The Credit Channel in Monetary-Policy Analyses

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INTRODUCTION

In the economic literature a distinction is usually drawn between various transmission channels of monetary policy. These describe how changes in interest rates and exchange rates affect the decisions of business enterprises and households. For instance, an increase in interest rates may entail a lower level of business investments since it will be more expensive to borrow (the investment channel), or lower consumption by households since their assets or disposable income will fall (the consumption channel).

In addition to these channels a monetary-policy credit channel has attracted increasing attention in recent years. The credit channel is an aggregate term for a series of theories implying that the supply of bank loans may decline when interest rates go up. This means that some bank customers cannot obtain the loans they want, or that their loan costs rise in excess of the original increase in interest rates. The credit channel thus amplifies the effect of the increase in interest rates on investments and private consumption.

This article first provides a brief overview of various theoretical explanations of the credit channel. This is followed by a presentation of various types of studies of the credit channel in the euro area, where it has been strongly in focus in recent years. Finally, the relevance of a credit channel in Denmark is briefly discussed.

Several empirical studies indicate that the mechanisms underlying a credit channel are of some relevance in the USA. Since financing in the euro area member states predominantly takes place via banks, this might be expected to apply to the euro area as well. However, recent studies indicate that a credit channel could be of less importance in the

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1 In principle the supply of loans may also increase when interest rates fall. However, several studies indicate that the mechanisms underlying a credit channel are particularly relevant when interest rates go up. The remainder of this article will focus on a scenario with rising interest rates.
euro area than previously expected. Presumably, a credit channel does not play a major role in Denmark either, partly as a result of the widespread use of mortgage-credit loans.

**THEORETICAL PRESENTATIONS OF THE CREDIT CHANNEL**

In the theoretical literature the credit channel is often split into two subchannels, the balance-sheet channel and the bank-lending channel. They emerge via the effect of interest-rate changes on respectively borrowers' and banks' balance sheets. The two channels are outlined below.

**The balance-sheet channel**

The mechanisms underlying a balance-sheet channel can be described on the basis of a normal lending situation. A bank considering granting a loan to a customer will require a higher rate of interest than its own financing interest rate (e.g. a deposit or money-market rate). The bank's credit-risk premium for lending to the customer accounts for part of this interest-rate differential. This premium covers the risk that the customer is unable to repay the loan.

A general increase in interest rates is now assumed (i.e. the same increase in all interest rates). According to the balance-sheet channel, this increase may affect the customer's balance sheet in a way that makes it more difficult for the customer to repay the loan. For example, the value of certain assets such as securities or real property may fall, so that the customer's wealth decreases. This heightens the risk that the customer will subsequently become insolvent. In addition, the customer's debt burden increases, which also makes it more difficult to service the loan.

Usually the bank reacts to this deterioration of the customer's ability to meet payments by tightening its credit policy. The bank can do so by altering its terms and conditions for loans to the customer (i.e. interest rates, credit maximum, collateral requirement, etc.). The bank may e.g. require a higher credit-risk premium when lending to the customer in question. This is equivalent to the bank raising its lending rate in excess of the general increase in interest rates. In this situation the balance-sheet channel thereby amplifies the effect of the interest-rate increase on the customer's loan costs.

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1 See e.g. Bernanke and Gertler (1995) or Hubbard (1995) for a more detailed description of the two channels.
2 The balance-sheet channel may also apply to other types of credit than bank loans. Consequently, it is often referred to as the broad credit channel.
3 The interest-rate differential must also cover the bank’s administration costs and the interest-rate risk arising from having deposits and loans with different maturities, and contribute to the bank’s return on equity.
The bank may also tighten its credit policy by altering its credit standards (i.e. the criteria for accepting customers as borrowers). If the bank tightens its credit standards, the customer may be rejected as a borrower by the bank. The customer may then obtain a loan from another bank or from another source of finance, but usually on less favourable terms. Again the result will be an increase in loan costs exceeding the general increase in interest rates.

