

Unlocking homeownership: A strategy to reverse Switzerland's declining ownership rate

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by

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Disclaimer

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Executive Summary

The research endeavour consists in providing a comprehensive analysis of the Swiss real estate market, focusing on the challenges faced by households in achieving homeownership. With the current situation being characterized by low vacancy rates, limited construction potential undermined by strict spatial planning laws, and tight financing norms, property prices have known a nearly uninterrupted rise in over 25 years. Households on the other hand, do not benefit from equal rises in their income, and current property prices are already putting mortgages out of reach of the extreme majority of them.

To address this challenge, the study explores alternative solutions to bypass these hurdles and open ownership opportunities for the future. Of the found solutions, the expansion of the land lease model has been deemed the most suitable since it is already in moderate use in Switzerland, does not create financial harm, nor does it require any additional legal or technical frameworks, and has proven effective in promoting homeownership in other economies. The montage being explored consists of landowners selling condominium lots under land lease agreements to become the property of the private households who will buy them. The fractioned purchase price allows for many more households to take out a mortgage whilst respecting the prudent mortgage norms that protect Switzerland's financial stability.

The study then conceptually tests the solution by employing a robust forecasting model that takes into account actual Swiss household compositions, demographic dynamics, wage levels, construction constraints, and mortgage norms to project homeownership and property prices over a 15-year period. The findings support the suggestion that an expansion of the leasehold property model can help reverse the declining trend of private ownership in Switzerland.

Based on the research findings, the report recommends that both public and institutional investors adopt the land lease model. This solution not only provides homeownership opportunities but also aligns with spatial planning objectives and can potentially lead to a more sustainable housing market by sharing the costs of future energy renovations.

To conclude, the comprehensive analysis, forecasting model, and industry experts' insights contribute to a better understanding of the real estate market dynamics and provide recommendations for all actors to address the current challenges stemming from the said market.

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1. Introduction

The following report aim to present an in-depth analysis of the Swiss real estate market, with a specific focus on the challenges households face in achieving homeownership. The current situation in the Swiss real estate market is characterized by low vacancy rates, complex building constraints posed by spatial planning laws, tight financing norms aimed at preserving Switzerland's world-renowned financial stability. From these fundamental factors, property prices have had a nearly uninterrupted rise ever since the late 1990's and are unlikely to significantly decrease and open new opportunities for households seeking to become homeowners.

To depict an accurate picture of the factors at play, a review of the current literature will be done with respect to demographics, tenure types and their distribution, price action across various segments, Swiss mortgages norms, income and savings growth, and the psychosocial implications of homeownership. Following the initial literature review, research on conceptual solutions that could untighten the situation will be executed. With the found solutions a forecasting model destined to replicate the interaction in the real estate market will be designed to test out the efficiency of the said solutions. Moreover, interviews with industry experts will be conducted to help in accurately developing the model, challenging the solutions in the context of the Swiss market, and gain other valuable insights.

1.1 Subject area

The study draws on theoretical concepts such as property rights, spatial planning, demographics, land economics, housing finance, and ownership perception. By examining data sets, academic papers, and real estate market reports, the study seeks to gain empirical evidence pertaining to the mentioned concepts, both from an international and domestic perspective.

1.2 Statement of problem / rationale

Prior to undertaking this research, most indicators were signalling that the future of homeownership in Switzerland would be complicated. Indeed, the small nature of the country, coupled with political effort to limit construction outside of already built urban developments, and a steady population growth would create an environment where property prices would be sustained and continue to increase. Moreover, Switzerland being a mature economy, its contained growth levels does not create an environment

where wages can significantly grow. Should the tempo of property price growth substantially dwarf the growth of household income, the future of homeownership would seem quite dire. In light of these upfront observations, it became crucial to identify viable alternatives that could help alleviate obstacles to homeownership and understand how critical the situation could become. The research endeavour aims to find conceptual solutions that can mitigate the adverse impact on homeownership that the prevailing conditions would pose. These solutions must be realistic, scalable, financially sound, and satisfy most stakeholders in the market.

2. Literature review and current context

2.1 The Swiss real estate landscape

2.1.1 Households, dwellings, and construction

The Swiss permanent population was of 8.738 million people in 2021 and was split in around 3.9 million households (Federal Statistical Office 2022). The main household type was single person households representing 36.8% of households, followed by 2 persons households (32.7%), 3 person households (12.8%), 4 persons (12.3%) and the remaining 5.4% for 5 or more-person households (Federal Statistical Office 2021). These 3.9 million households share the over 4'688'288 dwellings currently available in the country, for an average of 2.19 individuals per dwelling (Office Fédéral De La Statistique 2021). As of 2020, over 1'774'161 residential buildings were identified in Switzerland with 56.8% of them being single-family homes, 27.5% being multi-family homes, 11.1% were apartment buildings, and the remaining 4.6%, were apartment buildings with partial residential use (Federal Statistical Office 2020).

Switzerland is known to be a small country by international comparison and, given the presence of major geological formations such as the alps, the land available for construction and living is limited by definition. Thus, the legislation and strategy of planning living spaces with such restrictions should have clearly defined goals and rules of engagement formalized in a rigorous legal text. Indeed, the fields of construction and territorial planning are governed in Switzerland by the Federal act on spatial planning from 1979, or "LAT" in French. This act sets a mandate to the cantons and communes to limit the expansion of constructible land and to push for the further densification of current urban areas (ETH Zurich & Swiss Federal Office for Spatial Development 2008). Switzerland being a federal state, the LAT gives general guideline to local authorities with respect to how they should plan their territory. Nevertheless, it has been noted that many liberties have been taken by communes given the continued population growth in the late 1900s and early 2000s. The 2014 revision of the act has emphasized the political desire to urbanize within urban areas, leading to a further densification of urban centers in general (ETH Zurich & Swiss Federal Office for Spatial Development 2008). More concretely, the LAT aims to protect agricultural land and forest areas by committing communes to grant mostly all construction permits on former industrial quarters and urban land reserves within their jurisdictions. Moreover, the LAT mandates the cantons to review their master plans every 15 years, which has been judged by many experts to be too long given the fast pace of evolution of the underlying real estate market and the

alarmingly low vacancy rates in urban centers. (ETH Zurich & Swiss Federal Office for Spatial Development 2008). It is worth mentioning that the LAT is currently pending its second revision to better answer the developments that its original version and the first revision have failed to address. For example, some mechanisms have been proposed by the federal council to give more flexibility to cantons with respect to construction outside of building zones (Grêt-Regamey 2019). Nevertheless, in its message to the Swiss parliament, the federal council has mentioned that the overall objective of the LAT would be unchanged, and all deviations would be moderate and thoroughly justified.

As a result of LAT guidelines and the overall building conditions in Switzerland, only 131'539 net new residential buildings were added between 2010 and 2021, despite a decade of historically low interest rates (Federal Statistical Office 2021). In comparison, 180'455 buildings were added from 2000 to 2010 and 169'665 were added in the last decade of the 1900's. Nevertheless, the 2010 decade saw a proportionally higher number of additional new dwellings compared to the two prior decades, illustrated by the rise of vacancy rates to a range between 1.07% and 1.72% for a given year. From 2002 to 2003 they remained well below 1% (Federal Statistical Office 2022). This relative increase of annual vacancy rates can be explained by a higher share of apartment buildings being built during the 2010s meaning that more households per new building could be accommodated, thus illustrating the LAT's aim to densify living zones (Federal Statistical Office 2022). The last computed vacancy rate was in 2021 and stood at 1.31%, thus confirming how tight the housing situation really is.

2.1.2 Tenure types and ownership:

Only 36.3% of Swiss households are owners of their main residence, while 60.5% are tenants, and the remaining 3.2% are living rent free (for details see [**Appendix 1**](#)) (Federal Statistical Office 2021). This small ownership rate sees Switzerland rank second last of OECD countries by this metric and stands out also by the fact that 89% of owned dwellings are owned with outstanding mortgages (OECD affordable housing database 2022). Nevertheless the 36.3% rate is quite high by historical comparison in the country, since ownership proportion had been of only 28.5% in 70s, 30.1% in the 80s, 31.3% in the 90s, and 34% in the early 2000's (Federal Statistical Office 2021). Since 2010, homeownership rates have continued their upward progression, with some sources stating it peaked at 41% in 2017 although the FSO estimates the peak was indeed in 2017 but represented 38% of households.

The 2.4 million remaining households are currently tenants. Single person households and couples with one child are the most common type of tenant, representing respectively 37% and 54% of all tenants (Office Fédéral De La Statistique 2021). Many factors are known to be the reason of the high proportion of tenant households, the main one will be explained later. But it is important to note that Switzerland has a quite strong legal protection for the rights of tenants, and rents have been noted to grow at a significantly slower rate than property prices, creating a rather comfortable situation for tenants (Bourassa & Hoesli 2006). Additionally, it is important to note the high discrepancies between urban and rural cantons where for example 83% of households in Basel Stadt canton and 78% in Geneva are tenants, whilst that proportion falls to 38% in Appenzell Inner-Rhodes and 40% in Wallis (Office Fédéral De La Statistique 2021).

When analyzing the owners of these rented dwellings, a surprising fact arises. The biggest owner type for rented dwellings are private individuals with an ownership of 47% of all rentals. Institutional owners such as various funds, joint stock companies or other types of corporations own 34% of rented dwellings, the remainder being held respectively by housing cooperatives (8%), real estate agencies or construction companies (7%), and public institutions (4.1%) (Office Fédéral De La Statistique 2023). The discrepancies between urban and rural cantons are once again staggering with institutional owners fighting private individuals for domination in most urban centers whilst individuals comfortably have the major share of investment property in the rural cantons (for detailed overview see **Appendix 2: Owners of rented dwellings**).

With respect to ownership distribution in age groups, a graph showing the distribution of ownership in percentage per individual age was compiled by the FSO and found on a real estate research by Credit Suisse (2021). This graph shows that the ownership proportion peaks at 55% at age 65 but stays under 40% for all ages below 45. Below 32 years of age, the rate is consistently under 10%. (See detailed graph in **Appendix 3**). This distribution raises concerns for the outright ownership rate in Switzerland with respect should prices continue to rise, and wages don't outgrow the price increase.

2.1.3 Swiss Real Estate Index and price action

As mentioned in the previous section, the Swiss real estate landscape has shown consistent tightness throughout the 20th and 21st century. Indeed, the densification focused spatial planning policy, the steady population growth, and the very composition of households have led vacancy rates to remain close to the 1% mark for extended periods of time. As a symptom of this tightness, real estate prices have seen a nearly

uninterrupted hike for as long as aggregate data has been recorded. Indeed, 3 reputable consulting and research institutions (Fahrnländer Partner, IAZI, and Wüest Partner) have been computing various indexes for different types of dwelling typologies. The SNB keeps records of these indexes and allows the public to assess price evolution for any given period (SNB 2023). For the purpose of this study, we will be analyzing the evolution of privately owned apartments, single-family houses, and residential investment property from 2000 (basis 2000 = 100) to 2022. In addition to the indexes, we will also be assessing the evolution of rents as computed by Wüest Partner. (See [Appendix 4](#) for full overview and explanations on calculations).

NB: For sections 2.1.3.1 to 2.1.3.3, all index values will be stated by order of provider. First values will always be Fahrnländer Partner, second will be IAZI, and third will be Wüest Partner.

2.1.3.1 Privately owned apartments

From 2000 to 2022 the research institutions have computed respective rises of 152.97%, 110.58% and 135.89% for prices for privately owned apartments based on transaction prices. The differences between values of each institute can be explained by proprietary methodologies and the differences in selected transaction prices between institutes. Nevertheless, by computing a simple mean of their values it can be seen that apartment prices have increased of 133.45% in 22 years. The annualized growth rate of these prices stands between 3.43% and 4.31% and is averaged at 3.74%. The consensus across the 3 institutions is that prices have had an uninterrupted increase from 2000 to 2016, had decreased only in 2017, and resumed their hike ever since at an even higher rate.

Interestingly, Wüest Partner had also been computing an index of asking prices for privately owned apartments, thus providing us the opportunity to estimate the potential premium asked by sellers of property throughout all these years. Indeed, the difference between asking prices and transaction prices, compared to the difference between transaction prices over two consecutive years, could also give an approximation of the bargaining taking place in the real estate market. When comparing asking and transactional prices, it can be observed that from 2006 onwards, sellers were setting increasingly higher prices and were diverging increasingly more from transactional prices across the years. More specifically, the difference between ask and transaction was between 0.25 pp and 14 pp from 2007 to 2015. But between 2016 and 2022 this same difference stood between 10 and 54 pp. It is important to point out that the drastic increase in ask prices does seem to translate in major increases of transactions prices,

but it is far from being proportional. The price differential tends to show that in the last 5 years, price speculation has drastically increased, but a large proportion of the asked premium is not materialized.

2.1.3.2 *Single-family houses*

As stated in section 2.1.1, the main type of dwelling in Switzerland are single family houses. As such, their price evolution will most likely have weighed largely in the overall price action in the Swiss real estate market. From 2000 to 2022 the computed rises were of 108.47%, 98.16% and 112.32% for single family houses. The simple average between the values of the 3 providers stands at 106.32% and is 26.83 pp below the average of privately owned apartments. With respect to asking prices relative to transaction prices, the trend is quite the same for privately owned property, although price speculation looked more moderate following the GFC, but has also skyrocketed since 2017. Nevertheless, spreads between ask and transaction prices are much more contained with this typology of dwelling, suggesting either more liquidity in this segment or better affordability in general.

2.1.3.3 *Residential investment property*

Residential investment property price evolution is a crucial indicator in the wider real estate market given the high proportion of tenants in the country. One would expect to see the effects of fierce price competition in this segment as real estate or pension funds would be trying to grow their portfolios. It must be noted that the 3 research firms did not share the same reference until 2010, hence results discussed will encompass only the 2010-2022 period. Overall, the price in the segment grew by 3.73% p.a. Fahrnländer Partner and IAZI have been computing the index since 2000 and by adapting the basis to 2000 = 100, we realize that the price evolution is staggering in this segment. Indeed Fahrnländer computed a 153.91% growth but IAZI's result is 70pp lower at 83.51%. Discrepancies being so high and not having a common basis from Wüest Partner, the true picture is hard to paint. Nevertheless, it can be assumed that prices have at least doubled in this segment since 2000.

2.1.3.4 *Rents*

Finally, computed residential rental asking prices computed by Wüest Partner grew by 38.87 points in 22 years, showing how stable rent levels are in Switzerland. When comparing per annum growth with office space, industrial and retail space rents, residential is growing at almost twice the rate than the other types of rentals. Nevertheless, the growth differential between rents and investment property prices

raises the question on the current and future returns of investment real estate. Additionally, the moderate rise of rents also tends to confirm Bourassa & Hoesli's (2006) explanation for tenancy's popularity in Switzerland.

2.2 Mortgages in Switzerland

Mortgages play a paramount role in the process of owning property, particularly in Switzerland where nearly 89% of privately owned properties have an outstanding mortgage (OECD affordable housing database 2022). Despite the low private ownership rate, Switzerland has one of the largest mortgage markets relative to GDP in the OECD. This is largely due to the Swiss tax system where the fiscal administration imposes a theoretical rental income on all properties, considerably increasing the income tax of homeowners. Hence, owning property outright leads to a significantly larger taxable income. This Swiss particularity is also illustrated by the use of 1st and 2nd rank mortgages. The second rank covers 15% of the property's value and expected to be repaid in 15 years, while the senior 1st rank can be kept indefinitely and passed along through generations (Wymann & Hirt 2017). As a result, it is common practice among Swiss homeowners to constantly refinance the 1st rank for the reduction of tax liabilities, making this a major factor in the high volume of mortgages in the country.

Indeed, the SNB states that the total amount of outstanding private mortgages was CHF 524 billion in 2021 (Zurbrügg 2021). Subsequently, FINMA (2018) reported that the mortgage volume held by banks had doubled in 15 years to reach CHF 1.0446 trillion in 2018. The latter figure encompassing both private and institutional mortgages, proves that the Swiss property market has grown substantially in 2010s. Despite this rapid leveraging trend, foreclosure rates have fallen from 2% in 2005 to 0.7% in 2021 with the delinquency rate curve being flat after the GFC (The World Bank 2023). This achievement is a testimony to the rigorous oversight of the mortgage market and good risk practices with lending institutions.

2.2.1 Legal framework

As previously mentioned, Switzerland's proportion of non-performing-loans is of 0.7%, ranking 9th lowest of the World Bank's 2021 report. This statistic is impressive given the mortgage-to-GDP ratio of 150%, high both by historical and international comparison (Zurbrügg 2021), proving that the Swiss mortgage market is healthy. This is widely thanks to pertinent and effective regulation covering specifically the requirement for lenders to comply within their mortgage activities. The main piece of legislation in this field is the Swiss Federal Banking Act (SFBA) of 1934 requiring lenders to conduct strict credit suitability assessments before approving mortgage applications. More specifically, the SFBA commits banks to assess the borrower's credit history, the perennity of his income and employment status, and most importantly, sets recommendation for debt-to-income ratios (DTI) and the need to assess the debt service coverage ratio (DSCR). The

DSCR requirement forces banks and other lenders to include the potential borrower's other debts and current liabilities such as health insurance and taxes into the credit checks to ensure they can afford both the mortgage charges and their regular expenses. In this respect, the Federal Act on the National Credit Bureau empowers the ZEK to collect credit information on all natural and legal persons in the country, and to host a database accessible to lenders. This enables lenders to accurately assess credit risks on mortgages and other forms of liabilities. Additionally, the Federal Act of 1889 on Debt Collection and Bankruptcy lays the rights and obligation of financial institutions in the advent of foreclosures and states the norm for loan-to-value ratios. These ratios are of maximum: 80% for main residential properties, between 65% and 75% for rental and secondary residence and, generally 50% for the amount surpassing CHF 4 million on luxury assets. In addition to all the mentioned legal frameworks, the FINMA is empowered and entrusted with the enforcement of these credit checks and general application of diligence with respect to mortgage financing and lending in general. It is also the supreme authority tasked with regular auditing of credit risk processes within mortgage lending institutions.

2.2.2 The specificities of mortgage applications

Mortgage applications are complex processes governed by the previously discussed legal framework. Indeed, two major requirements need to be fulfilled for all applicants: one concerning equity and the other covering DTI ratios. Hence, provided the applicant has the right to discern and a credit profile deemed suitable by the lender, they will need to summon 20% of the purchase price in cash for the loan to be issued. The equity part can be financed by cash, donations, withdrawal of blocked 3rd pillar accounts, or by withdrawal of pension benefits (maximum 10% of the purchase price) (Wymann & Hirt 2017). Moreover, the withdrawal of pension assets for mortgage financing is subject to the approval of the borrower's pension foundation and is to be repaid in 15 years or at retirement age at the latest. Banks will perform background checks to corroborate the source of the down payment with respect to money-laundering legislation and will not lend in excess of 80% of the purchase value of the asset (Wymann & Hirt 2017). In addition to the 20% down-payment, borrowers will need to account for notary fees and mutation rights totaling 5% of the asset value. These fees are not financed by the mortgage, unless the purchase price is set at substantial discount like during legal auctions (Wymann & Hirt 2017). In sum, if a borrower were to bid for property of the current median value of CHF 1'180'000, as computed by RealAdvisor.ch (2023), the financing plan would be as shown in **Appendix 5**.

In this example, the borrower needs to gather a total of CHF 295'000 of equity in order to apply for a mortgage and secure the deal for an asset worth CHF 1'180'000. This large capital requirement makes it a substantial challenge for any prospective borrower. It also represents a security margin on the collateral for banks. With the equity part out of the way, banks will then analyze the financial ability of the borrower. In this part of the process the financial institution will require a list of documents from the applicant as per the institution's general terms and conditions, as shown in **Appendix 5**.

On the basis of the provided documents and following a report from the ZEK, the bank will compute the income considered for the calculation of the DTI ratio. A mortgage can only be issued to the borrower if the said ratio is below 33% as a general rule, but no formal text specifies this value (Wymann & Hirt 2017). The debt component first consists of a theoretical interest charge of 5% p.a. The 5% charge is a measure of risk mitigation originating from the SFBA and FADCB to ensure that borrowers would be able to honor their liabilities in the advent that rates rise to 5%. Indeed, the borrower will not contract a 5% fixed rate, but this protects them from over indebtedness in a high interest environment and commits the lender to only approve the safest credits (Wymann & Hirt 2017). As a side note, the SNB computed the average historical mortgage interest rate since 1934 and it came out at 2.6% p.a. (Zurbrügg 2021). Given this average, it can be acknowledged that the 5% interest used by most financial institutions for the DTI calculation is quite prudent. The other components of the debt charge are a 1% p.a. amortization charge on the 15% second rank, and a 1% of asset value maintenance charge. With the example of the purchase of a median price CHF 1'180'000 asset, the computation of the debt charge would be as follows:

On a CHF 994'000 loan and CHF 1'180'000 asset value:

- Theoretical Interest charges (5% p.a.): CHF 47'200.-
- Debt Amortization (1% p.a.): CHF 3'304.-
- Maintenance (1% of asset value): CHF 11'800.-

For the debt-to-income ratio to not exceed the 33% threshold, the borrower's computed gross income should be of at least CHF 188'800.- per annum. In other words, to purchase an asset worth 1'180'000 the borrower should earn roughly 16% of its value per year. This modality is a great restraint for any prospective homeowner, as the share of households earning such a wage is especially weak in the younger tranches of the population.

2.2.2.1 *Inheriting a home with an outstanding mortgage*

When a homeowner passes away, his ownership of property is transferred to his heirs or widow. In most cases an outstanding mortgage remains on the property, as previously explained, and lending institutions will recompute the DTI ratio on the new owner(s)'s income. Provided the spouse is willing to keep the property and has sufficient capital on hand, an extraordinary amortization will be allowed by the lender to bring the debt level down to the point where the DTI ratio is at 33% (Wymann & Hirt 2017). In cases where no surviving spouse lives, or does not want to keep the property, the heirs can claim it. Three scenarios can ensue with inherited houses; one of the heirs can claim the house with the outstanding mortgage provided their income is sufficient and can compensate the other heirs if any. Alternatively the property can be repurposed for rental in which case the norms for investment property will be used to assess if the mortgage can be kept. Finally, the property can be sold outright either voluntarily, or specifically to repay the mortgage and recover the equity tranche as cash (Wymann & Hirt 2017).

The scenarios in which the passing away of a homeowner is compensated by a new homeowner retrieving his property and mortgage are limited. Although no specific research has quantified the proportion of property inherited as main residence for at least an heir, it can be assumed that this occurrence is fairly rare. Indeed, both the willingness of the heirs to reclaim the familial house and their financial ability to do so makes it that only a minority of property is passed on through generations. Nevertheless, given the high share of rental property being owned by private individuals, it can be hypothesized that repurposing inherited property for renting is the most common occurrence.

From a lender's perspective, amortization rates are often adapted from the classical 1% p.a. to consider the gap in revenues passed retirement age in order to ensure that the property will not need to be sold against the will of the owners. Additionally, in their succession planning approach homeowners can seek advice from financial advisors, tax advisors, lawyers, fiduciaries, and other experts to determine the right levels of debt to hold in order to pass on their property to their heirs. This approach is usually constrained by financial effort and tax implications (Wymann & Hirt 2017).

2.2.2.2 *Additional arrangements for borrowers*

The capital and income requirements for mortgages discussed in the previous sections are not formally stated in the applicable legislation. This "loophole" gives institutions a minuscule degree of flexibility as to what deviations they are ready to tolerate in their risk assessment. Although the specific thresholds for each institution are not of public knowledge, it is known through mortgage brokers such as DL Money Park or Immo4G,

that some banks can calculate DTI ratios with a theoretical charge of 4.5% instead of 5% or, that some fully consider the average of variable compensation instead of weighting it down to 50%. Nevertheless, the arrangements are likely to be made on a one-off basis since there is no go-to bank for potential homeowners that are refused by most other institutions.

