

DANMARKS NATIONALBANK

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Female company owners pay higher interest rates



Women pay 1 percentage point higher interest rates

Microdata from the Danish credit register show that female company owners, on average, pay higher interest rates on corporate loans than their male counterparts.

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Different risk profiles explain part of the difference

Most of the interest rate differential is attributable to systematic differences in company and loan characteristics.

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The entire interest rate differential cannot be explained

However, when adjusted for company and loan characteristics, the interest rate paid by female company owners is an average of 0.28 percentage points higher than the rate paid by their male counterparts.

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Data in new ways

Data volumes have grown exponentially. By 2025, an estimated 450 exabytes of data will be created each day. This is equivalent to hundreds of millions of personal computers being filled with data on a daily basis. The vast volumes of data are highly diverse, but new and sophisticated methods enable analysis of this data in new and more efficient ways.

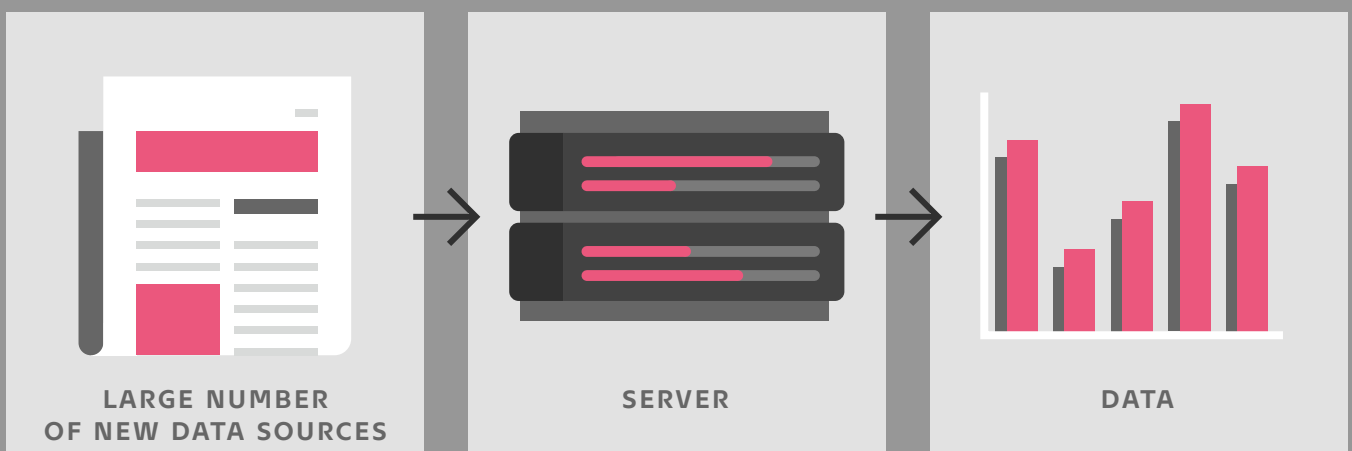
New data types and new data collection methods may be used in various contexts in Danmarks Nationalbank's ongoing work.

In order to acquire more knowledge and a better basis for assessing the Danish economy, Danmarks Nationalbank focuses on new data types and methods in a series of publications.

ABOUT THIS ANALYSIS

In this analysis, Danmarks Nationalbank has used microdata and sophisticated statistical methods to understand factors of significance to banks' interest rate setting behaviour in Denmark. The analysis shows that female company owners, on average, pay higher interest rates than their male counterparts.

New data creates new knowledge



Banks' access to detailed, quantitative information for loan pricing has increased significantly over recent years – thanks, in particular, to an increase in available data and methods for statistical analysis. As a result, loan pricing can be expected to become more objective, while the conventional approach based on negotiation and subjective assessment of potential borrowers takes a backseat.

This analysis is based on a new Working Paper published by Danmarks Nationalbank, drawing on microdata from the Danish credit register to identify factors of significance to banks in their lending to small and medium-sized enterprises in Denmark.¹

The analysis shows that a variable that should be of no significance, namely the gender of the borrower, plays a role for the interest rate on corporate loans. At first glance, the interest rate paid by female company owners is an average of 1 percentage point higher than the rate paid by their male counterparts. However, when adjusted for a range of factors indicating risk of corporate default, this differential is smaller, as explained in the following. Moreover, there are a number of potential explanations for the interest rate differential that cannot be examined by the analysis. These include the borrower's willingness to negotiate and the size of other commitments with the bank.

