WIFO
ÖSTERREICHISCHES INSTITUT
FÜR WIRTSCHAFTSFORSCHUNG

WORKING PAPERS

Housing Affordability in Austria

Tailoring the Ratio Approach in a Simple yet Effective Way

Andrea Kunnert

520/2016

WIFO
ÖSTERREICHISCHES INSTITUT FÜR WIRTSCHAFTSFORSCHUNG
AUSTRIAN INSTITUTE OF ECONOMIC RESEARCH

Housing Affordability in Austria

Tailoring the Ratio Approach in a Simple yet Effective Way

Andrea Kunnert

WIFO Working Papers, No. 520

July 2016

Abstract

The expenditure-to-income ratio is a widely used measure of housing affordability as it is easy to calculate and to interpret. Yet it suffers from several flaws that may diminish its usefulness. This paper addresses the main points of critique and improves the accuracy of the ratio measure by providing additional information about the distribution (values at the 10th, 25th, 50th, 75th and 90th percentile) for the cost burden and calculating cumulative distributions for a range of expenditure-to-income shares instead of one single benchmark. Furthermore, an upper limit for income and housing quality is set in order to avoid misclassifying households that have strong preferences towards housing consumption. The results indicate that these modifications are necessary to avoid overestimating affordability problems. The tailored ratio approach developed in this paper holds up well when contrasting its results to that of the residual income approach in Austria by tenure.

E-mail address: Andrea.Kunnert@wifo.ac.at
2016/215/W/0

Medieninhaber (Verleger), Hersteller: Österreichisches Institut für Wirtschaftsforschung • 1030 Wien, Arsenal, Objekt 20 •
Tel. (43 1) 798 26 01-0 • Fax (43 1) 798 93 86 • http://www.wifo.ac.at/ • Verlags- und Herstellungsort: Wien

Kostenloser Download: http://www.wifo.ac.at/wwa/pubid/58922

Housing Affordability in Austria – Tailoring the Ratio Approach in a Simple yet Effective Way

Andrea Kunnert

Österreichisches Institut für Wirtschaftsforschung (WIFO)
Arsenal Objekt 20
1030 Wien
Austria
Andrea.Kunnert@wifo.ac.at

July 2016

Abstract

The expenditure-to-income ratio is a widely used measure of housing affordability as it is easy to calculate and to interpret, yet it suffers from several flaws that may diminish its usefulness. This paper addresses the main points of critique and improves the accuracy of the ratio measure by providing additional information about the distribution (values at the 10th, 25th, 50th, 75th and 90th percentile) for the cost burden and calculating cumulative distributions for a range of expenditure-to-income shares instead of one single benchmark. Furthermore, an upper limit for income and housing quality is set in order to avoid misclassifying households that have strong preferences towards housing consumption. The results indicate that these modifications are necessary to avoid overestimating affordability problems. The tailored ratio approach developed in this paper holds up well when contrasting its results to that of the residual income approach in Austria by tenure.

Keywords: housing affordability, ratio approach, quality adjustment, residual income approach, Austria;

JEL-Codes: R21, R31, I32;

Acknowledgements: Supported by funds of the Oesterreichische Nationalbank (Anniversary Fund, project number: 14972).

1. Introduction

Applying an expenditure-to-income ratio to measure housing affordability has often been criticized for a number of reasons. These include most commonly (1) the misclassification of households with respect to income levels and quality choices (implying that it does not capture how much households can actually afford for housing in absolute terms), (2) the arbitrariness and normative character of one single benchmark, (3) the sensitivity to the definition of housing costs and income, (4) that – especially if only the average cost burden is calculated – the policy implications are vague at best, and (5) the failure to account for household size or composition (*Lerman – Reeder*, 1987; Hancock, 1993; *Hulchanski*, 1995; *Bogdon – Can*, 1997; *Chaplin* – Freeman, 1999; Thalmann, 2003; *Burke*, 2004; *Gabriel*, 2005; *Stone*, 2006).

There are many arguments why the residual income approach is more preferable than the ratio approach for measuring housing affordability. One such argument is that the analysis of absolute income and expenditure levels should allow for a better identification of (low-income) households that are not able to afford housing and other essential non-housing goods at a minimum adequate level (*Stone*, 2006). The main problem of the residual income approach is, however, that reference budgets or poverty measures, separated by housing and non-housing expenditures, are not always readily available and, should they be available, are usually no less normative than a maximum ratio.

The expenditure-to-income ratio approach is the most widely used approach to measure housing affordability (*Chaplin – Freeman*, 1999). The attractiveness of the ratio approach lies in its simplicity and its low computational requirements; it is also easy to interpret. Given its widespread usage and, in some situations, the lack of alternative approaches, this paper argues that addressing the shortcomings of the ratio measure is one way forward towards improving its usefulness.

