corporations: drivers and dynamics[1]

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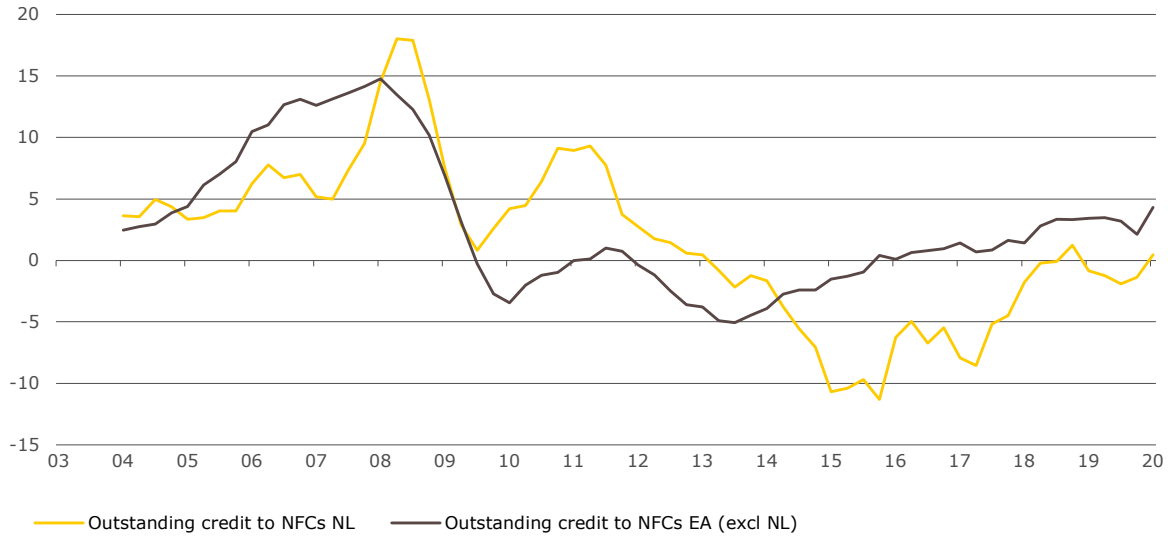
Main points

- Since the global financial crisis and until the onset of the COVID-19 crisis, the growth of outstanding bank loans to non-financial corporations (NFCs) has been subdued in the Netherlands, also when compared to the euro area. A recurring question among policymakers is whether this has been driven by restricted credit supply or weak demand for loans (or both). Understanding the relative role of credit supply and demand is important since they have different implications for policymaking.
- We find that domestic bank lending growth has been mostly driven by common *demand* shocks rather than credit *supply* shocks. Common shocks refer here to shocks originating in the foreign (or global) economy. Examples are the global financial crisis or the sovereign debt crisis. In addition, we find that the response of corporate bank lending to a common demand shock is stronger and much more persistent in the Netherlands than in the rest of the euro area. This latter finding raises the following question: why does a common demand shock affect bank lending in the Netherlands more than in other euro area countries?
- We can answer this question, though only partially, by disentangling the growth of outstanding bank loans to NFCs into new loans and repayments. Our results show that repayments in the Netherlands recover faster after a negative demand shock compared to the euro area, thereby suppressing the growth rate of outstanding loans relatively strongly. As the new loans and repayments data include loans supplied by Dutch banks to all NFCs in the euro area, we do not directly observe the repayment behaviour of Dutch NFCs only. However, as the lion's share of lending by Dutch banks goes to Dutch NFCs, this finding strongly suggests that repayments are one of the potential explanations for the observed difference between the Netherlands and the euro area in the growth of outstanding bank loans to NFCs.
- The reasons underlying this last finding are out of the scope of this analysis. Nonetheless, available data show that Dutch NFCs rely more on internal funding than their euro area peers and that they have shifted somewhat more to bonds and equity financing during the past decade. This might have helped them reduce their dependence on bank finance.

Introduction

Since the global financial crisis and until the onset of the COVID-19 crisis, the growth of outstanding bank loans to non-financial corporations (NFCs) has been subdued and mostly negative in the Netherlands. Figure 1 compares the growth rates of outstanding credit (hereinafter used interchangebly with bank loans) in the Netherlands and the euro area, showing that after a similar drop, credit growth in the euro area has been recovering somewhat faster. Two questions arise: why has credit growth in the Netherlands been so low during this period, and why has the recovery been slower relative to the euro area? In this analysis, we investigate the dynamics of credit growth in order to give potential explanations for these developments and differences. Specifically, we examine to what extent credit growth in the Netherlands has been restricted by credit supply or weak demand for loans (or both). This is a recurring question that is often discussed by policymakers as well as in bank supervisory and regulatory consultations.

Figure 1: Growth of outstanding bank loans to NFCs in NL and EA



Source: ECB.

Stylised facts about the supply side of the credit market have so far provided a mixed picture about its influence on weak credit growth. On the one hand, it seems that the supply side of the market should be functioning well. The robustness of banks' balance sheets, for instance, has increased substantially in the past decade: capital levels are now sufficiently above the

requirements and the level of non-performing loans is below the historical average. Furthermore, according to the Bank Lending Survey (BLS), the acceptance criteria for business loan applications have been roughly stable since around 2014 and in fact even loosened between 2018 and the start of the COVID-19 crisis. On the other hand, especially for small and medium sized enterprises (SMEs), the rejection rate for loan applications has been much higher in the Netherlands compared to other countries. In addition, SMEs pay a relatively high interest rate compared to large firms – the spread between small and large loans is much higher in the Netherlands compared to other countries. The latter raises concerns about the accessibility of credit, specifically for SMEs, and the degree of competition in the Dutch banking sector.