2.3 Income and savings

Having seen both income and equity requirements for mortgages, one must analyze the income situation in Switzerland to judge the feasibility of homeownership for households. In addition, the equity for mortgages is gathered from savings and pension assets, meaning an analysis of disposable income for the Swiss population is necessary to understand the current levels of wealth accumulated in households. It is important to mention that a paradigm shift has occurred in today's young population compared to the one of the early 2000s. Indeed, the proportion of adolescents taking the Federal Maturity ("gymnasiale", professional or specialized) has increased from 26% to 42.1% between 2000 and 2020 (Office Fédéral De La Statistique 2021). This statistic is a good proxy to judge whether more or less young adults enter the workforce before 18-19 years of age, and it is currently corroborating the observation that young people in Switzerland start making a living much later now than their parents or grandparents. Other proxies such as the mean age of parenthood and mean age of marriage are also pointing to a phenomenon many social psychologists call "the prolongation of post-adolescence".

2.3.1 The slowdown of income growth

To get a general idea of income levels per age in Switzerland, we will look into the Swiss earning structure survey from the FSO (2022). In this study, the surveyor broke down gross monthly level in 2020 per decade of age, gender, and management positions on a full-time equivalent basis. The data is segregated per top, upper and middle management, lower management, lowest management, and no management function. The total averages between all positions and regardless of gender in 2020 are found in **Appendix 6**.

In terms of household income, the average monthly household gross income in 2000 was CHF 8'453 and CHF 9'817 in 2020, representing a 16.14% nominal growth and 0.75% annual growth rate in this 20-year period. Interestingly, household gross revenues peaked in 2014 at CHF 10'079 per month and decreased by 2.5% when considering the progression until 2020 (FSO, 2022).

NB. Household revenue increased between 2019 and 2020, the covid pandemic seemingly not having negatively impacted household revenues.

When it comes to the evolution of revenue per age class since the early 2000's, the FSO (2019) has collected data on income distribution per household, depending on the age of the "reference person". The term "reference person" is defined by the surveyor as being "the person contributing to the largest share of the cumulated household income". Given the lack of more granular data, the FSO study on household income from 2006 to 2017 will be taken as proxy to estimate the income growth levels of income by age class in Switzerland. In this study, the household income and savings are averaged over four, three-year periods and split between 6 age groups for each period; *Less than 35 y.o, 35-44 y.o, 45-54 y.o, 55-64 y.o, 65-74 y.o, 75 y.o or more* (Federal Statistical Office 2019).

After dissecting the data, the results show that the *45-54 y.o* led households have the highest monthly revenue throughout all time frames. The *35-44 y.o* led households had slightly higher but comparable income levels to *55-64 y.o*, and consistently above the mean. Finally, *the less than 35 y.o.* category came in 4th out of the 6 age segments but was constantly under the mean in terms of monthly revenue. Please refer to **Appendix Z** for the most notable observations.

From observations A, B and C, we can conclude that the average monthly revenue is surpassed on average, somewhere in the *35-44 age group*, suggesting that above average pay is reached in the late 30's in Switzerland. Observation G supports the suggestion, showing that the household composition did not significantly change throughout the time frames thus disproving the possibility that it could be reached before. Additionally, observations D, E, F suggest that for young adults (*less than 35 y.o group*) the monthly revenue increase is more modest than for the two other age groups being compared. This stagnation of income evolution versus the other age groups could suggest that young professionals are struggling proportionately more than other age groups to increase their income levels. The data also shows that in periods of comparatively high revenue growth as the '12-'14 time frame, the *less than 35 y.o group's* revenue shows an increasing gap with the one of the highest earning, *45-54 y.o group*. In summary, this suggests that wage increases could possibly be granted to more seniors than juniors, or at least in higher amounts. To conclude on this section, the census data from the FSO tends to indicate that household nominal revenue growth in Switzerland has been modestly growing since the start of the century and has been marginally decreasing since 2014. Moreover, the average nominal revenue growth is comparatively significantly lower than the average nominal GDP growth for the same

period. Surprisingly, the data seems to indicate that the younger part of the population is getting a proportionately lesser part of this growth than more experienced generations.

NB: Real wages should not be significantly different since from 2006 to 2017, the Swiss CPI had a cumulated increase of 2.11 percentage points (Federal Statistical Office 2022).

2.3.2 Savings

As for household savings, in 2006 the monthly average stood at CHF 913, representing 10.2% of the gross household income. The average grew to CHF 1'289, or 13.8% of income in 2017 (Federal Statistical Office 2019). Hence the progression of average household savings between 2006 and 2017 was 41.18% in nominal terms, for an annual growth rate of 2.92% over 12 years. Additionally, the peak for savings was recorded in 2014 at CHF 1'544. Similarly to household income, its levels have slowly decreased ever since.

NB: Aggregate figures per period have a coefficient of variation greater or equal to 2% but smaller than 5%. Figures for the less than 35 y.o, 35-44 y.o and 45-54 y.o have a coefficient of variation between 5% and 10% which is judged "sufficient" by the surveyor. Figures for all age groups above 54 y.o have a coefficient of variation greater or equal to 10% and judged "poor" by the surveyor.

Despite the higher levels of variation in the data than for household revenues, the study suggests that young professionals have a promising savings capacity and could in time gather sufficient capital to apply for a mortgage. This hypothesis is encouraging for the prospects of future homeownership as average savings for young professionals are increasing despite the underwhelming increase in revenue for the same age group.

2.4 Homeownership: a strong ideal

What if Switzerland modest homeownership rate is just the result of households' indifference between tenure types ? To decide what form of tenure an individual will choose for his household, he will need to consider various factors. For example, financial ability, job mobility, future plans, willingness to have children, lifestyle preferences, market conditions, and tax considerations, to cite only a few (KEARNS et AL. 2000). In addition, one needs to understand the implications of buying property and accept the underlying rights and obligations coming with ownership. Luckily, the social desire for homeownership has been extensively studied and countless research articles tend to show that it is a strong ideal for most humans. For example, it has been found that a

majority Europeans dream of owning property for familial legacy reasons, for the sense of home security it provides, given the pride of ownership derived from investing life savings in land, and because of the perceived financial stability it can provide (Clark & Diaz-Serrano 2022). Similar conclusions were observed in North America with quantitative models assessing the well-being derived from homeownership (McCabe 2013). Moreover, a European joint study has tried to settle the debate between multiple similar studies aiming to demonstrate the positive relation between homeownership and housing satisfaction. This study has focused on the households that acquire a home after a life of tenancy and analyzes the satisfaction (utility) levels compared to households remaining renters. The researchers were able to demonstrate that homeownership has a strong tendency to increase housing satisfaction (Diaz-Serrano 2009). Adversely, homeownership is over all things a social construction and just another ideal. Indeed housing is a primary need that does not semantically differentiate between tenancy situations. Hence the choice of ownership often comes down to the ability of financing such a project and the willingness of constructing one's self-identity through intangible rights over a tangible asset (KEARNS et AL. 2000). Nevertheless, there is also a view in this field of research where homeowners largely overestimate the benefits of ownership and realize that even the rumored financial stability of this tenure type is not as obvious as expected (DiPasquale & Glaeser 1998). Finally, with respect to Switzerland, a joint study between the ZHAW management school (2022) and the federal housing office have gathered panel data on the desire of young professionals to own property. The results showed that almost half of respondents in the 30-39 y.o group were looking for a home to buy, and 78.1% of them were faced with financing problems preventing them from achieving their ideal (ZHAW School Of Management And Law 2022). To conclude this section, given the numerous studies on the subject it is safe to say that homeownership remains an ideal for many households, and perhaps they would welcome solutions to help them satisfy their life goal.

2.5 Alternative financing and ownership solutions

Having seen the price trends of Swiss real estate, the poor progression of wages, the strict rules and norms governing mortgages, and people's potential desire of becoming homeowners, we can ask ourselves how can it be achieved ? The current state of affairs and the underlying data show no signs of hope for future homeowners and fundamentals. Indeed, indicators strongly suggest that homeownership is set to decline. In light of these challenges, could any alternative to mortgages exist ? And if not, could any mechanisms in finance's "toolbox" allow for more households to be granted mortgages without risking

Switzerland's financial stability ? Or alternatively, could there be any other ownership models used elsewhere that Switzerland has not experimented with ? Indeed, with the recent continued rise of real estate prices in the country many so called solutions have emerged, offering a potential plan B for those who are deemed too risky debtors for banks.

2.5.1 Crowdlending

One of these alternative solutions is crowdlending, a by-product of the popular crowdfunding phenomenon that has risen on various internet platforms during the 2010s. The concept of crowdlending is based on leveraging the "crowd" on an internet platform to finance different projects or "campaigns". These platforms are similar to umbrella funds and pool together money from individual investors to lend it to debtors. In exchange for their investment, the investors will receive a predetermined but unguaranteed return that is usually relatively attractive and with little correlation to financial markets (Amrein & Dietrich 2016). As for the risks of such investments, each platform has its own policy, but most have an "all-or-nothing" clause. Additionally, most often the only legal disposition governing these investments is solely what is mentioned in the Swiss Code of Obligations article relating to credit contracts. The Swiss market for Crowdlending is very fragmented and consist in mostly platforms arranging consumer loans and operating credits for SMEs, but with no bespoke platform proposing specifically mortgages (Amrein & Dietrich 2021). Nevertheless, some of the platforms propose large consumer loans and give no sign of not being willing to crowd finance an asset-backed loan to help one achieve homeownership. Despite no available segregation between types of financed projects, the branch as whole has seen stellar growth from CHF 55.1 million of crowdlending in 2016 to CHF 448 million in 2020, and total of CHF 1.386 billion disbursed in 13 years of existence in Switzerland (Amrein & Dietrich 2021). Moreover, numerous actors keep entering this market every year and even banks and insurance companies have entered it with their own solutions or through equity stakes in crowdlending platforms. This last statement demonstrates the general interest for this alternative market from regular financial institutions. In theory, these platforms do not work with bank norms for credit risk assessments and would be open to lend to households that do not have the required income, especially with the 5% interest computed by banks. This means that, should a given platform have sufficient funds on hand, and the debtor having at least a certain amount of equity, a property purchase could take place. Nonetheless, questions about the conservation of the mortgage deed, investor protection in case of foreclosure, and many other aspects of mortgages remain unanswered in the literature.

2.5.2 Land leases

Land leases are contracts regulated by the Swiss Federal Law on Lease and Rentals of Immovable property, through which a landowner lends a parcel of land to a counterparty for a set period of time. During that period, usually between 30 and 100 years long, the tenant is free to construct a building or home that will become his property and to which the landlord promises to repurchase in case the lease is not reconducted at the end of the agreement (Dreier 2023). The land lease agreement is distinct right under the Swiss law and every agreement is registered on the leased parcel in the land register. Additionally it can be renewed, transferred, or inherited provided that terms are agreed upon by both parties.

In exchange for the lease, the tenant pays an annual “interest” on the value of the land. Like any other form of debt, the interest can either be fixed for the entire duration of the lease or floating with the rate pegged to some index (Dreier 2023). Most commonly, as reported by Wüest Partner (2017), 93% of land lease agreements have a floating rate and are indexed to either the CHF risk free rate, to the Swiss CPI, to the market value of the land, to rental property yields, or a weighted average of all four (Wüest Partner AG 2017). With respect to the lessee, the advantage of a land lease is found in the lower acquisition price of the property. Indeed, as they are purchasing the construction exclusively, they contract a mortgage on a smaller amount, meaning that interest and amortization charges will be proportionately smaller than buying outright. In the context of the Swiss mortgage norms, this implies that many more households can qualify for a mortgage on a fractioned value asset. Indeed, according to real estate investment firm Fundim, the land lease solution can allow for a 45% reduction in equity requirements and 20% income requirement for the buyers versus a full acquisition through a mortgage (Fundim 2022). Nevertheless, the lessee is also paying a monthly or yearly interest on the value of the land, which can represent a greater overall expense than a mortgage on a full acquisition. This can arguably become expensive for the tenant, but part of this expense will be reclaimed since the lessor is bound to repurchase the building at the end of the agreement, if no renewal is agreed upon. The estimated value of average repurchases prices on a sample of 2'000 were as follows (in % of the market value plus added value renovations): of 100% in 41% of cases, 80% in 33% of cases, between 70% and 75% in 11% of cases, at 65% in 11% of cases and at least 50% in 4% of cases (Wüest Partner AG 2017). It is to be noted that many methodologies exist to define the repurchase value, sometimes favoring the landowner, although the higher the repurchase value, the more it incentivizes the lessee to maintain and reinvest in the building potentially benefiting both parties.

With respect to returns for the landowner, Wüest Partner (2017) also computed a 10-year return on a sample of 2'000 leasehold residential investments. In their sample, 10th to 30th percentile returns amounted to between 3 and 4.5%, between 4.5 and 9.5% for 30th to 50th percentile returns, between 9.5 and 15% for 50th to 70th percentile returns, and between 15 and 25% for 70th to 90th percentile returns. One might be tempted to compare these figures to the returns of regular investment property, but Wüest Partner (2017) judges this comparison as “reductant”. Indeed, rents are often set on the basis of construction costs and result in land lease returns being often greater in relative terms given the different methodology in calculating the interest.

Land lease agreements are in some cases “no-go” clauses for banks to grant mortgages given the many risks related to the distinct ownership of property, along with additional credit risks for the landlord (Amrein & Dietrich 2017). On the other hand land leases are quite common with land owned by public authorities and in some cases, they are granted on land destined for residential property, although it is more common with commercial, industrial, or agricultural properties. Nevertheless, other actors are ready to answer the untouched demand represented by homeownership seekers not qualifying for a mortgage on freehold property. For example, such a montage was proposed by real estate investment firm Fundim in 2021 in partnership with the popular e-commerce brand QoQa.ch. Indeed, 30 condominium lots were sold in under two hours with over 9'000 people bidding. Consequently, other projects ensued given this impressive success. Regarding the exact montage, Fundim, through one of its Limited Partnership structures, acquired the land and gathered buyers through QoQa's popular online shop who could in turn, financed the construction with a partner bank. The firms argues that the land lease system could double the number of eligible buyers for individual houses in the country, and states that a majority of real estate transactions in the UK and the Netherlands are done through land leases (Fundim 2022). This specific montage where an institutional investor buys the land with a construction permit to sell off the condominium lots to private households under a land lease agreement seems quite revolutionary. Indeed, hardly any other similar montage can be found in the literature or on websites dedicated to real estate investment discussion or promotion, although it must be noted that the wording for such research often leads to unrelated topics. Nevertheless, this raises the question of how the model could be democratized, and if it an attractive investment structure for institutional investors and a similarly attractive ownership model for potential homeowners.

In order to get a remote idea of the potential implications of the democratization of the land lease model in Switzerland, one can look towards the Netherlands. Indeed, the

country modernized its land lease policy for municipalities in the 1990's when homeownership rates were in the mid 40% (Ploeger & Bounjouh 2017). Used mainly as a solution to increase the affordability of housing in urban areas, the effect on homeownership in the country was tremendous. Indeed the wide adoption of leasehold property by households pushed ownership rates to the low 60% in the early 2000's, and around 70% in 2021 (Luca & Geis 2021). Besides promoting ownership and affordable housing, this model allowed municipalities to maintain control on spatial planning whilst reducing building expenditures and receiving income for the use of the land (Ploeger & Bounjouh 2017). Although the outcome is seemingly positive in the Netherlands, the abrupt rise in homeownership has also led to a real estate bubble and a tangible increase in foreclosure rates in the early 2010's. The Dutch banks only then imposed stricter credit assessment with DTI and LTV ratio thresholds, in order cool down the situation (Luca & Geis 2021). In contrast, the possible effects of a democratization of the model in Switzerland would likely be more moderate. For instance the share of land owned by public authorities is significantly lower than in the Netherlands and part of it is already leased out. Conversely, it can also be supposed that the already high prices in Switzerland wouldn't result in the same massive bidding from households and enforced FINMA mortgage norms would largely contain the underlying credit risk. In conclusion, the need for private actors to adopt the model would be necessary to push homeownership significantly higher in Switzerland.

2.5.3 Third party guarantees

A less common solution exists in the form of guarantees for prospective homeowners who cannot gather the funds for the mandatory 20% down payment. The framework for these guarantees is laid out in the Swiss Code of obligations and Federal Act on Debt Collection and bankruptcy, stating that third party guarantees can be called upon as a form of collateral for most forms of debt. In practice, prospective homeowners who pass the income requirement check with a bank, but who can only provide a minimum of 10% equity, can apply for a guarantee from one of the many cantonal mortgages guarantee offices (Amrein & Dietrich 2017). These offices are backed by their canton of domicile and aim to promote homeownership by guaranteeing a maximum of 10% of the asset value that is missing to fulfil the down payment requirement for a loan. The guarantees being backed by the canton are considered to be first rank collateral by banks, who will accept them as equity for the down payment and subsequently grant a mortgage to the beneficiary. In reality, these guarantees do not seem to be popular solutions as for example, the CVCH (guarantee office for the canton of Vaud) has only accepted 8

requests in 2021 for a total value of CHF 496'500, and granted only 110 million in guarantees since 1945, a seemingly low amount for one of the most populated cantons in the country (La Coopérative Vaudoise de Cautionnement Hypothécaire 2021).

2.5.4 Pfandbriefe

Mortgage bonds or Pfandbriefe, as they are called in Switzerland, are an important by-product of most real estate markets in western economies. These bonds are issued by institutions that grant mortgages, or buy them from other institutions, to pool them into a mortgage portfolio and securitize them in the form of a bond (Bank for International Settlements 2021). The bonds subsequently obtain risk ratings from competent agencies as is required for regular bonds and will then be sold on dedicated securities exchanges like any other form of securitized debt. Once the bond is sold in the market, the issuer will receive capital in exchange for the mortgage bond and will no longer have any rights or exposure to the underlying mortgages. Its role will consist of collecting mortgage installments from the debtors of the pooled mortgages to repay them as coupons to the buyers of the bonds (Bank for International Settlements 2021). In theory a liquid mortgage bond market is advantageous for mortgage borrowers as well since it opens access to lower interest rates. Indeed, the issuer grants the loans specifically to be pooled, forgoing its desired interest margin that might be higher than what aggregate mortgage bond investors desire for a given level of risk. On the other hand, in periods of uncertainty, problems of adverse selection often occur since issuers have been known to misinform the market of the underlying credit risks (García 2022).

In Switzerland mortgage bonds are referred to as Pfandbrief and can only be issued by two government-sponsored institutions as formalized in the Federal act on mortgage bonds. These two institutions are the Pfandbriefzentrale and Pfandbriefbank, both of which are overseen by FINMA (2023) with respect to their collateralization processes and general mortgage portfolios. Hence, Swiss MBS fall in the agency MBS category since the securities are backed by government-guaranteed mortgages and are all rated Aaa by Moody's as a result (Pfandbriefzentrale der Schweizerischen Kantonalbanken AG 2022). Conversely, in some countries commercial banks or investment banks are permitted to issue their own MBS. For example, the US MBS market has been mainly supplied by Fannie Mae (Federal National Mortgage Association) and Freddie Mac (Federal Home Loan Mortgage Corporation) since the GFC. But many investment banks cover the nonagency part of the market which is still non-negligible in size (Fuster et al. 2022). Additionally, the Swiss MBS pool is only collateralized by residential assets (RMBS) and offers no commercial alternative (CMBS).

At the end of 2021 the Pfandbriefzentrale and Pfandbriefbank reported an MBS portfolio valued at CHF 70.227 billion and CHF 80.62 billion respectively, leading to a total value of outstanding Swiss MBS of CHF 150 billion (Moody's 2022; Pfandbriefzentrale der Schweizerischen Kantonalbanken AG 2022). As stated before, the SNB estimated the total amount of mortgages on banks' balance sheets to be around CHF 1.04 trillion that same year, meaning that the MBS market represents only a little under 15% of the underlying mortgage market (SNB 2021).

In practice, it could be imagined the mandates of the two Pfandbrief institutions would be extended to supply non-agency MBS. In that hypothetical scenario, commercial banks would issue mortgages to borrowers with a DTI ratio slightly above the 33% threshold but who have the required equity. The banks would bear the risk for a short period of time before selling the mortgages to the Pfandbrief institutions to be pooled in a new issue of MBS. The risk would thus be transferred from the bank to the issuer, to the market. Since mortgages would be granted only to debtors able to gather the 20% equity tranche, the MBS investors would bear very little collateral risk but could expect a credit risk premium versus government debt. The risk-return could also be more attractive than corporate bonds since the MBS are collateralized when corporate debt is unsecured.

3. Methodology

3.1 ***Problem statement***

Based on the current literature and wider context, the situation for households wanting to become homeowners appears pretty dire. Indeed, restrictive spatial planning laws, coupled with population growth, wage stagnation, and consistently growing property prices with strong fundamentals, suggest that it will become increasingly harder for households to get a mortgage for the desired property. Moreover, the norms governing mortgages in Switzerland are strict and result in homeownership being out of reach for a majority of households. Nevertheless, these norms have proven extremely useful, and with FINMA's overwatch, the country has seemingly avoided a real estate bubble and has even seen delinquency rates substantially decrease, despite soaring mortgage volumes in the last decade. With this positive outcome, it then seems highly unlikely that anything will be done in order to make financing achievable for the average household. Consequently, should property prices continue their increase, mortgages for median or slightly higher priced properties will be unobtainable for any household earning less than a staggering CHF 200'000 per year. Plainly put, this means that the extreme majority of households will only be able to afford lower end assets, will have to look outside of urban areas, or accept a life of tenancy. Luckily, the literature also shows that a few alternatives could exist for the remainder of the population. Yet, their feasibility and efficiency remain to be conceptually tested in the Swiss context.

To assess if the said solutions can succeed in maintaining or growing the share of households in homeownership status, a forecasting model should be built. This so-called model will try to foresee on a low-resolution scale, where homeownership and underlying property prices could be expected to be in a 15-year projection. Other methodologies could have been chosen to conceptually test the solutions. However, the extensive data provided by the FSO opens an attractive opportunity to paint a truer to life picture and gain a tangible view of how these solutions would work in Switzerland. This is especially valuable given the uniqueness of its real estate market and the financing challenges it presents. For greater substance, interviews with various industry experts could help to define how the variables interact with each other to ensure a more concrete overview of the problematic, along with other precious insights.

3.2 Choosing the solution

The first decision was to choose which of the apparent solutions would be worth to analyze. In order to decide of which suitable solutions to test out, the assumption that property prices will continue to rise was set. Then, a reflection ensued on the scalability of each solution, its tendency to worsen credit risk, potential adverse effects it could induce, along with other challenges that may arise. The result of the assessment where as follows:

- **Crowdlending:** This solution was abandoned mainly because too many challenges exist with respect to the sheer volume of funds to be pooled from investors. Also, the problem would be further exacerbated with property prices increasing and other investment alternatives being more attractive for investors. Moreover, the potential higher rates charges and less diligent risks assessment practices, these platforms could be expected to increase mortgage default in the country.
- **Third party guarantees:** These two solutions where also abandoned for their poor scalability and need for a review of bank credit risk assessment. Indeed, third party guarantees call on public money to finance equity tranches for mortgages, which if aggregated can lead to big financial commitments for cantons. Realistically this wouldn't happen on a large scale despite the positive political returns for a canton that is promoting homeownership.
- **Pfandbriefe:** The extension of the Swiss Federal act on mortgage bond to include non-agency MBS was rejected mainly due to the need of reviewing the legislation and creating the required infrastructure to supply more MBS. Indeed, this solution was an informal way to give banks a reason to take more short-term credit risk and seems unlikely that it would ever be used in Switzerland.
- **Land leases:** The democratization of the use of land leases is accepted for the model. Indeed, they are already in use in Switzerland and have great track record in enabling homeownership in the UK, Netherlands, and Singapore. Moreover, leasehold property should in theory remain affordable even if prices increase as households would be financing 50 or 60% of the asset's value thus drastically reducing the required income and equity.

3.3 Designing the model

Before building the homeownership forecast, it was critical to understand what variables are at play in a real estate market. To begin the modeling, it is understood that households either own or rent dwellings. These households are either composed of a single person or of multiple people, in which case classically two adults that contribute economically to the household. The people have various levels of income, predominantly determined by age. Income levels vary between social classes and have a certain annual growth rate. Meanwhile, property prices also grow at a certain annual rate, and the underlying pool of property also grows at a certain rate, determined by the average number of constructed dwellings. When it comes to the decision of owning or renting, it usually comes down to the ability to secure financing. Hence, if a household has a sufficient income for their DTI ratio to be 33% or less for a given price level, they will become homeowners, otherwise they will remain tenants. To ensure sufficient time for the various variables to have a perceptible change, the decision is to run the projection of all variables over a 15-year time frame. Since the latest FSO data on most of the aspects of the model were dated to the end of 2021, the decision was to start the projection from 2022 until the end of 2036. For the narrative this also meant that none of the geopolitical and economic events that took place in 2022, and more specifically the effects they had on interest rates and bank defaults, would happen in the model. Algebraically the forecast wouldn't account for interest rates but narratively we could imagine that interest rates are negative in Switzerland and that the yield curve is positively sloped. With the low-resolution view of major variables to include in the model, the plan is to build a base case scenario to see where homeownership rates could be in 15 years if nothing is done. The forecasting model would be done using Excel, by first compiling and cleaning up the data from the various FSO studies, and then designing the formulas and tables where the variables would interact. Following the successful design of the base case scenario, the integration of land leases in the same base case scenario would allow us to judge how efficient and likely this solution is set to be for future homeowners.