Interest rates paid by women are an average of 1 percentage point higher than the rates paid by men

Danmarks Nationalbank's survey of bank lending uses a dataset comprising information from the Danish credit register, the CVR register and the Danish Business Authority. The credit register provides detailed information on credit institutions' lending to companies' in Denmark, the CVR register gives the companies' annual reports, and the Danish Business Authority provides information on their ownership structure, number of employees, geographical location etc.

From this data, a sample has been selected, consisting of 45,000 active loans to small and medium-sized enterprises in Denmark at a value of at least kr. 10,000, observed in June 2020.² Preliminary tests show that female company owners pay interest rates that are an average of 1 percentage point higher than the rates paid by their male counterparts. This number does not, however, adjust for loan and company characteristics that should drive differences in interest rates.

The interest rate differential is partly due to company type

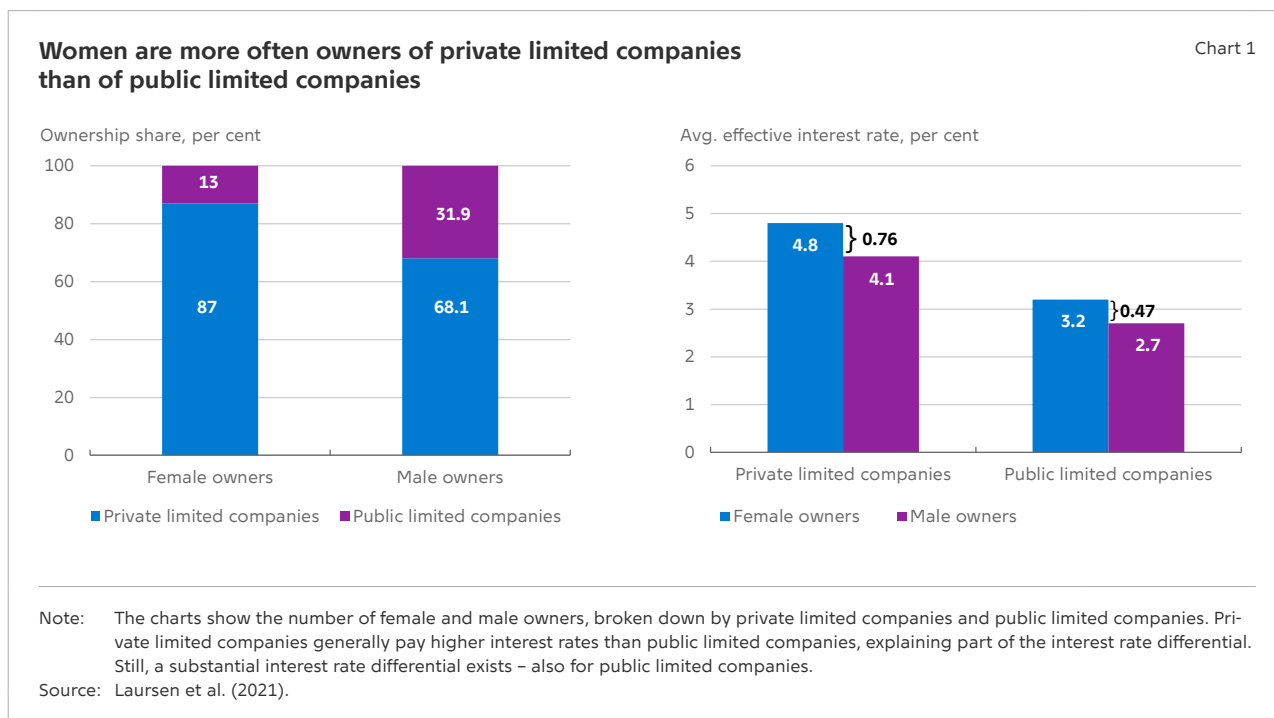
The interest rate set by banks on loans is based on an assessment of the risk that the borrower will be unable to repay the loan in the future. To understand the interest rate differential, it is therefore relevant to initially examine whether there are general differences in the types of companies owned by women and men, as this could impact the bank's assessment of the loan risk.

The data show that company type is an important factor in understanding the interest rate differential between women and men. The analysis distinguishes between two types of companies: private limited companies and public limited companies. Private limited companies tend to be smaller than public limited companies, implying, e.g. a higher risk of default, and consequently, higher interest rates.