Stylised facts and survey data about the demand for bank credit also provide a mixed picture. With economic growth having picked up after the eurocrisis and lending rates at historical lows, one might have expected bank credit to be in high demand. However, according to the SAFE survey, the net percentage of firms indicating they need a bank loan was mostly negative in the past decade.[2] Moreover, the percentage of firms that had not applied for bank loans because of sufficient internal funds has been increasing since 2014, reaching 61% in 2020 (versus 37% in the euro area). We also note that larger firms in particular have increased the issuance of bonds over the past decade, which might have dampened their demand for bank credit.

Hence, the purpose of the analysis presented in this work is to understand the main economic drivers behind the subdued growth of outstanding bank loans in the Netherlands after the global financial crisis, and how these affect credit developments over time. For this purpose, we study the dynamics of credit growth through the lens of a Vector Autoregressive model (VAR) for the period from 2000Q3 to 2019Q4. We proceed in three steps:

First, given the similarities and the differences between credit growth in the Netherlands and the euro area, we focus on the relative importance of *common shocks*. We interpret these as global

[2] The ECB's Survey on the access to finance of enterprises (SAFE). The survey mainly covers SMEs. Net percentage here is the difference between the percentage of firms reporting an increase in their need for bank loans and the percentage of firms reporting a decrease.

factors that had an impact on both the Netherlands and the euro area: examples are the global financial crisis or the sovereign debt crisis. We distinguish these shocks from *domestic shocks*, which originate in the Netherlands and only affect the Dutch economy. Of the two, we find that common shocks are responsible for the low and persistent drop in credit volumes in the Netherlands.

Second, we go more in depth in disentangling supply and demand factors among the common shocks. We find that the main driver behind the sluggish credit observed in the Netherlands during the sample period has been subdued demand. In the interpretation of the VAR, the global financial crisis and the sovereign debt crisis slowed down the demand for credit. While this is true for both the Netherlands and the euro area, we find that these shocks have a much more persistent effect in the Netherlands compared to the rest of the euro area.

Third, in order to take a better look at the underlying dynamics behind the observed differences in the behavior of outstanding credit between the Netherlands and the euro area, we shift the focus from the stock of credit to the flow of credit. To this end, we study the effect of new loans and repayments. Interestingly, our results show that repayments in the Netherlands recover faster after a negative demand shock compared to the euro area. The new loans and repayments data here involve loans supplied by Dutch banks to NFCs in the euro area instead of only to Dutch NFCs. About 75% of NFC credit supplied by Dutch banks goes to Dutch NFCs. Although the scope of the data differs somewhat from the first part of the analysis, these findings strongly suggest that sizeable repayments are one of the important explanations behind the difference in the growth of oustanding credit between the euro area and the Netherlands during the period studied. The underlying drivers of relatively high repayments in the Netherlands are out of the scope of this study, but are an interesting subject for future analysis. However, one part of the explanation seems to be that NFCs in the Netherlands rely more on internal funds for their financing needs and have also shifted their external financing away from banks more than NFCs elsewhere in the euro area.

Modelling framework and data

Our econometric strategy is based on the estimation of VARs to analyse the joint dynamics of macroeconomic variables for the Dutch and the euro area economy. VARs are typically recognised as excellent instruments for capturing statistical features of the data, such as correlations or data persistence. Moreover, additional assumptions enable us to identify the main economic drivers behind the development of the variables involved, and this is what we need to answer our questions on the development of credit.

Needless to say, the more the identifying assumptions, the higher the risk of model misspecification. For this reason we proceed gradually: we first use minimal assumptions to disentangle common global and idiosyncratic shocks, then we dig further and identify the role of supply and demand factors. In the results section, we explain the specifications of our model a bit further. For more details, please refer to the Appendix.