In this paper, it is shown how the ratio approach can easily be tailored to be more effective by calculating distributional measures for the cost burden and headcounts, and setting upper income and quality limits. One of the main shortcomings of the ratio approach, i.e. the arbitrariness and normative character of a single maximum ratio measure and its sensitivity to definitions of housing costs and income, are addressed by calculating cumulative distributions of households over various expenditure shares of income:

First, instead of using a mere average cost burden, the median, 10^{th}, 25^{th}, 75^{th} and 90^{th} percentiles of the distribution are calculated. It should be noted that the mean might not be a good measure of centrality as it is likely distorted by outliers. In addition, relying on percentiles does not presume normality of a distribution. This simple enhancement goes a long way in addressing some of the shortcomings described above; nevertheless it is not standard in the literature that the overall distribution of the cost burden is taken into account.

Second, instead of presenting the headcount at one single maximum ratio, the distribution of households affected by affordability problems at various levels of income shares is calculated. *Lerman – Reeder* (1987) use a similar approach. They illustrate how US households are affected by a lack of housing affordability at seven different maximum ratios. This paper

extends their approach to the full distribution. These two enhancements are particularly useful when comparing subgroups of the housing markets (e.g. tenure, income groups or regions) and allow for better policy conclusions.

When additionally taking quality aspects and income limits into account, the accuracy of the measure for identifying households with a lack of housing affordability is greatly improved – even though normative aspects are reintroduced (as is the case with the residual income approach or most likely any microeconomic measure of housing affordability). In addition, an upper income limit and an upper quality limit are introduced to separate issues of housing affordability from cases of households with high incomes or strong preferences towards housing consumption. While the upper income limit is for example regularly used in applications for the Australian housing market (30% as benchmark for the two lower income quintiles also known as 30/40-rule), few applications exist for an upper quality limit. *Hancock* (1993) suggests introducing an upper quality bound, as this is often done by housing policy makers in designing housing allowances. The goal of applying a maximum housing quality standard is to distinguish – even at low income levels – housing affordability problems from over-housing. In case of over-housing at low-income levels, this might be seen as a lack of affordability of other goods. In such cases, other non-housing policy instruments might be more suitable. In this paper, housing quality is measured as crowding based on the specific household composition (Eurostat bedroom standard), because housing quality with respect to building standards is very high in Austria. Lastly, equivalence scales are applied to account for household size.

By addressing all five common points of critique of the ratio approach, this paper contributes to the literature by making the ratio measure more suitable, more informative and more accurate, while remaining its simplicity. This so-called tailored ratio approach is applied to Austrian households using SILC data (2014) by tenure and contrasted to the residual income measure applying reference budgets. The comparison indicates that the tailored ratio approach can be useful when no alternative measures are available or even as a measure by itself.

2. Theoretical Foundation and Methods

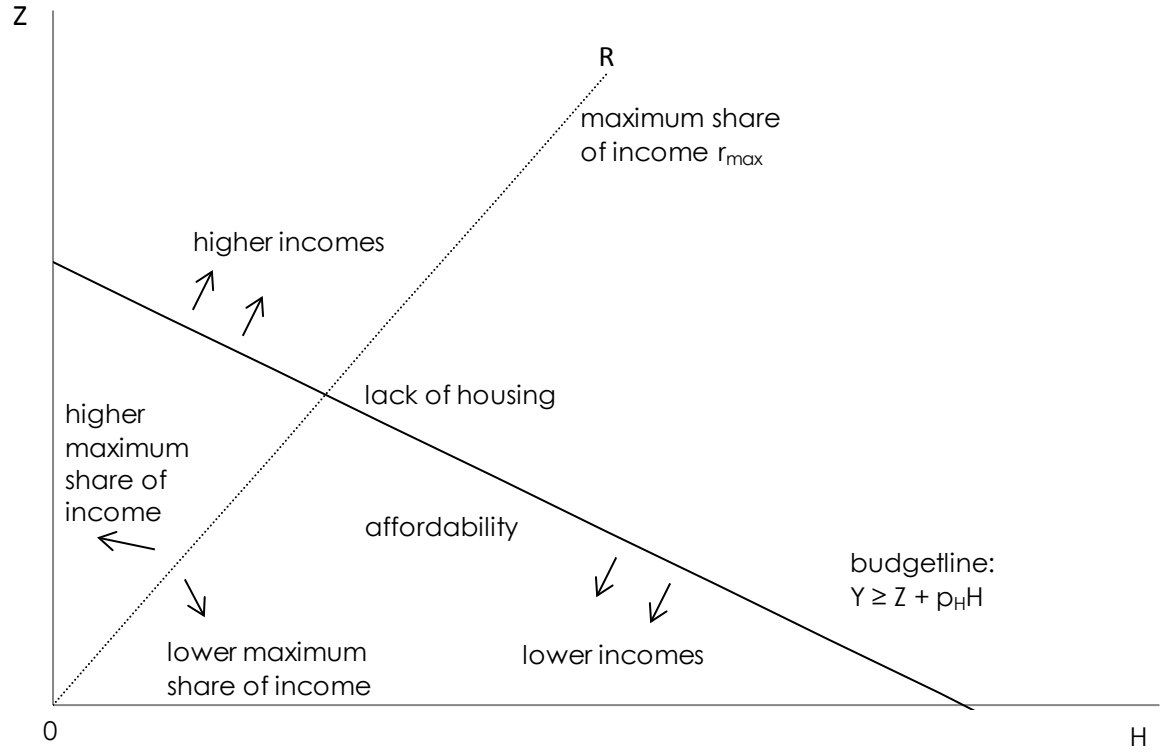
Because housing affordability is about a trade-off between housing H and other goods Z given a certain income Y, the following microeconomic foundation applies (Figure 1). The vertical axis represents consumption of non-housing goods Z, the price of Z is set at p_Z=1. The horizontal axis represents the quantity of housing consumption with price p_H. Housing can be interpreted as housing services consumed and not just as mere quantity, therefore representing a vector of housing qualities (*Thalmann*, 2003). The budget line represents the budget constraint in this diagram, its slope is $-p_H$. The budget constraint is given by equation (1) and shows the combinations of how much of each good can be consumed given a certain income Y. Higher incomes would be represented by a budget line further up and to the right, lower incomes by a budget line further down and to the left. If housing were

