

Online appendix to “Macroprudential Policy and Household Debt: What is Wrong with Swedish Macroprudential Policy?”

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Includes a complete reference list with hyperlinks.

B The consequences and costs of the credit tightening

Whereas section 3 has examined the rationale and possible benefits of and rationale for the credit tightening—and found that there are none—this appendix section examines the consequences and possible costs of the tightening, in particular, of the compulsory amortization requirements.

B.1 The credit tightening

I will simplify the discussion of the credit tightening by representing the situation without the tightening—approximately corresponding to the situation in 2010–2011—by an affordability-test interest rate of 6% and no amortization, that is, the availability of interest-only loans. The situation after the tightening will be represented by an affordability-test interest rate of 7% and the two amortization requirements, implying 3% amortization for a loan and a mortgagor with an LTV ratio above 70% and an LTI ratio above 4.5.

This representation of the lending standards without the tightening is justified as follows. First, FI (2013b, p. 12) reports that the affordability-test interest rates in 2012 varied from 5.7% to 8.0%. This is consistent with the availability of an affordability-test interest rate of 6%.¹

Second, regarding the availability of interest-only loans, Sveriges Riksbank (2011) was clearly worried about little or no amortization. “A distinguishing feature of the Swedish housing market in recent years has been that. . . amortisation payments have been small (p. 7).” One of the tasks of the inquiry was to analyze “what risks there are. . . with little or no amortisation (p. 8)”. It reports that “[t]he range of mortgage products has been widened including interest-only loans (p. 35).” Sveriges Riksbank (2014, table B1) reports that the *average* amortization rate among highly indebted mortgagors (with an LTV-ratio of 75%–80%) was only 1.3% in 2013. FI (2013b) reports that among new loans with a 76–85% LTV ratio, 21% in 2011 and 8% in 2012 were interest-only loans (diagram 9). Some banks offered “bottom” loans up to an 85% LTV ratio and least one bank did not have any requirement of amortization on the bottom loan in the affordability assessment (pp. 12–13). Sveriges Riksbank (2012, chart 3:7) reports that almost 60% of new mortgagors did not amortize in 2011. In particular, according to SBAB (2010):

Before the [85%] LTV cap was introduced [in October 2010], [the bank] SBAB required amortization of the loan amount exceeding 85%—the loan amount in the range of 85–95% should be amortized in at most 10 years. [In November 2010,] after the introduction

¹ Among anecdotal evidence, according to Dagens Industri (2013), the then minister of financial markets, Peter Norman, reported that his mother was required to manage a 6% interest rate on her new mortgage in 2013. There are reports that Danske Bank used an affordability-test interest rate of 6% as late as October 2018, for example, Expressen (2018). However, in January 2019, Danske Bank (2019) reports that mortgagors should be able to manage an interest rate of 7%.

of the LTV cap [of 85%], [the bank] offers a supplementary loan product (Private Loan), that requires amortization.

Altogether, I interpret the above as being consistent with the availability before the tightening of interest-only loans up to an LTV ratio of 85% with an affordability-test interest rate of 6%.

B.2 Higher housing payment, unchanged user cost, and higher involuntary saving

So, what are the consequences of the tightening? What do compulsory amortization requirements do? Compulsory amortization requirements increase the *compulsory housing payment* (the sum of the operating and maintenance cost [OMC], the after-tax mortgage interest payment, and the compulsory amortization payment). They do not increase the *user cost* of housing (the implied rent—the sum of the OMC, the real after-tax mortgage interest, and the real cost of housing equity, minus the real after-tax capital gains on housing).²

Amortization does not increase the user cost because it is not an *expense*; it is *saving*, in the particular form of increasing the housing equity by reducing the mortgage. The compulsory housing payment minus the user cost is the *involuntary saving* associated with the housing. It equals the sum of the compulsory amortization and the reduction due to inflation of the real value of the mortgage, minus the real cost of housing equity.

Thus, compulsory amortization increases the housing payment and the involuntary saving associated with the housing but does not affect the user cost of housing. The mortgagor is forced to pay more and save more each month.

How does compulsory amortization compare to an interest-rate increase? From a *housing-payment and cash-flow point of view*, a 3% amortization is equivalent to a 3 percentage point increase in the after-tax interest rate on an interest-only loan. With tax-deductible interest and a 30% capital-income tax, this is equivalent to a substantial $3/(1 - 0.3) = 4.3$ percentage point increase in the mortgage rate. For *households that are liquidity-constrained (cash-constrained)*, it is the housing payment that matters and constrains the household, and then 3% amortization has the same effect as a 4.3 percentage-point mortgage-rate increase, a pretty substantial increase.

From a *user-cost point of view*, compulsory amortization and an interest-rate increase are different. As mentioned, compulsory amortization does not increase the user cost. But an interest-rate rise increases the user cost, by increasing the real after-tax interest. For *households that are not liquidity-constrained*, it is the user cost that matters. Then 3% compulsory amortization has little or no effect. For example, households that are not credit-constrained can simply borrow more, deposit the excess borrowing in a savings account, and pay the amortization from the savings account (Svensson, 2016a). Alternatively, they may substantially reduce the impact of the compulsory amortization by frequent refinancing (Hull, 2017).

As a concrete example, we may consider the average studio (one-room apartment) in Stockholm (Municipality) in 2017 (table A.1).³ For an interest-only loan of SEK 2.38 mn (€238,000)—corresponding to an LTV ratio of 85% (equal to the FI’s mandated LTV cap of 85%, introduced

² The OMC here includes any property taxes. Sweden has a local property fee (“kommunal fastighetsavgift”) with a nominal tax rate of 0.75% of the tax-assessed value for most houses and 0.3% for apartment. However, the property fee is capped at a low indexed level (in 2018, SEK 7,812 [€781] and SEK 1,337 [€138] per year for single-family houses and apartments, respectively). For tenant-owned apartments, the property tax is included in the monthly fee to the tenant-ownership association.

³ Throughout the paper, Stockholm refers to Stockholm Municipality, which is substantially larger than the central city of Stockholm. I use an SEK/EUR exchange rate of 10, which was the approximate exchange rate during 2017–2018.

in 2010)—the monthly housing payment, user cost, and involuntary saving are about SEK 6,700 (€670), SEK 2,800 (€280), and SEK 3,900 (€390), respectively.⁴

Figure B.1: Monthly housing payment, user cost, and involuntary saving: Without amortization.

