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AMORTIZATION – WHAT HAPPENS?

An empirical study of the amortization requirement and its effect on Swedish municipalities
with respect to age.



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Abstract

The amortization requirement stipulates that all new mortgages will be amortized in the interval between 50-70 per cent of the residence value; an additional, stricter, amortization applies if the mortgage exceeds 450 per cent of the individual's gross annual income. The stricter amortization requirement is brand new, implemented the 1st of March 2018.

This action was introduced when the Swedish Financial Supervisory Authority (Finansinspektionen) concluded that the aggregate debt level in Sweden must be contained. The amortization requirement is designed to increase the resilience among Swedish households against financial crisis. The effects of the amortization requirement is fiercely debated and of great public interest because it concerns everyone who has or wants to purchase a residence.

The focus is to investigate the Loan-to-Income ratio and the "Left-to-live-on" –Calculation (KALP). Using a comparative method the Loan-to-income ratio and the KALP- calculations are compared between all 290 municipalities and across age groups. The result shows the different effects the amortization requirement has on different regions in Sweden.

The amortization requirement will affect the larger municipalities and the adjoining suburbs the most, as well as the younger and the older age groups, causing a decrease in residence prices and lower demand for mortgages. This result is explained within the context of the permanent income hypothesis, life cycle models of consumption as well as a spatial consideration of income growth.

The initial effects of the amortization requirement has been a drastic decrease in housing prices and the long –term goal is a more sensible loan-to –income ratio level in the country.

Key Words: Amortization, Loan-to-Income ratio, Finansinspektionen, KALP

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1. Introduction

Will the amortization requirement implemented in Sweden have different effects on different groups in Sweden?

This study will empirically investigate the effect an amortization requirement has on different municipalities, and the individuals within those municipalities in Sweden. In other words investigate if certain parts of Sweden will be made to amortize more on their loans compared to others and how that will affect different age groups residing in those parts.

The hypothesis posed in this study is that amortization will affect municipalities with a higher ratio between mortgage debt and income more severely compared to municipalities with a lower ratio and that the high ratios between mortgage and income is most frequently found in larger cities, meaning that individuals residing in for example Stockholm will be made to amortize more compared to people living in Alvesta. Furthermore, it will become more difficult, particularly for younger and older individuals with a relatively lower current income, to break into or move within the real estate market since all real estate purchases exceeding a certain limit are face with a type of forced savings, the amortization requirement, an additional portion of monthly repayment on mortgage debts.

To conduct this study a quantitative and comparative approach is used where first; all municipalities in Sweden are compared to each other in terms of their mortgage debt to income ratio and subsequently identified and ranked according to size. Second, different age groups within the municipalities that are affected by amortization are compared to each other in terms of how much of their income they have left after all monthly residence payments are made. This will allow a depiction of where the amortization requirement will strike hardest and what type of groups will be affected the most.

Focus will first and foremost be on the ratio between mortgage debt and income, otherwise known as a loan-to-income ratio (LTI) and the “left-to-live-on” calculation, known as KALP (kvar-att-leva-på beräkning). The LTI ratio measured the size of a mortgage an individual assumes in relationship to income. A municipality or individual exhibiting a high LTI ratio has a low monthly income in relationship to their loans and vice versa. The KALP calculation illustrates is the remaining income an individual has left after all living and residence expenses are paid. A high KALP value means that the individual is well equipped to handle for example unforeseen expenses and is a good measurement of how secure the individual is, from a financial perspective.

To investigate the hypothesis and empirically investigate the effect of amortization data is collected from the Swedish Statistics Agency (Statistiska Centralbyrån), providing data over income in different municipalities and different age groups, the Swedish Realtor Statistics Agency (Svensk Mäklarstatistik), providing data over residence prices and finally from the Swedish Central bank (Riksbanken), providing data over average mortgage debts across municipalities.

The empirical portion will then be compared and interpreted within the context of the permanent income hypothesis, first introduced by Milton Friedman in 1957 as well as the life-cycle of consumption framework. Mortgages are a natural part of the economy since many do not have enough resources saved up in order to purchase a residence without a loan. The redistribution of capital allowing individuals to spread their income over their life-span and by that achieves a higher total utility (Friedman, 1957). In general, young and old individuals with lower current income will come to seek financial aid in the form of borrowing in order to ensure such a constant consumption as possible over the life cycle. This borrowing is possible due to the individual expecting a higher current income in the middle of the life span, allowing for repayment of debts (Friedman, 1957). These theories will also be complemented with an empirically supported framework referred to here as spatial income growth. Spatial income growth provide a reasoning behind why certain regions experience higher income growth compared to others and in this study that difference manifests in a large difference in loan-to-income ratios between municipalities.

The amortization requirement was implemented in Sweden due to an increased worry that household's loan-to-income ratio have exceeded a financially sustainable limit. According to the European Central bank, the loan-to-income ratio has grown exponentially in Sweden during the past 20 years from remaining stable at an approximate level of 100 per cent of disposable income in the year 2000 to an increase to roughly 171 per cent in 2016 (European Central Bank, 2017). A continuously increasing loan-to-income ratio may open the household's, as well as the Swedish economy up to risks due to a decreased resilience towards economical fluctuations (Finansinspektionen, 2014).

What separates this study from others is the in-debt analysis over each municipality in Sweden that will allow a comprehensive understanding over the real estate and income distributions throughout the country as well as a detailed geographical mapping of the effects of the amortization requirement.

2. Background

There have been two separate implemented amortization requirements in Sweden during the past two years. The first requirement went into effect the first of June 2016, and is a progressive requirement dictating that all mortgages in the interval between 50 and 70 per cent of the residence value will be subject to a one per cent amortization of (Finansinspektionen, 2010) (Burda, M & Wyplosz, C, 2009) the mortgage per year. Furthermore, a mortgage exceeding 70 per cent of the residence value has to amortize two per cent of the mortgage per year. The second requirement went into effect the first of March in 2018 and works in conjunction with the first. It dictates that all mortgages exceeding 4.5 times the yearly-earned income must amortize an additional one per cent of the mortgage (Finansinspektionen, 2017).

In summation the first amortization requirement provided restrictions on the loan- to value ratio (LTV) for each individual whereas the second also provide restrictions on the loan- to – income ratio (LTI). This paper will mainly focus on the added second requirement, restricting the loan-to-income ratio. Important to note is that the amortization requirement only applies for new loans, meaning that mortgages issued before the first of June 2016 is not tied to any amortization requirement and mortgages issued before the first of March 2018 are only subject to the initial requirement (Finansinspektionen, 2017 b).

2.1 Rationale Behind & Predicted Effects of the Amortization Requirement

The amortization requirement was introduced by the Swedish Financial Supervisory Authority (Finansinspektionen) as a response to increased worry that the aggregate mortgage debt in Sweden was high in relationship to the earned income.

Purchasing a house is often the largest investment an individual makes during their lifetime, it involves a large amount of money and commitment extending over a long period of time. Therefore, it might not be surprising to note that the sum of household's total debt largely consists of mortgages. In Sweden mortgages constitute approximately 83 per cent of household's total debt (Finansinspektionen, 2018). This situation may pose a risk for individuals, households, financial institutions and the national economy. Due to higher debt levels these actors are less equipped to handle economical fluctuations and may therefore pose a risk of significantly altered consumption patterns when faced with economical fluctuations. Provided that many household's decrease consumption simultaneously, these changes may even cause or enhance recessions. By implementing a stricter amortization requirement, individuals are expected to handle financial downturns better, as well as maintaining their level of consumption.