In some descriptions of the balance-sheet channel it is assumed that the customer must pledge specific assets as collateral for the loan. If the value of the assets falls after an increase in interest rates, the maximum loan amount covered by the collateral decreases. The customer may borrow the differential amount without collateral, but usually at a higher rate of interest. The result is thus also a higher increase in loan costs than the general increase in interest rates warrants. In this case, however, the lower supply of bank loans is not due to a tightening by the banks, but a result of a decline in the value of the collateral.  

The mechanisms underlying a balance-sheet channel may also apply in other situations than when interest rates change. For instance, a borrower's ability to meet payments may deteriorate in a period of low growth and declining employment. By charging a higher risk premium on lending, or by tightening credit standards, the banks' credit policy tends to be procyclical. In the economic literature this mechanism is referred to as the financial accelerator effect.

The bank-lending channel

The bank-lending channel works through the effects of higher interest rates on the banks' balance sheets. These effects imply that the banks must reduce their lending in excess of any fall in the demand for loans. Consequently, the banks have to tighten their credit policies, i.e. their terms and conditions for loans or their credit standards. As a result some customers will not be able to obtain the loans they want, or their loan costs will increase disproportionately.

An explanation of this channel is based on a relationship between a change in interest rates and the banks' capital reserves (the "capital-adequacy explanation"). Today banks in most countries are subject to standardised capital-adequacy requirements intended to cover various

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1 In connection with the balance-sheet channel, the cash-flow channel is often mentioned. Many business enterprises prefer to finance their activities via their regular cash flows instead of bank loans, since they save e.g. the credit-risk premium. The cash-flow channel assumes that the cash flows of some business enterprises decrease when interest rates increase, entailing a higher degree of bank borrowing. The business enterprises’ financing costs thus increase in excess of the original increase in interest rates. The cash-flow channel differs from the balance-sheet channel in that the supply of bank loans does not change.
risks in relation to their activities. An increase in interest rates may entail a capital loss on securities, thus reducing the capital reserves of the banks. If the capital reserves drop to a low level or the statutory minimum level, the banks may wish to reduce lending by e.g. tightening their credit policy vis-à-vis some customers.

Box 1 outlines another explanation of this channel commonly found in the economic literature (the "deposit explanation"). It assumes that a tightening of monetary policy leads to a fall in bank deposits, so that

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The requirements are described in the Basel Committee’s capital-adequacy rules. For a status of the current work to revise these rules, see Borup and Lykke (2003).

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The deposit explanation of a bank lending channel

Box 1

According to the bank-lending channel, a monetary-policy tightening may have a number of balance-sheet effects forcing the banks to reduce their lending. A widespread explanation in the literature is that a monetary-policy tightening leads to a fall in bank deposits so that lending must be reduced correspondingly. For various reasons this explanation is, however, not fully relevant in all countries.

A monetary-policy tightening may reduce deposits if the banks are required to hold non-interest-bearing reserves at the central bank. A bank’s reserve requirement is often calculated as a fixed percentage of its deposits. If monetary policy is tightened, it usually becomes more expensive for the bank to meet the reserve requirement for a certain volume of deposits. Consequently, the bank often prefers to reduce deposits, e.g. by raising its deposit rates less than the monetary-policy interest rates.

The link between monetary policy and bank deposits can also arise if deposit rates are regulated. For instance, banks may not be allowed to raise the deposit rate above a certain limit. When monetary policy is tightened it will then become less attractive to deposit funds in bank accounts (because the yield on other assets, e.g. short-term bonds, has increased), and deposits will decrease.

In practice, however, there has been a tendency to abandon non-interest-bearing reserve requirements and regulation of deposit rates. For instance, in the euro area reserve requirements bear interest at the marginal rate for the ECB’s main refinancing operations. Some euro area deposit rates still respond with some sluggishness to changes in the monetary-policy interest rates, but this has become less pronounced since the introduction of the euro, cf. De Bondt (2002).

