Staff memo

Indebtedness in various age groups in Sweden

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20/03/2018

SVERIGES RIKSBANK

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Summary

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Many analysts, including the Riksbank, the IMF and the European Commission, have pointed out that high and rising household indebtedness has contributed to making Swedish households vulnerable and that this poses a serious threat to financial and macroeconomic stability in Sweden. To increase understanding of household indebtedness, this report analyses the development of debt in various age groups with the help of microdata from the loans of Swedish individuals.

Data show that the average debt-to-income ratio among indebted households has risen from 289 to 311 per cent, while median debt-to-income ratio has increased from 221 to 258 per cent between 2010 and 2016. By using data on the individual level, we can analyse how this increase is distributed among various age groups. It is important to understand how indebtedness differs among various age groups from a financial stability perspective, as lifecycle patterns cause income and income risk to vary with age. We see a clear lifecycle pattern in the debt-to-income ratio (and its components), i.e. individuals firstly increase their debt-to-income ratio and then, around the age of 35, it decreases as a result of a combination of increased income and lower borrowing. Between 2010 and 2016, the lifecycle pattern has become less obvious as individuals over the age of 35 have increased their debt-to-income ratio the most.

To analyse how age factors affect the aggregate debt-to-income ratio, a breakdown can be done of how many individuals there are in an age group (demographics), how many in an age group borrow (propensity to borrow) and how much borrowers in a specific age group borrow in relation to their income. Data show that, between 2010 and 2016, changes in the number of people and the proportion of borrowers in the various age groups, if anything, have offset the increase in the debt-to-income ratio. This is primarily due to an increase in the number of borrowers in older age groups that have a lower average debt-to-income ratio. At the same time, the number of borrowers between 30 and 40 years old, i.e. the group with the highest average debt-to-income ratio, has decreased. The increase in the number of older borrowers is due both to demographic changes (a higher number of older people) and to an increase in the propensity to borrow (higher proportion of borrowers) in older age groups. We see a particularly sharp increase in the number of borrowers over the age of 65. For these individuals, the average debt has also increased sharply and total debt has risen by over 100 per cent. This upturn is due to an increase in the size of the group, an upturn in the proportion of borrowers in the group and the fact that borrowers are borrowing more. One reason for the upturn in the propensity

[1] We would like to thank Johan Almenberg, Peter van Santen, Peter Gustavsson, Olof Sandstedt, Anna Grodecka, Erik Spector and Martin Flodén for their valuable comments on previous drafts. The opinions expressed in this staff memo are those of the authors and are not to be seen as the Riksbank´s standpoint.

to borrow may be a change in attitudes towards indebtedness over time, in line with findings in Almenberg et al. (2017).

Whether these changes pose a risk to financial stability depends on several factors. The number of borrowers around the age of 35 has thus decreased. As these borrowers have the highest debt-to-income ratio, this decrease could lead to lower aggregate risk. However, those who are borrowers are borrowing more, which may pose a greater financial risk. The net effect of the financial risks for society is difficult to determine.

The decrease in the number of borrowers between 31 and 40 years old is due to a reduction in the proportion of borrowers in the group, while their population has increased. The reduction may be a sign of the threshold into the mortgage market having increased between 2010 and 2016, as a result of the introduction of a mortgage cap in October 2010, for example.

The increase in debt-to-income ratio among older borrowers might pose a greater risk in that those who are above retirement age in particular may find it difficult to increase their income if borrowing costs rise, for example. It is not obvious, however, that the risks in this group have increased. In order to be able to comment on the risk outlook, we must also have an idea of how the value of these individuals' assets have developed over the same period. We can see that the majority of borrowers over 65 who have increased their borrowing have done so without moving house, and we know that housing prices have risen over the time period in question. The rise in debt might only, therefore, reflect the fact that borrowers are realising an upturn in asset prices, which does not necessarily mean that the risks have increased. But if individuals' loan-to-value ratio has risen or is on the same level as before (i.e. asset prices have risen as much as debt), it is an indication of their vulnerability having increased. This deterioration in resilience is a consequence of the nominal debt value remaining constant while asset value, housing prices, may fall. Regardless of how the loan-to-value ratio has changed, individuals have become more sensitive to changes in borrowing costs, as housing units are illiquid assets, and can therefore not be used to pay day-to-day costs. In order to make a more complete risk analysis, we would need to have more information about the individuals, such as access to data on both their interest expenses and values on the asset side.

Indebtedness in various age groups in Sweden

The financial system plays an important role in the economy. A stable and smoothly running system is a prerequisite for the economy to function well and to grow. For the financial system to be stable, it is important that there is good resilience to different types of shock among the various financial market participants. For example, it is important for households to have good resilience. Many analysts, including the Riksbank, the IMF and the European Commission, have pointed out that high and rising indebtedness has made Swedish households more vulnerable.[2] Indebtedness in Sweden, expressed as debt as a share of total disposable income (debt-to-income or DTI ratio), has increased from 80 per cent in the early 1970s to just over 180 per cent.[3] This high level of debt, together with considerable exposure to the housing market, makes households sensitive to changes in, for example, interest rates and housing prices. The development has been deemed by the Riksbank and many other analysts to pose a serious threat to financial and macroeconomic stability in Sweden.

The Riksbank has published a number of Economic Commentaries that, with the help of microdata, i.e. data about individual households, investigate the indebtedness of Swedish households.[4] Aggregate results can conceal individual differences in indebtedness that may be relevant from a financial stability perspective. The advantage of using microdata is that they provide more scope for understanding the drivers of the aggregate development in debt. In this report, we will also analyse the development in debt using microdata about the loans of Swedish individuals. Only borrowers with mortgages are included in the analysis; these are referred to in the report as *borrowers* and the analysis focus on individuals rather than households. The data cover the period 2010–2016. During this period, the average debt-to-income ratio among indebted individuals has risen from 289 to 311 per cent, while median debt-to-income ratio has increased from 221 to 258 per cent (see Figure 1).[5] The focus of the report is on how indebtedness differs among various age groups and how this affects the aggregate debt level. We also investigate whether and how the indebtedness of various age groups has changed over time. As people's financial vulnerability can vary with age, the distribution of debt among various age groups may have implications for financial stability. At the same time, it is important to understand whether the aggregate debt-to-income ratio changes as a result of demographic factors, as this does not necessarily mean that the financial stability risks are affected.

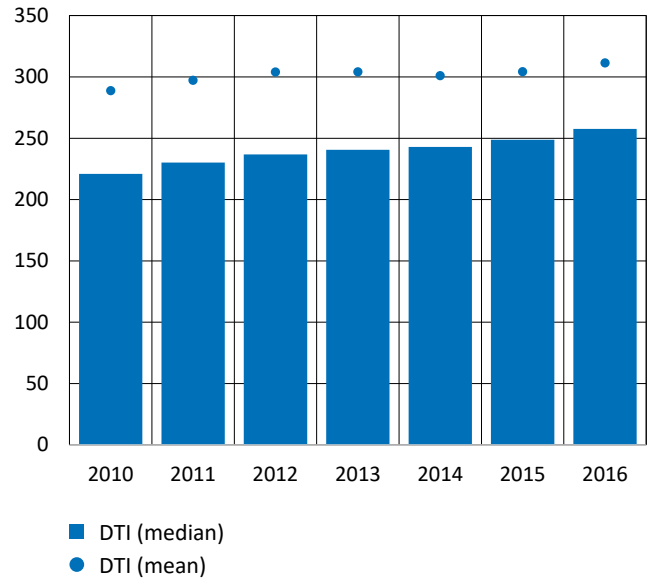
[2] For a broad review of resilience among Swedish households, see, for instance Emanuelsson et al. (2015), Sveriges Riksbank, Financial Stability Report 2015:1 and 2017:2.