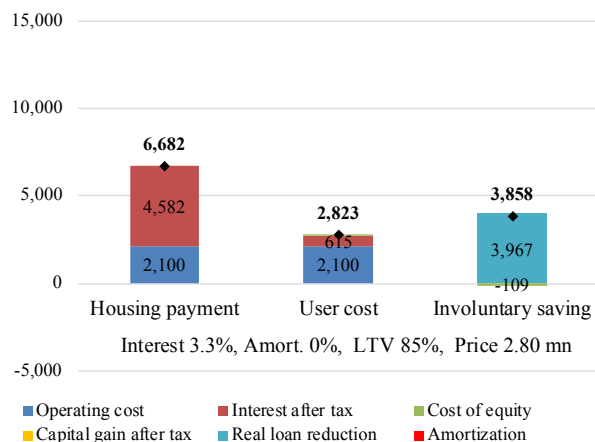
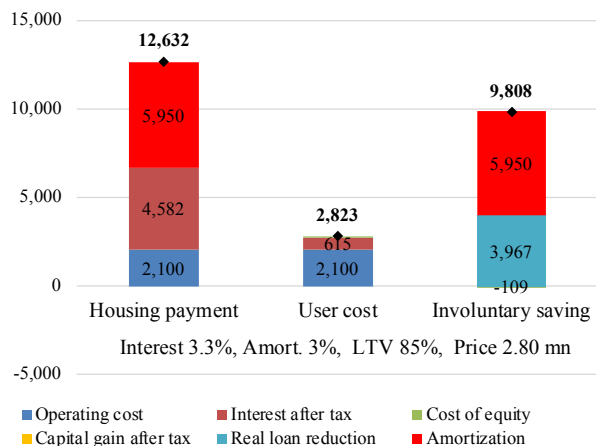


Figure B.2: Monthly housing payment, user cost, and involuntary saving: With amortization requirements.



Source and note: Own calculations. Assumptions as in table A.1. The housing payment equals the operating and maintenance cost plus the after-tax interest on the loan and the amortization. The user cost equals the operating and maintenance cost plus the real after-tax interest on the mortgage plus the real cost of equity minus the real after-tax capital gains. The involuntary saving equals the housing payment minus the user cost, which equals the reduction in the real value of the mortgage due to inflation plus the amortization plus the real capital gains minus the real cost of equity. The real rate of return on equity is set equal to the real after-tax interest rate. With amortization requirements, the amortization rate is 3% for a loan-to-value ratio above 70% and a loan-to-gross-income ratio above 4.5. SEK/EUR \approx 10.

For further concreteness, consider a Stockholm 25–29-year-old individual with monthly gross income of SEK 25,000 (€2,500), which happens to be the median income in 2017 for this Stockholm cohort (Statistics Sweden, 2019e). For brevity, this individual will be referred to as the 25K individual. The corresponding net income (income after tax) is about SEK 20,000 (€2,000). Assume that the individual can manage a down payment of 15% of the price of the studio and receives an interest-only loan for the remaining 85%. Then the housing payment, the user cost, and the involuntary saving are 34%, 14%, and 20% of net income, respectively. This makes this average Stockholm studio quite affordable for the median Stockholm 25–29-year-old. In particular, the user cost is quite small, both absolutely and relative to net income.

With amortization requirements, the amortization will be 3% of the loan amount at origination, adding SEK 5,950 (€595) to the monthly housing payment and the involuntary saving. Then the monthly housing payment rises to about SEK 12,600 (€1,260) and the involuntary saving to about SEK 9,800 (€980), whereas the user cost is unchanged.⁵

As a result, the housing payment, user cost, and involuntary saving are now 64%, 14%, and 50% of net income, respectively. The compulsory amortization is a full 30% of net income, quite large. Clearly, the housing payment becomes prohibitively high, and the involuntary saving rate of 50% is

⁴ The average price of a Stockholm studio in 2017 was SEK 2.8 mn (€280,000) (the source is Svensk Mäklarstatistik [Swedish Real Estate Agent Statistics]). The interest rate is 3.3% (a 10-year fixation-period mortgage rate in 2017; the 3-month variable rate was about 1.5%). See table A.1 and figure B.1 for details.

⁵ The LTV ratio is above 75%, so according to the first amortization requirement at least 2% shall be amortized. The loan exceeds 4.5 times gross income, so according to the second amortization requirement at least an additional 1% of the loan shall be amortized. See figure B.2 for details.

extremely high—in particular, from a life-cycle perspective, for a 25–29-year-old. Furthermore, with such high amortization, the individual will not pass the mortgage firms’ affordability assessment and will not get the mortgage, as we shall see in more detail in section B.3.

Thus, the 25K individual will not be able to afford the average Stockholm studio, and the individual will miss out on the low user cost of the studio. What are the alternative housing options in Stockholm?

Stockholm is rightly infamous for its dysfunctional rental market—dysfunctional because of rent control. The average monthly rent for a rent-controlled Stockholm studio was about SEK 5,300 (€530) in 2017. But for such a rent-controlled studio, the median and average queuing time was about 11 years (Stockholm Housing Agency, 2018, and own calculations). Therefore, aside from those that can live with their parents in Stockholm, the practical alternative for the 25K individual is the secondary rental market. The average monthly rent for a secondary rental in the Greater Stockholm Area (much larger than the Municipality) in 2017 was about SEK 11,000 for a rented apartment and about 13,000 for a tenant-owned apartment (NBHBP, 2018, table 3.8). I will use the SEK 11,000 (€1,100) rent here. Such a rent makes the housing payment and user cost 56% of the 25K individual’s net income. Because the housing payment and the user cost are both equal to the rent, the involuntary saving is zero. With such a high rent, the 25K individual may not be able to save to make a future higher down payment to get out of the secondary-rental market. The individual may indeed be caught in a poverty trap.⁶

Thus, aside from those that can live with their parents in Stockholm (or have rich and helpful parents, see below), the amortization requirements force a 25K individual that needs to borrow 85% to spend 56% of net income on the rent in a secondary studio rental instead of enjoying a user cost of 14% of net income in an owner-occupied studio. The difference between “insiders” (those with owner-occupied housing) and “outsiders” (those without owner-occupied housing and without rent-controlled rental housing) is large in Stockholm.

The above concerns the fate of this 25K individual, who needs to borrow 85%. Consider another 25K individual that has own wealth—or rich and helpful parents—and therefore only needs to borrow 50%. Then there will be no amortization according to the first amortization requirement and only 1% amortization according to the second requirement (the loan still exceeds 4.5 times the gross income). The monthly housing payment will be about SEK 5,900 (€590), the involuntary saving about SEK 3,100 (€310), and the user cost is unchanged.⁷ Then the housing payment, user cost, and involuntary saving are, respectively, 30%, 14%, and 16%. Clearly, for a 25K individual that only needs to borrow 50%, the average Stockholm studio is eminently affordable.

Figure B.5 summarizes the housing payment, user cost, and involuntary saving for the five alternatives mentioned: owner-occupancy, without amortization and with amortization requirements, respectively; a rent-controlled rental with an 11-year queuing time; a secondary rental; and owner-occupancy with amortization requirement but an LTV ratio of only 50%. (Note the zero involuntary saving for the rental alternatives.) The difference between the low user cost of owner-occupancy and the high rent of the secondary rental is striking. Furthermore, this low user cost is calculated under the assumption of zero real after-tax capital gains. Svensson (2019b, section 6.5) shows the result of the alternative and realistic assumption of an annual nominal housing-price growth of 4%. This results in annual real after-tax capital gains of 1.12%. When the negative of these capital gains are included in the monthly user cost, it drops to only SEK 210 (€21), making the difference to the rentals even larger, and the difference in user costs between insiders and outsiders extreme.⁸

⁶ NBHBP (2018) provides details on the secondary-rental market.