In many countries deposits are more likely to increase than to decrease when monetary-policy interest rates are raised. According to several empirical studies the demand for money (i.e. in practice the demand for deposits) is positively linked to short-term market interest rates or negatively to the spread between long-term and short term market interest rates. The reason is that deposit rates in many countries follow short-term market interest rates relatively closely.

Even if deposits were to decline following a monetary-policy tightening, the banks need not necessarily reduce lending. Instead they may choose to finance lending by borrowing in the money market or by issuing bonds. The banks may also start by reducing other – typically more liquid – assets than loans, e.g. deposits at other banks or their bond portfolios.
lending activities must be reduced correspondingly. The link between a change in monetary policy and bank deposits may be seen if e.g. the banks are required to hold non-interest-bearing reserves at the central bank, or if deposit rates are regulated. As stated in the Box, this explanation is not fully relevant in all countries.

Like the balance-sheet channel, the bank-lending channel may also apply in other situations than when interest rates changes. For instance, in a period of economic slowdown, some banks may sustain large lending losses, which undermine their capital reserves. As mentioned above, they may then tighten their credit policies in order to reduce lending. In practice it may be difficult to determine whether a tightening of the banks' credit policies is attributable to this factor or to concerns about a borrower's ability to meet payments (i.e. a balance-sheet channel).

METHODS TO ANALYSE THE CREDIT CHANNEL

A general problem in connection with empirical studies of a credit channel is how to distinguish between the supply and demand effects of a change in bank lending. For instance, reduced bank lending following an increase in interest rates may be attributable to a decrease in the supply of loans in accordance with a credit channel, as well as lower demand for loans owing to higher interest rates. In addition, the demand for loans may also fall if economic activity has slowed down or is expected to slow down.

Various methods have been applied to distinguish between changes in the supply of and demand for loans. Some are briefly described in Box 2. In general, the different methods have been initially applied to studies using US data, cf. the references in the Box.

The strength of a credit channel in various countries may also be assessed by comparing relevant indicators of financial structures. This has been done in studies of a credit channel in e.g. the euro area member states1. In another type of study selected banks are asked about their view of the development in the supply of and demand for loans. This is done regularly in both the USA and the euro area.

THE CREDIT CHANNEL IN THE EURO AREA

Recent years have witnessed growing interest in investigating the impact of a credit channel in the euro area. This should be seen against the background of the introduction of the single monetary policy in the euro area member states, which has boosted interest in its transmission

1 See e.g. Kashyap and Stein (1997) and Cecchetti (2001).
channels. Moreover, several US studies indicate that this channel plays a certain role in the USA\(^1\). Since a relatively large proportion of euro area

\(^1\) All the studies using US data referred to in Box 2 indicate that a credit channel exists in the USA.
financing takes place via banks, this could also be expected to be the case in the euro area.

**Empirical studies**
The most extensive study of a credit channel in the euro area was conducted by the Eurosystem (the ECB and the national central banks in the euro area member states) in 2001. It was part of a larger study of the monetary-policy transmission in the euro area member states and primarily comprised studies of business investments and bank lending based on data on individual enterprises and banks. The main conclusions from the study are outlined in Box 3.

The Eurosystem study showed that monetary policy primarily affects output in the euro area via the investment channel. The credit channel, on the other hand, may be less significant to monetary-policy transmission in the entire euro area than previously expected. This may be due in part to the high degree of financial stability in the euro area banking sector and traditional close relations between banks and borrowers in some member states (ECB (2002a) and Angeloni et al. (2002)).

Other empirical studies of a credit channel have generally been limited to only one or a few euro area member states. The methods and data sets applied have differed across studies, which may explain the variation in the results. However, several studies indicate that a credit channel has some significance in Germany and Italy. This is also in line with the results of the study conducted by the Eurosystem, cf. Box 3.