Chart 1 illustrates that systematic differences in ownership structure partly explain why women pay higher interest rates than men, as women predominantly own private limited companies. However, the chart also shows that a substantial interest rate differential remains, even when controlling for ownership structure. More specifically, an interest rate differential of 0.76 percentage points exists for loans to private limited companies, while the differential for public limited companies is 0.47 percentage points. As such, although company type is an important determinant in the overall level of interest rates, a substantial interest

¹ The Danish credit register, which contains information about all private and corporate debt in Denmark, was established by Danmarks Nationalbank and the Danish Financial Supervisory Authority. The information is reported by banks and mortgage credit institutions.

² The sample is limited to loans to small and medium-sized enterprises for which the gender of the owner can be established; therefore, large companies with complex ownership structures are excluded. See Laurssen et al. (2021) for further details.



rate differential exists between male and female owners of both company types.

The entire interest rate differential cannot be explained

Additional risk factors

The remainder of the analysis takes a broader look at various company and loan characteristics that also impact interest rates and, therefore, should explain the observed differential between companies owned by women and men, respectively. For instance, a number of financial ratios are included which are calculated based on the companies' financial statement information. See box 1 for a more detailed explanation.

The additional company and loan characteristics significantly reduce the observed interest rate diffe-

rential between women and men, however, without explaining it fully.

Chart 2 illustrates the interest rate differential in three stages, as more background information is gradually introduced into the estimation. First, the gross interest rate differential is shown without considering the relevant background information. At this stage, the interest rate paid by women is about 1 percentage point higher than the rate paid by men. Then, the interest rate differential is shown after adjusting for general company characteristics. Now, the interest rate differential narrows to 0.35 percentage points. Finally, the interest rate differential is shown when both company and loan characteristics are included in the analysis. At this final stage, the interest rate differential further narrows to 0.28 percentage points.³

Women pay between kr. 700 and 1,000 more in interest rate expenses per year

The remaining interest rate differential of 0.28 percentage points is both statistically and economically

³ These findings are achieved using the most flexible machine learning method applied in Laursen et al. (2021), thereby representing the highest amount of explanatory power extracted from data.

significant. In economic terms, it implies that the average annual interest expense paid by women in the sample is between kr. 700 and kr. 1,000 higher than the expense paid by men. This finding is in line with a comparable study, showing that during the period from 2004 to 2007, female company owners in Italy paid between 0.09 and 0.11 percentage points more for their overdraft facilities (Alesina et al. 2013).

Interest rate differential also in administrative margins

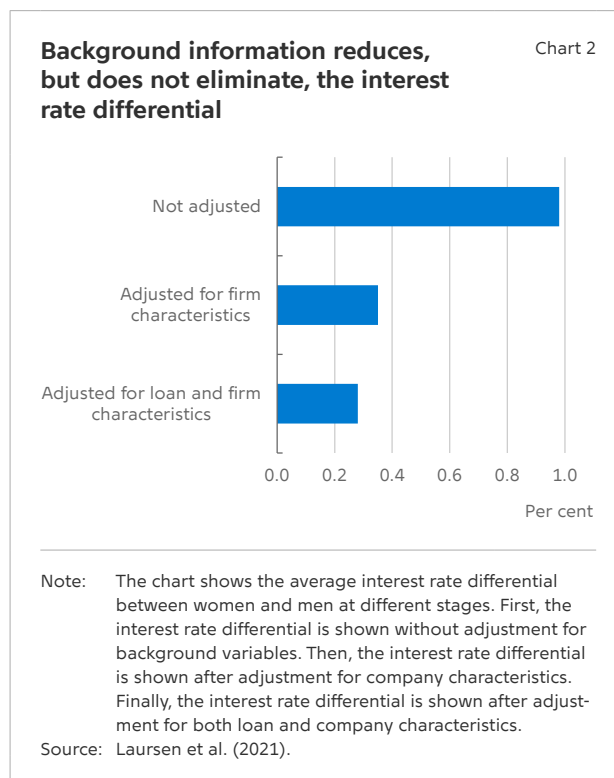
The primary focus of the analysis is on bank loans, but an interest rate differential is also detectable in male and female company owners' mortgage loans. Laursen et al. (2021) decompose the mortgage loan rate into the component set by the mortgage bond market, as well as the administrative margins set by the banks. As expected, no interest rate differential exists for mortgage bond rates, while a significant differential is observed for the administrative margins paid by women and men, in line with the main findings of the survey.

Internal credit rating models

An important motivation for the analysis is to establish whether data-driven pricing leads to more objective loan pricing. To this end, it is examined whether the interest rate differential is smaller for large banks that to a larger extent than small banks, rely on internal, data-driven models. However, this hypothesis is not supported by the data: the interest rate differential between women and men is the same whether or not the bank uses internal credit rating models, suggesting that the same, unidentified mechanism drives the interest rate differential across small and large banks.