[3] Total debt is put in relation to total disposable income, i.e. the income of those who borrow and those who don't.

[4] Blom and van Santen (2017), for instance, analyse the indebtedness and income levels of individuals and households between July 2010 and July 2017.

[5] In this analysis, the debt-to-income ratio is calculated as total debt in relation to income after tax. Total debt includes mortgages and consumption loans, i.e. the borrowers' total borrowing is included. Student loans and the like are excluded, however. See "Appendix: Data processing and differences compared with previous publications" for more detailed information on data processing.

Figure 1. Debt-to-income (DTI) ratio for borrowers, 2010-2016.
Per cent



Indebtedness varies over the lifecycle

In life, a person goes through different financial phases that affect their borrowing behaviour and their exposure to the housing market. A common pattern is that indebtedness in relation to income is relatively high and rising early on in life, and then recedes later on. This is due to both investment and consumption being high early in life when the individual may, for example, need to borrow money to study or buy a home. Debt in relation to income and assets may decrease automatically later on as income and asset prices rise, while the scope for amortisation can be expected to increase over time. The access to credit therefore enables households to even out their consumption over time, which can increase the welfare of the individual and thereby of society at large.[6] The mediation of credit is therefore one of the financial system's most important functions.

But high indebtedness can also be associated with risks for both the individual and society.[7] Situations may arise where a decision may seem the right one from the individual's perspective but not from a societal perspective. The collective decisions of individuals can give rise to risks for the financial system as a whole, known as "systemic risks", which the individual does not normally take into account in their risk management. Substantial debt early on in life can also, for example, make young households sensitive to changed financial and macroeconomic conditions. Unjustifiably high housing prices and debt can, in a financial crisis, lead to young households being caught in a "debt trap", from which it may take a long time to escape. This may have long-term repercussions on macroeconomic developments. The example also shows that it can be problematic to study the debt situation and resilience in the household sector in aggregated terms, as this can hide heterogeneous debt patterns that may be relevant from a financial stability perspective.

To assess whether an individual's indebtedness poses a financial stability risk, information is needed on the individual's overall economic situation. There is hence a need for information about assets, loan costs, as well as current and expected future income. It is important not to

[6] According to the "life-cycle hypothesis", individuals want to even out their consumption throughout life. Consumption in a period depends on future expected wealth, i.e. Expected future income from employment and net assets, see Modigliani (1954).
[7] See, for instance, Blom and van Santen (2017) and Sveriges Riksbank, Financial Stability Report 2017:2, which describe these risks.

just analyse an individual's debt in relation to disposable income (the debt-to-income ratio) but also the size of the debt in relation to the value of the assets and how large the loan-related payments are as a proportion of income, known as the debt-service-to-income ratio.[8] The assessment of an individual's financial resilience is hence affected by factors like expectations of and risks associated with future income development. As these may vary over the lifecycle, the assessment of individuals' resilience may also vary. Young individuals are often more indebted but their income can initially be expected to increase relatively quickly, which should also increase their resilience and reduce their vulnerability. Older individuals are often less indebted but are also likely to have less scope for increasing their income.[9] Usually, income decreases when an individual retires, which instead makes them more vulnerable if their indebtedness is high, all other factors being equal.[10] Income risks can also vary for different individuals, linked to, among other factors, age.[11] There are also studies showing that young and older people are more inclined to make financial mistakes than middle-aged people.[12] This may also imply that different debt levels can be more or less risky for different age groups.

Demographic changes can affect the aggregate debt-to-income ratio

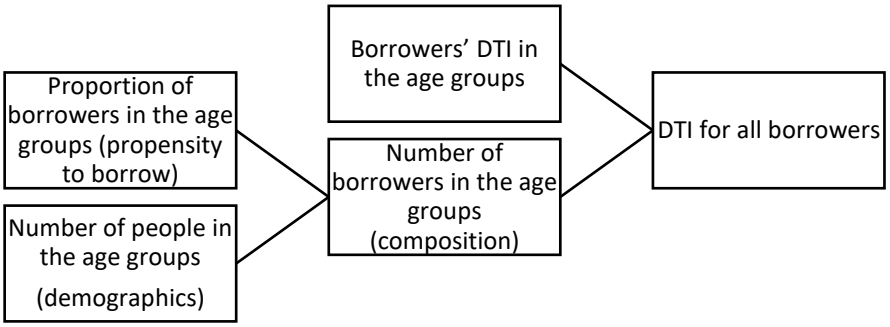
The variation in indebtedness over the lifecycle partly means that demographic changes, such as changes in the population's age structure, can affect the aggregate debt-to-income ratio. Thus, a rise in the aggregate debt-to-income ratio need not pose a greater financial stability risk. This may be the case, for example, if the increase in the aggregate debt-to-income ratio is the result of an age group with a low debt level increasing its indebtedness, or if an age group that borrows a lot grows. From a financial stability perspective, it is therefore important to analyse how the borrowing behaviour of different groups changes over time as well as whether, and how, changes in the age composition of borrowers (the composition of borrowers given their age) have affected the aggregate debt-to-income ratio. One purpose of this report is hence to analyse the extent to which the observed development in debt depends on factors such as demographic change.

Factors that influence the development in debt

Figure 1 showed that the debt-to-income ratio for borrowers has increased overall in recent years. The upturn may be due to a number of different factors. To analyse the development from an age perspective and hence study whether demographic changes have contributed to the upturn, we divide up and analyse the development in debt based on the following factors:

- *the indebtedness of borrowers* in the various age groups
- *the composition of borrowers,* which in turn is affected by
    - demographic changes, number of people in an age group
    - age groups' propensity to borrow, proportion of borrowers in an age group

[8] Unfortunately, there is no up-to-date data available on loan-to-value ratios (LTV) or debt-service-to-income ratios on the individual level in Sweden. See Norges Bank (2017) for a similar analysis.
[9] Such income development over time is in line with the "lifecycle hypothesis".
[10] See Norges Bank (2017).
[11] Guvenen et al. (2016) analyse US data and show that income risk has a negative skewness, i.e. a small number of individuals experience substantially negative income shocks, which means the income distribution is not symmetrical. The negative skewness is particularly obvious for older age groups. This in turn is due to the probability of positive shocks decreasing between 25 and 45, while the risk of major negative shocks increases after the age of 50. De Nardi et al. (2016) conclude similar findings. Guvenen et al. (2017) also show that young people are more exposed to aggregate risk than older people, but that the converse is true at the top of the income distribution.
[12] See Agarwal et al. (2009).