3.3.1 People and households

To keep the scope of the model realistic, the decision was to aggregate people in households based on age and assuming that two people of the same household fall in the same age group (**Appendix 8**). Indeed, 6 age groups were defined as follows: 25-34 y.o, 35-44 y.o, 45-54 y.o, 55-64 y.o, 65-74 y.o, and 75 and over. To assess the number of individuals in each age group, FSO study *su-f-01.05.03.01.03* was used. This

study based on population census estimates the number of individuals of each age from 15 to 89, with people over 90 being aggregated as one age. Once distributed in households by age groups, the total population between 25 and 75 and older amounted to 7'321'000 individuals and was 1'417'000 individuals short of the actual population of Switzerland. This missing population was indeed the less than 25 y.o which were regrouped in FSO study *ts-x-01.04.01.01* allowing for a distribution of children and young adults to the right household, based on the age of mothers at birth. For active young adults aged between 15 to 24 y.o, FSO study *T.03.02.00.02.01* allowed to distribute the working young adults to the correct households regardless of the age of the mother given their ability to earn a wage. At that point, 104'513 individuals were still missing versus the actual population. They were distributed to each age group based on the proportion of the said groups in the total population. To finish off, an average household composition per age group needed to be defined to determine the number of households per group. FSO study *t20.02.01.00.11* was instrumental since it provided average compositions from 2017 for the exact age groups the model was using. Adapting those figures to account for population growth between 2017 and 2021, it was found that 3'990'128 households lived in Switzerland. The distribution was deemed satisfactory as all age groups had increases comparable to actual population growth and the total number of households is 90'000 (2.3%) higher than the FSO estimate from 2021.

Having a fairly realistic overview of households, it was now time to forecast the ages of individuals over 15 years, add net migration, and account for deaths. To begin this titanic task, all individual ages were projected until 2036 to determine which individuals of each age group would access a higher age group during the 15 years forecast (**Appendix 9**). It turned out that people in the higher half of a given age group would climb up two age groups during the forecast, and people from the lower half would advance by only one. To transform this into household movement, the individuals' movement was averaged and divided by the average household composition for the age group. The result gave an average net annual outflow of households to the higher age group for each group, called annual variation coefficient. The average net migration in absolute terms over 20 years from FSO study *su-e-01.02.04.05* would be added in a 61-39 proportion respectively to age groups 25-34 and 35-44. Indeed the study demonstrates that a crushing majority of immigration is composed of people of those ages. As a result the projection of households per age group follows the below formula.

$$\text{Number of households}_i \text{ in year}_t = \text{Households}_i(t-1) + \text{net migration}_i + \text{Households in from lower age group} - \text{households}_i \text{ out to higher age group}$$

The final demographic variable to be integrated into the forecast is the passing away of the older part of the population. FSO study *su-e-01.02.04.05* shows that 85% of the average 64'295 annual deaths are individuals aged 65 and over, with proportions of 33% for individuals from the 65-74 y.o group and 66% for individuals from the 75 and older age group. It is important to highlight that model considers only deaths of old age, which is defined as all nonviolent or nonaccidental causes of death for senior close to, at, or past life expectancy age. The model does not differentiate death between individual ages but rather seeks to account for total deaths that can be expected in an age group. The 15% of total deaths related to the rest of the population is ignored in the model since the only thing that can be predicted is that people tend to die more as they approach life expectancy age. The computed household projection over 15 years for the senior population follows the formula :

$$\text{Number of households}_i \text{ in year}_t = \text{Households}_i(t-1) + \text{Households in from lower age group} - \text{annual deaths in to higher age group}_i$$

See **Appendix 10** for details on household per age projections.

To conclude, on the demographic aspect of the model, the suggested overview is deemed satisfactory. Indeed the starting point for the number of households is fairly close to FSO census data, and the projection manages to reflect the trend of ageing of the population known in Switzerland. Most importantly, the forecast ends with 4'265'184 households in 2036, which is dead center in the base case estimate of FSO study *gr-f-01.03.03.01.01*. This accomplishment suggests that all demographic factors were correctly set up in the model.

3.3.2 Household income

Since households can have an infinite amount of wage combinations, the decision was made to create 3 wage levels for each age group. Before doing so there was the need to separate single person households (SP) from multi-person households (MP) to have a more granular idea of which households could hope to qualify for mortgages. Knowing that SP households are more observable in the 25-34, 65-74 and 75 and over age group, the weighting of SP households was done as follows (by order of age) : 30%, 15%, 15%, 40%, 65%, 70%. To determine these exact weightings, the constraint was that the weighted average of SP households should be 37% of households in order to respect the FSO census on household compositions. Subsequently 3 wage levels were set for

each age group, according to FSO study *T_9*. The levels were set so that 25% of households earn lower quartile (LQ) wage or less, for that same age group 50% earn the median wage (MD) or less, and the remaining 25% earn the upper quartile (UQ) wage or less. Additionally, only the 4 first age groups are included in this part of the model since seniors (over 65 y.o) are shown to be net sellers of property. Wage levels are then multiplied by the average household composition, and by 12, in order obtain the cumulated household yearly revenue. In conclusion, by arbitrarily setting distribution of households by wages level on a 25-50-25 basis, and excluding the households over 65, a median wage for the population of CHF 6'901.35 is found, being only CHF 32.47 (0.47%) above the median computed by the FSO. (See **Appendix 11** for the full overview)

For the purpose of the projection, each wage level (SP/MP: LQ, MD, UQ) per age group is projected at a constant annual growth rate over the 15 years. The growth rates were derived from FSO study *t20.02.01.00.11* on household budgets and are average annual growth rates from 2006 to 2017 for the exact same age groups. In conclusion it is impossible to predict whether the household wage levels are representative of reality, but the model struggles to represent various levels of income and projects them at a modest rate (all annual rates are under 0.6%).

3.3.3 Dwellings and mortgage feasibility

With respect to the financial part of the forecast, current property prices, as provided by realadvisor.ch, were projected over 15 years at an annual rate of 3.34%. The prices taken were the 20th, 50th and 80th percentile prices for single family houses in 2023. The growth rate is the average of compound annual growth rates over 20 years for single family houses, as computed by Wüest Partner, IAZI and Fahrnländer Partner. Single family house prices were taken as reference as they encompass apartment prices in the range of values. To contain the number of available properties, dwellings numbers from 2021 as computed in FSO study *T.01.09.03* were projected on the 15-year scale adding the average annual construction of dwellings as reported by the same study from 2010 to 2021. This projection does not account for the typology of dwellings and is only used to ensure that households do not occupy more dwellings than possibly available. Moreover, average ownership rates were computed from the FSO chart on the distribution of ownership per age and multiplied by the number of households of each age group. The exact ownership rates by age group were of 9.4% for 25-34 y.o, 29.4% for 35-44 y.o, 42.50% for 45-54 y.o, 50.9% for 55-64 y.o, 54.10 for 65-74 y.o, and 43.44% for 75 and over y.o. Finally, the weighted average ownership rate for the total population

was of 36.3% which is the exact figure of homeownership for 2021 as stated by the FSO. This conclusion suggests that the number of households of each age group is accurate and that the average homeownership rate per age group is a good metric to work with. (See **Appendix 12** for full price projections and threshold income levels))

Finally, from the projected property prices, the underlying minimum wages for a 33% DTI ratio were computed and projected. For reminders, a 33% DTI ratio is synonym of being able to secure financing for a main residence property. As mentioned in section 2.2.2, these wages are of the level at which a 5% interest charge, plus 1% amortization, and 1% of asset value maintenance fee amount to no more than 33% of annual income. During the forecasted period this minimum wage will surpass the actual wages of the different households, signalling that homeownership is completely out of reach for that entire household group. The inability of an additional proportion of the population to become homeowners, should represent an additional decline in homeownership rates. This entire model will amount to the underlying homeownership rate for each year implied by the loss of an additional share of the population to tenancy. (See **Appendix 13** for the full base case scenario model)

3.3.4 Land lease model

The second part of the model will recover all the variables from the base case scenario. The only metric that will be tweaked is the property price and underlying minimum wage for the 33% DTI ratio. Since leasehold property implies buying a fraction of a freehold property's price, a certain coefficient will need to multiply the initial prices that will then reduce the required income. From this base, the model will only need to account for the willingness of households to become homeowners through this distinct ownership model. Hence, willingness coefficients will need to be implemented for each household type of each age group to determine the share of eligible buyers that will become homeowners each year. (See **Appendix 15** for property price and threshold wages adjusted to the land lease model)

To add a bit of realism, the willingness coefficients will need to consider the household group's possibility to buy freehold property. Indeed they would be expected to marginally rise as freehold property becomes out of reach and expected to decline as the affordability of leasehold reaches falloff levels. The maximum coefficient will need to be discussed with the experts during interviews. (See **Appendix 14** for the full land lease scenario projection)

3.4 Assumptions

Being a predictive model for scenario analysis with no primary data, a number of assumptions have to be set in order to work with the data provided by the FSO and the real estate research companies. The resulting assumptions can be divided into two categories. The first category concerns so called numerical assumptions that arise from the great complexity of the many variables at play in the real estate market and within the nature of the players involved. These numerical hypotheses directly impact the variables being used in the model but are essential given the lack of granularity and common methodology used by the data providers. Nevertheless, thorough critical analysis puts a challenge on all the assumptions, and comparison with standalone statistics found within other studies of the FSO makes sure that these assumptions lead to contained deviations from the possible reality.

The second category are behavioural assumptions which define how the variables interact with each other. Nevertheless, this category is not any more subjective than the other one. Indeed, all behavioural assumptions arise from observable phenomena in the population but that have not been explicitly quantified. Moreover, these assumptions being mostly qualitative in their nature, no standalone data can help to estimate the possible deviation induced by the assumptions. (See **Appendix 21** for the full set of assumptions and implications on the model)

3.5 Primary data

In order to add substance and realism to the study, primary data in the form of interviews with industry experts will be collected. Of course, these interviews will aim to answer some of the questions that are not present in the literature, help define the interactions of variables in the model, gain exclusive insights of the real estate market, and learn if homeownership through land lease can practically gain any ground in Switzerland.

With regards to what experts were sought out, the study direly needed expertise from a professional having worked in real estate investment and who had extensive knowledge of the current trends at play. Additionally, inputs from an expert of bank financing and particularly mortgages are quintessential to avoid any overzealous assumptions. Finally, and if possible, an expert that had experience with the use of the land lease model is needed to hopefully help understand where the model stands today and most importantly if it can be sufficiently scaled up to have a tangible impact in Switzerland.

In the late stages of the study three experts were found, matching exactly the desired profiles needed for the interviews. For the full transcriptions, interview methodology, and interviewee's curriculum, please see **Appendix 18**, **Appendix 19** and **Appendix 20**.

4. Results

4.1 Base case scenario

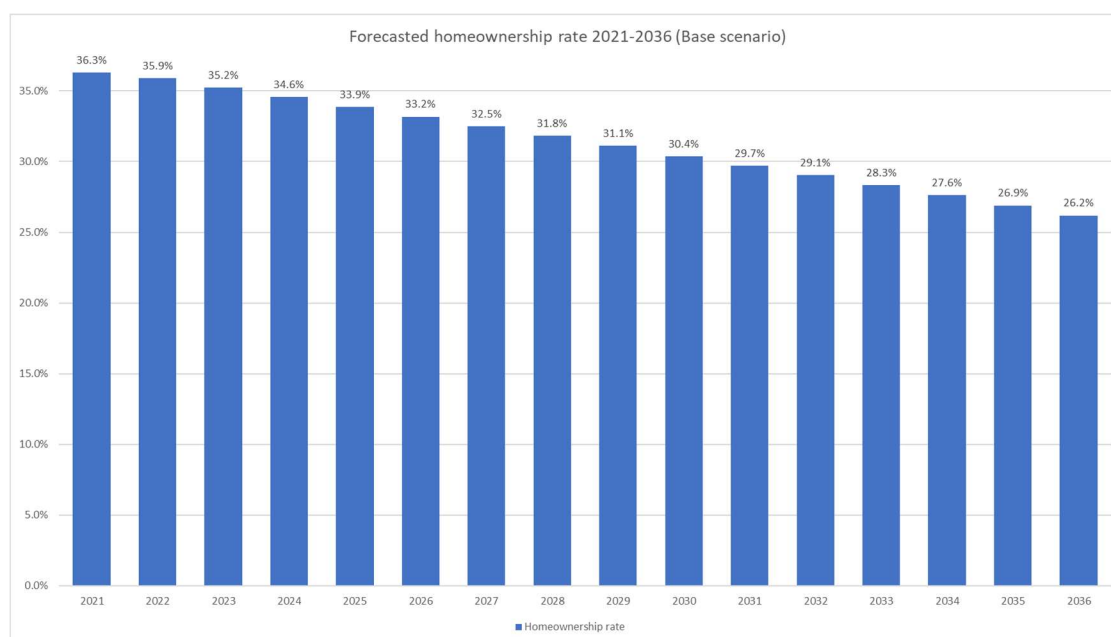


Figure 1: Homeownership rate in the base case scenario

4.1.1 Determining factors

The base case scenario model utilized the current ownership rates per age group from 2021. The ownership rates were follows: 9.4% for 25-34 y.o, 29.4% for 35-44 y.o, 42.50% for 45-54 y.o, 50.9% for 55-64 y.o, 54.10 for 65-74 y.o, and 43.44% for 75 and over y.o (Credit Suisse 2021). Indeed, the rates signal the proportion of households who can, and want to own property. Algebraically, this proportion is composed of a willingness factor and an affordability factor. Hence, the assumption was set that willingness if fixed in time, but that the affordability factor would decline as the spread between the minimum wage for a 33% DTI ratio and LQ, MD, UQ wages per age group increased. This spread is determined by the projection of low, median, and upper value property prices projected at a 3.34% annual rate. On this basis, the model calculated the DTI threshold wages as explained in the literature review. As a result, the ownership rate per age group was held constant throughout each year but a diminishing factor determined by the previously mentioned spread would bring the actual ownership rate per age group down each year of the forecast. **Figure 2** helped visually and arbitrarily determine what the diminishing factor should be for each age group for each year. For example, year 9 saw the crossing of the minimum income for median value property with the upper quartile earning 35-44 y.o households. This signalled the point where no more households from this age group

would be able to afford the averagely desirable property and helped set the diminishing factor accordingly.

This methodology could be qualified as simplistic, but the model being a fairly low resolution one, it has nevertheless managed to illustrate the decline of homeownership as the gap between prices and earnings increases.

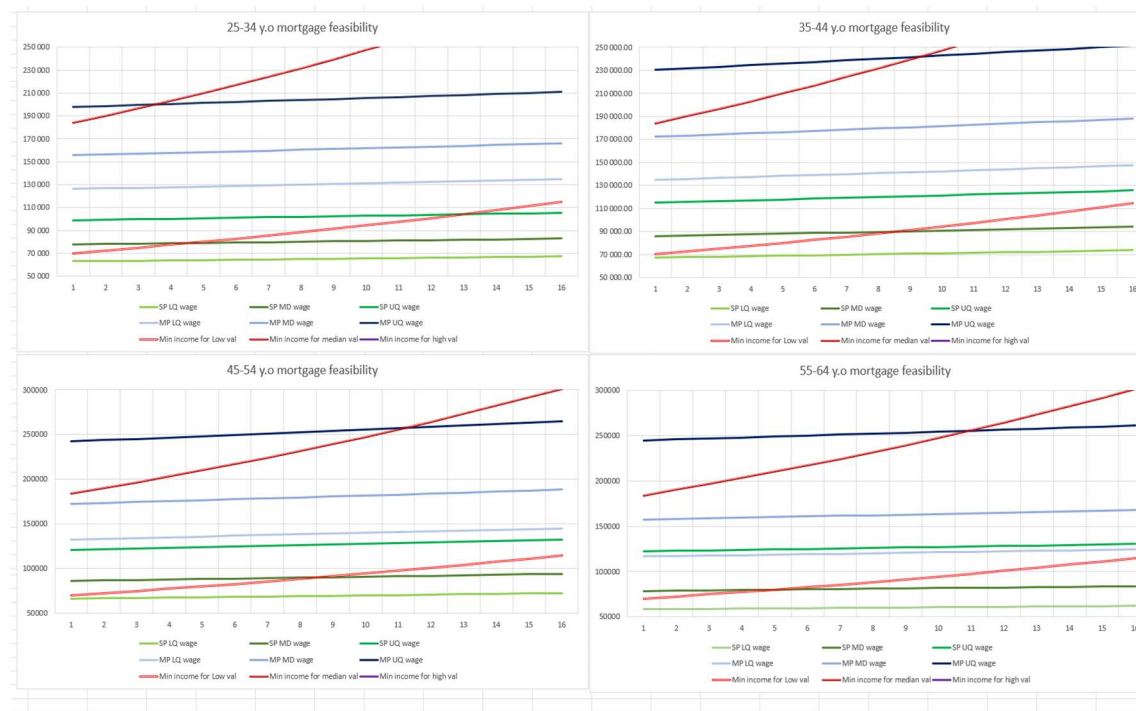


Figure 2: Forecasted mortgage feasibility per age group

4.1.2 Inheritance and ageing

Every year in a steady 34'697 homeownership persons from the over 65 y.o groups pass away, resulting in a loss of homeownership in 80% of cases. It had been discussed during an interview with a senior mortgage analyst that a safe assumption would be of considering that only 20% of these deaths would result in an heir recovering the house as main residence, or the surviving spouse retaining the property. The 20% of cases were added to the homeownership households from the 34-44 y.o and 45-54 y.o to in a 35-65% proportion simulate inheritance of owned houses. This dynamic induced a natural reduction of 32'266 homeownership households per year.

As shown in **Figure 1** the outcome of the base case scenario sees homeownership rates falling down to 26.2% in 2036. The value of the base case scenario was not in forecasting an exact homeownership rate but rather successfully illustrating the trend by using quite representative data of the Swiss population and real estate prices. Indeed, any modification in the diminishing factor would lead to largely different results. Despite this

statement, in a model where interest rates do not put a stop to price increases, the outcome can be deemed fairly satisfactory. Moreover, the interview with the experts helped provide confidence that if prices continued rising the homeownership rates would substantially fall in a 15-year time frame.

4.2 Land lease scenario

As explained in the methodology, the land lease scenario would take the exact same variables as the base case but with two major modifications. The first modification needed was to adjust the property prices to account for distinct property. Indeed, the experts in interviews 2 and 3 and the study on land lease by Wüest Partner (2017) say that land had anywhere between 30 and 50% of the value of a full property. To take an average case for the model, it was chosen to assign a 40-60% split of value between the land and the building. Since this part of the model was focusing on leasehold property, the property valuations from the base case scenario were multiplied by 60% to reflect the value of condominium lots bought under a land lease agreement. The threshold wages being a function of these prices, were automatically adjusted to reflect the required income to buy the leasehold property. As illustrated by **Figure 3**, the resulting spreads between threshold wages and actual wages were much tighter than in the base case and implied that more households could afford property and that the window of opportunity would be open for many more years. For the full comparison between income spread between both scenarios, see **Appendix 16**.

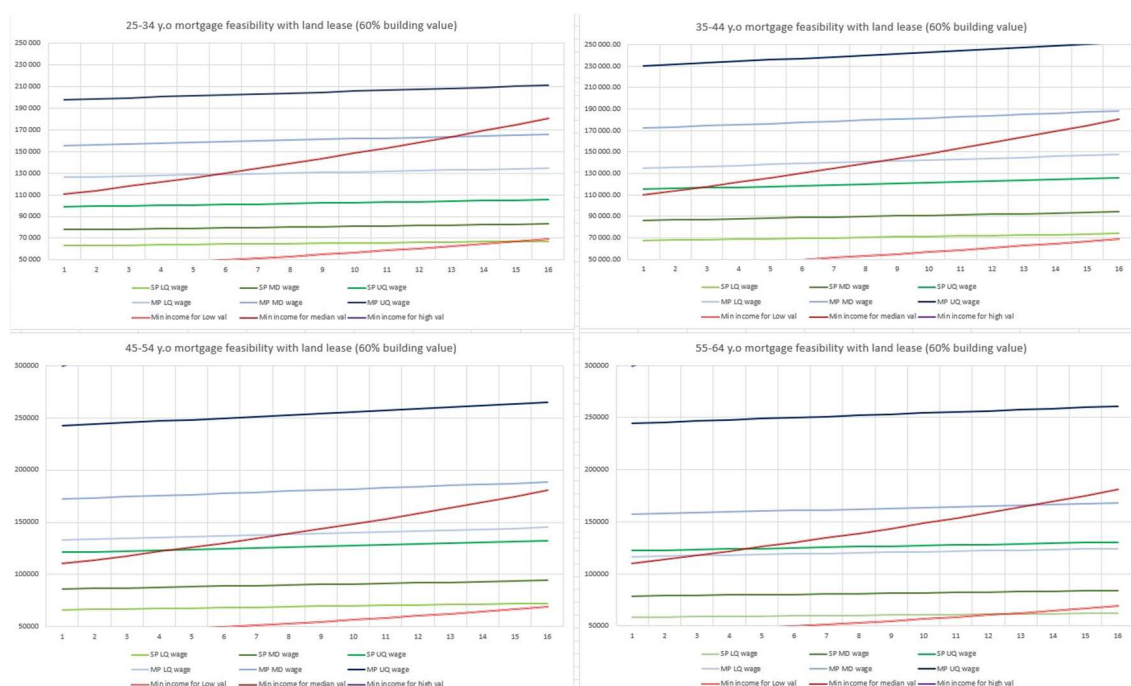


Figure 3: Forecasted mortgage feasibility per age group with land leases

4.2.1 Willingness to buy leasehold property

The second modification compared to the base scenario, is that the willingness factor was no longer held constant. Indeed, to reflect a more prudent or moderate adoption of land leases, this model had to account for the potential variations in willingness to own leasehold property across all types of households across all age groups. These variations could be explained by differences in perception of this less common ownership model, or by the ability to own freehold property for the high earning households for example. Hence, each type of household from each group (LQ earning, MD earning, UQ earning for both single person and multi-person households) would have assigned different willingness factors, and who would evolve differently. Each individual factor would be weighted to the given household's share of its age group population, in order to find the proportion of each age group that would become homeowners each year. Finally, the model integrated a fixed probability coefficient to account for those households willing to buy, financially able to do so but who just can't find the right property they wish to buy. For this purpose, a panel data of ZHAW study from 2022 was used. Indeed, in that study 61.6% of respondents financially able and willing to buy property affirmed they just hadn't found a home that suits them. In order to represent this challenge induced by the limited availability of property, a 39.4% probability (1-0.616) would multiply the proportion of household willing and financial able to buy the leasehold property. The new homeownership households each year were determined by the below formula, and added to the existing homeownership households, whilst considering the movement of households between age groups.

$$New\ HO\ year_t = \sum (Household\ type_i\ \% \ of\ age\ group_n \times willingness\ coef\ f_{i,n} \times 0.394)$$

Interview 3 (**Appendix 20**) was instrumental in defining these factors since precious insights were given by the CFO of the firm that is using this model currently. The interviewee said that for people close to their 50's or over, leasehold property is less attractive shown by the negative perception of the model that he has seen with more senior people. The interviewee also mentioned that for single person households this made less sense too, since people tend to turn to ownership once they have a life project with their partner. Most importantly, the interviewee said from experience that mostly couples in their 30's or 40's earning median levels of income were really eager to adopt the model. Finally, the interviewee suggested that up to 50% of the households falling in this category would be willing to buy lease hold property, hence the maximum willingness coefficient was set to 50%. For any given household type, the coefficient would start low if they could still buy freehold property or high if they are in the LQ or MD multi-family

from age group 25-34 and 35-44. Alternatively, single person households had willingness factors close to 0. For detailed factors and explanations, please see [Appendix 17](#).