⁷ See figure B.3 for details.

⁸ In order to be on the conservative side, most of the calculations in the paper nevertheless assumes zero real after-tax capital gains.

Figure B.3: Housing payment, user cost, and involuntary saving for a studio, for an LTV ratio of 50% and 1% amortization according to the second amortization requirement.

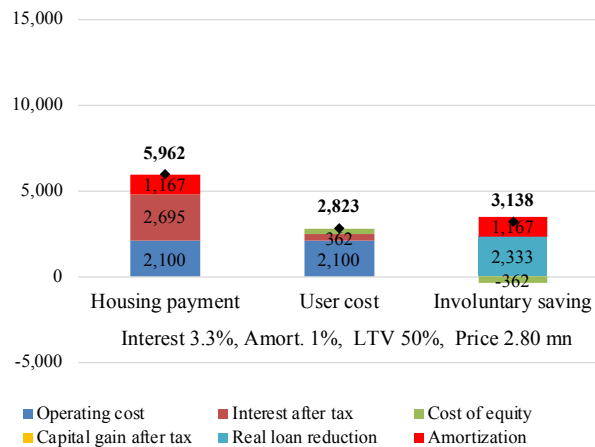
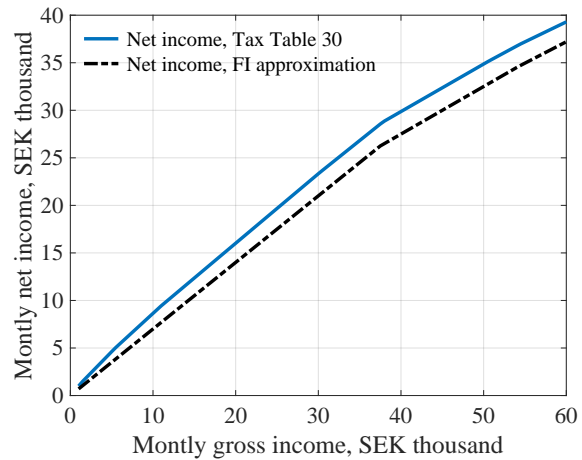
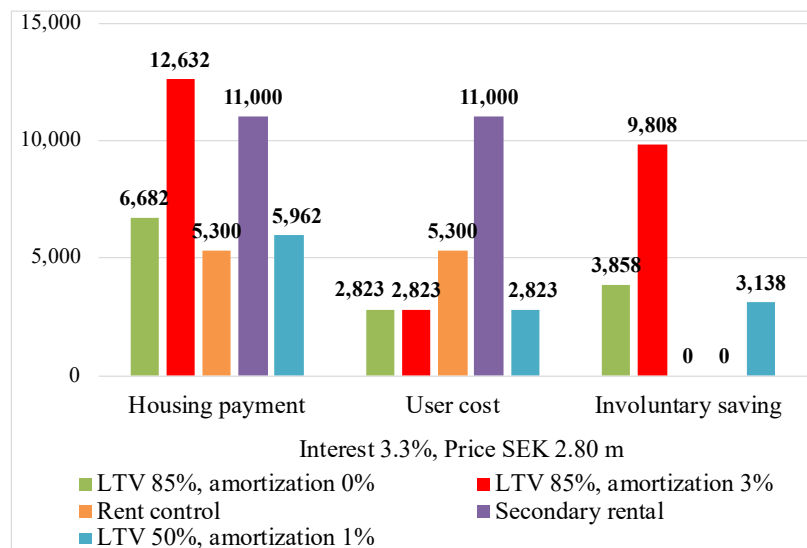


Figure B.4: Monthly gross and net income for a single adult: Tax Table 30 vs. FI approximation.



Source and note: Figure B.3, see note to figures B.1 and B.2. Figure B.4, Swedish Tax Agency (2017, Tax Table 30, column 1). Tax Table 30 is interpolated linearly with breakpoints SEK/month 0; 1,500; 5,400; 11,000; 30,200; 37,800; 50,600; 54,400; 80,000; and 208,000. Income is earned income. Thedéen and Braconier (2017, staff background calculations). The FI's approximation assumes that the marginal tax rate is 30% up to a monthly gross income of SEK 37,500, 50% in the interval up to about SEK 54,000, and 55% above. SEK/EUR \approx 10.

Figure B.5: Monthly housing payment, user cost, and involuntary saving: For an LTV ratio of 85% with zero and 3% amortization, respectively; for a rent-controlled rental; for a secondary rental; and for an LTV ratio of 50% and 1% amortization.



Source and note: The average Stockholm studio 2017 (table A.1, Stockholm Housing Agency, 2018, and own calculations). See note to figures B.1 and B.2. SEK. SEK/EUR \approx 10.

Thus, amortization requirements lead to very unequal situations for the 25K individual who needs to borrow 85% and the one who only needs to borrow 50%. More generally, they lead to a very unfavorable treatment of borrowed capital compared with owned capital to finance housing purchases.

It follows that the credit tightening increases the barriers to entry into the market for owner-occupied housing for households without high income, wealth or rich and helpful parents. FI’s policy favor housing buyers with high income or wealth and hurt buyers without high income and wealth.

B.3 A substantial credit contraction

For households that are liquidity-constrained and thus constrained by their housing payments, 3% compulsory amortization is equivalent to a 4.3 percentage-point mortgage-rate increase and leads to a corresponding fall in *demand* for mortgages. But amortization requirements is a credit tightening that also directly contracts the *supply* of mortgages.

In deciding how much to lend to mortgagors, Swedish mortgage firms use affordability assessments that include a stress test of whether the mortgagor can afford the mortgage for a given high interest rate—the affordability-test interest rate—that is substantially higher than prevailing interest rates. More precisely, the mortgagor’s *cash-flow margin* (CFM) shall be nonnegative for the affordability-test interest rate. The CFM is defined as the mortgagor’s net income minus the sum of the housing payment and standardized (basic) (non-housing) living expenses.⁹ As explained in section B.1, the lending standards before the tightening—also referred to as “without the tightening”—may be represented by an affordability assessment with an affordability-test interest rate of 6% and an interest-only loan.¹⁰

For such an affordability assessment *without the tightening* of lending standards, the required minimum monthly gross income to get the above loan of SEK 2.38 mn is about SEK 25,000 (€2,500), so the 25K individual would just pass the affordability test and get the mortgage.¹¹