An increase in the debt-to-income ratio (for all borrowers) may occur if, for example, the indebtedness of borrowers in one or more age groups increases, i.e. if debt rises faster than income, all other factors being equal. The number of people and the proportion of borrowers in the age group are thus unchanged, but the individuals who borrow increase their borrowing. This can in turn be due to cheaper borrowing costs, for example.

Changes in the number of borrowers in the age groups (composition) can also affect the debt-to-income ratio for all borrowers. The number of people in a certain age group can, for example, rise relative to other age groups. If the age group has high indebtedness, the aggregate debt-to-income ratio (i.e. the combined debt-to-income ratio for all age groups) will increase, all other factors being equal. The propensity to borrow may also increase in a certain age group. In other words, the percentage of borrowers in a certain age group increases. If the proportion increases in a group with a debt-to-income ratio that is lower than the total debt-to-income ratio, the aggregate debt-to-income ratio decreases, all other factors being equal.

However, changes in the number of borrowers in the age groups (composition) affect the aggregate result only if indebtedness varies among different age groups. If indebtedness is the same throughout the entire lifecycle, the age distribution of borrowers will not affect the aggregate result.

One reason for dividing up propensity to borrow and demographic changes is that changes in propensity to borrow suggest a different borrowing behaviour that may be (or may have been) influenced by, for example, macroprudential regulations, such as amortisation requirements and mortgage caps. Demographic changes, on the other hand, cannot be influenced in practice.[13] Below, we analyse whether, and to what extent, these factors have affected the aggregate development in debt in Sweden.

Data show a clear lifecycle pattern

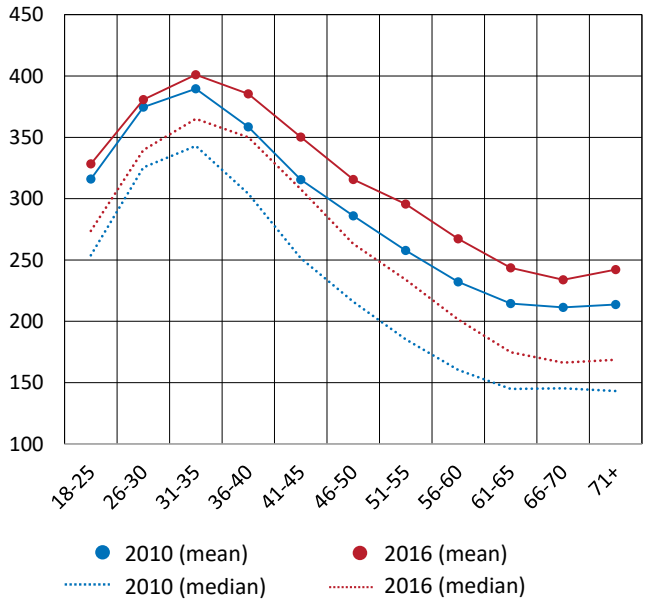
Figure 2 shows the average debt-to-income ratio (unbroken line) and the median debt-to-income ratio (broken line) for the various age groups in 2010 and 2016.[14] A clear lifecycle pattern is visible in both 2010 and 2016, the debt-to-income ratio increases with age to begin with and then decreases later on in life. The debt-to-income ratio is highest in the 31-35 year age group.

[13] It is possible to influence a country's demographic structure but this is linked more to other policy measures related to migration, healthcare, etc.
[14] See also Table A1 in the Appendix.

In addition to a clear lifecycle pattern, the figure also shows that the debt-to-income ratio has increased between 2010 and 2016 for all age groups and that the increase is greatest for the over-35s. The change implies that the age curve has flattened out slightly between the two years. The change also suggests that the upturn in the aggregate debt-to-income ratio is partly due to the increase in the debt-to-income ratio in the various age groups.

Figure 2. Debt-to-income (DTI) ratio for various age groups, 2010 and 2016

Per cent



The debt-to-income ratio shows the relationship between debt and income, $DTI = \frac{Debt}{Income}$. It is also interesting therefore to look at the development of debt and income separately. Figure 3 shows that average debt and median debt (broken line) have increased among borrowers in all age groups.[15] Calculated as an average for all age groups, debt increased by just over 40 per cent[16] over these six years, i.e. about 6 per cent per year. In the 50-60 age group, average debt increased by almost 50 per cent between 2010 and 2016. Debt rose less in the lowest age groups.

Figure 4 shows that average disposable income and median income (broken line) also increased among borrowers in all age groups.[17] The average for all age groups is around 26 per cent, i.e. income increased by about 4 per cent per year.[18] The upturn in the debt-to-income ratio, primarily in older age groups, is therefore driven by the relative rapid increase in debt. In the 26-35 age group, debt rose only slightly more than income, which also contributed to only a weak increase in this age group's debt-to-income ratio.

As mentioned earlier, it is reasonable to expect that the income of young people increases relatively quickly initially, then flattens out and finally decreases later on in life. This pattern is clearly visible in Figure 4. Average income reaches its highest level when the individual is around 50 years old. This is also in line with other studies.[19]

[15] See also Table A2 in the Appendix.
[16] Calculated as an average of all age groups. Taking an average for all individuals, this is a 39.5-percent increase in debt.
[17] See also Table A3 in the Appendix.
[18] Calculated as an average over the groups. Not weighted with borrowers per age group. Taking the average for all individuals, the upturn is 25.1 per cent.
[19] See, for instance, Guvenen et al. (2016).

Figure 3. Debt in various age groups, 2010 and 2016
SEK

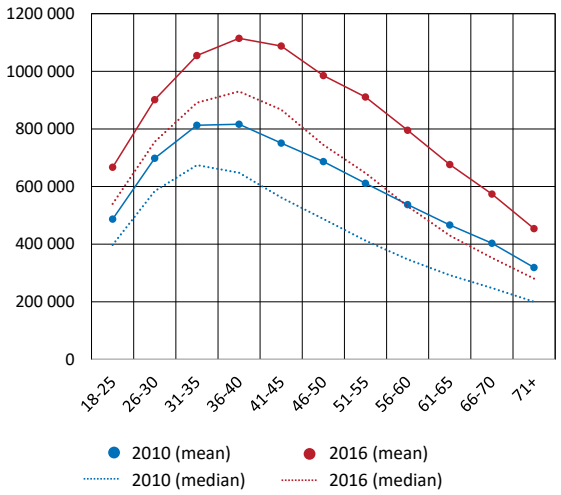
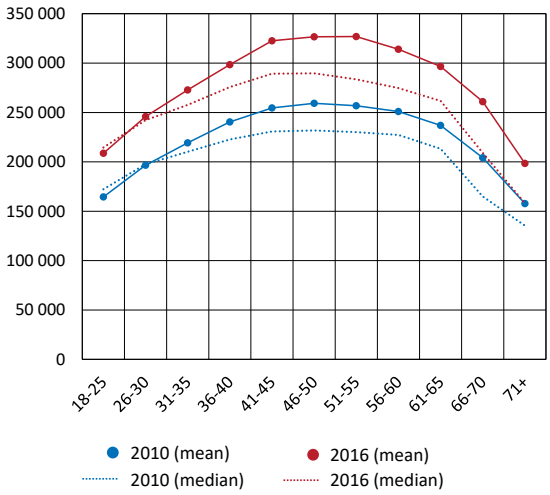