to become cheaper (more expensive) compared to other goods, the budget line would be more flat (steeper).

(1) $Y \geq Z + p_H H$

Households – in theory – can freely choose a bundle B(Z', H') given their income constraint and preferences to maximize their utility. However, housing markets are characterized by market imperfections that are not depicted in Figure 1. Among others, these include price discrimination, missing choices for low-income households, different price ratios of housing compared to other goods due to different consumption baskets and indivisibility. Transaction costs are also non-negligible and can hinder moving from one consumption bundle to another along the budget line.

Figure 1: Housing affordability under the standard expenditure-to-income ratio approach.



S: Own illustration, adapted from *Lerman – Reeder* (1987).

For the ratio approach, the share of housing expenditures $p_H H$ of income Y ($p_H H/Y$) is computed. Introducing a maximum share of income r_{max} implies that households to the right of the line OR have a housing affordability problem. This implies that $r_{max} < p_H H/Y*100$. A higher (lower) ratio would be represented by a flatter (steeper) line, and more (less) households would be affected *c.p.* – showing affected households at a range of maximum measures is a simple yet effective way to demonstrate the distribution of affordability problems and to enhance a single ratio benchmark. Providing the cumulative distribution for various income shares also makes this measure less dependent on the definition of housing expenditures and

incomes (e.g. gross vs. net incomes, inclusion or exclusion of housing allowances, etc.). Inequality condition (2) is the algebraically reformulated condition of a housing affordability problem in terms of Z and H for a consumption bundle B(Z', H'). Households in areas c, d, e, and f are classified as having an affordability problem (Figure 2):

(2) $Z' < [(100-r_{max})/r_{max}]*p_H H'$

In an extended version of the ratio approach, *Lerman – Reeder* (1987) introduce a minimum quality H** and set price levels for this quality to find the income level at which this minimum housing quality is still affordable, while not more than a certain share of income is spent. However, introducing such a minimum quantity basically implies setting an income bound – all households falling below are classified as having an affordability problem, no matter what their ratio is. The affordability criterion is defined in inequality condition (3) for households with a certain income Y' and it is equivalent to the areas e, f, g and h (Figure 2):

(3) $Y' < (100/r_{max})*p_H H^{**}$

This appears to be more similar to the residual income approach than to the ratio approach and requires intensive calculations to determine the market price for such a minimum quality or reference housing costs. The traditional residual income approach is shown in inequality condition (4). Households affected by a lack of housing affordability are in areas d, e, f, and g:

(4) $Z^{**} < Y - p_H H$

In general, setting a minimum housing quality seems appropriate for measuring affordability. However, given that the building quality level of Austria is very high (overcrowding is the main way to underconsume housing), this approach is not implemented in this paper (*Kunnert*, 2016).[1] Additionally, *Hancock* (1993) argues that it is difficult to disentangle those households who purposely underconsume and those who are forced to underconsume (either by income or non-income constraints); the former group would not be well targeted by housing policy measures to increase affordability.