**Indicators of financial structures**
The strength of a credit channel in the euro area member states can also be assessed by comparing indicators of financial structures. For instance, it may be relevant to look at conditions in the banking sector that may be of importance to a bank-lending channel. The same applies to indicators of households' and business enterprises' access to other sources of financing than banks. If there is access to a broad range of other sources of financing than bank loans, the strength of the credit channel will usually diminish.

Chart 1 shows a number of frequently observed indicators in this kind of studies. The assumed relationship between the indicators and the potential of a credit channel is also stated. For example, the strength of a bank-lending channel is often assumed to be greater in countries where the banking sector is dominated by many small banks (a low de-

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1 For instance, Kakes and Sturm (2002) and De Bondt (1999) found indications of a credit channel in Germany, and so did Angeloni et al. (1995) and Altunbas et al. (2002) as regards Italy. Some studies, however, show diverging results. Thus neither Guender and Moersch (1997) nor Kakes et al. (2001) found indications of a credit channel in Germany.
In 2001 the Eurosystem conducted a comprehensive study of the monetary-policy transmission in the euro area. It comprised three types of studies: (i) Studies based on macroeconomic models and statistical (vector autoregressive) models for the individual euro area member states and the entire euro area, (ii) studies of business investments at enterprise level, and (iii) studies of bank lending based on data on individual banks.¹

According to the macroeconomic and statistical models, changes in monetary policy have a temporary impact on output in the euro area. The maximum effect is seen around 1 year after the monetary-policy adjustment, after which output gradually approaches its base scenario. Prices in the euro area are affected later than output, but the impact is of longer duration. To some extent the size of these impacts on output and prices depends on the specific model, but there are no signs of significant systemic differences across countries.

Studies show that in most countries business investments depend on a measure of capital costs. This reflects the normal investment channel. In addition, investments in most countries depend on business enterprises’ cash flows. If cash flows diminish when interest rates go up, this indicates that a cash-flow channel is relevant. Several studies demonstrated that cash flows do indeed diminish when interest rates increase.

The studies of banks’ lending confirmed that a monetary-policy tightening normally dampens lending activity. Furthermore, in most countries the lending reaction is greater in banks with a relatively small portfolio of liquid assets than in other banks. This difference indicates a reaction on the supply side. However, a greater lending reaction in small banks or banks with relatively small capital reserves is only seen in a few euro area member states. This is contrary to the findings of similar surveys in the USA (Kashyap and Stein (1995) and Kishan and Opiela (2000)). Thus, these surveys show clearer signs of a credit channel in the USA than in the euro area.

ECB (2002a) and Angeloni et al. (2002) include a summary of the studies and an assessment of the significance of the various transmission channels. They conclude that most of the monetary-policy impact on output in the euro area is related to the direct effect of interest-rate changes on investments (the investment channel). On the other hand, the effect of the credit channel on output in the euro area as whole may be rather limited. The credit channel may have some significance in a few member states, including Germany and Italy.

ECB (2002a) and Angeloni et al. (2002) also present a number of explanations of why banks apparently play a smaller role in the monetary-policy transmission than previously expected. These include the high degree of financial stability in the euro area banking sector (illustrated by the relatively few cases where banks have collapsed), as well as traditionally close relations between banks and borrowers in some countries. The strength of the bank-lending channel may also be smaller in the euro area than in e.g. the USA because bank deposits decrease less when monetary policy is tightened, cf. Box 1.

¹ The studies have been published in the ECB’s Working Papers as nos. 91-112.
Banks’ portfolios of liquid assets and the proportion of short-term lending are usually also assumed to affect the strength of a bank-lending channel. If the portfolio of liquid assets is relatively modest, the banks have limited options to reduce other assets than lending. If the loans have a relatively short term to maturity, the banks can reduce lending faster.