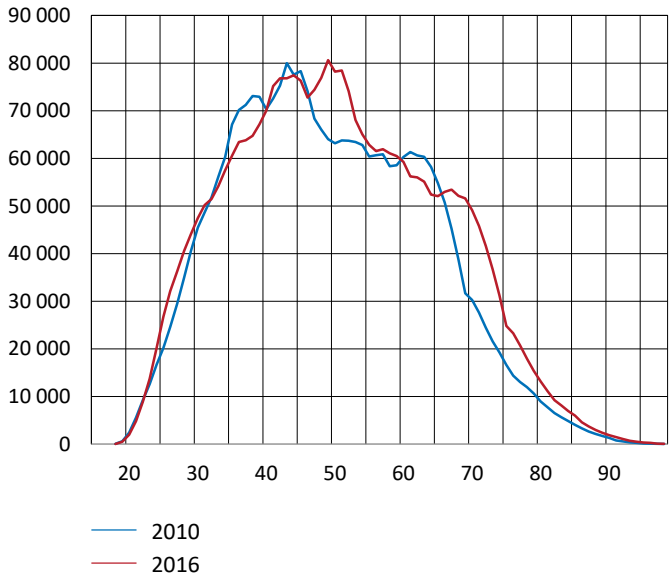
Figure 4. Disposable income in various age groups, 2010 and 2016
SEK



Borrowers have become older

Below we investigate whether changes have occurred in the age composition of borrowers and whether this has affected the development of the average debt-to-income ratio. Figure 5 shows the age distribution of mortgage holders in 2010 and 2016.[20] It is clear from the figure that borrowers have become noticeably older since 2010. The rise in mortgage holders among the over-65s is striking. The number of people over 70 with mortgages has increased by almost 60 per cent. The number of borrowers around 50 years old has also risen. On the other hand, there has been a certain reduction in the number of mortgage holders among 31-40 and 61-65 year-olds. In the most recent measurement in 2017, the highest number of mortgage holders was around 41-50 years, the corresponding figure for 2010 was 45 years.

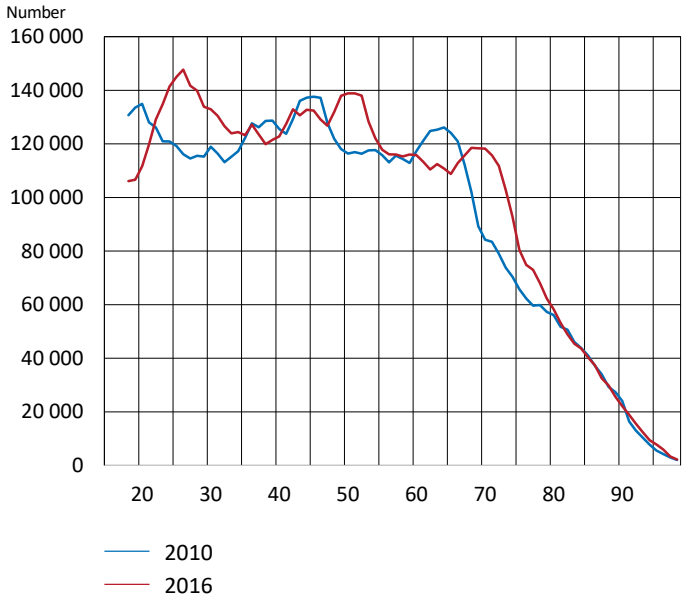
Figure 5. Number of people with mortgages broken down by age, 2010 and 2016
Number



[20] See also Table A4 in the Appendix.

The question is then whether the rise in the number of older borrowers is due to the increase in the older population in general (i.e. a demographic change has occurred) or whether older people have become more inclined to borrow (the proportion of borrowers in older age groups has risen). To start with, Figure 6 shows the age distribution of Sweden's population in 2010 and 2016.[21] The figure shows that changes have occurred in the age structure, especially in the youngest and oldest age groups. In most cases, the changes are similar to those noted for the number of people with mortgages, as shown in Figure 5. One factor is that Sweden's population has grown older; in particular there are more people over the age of 70. There are also more people around the age of 50. The same is true for people between 26 and 35 years old, something which is not completely reflected, however, in the number with mortgages in Figure 5. At the same time, the number of people has decreased in the 36-40 and 61-65 age groups.

Figure 6. Number of people in Sweden by age, 2010 and 2016

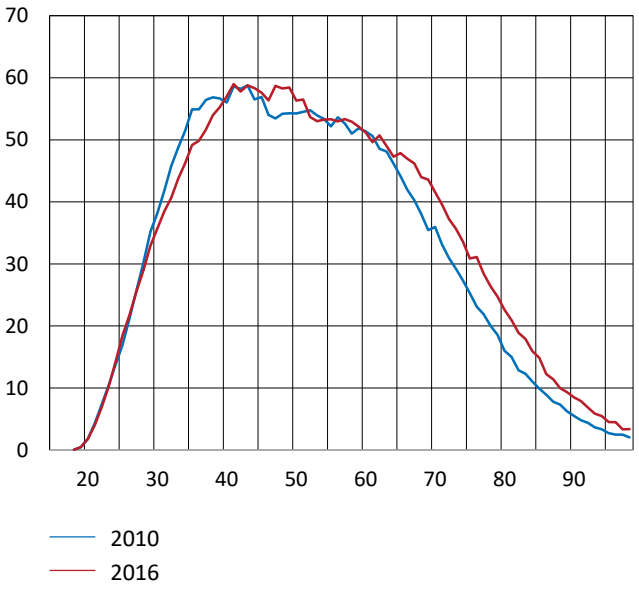


Source: Statistics Sweden and the Riksbank

Lastly, Figure 7 shows the proportion of mortgage holders in relation to population size (per age group) for 2010 and 2016.[22] The changes in the various age groups are relatively concordant with the change in age composition. The proportion of mortgage holders between 30 and 40 has decreased, while the proportion of borrowers aged around 50 and 65 and over has increased.

[21] See also Table A5 in the Appendix.
[22] See also Table A6 in the Appendix.

Figure 7. Proportion of people with mortgages in Sweden by age, propensity to borrow, 2010 and 2016
Per cent



Source: Statistics Sweden and the Riksbank

The figures above therefore show that a change has occurred in the composition of borrowers. The number of borrowers aged around 50 and over 65 has increased. This is due partly to an increase in the population of these age groups, and partly to the rise in the proportion of mortgage holders in the groups.

The proportion of mortgage borrowers has increased in most of the over-40 age groups and the increase is particularly obvious for individuals over the age of 65. Among these individuals, the propensity to borrow has risen by just over 25 per cent.[23] One reason for this upturn may be a change in attitudes towards indebtedness over time, in line with findings in Almenberg et al. (2017).[24]

At the same time, the number of mortgage borrowers among people around the age of 35 has fallen. This is mainly due to a decline in the propensity to borrow, i.e. the proportion of those in debt is lower in this age group.

All other factors being equal, these changes in composition would have led to a decrease in the debt-to-income ratio, as younger individuals have higher average indebtedness than older people. The fact that this is not the case is due to the higher average debt-to-income ratio.