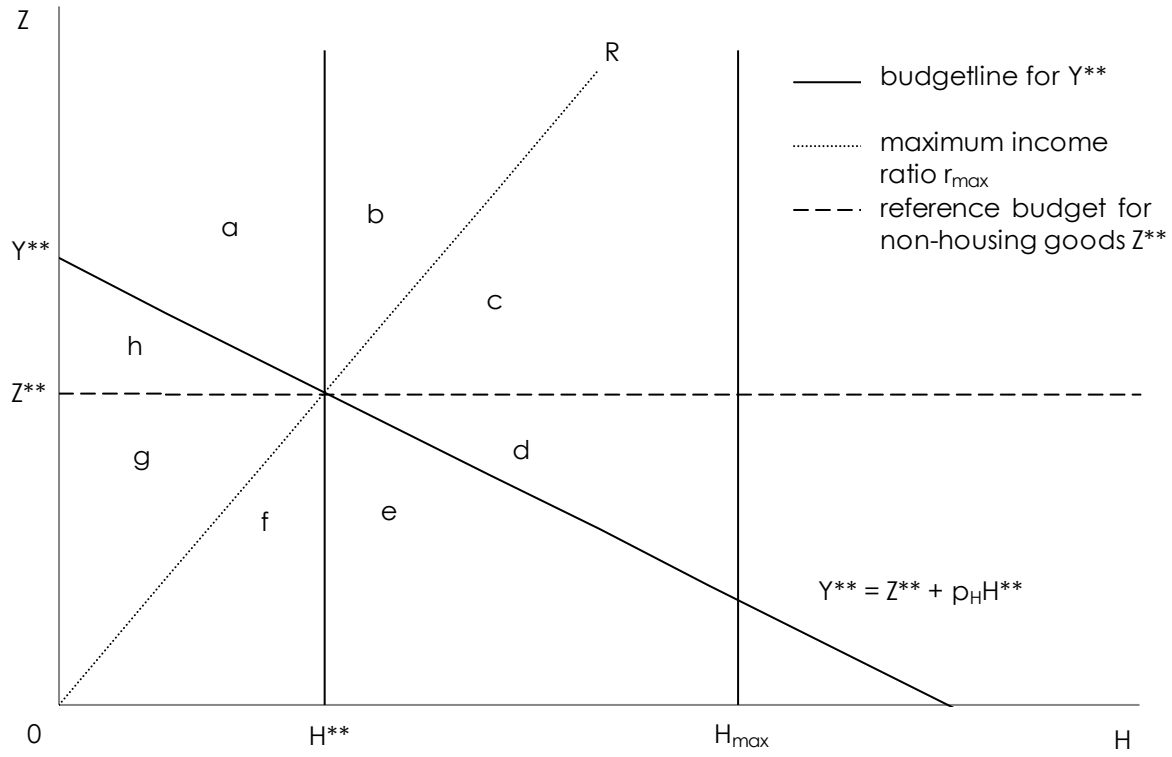
In contrast to the lower quality limit, *Hancock* (1993) argues that for housing policy instruments, often an upper limit of housing H_{max} is introduced. Households to the right of H_{max} then are classified not to have an affordability problem because of over-consumption. She applies this approach in combination with a residual income approach based on the criteria of the British housing benefit scheme, but it could also be applied to any of the above mentioned housing affordability definitions (Figure 2).

In general, the various definitions given above show that there are shades of grey when it comes to measuring housing affordability. Applying a dichotomous affordability measure will always misclassify some households, especially when keeping in mind various housing market imperfections that are difficult to account for. *Thalmann* (1999) addresses one of these imperfections – he notes that some of the households might in fact not underconsume housing, but profit from below market rents as the price relation between housing and other

[1] For other countries, where minimum quality represents a housing market issue, one simpler solution would be to classify all households as having a housing affordability problem – irrespective of their cost burden – below a certain income.

goods might not be equal for all households. This is accounted for in this paper by using an imputed rent approach for renters benefitting from reduced rates accounts for price discrimination.

Figure 2: Housing affordability by various criteria with minimum and maximum quality limits.



S: Own illustration, adapted from *Lerman – Reeder* (1987) and *Hancock* (1993).

Instead of propagating a single ratio measure, this paper takes a look at the full distribution at various benchmarks and compares different types of households by tenure. For all households, the share of housing expenditure in terms of household income is computed. The analysis in this paper adopts a user cost approach based on imputed rents. This has several advantages over using actual housing expenditures. First, it allows for an increased comparability of households by tenure status as owner occupiers are treated as if they were renting from themselves. Second, because imputed rents are also used to achieve comparability between households renting at market prices and those renting at a reduced market rate, comparability with households that receive monetary housing benefits (below-market rents can be seen as an in-kind equivalent) is improved. Third, this limits distortions caused by price discrimination without having to estimate a hedonic price model for housing as is done by *Thalmann* (1999, 2003); Otherwise, affordability measures might misclassify households if only adjustments for quality are made, but not for price discrimination

(*Thalmann*, 1999 and *Thalmann*, 2003). Fourth, it can be seen as a broader concept that focuses on the longer-term affordability.