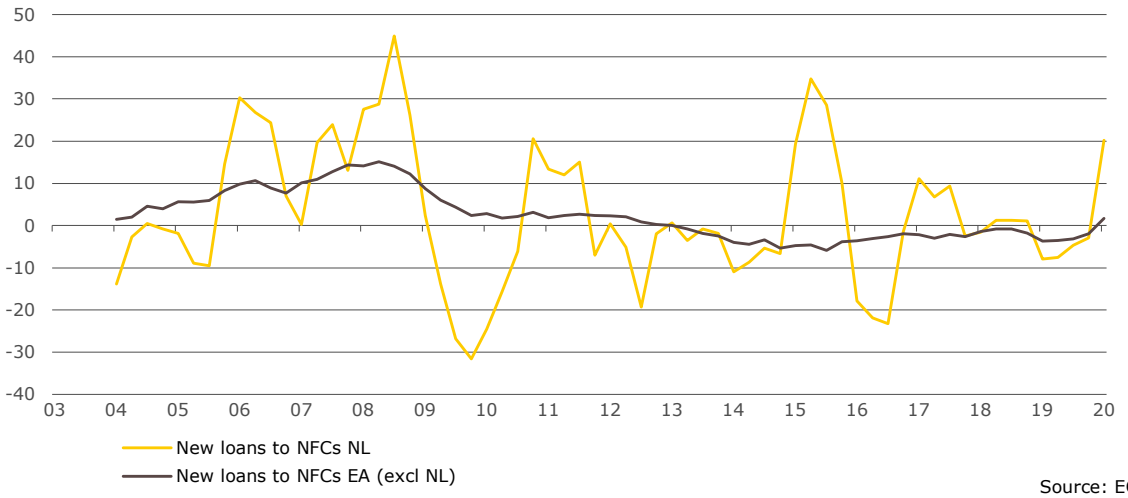
2.1 Data

We estimate two versions of the model with a Bayesian approach, using quarterly data from 2000Q3 to 2019Q4 and including foreign and domestic variables. Our sample ends at 2019Q4 due to the fact that the COVID-19 crisis represents a large shock that violates the assumptions of the model. This leads to parameter instability and makes it difficult to obtain reliable coefficient estimates. In the first version, we focus on the stock of credit: domestic variables here are outstanding bank loans to NFCs, the corresponding interest rate, GDP, CPI inflation, the AEX stock market index and a domestic corporate bond spread. Foreign (euro area) variables are GDP, HICP inflation, outstanding loans to NFCs and the corresponding interest rate, and the EONIA. All the euro area variables are computed by excluding the Netherlands from the composition. Moreover, each variable is expressed in deviations from its specific steady state or linear trend. This trend

captures long term developments and therefore controls for more structural factors that can affect credit dynamics in the long run.[3]

In the second version of the model, we take a closer look at the underlying dynamics behind the stock of credit and shift our attention to the flow of credit. The change in outstanding bank loans (a stock variable) is based on net flows and conceals underlying dynamics in new loans (loan origination) and principal repayments (hereinafter "repayments"). In the final part of our analysis, we therefore include new loans and repayments in the model instead of outstanding loans. A caveat for this part of the analysis is that the data has a slightly different scope than the former part, as it includes all the NFC credit extended by Dutch Banks and therefore also consists of about 25% of loans to non-Dutch NFCs. Nonetheless, the data reveals interesting new insights and potential evidence about the behaviour of credit to Dutch NFCs compared to the euro area. For instance, while the growth of outstanding credit clearly differs between the Netherlands and the euro area, we do not observe such a clear pattern for new loans (see Figure 2), suggesting that repayments play a role in explaining the differences in NFC credit growth[4].

Figure 2: Growth rate of new loans



Source: ECB.

[3] Modelling the long term trend in a more sophisticated (non-linear) manner is challenging because of the short data sample we have available.

[4] Note that the growth rate of new loans is more volatile in the Netherlands compared to the euro area as a whole. A similar pattern is observed in other individual countries, but the swings get averaged out in the aggregated euro area data.

As there is only data available on new loans[5], and data on repayments does not exist, we produce an estimate for the latter. Using data on outstanding loans, new loans, renegotiations and Special Purpose Vehicle (SPVs) purchases, we are able to construct a fairly precise estimate for the amount of repayments by NFCs to Dutch banks:

$$rep_t = newloans_t - \Delta outstanding\ debt_t - renegotiations_t - sales\ to\ SPV_t$$

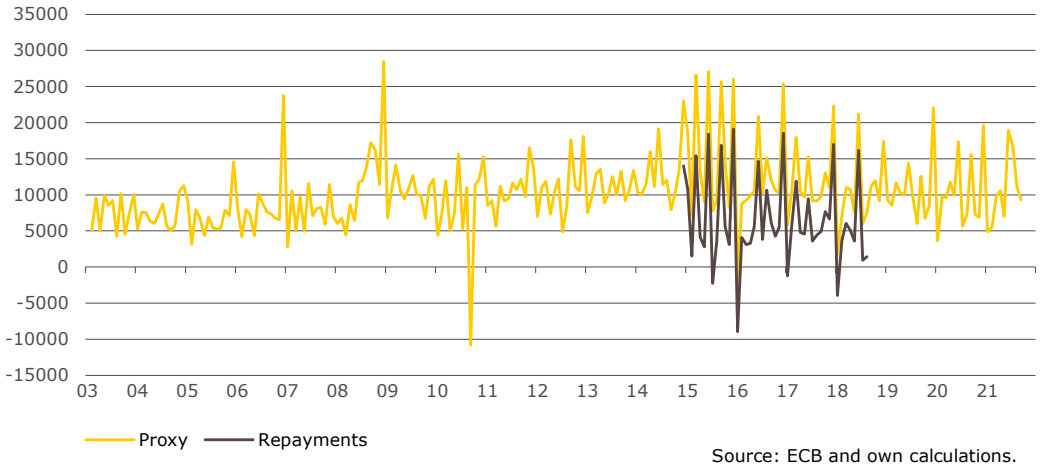
Unfortunately, the data is only available for a limited time period and only for the Netherlands (see Figure 3). Nonetheless, we show that a proxy – that leaves out renegotiations and net sales to SPVs – follows a very similar pattern as our more precise estimate (the correlation coefficient is 99,1%). Once we calculate this proxy for the euro area too, we note that repayments were relatively high in the Netherlands between 2011-2018 compared to the euro area (see Figure 4).[6,7]

[5] New business loans comprise all new loan agreements between banks and businesses, including the renegotiation of existing agreements (for instance the interest rate). Drawings from an existing credit line are hence not regarded as new loan agreements as the terms were agreed upon earlier. Note that renegotiations of existing contracts are also reported separately in the data, but are only available for a limited period. We conclude that they are relatively stable over time and therefore only have a level effect – this implies that growth rates are not affected substantially if we do not correct for them.