The age composition of borrowers is not the reason for the increase in the aggregate debt-to-income ratio

Another way of analysing how the three factors (average indebtedness, propensity to borrow, demographics) have changed and affected aggregate indebtedness is to compare the actual debt-to-income ratio in 2010 and 2016 with hypothetical values, in which one or more factors are left unchanged between the years. The difference with the analysis performed above is that we do not see how changes for specific age groups have affected developments. Instead, we see how, for example, the overall change in demographics has affected the development in debt.

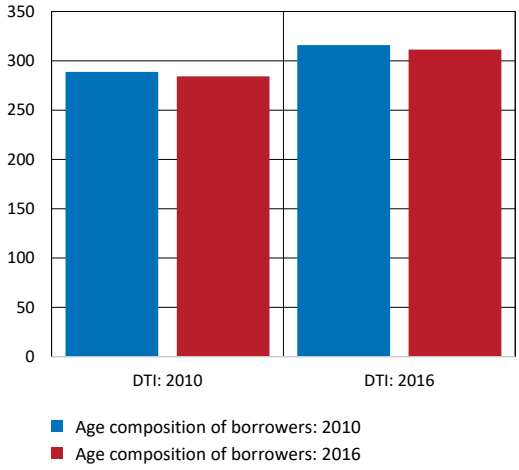
[23] From 25 per cent in 2010 to 31.4 per cent in 2016.
[24] The authors use survey and register data to analyse attitudes towards indebtedness. They find that the proportion of those who are uncomfortable about being in debt has fallen over time and suggest that this may be one reason for the sharp increase in debt in recent years.

Figure 8 shows a calculation of the hypothetical values by applying the average debt-to-income ratio from 2010 to the age composition of borrowers in 2016 (and vice versa).[25] These hypothetical values are then compared with actual debt-to-income ratio in each year respectively. The actual outcome is represented by the blue bar for 2010 and the red bar for 2016. The actual debt-to-income ratio in 2010, the blue bar furthest to the left, is marginally higher than the red bar where the age composition for 2016 is used instead. The same is true for the two bars furthest to the right in Figure 8. It is clear, therefore, that the overall changes in age structure among borrowers is not the primary driving force behind the increase in the aggregate debt-to-income ratio. As above, the result indicates rather that the change in the composition of the borrowers has had a slight dampening effect on the development of the debt-to-income ratio, both the red bars in Figure 8 (which is based on the composition in 2010) are slightly lower than the blue bars.

Comparing bars of the same colour in Figure 8, the composition of borrowers is instead held constant and average indebtedness is the only factor that changes. As a result, the debt-to-income ratio then rises by 27 percentage points, which is in line with the change in aggregate debt-to-income ratio that amounts to 23 percentage points. Hence, only the increased indebtedness level explains the observed aggregate rise in the debt-to-income ratio. If anything, the composition reduces aggregate indebtedness.

Figure 8. Aggregate debt-to-income (DTI) ratio with a shift in the number of borrowers in the age groups

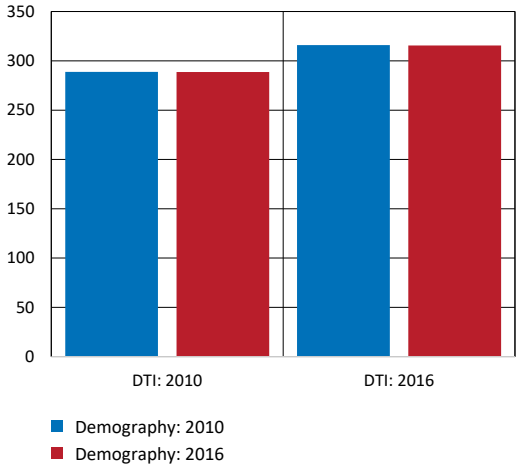
Per cent



Source: Statistics Sweden and the Riksbank

Figure 9. Aggregate debt-to-income (DTI) ratio with a shift in demographics

Per cent



Source: Statistics Sweden and the Riksbank

To further investigate the effects of demographic changes and changes in the propensity to borrow of various age groups, Figure 9 calculates hypothetical debt-to-income ratios by only including the demographic changes. It might, for example, be the case that changes in demographics are largely offset by changes in propensity to borrow. The difference compared to Figure 8 is the assumption in this case that not only the indebtedness levels but also the proportion of borrowers in each age group remain unchanged between the years.[26] The

[25] Example *DTI levels from 2010 with the age structure from 2016:* a weight for each age is calculated based on the proportion of borrowers of that age to total borrowers in 2016, e.g. 41-year-olds make up 2.4 per cent of total borrowers in 2016. The weight is then multiplied by each age group's DTI level for 2010, e.g. 41-year-olds had an average indebtedness of 333.5 per cent in 2010, which means that this age group contributes 333.5*0.024 = 8 to total DTI. The contribution from all age groups is then added together to calculate the total aggregate (hypothetical) DTI level. In general, this means that:

$$DTI_{2016,2010} = \sum_{i} w_{i,2016} * DTI_{i,2010}$$

In the equation above, i represents the various age groups, $w_{,2016}$ is the weight for each age group in 2016 and $DTI_{i,2010}$ is the debt-to-income ratio for age group i in 2010. We do the same type of addition to derive $DTI_{2010,2016}$.

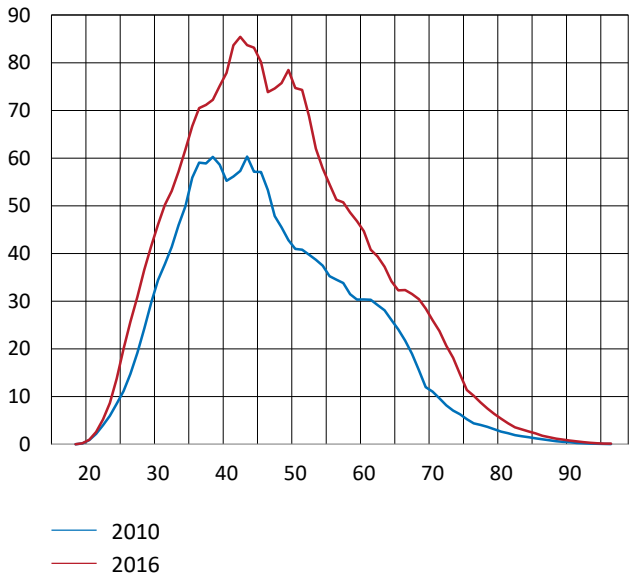
[26] The proportions from 2010 are used in this case. The equation for DTI with the 2016 demographic composition and the 2010 propensity to borrow and average debt-to-income ratio is as follows:

findings suggest that demographic changes have not had any major effect on the results. The slightly dampening effect seen in Figure 8 is therefore mainly due to changes in the age groups' propensity to borrow.