After the tightening of lending standards, banks use a higher affordability-test interest rate of typically 7% and include the higher housing payment due to the compulsory amortization requirements in their affordability assessment.¹² For a given loan amount, this increases the required minimum gross income. For the above loan, the minimum monthly gross income required increases from SEK 25,000 to about SEK 35,000 (€3,500), that is, from the median income to 40% above the median income—which corresponds to the 80th percentile of the income distribution of Stockholm 25–29-year-olds (figure B.7). Of this increase of SEK 10,000 (€1,000), about SEK 8,000 (€800) is due to the amortization requirements and about SEK 2,000 (€200) is due to the higher affordability-test interest rate.¹¹

Figure B.6 summarizes the effect on the maximum loan of the tightening. The horizontal dashed black line shows the required loan, and the solid blue line shows the maximum loan for an interest-only loan and an affordability-test interest rate of 6%, as a function of monthly gross income. The intersection occurs at SEK 25,000. The dashed blue line shows the maximum loan for a higher affordability-test interest rate of 7%. The solid yellow line shows the maximum loan for the first amortization requirement, and the dashed-dotted red line shows the maximum loan for both amortization requirements. The minimum gross income to get the required loan is SEK 35,000.¹³

⁹ See table A.1

¹⁰ Affordability assessments are also known as “discretionary-income calculations” and the CFM is also known as “discretionary income” (FI, 2017e, Glossary, p. 27). In Swedish, affordability assessments are called “Kvar Att Leva På (KALP) [Left To Live On]” calculations.

¹¹ See table B.1 for details.

¹² Some lenders even use 8%, but SBAB and Skandia recently reduced their affordability-test interest rate to 6.5% (SBAB, 2019c; Privata affärer, 2019).

¹³ As noted in the beginning of section 3, some mortgage firms after the tightening also use internal LTI ratio limits, typically 5–6 times annual gross income, although the limits are not necessarily hard but advisory. A line corresponding to an LTI ratio limit of 5.5 in figure B.2 (not shown) by coincidence intersects the horizontal required-loan line close to SEK 35,000.

Table B.1: Affordability calculations for an average Stockholm studio and a single individual, without and after the tightening of lending standards.

	Without	After	Increase
1. Price, SEK	2,800,000	2,800,000	
2. LTV ratio	85%	85%	
3. Down payment, SEK	420,000	420,000	
4. Loan, SEK	2,380,000	2,380,000	
5. Standardized living expenses, SEK/month (1)	9,300	9,300	
6. Operating and maintenance cost, SEK/month (2)	2,100	2,100	
7. Affordability-test interest rate	6%	7%	1 pp
8. After-tax interest in stress test, SEK/month (3)	8,330	9,718	1,388
9. Required gross income increase, SEK/month			1,945
10. Amortization rate	0%	3%	3 pp
11. Amortization, SEK/month (4)	0	5,950	5,950
12. Required gross income increase, SEK/month			8,337
13. Minimum net income, SEK/month = (1+2+3+4)	19,730	27,068	7,338
14. Minimum gross income, SEK/month	25,081	35,363	10,282

Source and note: Assumptions as in table A.1. “Without” (the tightening) is represented by an interest-rate stress tests with a 6% interest rate and no amortization. “After” (the tightening) is represented by a stress test with a 7% interest rate and 3% amortization rate (the amortization rate for an LTV ratio above 70% and an LTI ratio above 4.5). Gross (before tax) and net (after tax) income is related as in figure B.4, Tax Table 30, taking into account the increase in the marginal tax rate from 27% to 30% at the breakpoint SEK 30,200. Gross (before tax) and net (after tax) income increases are calculated using a constant average marginal tax rate of 28.633%, which equals the average marginal tax rate according to the 2017 Tax Table 30 for the interval between the monthly gross incomes of SEK 25,081 and SEK 35,363. SEK/EUR \approx 10.

Figure B.6: Maximum and required loan for the average Stockholm Municipality studio 2017 and a single individual.

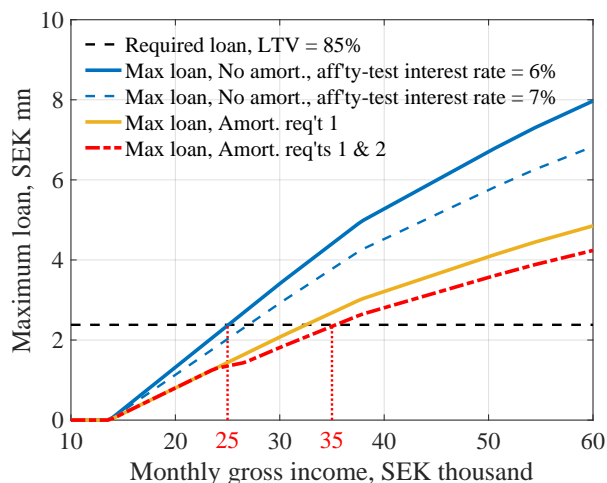
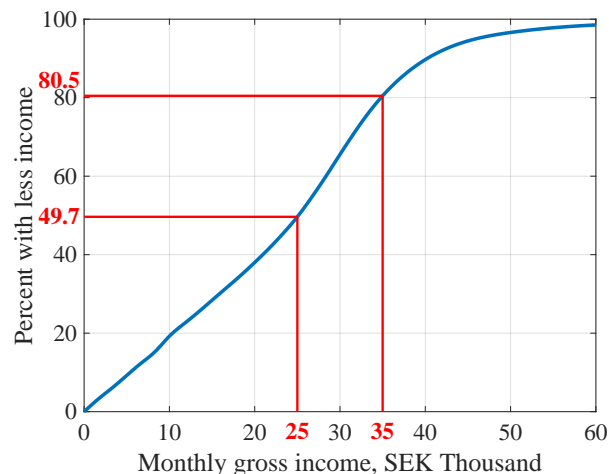


Figure B.7: Cumulative income distribution 2017 for individuals of age 25–29 years in Stockholm Municipality.



Source and note: Figure B.6. Table A.1 and own calculations. Figure B.7. Statistics Sweden (2019e) and own calculations. The blue line is a cubic spline. The vertical axis shows the percentage of individuals that have less gross income than the gross income on the horizontal axes. Individuals with zero gross income are excluded. The sample refers to individuals who lived in Sweden the whole year of 2017. The mean and median monthly gross income for individuals with positive income are, respectively, SEK 24,340 and SEK 25,120. SEK/EUR \approx 10.

For a given gross income, the maximum loan drops by 14% from the increase in the affordability-test interest rate from 6% to 7% and by a total of 47% when both amortization requirements apply.¹⁴

B.4 Measures of the credit tightening

One can consider several measures of the credit tightening. A *first* measure is that amortization of 3% is from a housing-payment point of view equivalent to a before-tax interest-rate increase of 4.3% on an interest-only loan. Thus, the tightening is equivalent to an increase in the affordability-test interest rate on an interest-only loan from 6% to $7 + 4.3 = 11.3\%$, an increase of 5.3 percentage points.