[6] Outstanding loans are corrected for notional cash pooling because these loans do not constitute a genuine provision of loans to the economy from an economic perspective. This information is not reported for new loans. To the extent that notional cash pooling is relevant for new loans, our repayments estimate might be affected by it. However, a comparison of outstanding loans with and without correction for cash pooling reveals that cash pooling is more or less a constant over time, implying that our model results would not be affected by it.

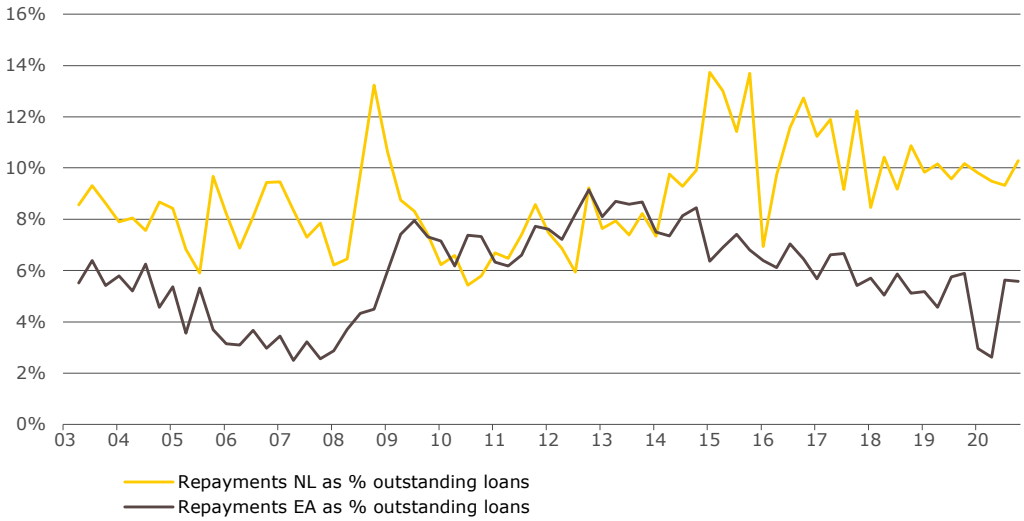
[7] The underlying assumption for the time series of our repayment proxy is that renegotiations and sales to SPVs were also relatively constant outside the time sample of Figure 3. Moreover, we assume that the proxy is also appropriate for the rest of the euro area. Note that the proxy is higher than the more precise estimate, but that the difference between the series is relatively constant. This level effect does not affect our results because the analysis relies on growth rates of new loans and repayments.

Figure 3: Repayments variable versus proxy



Source: ECB and own calculations.

Figure 4: Repayments as percentage of outstanding loans EA and NL



Source: ECB and own calculations.

Results

We use the VAR to study the role of economic drivers gradually: first we concentrate on the role of common shocks, then we disentangle supply and demand factors, and finally we decompose the dynamics of the stock of credit into flows (i.e. new loans and repayments).

3.1. The important role of common shocks

The main Dutch macroeconomic variables such as GDP and inflation display high correlation with the corresponding euro area aggregates. This is also true for credit: we already noted the common drop in outstanding loans to NFCs after the global financial crisis, followed by a recovery which was more pronounced for the euro area. As a first step, we therefore investigate the relative role of common versus idiosyncratic shocks in explaining the dynamics of different economic variables. For this purpose, we use a minimal and rather standard identification assumption: the Netherlands is a small open economy. In practice, we assume that idiosyncratic shocks (that originate in the domestic economy) do not affect foreign variables, while common shocks (that originate in the rest of the world) affect both the Dutch and the euro area variables.

We find that common shocks play a significant role in explaining the dynamics of domestic variables. One way to check for this is by looking at the Forecast Error Variance Decomposition (FEVD) reported in Table 1 below. The FEVD tells us the percentage of the variation in a given variable that is explained by the corresponding group of shocks (in this case common shocks). Looking at different horizons allows us to consider both short-run variations and more persistent movements.

Table 1. Forecast error variance decomposition of domestic variables at different horizons: the share of common shocks

Variable	1q	1y	3y	5y
Lending rate	90%	96%	98%	98%
Credit volume	26%	51%	71%	75%
GDP	64%	73%	77%	78%
Inflation	44%	52%	54%	55%

The lending rate in the Netherlands is almost entirely explained by common shocks, a result that is in line with the textbook definition of a small, open economy. This is not surprising given that the lending rate closely follows monetary policy, which is set by the ECB for the euro area as a whole. It is therefore unsurprising that in domestic credit markets, given that prices are *de facto* determined by common foreign developments, the role of common shocks also predominates in explaining the dynamics of credit volumes. This is particularly the case for longer horizons: long-lasting movements, like the persistently low credit growth in the post global financial crisis period, are mainly explained by common shocks.