4.3 Effects of the adoption of the land lease model

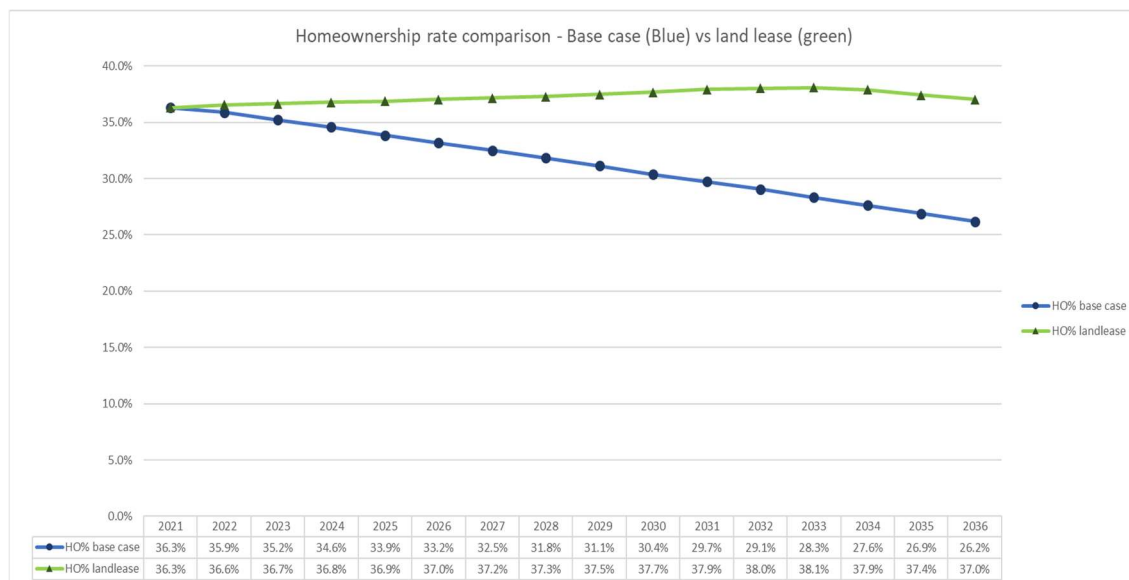


Figure 4: Forecasted evolution of ownership rates - base case scenario vs land lease scenario

By comparing the outcomes between scenarios, it can be seen that this moderate adoption of leasehold property by households has a significant effect on ownership rates. Indeed, over the 15-year projection, the land lease scenario manages to preserve homeownership in the country with a 0.7% increase from 2021 levels and avoids the rates being 10.85% lower as shown in the base case. Moreover, as illustrated in **Figure 5** the model also largely impacts the age groups where homeownership happens. Currently, homeownership is widespread from 45 years of age and onwards whilst land the land lease model as intended, opens up this opportunity in the early 30's and sees half of households with people in their late 30's or early 40's being homeowners.

	2021 - both scenarios			2036 - Base case			2036 - Land lease scenario			HO% deltas in pp.	
	Total HH	HO HH	HO% per age	Total HH	HO HH	HO% per age	Total HH	HO HH	HO% per age	2021	2036 base case
25-34	1 121 390	112 532	9.4%	1 114 295	57 028	5.12%	1 114 295	137 670	12.35%	2.95%	7.24%
35-44	648 446	203 521	29.4%	1 100 196	208 045	18.91%	1 100 196	549 861	49.98%	20.58%	31.07%
45-54	542 764	246 258	42.5%	680 748	213 450	31.36%	680 748	234 411	34.43%	-8.07%	3.08%
55-64	645 049	350 510	50.9%	530 438	227 703	42.93%	530 438	233 242	43.97%	-6.93%	1.04%
65-74	499 015	288 204	54.1%	308 700	178 288	57.75%	308 700	178 288	57.75%	3.65%	0.00%
75+	533 464	247 391	43.4%	530 807	246 159	46.37%	530 807	246 159	46.37%	2.93%	0.00%
Total HH	3 990 128	1 448 416	36.3%	4 265 184	1 116 900	26.19%	4 265 184	1 579 631	37.04%	0.74%	10.85%

HH = Households
HO HH = Homeowning Household
HO% = Homownership rate

Figure 5: Comparison on homeownership in terms of households and ownership rate per age group (2021 vs 2036 base case vs 2036 land lease)

To conclude the brief result analysis, the modest and relatively prudent forecasting of leasehold adoption shows great potential. Indeed, the model does not reflect homeownership rates rising by 20 pp in less than 20 years as was the case in the Netherlands following their modernization of their leasehold policy (Luca & Geis 2021). Instead, due to the aggressive decline produced by the base case, added to a modest adoption of the model in Switzerland, and considering the current struggle to find appropriate housing, the model forecasts homeownership levels remaining stable. In absolute terms, in 15 years an extra 131'215 households would be able to find a property to their liking, that they can afford, and through which they can satisfy their ideal of being homeowners. Additionally, should construction continue at the same rhythm from the 2010 decade over this period, approximately 279'000 new dwellings should be added to the market. This suggests that perhaps sufficient land lease projects could be done to put on offer the 131'215 lots needed for these households to purchase.

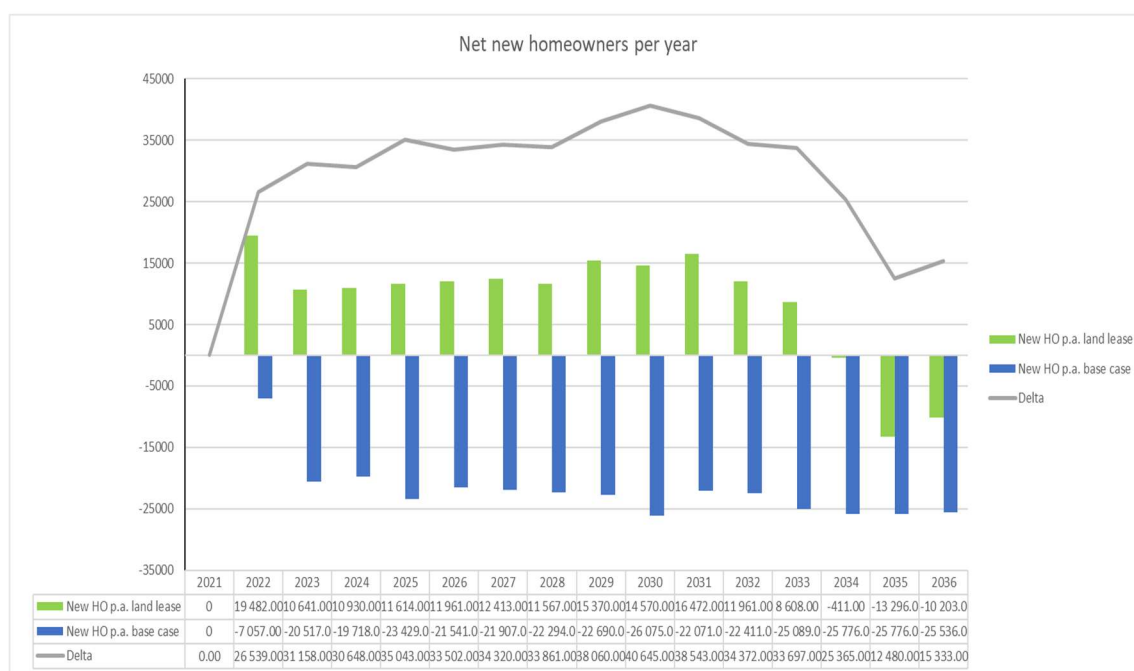


Figure 6: Absolute annual variation of households in homeownership status (Base case vs Land lease)

5. Discussion

5.1 The value of the findings

The main contribution of this study lies in its dedication to work with data that is particularly representative of the Swiss population and real estate market. While it may seem predictable that the use of an ownership model fractioning the acquisition price of property would boost homeownership, the study goes beyond assumptions and undertakes the challenge of substantiating this claim through a robust forecasting model. Indeed, the forecasting model respects Swiss household compositions, other demographic dynamics, wage levels, construction constraints, representative wage levels, and adheres to the Swiss norms for mortgages. This comprehensive approach makes the uniqueness of this study. Moreover, the solution being leveraged is already in use in Switzerland and has proven to substantially promote ownership in other economies. Additionally, all 3 expert interviews concluded that expanding the land lease model would be realistic, would most likely not pejorate the credit risk situation, and would not require any legal modifications or additional technical infrastructure to be set up. Indeed, should land owning actors wish to expand the offering of condominium lots under land lease agreements, there would be no obvious constraints that would prevent this solution from halting the impending loss of private homeownership in the country.

Nevertheless, the forecasting models made use of data from 10 different FSO studies, all containing their respective limitations, differences in methodology and error margins. Furthermore, over 15 major assumptions were set to simplify the construction of the model. These simplifications largely influenced the direction of the forecasts and could have made the outcomes too extreme for the base case scenario and perhaps too prudent for the land lease one. Regardless, extensive efforts were made to challenge the results induced by most assumptions with standalone figures or statistics from other studies, and when no documentation was found on a particular aspect, the use of critical thinking was used in good faith.

5.2 **Recommendations and motives to expand the land lease model**

5.2.1 Households

The literature review conducted for this study helped to identify that homeownership is a widespread ideal amongst individuals. Despite not being the predominant determinant of quality of life, owning property is shown to be a common life goal for many individuals

and is usually forgone for lack of financing opportunities. This claim is illustrated by the average homeownership rate across OECD countries standing in the mid-70%, whilst Switzerland with its peculiar mortgage system has an ownership rate of half of this average. Interviews 1 and 3 helped to understand that the situation is bound to substantially worsen in years to come since institutional investors have become more aggressive and are seen to overbid to acquire property for rental investment and driving prices ever higher in the process. Furthermore, the political will to densify creates self-sustaining price floors under which prices are very unlikely to fall. Consequently, prospective homeowners, especially in the younger age groups of the populations, face limited prospects of achieving their ideal without any alternative solution. But, as demonstrated by the forecasts, leasehold property opens ownership to many households and keeps affordability at reach for many more years than for full ownership.

The main outstanding question is whether households would be willing to seize this opportunity if sufficient projects were on offer. To address this question, we must look at what types of households may struggle to get financing on freehold property especially if willing to make a life in urban centers. As demonstrated in the results section, there is a substantial number of households that would be prime candidates for leasehold property. However, the model not being widely democratized in Switzerland and little promotion being made for it, Swiss households may initially be slightly reluctant in adopting the model. To facilitate informed decision making about buying in, it should be demonstrated that in the same location and for the same typology of dwelling, leasehold property offers long term cost advantages over renting. Since tenant protection is quite strong in Switzerland and that rents seem to have contained rises, the comparison would largely depend on the lease interest and the modality of the repurchase value agreement at the end of the land lease (Bourassa & Hoesli 2006; SNB 2023; Wüest Partner 2017). As a general rule, provided that interest rates are not particularly high, that the lease interest is indexed to anything but the market value of the land, and that a repurchase value neighbours 90%, leasehold property would definitely be cheaper than renting. Additionally, when considering the favourable tax treatment of having debt, the claim would prove to be true in a majority of use cases.

As for the psychological perception of the model, the expert interviewed in interview 3 suggested that with the upward construction in urban areas, most households have no physical connection with the ground and would not perceive the value of paying for it. This claim is quite relatable since land prices are extremely elevated in urban areas and the exploitable land is largely sacrificed to expand the surface area of the building. This exceptionally relevant in condominiums, where individuals can hardly exploit the land

without the unanimous agreement of the other owners. In this respect, it can be hardly contested that overpaying for land would make any economic sense for households, thus promoting the use of leasehold property. Moreover, the psychosocial studies explored in the literature review, demonstrate that households tend to overvalue the benefits of becoming homeowners and usually pay a “homeownership premium” in cases where renting is less costly than owning. This observation coupled with the widespread adoption of the model in the Netherlands, could suggest that leasehold property could gain even more success in Switzerland than what was forecasted by the simulation in section 4.

5.2.2 Landowners – Municipalities or institutional investors

Another reason for prudently comparing the results achieved in the Netherlands with what could happen in Switzerland, is that the share of land owned by public authorities largely varies between both countries. Indeed, Swiss publicly owned rental dwellings represent only 7% of the total dwellings according to the FSO (2022). In contrast, Ploeger & Bounjouh (2017) report that public authorities were the prominent landowners in the Netherlands. This notable difference suggests that other actors should join the public authorities in using and promoting the land lease model.

But first, for public authorities there could be several reasons to use the lease model for the specific montage proposed in the study. Indeed municipalities already participate in rental property, meaning they commit more capital and potentially get poor return given their mission to promote affordable housing through moderate rents. By transitioning a portion of their current residential portfolios to the land lease model, they could achieve higher returns with lower capital commitments. Looking ahead, public authorities could leverage this model for most of their future lots planned to be used for residential property, thereby shifting the building costs to households seeking ownership. Furthermore, if a high demand ensues and especially so if demand grows rapidly, it could be challenging for authorities to supply sufficient lots under land lease agreements. Consequently, institutional actors such as real estate promoters, funds and private partnerships would need to supply the remaining lots.

Admittedly, these actors are currently struggling to obtain desirable returns on rental property given the high prices of freehold property. According to the information obtained in interview 3, these investors could obtain desirable inflation hedged returns by committing less capital and less time through the land lease model. Indeed the actors could transition their existing rental property into condominium lots sold to households

under land lease agreements. However, this could pose some administrative challenges since some current tenants may not be willing or able to buy the leasehold lots and cannot be forced to leave. Alternatively, the institutional investors could acquire land from private individuals owning a significant portion of investment property in Switzerland as shown in **Appendix 2**. These private owners of rental investment property would be increasingly inclined to sell their investments as more policies requiring renovations to meet energy efficiency standards are implemented in the country. Indeed, the financial effort of the renovations would be significant for them, and the extra rent they could charge would be limited by the tenant protection laws. Moreover, the institutional investors themselves would benefit from sharing the financial burden of energy renovations with private households by transitioning their existing rental properties to the land lease model and selling the lots to households. Also, the expert interviewed in interview 3, suggested that the land lease model makes most sense for the investor in areas where vacancy rates are nearing housing shortage points. With the planned densification of urban areas, more cities could reach these levels, giving place to more institutional investors willing to exploit the model. The interviewee added that there would be a market of tens of thousands of households potentially ready to buy in to the model if properly promoted, meaning that institutional investors would have no apparent reasons to not work with it.

5.2.3 Why the land lease model should be adopted

To conclude this section, the promotion and expansion of the land lease model would require both public and institutional investors to adopt it and should in theory have sufficient households willing to buy the lots in urban areas. Moreover, and despite not being formally proven, the land lease model could help to share the load of future energy renovations costs in the Swiss real estate market, offering a more diverse and sustainable housing stock. This solution also satisfies the densification of urban areas as required by the spatial planning act and does so by potential easing the overbidding practices currently observed. Indeed, experts from interview 1 have acknowledged the potential on the energy renovation front, and the expert from interview 3 has acknowledged that the land lease model creates a new segment in the property market. Indeed, he mentioned that with the expansion of the model, it could be expected that condominium prices would ease off given the new supply proposed through land leases. In addition, a certain rise in vacancy rates in the rental property segment could ease prices there as well. From a micro economic standpoint, his claims do make sense as

the supply of a lower cost substitute good translates in the decrease in demand and price of the initial good.

5.3 Improvement points and future research

The current research has achieved its primary goal through a fairly low resolution but quite representative modelization of the actors and interactions expected in the Swiss real estate market. However this research fails to consider the reality of the land and actual typologies for property. Hopefully, some researchers specialized in spatial planning and urbanization could build upon it and get a more realistic depiction of how the increasing use of land leases would be executed in a given urban centre such as Basel, Zurich, or Geneva for example.

Moreover, the willingness factors that defined the ownership trends were set arbitrarily in a controlled environment. To add to the credibility of the model, a survey on a large sample of tenants would have been quite precious to have real market participants defining the variables of the model. Likewise, interviews with additional experts such as urban planners, public housing officials, and opponents of the land lease model could have allowed for a more holistic overview and add more granularity to the findings. Interviews with some of this typology of experts were planned but failed to materialize in time to be exploited.

End to end, the thesis mixed a series of true to life data with a series of subjective assumptions leading hopefully to a comprehensive conclusion. The aim of the study never was to argue that homeownership is a net good for people, or that renting is an inferior choice of tenure. In reality, the aim was to find a desirable outcome for people wishing to own property in a country where rigorous, but extremely valuable and effective financing norms lead to an exclusion of many households from this outcome.

6. Conclusion

The above body of research has reached satisfying conclusions in the way of finding a conceptual solution that can ensure homeownership opportunities for today's young professionals and other prospective homeowners in Switzerland. As a full package the study highlights the forces at play in the real estate market, reviews the reasons for the tightness observed in Switzerland, identifies psychological implications linked to ownership, proposes solutions that could be leveraged, and tries to predict the future outcomes expected in the Swiss context.

By building a low-resolution forecasting model that managed to reproduce the expected interactions in a real estate market quite successfully, the study reached the conclusion that the expansion of leasehold property can help in reversing the impending loss of private ownership in Switzerland. The resulting recommendations emerged from fruitful discussions with high level industry experts specialized in real estate investment, mortgage credit risk analysis, and use of the land lease model for investment.

Finally, during the 6-month period the study was conducted, many local news outlets and various television reports have documented the struggle of households in achieving homeownership in Switzerland. This unprecedented coverage of the problematic had me thinking that the market could be at a turning point, and that some new solutions would soon be unlocked. Hopefully, this study can help prospective homeowners to understand what has shaped the current situation and will have them being on the lookout for leasehold property developments. Perhaps that signalling to real estate operators, or public authorities that a substantial demand exists outside of rental properties, will have these actors creating the necessary offering.

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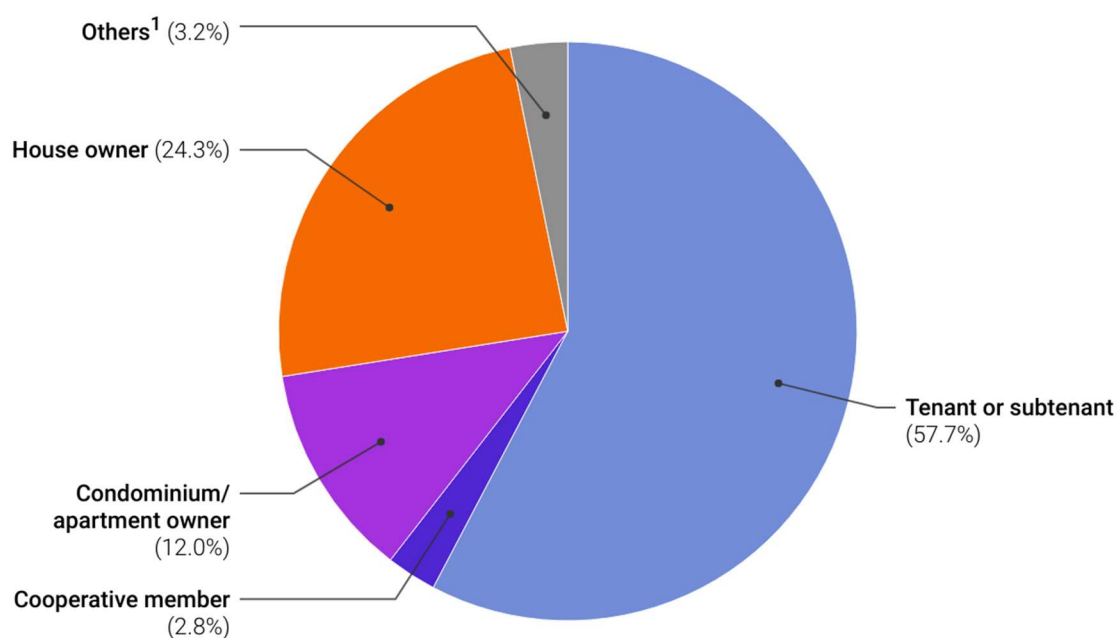
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Appendix 1: Share of households per tenure type

Occupancy status of occupied dwellings, 2021



¹ Dwelling provided free of charge by relative or employer, employee accommodation (e.g. caretaker dwelling), lease.

Sources: FSO – SS, BDS

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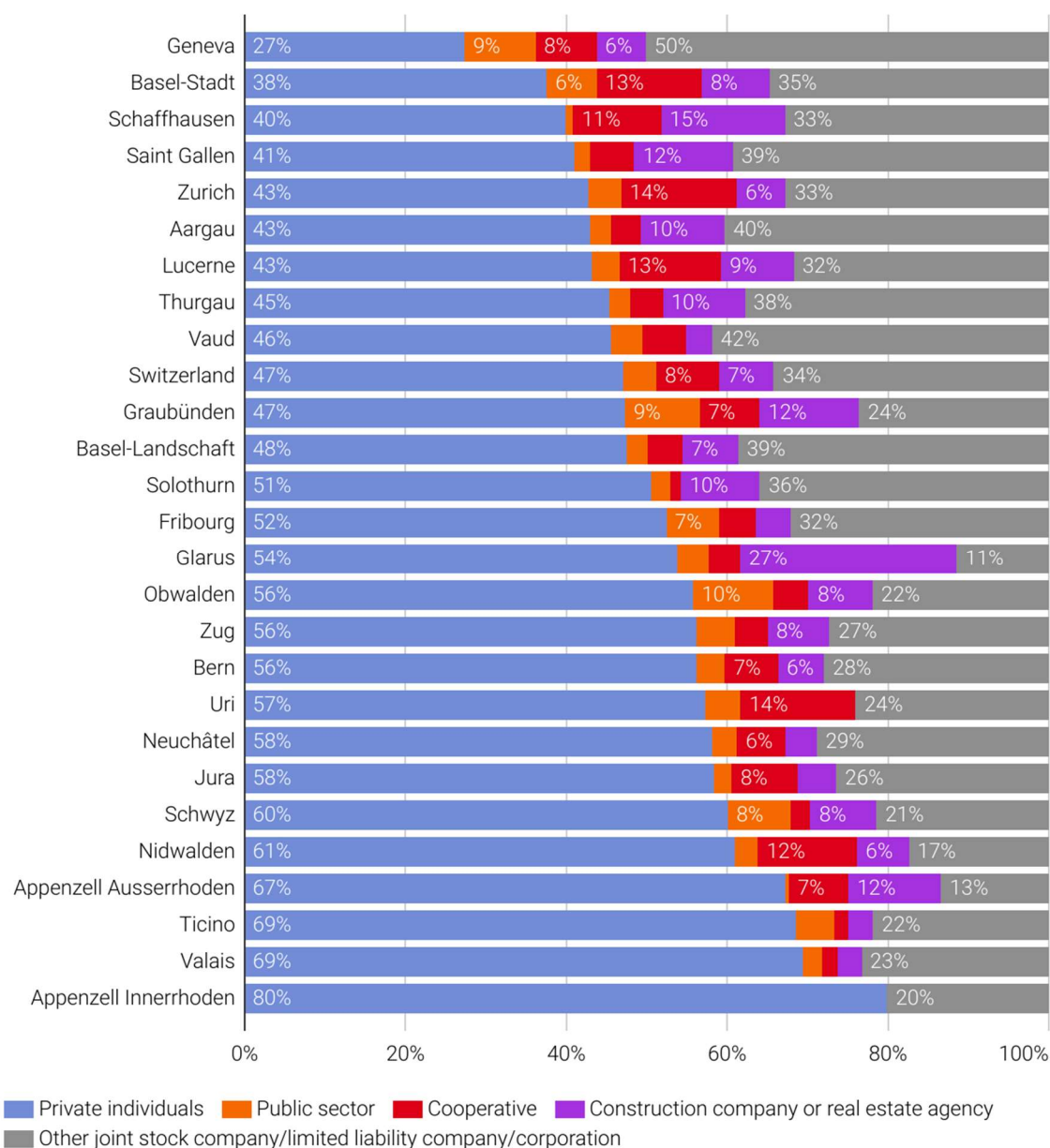
Figure 7: Occupancy status of occupied dwellings, 2021