Sharp rise in debt among older borrowers

Figure 10 shows total debt broken down by age for the years 2010 and 2016.[27] Indebtedness for individuals over the age of 65 has increased from SEK 146 billion to SEK 300 billion, the largest percentage increase of all the age groups. The debt-to-income ratio has also increased for this group, which we have shown earlier. This rapid rise in debt is due not only to an increase in their average debt but also to increases in the size of the age group and in the propensity to borrow, which was made clear above. The fact that we see a rise in indebtedness among individuals over 65 years old is in line with findings in Lusardi et al. (2017), who show that indebtedness among American individuals in the 51-65 year age group has increased and that the age group has become more sensitive to factors such as interest rate adjustments.

Figure 10. Total debt broken down by age, 2010 and 2016
SEK billion



As age groups change over time, the rise in debt may be due to those turning 65 between 2010 and 2016, and hence having entered the age group, have higher indebtedness in general, or due to people already belonging to the age in 2010 having taken on more debt. Figure 11 shows the development in debt for the entire age group and compares with the development in debt for the group that was 65 or older in 2010.[28] Average debt is shown by an unbroken line and median debt by a broken line. We see that only half the rise in debt can be attributed to those who, between 2011 and 2016, have turned 65 years old and hence become part of the age group. The remaining increase in debt is due to those who were already at least 65 in 2010 having taken on greater debt later in life. The major difference between average debt and median debt suggests that it is a small proportion of borrowers who are much more highly indebted than the rest of the age group.

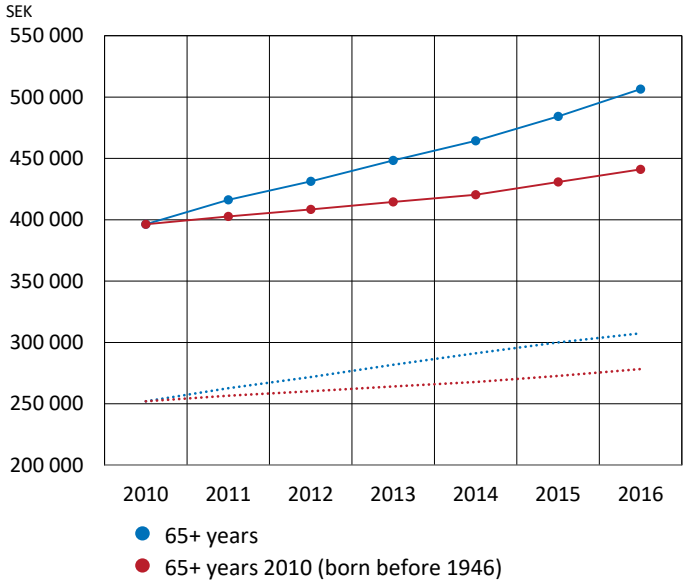
$$DTI_{2016,2010} = \sum_i \widetilde{w_{i,2016}} * DTI_{i,2010}$$

In this case, $\widetilde{w_{i,2016}}$ represents adjusted weight. We take the number of individuals in an age group in 2016 and multiply by the proportion of borrowers in the same age group from 2010. We then multiply this weight by the DTI for 2010.

[27] See also Table A7 in the Appendix.

[28] Only individuals who remain in the data-set for the entire period are included. This prevents people who disappear from the data-set, due to having fully paid off their loan, for example, from influencing the results.

Figure 11. Average and median debt among the over-65s



Debt can rise if people choose to move to a new, more expensive home, increase their current mortgage debt without moving or take out consumption loans. Similarly, reduced debt is conceivably the result of people either moving to a cheaper home or paying off some of their current loan.

Table 1 shows that, among individuals over 65 who increase their debt (about a third of them), 95 per cent, on average, do so without moving house.[29] Table 2 shows that the increase in debt is, on average, significantly lower for those who do not move.[30] As they constitute a sizeable majority, it is mainly people who mortgage their existing home or take out other loans without moving who drive the debt growth in this age group, despite them borrowing less.

Between 2005 and 2016, several Swedish banks offered so-called "senior loans" aimed at older people. A senior loan was a loan with the home pledged as collateral and as a result, people were able to release some of the capital tied up in their home without having to move. The major difference to other loans is that interest is not paid on a regular basis. Instead, interest expenses are added to the debt and paid in connection with the loan maturing or the home being sold. The interest rate is also significantly higher than on other types of mortgage.[31] Our data only cover up to 2016 and it is therefore difficult to determine how senior loans have affected the observed sharp upturn among older people. The recent substantial increase in housing prices has enabled many people to make use of senior loans and hence increase their purchasing power while one of the reasons why banks stopped offering senior loans was low demand and too small a market.

[29] An individual is defined as "moved" if their registered address changes between one year and the next.
[30] Among those who reduce their debt, about two-thirds, the majority do so without moving house. The reduction in debt is significantly larger among those who move than those who stay in the same home.
[31] Swedish Pensions Agency (2017).

Table 1. Distribution of the change in debt among the over-65s
Per cent

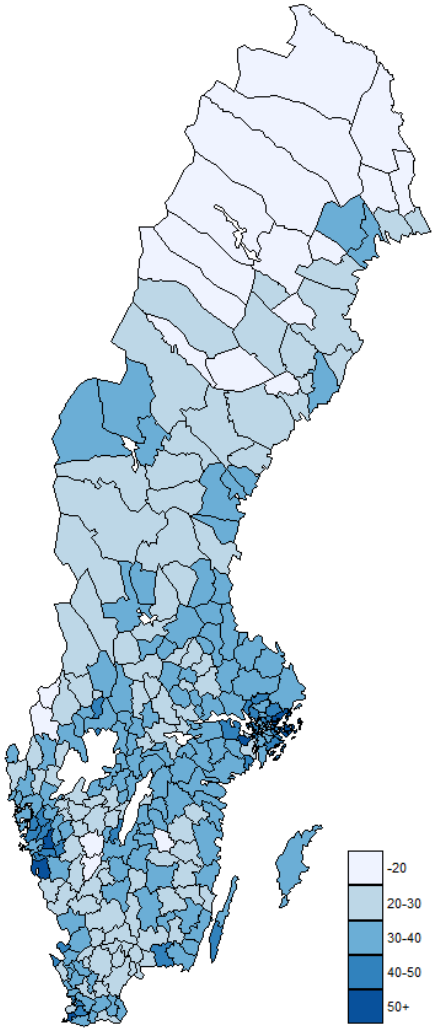
	2011	2012	2013	2014	2015	2016
Increase their debt	35.6	34.7	34.4	34.3	36	33.6
Move house	8.8	3.6	3.5	3.6	6.4	3.3
Do not move house	91.2	96.4	96.5	96.4	93.6	96.7
Reduce their debt	64.4	65.3	65.6	65.7	64	66.4
Move house	9.3	3.4	3.1	3.3	6	2.8
Do not move house	90.7	96.6	96.9	96.7	94	97.2

Table 2. Average change in debt among the over-65s
SEK

	2011	2012	2013	2014	2015	2016
Increase their debt	88000	86000	90000	95000	109000	106000
Move house	137000	241000	260000	258000	211000	281000
Do not move house	83000	80000	83000	89000	101000	100000
Reduce their debt	-34000	-35000	-35000	-37000	-41000	-42000
Move house	-74000	-169000	-194000	-188000	-134000	-208000
Do not move house	-30000	-30000	-30000	-32000	-35000	-38000