Table 1 also reports the FEVD of GDP and inflation, showing the relevance of common shocks for the main macroeconomic variables as well. Common shocks find their way to domestic credit growth through several channels. An obvious channel is the export channel, through which foreign shocks affect domestic firms' demand for loans. Given that the Netherlands is a small and open economy exposed to external shocks, it is plausible that exports play an important role in transmitting foreign shocks. Besides the export channel, foreign shocks likely transmit indirectly to domestic credit growth through other domestic channels, such as consumption and investment. If a given foreign shock affects domestic GDP and employment, for instance, it will also affect the demand for domestic firms' products, and thus also their investment decisions and demand for loans. In addition, other transmission mechanisms likely play an important role such as the strong financial linkages within the euro area or the effects generated by uncertainty.[8]

3.2. The main driving force behind domestic credit: supply versus demand

3.2.1 The effects of economic drivers over time

Building on these results, we proceed by adding further assumptions to decompose the common shocks into three foreign shocks that are found to be important drivers of domestic credit: credit supply, aggregate demand and aggregate supply (cost-push).[9] We follow the literature on

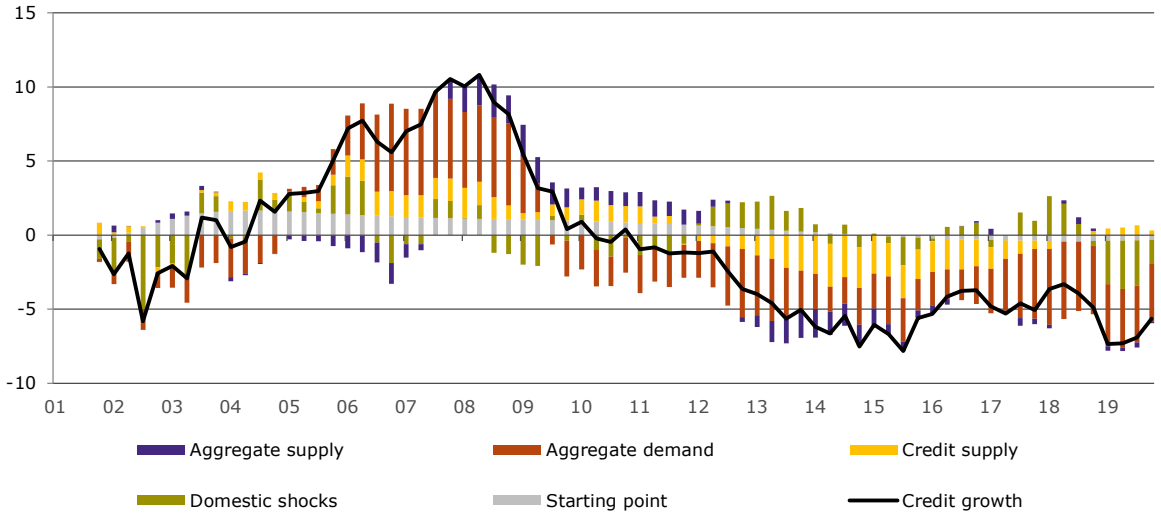
[8] Understanding these transmission mechanisms goes beyond the aim of the model employed in this study and requires a different analysis that is left for future research.

[9] The shocks that we label as aggregate supply do not have permanent effects on GDP: we interpret them as cost-push shocks (e.g. markup shocks) rather than technological changes.

identifying credit supply shocks and assume that they are associated with an increase in credit volume and a decrease in the corresponding lending rate.[10] An expansionary foreign aggregate demand shock is associated with an increase in output and inflation. An aggregate supply shock is assumed to drive inflation and output in opposite directions (please refer to the corresponding table in the Appendix for more details).

We can use this identification to decompose the observed growth rate of credit (in deviation from its steady state) into the contribution of different shocks. Figure 5 shows this decomposition over time: at each quarter the observed variable (the black line) is equal to the sum of four different factors indicated with a bar of a different colour.[11]

Figure 5: Historical decomposition of annual (real) credit growth to NFCs (NL)



The decomposition indicates that domestic credit growth is mostly driven by common demand shocks (red bars in Figure 5) rather than credit supply shocks (yellow bars). Similar to the literature, we find that credit supply shocks play an important role mainly during periods of crisis (Darracq Pariès et al., 2014; Gambetti and Musso, 2016). These shocks have a relatively large

[10] See Bijsterbosch and Falagiarda (2015), Gambetti and Musso (2017), Mumtaz et al. (2018)
[11] Note that a bar for a particular quarter does not just reflect the shock in that particular quarter, but also the dynamic effect of past shocks of the same kind. The starting point is a residual part: it is present because the data at the beginning of the sample cannot be decomposed into shocks.

contribution, as was especially the case during the euro area sovereing debt crisis. However, the impact of credit supply shocks on credit growth seems to have gradually declined thereafter (see also Bijsterbosch and Falagiarda, 2015). The importance of common euro area demand shocks is high and relatively constant throughout the sample period. In addition, negative demand shocks were very persistent in the last decade and also seem to have played an important role in the more recent episode of low credit growth, which started after 2018.