Source: OFFICE FÉDÉRAL DE LA STATISTIQUE. Statut d'occupation des logements occupés, en 2021. Office fédéral de la statistique [online]. 2023. [Accessed 26 February 2023]. Available from: <https://www.bfs.admin.ch/bfs/fr/home/statistiques/construction-logement/logements/conditions-habitation/locataires-proprietaires.html>

Appendix 2: Owners of rented dwellings

Type of owners of rented dwellings, per canton

2020–2022 cumulated



Source: FSO – rental index

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Figure 8: Types of owners of rented dwellings, per canton

OFFICE FÉDÉRAL DE LA STATISTIQUE. Logements de Locataires. Office fédéral de la statistique [online]. 2023. [Accessed 25 February 2023]. Available from: <https://www.bfs.admin.ch/bfs/fr/home/statistiques/construction-logement/logements/logements-locataires.html>

Appendix 3: Homeowners by age

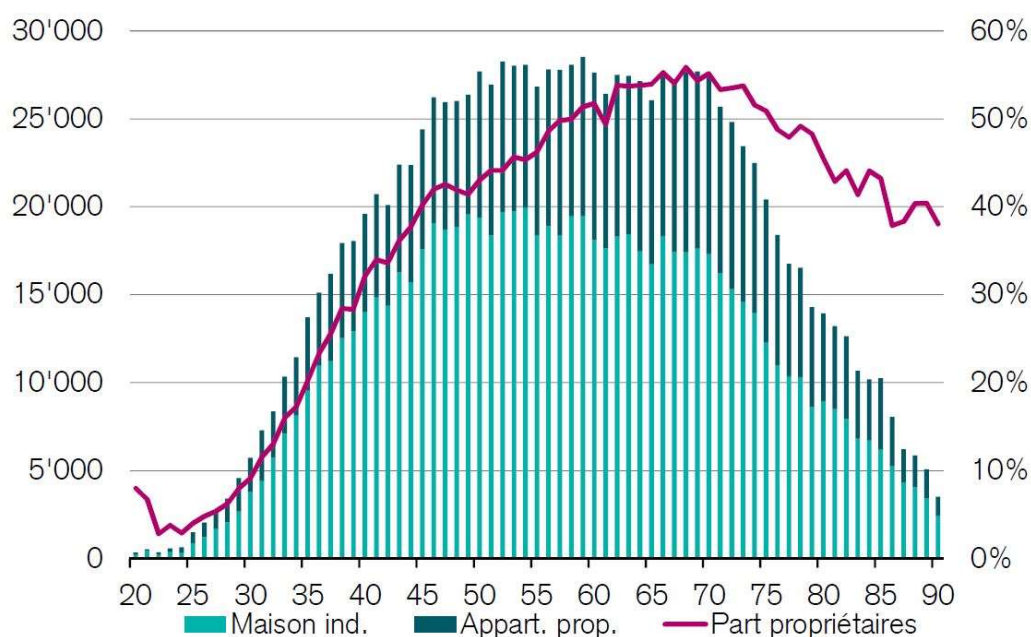
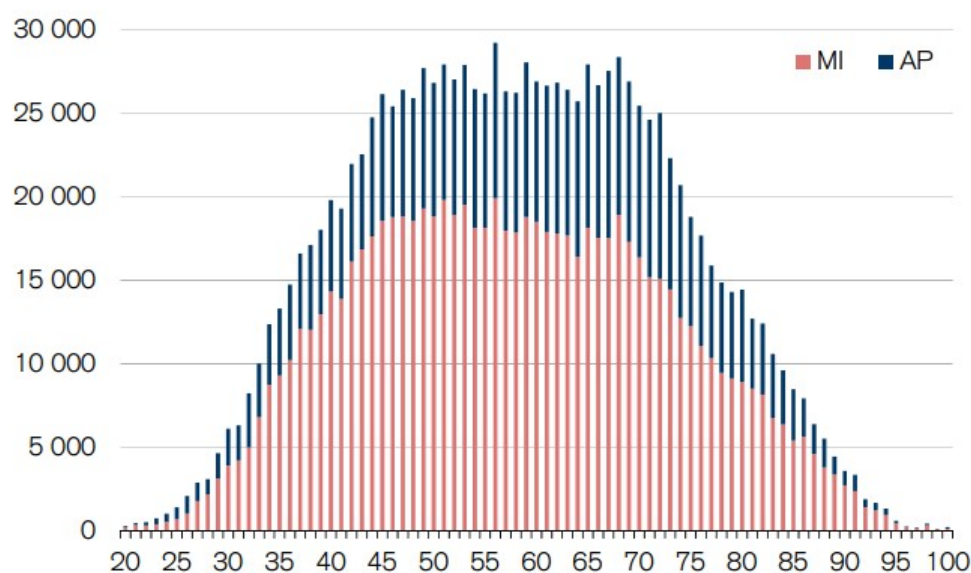


Figure 9: Distribution of homeownership by age

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Fig. 3: Nombre de propriétaires par âge

Nombre de propriétaires par âge



Source: Office fédéral de la statistique, Credit Suisse

Figure 10: Distribution of homeownership by age with more granularity

Appendix 4: Real Estate Price Index

	Residential property prices ²										Rents									
	Privately owned apartments					Single-family houses					Apartment buildings (residential investment property) ³					Rental housing units				
	Swiss Federal Statistical Office	Fairlander Partner	IAZI	Wuest Partner	Wuest Partner	Swiss Federal Statistical Office	Fairlander Partner	IAZI	Wuest Partner	Wuest Partner	Fairlander Partner	IAZI	Wuest Partner	Wuest Partner	Wuest Partner	Wuest Partner	Wuest Partner	Wuest Partner	Wuest Partner	Wuest Partner
Annual average 2000 = 100	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price	Transaction price
2000	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2001	101.8	102.2	104.3	100.5	104.8	101.9	100.9	101.9	101.9	101.9	101.9	101.9	101.9	101.9	101.9	101.9	101.9	101.9	101.9	101.9
2002	103.7	102.7	112.4	101.7	102.1	108.6	100.8	103.8	102.2	103.2	108.8	102.2	103.2	108.8	102.2	103.2	108.8	102.2	103.2	108.8
2003	107.9	104.4	119.5	104.2	103.9	103.2	109.8	102.2	103.2	109.8	102.2	103.2	109.8	102.2	103.2	109.8	102.2	103.2	109.8	102.2
2004	112.8	105.9	122.5	110.2	103.7	104.8	112.4	105.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9
2005	117.7	108.6	125.2	115.7	108.3	105.5	113.6	109.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9	109.9
2006	124.7	111.8	127.0	123.7	113.5	109.9	116.6	116.6	116.6	116.6	116.6	116.6	116.6	116.6	116.6	116.6	116.6	116.6	116.6	116.6
2007	133.0	121.0	130.2	133.5	120.5	117.3	118.9	123.5	123.5	123.5	123.5	123.5	123.5	123.5	123.5	123.5	123.5	123.5	123.5	123.5
2008	140.0	129.9	135.5	139.7	125.4	128.4	122.1	128.1	128.1	128.1	128.1	128.1	128.1	128.1	128.1	128.1	128.1	128.1	128.1	128.1
2009	145.7	131.6	144.2	144.5	130.3	127.5	128.2	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7	128.7
2010	162.8	132.2	151.7	152.8	141.9	127.9	134.2	132.3	132.3	132.3	132.3	132.3	132.3	132.3	132.3	132.3	132.3	132.3	132.3	132.3
2011	170.0	138.5	159.0	168.1	148.4	134.1	139.7	140.7	140.7	140.7	140.7	140.7	140.7	140.7	140.7	140.7	140.7	140.7	140.7	140.7
2012	180.3	154.9	167.2	177.2	153.5	150.5	144.9	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5
2013	199.1	165.6	172.8	188.1	164.9	155.6	151.6	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9	151.9
2014	206.5	170.5	176.7	191.0	168.9	159.5	153.6	156.0	156.0	156.0	156.0	156.0	156.0	156.0	156.0	156.0	156.0	156.0	156.0	156.0
2015	208.5	172.8	179.4	194.2	172.5	161.9	157.1	160.1	160.1	160.1	160.1	160.1	160.1	160.1	160.1	160.1	160.1	160.1	160.1	160.1
2016	208.0	178.6	181.1	192.0	171.2	162.6	159.1	162.7	162.7	162.7	162.7	162.7	162.7	162.7	162.7	162.7	162.7	162.7	162.7	162.7
2017	199.6	183.6	181.5	191.7	164.9	167.2	162.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9	165.9
2018	213.8	185.0	178.0	198.8	174.5	171.7	164.8	170.9	170.9	170.9	170.9	170.9	170.9	170.9	170.9	170.9	170.9	170.9	170.9	170.9
2019	100.0	219.2	188.0	175.1	201.5	172.3	165.6	177.0	177.0	177.0	177.0	177.0	177.0	177.0	177.0	177.0	177.0	177.0	177.0	177.0
2020	102.2	227.6	192.5	174.4	207.4	177.0	169.5	184.7	184.7	184.7	184.7	184.7	184.7	184.7	184.7	184.7	184.7	184.7	184.7	184.7
2021	107.8	238.0	201.6	177.6	221.2	186.1	180.0	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
2022	113.8	253.0	210.6	181.9	235.9	198.2	188.5	212.3	212.3	212.3	212.3	212.3	212.3	212.3	212.3	212.3	212.3	212.3	212.3	212.3

2006 Until Q3 2005, advertisements in print media were used exclusively for calculating the index. From Q4 2005, data collection also covers advertisements from websites.

1 For asking prices, the annual indices are calculated using a weighted arithmetic mean of the quarterly indices. The weighting for each quarter varies according to supply quantiles. For transaction prices, the annual indices are calculated using an unweighted arithmetic mean of the quarterly indices.

2 Quality-adjusted transaction prices using the hedonic pricing method for a reference property in the middle segment.

3 Index 2010 = 100

4 Index 2019 = 100

Sources: Fairlander Partner, IAZI, Swiss Federal Statistical Office (SFSO), Wuest Partner

Figure 11: Real Estate Prices indices

SNB. Real estate price indices – total for Switzerland – by year . SNB [online]. April 2023. [Accessed 5 April 2023]. Available from: <https://data.snb.ch/en/topics/uvo/cube/plimoincha?fromDate=2000&toDate=2022&dimSel=D0%28EW%2CEH%2CMH%2CMW%2CBF%2CGF%2CVF%29%2CD1%28TP3%2CTP1%2CTP2%2CAP%2C>

Appendix 5: Example of mortgage financing plan and required documents for credit assessment

Financing plan of typical primary residence purchase of current median value

- Purchase price (100%): CHF 1'180'000.-
- Equity (20%): CHF 236'000.- of which maximum CHF 118'000 (10%) of pension withdrawals to be repaid at 1% p.a. in 15 years.
- Total Mortgage (80%): CHF 944'000.- of which CHF 177'000 (15%) as 2nd rank to be amortized at 1% p.a. in 15 year or at maximum before retirement age.
- Notary and mutation fees (5%): CHF 59'000.- to be paid outright at the conclusion of the purchase.

N.B: Banks usually lend 80% of the value for main residence properties, but insurance companies are mostly willing to finance 65% as subordinate debt is deemed too risky for their asset base.

List of mandatory documents for mortgage applications

- **Tax reports for the previous 3 years:** To assess the borrower's assets, perennity of income, other liabilities, and to have a general idea of their disposable income.
- **Salary certificates for the previous 3 years:** To assess the income level and compute the variable compensation value if bonuses vary greatly. Bonuses can be fully accounted for if they are contractual, 50% if they vary moderately, or disregarded if their variation is too big as per the bank's credit assessment policies.
- **Original official attestation from the local enforcement office:** To see if the borrower has had defaults or credit issues in the past, and if any outstanding overdue liabilities exist.
- **Pension foundation statement:** In case pension assets are used as equity, the statement will allow the bank to see what share of the assets are eligible for withdrawal.
- **Account and 3rd pillar account statements:** For corroboration of down-payment.

Appendix 6: Gross monthly wage (median and quartile range) by age for year 2020

Synthesis of results

- Under 20 y.o: Median CHF 4'395; Quartile range CHF 3'943-4'773
- 20-29 yo: Median CHF 5'301 ; Quartile range CHF 4'599-6'270
- 30-39 y.o: Median CHF 6'665 ; Quartile range CHF 5'386-8'382
- 40-49 y.o: Median CHF 7'311 ; Quartile range CHF 5'661-9'944
- 50-64/65 y.o: Median CHF 7'436 ; Quartile range CHF 5'803-10'127
- Over 64/65 y.o: Median CHF 6'557 ; Quartile range CHF 4'860-10'193
- Total: Median CHF 6'665 ; Quartile range CHF 5'250-8'861

Gross monthly wage (median and quartile range) by age, professional position and gender															
Private and public (Confederation, cantons, districts, communities, corporations) sectors combined, Switzerland 2020															
Age	Professional position														
	Total									1+2					
	Total			Women			Men			Total			Women		
	Median	Quartile range		Median	Quartile range		Median	Quartile range		Median	Quartile range		Median	Quartile range	
TOTAL	6 665	5 250 8 861		6 211	4 850 8 057		6 963	5 562 9 475		10 531	7 658 14 316		9 249	6 666 12 341	
Under 20 years	4 395	3 943 4 773		4 353	3 924 4 696		4 443	3 967 4 867		*	*	*	*	*	*
20 - 29 years	5 301	4 599 6 270		5 192	4 486 6 242		5 379	4 693 6 289		6 458	5 158 7 980		6 330	5 117 8 065	
30 - 39 years	6 665	5 386 8 382		6 494	5 077 8 105		6 763	5 566 8 581		8 942	6 962 11 585		8 633	6 470 10 867	
40 - 49 years	7 311	5 661 9 944		6 767	5 040 9 000		7 685	6 006 10 584		11 342	8 370 15 180		10 347	7 500 13 725	
50 - 64/65 years	7 436	5 803 10 127		6 702	5 103 8 754		7 958	6 235 11 057		11 622	8 498 15 600		10 012	7 059 13 003	
Over 64/65 years	6 557	4 680 10 193		5 867	4 340 8 125		7 109	4 982 11 517		8 791	5 416 13 485		7 278	4 907 10 913	

Figure 1: Gross monthly wage table from FSO study T9_B

OFFICE FÉDÉRAL DE LA STATISTIQUE, FSO. Gross monthly wage by Economic Division (NOGA08) - private and public sectors combined - Switzerland [T1_b] - 2008, 2010, 2012, 2014, 2016, 2018, 2020: Tableau. Office fédéral de la statistique [online]. 28 March 2022. [Accessed 13 April 2023]. Available from: <https://www.bfs.admin.ch/bfs/fr/home/statistiques/travail-remuneration/salaires-revenus-cout-travail.assetdetail.21224921.html>

Appendix 7: Monthly household revenue and savings by age of the reference person

- Obs. A): *The 45-54 y.o group* had a steady distance from the mean throughout the time frames, ranging from 19.19% to 20.6%.
- Obs. B): *The less than 35 y.o group* had a highly varying distance from the mean across time frames, ranging from -8.39% ('12-'14) to -3.53% ('09-'11).
- Obs. C): *The 35-44 y.o group* had a stable variation of distance from the mean across time frames of minimum 10.44% ('06-'08) and maximum 12.18% ('12-'14).
- Obs. D): *The 45-54 y.o group* had a 6.52% increase in monthly revenue between the '06-'08 and '15-'17-time frames. The group had a 12.67% increase from '06-'08 to the maximum value. The decrease from the maximum to the '15-'17-time frame was of -5.46%. The starting monthly income for the age group was CHF 11'054 and the closing one was CHF 11'774, with a peak at CHF 12'454.
- Obs. E): *The 35-44 y.o group* had a 6.46% increase in monthly income between the '06-'08 and '15-'17-time frames. It had a 15.10% increase from '06-'08 to the maximum value. The ensuing decrease was of -7.51% from '12-'14 to '15-'17. The starting monthly income for the age group was CHF 9'955 and the closing one was CHF 10'598 with a peak at 11'459.
- Obs. F): *The less than 35 y.o group* had a 4.70% increase in monthly income between the '06-'08 and '15-'17-time frames. The revenue increase between '06-'08 and the maximum value was of 10.11%. The decrease from maximum to the closing periods was of -4.91%. The starting monthly income for the age group was CHF 8'432 and the closing one was CHF 8'829 with a peak at CHF 9'285.
- Obs. G): The average people per household in the '06-'08 period was of 2.04 for the *less than 35 y.o group*, 2.84 for the *35-44 y.o group* and 2.77 for the *45-54 y.o group*. For the '15-'17 period the average person count per household was of 2.01 for the *less than 35 y.o group*, 2.82 for the *35-44 y.o group* and 2.61 for the *45-54 y.o group*. There were no significant differences in household composition in the intermediary time frames.

NB: Mostly all figures in the above study have a coefficient of variation greater or equal to 1% but smaller than 2%. A minority of the figure have a coefficient of variation greater or equal to 2% but smaller than 5%.

rearrangement from FSO study T20.02.01.00.11																					
Income																					
Less than 34yo																					
35-44yo																					
45-54yo																					
55-64yo																					
65-74yo																					
Over 75yo																					
Delta																					
8916	2006-09	a	100.0%	8432	b	100.0%	955	b	100.0%	11054	b	100.0%	9705	b	100.0%	6275	c	100.0%	5540	c	100.0%
				dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max
				- 484	-5.73%	-2 621	1 040	10.44%	-1 098	2 138	19.34%	0	789	8.13%	-1 348	-2 660	-42.08%	-4 778	-3 376	-60.94%	-5 514
614		Delta		773			853			764			713			156			142		
930	2009-11	a	100.0%	9205	b	100.0%	10809	b	100.0%	11818	b	100.0%	10418	b	100.0%	6401	b	100.0%	5682	c	100.0%
				dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max
				- 325	-3.53%	-2 612	1 279	11.83%	-1 009	2 288	19.36%	0	888	8.53%	-1 400	-3 059	-48.18%	-5 387	-3 848	-67.73%	-6 136
534		Delta		80			650			637			945			557			446		
1064	2012-14	a	100.0%	9285	b	100.0%	11459	b	100.0%	12454	c	100.0%	11383	c	100.0%	6988	c	100.0%	6127	c	100.0%
				dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max
				- 779	-8.39%	-3 169	1 395	12.18%	- 995	2 390	19.19%	0	1 299	11.43%	-1 091	-3 075	-44.00%	-5 466	-3 936	-64.24%	-6 327
- 715		Delta		- 456			- 861			- 680			-1 231			- 131			- 203		
949	2015-17	a	100.0%	8829	b	100.0%	10598	b	100.0%	11774	b	100.0%	10132	c	100.0%	6888	c	100.0%	5925	c	100.0%
				dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max
				- 521	-5.90%	-2 946	1 249	11.79%	-1 176	2 425	20.60%	0	783	7.72%	-1 642	-2 491	-36.33%	-4 916	-3 424	-57.79%	-5 849
Delta since 06-08				396			643			721			427			583			385		
Δ from 06 to max				4 704			6 468			6 528			4 404			9 294			6 966		
Δ from 06 to max				853			1 504			1 401			1 658			713			588		
Δ from 06 to max				10 111			15 108			12 678			17 088			11 378			10 618		
Δ from max to 17				- 456			- 861			- 680			-1 231			- 131			- 203		
Δ				-4 914			-7 514			-5 468			-10 838			-1 878			-3 314		
P.a growth				0.43%			0.59%			0.59%			0.40%			0.84%			0.63%		
Savings																					
Less than 34yo																					
35-44yo																					
45-54yo																					
55-64yo																					
65-74yo																					
Over 75yo																					
Delta																					
913	2006-09	c	10.2%	1275	c	15.1%	1147	d	12.0%	1322	d	12.0%	789	e	8.1%	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max
				dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max
				361	28.34%	- 48	234	20.40%	- 175	409	30.94%	0	- 124	-15.71%	- 533	- 883	-2950.50%	-1 293	- 594	-186.20%	-1 003
270		Delta		338			579			405			46			- 93			228		
1183	2009-11	c	12.4%	1612	c	17.5%	1727	d	14.6%	1728	d	14.6%	835	e	8.0%	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max
				dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max
				429	26.61%	- 116	543	31.47%	- 1	545	31.51%	0	- 348	-41.68%	- 893	-1 246	1976.55%	-1 791	- 636	-116.14%	-1 180
227		Delta		39			261			300			656			207			- 230		
140	2012-14	c	14.0%	1652	d	17.8%	1988	d	16.3%	2027	d	16.3%	1532	e	13.5%	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max
				dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max
				242	14.64%	- 376	578	29.08%	- 39	617	30.45%	0	121	7.93%	- 496	-1 266	-877.16%	-1 883	-1 093	-344.66%	-1 710
- 121		Delta		98			- 106			- 154			- 207			- 171			6		
1289	2015-17	c	13.8%	1748	c	18.8%	1882	d	15.9%	1874	d	15.9%	1324	d	13.1%	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max
				dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max	dist from mean in %	dist from max
				460	26.29%	- 133	593	31.44%	0	584	31.17%	- 9	35	2.62%	- 558	-1 316	9945.07%	-1 909	- 966	-299.11%	-1 559
Delta since 06-08				475			735			551			535			- 57			4		
Δ from 06 to max				37.26%			64.05%			41.67%			67.75%			-188.99%			1.24%		
Δ from 06 to max				475			841			705			742			114			- 2		
Δ from max to 17				37.26%			73.29%			53.31%			94.03%			381.96%			-0.63%		
Δ from max to 17				0			- 106			- 154			- 207			- 171			6		
Δ				0.00%			-5.33%			-7.59%			-13.55%			-118.44%			1.88%		

Table 2: Monthly household revenue and savings per age of the reference person. Based FSO study T20.02.01.00.11

Appendix 8: Population in households

Age distribution of the population						
	Total	25-34 y.o	35-44 y.o	45-54 y.o	55-64 y.o	65-74 y.o > 75 y.o
People per household ¹⁷		2.14	2.01	2.82	2.61	1.93 1.6 1.44
Individuals in age class ex <15 y.o (rounded to 1'000-th)	7 321 000.00	2 046 000.00	1 212 000.00	1 240 000.00	1 184 000.00	838 000.00 801 000.00
Age class share of the observed population	100.00%	27.95%	16.56%	16.94%	16.17%	11.45% 10.93%
Households groups (based on the age of the reference person)						
	Total	25-34 y.o	35-44 y.o	45-54 y.o	55-64 y.o	65-74 y.o > 75 y.o
Individuals of each group age (in ref person's age group)	6 438 000.00	1 163 000.00	1 212 000.00	1 240 000.00	1 184 000.00	838 000.00 801 000.00
Employed 15-24 y.o	530 435.00	530 435.00				
Corrections for unemployed young adults	351 928.00	136 140.00	138 075.00	57 018.00	20 695.00	
Corrections for children < 15 y.o	1 313 868.00	508 255.00	515 482.00	212 868.00	77 263.00	
Correction for 104'513 missing vs actual population	104 513.00	39 516.00	14 935.00	15 280.00	14 590.00	10 326.00 9 866.00
Total population	8 738 744.00	2 377 346.00	1 880 492.00	1 525 166.00	1 296 548.00	848 326.00 810 866.00
Final household age distribution (Relevant for the model)						
	Total	25-34 y.o	35-44 y.o	45-54 y.o	55-64 y.o	65-74 y.o > 75 y.o
Households composition (estimated 2022)		2.19	2.12	2.9	2.81	2.01 1.7 1.52
Number of households of each age group of ref. person	3 990 128.00	1 121 390.00	648 446.00	542 764.00	645 049.00	499 015.00 533 464.00
Share of total households	100.00%	28.10%	16.25%	13.60%	16.17%	12.51% 13.37%

Figure 12: Table for the distribution of individuals into households.