Based on housing costs and income, the average housing cost burden is computed. Given that this measure can be strongly distorted by outliers, the median is presented as well. In addition, the 10th, 25th, 75th and 90th percentiles are computed. These calculations are simple, yet enhance the ratio measures (sensitivity) greatly.

Instead of using a single normative maximum ratio, a spectrum of ratios at 0, 5, 10, …, 90, 95, and 100% is computed. Again, the computations are simple, yet the value of an affordability analysis is improved by making the sensitivity of the analysis to a certain maximum limit transparent. One might argue that merely calculating a distribution without providing a benchmark is not a useful exercise for policy makers; similarly, merely calculating the average housing cost burden does not identify the households with affordability problems. Therefore, it should be emphasized that calculations of such a distribution of households that suffer from a lack of housing affordability at certain levels is particularly valuable when dividing the households in subgroups, such as by tenure, crowding, region, household type or by income groups. Policy makers can then use the different levels of affectedness of these groups as guidance.

In addition, these distributions are calculated after introducing an upper quality bound as well as an upper income bound at the 25th percentile of the income distribution. The quality of this tailored ratio measure is evaluated by comparing it to the residual income approach using Austrian reference budgets. Notably, the reference budgets are just slightly below the chosen income limit.[2] The upper quality bound is defined as not having more than one extra room compared to what the household needs according to the Eurostat bedroom standard and counting kitchens above four square meters as room.

3. Data and Definition of Housing Costs and Income

The analysis is based on the Austrian Survey of Income and Living Conditions (SILC) data for 2014. SILC covers in detail personal and household income, the housing situation and housing expenses as well as imputed rents. The sample size is 5,909 private households, representing 3.76 million households. Housing costs are measured as user costs using imputed rents for owners and rent-free tenures. Imputed rents are also included to account for below-market rents: in this case, imputed rents are the difference between the reduced and the market rent. Therefore, housing costs are a combination of actual and/or imputed rents, utilities, energy expenses and taxes. Overall, more than two thirds of households have some of their rent imputed. Incomes, which are defined as net equivalent incomes (EU-scale) – are adjusted accordingly: For owners, 60% of the imputed rents minus financing costs are added to account for their costs as landlords (e.g. maintenance and depreciation, insurances, etc.),

[2] Using the reference budgets housing costs as price for the minimally adequate housing unit implies that households below the 25th income percentile could not afford minimally adequate housing without spending more than 36% of their income. This gives an idea of how incomes, qualities and housing costs compare in Austria. It is comparable to the approach by *Lerman – Reeder* (1987) – only an income limit is set first, instead of initially determining a ratio.

for others the full amount of the imputed rent is added. This definition of housing costs with imputed rents allows for maximum comparability between tenures. Nevertheless, because other intrinsic differences between owners and renters call for a separate treatment of these two groups, they are treated as subgroups in section 4.

4. Results for Austria 2014

Table 1 shows the distribution of incomes, housing costs and the average cost burden of Austrian households by tenure and in total. In general, owners have higher incomes than renters or other tenures but both groups have similar housing costs. This implies lower cost burdens for owners. It is noticeable that the median rent burden is well below the mean – extremely high rent burdens by households with almost no income account for the distortion of the mean.

Table 1: Descriptive statistics for income, housing costs, cost burden and potentially affordable cost burden by tenure in Austria 2014

Tenure	Mean	10th percentile	25th percentile	Median	75th percentile	90th percentile
Renters			*Monthly amounts (€)*			
Income	1,972	880	1,214	1,709	2,330	3,160
Housing costs	462	258	320	416	547	700
Cost burden	114	13	18	24	35	52
Potentially affordable cost burden	-88	9	34	53	66	75
Owners						
Income	2,575	1,349	1,763	2,291	3,014	3,986
Housing costs	464	267	335	431	551	702
Cost burden	23	10	13	18	26	37
Potentially affordable cost burden	60	41	55	65	73	80
Others						
Income	1,978	1,059	1,414	1,888	2,302	2,929
Housing costs	430	215	295	395	528	688
Cost burden	28	11	16	22	30	41
Potentially affordable cost burden	44	24	43	58	65	73
Total						
Income	2,272	1,053	1,462	2,015	2,698	3,628
Housing costs	460	259	325	421	547	701
Cost burden	61	11	15	21	30	43
Potentially affordable cost burden	-2	24	45	60	70	78