We further find that the historical decomposition remains robust and that demand shocks still play the largest role in explaining credit growth even when we rerun the model based on the sample period including the first year of the COVID-19 crisis (2020). However, the coefficient estimates obtained based on this sample should be interpreted with caution, as the COVID-19 crisis represents a large and unusual shock that violates the assumptions of the model. Nevertheless, given their persistent character, it is likely that common demand shocks continued to surpress credit growth in 2020 as well. Furthermore, it is also important to note that these results hold at the aggregate level: total bank lending to NFCs. At a more disaggregated level, the importance of supply and demand shocks might vary for firms of different sizes.[12]

3.2.2 Why is domestic credit growth divergent from credit growth in the euro area?

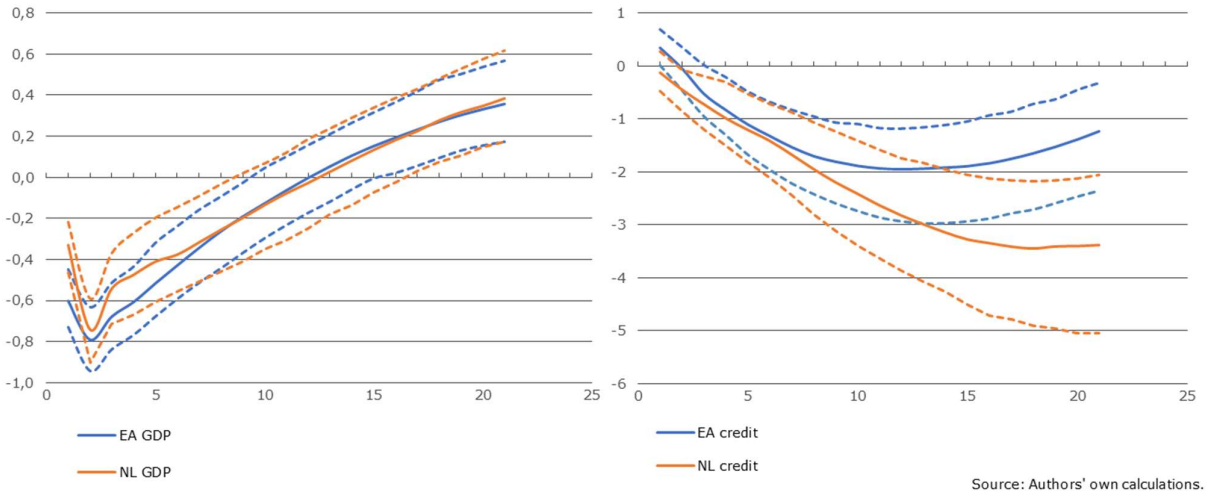
In order to shed light on the question of why credit growth in the Netherlands remained at very low levels while it recovered faster in the rest of the euro area, we now turn to the impulse response functions and compare the effects of the identified shocks on the dynamics of domestic and euro area variables. An impulse response functon shows the changes in the variables over time in response to a one-time exogenous shock to the model. Since we found earlier that demand factors play an important role explaining the observed low credit growth, we compare the responses of domestic and foreign variables to a common negative demand shock. We find that while the response of GDP is quite similar in both the Netherlands and the rest of the euro area, the response of credit growth in the Netherlands is systematically stronger and much more

[12] Survey data and anectodal evidence suggest that SMEs in the Netherlands might be experiencing bottlenecks in receiving bank credit, pointing at possible supply side constraints.

persistent (see Figure 6). This persistency suggests that low credit growth in the Netherlands is still a result of negative demand shocks that affected the economy in the recent past, as the effects of a demand shock on credit developments take a long time to die off.

Figure 6: Impulse response functions to a negative demand shock in EA

y axis: percentages; x axis: quarters



Source: Authors' own calculations.

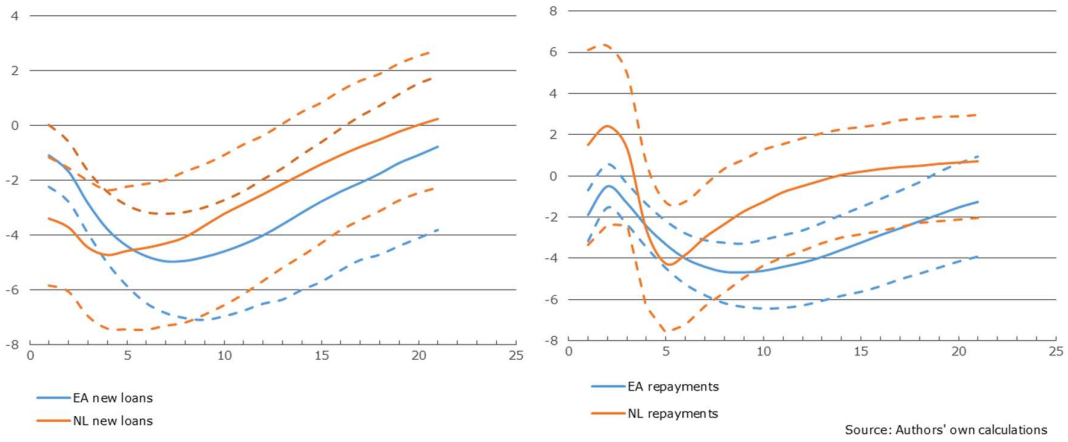
3.3. The effect of common demand shocks on the dynamics of new loans and repayments

The last result from the previous analysis is somewhat puzzling: it implies that if, for example, there is a crisis that lowers demand globally, credit in the Netherlands will take longer to recover than in the euro area, while the behavior of GDP will be similar. In order to better understand what accounts for this observation and take a deeper look at the underlying dynamics of outstanding credit, we extend the model and study the effects of these shocks on new loans and repayments, both for the Netherlands and the euro area by way of comparison.