The amortization requirement is intended to affect many societal actors such as credit lenders, households, individuals and the society and is, at its core, expected to lower the loan-to-value and loan-to-income ratios in the long run, thereby making households more resilient toward fluctuations and recessions. However, this is intended as a long run effect, only about 14 per

cent of new mortgages will initially be affected by the stricter requirement and the effort is predicted to reach its full effect in approximately 20 years (Finansinspektionen, 2014). However, this is of course dependent on the price of residence and income development. If residence prices increase more compared to income, more people will be affected, provided that the preferences for the same type of residence remains; if prices decrease in relationship to income fewer will be faced with amortization.

The amortization requirement is created to target individuals with large loan-to-income ratio; usually these are individuals with high incomes. Furthermore, the amortization requirement may also target individuals with relatively lower income as well. This is because amortization entails a larger portion of income being dedicated to savings. These groups are now forced to save more each month and thereby decrease the disposable income available each month (Finansinspektionen, 2016 a).

The direct effect of amortization on consumption is expected to be relatively small, approximately 0,5-1 per cent because more people who, previously were not made to amortize are now required to do so, increasing their savings and decreasing consumption in the process. Consumption is predicted to first and foremost redistribute consumption to a later period since the individual can be expected to have more money over later in life since they face smaller interest rate payments due to lowered mortgage debt (Finansdepartementet, 2015), (Finansinspektionen, 2017).

Amortization is also predicted to cause a degree of "lock-in-effect" on the real estate market. The lock-in-effect is the inability to move for financial reasons, despite the individual wanting to or needing a new residence. This is because the amortization requirement only affects new mortgages and therefore only applies to people who want to purchase their first home or people who want to move. The choice not to move is based on a cost benefit analysis of assuming a new loan, subject to amortization requirements. A new loan affects future expected consumption negatively due to an increased outlay in the form of increased savings. The "lock-in-effect" may result in increased welfare costs and possible stagnations on the real estate market (Finansinspektionen, 2016 a). However, since amortization is a form of saving, not a cost the "lock-in-effect" is estimated to be limited since individual are mostly concerned with increased prices and costs when considering a house-purchase rather than involuntary but increased savings (Finansinspektionen, 2017).

The effect of amortization on credit institutes in the long run is a faster decrease in interest rate incomes. Amortization expedites the repayment process of the loan and individuals that amortize will therefore pay off their loans faster compared to without the amortization requirement, resulting in lower interest payments. Amortization will probably also lead to decreased residence prices which means that individuals now are able to borrow less compared to before. This means further lower interest rate incomes for the financial institutions. How big the effect is going to be is hard to determine since it will depend both on the future interest rate level as well as the future change in demand for mortgages. However, the negative impact amortization will have on the credit institution's profit margins have to be balanced with the potential gains of increased resilience of individuals and society as a whole towards economic fluctuations (Finansinepsktionen, 2016 b) (Finansinspektionen, Riksgälden & Riksbanken, 2015).

2.2 Previous Research

The amortization requirement is a relatively new phenomenon in Sweden and therefore an area that is frequently debated and thoroughly studied today. Previous research mostly consists of memorandums from The Swedish Financial Supervisory Agency (Finansinspektionen) and the Finance Ministry (Finansdepartementet) with the purpose to investigate the probable effects of the amortization requirement.

As a report from the Finance Ministry (2015) suggests, the primary driving force behind a financial stability risk is the household's increased loan-to-income ratios and that a amortization requirement will decrease the individual's preferences for mortgages and thereby increase resilience. This is confirmed and expanded upon in a joint memorandum written by the Swedish Central Bank, the Swedish Financial Supervisory Agency and the Swedish National Debt Office (2015) aimed to give a general depiction over the factors that generate increased loan-to-income ratios. The memorandum discusses the effects on the supply and demand for real estate and credits and what effects these changes has on the individual's preference and opportunity to take out a mortgage.

The Swedish Financial Supervisory Authority also issued a report (2017) that investigates the effects of the amortization requirement on Swedish mortgages, housing prices and the loan-to-income ratio. The report is called "Den Svenska Bolånemarknaden" and shows that amortization causes individuals to alter their behaviour towards new mortgages and thereby slightly decreased their loan-to-income ratio during 2016. Hence, individuals have increased their resilience against financial fluctuations. However, the memorandum also points out that previously existing mortgages exhibit a high loan-to-income ratio. The Swedish National Debt Office published a referral response (2017) agreeing with previous points made by the Swedish Financial Supervisory Authority (2017) but also saying that the actual issue is a malfunctioning real estate market and that the price of credit is currently low. Therefore, they suggest additional action be taken for example concerning tax politics in order to mend the structural imbalances on the real estate market.

Lastly, the Swedish Financial Supervisory Authority also published a report on the connection between the real estate market and credit institutions (2010) called "Den Svenska Bolånemarknaden och Bankernas Kreditgivning". This report discusses the KALP calculation and states that it is the method used by credit institutions when determining if a mortgage request should be approved and to what value. This is one factor that will be discussed in this paper.

3. Theory

3.1 Permanent Income Hypothesis/ Life Cycle Models

Milton Friedman first introduced the Permanent Income Hypothesis in 1957 in the paper “A Theory of the Consumption Function”. The theory says that an individual consumes, not only according to their current income, but also according to their expected aggregate income in life, referred to the permanent income. Permanent income is used as a measure of sustainable consumption over a lifespan and is defined as the income that would deliver the same present value of expected income throughout a lifetime. The permanent income hypothesis means that an individual’s consumption is not only dependent on current income but also the expected aggregate income throughout life meaning that consumption patterns are driven by expected wealth rather than current income (Burda, M & Wyplosz, C, 2009).

In conjunction with the assumption of utility maximization stipulating that an individual seeks to maximize their utility of consumption throughout their lifespan, the permanent income hypothesis argues that an individual maximizes utility through life by smoothing out consumption over time by borrowing when the disposable income is low and lending or saving when the disposable income is high. This reasoning is congruent with the assumption of a concave utility function where the first derivative is positive, stating that more is always better, and the second derivative is negative indicating a decrease in marginal utility of consumption (Friedman, 1957). Hence, an individual seeking to maintain such a smooth consumption habit as possible since the excess utility gained from having more consumption during the first period is lower than the loss of less consumption during the second period (Cord & Hammond, 2016). This means that an individual is not concerned with consumption in absolute terms, rather smoothing entails maintaining the marginal utility of consumption constant over time. This is illustrated as an inverted U-shape when income is set in relationship to time (Browning & Crossley, 2001).

During the life cycle an individual earns a higher income during one period, for example individuals in their middle age who have been in the workforce for some time and have developed experience in their field, and a lower income in another period, for example students or pensioners. According to the permanent income hypothesis consumption is lower than the actual consumption capability during the period of high income and higher in periods when the incomes are lower. In other words, during periods of high income the consumption is lower than otherwise in order to smooth consumption over periods of lower income. If this type of smoothing was inhibited, for example because a rejected loan, the utility of consumption would be less compared to if the individual had the possibility to borrow when income is low and repay when income is high (Friedman, 1957).

The total consumption during the entire lifespan is the same however; the distribution of consumption is uneven over time without borrowing and lending capabilities and more even when those choices are provided. Current rate of consumption and savings can be explained not by the current income but the individual’s current positions- described as age and present wealth – in the life cycle (Roland A & Varajya P, 1978).