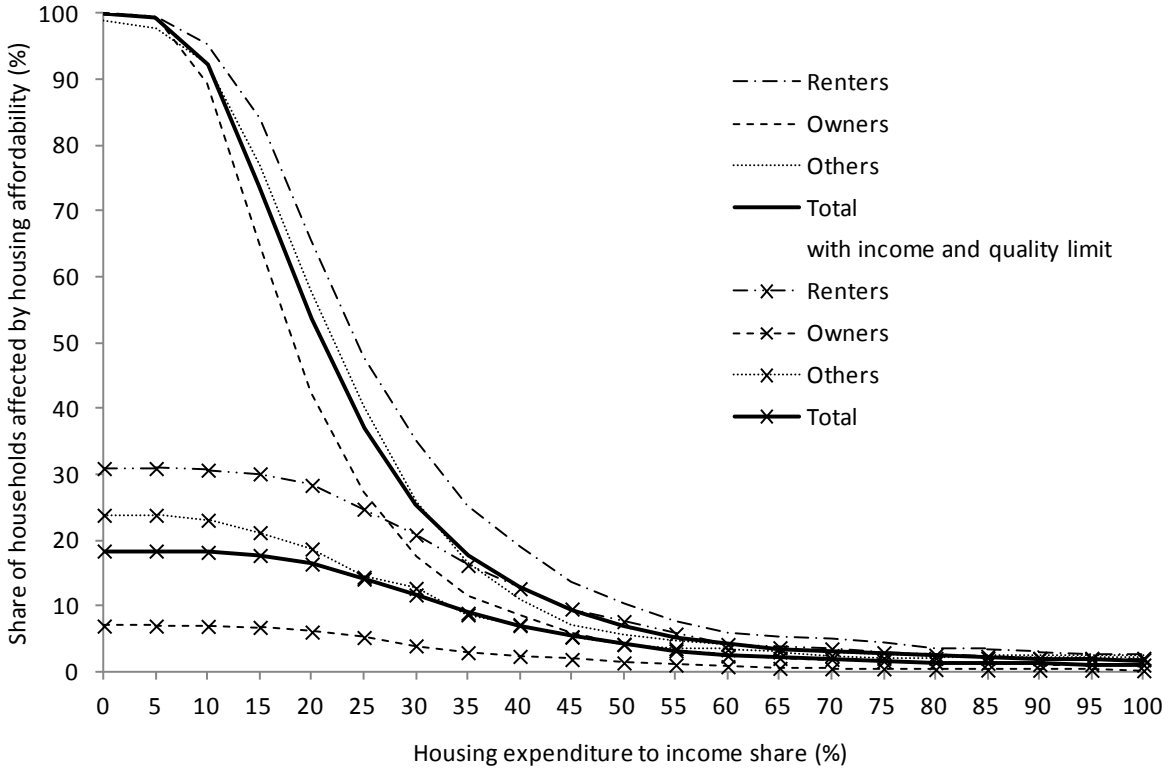
S: Statistik Austria, SILC 2014, own calculations using Stata 14. – Housing costs including imputed rents, incomes are net equivalised disposable incomes including imputed rents (minus costs of owners).

In total, the median cost burden is at 21% of income, at the 10th percentile it is 10 percentage points lower, at the 90th percentile it is 22 percentage points higher indicating the skew of the distribution (Table 1). This suggests that only 10% of Austrian households pay more than 43% of their income for housing. Even though this seems low, it is likely that these households are low-income households and that in absolute terms their income does not suffice for housing and other necessities. After all, at the 10th percentile, households can only carry a housing cost burden of 24%, and it is much lower for renters (9%).[3]

[3] The potentially affordable cost burden is a measure derived from the residual income approach: Reference budget values for non-housing goods are deducted from the income – this is what a household could potentially afford in

Figure 3 depicts the cumulative distributions of households and whether they are affected by affordability problems at various maximum income ratios. Without accounting for any income or quality limit, 37% of all households would not be able to afford housing at a 25%-maximum ratio (Table 2 shows the exact numbers). For renters, the share would be higher at 48%, for owners it would only be 27%. However, significantly fewer households are affected by a lack of affordability after introducing income and quality constraints. This result shows how the simple ratio approach can lead to highly misleading results, especially for relatively lower ratios.

Figure 3: Cumulative distribution of households by tenure over various expenditure shares of income with and without maximum income and quality limits



S: Statistik Austria, SILC 2014, own calculations using Stata 14. – Housing costs including imputed rents, incomes are net equivalised disposable incomes including imputed rents (minus costs of owners).