Figure 7 shows the estimated impulse response functions of new loans and repayments to a negative common demand shock, for both the Netherlands and the euro area. We find that while the responses of new loans to the same common demand shock are quite similar across the Netherlands and the euro area, the responses of repayments clearly differ.

Figure 7: Impulse response functions to a negative demand shock in EA

y axis: percentages; x axis: quarters



Source: Authors' own calculations

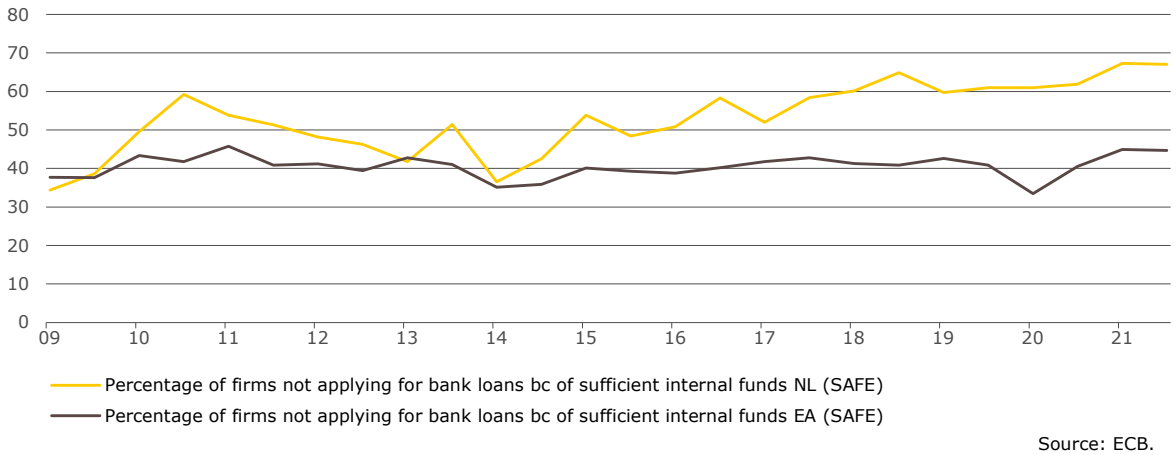
Repayments decline after a negative shock as firms' ability to repay worsens due to a decline in their operating surplus. In addition, it is likely that firms prefer to hoard cash in response to increased uncertainty. Our estimates also indicate that repayments in the Netherlands start converging back to a steady state after six quarters, while the response of repayments in the euro area is more persistent. This divergence implies that firms repay Dutch banks much faster after a crisis, and this mechanically explains the lower growth of the stock of loans, which is the starting point of our analysis.

As mentioned earlier in the data section, a caveat of this part of the analysis is that the data involve credit from Dutch banks to all NFCs in the euro area instead of only to Dutch NFCs, as was the case in the first part of the analysis. This implies that the analysis hides possible differences in the dynamics of credit extended by Dutch banks to Dutch NFCs and to NFCs elsewhere in the euro area. As the level of total credit issued by Dutch banks to all NFCs in the euro area declined more strongly in the past decade than the level of credit extended to Dutch NFCs only, this suggests that dynamics in repayments were driven relatively strongly by foreign firms. Nevertheless, since foreign firms comprise only roughly 25% of outstanding credit, our results suggest that high repayments by Dutch firms are a potential explanation for (at least part of) the

difference in the development of outstanding credit in the Netherlands versus the euro area since the great financial crisis. Future research on the role played by Dutch firms in total repayments to Dutch banks would be useful.

Sizeable repayments by NFCs in the Netherlands could be a sign of deleveraging needs. By 2015, the corporate debt-to-GDP ratio in the Netherlands was among the highest in the euro area. Since then, both debt-to-assets and debt-to-GDP ratios for the NFC sector have been declining. Sufficient liquidity in the corporate sector and an increase in non-bank finance might have served to facilitate this. According to the SAFE survey, a significantly larger share of Dutch firms indicate that they have not applied for bank loans in the past six months because of sufficient availability of internal funds (67% vs. 45% in the euro area in 2021H2, see Figure 8). While this share has been stable in the euro area since 2009, it has been increasing in the Netherlands since 2014. ECB data also shows that internal funding makes up a relatively large share of Dutch NFC funding. Additionally, in the last decade there was a somewhat higher issuance of shares and bonds by Dutch NFCs, which implies a relatively strong shift away from bank finance. These shifts in internal and external finance could partly explain higher repayments to domestic banks.

Figure 8: Share of firms not applying for loans because of sufficient internal funds



Source: ECB.

Discussion and policy implications

The results of this study suggest that common demand shocks played an important role in explaining credit growth to Dutch NFCs since the global financial crisis and until the onset of the COVID-19 crisis. In addition, as an open and small economy, credit growth in the Netherlands responds more strongly to demand shocks compared to the rest of the euro area. The role of supply side shocks is generally smaller, with the exception of the global financial crisis as well as the European debt crisis when their impact was substantial.