Secondary data extracted from various FSO studies (references in 3. Methodology)

Appendix 9: Age projections

No of people (thousand)	Total age group	age 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	avg
101		25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
109		26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	
110		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	
114		28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	
115		29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	
121		30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	
122		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	
118		32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	
127		33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	
126		34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	
	1163		8.68%	9.37%	9.46%	9.80%	9.89%	10.40%	10.49%	10.15%	10.92%	10.83%						10.00%
120		35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	
122		36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	
124		37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
126		38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	
125		39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
124		40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
112		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	
120		42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	
121		43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	
118		44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	
	1212		9.90%	10.07%	10.23%	10.40%	10.31%	10.23%	9.24%	9.90%	9.98%	9.74%						10.00%
115		45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
114		46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	
118		47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	
120		48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	
126		49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	
124		50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	
128		51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	
132		52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	
133		53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	
130		54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	
	1240		9.27%	9.19%	9.52%	9.68%	10.16%	10.00%	10.32%	10.65%	10.73%	10.48%						10.00%
131		55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	
136		56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	
131		57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	
126		58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	
124		59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	
114		60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	
115		61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	
108		62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	
100		63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	
99		64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	
	1184		11.06%	11.49%	11.06%	10.64%	10.47%	9.63%	9.71%	9.12%	8.45%	8.36%						10.00%
92		65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	
90		66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	
82		67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	
86		68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	
88		69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
86		70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	
80		71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
76		72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	
78		73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	
80		74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	
75		75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	
70		76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	
62		77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	
67		78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	
64		79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	
59		80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	
55		81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	
52		82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	
39		83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	
37		84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	
36		85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	
33		86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	
29		87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	
23		88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	
14		89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	
86		90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	

Figure 13: Projection of ages 25 to 90 from 2021 to 2036.

Used to determine share of households of an age group leaving the group for the higher age group. Yellow cells represent the cutoff point of age groups

Appendix 10: Projection of households from 2021 to 2036

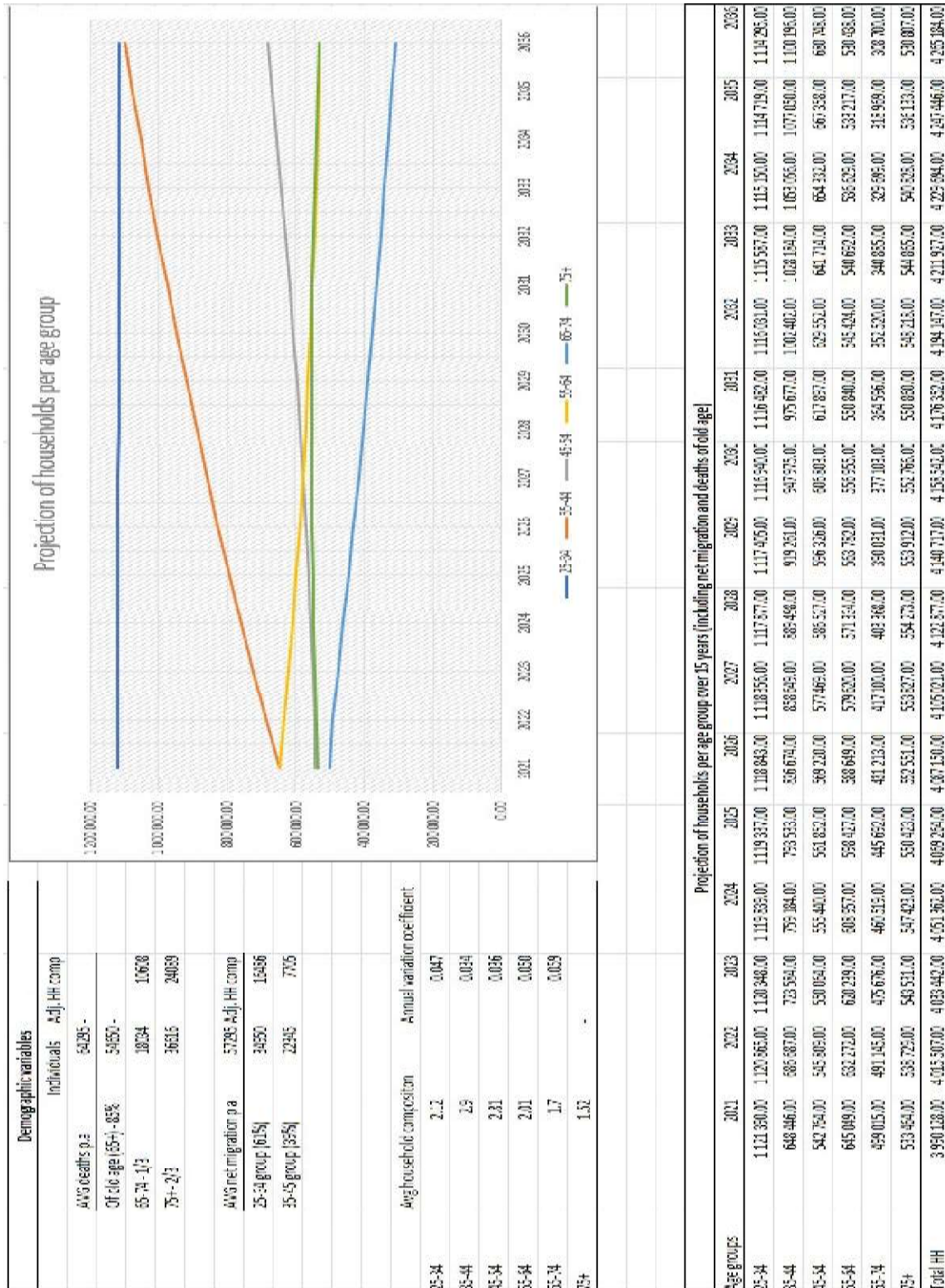


Figure 14: Projection of households per age group from 2021 to 2036, and demographic variables used.

The graph shows the dynamic of age groups through time. The Demographic variable determines demographic coefficient for deaths and net migration. Coefficients feed directly in the projection model

Appendix 11: Tenancy status of households and income levels

	Total	25-34 y.o	35-44 y.o	45-54 y.o	55-64 y.o	65-74 y.o	> 75 y.o
Proportion of households making low quartile wage		25%	25%	25%	25%	25%	Out of scope
Proportion of households making median wage		50%	50%	50%	50%	50%	
Proportion of households making upper quartile wage		25%	25%	25%	25%	25%	
LQ earning households		280 348.00	162 112.00	135 691.00	161 262.00		
MD earning households		560 695.00	324 223.00	271 382.00	322 525.00		
UQ earning households		280 348.00	162 112.00	135 691.00	161 262.00		
Total number of households	2 957 651.00	1 121 391.00	648 447.00	542 764.00	645 049.00	-	-
Single person households (37% of total households)	1 470 900.00	336 417.00	97 267.00	81 414.00	258 019.00	324 359.00	373 424.00
Lower Quartile wage (for age group)		5 258.00	5 627.75	5 531.75	4 860.00		
Median wage (for age group)		6 485.50	7 180.75	7 185.00	6 557.00		
Upper Quartile wage (for age group)		8 244.50	9 599.25	10 097.75	10 193.00		
Total yearly wage of LQ households		63 096.00	67 533.00	66 381.00	58 320.00		
Total yearly wage of MD households		77 826.00	86 169.00	86 220.00	78 684.00		
Total yearly wage of UQ households		98 934.00	115 191.00	121 173.00	122 316.00		
Multi-person households (2 working adults)	2 519 228.00	784 973.00	551 179.00	461 350.00	387 030.00	174 656.00	160 040.00
Total yearly wage of LQ households		126 192.00	135 066.00	132 762.00	116 640.00		
Total yearly wage of MD households		155 652.00	172 338.00	172 440.00	157 368.00		
Total yearly wage of UQ households		197 868.00	230 382.00	242 346.00	244 632.00		

Figure 15: Wage levels of households

LQ : Lower quartile
MD: Median
UQ: Upper Quartile

Appendix 12: Income, property price, and threshold wage projection from 2021 to 2036

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
25-34 y.o																
SP LQ wage	63 096	63 367	63 640	63 913	64 188	64 464	64 741	65 020	65 299	65 580	65 862	66 145	66 430	66 716	67 002	67 291
SP MD wage	77 826	78 161	78 497	78 834	79 173	79 514	79 856	80 199	80 544	80 890	81 238	81 587	81 938	82 291	82 644	83 000
SP UQ wage	98 934	99 359	99 787	100 216	100 647	101 079	101 514	101 951	102 389	102 829	103 271	103 715	104 161	104 609	105 059	105 511
MP LQ wage	126 192	126 735	127 280	127 827	128 377	128 929	129 483	130 040	130 599	131 160	131 724	132 291	132 860	133 431	134 005	134 581
MP MD wage	155 652	156 321	156 993	157 669	158 347	159 027	159 711	160 398	161 088	161 780	162 476	163 175	163 876	164 581	165 289	165 999
MP UQ wage	197 868	198 719	199 573	200 431	201 293	202 159	203 028	203 901	204 778	205 659	206 543	207 431	208 323	209 219	210 118	211 022
35-44 y.o																
SP LQ wage	67 533.00	67 931	68 332	68 735	69 141	69 549	69 959	70 372	70 787	71 205	71 625	72 048	72 473	72 900	73 330	73 763
SP MD wage	86 169.00	86 677	87 189	87 703	88 221	88 741	89 265	89 791	90 321	90 854	91 390	91 929	92 472	93 017	93 566	94 118
SP UQ wage	115 191.00	115 871	116 554	117 242	117 934	118 629	119 329	120 033	120 742	121 454	122 171	122 891	123 616	124 346	125 079	125 817
MP LQ wage	135 066.00	135 863	136 664	137 471	138 282	139 098	139 918	140 744	141 574	142 410	143 250	144 095	144 945	145 800	146 661	147 526
MP MD wage	173 338.00	173 355	174 378	175 406	176 441	177 482	178 529	179 583	180 642	181 708	182 780	183 859	184 943	186 035	187 132	188 236
MP UQ wage	230 382.00	231 741	233 109	234 484	235 867	237 259	238 659	240 067	241 483	242 908	244 341	245 783	247 233	248 692	250 159	251 635
45-54 y.o																
SP LQ wage	66 381	66 773	67 167	67 563	67 962	68 362	68 766	69 172	69 580	69 990	70 403	70 818	71 236	71 657	72 079	72 505
SP MD wage	86 220	86 729	87 240	87 755	88 273	88 794	89 318	89 845	90 375	90 908	91 444	91 984	92 526	93 072	93 621	94 174
SP UQ wage	121 173	121 888	122 607	123 330	124 058	124 790	125 526	126 267	127 012	127 761	128 515	129 273	130 036	130 803	131 575	132 351
MP LQ wage	132 762	133 545	134 333	135 126	135 923	136 725	137 532	138 343	139 159	139 980	140 806	141 637	142 473	143 313	144 159	145 009
MP MD wage	172 440	173 457	174 481	175 510	176 546	177 587	178 635	179 689	180 749	181 816	182 888	183 967	185 053	186 145	187 243	188 348
MP UQ wage	242 346	243 776	245 214	246 661	248 116	249 580	251 053	252 534	254 024	255 522	257 030	258 547	260 072	261 606	263 150	264 702
55-64 y.o																
SP LQ wage	58 320	58 571	58 823	59 076	59 330	59 585	59 841	60 098	60 357	60 616	60 877	61 139	61 402	61 666	61 931	62 197
SP MD wage	76 684	76 922	77 160	77 398	77 636	77 874	78 112	78 350	78 588	78 826	79 064	79 302	79 540	79 778	80 016	80 254
SP UQ wage	122 316	122 842	123 370	123 901	124 433	124 969	125 506	126 046	126 588	127 132	127 679	128 228	128 779	129 333	129 889	130 447
MP LQ wage	116 640	117 142	117 645	118 151	118 659	119 169	119 682	120 196	120 713	121 232	121 754	122 277	122 803	123 331	123 861	124 394
MP MD wage	157 368	158 045	158 724	159 407	160 092	160 781	161 472	162 166	162 864	163 564	164 267	164 974	165 683	166 395	167 111	167 830
MP UQ wage	244 632	245 684	246 740	247 801	248 867	249 937	251 012	252 091	253 175	254 264	255 357	256 455	257 558	258 665	259 778	260 895
65-74 y.o																
> 75 y.o																
Out of scope																
Property price projection (based on 20 percentile, 50 percentile, 80 percentile prices) - 3.34% annual compound growth																
Low value house	450 000.00	465 030.00	480 562.00	496 612.77	513 196.64	530 340.51	548 053.88	566 338.86	585 275.27	604 823.46	625 024.56	645 900.38	667 473.46	689 767.07	712 805.29	736 612.99
Median value house	1 180 000.00	1 219 412.00	1 260 440.36	1 302 229.05	1 345 723.50	1 390 670.66	1 437 119.06	1 485 118.84	1 534 721.81	1 585 981.52	1 638 953.30	1 693 694.34	1 750 263.73	1 808 722.54	1 869 133.87	1 931 562.95
High value house	3 200 000.00	3 306 880.00	3 417 329.79	3 531 468.61	3 649 419.66	3 771 310.28	3 897 272.04	4 027 440.92	4 161 957.45	4 300 966.83	4 444 615.12	4 593 069.40	4 746 477.92	4 905 010.28	5 068 837.62	5 238 136.80
Computed minimum income required for a 33% DTI ratio on corresponding property price (5% interest, 1% amortization, 1% maintenance fee)																
Min income for Low val	70 227.27	72 572.86	74 996.80	77 501.69	80 090.25	82 765.26	85 529.62	88 386.31	91 338.41	94 389.12	97 541.71	100 799.61	104 166.31	107 645.47	111 240.83	114 956.27
Min income for median val	184 151.52	190 302.18	196 658.27	203 226.65	210 014.42	217 028.91	224 277.67	231 768.55	239 509.62	247 508.24	255 776.05	264 318.97	273 147.22	282 270.34	291 698.17	301 440.88
Min income for high val	499 393.94	516 073.70	533 310.56	551 123.13	569 530.64	588 552.97	608 210.64	628 524.87	649 517.60	671 211.49	693 629.95	716 797.19	740 738.22	765 478.88	791 045.87	817 466.80

Figure 16: Income, property price, and required income for mortgage approval forecasted on 15 years

25-34 y.o wage growth rate: 0.43% p.a.

35-44 y.o wage growth rate: 0.59% p.a.

45-54 y.o wage growth rate: 0.59% p.a.

55-64 y.o wage growth rate: 0.40% p.a.

Property price (Low median and high) growth rate: 3.34% p.a.

Appendix 13: Full base case scenario computation model

Age group	2021			2022			2023			2024			2025			2026			2027			2028		
	Total HH	HO	n/a	Total HH	HO	Deaths	Total HH	HO	Deaths	Total HH	HO	Deaths	Total HH	HO	Deaths	Total HH	HO	Deaths	Total HH	HO	Deaths	Total HH	HO	Deaths
25-34 yo	1 121 390.00	112 532.00		1 120 865.00	112 479.00		1 120 340.00	109 055.00		1 119 815.00	108 753.00		1 119 290.00	107 491.00		1 118 765.00	106 233.00		1 118 240.00	104 971.00		1 117 715.00	103 709.00	
35-44 yo	649 445.00	203 321.00		648 687.00	216 384.00		713 334.00	221 152.00		739 384.00	223 842.00		795 533.00	227 594.00		826 674.00	229 185.00		858 649.00	229 932.00		889 490.00	229 787.00	
45-54 yo	542 754.00	246 538.00		545 890.00	249 310.00		550 054.00	245 650.00		555 440.00	244 491.00		561 852.00	239 664.00		569 220.00	237 104.00		577 469.00	234 754.00		586 327.00	232 557.00	
55-64 yo	645 049.00	350 510.00		632 272.00	343 567.00		620 239.00	331 973.00		608 957.00	320 971.00		598 407.00	310 545.00		588 649.00	300 671.00		579 620.00	291 335.00		571 334.00	282 513.00	
65-74 yo	499 015.00	288 204.00	4 870.00	491 145.00	283 659.00	4 870.00	475 676.00	274 725.00	4 870.00	460 519.00	265 971.00	4 870.00	445 692.00	257 480.00	4 870.00	431 213.00	249 045.00	4 870.00	417 100.00	240 094.00	4 870.00	403 360.00	232 963.00	4 870.00
>75 yo	533 464.00	247 391.00	8 855.00	538 729.00	249 833.00	8 855.00	543 531.00	251 060.00	8 855.00	547 423.00	253 864.00	8 855.00	550 423.00	255 255.00	8 855.00	552 551.00	256 242.00	8 855.00	553 827.00	256 634.00	8 855.00	554 273.00	257 041.00	8 855.00
	3 990 128.00	1 449 416.00	-13 773.00	4 015 307.00	1 441 359.00	-13 773.00	4 033 442.00	1 420 842.00	-13 773.00	4 051 362.00	1 401 124.00	-13 773.00	4 069 294.00	1 377 693.00	-13 773.00	4 087 150.00	1 355 154.00	-13 773.00	4 105 021.00	1 334 247.00	-13 773.00	4 122 877.00	1 311 953.00	-13 773.00
	HO%	36.3%		HO%	35.9%		HO%	35.2%		HO%	34.6%		HO%	33.9%		HO%	33.2%		HO%	32.5%		HO%	31.8%	
Age group	2029			2030			2031			2032			2033			2034			2035			2036		
	Total HH	HO	Deaths	Total HH	HO	Deaths	Total HH	HO	Deaths	Total HH	HO	Deaths	Total HH	HO	Deaths	Total HH	HO	Deaths	Total HH	HO	Deaths	Total HH	HO	Deaths
25-34 yo	1 117 405.00	87 463.00		1 116 940.00	84 064.00		1 116 480.00	80 668.00		1 116 031.00	77 276.00		1 115 587.00	73 887.00		1 115 150.00	69 363.00		1 114 719.00	62 643.00		1 114 285.00	57 028.00	
35-44 yo	919 351.00	228 791.00		947 875.00	224 039.00		975 677.00	221 875.00		1 002 402.00	221 090.00		1 028 094.00	219 687.00		1 053 656.00	215 694.00		1 077 050.00	212 138.00		1 100 196.00	208 045.00	
45-54 yo	596 316.00	230 463.00		606 803.00	228 428.00		617 897.00	226 408.00		629 532.00	224 365.00		641 714.00	219 955.00		654 332.00	217 697.00		667 338.00	215 538.00		680 749.00	213 450.00	
55-64 yo	563 782.00	274 184.00		556 955.00	266 324.00		550 840.00	259 910.00		545 424.00	251 919.00		540 692.00	245 336.00		536 629.00	239 109.00		533 217.00	233 242.00		530 438.00	227 703.00	
65-74 yo	390 031.00	225 361.00	4 870.00	377 030.00	217 794.00	4 870.00	364 596.00	210 571.00	4 870.00	352 320.00	203 556.00	4 870.00	340 885.00	196 877.00	4 870.00	329 699.00	190 416.00	4 870.00	318 969.00	184 219.00	4 870.00	308 700.00	178 288.00	4 870.00
>75 yo	553 912.00	256 074.00	8 855.00	552 766.00	256 342.00	8 855.00	550 860.00	255 458.00	8 855.00	548 128.00	254 233.00	8 855.00	544 865.00	251 670.00	8 855.00	540 828.00	250 866.00	8 855.00	536 133.00	248 629.00	8 855.00	530 807.00	246 159.00	8 855.00
	4 140 717.00	1 289 363.00	-13 773.00	4 138 540.00	1 263 188.00	-13 773.00	4 136 352.00	1 241 117.00	-13 773.00	4 134 147.00	1 219 706.00	-13 773.00	4 131 927.00	1 193 617.00	-13 773.00	4 129 694.00	1 169 212.00	-13 773.00	4 127 446.00	1 142 566.00	-13 773.00	4 125 184.00	1 116 900.00	-13 773.00
	HO%	31.1%		HO%	30.4%		HO%	29.7%		HO%	29.1%		HO%	28.3%		HO%	27.6%		HO%	26.9%		HO%	26.2%	

Figure 17: Base case full computation model.

(coefficients from outside the table feed into the cells as explained in methodology and result sections)

HO: Homeowners
HO%: Homeownership rate
HH: Households

Appendix 14: Full land lease scenario computation model

[illegible]

Figure 18: Land lease full computation model

(coefficients from outside the table feed into the cells as explained in methodology and result sections)

HO: Homeowners
HO%: Homeownership rate
HH: Households

Appendix 15: Property price and threshold income projections under land lease model

Property price projection (based on 20 percentile, 50 percentile, 80 percentile prices) - 3.34% annual compound growth																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Low value house	270 000.00	279 018.00	288 337.20	297 967.66	307 919.78	318 204.30	328 832.33	339 815.33	351 165.16	362 894.08	375 024.74	387 540.23	400 484.07	413 860.24	427 683.17	441 967.79
Median value house	708 000.00	731 647.20	756 084.22	781 337.43	807 434.10	834 402.40	862 271.44	891 071.30	920 833.09	951 588.91	983 371.98	1 016 216.60	1 050 158.24	1 085 233.52	1 121 480.32	1 158 937.77
High value house	1 920 000.00	1 984 128.00	2 050 397.88	2 118 881.16	2 189 651.80	2 262 786.17	2 338 363.22	2 416 464.55	2 497 174.47	2 580 580.10	2 666 771.47	2 755 841.64	2 847 886.75	2 943 006.17	3 041 302.57	3 142 882.08
Computed minimum income required for a 33% DTI ratio on corresponding property price (5% interest, 1% amortization, 1% maintenance fee)																
Min income for low val	42 136.36	43 543.72	44 998.08	46 501.01	48 054.15	49 659.16	51 317.77	53 031.79	54 803.05	56 633.47	58 525.03	60 479.76	62 499.79	64 587.28	66 744.50	68 973.76
Min income for median val	110 490.91	114 181.31	117 994.96	121 935.99	126 008.65	130 217.34	134 566.60	139 061.13	143 705.77	148 505.54	153 465.63	158 591.38	163 888.33	169 362.20	175 018.90	180 864.53
Min income for high val	299 686.36	309 644.22	319 986.34	330 673.88	341 718.39	353 131.78	364 926.38	377 114.92	389 710.56	402 726.89	416 177.97	430 078.32	444 442.93	459 287.33	474 627.52	490 480.08

Figure 19: , property price, and required income for mortgage approval forecasted on 15 years

Property price (Low median and high) growth rate: 3.34% p.a.