The permanent income hypothesis states that income consists of a permanent and temporary component. The permanent component reflects what the individual considers to be variables affecting the expected value of income such as capital value, chosen field of profession, city of occupation and residence as well as assets such as real estate, education and personal abilities. The temporary component of income includes all other factors affecting income, such as temporary and unexpected fluctuations and can be equated to a statistical error term (Friedman, 1957). It is only the permanent component that affects consumption behaviour and it is subject to changes in nominal interest rate, changed preferences of consumption and altered ratios between assets and savings to income. Mortgages serves as an essential function in the economy, since it allows households to purchase a residence and use future income to pay off the loan, thereby alleviating households from saving the entire cost for a residence before acquiring it. Such a purchase would, without the possibility of a mortgage, be impossible for the majority of households. Borrowing and indebtedness is a natural part of the modern economy and redistributing capital helps spread household income throughout the lifespan, thereby achieving a higher level of utility (Friedman, 1957).

A central assumption associated with the theory is that households have no liquidity constraints throughout time, meaning that a household has the potential for unlimited saving and face no borrowing restrictions. Both these assumptions are quite unrealistic, an individual cannot be expected to exclude essential purchases such as food and clothing and indiscriminate borrowing is implausible since credit institutions only approve loans matching a fraction of the value of the residence and puts this in relationship to the income (Cord & Hammond, 2016). Violating the no-liquidity- constraint assumption means that at a time when current income is lower than the permanent income the individual might not receive a loan, and is therefore forced to reduce consumption. However, as long as current income at one time is equal to or higher than the permanent income, the individual will not be constrained and can maintain consumption behaviour (Fernández-Villaverde & Kruger, 2011).

An amortization requirement is a form of saving for the individual and in the context of the life cycle theory the role of savings is to serve as a cushion against variations in income during the life cycle and to provide for retirement and emergencies (Roland A & Varajya P, 1978). This is exactly the purpose of the amortization requirement, to provide a safety net for individuals so that consumption does not have to be significantly altered in case of unexpected fluctuations.

It is also important to mention that the life cycle framework is not one theory but several models and they, among other things, used as a way to apply and extend the permanent income hypothesis.

3.2 Spatial Income Growth

A concept closely related to the permanent income hypothesis is the spatial nature of income growth. As mentioned above, permanent income is not only dependent on the consumption an individual has today but rather, depends more on the aggregate income an individual expects to earn in the future. This in turn is partly dependent on the level of education the individual has attained before joining the labour force. A highly educated person expects to earn a higher income later in life, compared to someone with lower education. Spatial income growth concept provides one explanation as to why individuals living in certain areas may expect to earn an exponentially higher income compared to living elsewhere.

The concept states that regions within a country that are able to nurture and support human capital will, because of this, exhibit regional growth and that workers within that same region are more productive when they locate around others with the same high level of human capital (Florida, 2002). Furthermore, both people and firms are drawn to regions with an active labour market, where there are many employers looking for employees and many employees searching for employment. It improves the matching process between individuals and firms. All of these factors causes clusters to form within the country and skews the distribution of workers with high human capital and concentrates them to a few particular areas. It also means that regions that already have a lot of innovation tend to attract even more workers and even more employers, further strengthening the circle (Enrico Moretti, 2013).

Higher productivity, better matching processes and a constant inflow of new companies demanding workforce all contribute to higher nominal wages, higher income growth as well as an increased demand for residences. A higher demand for residences increases the prices on the real estate market and higher wages causes individuals to readjust their expected income and may now, more readily, consider a large mortgage in relationship to the current income for a real estate purchase (Moretti & Hsieh, 2018). The increase in nominal wages does not only apply for highly educated, highly skilled individuals. Any worker within the cluster will expect a higher wage compared to other regions within the country (Florida, 2002). All youth exhibit income growth but youth in Stockholm expects it on a higher scale and faster phase.

Applying the spatial income growth concept in the context of the amortization requirement will enable a more in depth explanation as to why certain municipalities exhibit higher loan-to-income ratios. It will also provide insight in the difficulty for younger and older individuals to purchase a residence within such a cluster.

4. Data

This study investigates the effect of amortization on municipalities as well as over different age groups within each municipality. Therefore data for each variable investigated was collected for all 290 municipalities in Sweden.

4.1 The LTV & LTI ratios

The variables chosen are based on the constraints set forth by the Swedish Financial Supervisory Agency when implementing the amortization requirement. The variables collected for this investigation are average set earned income, average disposable income, average prices of residences and age. All are collected for each municipality. All these variables are a prerequisite to calculate the loan-to-value (LTV) and loan-to-income (LTI) ratios, which are the parameters of which the amortization requirement is structured around.

The variable set earned income is gathered on a municipal level (kommunivå) and is an income before tax. Set earned income is a subset of gross income and accounts for all earnings that are *ensured* and *lasting* meaning that the set earned income excludes income that is not lasting, such as income from some financial capital (i.e selling of stock shares) or received inheritance. It also excludes income that is not ensured such as a profit from a real estate sale (Inkomstskattelagen, 1999). It is up to each credit institution to determine what income is ensured and lasting, and it is partly a subjective assessment. In order to facilitate comparability between municipalities this study chooses as clear as measurement as possible of income. Furthermore, in many cases the set earned income coincide with the gross income. This definition of income is also recommended by the Swedish Financial Supervisory Agency in order to maintain accuracy and measurability (Finansinspektionen, 2017) (Mäklarstatistik). The set earned income data was collected from the Swedish Statistics Agency (Statistiska Centralbyrån) for the year 2016 and is intended to provide as current recording of income as possible.

The variable residence price is a moving average over all residence sales during the past year (2017-04-25-2018-04-25) for each municipality. Residence prices are used to calculate the loan-to-value ratio that determines one part of the amortization requirement. The data was collected from the Swedish Realtor Statistics Agency (Svensk Mäklarstatistik), an independent organization working in conjunction with almost all real estate agencies in the country to provide data over prices and price developments in each municipality.

Due to a lack of data on an individual level it is difficult to deduce certain aspects of the raw data. For example, the true LTV ratios for each municipality and age groups are unknown. In order to improve accuracy in the study the raw data was complimented with two investigations made by the Swedish Central Bank and the Swedish Financial Supervisory Authority. These provided average LTV ratios for new mortgage loans in each municipality as well as for each age group (Riksbanken) (Finansinspektionen).

4.2 KALP- calculation

The KALP- calculation is a widely used measurement of how much an individual has left to spend after paying all essential cost associated with a residence and basic living expenses. Many credit institutions use the KALP- calculation to find out if the individual can manage the commitment to a particular mortgage.

The variable age ranges from the age of 18 to 85+ and is divided into five intervals: 18-29, 30-49, 50-64, 65-79 and 85+. This division was made in order to gain a far-reaching perspective that will facilitate analysis in regards to the life cycle models as well as make the KALP calculations comprehensible. The age groupings are the same across all municipalities and all have an average income. The data for age groups are collected from the Swedish Statistics Agency.

For the KALP calculations average disposable income is collected as the income variable. Set earned income is often set as the reference point by credit institutions when laying the basis for the size of the mortgage whereas the disposable income is used for the KALP calculation, the measurement of how much an individual has left to spend after accounting for the mortgage payments and basic living expenses (Finansinspektionen, 2017 b). The distinction is important, especially since data is gathered on a municipal level and that the income data collected vary across tax limits. An alternative would be to apply a 30 per cent tax on all set earned income and treat that as the disposable income across municipalities, but since raw data over disposable income is readily available it is preferred because of the improved accuracy. Data over disposable income is collected from the Swedish Statistics Agency, same as set earned income, for the year 2016.