A *second* measure is the reduction in the maximum loan for a given income of the 25–29-year-olds who need to borrow 85%. The maximum loan falls by 14% because of the 1 percentage point increase in the affordability-test interest rate and by 33% because of the two amortization requirements. Thus, the total fall in the maximum loan is 47%.¹⁴

A *third* measure is the above 40% increase in the minimum required gross income caused by the tightening.

A *fourth* measure is the share of the Stockholm 25–29-year-olds that are excluded by the tightening. Without the tightening, the top 50% of the income distribution of such individuals had enough income to get the above loan. After the tightening, only the top 20% of the income distribution had enough monthly income. This is thus a credit contraction that excludes $(50 - 20)/50 = 60\%$ of those that would have qualified for the loan without the tightening.¹⁵

One can also consider a *rough measure of the fall in housing demand* of 25–29-year-olds caused by the tightening. By adding the down payment to the maximum loan, one gets the maximum price the individual can pay for the Stockholm studio. The percentage fall in the maximum price can be seen as a rough measure of the fall in housing demand. For the 25K individual, the maximum price has fallen by 37%.

For this individual to still be able to buy the Stockholm studio after the tightening, prices would thus have had to fall by 37%. Stockholm housing prices fell by about 10% from August 2018 to January 2018 and has since then recovered somewhat. Thus, the 25K individual is unable to buy the Stockholm studio by a wide margin and is in a considerably worse situation after the tightening.¹⁶

B.5 The FI and the government understates the effects of the tightening¹⁷

The FI and the government has given misleading statements about the consequences of the amortization requirements. The FI has stated, in proposing the second amortization requirement, that “*Most borrowers [are] not affected*” (by the second amortization requirement) (Thedéen and Bronconier, 2017).¹⁸ The FI showed a figure and stated that the second amortization requirement would only affect single adults without a children with a monthly gross income exceeding a threshold of SEK 31,000 (€3,100). Of Stockholm 25–29-year-olds, 31% had a monthly gross income exceeding this threshold in 2017—which is a minority but still a substantial proportion.

However, the FI used an imperfect approximation of the income tax schedule in its background calculations (figure B.4). When the correct tax schedule Swedish Tax Agency (2017, Tax Table

¹⁴ For the specific income of SEK 25,000, the maximum loan drops by a total of 43%, because of the barely visible tilt in the dashed-dotted red line, which in turn is caused by the second amortization requirement’s DTGI limit of 4.5 being the binding constraint before the full extra 1% amortization kicks in.

¹⁵ See figure B.7 for details.

¹⁶ See Svensson (2019c, section 4.3) for details.

¹⁷ See Svensson (2019b, section 4.5) for details.

¹⁸ “Flertalet omfattas inte” in Swedish.

30, column 1) is used, the threshold is only SEK 24,000 (€2,400). Of Stockholm 25–29-year-olds, 53% had a monthly gross income exceeding this threshold in 2017. Thus, a correct, rather different statement would be “*More than half of the borrowers are affected.*”

[Thedéen and Braconier \(2017\)](#) also stated that the second amortization requirement would only affect households with two adults and two children that had a combined monthly gross income exceeding a threshold of SEK 71,000 (€7,100). The government through the minister of financial markets, Per Bolund, has also repeated the statement “*Most borrowers [are] not affected*” and presented a figure with this result for such households ([Bolund, 2017](#)). However, this calculation also used the same imperfect approximation of the tax schedule. With the correct tax schedule, the threshold is only SEK 60,000 (€6,000).

Both the FI and the government were only talking about the second amortization requirement. They did not mention that the first requirement affects even more mortgagors, namely everyone that has to borrow more than 50% of the price of the housing.

Another apparently misleading statement by the FI is in an op-ed by the director-general, “*The young are excluded by ever higher housing prices—not by amortization requirements*” ([Thedéen, 2018](#)). The director-general maintained that the minimum monthly gross income required to buy an average Stockholm studio had increased by SEK 7,400 (€740) from 2012 to 2017. Of this increase, only a minuscule SEK 190 (€19) was supposed to be due to the amortization requirements, whereas SEK 6,700 (€670) was supposed to be due to higher housing prices. How can the effect of the amortization requirements be so small, when 3% amortization on the loan to finance 85% of the average Stockholm studio implied monthly amortization of about SEK 6,000 (€600), which in turn required an increase in the monthly gross income of about SEK 8,000 (€800).

Scrutiny of the calculation reveals several misleading assumptions (see [Svensson, 2019b](#), section 4.5, for details). In particular, it is assumed that young mortgagors would (voluntarily) pay 1.75% amortization without the tightening and 2% with the tighten (disregarding the second amortization requirement). Thus, the amortization requirements only increase the amortization by 0.25 percentage points. Furthermore, the LTV ratio is assumed to be 75%, not 85%. When these are replaced by more reasonable assumptions—in particular, that interest-only loans would be available without the tightening, that both amortization requirements would apply with the tightening, and that the LTV ratio is 85%—a more correct calculation shows that the total increase in the minimum gross income from 2012 to 2017 is about SEK 14,400 (€1,440)—almost double that reported by the FI. Of this, the increase due to the amortization requirements is about SEK 8,300 (€830), much larger than the FI’s reported SEK 190 (€19), and the increase due to higher prices is about SEK 4,500 (€450), smaller than the FI’s reported SEK 6,700. Thus, a more correct statement is “*The young are excluded mainly by the amortization requirements and to a lesser extent by higher housing prices.*”

In a new report and op-ed ([Olsén Ingefældt and Thell, 2019](#); [Thedéen, 2019](#)), the FI is again maintaining that the amortization requirements do not exclude the young from owner-occupied housing. The argument is that, of the young that bought housing in 2012, 85% would be able to buy the same housing in 2018 if they had been young in 2018. For Stockholm, however, the fraction is only 67%. But the effects of the compulsory amortization requirements are measured in a misleading way, as resulting from the difference between the actual amortization rates of, on average, 2.2% in 2018 and the actual amortization rates of, on average, 1.8% in 2012. But the high actual amortization rates in 2012 were to a large extent the result of the mortgage firms’ considerable tightening of lending standards since 2010–2011 – presumably in the vain hope of avoiding a regulation of compulsory amortization – and should be seen as part of the general credit tightening induced by the FI. Some of the amortization in 2012 was probably voluntary. With higher housing prices and larger loans in 2018, many young persons may have preferred to amortize

less in 2018 than in 2012.

The report notes that the share of the young has increased among new borrowers. But the report – but not the op-ed – emphasizes that this does not imply that it has become easier for the young to buy a home (Olsén Ingefældt and Thell, 2019, p. 15). The rental market has become less accessible which has reduced the alternatives to owner-occupied housing and may have forced some of the young to take larger loans relative to incomes and the value of the property. It is also likely that the young, more than the old, have been restricted to buying housing with less attractive locations and smaller sizes. The increased share of young borrowers may also be due to parents’ housing-equity withdrawals. In particular, data are not available on the fraction of young with rejected loan applications in 2012 and in 2018, in particular compared to a situation in which interest-only loans are available. The FI’s database include only those that are granted loans.