The unexplained interest rate differential

The analysis cannot test all possible hypotheses for the existence of the interest rate differential. A possible explanation is that banks offer more favourable interest rates to borrowers who gather all their finan-



cial activities with the bank. Men tend to have more wealth than women, and are more active participants in the stock market, which can be a profitable activity for the bank.⁴ As such, if the bank looks at its overall earnings from the customer relationship, rather than at the individual loan, it may offer lower interest rates to male company owners. Another possible explanation is that men are more willing to negotiate and contact several banks to obtain a better loan offer.⁵

It is not possible to examine these examples of explanations on the basis of the existing data. In the future, the credit register will grow to contain more time-series observations, making it possible to examine whether male company owners change banks more often than their female counterparts. Should that be the case, it could be part of the reason why men obtain better loan offers.

4 For a description of the net wealth of women and men, see Danmarks Nationalbank (2019). For a description of male and female stock market behaviour, see Almenberg and Dreber (2015) and Bianchi (2018).

5 For a description of women's and men's willingness to negotiate, see Kaman and Hartel (1994), Niederle and Vesterlund (2007) and Goldsmith-Pinkham and Shue (2020).

Variables that are controlled for in the determination of the interest rate differential between women and men

Box 1

The price of a loan, i.e. the interest rate, is determined by the bank’s assessment of the expected loss as well as the expenses associated with issuing the loan. In the analysis, the gender-based interest rate differential is estimated after controlling for factors associated with these two categories. Data from the credit register, the CVR register and the Danish Business Authority are used. You can find a full overview in Laursen et al. (2021).

Expected loss

The expected loan loss is based on an assessment of the risk that the borrower is unable to repay the loan, and depends on factors related to the company and the loan. The expected loss is typically decomposed into three subcategories: probability of default, exposure at default and loss given default.

Probability of default consists of factors indicating the company’s risk of defaulting on the loan. These factors include the company’s size, sector and geographical location. In addition to these company characteristics, a number of financial ratios are calculated based on the companies’

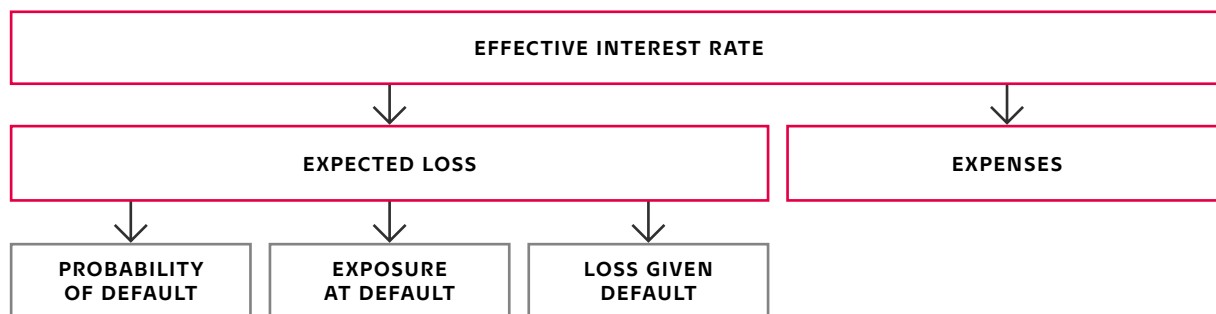
financial statements. These ratios focus e.g. on the companies’ capitalisation and profit-generating ability. All financial ratios applied in the analysis have been tested in the literature on company default probabilities, see, for instance, Ohlson (1980), Shumway (2001), Lando and Nielsen (2010), Penman (2010), Altman and Sabato (2013), Jensen et al. (2016). The data also include probabilities of default calculated by the banks, which are included as a variable in the analysis’ estimations.

Exposure at default includes factors related to the bank’s exposure if the company defaults.

Loss given default consists of factors related to loan loss if the company defaults, including e.g., the amount of collateral provided, if any, and the company’s liquid assets.

Expenses

Expenses associated with the loan depend on loan size, loan type, the issuing bank and date of issue. The analysis also takes into account these expenses.



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WORKING PAPER

Working Papers present research projects by economists in Danmarks Nationalbank and their associates. The series is primarily targeted at professionals and people with an interest in academia. Working Papers are published continuously.

The analysis consists of a Danish and an English version. In case of doubt regarding the correctness of the translation the Danish version is considered to be binding.

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