In addition to disposable income the KALP – calculation require assumptions about the set costs, the operating costs and the interest rate. The set cost is defined as the estimated average cost for living expenses, these include for example food and mobile phone charges. The operating cost is the cost of a residence and includes monthly rent, electricity and other utilities. The Swedish Financial Supervisory Agency estimates the set cost for a combination of households and family constellations. The last variable to consider before a KALP- calculation is the interest rate. The interest rate varies largely between credit institutions and depends on the individual assessments but the purpose of the KALP is, to some extent, to test if the individual can withstand harsh borrowing terms in order to safeguard against economic fluctuations. Therefore, the interest rate set in this study is a stress-test interest rate, intentionally set high to ensure fiscal responsibility (Finansinspektionen, 2010). The set costs, operating cost and interest rate recommended by the Swedish Financial Supervisory Agency is presented below.

KALP- calculation	Cost
Set costs	9300 per person per month
Operating costs	3100 per residence per month
Interest rate	7% annually, not adjusted for tax.

Source: (Finansinspektionen, 2017)

5. Model & Method

This is a comparative study where the amortization requirement is compared across municipalities and age groups with a focus on the loan-to-income (LTI) ratio as well as the KALP- calculation.

First, the loan-to-varlue (LTV) ratio is defined as the percentage of the residence price that is a loan, otherwise known as the mortgage. The remaining amount works as the down payment for the residence.

Second, the loan-to-income (LTI) ratio is defined as the relationship between the mortgage and the set earned income.

$$LTI\% = \frac{LTV \text{ (Mortgage)}}{\text{Earned Income}} * 100$$

The LTI ratio is calculated for each municipality and even though the LTI ratio is the focus of this study the LTV ratio is required in order to calculate the LTI ratio. As mentioned above the actual LTV values are unknown and therefore the average LTV ratios for each municipality are used and are kept constant for each age group in order to facilitate easy comparison of LTI ratios across municipalities.

Third, the KALP- calculation is the remaining income available for consumption after subtracting set costs, operating costs, interest rate payment and amortization. Both the set and operating costs are fixed throughout all municipalities and age groups and the interest rate is equal to 7% annually which is adjusted for tax using a 30% taxation rate. The amortization varies across municipalities depending on their LTV and LTI ratio. If the LTV ratio is greater than 50% but less than 70% the individual is required to amortize 1% of the total mortgage annually. If the LTV exceeds 70% the amortization rate increases to 2%. In conjunction, if the LTI ratio exceeds 450% of the individual's set earned income an additional amortization of 1% annually is required.

$$KALP_i = \text{Disposable income}_i - \text{set costs} - \text{operating cost} - \text{mortgage}_j \\ * \text{tax adjusted interest rate} - \text{mortgage}_j * \text{amortization}$$

KALP is calculated across all age groups (i) and mortgages for each municipality (j) affected by the stricter amortization requirement.

5.1 Assumptions & Restrictions

In order to accomplish a clear and concise analysis a few simplifying assumptions and restrictions have been made in this model.

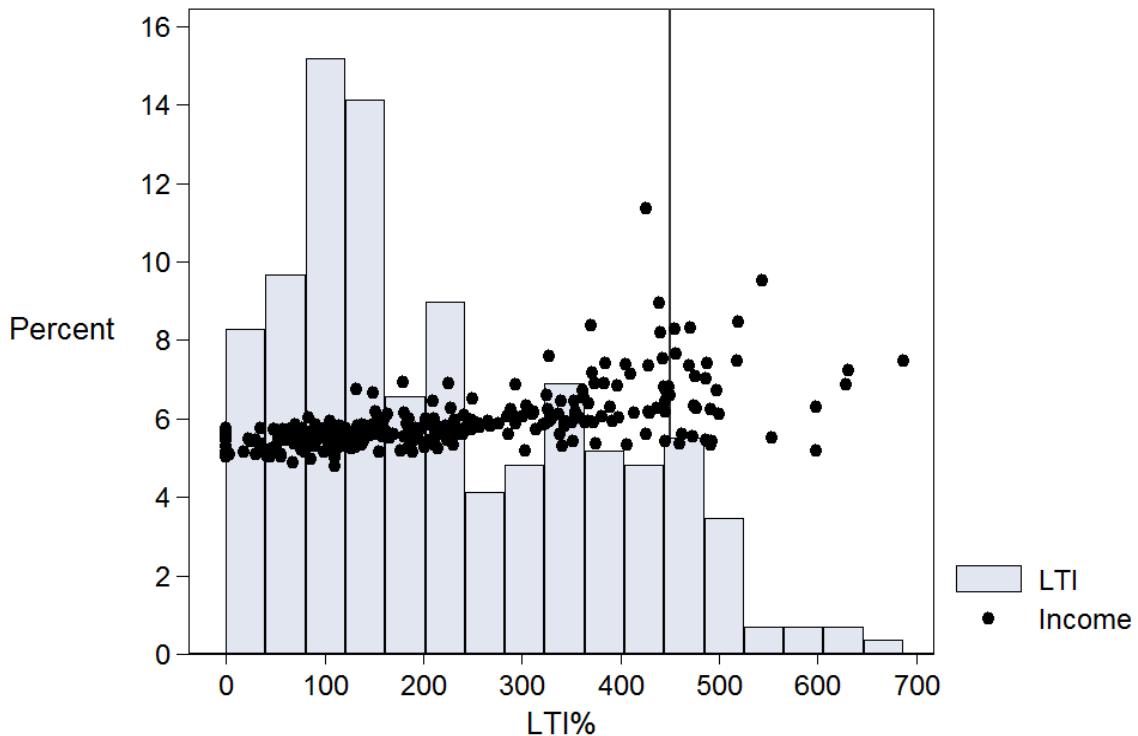
First, this study is only investigating apartments in the different municipalities. This means that all residence prices collected from each municipality are for apartments. This might seem as an unrealistic restriction however, the average LTV as well as LTI ratios are quite constant, regardless of residence type (LTV varies between 60% for apartments and 62.3% for houses and LTV varies between 300% for apartments and 320% for houses) (Finansinspektionen, 2018). Therefore, the result presented in this study can, to some degree, also be extended to other types of residences.

Second, this study only considers one person households, meaning that any real estate purchases are made by only one individual and that same person is accountable for the mortgage and associated payments. The amortization restriction dictates that any jointly held loans are to be considered in relationship to the sum of income earned by both parties. To clarify, if two people intend to purchase a residence, it is their joint income that is considered in the LTI ratio. The one individual restriction is also relevant for the KALP-calculation as the set cost only takes into consideration the consumption needs for one person. This restriction is not necessarily true but important in order to make comparability between municipalities and age groups more clear. For a more accurate result different constellations of households should probably be included, however, this is out of the range of this study due to the available timeframe.

Finally, this study is restricted to the current effects of the amortization requirement due to the lack of individual data and considering that the stricter amortization requirement relatively new this study is only intended to interpret the current economical climate. The effect of the amortization requirement is to make individuals with a high loan-to-income ratio pay off their loans faster through involuntary saving, thereby gradually lowering their LTV faster compared to individuals not required to amortize. Following this logic, the loan-to-income ratio will decrease for the individuals at risk and the LTI will eventually even out throughout municipalities in the long run.