Meanwhile, more and more independent evidence of increasing difficulties for the young are accumulating (Evidens, 2018a; Ljung, 2018; SBAB, 2018; Skandia, 2019; Svensson, 2019b; Ekvall, 2019).

Interestingly, in the op-ed (Thedéen, 2019), the director-general is no longer referring the main previous justification for the credit tightening, namely the “elevated macroeconomic risk” from high household indebtedness—for which risk there is no demonstrable evidence. One might wonder whether the FI has by now accepted that there is no demonstrable individual or social benefit from the amortization requirements and changed tactics, no longer repeating easily disproved arguments about benefits but instead focusing on detracting from the obvious and demonstrable individual and social costs.

Andersson and Aranki (2019) conclude in a report from the FI that the second (“stricter”) amortization requirement has led to “fewer vulnerable households.” They conclude this because the LTI ratios for new mortgagors have fallen, and they take for granted that a lower LTI ratio reduces vulnerability (increases resilience).¹⁹

That the LTI ratios have decreased after the second amortization requirement is natural. Amortization become larger for mortgagors with high LTI and by the affordability tests they get to borrow less for a given income (figure B.6). But, importantly, the LTI ratio is not an appropriate measure of household vulnerability or resilience (section 3). The best measure in this context is the cash-flow margin as well as access to credit and liquid assets. Because the amortization requirements result in both lower cash-flow margins and less access to credit, they result in higher vulnerability to income disturbances, not lower. The Andersson and Aranki conclusion is thus wrong, as is further explained in sections B.6 and B.7.

Aranki and Larsson (2019) show that housing-equity withdrawals have fallen after the introduction of the amortization requirements. This is a natural consequence of the tighter credit and liquidity constraints, especially since housing-equity withdrawal is considered a new mortgage that requires amortization on either the existing old mortgage or a higher amortization rate on the withdrawal part.

B.6 A strongly frontloaded debt-service-to-income ratio over time

With 4% annual growth of nominal incomes (consistent with 2% real growth and 2% inflation), nominal incomes will double in about 18 years. (For many young persons with a good education and making a career, incomes will grow faster.) For a given interest-only loan, the mortgagor’s debt-service-to-net-income (DSTI) ratio for a constant interest rate as well as the loan-to-income (LTI) ratio will then fall gradually by about 4% per year and be halved in about 18 years. With

¹⁹ The FI sometimes refers to “vulnerability,” sometimes to “resilience.” As far as I can see, the increased (decreased) vulnerability is the same as decreased (increased) resilience.

also 4% growth of nominal housing prices, nominal housing prices will also double in about 18 years. Then the LTV ratio will also fall by about 4% and be halved in about 18 years. In 10 years, the LTV ratio would fall from the initial 85% to 57% in 10 years, thus corresponding to a substantial increase in housing equity from 15% to 43%.

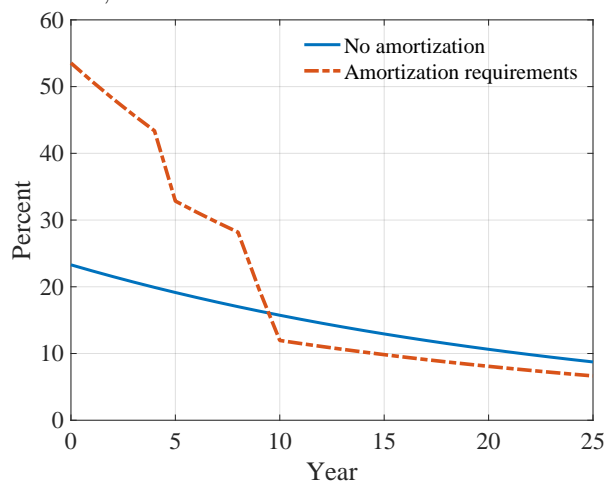
Table B.2: Additional benchmark assumptions.

Annual growth rate of nominal price, gross and net income, and OMC	4%
Annual growth rate of nominal standardized living expenses	3%
Annual growth rate of nominal rent on secondary rental	4%
Expected and actual inflation rate	2%
Real capital-gains after tax	1.12%

Source and note: OMC denotes the operating and maintenance cost. Expected inflation and nominal capital-gains tax as in table A.1. With 4% nominal capital gains and 2% real capital gains, the real after-tax capital gains are 1.12%.

Thus, for a given interest-only loan, 2% real growth and 2% inflation results in an “automatic” amortization of 4% per year, corresponding to a half-time of about 18 years. There is little reason to believe that an optimal amortization rate would be faster.

Figure B.8: Debt-service-to-net-income ratio ratio, without amortization and with amortization requirements. Initial monthly gross income SEK 25,000.



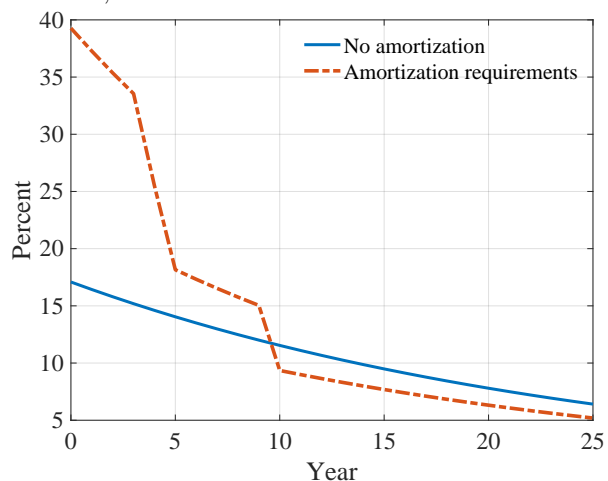
Source and note: Tables A.1 and B.2 and own calculations. SEK/EUR \approx 10.

In figure 6.1, the solid blue line shows the DSTI ratio for the 25K individual for the above interest-only loan. The initial DSTI ratio would be 23%, and it would gradually fall to 16% in 10 years. The individual would easily manage the debt service on the interest-only loan.

With amortization requirements, as noted above, the 25K individual will not pass the affordability test and will not get the loan, whereas the 35K individual will pass the test and get the loan. Nevertheless, the dashed-dotted red line in figure 6.1 shows the DSTI ratio with amortization requirements, for the hypothetical case that the 25K individual would get the loan. The DSTI ratio starts at a very high 54%, falls rapidly over time, but it does not fall below that of an interest-only loan until year 10.

Figure 6.2 shows the DSTI ratio for the 35K individual, for the two loans. For the interest-only loan, the DSTI ratio would have started out at 17% and fallen gradually to 12% in year 10. With

Figure B.9: Debt-service-to-net-income ratio, without amortization and with amortization requirements. Initial monthly gross income SEK 35,000.



amortization requirements, the strongly frontloaded DSTI ratio starts out at 39% and remains above that of the interest-only loan until year 10, when it drops to 9%, 3 percentage points below the one for the interest-only loan. For the cost of a higher DSTI ratio during the first 9 years, there is a gain of a 3 percentage point lower DSTI ratio from year 10. It is difficult to see that a reduction of 3 percentage points from the low DSTI ratio of 12% would have any significant benefit.