In the second part of the analysis, we shed new light on the question of why bank lending to NFCs responds differently to demand shocks in the Netherlands compared to other euro area countries. By disentangling the growth of outstanding bank loans into new loans and repayments, the underlying dynamics of outstanding debt can be studied in more detail. We find that while new loans from Dutch banks respond similarly to a demand shock when compared to new loans from banks in the rest of the euro area, repayments respond much less. This implies that outstanding credit declined in the past decade mainly because repayments were relatively high compared to the amount of newly issued loans. An interesting question for further research is to get a better understanding of why the dynamics of repayments by NFCs were so different in the Netherlands. Furthermore, if new data were to become available, it would be interesting to see what share Dutch NFCs played in repayments to Dutch banks compared to foreign NFCs.

While the BVAR model in this study suggests that supply side shocks play a relatively small role in explaining credit growth in the last decade, our results do not imply that there are no supply bottlenecks. Since we study NFC credit on an aggregate level, including both large firms and SMEs, we do not pick up on possible differences among the different segments of the market. Due to data limitations – data on SME credit is only available as of 2013 – we are unable to make this distinction as a robustness check either. Nonetheless, there are some structural concerns regarding bank lending to Dutch SMEs that require additional research. First, according to SAFE, Dutch SMEs are much more likely to report that their credit request was rejected. Second, the

interest rate spread between small and large loans in the Netherlands widened after the global financial crisis and is substantially higher than in the rest of the euro area. Third, SMEs in the Netherlands have on average the lowest number of banking relationships, which partly reflects the relatively concentrated Dutch banking sector and raises concerns about the market power of lenders. A credit registry in the Netherlands could improve lending to SMEs by reducing transaction costs for lenders and improving competition between financial institutions.

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Appendix

The econometric framework

We base our analysis on VARs estimated using Bayesian methods, in which the variables are expressed as deviations from a deterministic long-run equilibium. Formally, indicate with Y_t the vector with the observed variables at time t, we assume:

$$A(L)(Y_t - \bar{Y}_t) = Be_t \qquad e_t \sim N(O, I)$$

where $A(L)$ is a polynomial in the lag operator L restricted to ensure stable dynamics, and $\bar{Y}_t$ is the vector with the equilibrium values at time t: each equilibrium can be either a constant steady state or a deterministic linear trend.[13]

We consider two specifications, analysing first the dynamic of the stock of credit and then the dynamics of flows of credit.

First model: analysing the dynamics of the stock of credit

In the first specifiction we consider a VAR with 11 variables and 2 lags. The variables are: outstanding bank loans to NFCs, the corresponding interest rate, GDP, CPI inflation, the AEX stock market index and a corporate bond spread. We also include euro area variables: GDP, HICP inflation, outstanding loans to NFCs, the corresponding interest rate and the EONIA. All the euro area variables are computed by excluding the Netherlands from the composition. The sample starts in 2000Q3 and ends in 2019Q4.

Euro area GDP and outstanding loans are trending variables, so we assume their equilibrium is a linear trend. Their Dutch counterparts are expressed as a share of the respective euro area variables: in this way we can eventually impose cointegration relations between domestic and foreign variables choosing, as equilibrium for the domestic variable, a constant steady state. In particular we assume that the equilibrium for the relative outstanding loans is constant, implying a cointegration relation between the domestic and the foreign variables. We have a different

[13] This framework was introduced by Villani (2009). Here we consider a generalised version allowing for deterministic linear trends in addition to constant steady states.

choice for the the equilibrium relative GDP: we assume it is a linear trend and we estimate a positive slope, implying that GDP in the Netherlands grows faster.

For the identification of the shocks we use a combination of zero and sign restrictions. The first hypothesis we use is that the Netherlands is a small open economy: we assume that domestic shocks (for example a demand shock in the Netherlands) do not affect the rest of the euro area, while foreign shocks do affect the Dutch economy. For this reason we label the latter as "common shocks". In practise this is achieved by imposing appropriate zeros both on the impact matrix B, and on the matrices of the polynomial $A(L)$.
The common shocks are further disentangled by imposing extra zeros and sign restrictions according to the table below:

Table A1: Zero and sign restrictions in the foreign block for the identification of common shocks

Shock/Variable	Credit	Lending rate	EONIA	EA Inflation	EA GDP
Credit supply	+	-	0	0	+
Demand				+	+
Aggregate supply				-	+

Second model: analysing the dynamics of the flows of credit

In the second specifiction we focus on the dynamics of credit flows. The VAR has 2 lags and the following 12 variables: new loans to NFCs, the corresponding interest rates, GDP, CPI inflation, a proxy for repayments, a corporate bond spread, euro area GDP, HICP inflation, new loans to NFCs in the euro area, the corresponding interest rate, a proxy for repayments in the euro area and the EONIA. The sample starts in 2003Q2 and ends in 2019Q4.

The identification of the shocks is achieved by imposing the same assumptions as in the previous analysis. In particular we use the small open economy assumption to block identify the domestic and common shocks, and the same combination of zero and sign restrictions to identify the common demand shock: it is the unique shock that moves euro area GDP and HICP inflation contemporaneously in the same direction.