6. Results

6.1 Loan-to-Income Distribution



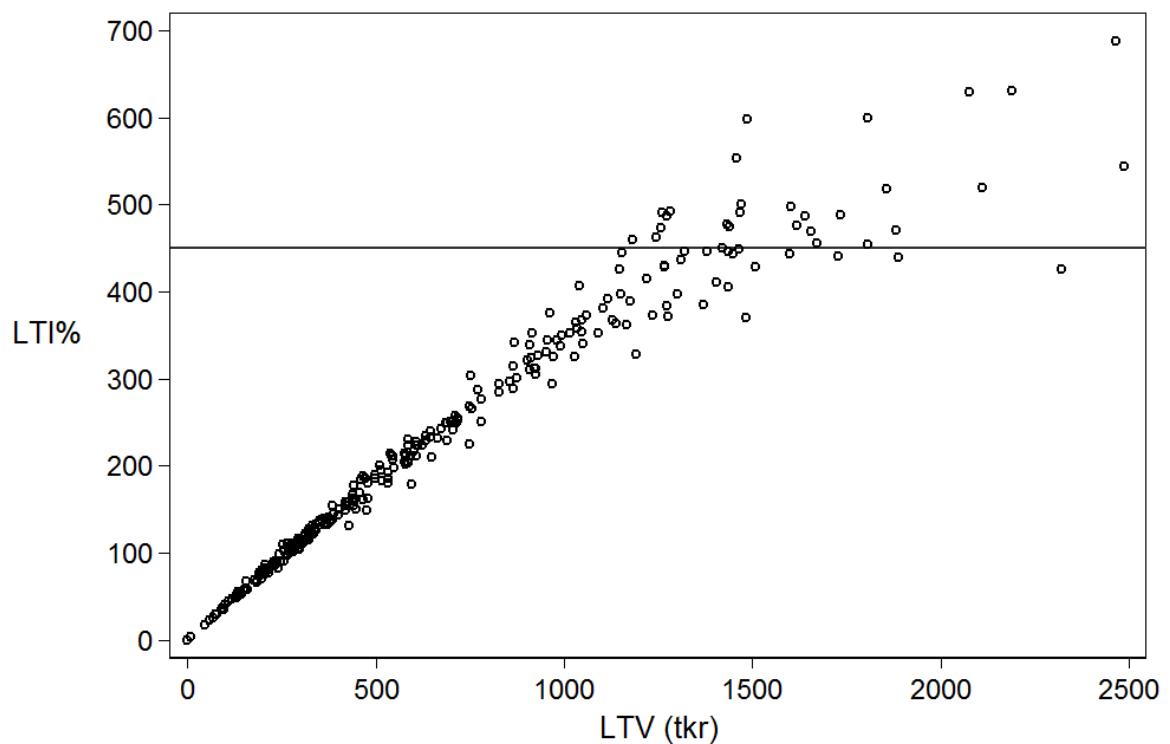
This histogram shows the distribution of the average LTI ratios across all municipalities. The LTI ratio is measured in per cent and the y-axis shows the relative frequency of each LTI level. From this graph the most frequent LTI ratio in municipalities is 100%, meaning that the household has mortgage debt in the same amount as they have annual income. The majority of LTI ratios are clustered around 150%. This means individuals residing within most municipalities have a loan consisting of approximately 150% of their annual set earned income. The vertical line intersecting the x-axis at 450% is the limit for the stricter amortization requirement. All observations exceeding the 450% limit are subject to amortization of an additional 1% per year, regardless of the LTV ratio. As seen in the graph approximately 10% of all LTI observations fall above the amortization limit. This is an approximation over how many municipalities will, on average be affected by the amortization requirement. The scatter plots along the histogram are observations of the average set earned income for each municipality. The income level is relatively constant for municipalities with an average LTI ratio between 0-300% but disperses for LTI ratios exceeding 300%. The difference in income between a municipality with low LTI ratio and a municipality with high LTI ratio is between 2-0,5%.

This result shows the tendency for municipalities with higher LTI ratios to have a higher income, which is congruent with the spatial income growth framework, suggesting that the municipalities exhibiting high LTI ratios as well as relatively higher incomes are most probably larger cities with a high demand for residences. This result is also supported by the

permanent income hypothesis. An individual earning a high income can, in most scenarios, handle a high mortgage because of expectations of constant or even increased income over time.

This result is also meant to illustrate the general distribution of loan-to-income across the country as well as establish how large effect the amortization requirement will have. The distribution is definitely skewed to the right and municipalities vary quite much in LTI level. Despite the highest frequency being at a healthy 100% it does not reflect the general level in Sweden, estimated to be around 220%.

6.2 The Loan-to-Value & Loan-to-Income Relationship



This graph shows the relationship between the average LTV ratio, shown here in absolute size measured in SEK (written as a fraction of 1/1000) and the corresponding average LTI ratios, expressed in per cent. Each observation represents one municipality and the horizontal line intersecting 450% is the limit for the stricter amortization requirement. The graph shows how the majority of municipalities initially are clustered down to the left of the graph and suggest an even and linear LTI/LTV relationship across municipalities. However, as the observations move up and to the right they gradually disperse and municipalities tend to grow faster in the LTV rather than LTI direction.

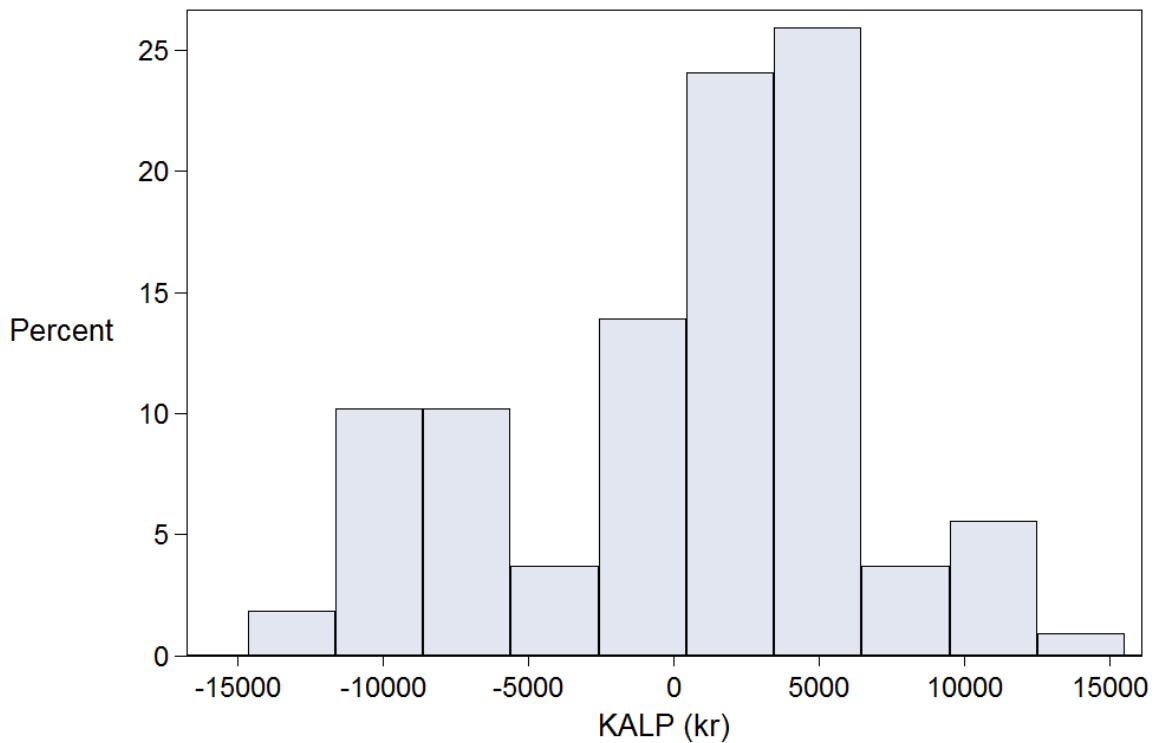
There are 27 municipalities above the 450% limit and are therefore affected by the stricter amortization requirement. The most notable ones are Stockholm, Göteborg and Uppsala (LTI = 686, LTI = 598 and LTI = 474) the first, second and fourth largest cities in Sweden. Most other observations consist of suburbs or adjacent areas to these municipalities. However, there are three clear exceptions, Åre, Malung-Sälen and Härjedalen (LTI = 552, LTI = 492 and LTI = 460). For a complete list of affected municipalities, see Appendix 1.1.