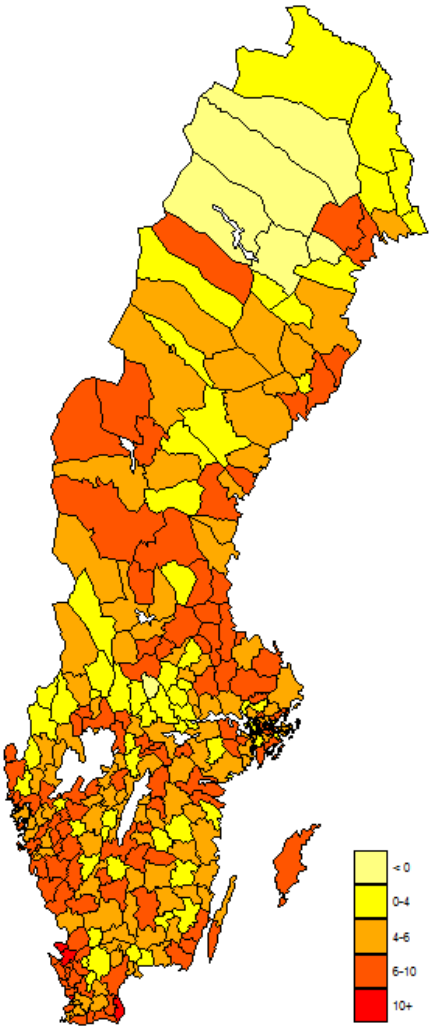
Figure 12 shows the proportion of people over 65 with a mortgage in each municipality respectively in 2016. The proportion of people with a mortgage is relatively even across the country but greatest in the country's metropolitan regions. Figure 13 shows the change in the proportion of people with a mortgage between 2010 and 2016. The proportion of older people with a mortgage has increased in all but a small number of municipalities in northern Sweden. The increase is relatively evenly distributed across the country and there does not seem to be any major differences in the trend among different regions.

Figure 12. Proportion of over-65s with a mortgage, broken down by municipality, 2010 and 2016
Per cent



Source: Statistics Sweden and the Riksbank

Figure 13. Change in the proportion of people over 65 with a mortgage between 2010 and 2016, broken down by municipality
Percentage points



Source: Statistics Sweden and the Riksbank

Main findings

Findings for total indebtedness

- Indebtedness and borrowing behaviour differ among age groups.
- Indebtedness follows a clear lifecycle pattern: early on in life, debt in relation to income increased with age, and then decreases later on. The same is true of average income.
- The lifecycle pattern has become flatter between 2010 and 2016.
- The debt-to-income (DTI) ratio is highest in the 31-35 year age group and average income is highest among those who are around 50 years old. Most mortgage borrowers are in 41-50 year age group.
- The debt-to-income ratio for all borrowers has increased on average from 289 to 311 per cent between 2010 and 2016.
- The upturn in the total debt-to-income ratio can be explained by the increase in debt-to-income ratio in the various age groups. It has increased most of all for people over 35 years old. Changes in age composition (number of people and proportion of borrowers in the various age groups) have had the opposite effect, however, see below.

Findings for the various age groups

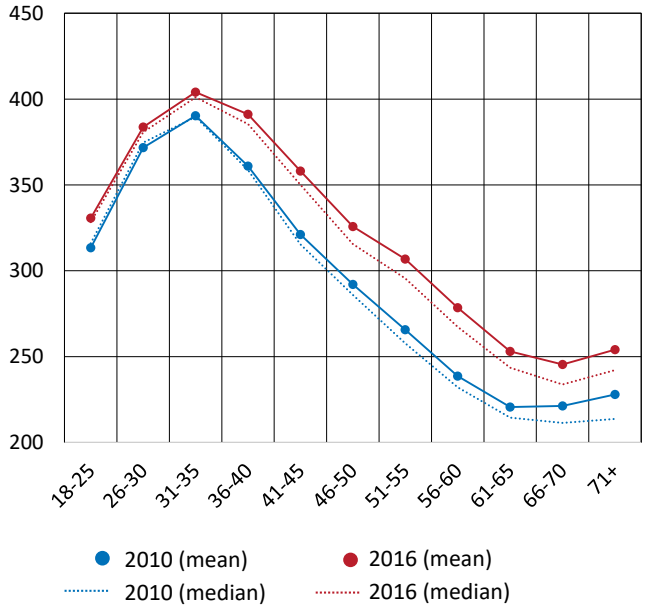
- Borrowers are noticeably older in 2016 than they were in 2010. The rise in the number of mortgage borrowers among the over-65s is striking. The number of people over 70 with mortgages has increased by almost 60 per cent. The number of borrowers around 50 years old has also risen. On the other hand, there has been a certain reduction in 31-40 age group. These changes in composition have had a dampening effect on the aggregate debt-to-income ratio, as younger individuals have higher average indebtedness than older people. The fact that the total debt-to-income did not fall is hence due to the higher average debt-to-income ratio.
- The change in the number of borrowers in the various age groups is partly due to the change in the number of people in the groups. One factor is that Sweden's population has grown older; in particular there are more people over the age of 70. There are also more people around the age of 50. But the change is also due to the fact that the propensity to borrow, i.e. the proportion of people with loans in a certain age group, has changed. The proportion of borrowers aged about 50 and over around 65 has risen, while the proportion of borrowers between 30 and 40 has fallen.
- Total debt for individuals over 65 has increased by 105 per cent in six years, from SEK 146 billion in 2010 to SEK 300 billion in 2016. All factors in this analysis contribute to this; the group is larger, a bigger proportion of individuals in the age group borrow and average debt is higher. The increased borrowing reflects partly more borrowing among those who were already over 65 in 2010 and partly higher indebtedness among those who have come into the age group during the period. On average, 95 per cent of individuals over 65 who increase their debt do so without moving house.

Appendix: Data processing

The Riksbank collects data from the eight largest lenders in Sweden. These data contain information on debt amounts and type of credit (loans with collateral in tenant-owned home or single-family house, credit cards, instalment payments and consumption loans). The credit information company, UC AB, provides information on borrowers, as taxed income and paid taxes (from the Swedish Tax Agency), age, sex, municipality, a serial number that replaces address, property information, records of non-payment and amount of debt at the Swedish Enforcement Authority.[32] These data cover the time period July 2010 to July 2017, and in total cover about 98 per cent of the total Swedish mortgage market. If certain age groups have been more inclined than others to make use of other banks, this affects the findings presented in the report.

These data have been used as the basis for a number of previous Riksbank studies analysing household indebtedness. As the focus of this publication is on how indebtedness is distributed among various age groups, the analysis is based instead on individuals rather than households. There are cases where people share loans but are not part of the same household, which means that the findings can differ depending on whether the analysis is based on individuals or on households. The difference in aggregate indebtedness is not affected very much, however, and basing the analysis on individuals simplifies interpretation of the findings. Figure A1 shows how the findings presented in Figure 2 would have been affected if the analysis had been based on households (unbroken line) instead of individuals (broken line).