Property price (Low median and high) valuations: 60% of freehold price (c.f base case scenario)

Appendix 16: Threshold wage and actual income projections (Base case vs land lease)

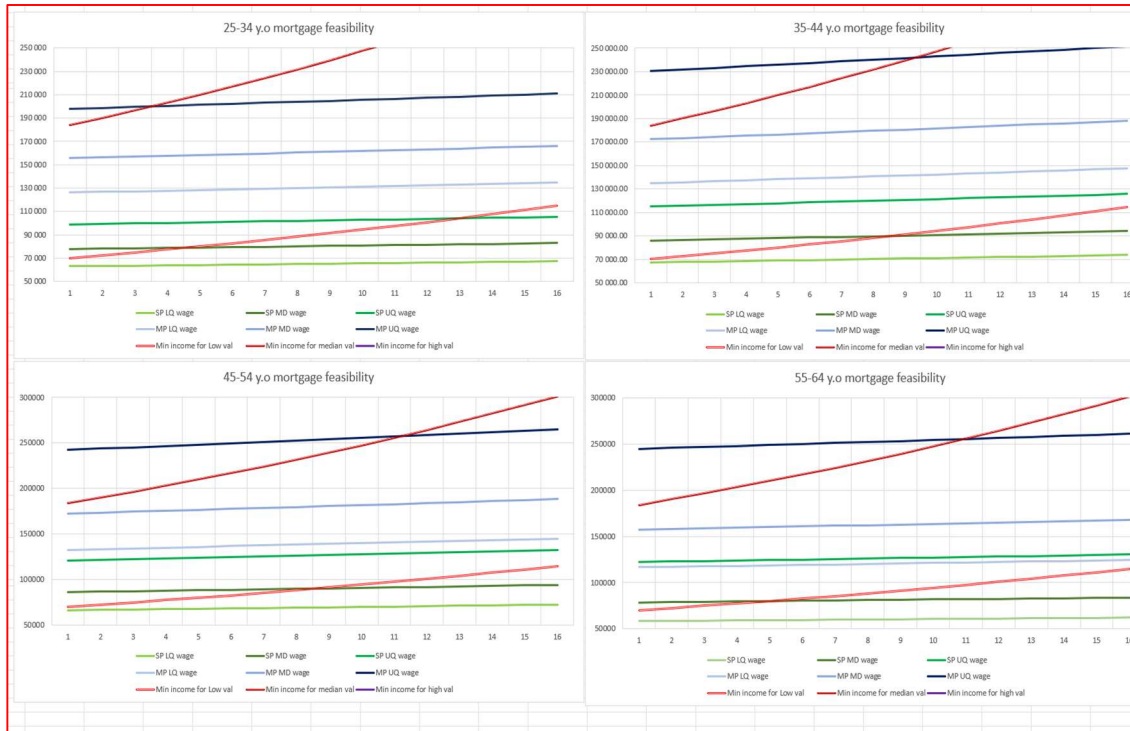


Figure 20: Wage (Threshold and actual) forecast - Base case

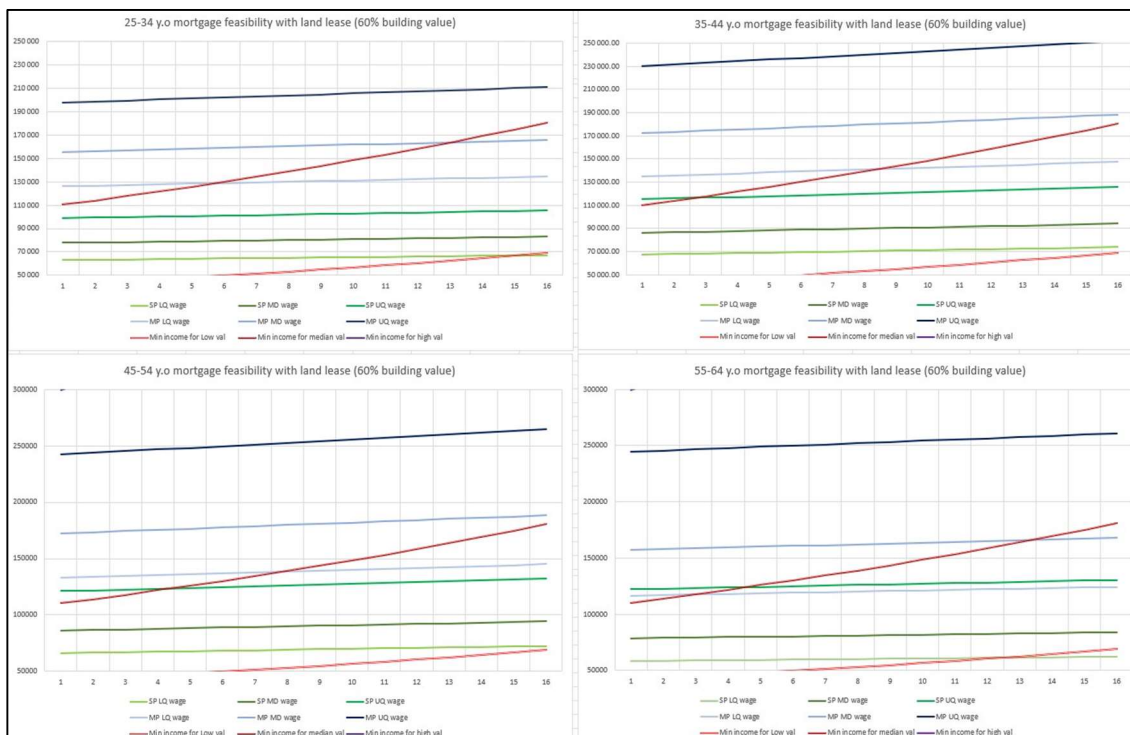


Figure 21: Wage (Threshold and actual) forecast – Land lease

Appendix 17: Land lease willingness coefficients

	HH type and proportion	2022		2023		2024		2025		2026		2027		2028		2029	
		Coef	Weighted Adj [39.4%]	Coef	Weighted Adj [39.4%]	Coef	Weighted Adj [39.4%]	Coef	Weighted Adj [39.4%]	Coef	Weighted Adj [39.4%]	Coef	Weighted Adj [39.4%]	Coef	Weighted Adj [39.4%]	Coef	Weighted Adj [39.4%]
15-34 y.o.	MP LQ	17.5%	0.5	0.0875	3.45%	0.4	0.07	2.76%	0.3	0.0525	2.07%	0.2	0.035	1.38%	0.1	0.0175	0.69%
	MP MD	35.0%	0.4	0.14	5.52%	0.4	0.14	5.52%	0.3	0.105	4.14%	0.3	0.105	4.14%	0.3	0.105	4.14%
	MP UQ	17.5%	0.2	0.035	1.38%	0.2	0.035	1.38%	0.2	0.035	1.38%	0.2	0.035	1.38%	0.3	0.0525	2.07%
35-44 y.o.	MP LQ	21.3%	0.5	0.10625	4.19%	0.4	0.085	3.35%	0.3	0.06375	2.51%	0.2	0.0425	1.67%	0.15	0.031875	1.26%
	MP MD	42.5%	0.2	0.085	3.35%	0.2	0.085	3.35%	0.2	0.085	3.35%	0.25	0.10625	4.19%	0.25	0.10625	4.19%
	MP UQ	21.3%	0.1	0.02125	0.84%	0.15	0.031875	1.26%	0.2	0.0425	1.67%	0.25	0.053125	2.09%	0.25	0.053125	2.09%
45-54 y.o.	MP LQ	21.3%	0.1	0.02125	0.84%	0.08	0.017	0.67%	0.07	0.014875	0.59%	0.06	0.01275	0.50%	0.05	0.010625	0.42%
	MP MD	42.5%	0.01	0.00425	0.17%	0.02	0.0085	0.33%	0.02	0.0085	0.33%	0.03	0.01275	0.50%	0.03	0.01275	0.50%
	MP UQ	21.3%	0.05	0.010625	0.42%	0.05	0.010625	0.42%	0.05	0.010625	0.42%	0.05	0.010625	0.42%	0.05	0.010625	0.42%
55-64 y.o.	MP LQ	17.5%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%
	MP MD	35.0%	0.2	0.07	2.76%	0.2	0.07	2.76%	0.2	0.07	2.76%	0.1	0.035	1.38%	0.062	0.0217	0.85%
	MP UQ	17.5%	0.3	0.0525	2.07%	0.3	0.0525	2.07%	0.25	0.04375	1.72%	0.25	0.04375	1.72%	0.25	0.04375	1.72%
65-74 y.o.	MP LQ	21.3%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%
	MP MD	42.5%	0.3	0.1275	5.02%	0.3	0.1275	5.02%	0.25	0.10625	4.19%	0.2	0.085	3.35%	0.15	0.06375	2.51%
	MP UQ	21.3%	0.3	0.06375	2.51%	0.3	0.06375	2.51%	0.25	0.053125	2.09%	0.25	0.053125	2.09%	0.2	0.0425	1.67%
45-54 y.o.	MP LQ	21.3%	0.01	0.002125	0.08%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%
	MP MD	42.5%	0.05	0.02125	0.84%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%
	MP UQ	21.3%	0.05	0.010625	0.42%	0.05	0.010625	0.42%	0.05	0.010625	0.42%	0.05	0.010625	0.42%	0.04	0.0085	0.33%

Important precision 1: Only multi-person (MP) households' coefficient are described below since single person (SP) households are assumed to not be actively seeking homeownership, and perhaps even less so for leasehold properties.

Important precision 2: Only age groups 25-34 y.o, 35-44 y.o and 45-54 y.o are assumed to be target groups for leasehold property. All other age groups do not have coefficients assigned and buy freehold property as long as affordable (defined in base case scenario)

Important precision 3: The 0 coefficient point for each household type is determined by intersection of threshold and actual wages curves for the household type, as shown in appendix 16. The intersecting threshold and actual wage will be referred to as "cut-off" point.

25-34 y.o age group:

MPLQ: This household group is deemed to be highly interested in freehold property since unless major career developments occur, their income level will likely never be sufficient to purchase outright even with raises attributable to ageing. The cutoff point being reached in 2027, the coefficient starts at 0.5 and falls on a sliding scale basis until 2027.

MPMD: This group is deemed to be well interested by the model hence has a starting coefficient of 0.4. The cut-off point being in 2035, their coefficient will drop by 10 bps every 3 years.

MPUQ: This group being high earners, they could hope to purchase outright as they age. Hence, their coefficient is set at a moderate 0.2 level. As prices get more and more expensive their coefficient grows to 0.3 but falls back to 0.2 towards the end of the projection.

35-44 y.o age group:

MPLQ: The same narrative stands for this group as for the MPLQ households of the 25-34 y.o age group. Their cut-off point is reached later in 2030 meaning that the sliding scale is less steep in its decline.

MPMD: This group being able to afford freehold property for at least 5 or 6 years in the projection, their initial coefficient is set at a moderate 0.2. As affordability decreases, the coefficient for leasehold increases to 0.3 where it peaks. As prices of leasehold property render the feasibility of homeownership more difficult, the coefficient falls by 5 bps per year from 2031 to 2036.

MPUQ: Being a high earning group, their cut-off point is reached in 2032 meaning their initial coefficient is low at 0.1. It rises by 1 bps per year until 2025 where it stays flat to reflect the dilemma between buying very expensive freehold property and more affordable leasehold property. The coefficient peaks at 0.3 as the freehold cut-off point is reached and slides to 0.15 as leasehold continues to become more and more expensive. If the model was extended for 2 years, leasehold cut-off would also be reached.

45-54 y.o age group:

MPLQ: Having reached the last age group where considering homeownership makes sense but not being able to afford anything but low value property, their coefficient is set at a low 0.1 to start. The cut-off for leasehold being reached in 2030, the coefficient falls on a sliding scale basis.

MPMD: Being able to afford freehold property, the same narrative as for the lower age group's median wage-earning households stands. Nevertheless, assuming that leasehold property is less attractive with age, the group gets a low coefficient of 0.01 to start. It will slightly increase to 0.05 until 2030 and will fall to 0 afterwards as the cut-off point is nearing.

MPUQ: The coefficient starts at a low 0.05 and remains fixed until 2033. Afterwards, it slightly declines as with affordability. The 0.05 value was chosen since this group would likely opt for freehold property until the cut-off is reached in 2032.

Appendix 18: Interview with industry expert n°1

Interview with Lucia Morgillo and Laure Carrard on May 2nd, 2023, in Nyon:

Attendants:

GB : George Budusan (interviewer)

LC: Laure Carrard

LM: Lucia Morgillo

Methodology:

Semi-structured interview with prepared questions but aimed at opening a discussion on the wider real estate market to extract the two interviewees' extensive knowledge on the topic. The interview audio was recorded on a smartphone, totaling 68 minutes of recording.

Interviewer presented the general research topic and research problem, gave some context to the problem, explained the solutions to explore and the general idea of the model and scenarios being developed. The interviewer then opened up the question round in the hopes of leading to extensive discussions on the general topic of the question. In total, 9 formal questions were asked to the interviewees.

The interview took place in the offices of ImVestir Partners in Nyon. The interviewees sat side by side in front of the interviewer and had received no material or preparation for the interview. The interviewer had a paper sheet with the interview questions and another sheet with important facts to bring up in case the discussion required it.

The entire interview was done in French and hand transcribed based on the recording by the interviewer. The translation to English was done with the help of DeepL and with thorough ad hoc corrections by the interviewer.

GB starts the interview with an explanation of the research topic, explaining the two main solutions he wants to explore (use of non-agency MBS to lend to more households and land leasing), and gives an idea to LC and LM of the model he wants to build to estimate the progression of the homeowner rate over 10 years and the possible results on the property prices. GB also emphasized the important share of private homeownership represented by the early baby boomers who will soon surpass the life expectancy age.

During the introduction, MC adds a comment to clarify a dimension that GB had not fully understood.

LC: The FINMA and the Swiss government put a brake on the ability of private individual to buy property by introducing the CCyB through the SNB. This move was intended to avoid an overbidding of prices that would result in too many individuals applying for mortgages in a short time frame. Given the lack of real estate supply on the market in the early 2010s, granting mortgages to many households would have had the effect of propelling real estate prices upwards with an even greater amplitude than in the past.

GB replied: I would like to clarify that the model is set to start at the end of 2021, ignoring the shocks that have occurred since then (persistent inflation, rising interest rates, bankruptcy of Credit Suisse and the possible "credit crunch" given the rise in implicit risk in the market). I also want to clarify that the term "private ownership rate" is defined by the Confederation and the FSO as "the proportion of households that own their dwelling". This definition does not separate between freehold or leasehold ownership.

LM added with respect to the passing of the early baby boomers: In the vast majority of cases when a senior homeowner dies, the surviving spouse is placed in a retirement home or possibly in rental apartment and the house is sold. In the vast majority of cases in urban and peri urban areas, the house is bought by an institutional investor that will demolish it and make a small apartment building for rental. That's why I think it's almost certain that the rate of private homeowners is bound to decrease. Single-family houses will become rarer and will be replaced by condominiums and apartment buildings.

GB adds : That is also what I assume and that is a cause for concern for the distribution of ownership in the country. Also when we look at the growth rate of wage versus the growth of the various real estate price index, we realize less and less heirs will even be able to inherit the house with an outstanding mortgage, meaning more and more properties will just go for sale. I've looked up the FSO's data and salaries have increased by 0.81% on average over the last 20 years while the various real estate price indices have increased by 6% to 7% per year over the same period. This is why I am very interested in investigating the potential of land leasing because the property purchase price is reduced, and less income and equity are needed to acquire a home.

LC objects: In the private world I don't think land leasing is a (desirable) solution, but in the institutional world it is very trending.

LM adds: Psychologically, I'm not sure either that private individuals are comfortable owning a property on a piece of land where there is no certainty that the lease agreement will be extended by the landowner.

GB explains that there is no data to indicate that land leases are not renewed in Switzerland in a large proportion of cases. Additionally, psycho-social research also shows that homeownership remains an ideal for many people and that given the widespread adoption of PDDs in other economies, it is not clear that owning lease held property causes people major discomfort.

LM agrees: Yes, it makes a lot of sense. I also think that getting households for whom ownership is an ideal to understand what the implications of land leasing entails for them, is a big challenge. Many households could be under a leasehold agreement and not even understand what it is. We find that with our private clients, talking to them about indirect real estate investment, it is very challenging to get them to understand. Because in the end, what generally matters most to households is their job, getting food on the table and taking the kids to school. So I am quite convinced that the adoption of leasehold properties by private individuals is not impossible and maybe quite likely.

LC adds: If I may add; what FUNDIM has done very well in partnering with QoQa is to be able to reach an extremely diverse pool of people because they can reach both the local hairdresser and the person who works in finance. Given the very positive experience that QoQa users have on the platform, they may have been attracted to this offer exclusively because of QoQa's image. In the end, I don't think that the vast majority of buyers have understood the transaction they made buying into that property.

Another thing I wanted to add before continuing is that with Lucia we are seeing more and more people coming to us with a lot of uncertainty, and they are all scratching their heads given the current situation. Everyone is saying to themselves that we have to overcome this credit problem. We see funds coming

in with 10% equity and trying to call the missing 10% in another way. We also see a lot of reverse mortgage funds emerging. What we also get to see a lot are pension funds and other funds that are trying to capture the dwellings of those households that are suffering from rising interest rates and difficulty in obtaining credit. Basically there are various new structures that are starting to appear to find opportunities in this environment where private individuals are starting to have financial problems.

LM confirms: Yes, there is a real phenomenon where the heirs are no longer able to inherit the properties and are forced to sell. Or seniors more often than not, seniors who explore the reverse mortgage solution. As such, the result in the long run will be the sale of small properties to institutions that will make rental apartments. Moreover, with the Federal Law on Spatial Planning, and the political will for densification (of urban areas), it is very likely that the phenomenon will accelerate. So in your model, you need to think only the rate of ownership but also about what kind of dwellings will be available to own.

QUESTION SECTION BEGINS

Question 1: *Could you rank order the top 5 factors that best explain the current tight situation in the real estate market.*

LM and LC together: Interest rates !

GB interrupts to rectify: Could we rather look at this question from a 2021 perspective ? Rates are not really integrated into the model or at least we presume that all actors are able to lock in a desirable fixed rate for the long-term.

LC rectifies: So first I would say FINMA and the increased regulation in terms of credit requirements. Then the poor growth in wages revenues. Then Federal Law on Spatial Planning because it creates a market situation where prices are self-maintained and can only increase. Finally, the need for institutional investors to continually look for yield has created very aggressive players who are now buying assets with very low yields just to increase their portfolio.

That is not what institutional investors are intended for in Switzerland. Their mission is to pay distributions for pensions and should not be aggressively getting into deals where they overpay and redistribute weak returns.

GB interrupts: But are institutional investors only seeking assets in urban areas ?

LC replies: No ! Not only urban. We have seen them venturing out into the countryside more and more these past few years. If you look at the medium-sized towns in the countryside, the vacancy rates skyrocketed in recent years.

GB interrupts again: But was this venture to the countryside not done to meet the demand generated by this so-called "exodus" to the countryside during the lockdowns?

LC replies: No, the exodus is nowhere to be seen in the figures, it was mostly a nice positive story told by the media, but it's not at all a phenomenon that happened on a large scale. And most importantly, there's also quite an increase in commercial and office space in cities, so it suggests that the population in the city is still growing and is reflected in the miserable vacancy rates in the cities. For instance if we get to 2%-3% vacancy (rate) in some cities, you could say it's a healthy market.

LM adds: Yes, it is rather something that was observed in France and the media took these beautiful stories and adapted them to Switzerland.

GB opens a parenthesis: Back to the spatial planning law, don't you think that the cantonal master plans should be reviewed at a lower frequency than every 15 years ?

LC in agreement: Oh Yes, absolutely. Looking from the standpoint of your model in 2021, at knowing the current situation, look how everything changed drastically except the master plans. In a handful of quarters a lot fewer players have disappeared because of the interest rates, and the remaining ones are not the same players anymore. The real estate market is very sensitive, and you would need to review the master plans every 3 to 5 years maximum to avoid redundancy.

Question 2: *The early baby boomers (who are among the age groups with the highest proportion of homeowners) will soon reach, or surpass, life expectancy age and slowly but surely pass away. This is likely to put a lot of new properties on the market. Are any of your partners incorporating this phenomenon into their strategy or at least talking about it openly?*

LC replies: Yes, of course, they are already creating so many reverse mortgage (investment) vehicles through which they are taking ownership of real estate. They are sort of taking advantage of this aging of the population but more in a "win-win" situation.

The progression of these vehicles is impressive but still not huge compared to the other types of investment vehicles. What is holding back is the lack of appetite for credit risk and there is the problem of not knowing in which asset class to put these vehicles. For a given vehicle it is unsure whether it has the properties of a real estate fund or a private equity/private debt fund.

(Following question 2, a 15-minute discussion about mortgage-backed securities and the 2008 GFC took place. Not much material can be extracted from it for the purpose of the study.)

Question 3: *If we could define a few other critical events that could occur in the next few years and that would have a significant impact on the real estate market in Switzerland, what would they be?*

LM replies: I would say immigration. The exceptional immigration wave of the past year has indeed generated a shortage of about 50'000 dwellings according to COPTIS. So in spite of the construction qualified by some as "intensive" and which scares off many people, there is a shortage of housing in the country. So indeed almost everything we are building is quickly occupied by households, and this could change.

LC emphasizes: We don't know if the net positive immigration will continue. There is no certainty with the various political problems that currently occupy the country that we are not going to end up with empty buildings eventually.

LM takes over: Indeed, migration flows can change and are not constant. The anti-immigration initiatives, or agreements with the EU can accelerate or decelerate immigration. Also, if the quality of life improves in the countries of origin of the main immigrant populations, we may see some of these immigrants voluntarily return to their countries of origin, as has been observed with Portuguese nationals.

LC follows up with her answer: The energy law that can be revised to meet Switzerland's climate commitments is also a risk. This will entail major renovation costs that many private individuals will not be able to finance and will sell the houses "for scrap".

There could also be a tightening of the lease law, which could make investment properties less attractive because the obligations of the owners are becoming more and more restrictive(!) and make the returns less attractive.

Also I know rates are not part of your model, but at some point, fixed income could rival real estate in terms of yields, leading to divestment and shrinking of institutional portfolios.

Finally, everything that promotes ESG is likely to become much more important and that can also have an impact on real estate.

GB in agreement: : Yes, and the ESG agenda is really like a mandate that the government can force on institutions. But as we have seen in recent times, the government can hardly incentivize households except through taxation.

LC and LM together: Yes absolutely !

LM adds: In fact, we see funds that specialize in SWAPs. Private owners put their property in real estate funds and receive shares of the fund in exchange. The fund can then undertake the renovations to update the energy profile of the property, which is difficult for the private owner to do alone. Institutional investors will have a huge role to play in updating the energy profile of real estate in Switzerland.

Question 4: Single-family houses are the most common type of residential building in Switzerland today (58.6% of all residential buildings according to the FSO). How can cities be significantly densified knowing this composition ?

LC replies: This is done by destroying these single-family houses and by building mainly condominiums on the land. They are not very high constructions, but they allow more households to live on the same plot of land whereas only one household lived there before. In addition, the land has become so valuable that one can borrow more money and build higher down the road. Private households sell to general contractors or real estate companies who make these transactions and construction work in general.

Question 5: Do the funds ever work directly with the individual house?

LM replies: No, funds have the obligation to own constructible and with a construction permit. The seek yield so renting one single-family house is not interesting to them.

LC adds: Sometimes they buy a piece of land with a house on it, and they build one or some buildings on it and keep the house until they have another project to develop. And yes, funds cannot buy land with more than 5% of unbuildable area.

Question 6: How do the returns compare between funds that do the land lease model and those that do regular investment property?

LC replies: You'd have to check with a fund that does that. But I imagine it's very interesting for them especially if they're doing it in large urban centers because the land is bound to appreciate while the building is going to hold or increase in value a bit.

Question 7: Is there an implicit limit to how far the land leasing model can go in Switzerland? Can we imagine a substantial share of dwellings being held through this model like in the Netherlands or the UK ?

LM replies: With land that is owned by the state, it's very common to do land leasing so it can probably expand substantially. But it's hard to estimate.

Questions 8: What do you think about the following quote by FUNDIM: "Indeed, the financing of real estate deals by way of land leasing opens interesting possibilities of diversification of the proposed real estate market"?

LM replies: Well the need for equity is reduced for the building owners and they can keep more savings so more people should be able to own their dwelling. For the investors, you would have to check with FUNDIM.

Question 9: Swiss Banks never finance land leased properties, but those who had the transacted with FUNDIM in the QoQa deal, received financing for their purchase of the condominium lots. Why this difference in risk policy?

LC replies: FUNDIM is a very well-known player and must have a very good relationship with their banker who may have seen this project as a big marketing coup.

LM agrees: Yes, and it was a small bank that did this financing and could see an opportunity to market itself to private buyers.

GB concludes: Yes, I agree. As we discussed before, individuals may not even have understood the entire specificity of the transaction.

Well this rap's it up. Thank you so much for your time and precious insights. I look forward to integrating all this new knowledge in my work and will be sure to share my findings with you.

End of recording.

Appendix 19: Interview with industry expert n°2

Interview with NS on May 10th, 2023 on MS Teams

Attendants:

GB: George Budusan (interviewer)

NS: (Interviewee)

NB. Interviewee and interviewer work for the same financial institution in the same division, but in different business units. They have not collaborated in the past nor had direct contact with each other. The interviewee's answers do not engage the said financial institution's view of the topic, nor do they disclose any confidential information about strategy or processes. Any answer provided by the interviewee is based on his understanding of the topic and based on his broad experience in the field of real estate financing.

Interviewee curriculum (provided during interview): Interviewer has been working in the field of real estate financing since 2002. His entire career in this field was in the private wealth management segment of large bank active in Switzerland. He covered the Lausanne and Vaud canton area for 2 years before leaving for 15 years in the canton of Bern and returning back to Lausanne 6 years ago and worked there until the present day. Initially, he was a client relationship manager and then joined the real estate expert team where he deals with asset valuations, risk assessment, and build up and maintenance of mortgage deals. He is still passionate about this field to this day given the large number of novelties with respect to new financing norms either proprietary or FINMA imposed.

Methodology:

Semi-structured interview with prepared questions but aimed at opening a discussion on the wider credit risk implications of land leasing from a bank's perspective to extract the interviewee's extensive knowledge on the topic. The interview took place on Microsoft Teams, with both camera's turned on, and the audio was recorded on a smartphone, totaling 44 minutes of recording.

The interviewer introduced himself and exposed his experience in real estate financing and explained to the interviewee why he asked him to participate. The reasons were that the interviewee had been in the interviewer's LinkedIn network for over a year and had posted many articles on the topic of the struggles of young professionals in achieving homeownership and specifically in obtaining financing.

The entire interview was done in French and hand transcribed based on the interview. The translation to English was done directly by the interviewer.