Both Stockholm, Göteborg and to some extent Uppsala are regions inhabiting large portions of human capital and can be considered highly productive geographical clusters where income is higher but demand and therefore prices for residence are higher as well. Since income is expected to grow faster in larger cities, inhabitants recalibrate their permanent income and can, because of that, consider a larger loan for a real estate investment. This can also be an explanation to the slightly faster growth in LTV compared to LTI for some municipalities around the 450% horizontal line. This skewed growth means that the loan to value is high while the income supporting the loan is smaller in relation. This type of trend suggests an expectation of high-income growth combined with a lower current income.

These results support the hypothesis that larger municipalities will be made to amortize more compared to smaller. However, there is also significant impact on smaller municipalities closely adjoining Stockholm, Göteborg and Uppsala. The three clear exceptions to the general rule, that amortization affects larger cities and their surroundings, are quite distinct but not surprising. All three outliers are popular vacation locations, first and foremost for individuals who do not experience snow on a regular basis. The high LTI ratios may be explained through the high demand for residences in those areas and the relative small supply.

Important to note is that the highest LTI ratios, for example from Stockholm. That is not the general LTI ratio within the city but the average LTI ratio for those individuals who can afford to buy an average apartment in Stockholm with an average down payment.

6.3 KALP-Calculation Distribution

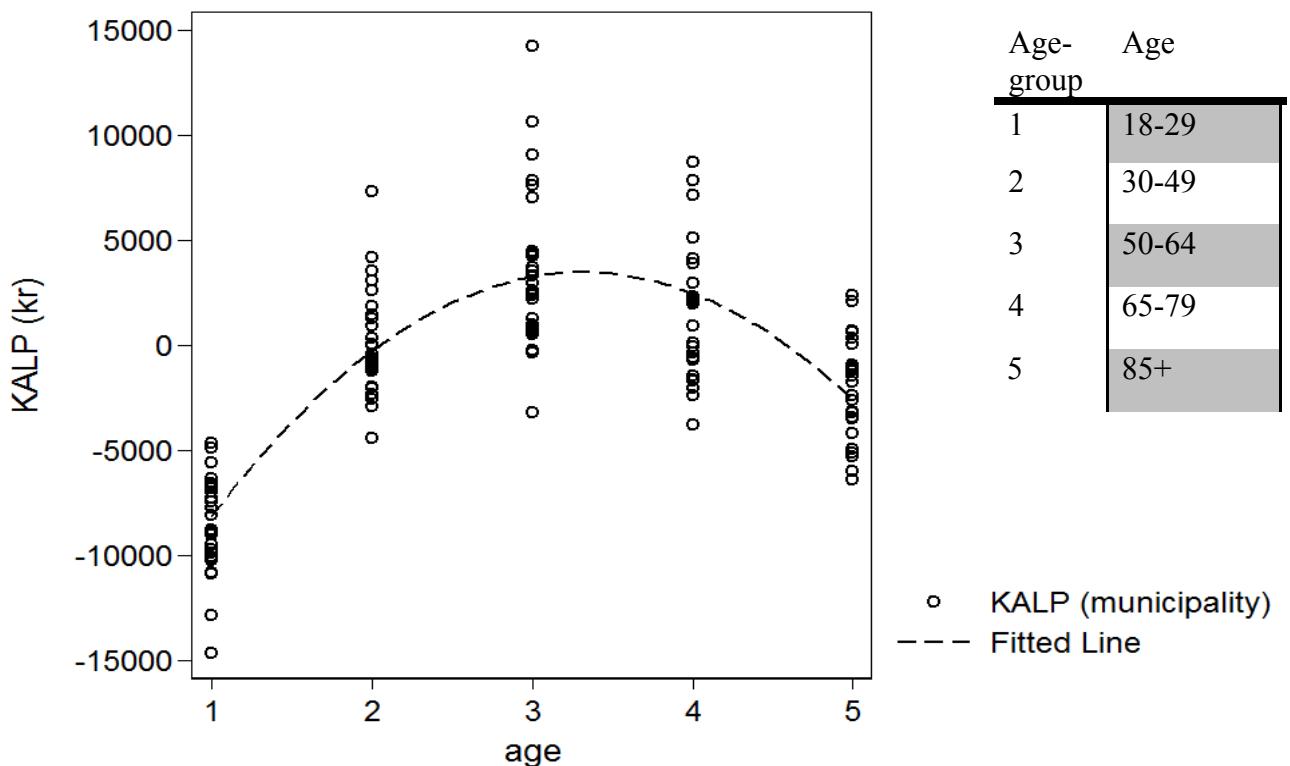


This histogram shows the distribution of the KALP-calculations performed for the 27 municipalities affected by the stricter amortization requirement when considering an average LTV ratio (the result from 6.2) as well as average residence prices for each municipality. The KALP- calculation is expressed in SEK and the y-axis shows the frequency of each KALP-level. Approximately 50% of all KALP-values are between 0 and 5100kr however the mean value is negative and the variation is large.

This histogram implies that approximately 36% of individuals will have a deficit in their budget each month after all payments regarding the residence are made based on their current income. These individual's would not be approved for a mortgage from a credit institution to purchase and average apartment within their municipality. The remaining 64% of the sample break even or exhibit a surplus after all monthly payments associated with an average apartment are made.

This result illustrates the concrete difficulties some groups experiencing when seeking to breaking into the real estate market and make a residence purchase. Credit institutions do not consider expected future wealth as ensured and lasting, and therefore will deny a request. The amortization requirement adds an additional factor to the KALP calculation that is subtracted from disposable income.

6.4 KALP- Calculation & Age



This graph shows the KALP- calculations for each age group within the 27 municipalities affected by the stricter amortization requirement, given an average LTV ratio (the result from 6.2) as well as average residence prices for each municipality. Each observation in each age group represents a municipality and the line connecting the age groups is a polynomial fitted line.

The KALP levels are presented in SEK and the age groups are divided into five sections, the division is presented in the table to the right. Between the ages of 18-29 (1) all KALP values are negative for all municipalities, implying that regardless of where the individual seeks and average apartment, will not be granted a mortgage loan (SCB). Proceeding to the age group 30-49 (2), here the KALP- values are quite evenly distributed. Approximately half of the municipalities allow for a KALP- value surplus due to a slightly lower average residence price and the other half exhibit a deficit. The peak is reached within the age group 50-64 (3). Here most of the KALP- values are positive or relatively close to zero. Next age group is 65-

79 (4), which is around retirement age and the KALP- values already shows signs of decreasing and finally 85+ (5) where the KALP- values have decreased even further and is almost back to where they were for age group 18-29 (1).

This graph provide a very important empirical result since it supports the permanent income hypothesis and life cycle models stating that incomes grows exponentially with age, reaches a peak during middle age and thereafter decreases slightly after retirement. This is the basis of which the theory and is characterized as an inverted U-shape of consumption possibilities during the life cycle.