Access to other financing than bank loans can be assessed by looking at the composition of households' and business enterprises' debt. If there are a broad range of alternative borrowing options, other loans...
than bank loans will constitute a larger proportion of the debt, viewed in isolation. In addition to debt financing, business enterprises may also obtain financing by issuing shares. If access to this source is favourable, the value of issued shares will, other things being equal, constitute a larger proportion of the business enterprises’ liabilities.

The indicators in Chart 1 point to a credit channel having a greater impact in Italy and Germany than in other euro area member states. In both member states the banking sector is dominated by many relatively small banks. Moreover, Italian banks’ portfolios of liquid assets are relatively small, and a large proportion of their lending consists of short-term loans. In both Italy and Germany, bank loans constitute a relatively large proportion of households’ and business enterprises’ debt, and share financing is less prevalent than in several other member states.

The potential for a credit channel is lower in Belgium, France and the Netherlands. In these member states the banking sector is more concentrated than in Italy and Germany, and loans have longer maturities than in Italy. Bank loans also constitute a relatively small proportion of households’ and business enterprises’ financing in these countries, which indicates fairly easy access to other sources of financing.

**The ECB’s bank-lending survey**

The significance of the credit channel may also be investigated by asking selected banks about their views on the development in the supply of and demand for loans. The ECB has introduced a quarterly survey in which euro area banks respond to a series of questions about their credit policies and customer demand for loans. Box 4 briefly describes the main content of the survey.

So far, the ECB’s bank-lending survey has been conducted four times. Charts 2 and 3 show the development in the banks’ credit standards and their perception of the development in the demand for loans. The net figure in the two Charts is the difference between the percentage of banks which have respectively tightened and eased their credit standards (or believe that the demand for loans has increased and decreased, respectively). The two Charts also show the net figures for the banks’ expectations for the 4th quarter of 2003.

The first results show that throughout the period of the survey the banks tightened their credit standards (the net figure is higher than 0). According to the banks the main reason is greater uncertainty as to the general economic situation and the prospects for specific industries and business enterprises. The banks’ tightening of their credit standards is thus attributable to concerns as to the borrowers’ ability to meet payments, i.e. the balance-sheet-channel mechanisms.
The banks also report that the demand for loans was declining throughout the period under review. This particularly applies to business enterprises. However, the banks expect higher demand for loans from both households and business enterprises in the 4th quarter of 2003.

The combination of tighter credit policies and lower demand for loans is also reflected in actual growth in lending. During 2003 lending by euro area banks to the private sector has increased by around 5 per cent on an annual basis, which is somewhat below the level in the preceding years.
CREDIT STANDARDS FOR LENDING

Chart 2

Note: The percentage balance indicates the percentage of banks which have tightened (expect to tighten) their credit standards less the percentage which have eased (expect to ease) their credit standards. Lending to households is for consumption.

Source: ECB.

DEMAND FOR LOANS

Chart 3

Note: The percentage balance indicates the percentage of banks which state that demand has increased (expect it to increase) less the percentage which state that demand has fallen (expect it to fall). Lending to households is for consumption.

Source: ECB.
THE CREDIT CHANNEL IN DENMARK

This section briefly discusses the significance of a credit channel in Denmark in connection with interest-rate changes. Generally, a credit channel does not seem to play a significant role in Denmark.

Lending by mortgage-credit institutes and the balance-sheet channel

Most loans of Danish households have been raised from mortgage-credit institutes against real property as collateral. The loans run for many years, and normally the mortgage-credit institutes do not tighten the loan conditions during the term of the loan, even though the value of the real property, i.e. the collateral, decreases. The Danish mortgage-credit system thereby tends to dampen the potential of a credit channel.