GB starts the interview with a summary of his experience in the field and by asking the interviewee to expose his background, experience, and field of work. The interviewer then presented the overall aim of the study, the willingness to develop a model and the exact financial montage in the context of land leasing that would be assessed in the model.

1) Is it known roughly what the average mortgage debt levels of the senior population (Debt-to-value ratio) are. Passed retirement age, do they still amortize and at what rate ?

NS: It depends on the institution, usually you would want a DTV ratio of 65% by retirement age (only the first rank outstanding). Institutions would assess the expected pension levels of the debtors and would impose a higher amortization rate if projected pensions are too low to keep a 65% DTV. In some cases, I have seen DTVs brought down to 50% after retirement.

GB: In the cases where extraordinary amortization is required, are the debtors discharged of the interest penalty ?

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NS: Usually a good advisor would try to match maturities of mortgage with the debtor's retirement and inform them years in advance of which reserves to constitute to amortize. Also for those households taking a mortgage out a handful of years before retirement, you would discuss an appropriate amortization rate above the minimum 1% p.a. to ensure they can keep the asset at retirement.

2) Is known approximately what share of share of privately owned main residence properties are inherited as main residence of the heir(s) ?

NS: No exact number comes to mind.

GB: No problem. In that case, if I assume that in 80% of cases the house is sold off or repurposed to investment property by the heirs, is it too prudent or too ambitious ? Because from my experience, I have hardly ever seen an inheritance case where one of the heirs recovered the familial house as main residence for him/herself.

NS: 80-20 seems right. I have also rarely seen the occurrence. Most often the property is indeed sold off for lack of will or financial ability to recover it, and in most other cases it is repurposed to generate rental income for the heirs.

3) Do banks prepare for the upcoming passing away of the many senior homeowners. In other words, is it expected that private homeownership will naturally decline the following years and is there any fears over the underlying mortgage portfolios held by banks?

NS: I do not think a bank can anticipate this. It is the job of the homeowner to plan for his successors to be able to inherit the house if so, they will.

GB: Agreed. But I am asking this having interviewed experts from the institutional world and they have told me that funds and real estate companies have prepared to capture this so-called phenomenon. They are seeing increasingly more houses bought off from heirs or seniors with the purpose of destroying and building apartment buildings or condominiums.

NS: Yes, that I also see, but from a bank perspective I do not think it will notice since these mortgages are distributed between many institutions, and it is unlikely that one given bank will have so many senior debtors passing away that it will notice it happening. It is likely to be smoothed out by another phenomenon.

GB: Are the questions too abstract or strange ?

NS: Not at all. Your questions are spot on. These phenomena are indeed very actual and succession planning and debt levels are something many people ask me questions about.

4) FUNDIM has showed a scheme where 55% of a real estate asset's value is attributed to the construction and 45% to the land. What do you think about this decomposition ? Is it a good average or a rule of thumb ?

NS: I would say it's a bit high. From my knowledge most banks would use 30-40% to value the land and the rest for the building. 45% for land really seems high but could be right for given parcels.

5) FUNDIM cites on its website that (translation) : "the market needs an adapted structure so that private real estate operators can also leverage this model (land lease)". How do you understand this affirmation ?

NS: Hmmm, I'm not sure. Do they mean banks for private operators or real estate developers ? The way I see it, it refers perhaps to a developer that buys a parcel of land and sells the construction with a land lease. They (Fundim) would probably like for more actors to use the model.

- 6) The firm also says: "indeed, the financing of real estate deals through land leases can open diversification opportunities for the underlying real estate market". What does this inspire to you ?**

NS: I understand it as a need to change investment models from regular investment property to this distinct ownership model with land leases.

GB: What I heard from other experts advising real estate fund, is that fund managers are pushed to make deals with returns much lower than what they usually get given the high prices. Some are even happy to see interest rates going up as this slows down aggressive bidding and possibly will drive prices down slightly. Perhaps that switching to this land lease model will help institutional investors to find deals where returns are higher despite reduced investment sizes.

NS: Yes, that makes sense. It will perhaps prevent the current overbidding I am also seeing with our clients on investment property that create self-sustaining prices and other feedback loops.

- 7) I find it odd that most banks do not finance buildings on land where a land lease agreement is in force. How can other banks be attracted to this mode of financing.**

NS: I have always worked with land lease so I can't really say. A land lease agreement has a value that you need to be able to compute and understand the other implications. But it does negatively affect the value of the assets and sometimes amortization. But it does happen if the lessor is a reputable institution like public authorities, amortization will not be affected.

GB: So if a real estate fund would be the lessor, would this be a reputable lessor ?

NS: Yes, usually some private real estate companies and individuals are considered as riskier lessors and impact the required amortization rate.

- 8) Do see any reasons for the credit risk level in Switzerland to substantially increase if the land lease model makes significant progress ?**

NS: No I don't think so. Banks would adapt their financing norms to this new trend. Banks would absolutely want to be part of this new model. And also FINMA would ensure that the right norms are set in place and applied by banks.

- 9) Would you know what share of real estate price increase can be attributed to the land and what share to the building ?**

NS: (Laughs). I don't think that a distinction can be made in general. A building's value is usually maintained given the maintenance charges invested by the owner. Then it appreciates in line with the land it sits on. They go in line as long the building is not badly maintained.

GB: Understood, and also, I believe that the 3 big real estate research firms (Wüest Partner, IAZI and Fahrlander Partner) would compute land and building prices distinctly wouldn't they (if a difference in appreciation rate existed) ?

NS: Yes, most likely.

10) Is there any other solution or idea you would have to help individuals achieve homeownership ? Or perhaps any feedback ?

NS: Well I think your topic makes a lot of sense, I do indeed see a lot of clients and other stakeholders worried, or at least, asking questions about how ownership (or chance of ownership) can be passed on to futures generations. The answer is quite difficult as long as FINMA norms remain as they are. I have heard rumors of discussions taking place in Bern (legislative action) to allow to finance the whole equity tranche through pension withdrawals. But that is also not a good solution, since you would be offsetting the problem to later on. There is no ideal model either way. But the FINMA norms have helped avoid a real estate bubble by not allowing too many people to come bidding in market and pushing prices even higher.

GB: Oh no, I would never consider dropping the norms as I was really surprised that despite mortgage volumes doubling, delinquency rate has been divided by 3.

End of recording

Appendix 20: Interview with industry expert n°3

Interview with CFO of a local real estate investment firm on May 22nd, 2023 in Lausanne

Attendants:

GB: George Budusan (interviewer)

EE: (Interviewee): The Interviewee is the CFO of a real estate investment firm that has made use of the land lease model in multiple real estate projects.

NB. The interviewee's answers do not engage the said firm's view of the topic, nor do they disclose any confidential information about strategy or processes. Any answer provided by the interviewee is based on his understanding of the topic and based on his broad experience in the field of real estate investment and land leases. Sentences in parenthesis represent information not explicitly given by the interviewee, but rather suggestions as to what could be proposed. Some transcription errors may occur as a result of the transcription being made from notes taken during the interview.

Methodology:

Semi-structured interview with prepared questions but aimed at opening a discussion on the wider use of land leasing from an investment point of view and extracting the interviewee's extensive knowledge on the topic. The interview took place in a closed conference room in the offices of the interviewee's firm.

The interviewer introduced himself and exposed his experience in real estate financing and explained to the interviewee why he asked him to participate. The reason was that the interviewee had been referred to the interviewer by a common contact, saying that EE had tremendous experience in working with land leases.

No recording was done at the request of the interviewee to encourage the interviewer to take notes on the important elements of the discussion. The entire interview was done in French and hand transcribed based on the interview notes and memory. The translation to English was done directly by the interviewer.

GB starts the interview with a summary of his experience in the field and presenting the overall aim of the study: the willingness to develop a predictive model to assess how the use of the land lease investment montage could help with homeownership rates in Switzerland. **GB** then asked **EE** to explain the specificities of the financial montage and the advantages for both institutional investors and households.

EE understood that the question implied the advantages versus classic investment property for investors, and full ownership for households. He started by just setting the context for the tight situation in the Swiss real estate market given the constraints imposed by the territorial planning law and net positive migration (that is adding extra households to house each year).

EE started by saying that real estate in the context of a portfolio, is a stable asset but an expensive one. Indeed both capital and time intensive, real estate is hard to manage and to get the desired return out of (versus the broader financial markets). Conversely, land on its own is less capital intensive, less time-consuming and bears similar risk rewards to a corporate bond but with no inflation risk. Indeed for a

lesser committed amount, the investor can get a stable income stream on a set duration. The income stream is inflation hedged (since it can be pegged to price index as the CPI), and returns are usually uncorrelated from financial markets during downturn periods. Nevertheless, the investor bears a credit risk on the lessee's ability to pay the lease, but experiences reduced volatility versus a freehold investment in real estate.

On the leaseholder's side, the fact that he is not paying for the land means less leverage needed, less capital immobilized and reduced income requirements to get financing. EE added that calculations on theoretical interest charge are done with a 3% rate versus a 5% rate for freehold property. This means that you can become owner of a real estate asset for less upfront capital.

After the introduction and explanation on the land lease model, GB introduced the round of questions. EE responded to many of the questions upfront but also responded indirectly to many of the questions in an unstructured order.

- 1) If we fast forward a few years and imagine that the land lease model is democratized, will mostly unbuilt terrains be used despite their short supply, or could existing buildings be used and repurposed for this model ? (e.g. a real estate investment promoter owning an investment property for rental that sells the apartment or condominium lots with a land lease agreement ?)**

EE answered saying that both are possible. There is no real preference from an investor's point of view between buying an unbuilt lot and selling a construction permit for a condominium to be built, or repurposing an existing building (to switch to a different payoff model).

- 2) What is the difference in returns between the land lease model and traditional rental investment property ? (What influences the decision for an investor to build on his land and rent, or to buy land and lease it?)**

EE explained that (In the long run) returns are comparable but during downturns the land lease model can be more stable depending on what the interest is indexed to. For example during a (prolonged) recession you could see rents going down meaning that the rental property model's returns will definitely be hit whilst the land lease model could be stable (if it is indexed to something else than rents). Also for the investor, if he needs to finance a renovation on one of his assets during a high interest rate period, the returns would be diminished but not for the land lease investor. Additionally, when a promoter grants a land lease with a construction permit, he can pocket a premium on the construction permit since the permits also have a value.

- 3) How can it be explained that this model is not more common today ? Or at least not nearly as common as regular investment property. Are there any specific obstacles to its democratization (eg. Political, legal, societal, infrastructural) ?**

EE explained that the model is quite common. He explained that public authorities have been using it for over 300 years since the Napoleonic law. It is also widely used for commercial and industrial property. For example the Swiss Railway company (CFF) or McDonalds are often leasing out the owned land. For residential property it is really common with municipalities granting leases to housing cooperatives, or with "Bourgeoisies" leasing land to private households.

EE concedes that he has hardly seen it done by private institutional investors specifically for residential properties. He explained that the land lease really makes sense in dense urban areas where vacancy rates are close to the housing shortage point (since the land there is bound to substantially appreciate

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and cannot be afforded by households). He then recognized that the model could make quite some progress in Switzerland and quoted how effective and wide spread it is in the United Kingdom, Singapore and the Netherlands.

4) From the perspective of households (potential buyers of condominium lots under a land lease agreement) do you think this model can work ? Is there no reluctance to being only partially owner of property and for a set period of time ?

EE said he is convinced that it is a generational thing. Mostly all the investments he has made with the model saw buyers massively apply to get a lot. The average demographic buying in was of couples of two in their mid-30's or early 40's, earning two median wages, or a median wage and a lower wage. He also added that the newer generations are more used to the sharing economy with Spotify and all the other lease services, so they tend to have a more flexible conception of ownership. EE also explained how the couples saw the purchase as their most serious joint project to date in their lives and were thrilled to be in front of the notary with him. EE suggested that with the densification trend accelerating, most people will be living in multi-story buildings where they don't even have a physical link to ground. This creates a psychological distance from the actual land and decouples the perceived value from owning that land. Also (economically and practically speaking) there is no sense for households to pay for the land in urban areas, since they would be just immobilizing capital on a surface they cannot even exploit, given the urban context and condominium rules.

EE added that he had tried probing the same model with more senior prospects and said that they weren't at all attracted by this distinct ownership only valuing full ownership. He also explained that past a certain age many seniors tend to sell off their real estate holdings to transform their wealth into more liquid assets and go to the city and become tenants. End-to-end, this suggests that the model would have very little if any seniors buying in but would be largely successful with part of the younger generations living in couples and earning a median wage.

5) For the forecasting model in the thesis I would need to assign a coefficient representing the share of households that can become homeowners with the land lease model and that want to do the deal. What value would be safe to assign to be prudent but also realistic (25-30-50% ?)

EE said 50% wouldn't be too farfetched. Nevertheless, he nuanced that this would only be the case for households in their 30's and early mid 40's. The fact that banks recompute the post-retirement income and would want to know if the lease agreement will be rolled over by retirement age, it wouldn't make that much sense for them. Moreover, EE has noticed that single person households are not really interested in these types of acquisitions, and that usually couples that maybe want to have children soon and secure a home for them are the most interested.

6) FUNDIM has posted a scheme on their website where 55% of a real estate asset's value is attributed to the construction and 45% to the land. What do you think about this decomposition ? Is it a good average or a rule of thumb ?

EE explained that this is valid in some cases, specifically in urban settings. The weighting range for the land he has seen across various projects was between 30-50%. He added that anything below 30% implied a low-density area (and would make less sense for both the investor and households to use the model), and over 50% can be seen but usually suggests that the building is below standard for the location.

7) FUNDIM cites on its website that (translation) : “the market needs an adapted structure so that private real estate operators can also leverage this model (land lease)”. How do you understand this affirmation ?

EE said that they are calling for more promoters to use the model. He explained that simply put there are tens of thousands of households that would love to own property but won't (ever) get the opportunity if this model is not leveraged by more actors. He added that so many people coming from rural areas or that have more “old-fashioned” values often get raised with pressure from the parents saying that homeownership is critical. These people are (desperately) looking for solutions, and a democratization of this model would really materialize this desire. He added that he personally believes that the land lease model can become much more in use.

8) I find it odd that most banks do not finance buildings on land where a land lease agreement is in force. How can other banks be attracted to this mode of financing.

EE said that to his knowledge all banks finance leasehold property.

EE explained as a side note that for long term leases from 50 to 100 years, banks can often suspend amortization and feel comfortable with the risk situation with respect to the lease agreement. He said things are different when the leaseholder is nearing retirement, with 30 or less years to go on the lease agreement. Usually banks will then ask the borrower to clarify with the landowner if a rollover of the agreement will or will not take place. EE also explain that with respect to the collateral, if the repurchase value is set to any value above 65% and the debtor has paid off his 2nd rank tranche, the bank has hardly any collateral risk outstanding, meaning that financing these deals is usually fine. Also these land lease agreements need to be set for 30 and 100 years in order to be recognized as servitude in the land register, and therefore be mortgaged.

The interview concluded with a small talk about current developments in the market and how the FINMA lending norms have indeed shown great value in protecting the Swiss real estate market and financial stability in general.

GB thanked the interviewee for his time and precious contribution.

The interview ended after roughly 50 minutes of discussions.

Appendix 21: Assumptions for the model

Numerical assumptions

1) Adults only form households with people of the same age group. No households are formed between a 46 y.o and a 34 y.o person for example.

This decision will have cascading effects on all other household related deviations. Nevertheless, a 2016 study by the FSO about families and couples show that have more than 74% of couples have less than 5 years of age difference between members, of which 36% are of the same age (Office fédéral de la statistique OFS, 2016). Moreover, as mentioned in section 2.1.1, the main household type was single person households. Overall, these two facts make it so that the errors induced by the assumption is contained.

2) The share of 15 to 24 y.o that are working is proportionate to each age of the interval, the same standing for the unemployed or unoccupied.

This assumption can lead to overstating the economic contribution of individuals between 15 and 20 years of age. Nevertheless, the total population from the 15 to 24 y.o group represents only 6.06% of the total population.

3) The total amount of households in the country is exactly 3'990'128.

The assumption is made by dividing the total population by the average number of individuals per household and was made to be more exact than the "approximately 3.9 million households" stated by the FSO. The distribution being made on an average composition ignores the possibility of having larger share of single person households in the younger tranche of the population having not found a spouse and having no children, and in the older part of the population where a number of seniors are widowed and live alone or in nursing homes. On the topic of nursing homes, the FSO does not state if seniors living in nursing homes are counted as households, but it is estimated that about 2.8% of the population lives in nursing homes.

4) The tenure status of households per age is determined on the average of homeownership rate per individual age of each group.

The homeownership by age statistics computed by the FSO are averages per each year of age. To accommodate the figures to the age groups used in the model each year of age was grouped in the corresponding age group from the model and averaged to get one value per group. The figures effectively are averages of averages and thus remove

all the variability between individual ages. Nevertheless, for the purposes of the scenario the values do represent the trend and linkage between age progression and ability to own property.

5) Single person households are distributed in each age group proportionately to that group's share of the total population.

The FSO provides the share of single households over total household to be of 36.8% in 2021. Not being able to find any estimate or proxy for a realistic distribution, it is decided to distribute them according to the proportion of each age group in the total household population. Intuitively you would expect single households to be concentrated in the lower and upper age groups given the higher likelihood of being single and without child under charge at those ages.

6) Net migration as proxy of immigration and emigration.

Not knowing the share of each age group emigrating out of Switzerland, the decision was taken to only use net migration. This assumption means that no households are exiting the country but less households are entering the country than in reality. Since a positive net migration figure implies that every exiting household has been at least balanced out by an entering household, the balance will be sufficient to account migration phenomena. Additionally, it is known from the FSO that almost all immigrants are aged between 1 and 45 y.o. Of this population 31% are known to be aged between 35 and 45, the remainder being aged less than 35.

7) Deaths only occurs for people aged 65 and older and the distribution of deaths is uniform in this age group

The model only accounts for death than can be classified as “dying of old age”. Old age is in fact never the medical reason for death as usually another condition causes death when one’s body is too fragile due to age. For this reason, the deaths of individuals in the 65-74 y.o group and 75 and older group will be considered as dying of old age. As a result, all deaths for groups aged less than 65 will not be accounted for in the model. This means that in the projection, 15% of deaths in Switzerland will not be factored in. Since we are referring to households with average compositions, this shortcut should not have a significant impact on the model.

8) Multifamily households have two adults earning wages fulltime wages.

The assumption was made to set economic contribution of each household member other than the two expected parents to be 0. This assumption certainly has minor effects

as for mortgage applications, it is extremely uncommon to have more than two co-debtors. It nevertheless will lead to overall more household income since it does not account for part time work or single active worker in a couple.

9) *Households of each age group only make the upper quartile, median, or lower quartile wage for their respective age group and all household members make the same wage.*

Having no granular data apart from upper quartile, median, or lower quartile wage for each age group, and no satisfactory proxy to distribute more accurately, it is supposed that only 3 levels of wages can be earned in Switzerland per each group of age. This assumption will be a major cause for deviations in assessing the potential pool of buyers who can be prospects to homeownership in the model. Also the assumption will lead to extra inaccuracies since it does not account for situations where a household member can make a low quartile wage while the other member makes a median or upper quartile wage. On the bright side, we can assume that households in the lower distribution of income are hopeless to buy property while households in the very top have already acquired property if desired. With this decomposition we can imagine that most of the population could be in the vicinity of these 3 income levels per age group. For example if the LQ and MD yearly income for the 35-44 y.o group is respectively CHF 135'000 and CHF172'000, it is highly likely that most households of this age group would earn between both amounts or marginally more.

10) *Property prices will continue rising at an uninterrupted historical average rate*

In reality, property prices do not increase evenly in all parts of the country and sometimes pull back even on an average scale. Nevertheless, the model does not account for geographical disparities and only analyzes 3 price levels (low, median, and high) on a national average basis. The assumption of a distributed price increase should not significantly skew the outcomes of the forecast since arbitrage is not something the Swiss population seems to do. Indeed, urban centers increasingly attract more and more households despite the cost of living whereas affordable property as in Jura for example, does not seem enough to attract a significant share of the population. On the other hand the compounding of a 3.34% annual growth could be seen as a bit extreme since prices would inevitably hit some resistance points, and the lack of transactions would translate to a pullback in prices. Having acknowledged this dystopian presumption, the forecast tries to project the spread between real estate prices and wages to see how homeownership would naturally decline, all other factors held equal.

11) Macroeconomic variables and monetary policy are not factors in the model

Since forecasting variations of economic growth is not in scope of the thesis, underlying variables such as wages per age group will be projected at their recorded annual rate as computed by the FSO over the 2006 to 2017 period. In reality, wages would depend on the underlying economic growth, productivity gain or loss, inflation, and other uncontrollable factors. Monetary policy is also ignored in the model, meaning that interest rates are not variables in the model. Indeed the forecast assumes that if a tenant household is able to buy property they will buy it, and a homeowner household will keep their property regardless of interest rates. In reality interest rates are possibly the main determinants of real estate prices since less buyers would bid for property if financing is more expensive than it has been, and inversely if rates are comparatively low. Nevertheless, the study tries to assess the impact of using alternatives, and this impact would be more noticeable if property prices do not go through a correction induced by high interest rates for example. Should the model have factored interest rates, the outcome could have been likely the same in the long run. Indeed as of writing in May 2023, the CH government yield curve is massively inverted between 3-6 months and 2 years suggesting high interest level are likely to rapidly decrease from 1.5% to 0.86% in two years. From 3 to 40 years, the yield curve is flat in 0.9 percents suggesting positive but moderately low rates could be expected in a 15 year forecast.

12) Landowners and investors will supply sufficient land for the demanded land lease projects

In reality there is a certain lag (mainly due to construction time) between the moment a land lease project is conceived, and the actual households become owners of the building. In the forecast, most households willing and able to buy a leasehold condominium lot will get one the same year. Nevertheless, the model tries to account for the other challenges households can face, such as finding an appealing dwelling in the area they wish to live in and that has not already been sold. This assumption is carefully used since an overly optimistic probability of finding the desired dwelling would largely overstate the effectiveness of this solution, and an overly pessimistic one would hardly have an effect on homeownership rates. The exact probability of finding a suitable dwelling when acquisition is feasible will be set to 39.4% regardless of age and household typology. This coefficient is set on the basis of a single study led by the ZHAW School of Management and law in 2022 (see bibliography) and does not necessarily represent the real hurdle of finding a home, despite a significant sample of 1002

respondents. Indeed 61.6% of interviewed households had financial capacity to buy and willingness to do so but affirmed they hadn't found a suitable home (ZHAW, 2022).

Behavioral assumptions

1) Age groups of more than 65 years of age do not desire, or cannot purchase a dwelling

The assumption is made to exclude the senior tranche of the population from the potential homeowner pool. It is observed in the ownership rate per age group that ownership peaks at 65 and only goes down from there. Social and financial factors leading to this observation is the decrease of revenues post-retirement and the gradual inability to maintain a home as age progresses. As such, seniors over 65 will only maintain their tenure status or sell their owned dwelling.

2) Share of single person household is constant through time and average household composition per age group does not change

Household composition and share of single person households are given by the FSO and act as constraints to find and estimate of number of households in Switzerland. During the projection, both constraints will remain unchanged since there is no realistic way to determine if willingness and ability to form households with other people will rise or decline in the future. Nevertheless, on aggregate, it will take a lot of changes in family compositions to significantly skew away from the current situation. Additionally, the proportion of single person households was arbitrarily chosen in the model considering the average household compositions for each age group.

3) Households with sufficient income chose homeownership

This assumption ignores the fact that some households might be unwilling to own a property or that the sometimes do not find one that is suitable for them. Given the fact the there is no real gauge for these specific households there is no real way to factor them into the model. Nevertheless, they arguably represent a minority of households since homeownership rates have risen in the last decade despite prices rising and vacancy rates not substantially easing. This assumption also ignores the size and typology of the dwellings being acquired as it is nearly impossible to account for this set of additional dimensions to the model. The last variable ignored with this assumption is household savings. Indeed, since the 20% equity is financed through savings or pension assets some households might have the required income but no equity. Nevertheless, their proportion should also be negligible in reality since the literature review shows that

households have healthy levels of savings and should in their mid-40's have sufficient equity. If homeownership rates for the 25-34 y.o and 35-44 y.o increase in the base case scenario this would mean that the assumption is unrealistic and would be corrected.