6.5 An illustration

It is clear that the amortization requirement affect the young and the elder. From the results above we have assumed average LTV ratios and average residence prices in each municipality and within each age group.

However, when young people purchase their first residence, it is usually something smaller than a average apartment and most often they are only able to provide a 15% down payment, meaning a LTV ratio of 85%. The same reasoning can be applied for the elder. When a retiree wishes to move it is usually to a smaller apartment and even though they may receive profits from a sale of a previous residence usually require rather big mortgages. What follows is a simulation of these conditions in three different municipalities that represent the general economical climate in Sweden - Stockholm, Uppsala and Nyköping.

Based on a LTV ratio =85% and a 30m² apartment.

Municipality	Population	Age-group	Disposable Income	Kr/m ²	LTI-ratio	Amortization
Stockholm	952058	18-29	20108	70943	834%	4522 kr
		85+	20891		580%	4522 kr
Uppsala	221141	18-29	14300	39342	613%	2508 kr
		85+	18791		362%	1672 kr
Nyköping	55552	18-29	17691	20603	249%	875 kr
		85+	15516		169%	875 kr

Source: (SCB)

Both Stockholm and Uppsala have LTI ratios above 450% for both age groups and the amortization payment in Stockholm is almost five times bigger compared to the one in Nyköping. In Nyköping on the other hand, none of the LTI ratios fall above the stricter amortization limit, which is one explanation why the amortizatino payment is so much smaller in Nyköping compared to Stockholm and Uppsala.

7. Analysis

In its essence, the Swedish Financial Supervisory Authority constructed the amortization requirement to target individuals with high loan-to-value and loan-to-income ratios. What this essay does is make an attempt at identifying, more precisely, which groups are affected and how much of a difference amortization will entail for them.

The results show that approximately 10% of all municipalities will be affected by the amortization requirement when accounting for an average LTV ratio within each municipality. The hypothesis of this study is, to some extent, confirmed. Municipalities with a high LTI ratio will be made to amortize a larger sum every month and high LTI ratios are definitely found for the largest municipalities such as Stockholm and Göteborg, but also relatively small municipalities such as Lidingö and Partille, located in close proximity to the larger cities, have high LTI ratios and are therefore faced with a similar constraint. There seems to be a clear spill over effect from larger to the smaller, adjoining municipalities. This spill over can be explained in the context of the spatial income growth framework. Here Stockholm for example can, most definitely, be considered a productive cluster with all associated features such as higher productivity, higher income and higher income growth compared to other municipalities. These factors make moving to such a cluster more attractive, the demand for residences in Stockholm would increase and prices of residences would follow, pushing the affordable real estate areas farther away from the centre. However, the residences in the suburban areas still consider themselves as very much connected to the highly productive human capital cluster (for example because of work) and they experience the same type of expectations as individuals in the centre of the cluster which entails a high level of income as well as higher income growth compared to other municipalities. This would cause an increase in both the LTV and LTI ratio even in the suburbs and explains why the LTI ratios are roughly the same for large municipalities and their smaller, but closely connected neighbours. High LTI ratios really mean that the individual's income is low in relationship to their mortgage. However, as mentioned above it is the municipalities with the expectation of highest income growth that exhibit the largest LTI ratios. This is not surprising in the context of the permanent income hypothesis. Since the expectation of future income is higher, the individual can justify large debts in relationship to current income since income is expected to grow to match the mortgage.

According to the permanent income hypothesis the percentage increase in income increases the permanent income and is one of the key determinants of an individual's level of consumption. There is nothing that points to that the income growth in Sweden has decreased and this is taken into consideration when making a real estate purchase. However, the income growth in Sweden is not considered to be even. The rate of change is, according to the spatial income growth concept, expected to be higher in the productive human capital clusters compared to the rest of the country. In other words, municipalities experiencing a relatively

large income growth are more likely to recalibrate their level of consumption and find that they now can afford more expensive residences, this despite having more of their income tied up in involuntary savings.

The result also show that the age groups that will be affected the most by the amortization requirement are individuals between 18 and 29 as well as 85 years or older. This is congruent with the permanent income hypothesis stating that income is lower in the beginning and end of life and that this causes individuals to attempt to smooth out consumption over life, thereby maintaining the marginal utility of consumption constant. According to the theory younger and older individuals are meant to consume more than their current income and can do so because of their expected income increase during the individual's middle age. For a younger or older individual purchasing a residence the amortization requirement poses as an additional subtraction from the disposable income. One of the key factors affect the permanent income component is the ratio between assets and savings to income. An altered ratio between savings to income is what the amortization requirement is intended to do.

When the loan-to-income ratio exceeds 450% and the mortgage is subject to the stricter amortization requirement the amount to amortize is approximately 4.5% of the individual's monthly income that goes to additional savings rather than to be available for consumption. As long as the current income is relatively high 4.5% is, in general, not considered a large saving and the amortization would have little effect on the individual's day-to-day consumption possibilities. However, during the younger and older years, when income is lower 4.5% of the monthly income is a considerably larger portion and may be the difference between a negative or a positive KALP-value. Usually the distinction is not quite so dramatic but illustrates the point that amortization affects the young and the olds, those who, according to the theory, are supposed to consume more, not save more and this may lead to younger and older people having trouble entering the real estate market because of the stricter requirements on payment capabilities.

It is difficult to determine exactly how much more difficult it will be for young and older individuals to purchase a new residence, however, as seen from the results, most individuals between 18 and 29 were left with a negative KALP- value if they attempt to buy an average apartment in one of the municipalities that are, on average affected by amortization. But when adjusting for size of the apartment, counting with a larger mortgage and including a municipality allowing for a significantly lower LTI ratios it is clear that the inability for young and old to break into the housing market most definitely applies for larger municipalities, considered attractive productivity clusters, but less so to the rest of the regions throughout Sweden. At an 85% LTV ratio most municipalities falls above the 450% line and become required to comply with a stricter amortization. However, for smaller municipalities outside of the productivity clusters the absolute size of the amortization sum is still considerably smaller compared to the amortization requirement in a large municipality.

These two age groups are now, to a larger extent, excluded from making a real estate purchase especially in one of the larger municipalities where the amortization requirement has the largest effect (for example Stockholm, Göteborg or Uppsala). This may cause a decreased demand for residences in those areas and subsequently lead to a decrease in prices. Following this logic, the mortgage required to buy a residence will also decrease, lowering the demand for mortgages. Eventually the average LTV and LTI ratios are lowered because a smaller loan can now buy a bigger residence, due to the price decrease and the individual has increased resilience toward economic fluctuations. The amortization requirement is a liquidity constraint and a form of forced savings. Therefore, it is probable that individuals with a strong

preference against savings will respond strategically to circumvent this policy. Thereby trade a lower payment against more borrowing and reduce borrowing in order to attain a lower amortization rate. The increased difficulty for younger to receive a loan as well as individuals deliberately taking a smaller loan as a strategy both move the demand for mortgages and the price of residences in the same direction, reducing LTI and LTV with increased resilience. This is the intention of the Swedish Financial Supervisory Authority, to decrease and even out LTV and LTI ratios across Sweden. Based on the result presented in this study this cause and effect relationship is entirely plausible.