The share of households affected by a lack of housing affordability is remarkably similar for higher housing-expenditure-to-income ratios as shown in Figure 3. There seems to be some conversion when higher income ratios are chosen. This implies that households with high cost burdens have low incomes and do not over-consume housing. Figure 3 also shows that differences between tenures are much more pronounced when upper income and quality limits are introduced. While affordability issues almost vanish for owners–mostly because they

absolute terms for housing. This value is set in relation to the household's income in order to derive the potentially affordable cost burden.

have larger living units and excess rooms (Table 2) − this is not the case for renting households (21% of renters are affected at a 30%-maximum ratio).

Contrasting these results to the residual income approach shows that the residual income measure of housing affordability is much less sensitive to the introduction of the upper income and quality limits then the ratio approach. This is because the residual income approach is already targeted at lower incomes. Without upper income and quality limits, 15% of all households are affected (25% of renters) by the residual income approach. When the upper income and quality constraints are applied the share of households affected by housing affordability drops to 11% (20% of renters). This implies that the share of renters affected by housing affordability problems is approximately equal for the residual income approach and at a 30%-income ratio (applying the income and quality limits). This holds also true when looking at all households (11% for the residual income, 12% for the tailored income ratio at 30%).

5. Summary and Conclusions

This paper enhances the ratio approach in two main ways: First, it broadens its spectrum by showing distributional measures of the cost burden and also of the share of households affected by housing affordability problems at various levels of expenditure-to-income ratios. Second, it refines its application by introducing an upper income limit and also an upper quality limit. This seems to be important in countries where housing quality is generally very high and where housing might easily be over-consumed, such as in Austria. These two adjustments are simple to implement, yet very effective in enhancing the accuracy of this measure.

The results indicate that the distribution of cost burdens in Austria is skewed, meaning that any analysis based on the mean of such a distribution would be inaccurate as the mean would be a distorted measure of centrality. Reverting to the median seems to be the better choice. The analysis also shows that only relatively few households are affected by high cost burdens. However, these households appear to be low-income households so that even if they had lower cost burdens their budgets would be strained.

Furthermore, any analysis that neglects introducing upper income and quality limits would highly overstate affordability problems when applying the expenditure-to-income approach. Renters are in general more affected by housing affordability problems; they tend to have lower incomes and are also more likely to live in overcrowded units. The quality limit particularly lowers affordability issues for owners. These results are also supported by the residual income approach. While the residual income approach might still be the preferable indicator as it targets low-income households better, the tailored ratio approach seems to be a viable alternative when the residual income approach is not feasible.

Table 2: Housing affordability by the ratio and by the residual income approach without and with an upper income and quality limit by tenure in Austria 2014