In summary, amortization requirements lead to a strongly frontloaded DSTI ratio compared with an interest-only loan. Importantly, the DSTI ratio remains higher than that of an interest-only loan for several years, and only drops a few percentage points below that of the interest-only loan when amortization ceases in year 10. Because, in year 10, the DSTI ratio for an interest-only loan is already small, it is difficult to see that there would be much benefit from the reduction of it.

From an informal cost-benefit analysis, it seems rather likely that the cost of a substantially higher DSTI ratio during the first 9 years are larger than the possible benefits a modest reduction of a relatively small DSTI ratio from year 10. More generally, the strongly front-loaded DSTI ratio under amortization requirements makes more mortgagors liquidity-constrained for many years, forces more mortgagors to oversave and underconsume, and makes it more difficult or even impossible for mortgagors to smooth their consumption when shocks to their current income occur.

The mortgagors' consumption becomes more sensitive to current income, and the mortgagors become less resilient to income shocks.

B.7 Reduced household resilience to income shocks

The FI's aim of the amortization requirements is to increase households' resilience to shocks (FI, 2017d, p. 1):

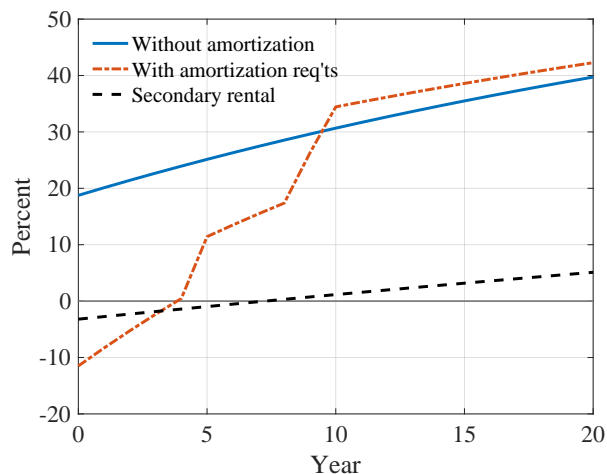
The aim of the measure[s] is to increase the Swedish households' resilience to shocks.

But a closer look reveals that amortization requirements actually reduce households' resilience.

As noted in section 3.4, the resilience in question is mainly the resilience of the households' consumption, more precisely, the households' capacity to smooth their consumption while fulfilling their debt service, when negative shocks to current income occur. This resilience can be measured by the households' CFMs. As mentioned in section B.3, the CFM is defined as the household's current net income minus the sum of the compulsory housing payment—the OMC plus the compulsory debt service (the after-tax interest plus the compulsory amortization)—and standardized (basic) (non-housing) expenses. The CFM shows the scope for actual non-housing consumption to exceed the standardized basic living expenses and the capacity to maintain a smooth normal non-housing consumption without having to draw on any liquidity buffer, when negative shocks to current income occur.

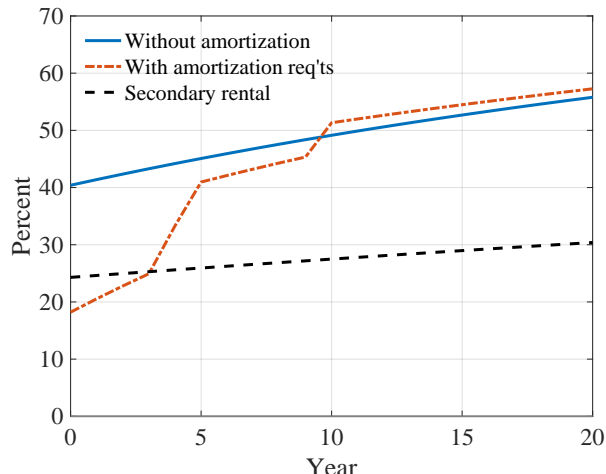
Amortization requirements increase the housing payment and reduce households' CFMs and thereby reduce households' resilience compared with an interest-only loan. A given interest-only loan results—with nominal income growth—in a gradually increasing cash-flow-margin-to-net-income (CFMTI) ratio; this is the mirror image of the gradually decreasing DSTI ratio for an interest-only loan noted in section B.6. In contrast, amortization requirements result in a strongly *backloaded* CFMTI ratio; the mirror image of the strongly *frontloaded* DSTI ratio with amortization requirements. The relevant CFMTI ratios are shown in figures B.10 and B.11, including the CFTNI ratio for a secondary rental. The initial CFMTI ratio is thus much lower with amortization requirements than for an interest-only loan. The CFMTI ratio remains lower than that for an interest-only loan until amortization ceases in year 10, when the CFMTI ratio rise to slightly exceed the that for an interest-only loan; this is again the mirror image of the DSTI ratio with amortization requirements, which only after about 10 years slightly undershoots the DSTI ratio for an interest-only loan.

Figure B.10: The cash-flow-margin-to-net-income ratio over time, without amortization, with amortization requirements, and for a secondary rental. Initial monthly gross income SEK 25,000.



Source and note: Tables A.1 and B.2 and own calculations. SEK/USD \approx 10.

Figure B.11: The cash-flow-margin-to-net-income ratio over time, without amortization, with amortization requirements, and for a secondary rental. Initial monthly gross income SEK 35,000.



With amortization requirements, the cost of a substantially lower resilience during the first 9 years are likely to be significantly larger than the possible benefits of a modest increase in resilience from year 10. More generally, the marginal welfare loss from less resilience is likely to increase when resilience falls. The marginal welfare loss from a lower CFM is larger when the CFM is initially low than when it is initially high. This means that it is optimal to smooth the CFM over time, for the same reason why decreasing marginal utility of consumption makes it optimal to smooth consumption over time.²⁰

It follows that the FI's amortization requirements with its frontloaded CFM profile results in less resilience and a welfare loss compared with the smooth CFM profile for an interest-only loan. More intuitively, the more smoothly increasing CFMTI ratio for an interest-only loan makes mortgagors less liquidity-constrained and make it easier for mortgagors to smooth their consumption when shocks to their current income occur. Clearly, amortization requirements are a counterproductive way to increase mortgagors' resilience.

Furthermore, the secondary-rental outsiders—the individuals that are excluded from owner-occupied housing because of the credit tightening and have to resort to the secondary-rental market—end up having a lower CFM and a lower resilience to income shocks than if they had received the interest-only loan. This is because the secondary rent is higher than the housing payment for an interest-only loan. In addition, the secondary-rental outsiders' CFMs do not benefit from lower mortgage rates in recessions.