The KALP-calculation is a useful tool to estimate the ability of an individual to keep up with the payments associated with an apartment and it is a widely used measurement. However, there are a number of limitations to the measurement. First, the calculation uses a standardized cost for example the monthly fee and food expenses, something that varies widely from person to person. Furthermore, the interest rate is in this study set unrealistically high which resulted in a large number of negative KALP-values in this study compared to what usually is the case. Nevertheless, the KALP-calculation has tremendous advantages when it comes to comparing different age groups and the amortization effect upon them.

It is not only individuals within some municipalities that are affected by the amortization requirement. Credit institutions will experience a redistribution of income as the individual borrows less and repays the mortgage faster than previously expected. Following the same logic as above, credit institutions may find that the demand for mortgages is lower, people now need to borrow less in order to buy an apartment due to the lower demand and subsequent lower prices. This involves lower interest payment to the credit institution from the individual as well as a faster rate of repayment due to amortization. The credit institutions therefore receive lower interest rate income as well as maintain the creditor for a shorter period of time. However, the supply of credit might also decrease. Because of the amortization requirement individuals are now faced with a liquidity-constraint and are therefore not always allowed a credit of their choosing. Credit is restricted by the KALP-calculation showing that fewer people are now eligible for loans at each income level and may not be approved credit that they would have received before the requirement.

It is important to note that amortization is not a cost but a form of saving. One possible effect of the amortization requirement is that individuals purchasing a new home who previously saved in another form, for example as stocks or in options now chooses to withdraw this type of savings and save through amortization instead. This process results in the exact same amount of saving as before and consumption can be maintained constant. However, amortization may be considered a safer form of investment and is subject to fewer fluctuations. According to the permanent income hypothesis and in the context of this study individuals reach a higher utility level if they have the opportunity to redistribute their income and maintain an even consumption level over the lifetime. The amortization requirement disrupts this as it is characterised as non-liquid savings. If the individual wishes to utilize these savings as consumption they would be required to take out an additional loan of the exact amortization amount. This is both a more complicated and longer process compared to extracting the same amount of money from a regular savings account. This is one of the intended effects of the amortization requirement, to get individuals who do not save to start and to encourage those who already do save to allocate a portion of their savings into, what the Swedish Financial Supervisory Authority considers to be a safer form of investment.

The Swedish financial supervisory authority predicts a degree of lock-in-effect to occur on the real estate market. It is natural to assume that an individual who falls within the amortization range must dedicate a larger portion of the income to their residence. This means that some individuals might exhibit a poor KALP-value at the moment and are therefore forced to remain where they are and not assume a new mortgage. This means that the individual is incapable of moving due to the amortization requirement.

These situations disrupt the real estate market and leads to a dysfunctional moving-chain. The lock-in-effect contributes to both a decrease in demand and supply. However, the actual size of the lock-in-effect is estimated to be quite small. Many individuals who seek to move also have the necessary foresight to adjust the consumption and savings ratio and therefore have no problem receiving a new loan.

Household resistance in the event of financial disruptions and business cycle fluctuations are expected to strengthen over time rather than right away. Therefore it might be too soon to evaluate the effects of amortization. It is also worth mentioning that amortization is a safer form of saving compared to stocks or bonds, in the absence of a real estate bubble, making this type of saving a relatively safe option. Even though the individual chose to save by financial investments in addition to amortization they would be more resilient in the event of a stock market crash because of the amortization buffer. A lowered loan-to-income ratio benefits the individual in this case and this is the positive aspect of the amortization requirement.

8. Conclusion

The effect of the amortization requirement on municipalities and over age groups is palpable. Larger municipalities and adjoining suburbs exhibits higher loan-to-income ratios compared to the rest of the country and are therefore affected more by amortization. The reason certain municipalities are affected more than others is because of an uneven distribution of income growth between different municipalities. As larger cities attract a more productive workforce due to a ability to nurture and incubate human capital more income is generated faster compared to outside these clusters. This is also in line with the permanent income hypothesis suggesting that individuals experiencing higher income growth are more ready to take out larger mortgages with the expectation that future income will balance the loan-to-income ratio.

Amortization affects the younger and older age groups of society more than it does the middle aged. As income is lower early and later in live the permanent income hypothesis states that additional consumption should be supplemented into the younger and older ages groups and that the additional consumption should come from income earned during the middle of a life. Simplifying, additional consumption should occur early and later in life and this additional consumption should be finances by the individuals prime working years. The amortization requirement disrupts this logic and stipulates that all anyone purchasing a residence will save regardless of what age groups it is making the purchase.

These effects, combined with other forces are predicted to decrease demand for residence prices, especially within the municipalities already exhibiting high loan-to-income ratios, decrease demand as well as supply for credit and eventually less money is required to purchase a residence for the same level of income. Loan-to-value and loan-to-income ratios will decrease and even out across the country and the allocation of money will shift from the credit institutions to the individual. This is the intended purpose of the amortization requirement and seen as a way to increase financial stability for Swedish households and safeguard from economic fluctuations.

Because the amortization requirement is quite new it is difficult to definitely assess the effect on individual's economy. However, the results presented in this study point toward a future decrease in the loan-to-income ratio as the amortization requirement decreases the individual's KALP-value, thereby reducing the range of mortgages that would be approved. This decrease will probably be most prominent in the larger municipalities as there are more people excluded from the real estate markets there, due to a larger impact of amortization on the KALP- calculation.

8.1 Future Research

Suggestions for interesting future research would for example be a comparative investigation between two countries, one where the amortization requirement is implemented and another where it is not. This type of natural comparative experiment would reveal if the amortization requirement had the intended effect and if the country implementing the borrowing constraint is better off in case of economic fluctuations.

Furthermore, a more in depth investigation concerning the KALP- calculation would be interesting. This study is only concerned with the effect of the amortization amount on the KALP-value, however the interest rate is an equally important component as it effects, not only the KALP- calculation but is a key discussion component in the permanent income hypothesis. A suggestion for further research would be an investigation into the effect of different interest rates on the KALP-calculation.

This study is restricted to investigating apartments and only considers one person households in purchasing a residence. A natural suggestion for further research would first and foremost extend the research to include other forms of living such as houses, vacation houses or other. The investigation would in that case be on the amortization effect on different forms of living. A second suggestion would be to investigate different households constellations to see where amortization would have the largest effect. As different family structures are subject to change in the form of divorces, marriage, death and so on, this quickly would become a (Riksbanken)intricate investigation. However, it is precisely that type of mapping that would allow for a further understanding of the effects of the amortization requirement.

Lastly, further research surrounding spatial income growth, the formation of productivity clusters and why human capital is drawn towards where it already exists is a fascinating field which could shed further light on the amortization effect.

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9. Appendix

1.1 List over municipalities affected by the stricter amortization requirement.

	LTI60	kommun1
4.	518.44823	Värmdö
6.	471.02102	Ekerö
7.	497.36107	Huddinge
8.	462.60223	Botkyrka
11.	469.82416	Tyresö
17.	686.95652	Stockholm
19.	519.26199	Nacka
20.	628.71857	Sundbyberg
21.	631.15984	Solna
22.	543.8443	Lidingö
23.	454.56834	Vaxholm
32.	474.11067	Uppsala
44.	575.92447	Ödeshög
90.	487.21286	Gotland
99.	455.92805	Vellinge
133.	491.49364	Varberg
135.	487.82682	Härryda
136.	475.30864	Partille
141.	500.20408	Sotenäs
143.	473.1377	Tanum
165.	598.80716	Göteborg
166.	486.6548	Mölndal
170.	491.46199	Strömstad
173.	477.28181	Alingsås
223.	492.24866	Malung-Sälen
258.	552.93672	Åre
259.	598.54897	Berg
260.	460.10121	Härjedalen