	No income and quality limits				Households within first income quartile and maximum of one extra room			
	Renters	Owners	Others	Total	Renters	Owners	Others	Total
Number of households (sample)	2,293	3,070	546	5,909	2,293	3,070	546	5,909
Number of households (population)	1,553,839	1,870,325	337,626	3,761,790	1,553,839	1,870,325	337,626	3,761,790
Average household size (persons)	1.94	2.57	1.74	2.23	1.94	2.57	1.74	2.23
Average housing unit size (m²)	69	126	89	99	69	126	89	99
Number and share of households not able to afford housing according to								
Residual income approach	381,928	142,526	49,611	574,065	316,362	66,585	38,056	421,002
Share of households (%)	25	8	15	15	20	4	11	11
Expenditure-to-income-ratio at 0%	1,552,391	1,870,325	334,249	3,756,966	481,225	131,635	80,586	693,446
Share of households (%)	100	100	99	100	31	7	24	18
Expenditure-to-income-ratio at 5%	1,545,598	1,859,979	329,765	3,735,341	481,225	131,635	80,586	693,446
Share of households (%)	99	99	98	99	31	7	24	18
Expenditure-to-income-ratio at 10%	1,484,511	1,673,793	311,634	3,469,939	477,344	130,703	78,047	686,095
Share of households (%)	96	89	92	92	31	7	23	18
Expenditure-to-income-ratio at 15%	1,304,787	1,210,342	259,982	2,775,112	468,634	127,888	71,696	668,217
Share of households (%)	84	65	77	74	30	7	21	18
Expenditure-to-income-ratio at 20%	1,020,292	796,957	195,815	2,013,064	441,435	114,538	63,290	619,263
Share of households (%)	66	43	58	54	28	6	19	16
Expenditure-to-income-ratio at 25%	745,042	512,660	136,124	1,393,826	385,280	99,091	48,810	533,181
Share of households (%)	48	27	40	37	25	5	14	14
Expenditure-to-income-ratio at 30%	544,258	329,859	87,302	961,419	324,266	75,321	43,103	442,690
Share of households (%)	35	18	26	26	21	4	13	12
Expenditure-to-income-ratio at 35%	394,806	218,594	55,954	669,354	252,451	56,034	29,525	338,010
Share of households (%)	25	12	17	18	16	3	9	9
Expenditure-to-income-ratio at 40%	295,545	159,044	37,095	491,684	197,586	45,534	24,493	267,612
Share of households (%)	19	9	11	13	13	2	7	7
Expenditure-to-income-ratio at 45%	212,535	112,735	23,671	348,941	149,549	36,639	18,077	204,265
Share of households (%)	14	6	7	9	10	2	5	5
Expenditure-to-income-ratio at 50%	162,140	78,726	18,736	259,602	119,960	26,983	14,248	161,191
Share of households (%)	10	4	6	7	8	1	4	4
Expenditure-to-income-ratio at 55%	122,375	60,512	16,138	199,025	90,429	20,907	12,165	123,501
Share of households (%)	8	3	5	5	6	1	4	3
Expenditure-to-income-ratio at 60%	93,652	50,283	13,899	157,834	65,859	16,194	11,615	93,668
Share of households (%)	6	3	4	4	4	1	3	2
Expenditure-to-income-ratio at 65%	83,593	37,331	12,220	133,144	58,144	11,482	10,482	80,109
Share of households (%)	5	2	4	4	4	1	3	2
Expenditure-to-income-ratio at 70%	78,158	33,458	10,329	121,945	55,406	10,255	8,591	74,252
Share of households (%)	5	2	3	3	4	1	3	2
Expenditure-to-income-ratio at 75%	67,934	31,358	8,974	108,266	46,466	10,075	7,237	63,778
Share of households (%)	4	2	3	3	3	1	2	2
Expenditure-to-income-ratio at 80%	57,713	25,836	8,259	91,808	40,743	8,164	7,237	56,143
Share of households (%)	4	1	2	2	3	0	2	1
Expenditure-to-income-ratio at 85%	53,499	24,011	8,259	85,769	38,023	6,759	7,237	52,019
Share of households (%)	3	1	2	2	2	0	2	1
Expenditure-to-income-ratio at 90%	47,522	20,490	8,259	76,271	32,346	6,127	7,237	45,710
Share of households (%)	3	1	2	2	2	0	2	1
Expenditure-to-income-ratio at 95%	43,380	20,490	8,259	72,129	31,013	6,127	7,237	44,376
Share of households (%)	3	1	2	2	2	0	2	1
Expenditure-to-income-ratio at 100%	41,626	17,317	8,259	67,201	29,789	4,774	7,237	41,800
Share of households (%)	3	1	2	2	2	0	2	1

S: Statistik Austria, SILC 2014, own calculations using Stata 14. – Housing costs including imputed rents, incomes are net equivalised disposable incomes including imputed rents (minus costs of owners).

References

Bogdon, A., Can, A., „Indicators of Local Housing Affordability: Comparative and Spatial Approaches", *Real Estate Economics*, 25(1), S. 43-60), 1997.

Burke, T., 2004, „Measuring Housing Affordability", Australian Housing and Urban Research Institute, Melbourne, 2004.

Chaplin, R., Freeman, A., "Towards and Accurate Description of Affordability", *Urban Studies*, 36(11), S. 1959-1957, 1999.

Gabriel, M., Jacobs, K., Arthurson, K., Burke, T., Yates, J., "Conceptualising and Measuring the Housing Affordability Problem", Research Paper, Australian Housing and Urban Research Institute, Australia, 2005.

Hancock, K., "Can Pay? Won't Pay? or Economic Principles of Affordability", *Urban Studies*, 30(1), S. 127-145, 1993.

Hulchanski, J., „The Concept of Housing Affordability: Six Contemporary Uses of the Housing Expenditure-to-Income Ratio", *Housing Studies*, 10(4), S. 471-492, 1995.

Kunnert, A., "Leistbarkeit von Wohnen in Österreich: Operationalisierung und Betroffenheit unter Berücksichtigung demographischer Aspekte", WIFO, Wien, 2016. Mimeo.

Lerman, D., Reeder, W., "The Affordability of Adequate Housing", *AREUEA Journal*, 15(4), S. 389-404, 1987.

Stone, M., "What is Housing Affordability: The Case for the Residual Income Approach", *Housing Policy Debate*, 17(1), S. 151-184, 2006.

Thalmann, P., "Identifying Households which Need Housing Assistance", *Urban Studies*, 36(11), S. 1933-1947, 1999.

Thalmann, P., "'House poor' or simply 'poor'", *Journal of Housing Economics*, 12, S. 291-317, 2003.