Figure A1 Debt-to-income (DTI) ratio for households and individuals, 2010 and 2016
Per cent



There are three major differences in the data processing compared with previous publications. The first refers to individual income. The income measure used is taxed income reported by the Swedish Tax Agency. This means that the income reported for 2016, for example, is the individual's actual income from 2015. To take this into account, the income has been adjusted forward one year in cases where income data has been available for the subsequent reporting year. This means that findings are not presented for 2017 even though debt data are available

[32] See https://www.minuc.se/kallor/ for a list of UC's sources.

for that year. This change is important especially for the analysis of young individuals as their income can vary quite considerably from one year to the next.

The second major difference is in how debt is distributed among borrowers if a loan has several borrowers. In previous publications, a debt divided among several households has been distributed evenly between them.[33] In this report, the analysis is instead based on individuals. If a debt is shared among several borrowers, it is distributed in proportion to their income.[34] This is deemed to give a more accurate picture of the individual's debt.

The last difference is that extreme values are dealt with by truncating the estimated debt-to-income ratio at the 1st and the 99th percentile for each year. This means that individuals with debt-to-income ratios higher or lower than these values are excluded from the sample. Winsorisation, which has been used in previous publications, means that observations with extreme values are instead kept in the sample and given a value equal to the value of the 1st and 99th percentile respectively. Most individuals with a debt-to-income ratio higher than the 99th percentile belong to the youngest age groups. The high extreme values are therefore unevenly distributed over the age groups. So that certain age groups, young ones in this case, don't have too many winsorised values, we choose instead to truncate the sample. The assessment is that the findings will be clearer and more transparent in this way.

[33] This may occur if, for example, one or more parents are co-borrowers with one of their children.
[34] See van Santen, P and Ölcer, D. (2016) for a detailed analysis of how the distribution of debt affects the result.

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Tables

Table A1. Average debt-to-income (DTI) ratio for various age groups, 2010 and 2016
Per cent

Age group	2010	2016	Δ (p.e.)	Δ (%)	Deviation (p.e.)[35]
18-25	315.9	328.3	12.4	3.9	-5.6
26-30	374.6	380.7	6.1	1.6	-7.9
31-35	389.6	401.1	11.5	2.9	-6.6
36-40	358.6	385.5	26.9	7.5	-2.0
41-45	315.4	350.1	34.7	11.0	1.5
46-50	285.9	315.6	29.7	10.4	0.9
51-55	257.7	295.5	37.8	14.7	5.2
56-60	232.1	267.3	35.2	15.2	5.7
61-65	214.5	243.5	29.0	13.5	4.0
66-70	211.4	233.8	22.4	10.6	1.1
70+	213.7	242.2	28.4	13.3	3.8

Table A2. Average debt for various age groups, 2010 and 2016
SEK

Age group	2010	2016	Δ (SEK)	Δ (%)	Deviation (p.e.)
18-25	487000	667000	180000	36.9	-3.8
26-30	698000	901000	203000	29.1	-11.6
31-35	813000	1055000	242000	29.8	-10.9
36-40	816000	1115000	298000	36.5	-4.2
41-45	751000	1088000	337000	44.9	4.2
46-50	686000	986000	299000	43.6	2.9
51-55	611000	911000	300000	49.0	8.3
56-60	537000	796000	258000	48.1	7.4
61-65	466000	676000	210000	45.0	4.3
66-70	403000	574000	171000	42.4	1.7
70+	319000	454000	135000	42.4	1.7

Table A3. Average disposable income for various age groups, 2010 and 2016
SEK

Age group	2010	2016	Δ (SEK)	Δ (%)	Deviation (p.e.)
18-25	165000	209000	44000	26.7	0.8
26-30	197000	246000	49000	24.9	-1
31-35	219000	273000	54000	24.7	-1.2
36-40	240000	299000	59000	24.6	-1.3
41-45	255000	323000	68000	26.7	0.8
46-50	259000	327000	68000	26.3	0.4
51-55	257000	327000	70000	27.2	1.4
56-60	251000	314000	63000	25.1	-0.8
61-65	237000	297000	60000	25.3	-0.6
66-70	204000	261000	57000	27.9	2.1
70+	158000	198000	40000	25.3	-0.6

[35] Deviation refers to the difference in percentage points between the age group's percentage change and the average change among all age groups.

Table A4. Number of people with mortgages for various age groups, 2010 and 2016
Number

Age group	2010	2016	Δ (N)	Δ (%)	Deviation (p.e.)
18-25	67000	77000	10000	14.1	2.7
26-30	175000	201000	25000	14.5	3.1
31-35	284000	274000	-10000	-3.6	-15.0
36-40	358000	329000	-29000	-8.0	-19.4
41-45	384000	383000	-1000	-0.3	-11.7
46-50	336000	383000	47000	14.1	2.7
51-55	314000	348000	34000	10.9	-0.5
56-60	299000	304000	6000	1.9	-9.5
61-65	295000	272000	-24000	-8.0	-19.4
66-70	197000	259000	63000	31.8	20.4
70+	211000	332000	121000	57.6	46.2

Table A5. Sweden's population in various age groups, 2010 and 2016
Number

Age group	2010	2016	Δ (N)	Δ (%)	Deviation (p.e.)
18-25	1015000	994000	-20000	-2.0	-7.4
26-30	580000	696000	116000	19.9	14.5
31-35	584000	629000	44000	7.6	2.2
36-40	637000	615000	-22000	-3.4	-8.8
41-45	664000	656000	-8000	-1.2	-6.6
46-50	621000	665000	43000	7.0	1.6
51-55	584000	645000	61000	10.4	5.0
56-60	573000	579000	6000	1.0	-4.4
61-65	622000	556000	-66000	-10.6	-16.0
66-70	509000	584000	75000	14.7	9.3
70+	1118000	1298000	180000	16.1	10.7

Table A6. Proportion of people with mortgages in various age groups (propensity to borrow), 2010 and 2016
Per cent

Age group	2010	2016	Δ (p.e.)	Δ (%)	Deviation (p.e.)
18-25	6.6	7.7	1.1	14.1	10.2
26-30	30.2	28.8	-1.4	-4.7	-8.6
31-35	48.6	43.6	-5.0	-11.6	-15.5
36-40	56.2	53.5	-2.7	-5.0	-8.9
41-45	57.8	58.3	0.5	0.9	-3.0
46-50	54.0	57.6	3.6	6.2	2.3
51-55	53.8	54.0	0.3	0.5	-3.4
56-60	52.1	52.5	0.4	0.8	-3.1
61-65	47.5	48.9	1.4	2.9	-1.0
66-70	38.7	44.4	5.8	13.0	9.1
70+	18.9	25.6	6.7	26.3	22.4

Table A7. Total debt in various age groups, 2010 and 2016
SEK billion

Age group	2010	2016	Δ (SEK)	Δ (%)	Deviation (p.e.)
18-25	33	51	18	56.3	-0.5
26-30	122	181	59	47.9	-8.9
31-35	231	289	58	25.2	-31.6
36-40	292	367	75	25.6	-31.2
41-45	288	416	128	44.5	-12.3
46-50	230	377	147	63.8	7.0
51-55	192	317	125	65.3	8.5
56-60	160	242	82	50.8	-6.0
61-65	138	184	46	33.5	-23.3
66-70	79	149	69	87.7	30.9
70+	67	151	84	124.4	67.6

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