Borrowing from a mortgage-credit institute also differs from bank loans in other respects. A mortgage-credit institute may tighten its credit policies (vis-à-vis a new customer or in connection with a supplementary loan) by reducing the accepted loan-to-value ratio for the property in relation to the statutory maximum. On the other hand, the mortgage-credit institute only has limited options to tighten credit by changing its lending rate, which is mainly determined by the bond market.

For a borrower considering raising a supplementary loan, a balance-sheet channel may in principle operate via a change in the net housing wealth. If the latter falls after an increase in interest rates, the maximum loan amount against the home as collateral is reduced. The borrower may be able to borrow the differential amount from a bank, but the loan costs are usually higher than for mortgage credit. From the borrower's point of view the effect of the original increase in interest rates is thus reinforced.

The relationship between changes in interest rates and net housing wealth is relatively complex. It depends on the effect of short-term and long-term interest rates on housing prices, and on the type of loan (adjustable-rate or fixed-rate loans). The widespread use of adjustable-rate loans in recent years may have amplified the effect of changes in both short-term and long-term interest rates on the households' net housing wealth.

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1 The mortgage-credit institute may adjust the contributions to cover e.g. its administration costs and lending losses. The contribution is, however, usually fixed on a long-term basis and constitutes only a small part of the outstanding debt, e.g. 0.5 per cent per annum.

2 The net housing wealth can be calculated as the cash value of the home less the cash value of its financing.

3 See Christensen and Kjeldsen (2002). If the more widespread use of adjustable-rate loans has increased the significance of short-term interest rates to housing prices, this may have reinforced the effect of short-term interest rates on net housing wealth. The growing popularity of adjustable-rate loans may also have amplified the effect of long-term interest rates on net housing wealth, since the value of the outstanding debt on such loans is not affected by a change in long-term interest rates, while housing prices usually are.
Bank lending and the bank-lending channel
Under normal circumstances, a bank-lending channel is not believed to have any significant impact in Denmark.

The banks' capital reserves may decline when interest rates increase. If short-term interest rates go up, some banks will sustain capital losses on their short-term bonds. However, this is often offset in the slightly longer term by higher net interest income from deposits and lending. If long-term interest rates rise, the banks will also sustain capital losses on their long-term bonds. In a period with sound capital reserves and limited lending losses, capital losses must, however, be large before they can be expected to affect the banks' supply of loans.\footnote{The sensitivity to an increase in interest rates can be illustrated by calculations in Danmarks Nationalbank (2003). On an upwards parallel displacement of the yield curve by 1 percentage point the number of Danish banks (categories 1, 2 and 3) with negative results in 2002 would increase from 2 to 3. On a similar displacement by 3 percentage points, a further 17 banks would have negative results.}

The other explanation of a bank-lending channel – the "deposit explanation" – is not particularly relevant in Denmark. In practice, fluctuations in the Danish banks' deposit rates reflect changes in short-term interest rates fairly closely, \textit{inter alia} because the banks are not required to hold non-interest-bearing reserves at Danmarks Nationalbank, and because deposit rates are not regulated. Consequently, bank deposits do not usually fall when short-term interest rates rise.

The potential for a bank-lending channel also depends on access to other financing than bank loans. In Denmark owners of real property may raise loans from mortgage-credit institutes as an alternative to bank loans. Owing to the balance principle mortgage-credit institutes are not affected by the mechanisms underlying a bank-lending channel to the same extent as banks. In this respect, too, the mortgage-credit system tends to dampen the potential for a credit channel in Denmark.

Indicators of financial structures
Chart 1 includes the same indicators for Denmark as for the euro area member states. In terms of these indicators, Denmark does not differ significantly from the euro area. The relatively small proportion of short-term lending in Denmark is attributable to the widespread use of long-term mortgage-credit loans. The relatively small portfolio of liquid assets is also a consequence of the importance of mortgage-credit loans in Denmark. Thus, it can be explained by the fact that mortgage-credit institutes do not have the same requirement for liquid assets as e.g. banks, since their financing is more stable.
LITERATURE


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