Amortization requirements reduce the resilience of mortgagors in other more indirect ways. The high housing payment and low CFM prevent mortgagors from building up a liquidity buffer—or force them run down an existing liquidity buffer. They also prevent the mortgagors to invest in a more diversified portfolio. The mortgagors are forced to oversave and underconsume, and become liquidity-constrained. In particular, these households are prevented from their preferred consumption-smoothing over time. Their marginal propensity to consume out of current net income

²⁰ It is easy to show that reasonable measures of the welfare loss display increasing marginal loss to less CFM. See Svensson (2019b, appendix E) for an example.

(MPC) will be very high. They may indeed be hand-to-mouth consumers with an MPC equal to unity (Campbell and Mankiw, 1989; Kaplan et al., 2014; Ampudia et al., 2018). Thus, amortization requirements imply that mortgagors’ consumption is more sensitive to their current income.

Finally, as discussed in section 3.5, by *design* the amortization requirements make the amortization and associated involuntary saving inherently countercyclical, because the amortization rate rises when LTV and LTI ratios fall due to housing-price and income falls. This makes consumption inherently procyclical and increases the macroeconomic risk that FI wanted to reduce.

Thus, amortization requirements make it more difficult for mortgagors to smooth their consumption, when negative income shocks occur. Their consumption becomes more sensitive to income shocks, which may reinforce a recession. Amortization requirements may create and increase the macroeconomic risk that FI is trying to reduce.

B.8 The FI’s exemptions on “special ground” do not solve the problem of reduced resilience

The FI’s is aware of the problem that amortization requirements reduce households’ resilience. Its response to this problem—and contradiction—is to allow mortgage firms to make exemptions from amortization payments for mortgagors on “special grounds” (FI, 2017d). However, the special grounds FI mentions refer to situations when individual mortgagors face *individual problems in fulfilling their debt service* for reasons such as “unemployment, long periods of absence from work due to illness and the death of a close relative.” There is no suggestion in the FI’s discussion that mortgage firms might consider mortgagors’ *consumption* or the *macroeconomic risk from a reduction in mortgagors’ consumption*—the FI’s official rationale for having introduced the amortization requirements. It difficult to believe that mortgage firms would exempt mortgagors from amortization on the ground that certainly they can fulfill their debt service, but they cannot maintain their normal consumption. The mortgage firms will most certainly be focused on any risk to their individual debt service rather than on any macroeconomic consequences. Thus, the FI has not provided any mechanism through which the exemptions to amortization payments would avoid the reduced resilience caused by the amortization requirements.²¹

B.9 A reduction in already too-low construction

As discussed in Svensson (2019c), the main problem with the Swedish housing market is a structural excess demand for housing in the major cities. Demand for owner-occupied housing has been growing, due to a downward trend in mortgage rates, a reduction of and low cap on property taxes, increases in disposable income, urbanization and migration to the major cities, the dysfunctional rental market, and other structural factors. For several reasons, the supply of housing has not kept up with the growing demand. The reasons include restrictions on land use, building regulations, lack of regional planning, local special regulations, local permit handling times, limited competition, and so on. Given this, it is not surprising that housing prices and household debt have been rising.

The obvious solution to this problem of a structural excess demand for housing is to *increase the supply of housing*, through increased construction of new housing and more efficient use of the existing housing stock, including reforms of the rental market. In contrast, the FI’s tightening of

²¹ In March 2020, the corona pandemic forced the FI to adapt and to make an unanticipated special recommendation: “Loss of income due to the corona-virus [is] a cause for exemption from amortization” (FI, 2020b). But borrowers have no right to an exemption; it is still the mortgage firm that decides. And the recommendation did not apply to those that have not yet lost their income. In April, the FI corrected the latter and stated that banks may grant all mortgagors amortization exemption (FI, 2020a). But the exemption is so far only in force until the end of June 2021. Bäckman (2020) has argued that it is better to simply abolish the amortization requirements.

lending standards and the resulting credit contraction has served to artificially *reduce the demand for housing, especially from households without high income and wealth* and thus lowered housing prices. This in turn has led to a substantial fall in the construction of new housing, in a situation when housing construction was already lower than socially optimal. This makes the structural housing problem worse.

B.10 Many distortions

It is clear that the tightening of lending standards, especially the compulsory amortization requirements, cause—or exacerbates—several obvious distortions (and some less obvious). These distortions cause efficiency (welfare) losses. They also cause equity (welfare distribution) losses between insiders and outsiders of the owner-occupancy market and between insiders with and without high income and wealth.

The FI’s compulsory amortization requirements increase the housing payment and cause a large difference between the housing payment and the user cost of housing and thereby a large involuntary saving. The large difference between the housing payment and the user cost of housing as well as the large involuntary saving cause several distortions compared with an interest-only loan. The amortization requirements also cause a strongly frontloaded time profile of the debt-service-to-net-income ratios as well as a strongly backloaded time profile of the cash-flow-margin-to-net-income. This causes distortions compared with the smoother time profiles resulting from an interest-only loan.

The distortions are examined and listed in [Svensson \(2019b, section 8\)](#). Table [B.3](#) provides a non-exhaustive summary of the distortions. In the table, “outsiders” denote individuals that are excluded from the market for owner-occupied housing by the credit tightening. “Insiders” denote individuals that are still able to buy the average studio after the tightening. “Secondary-rental outsiders” denote outsiders that have to resort to the secondary-rental market.

Table B.3: A non-exhaustive summary of distortions caused by the credit tightening, especially the compulsory amortization requirements.

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1. Households without high income or wealth face higher barriers to entry into owner-occupancy.
 2. The mobility within the market for owner-occupied housing is reduced.
 3. First-time buyers without high income or wealth are excluded from the owner-occupancy market in Stockholm Municipality and many have to resort to the secondary-rental market. To prevent such exclusions, housing prices may have to fall by almost 40%.
 4. Less-than-high-income outsiders have higher housing user cost than high-income insiders.
 5. A less wealthy outsider has a higher user cost than a high-wealth insider with similar income.
 6. Mortgagors are forced to oversave and underconsume.
 7. Mortgagors' consumption becomes more sensitive to income shocks.
 8. Mortgagors have to save in illiquid housing equity instead of more liquid and diversified assets.
 9. Mortgagors are less resilient to shocks for many years, for a small gain in resilience later.
 10. Secondary-rental outsiders are forced to overpay, undersave, and underconsume.
 11. Secondary-rental outsiders' consumption is more sensitive to income shocks.
 12. Secondary-rental outsiders are less resilient to shocks, without any gain in resilience later.
 13. By design the amortization requirements make amortization and involuntary saving counter-cyclical, which makes consumption more procyclical and sensitive to income shocks.
 14. Reduced demand for and lower prices of housing reduce already too-low housing construction and exacerbates the structural problem of excess demand for housing.
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Source and note: [Svensson \(2019b, section 8\)](#) “Outsiders” refer to households excluded from the market for owner-occupied housing because of the credit tightening. “Insiders” refer to households still being able to enter the market for owner-occupied housing after the tightening. “Secondary-rental outsiders” refers to outsiders that have to resort to the secondary rental market, with very high rents.

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