TransFair-AT Research Brief #2: Exploring the characteristics of mobility and energy poor households in Austria

Analysis of data from a mobility and consumer expenditure survey

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1 Introduction

The target of a full decarbonisation of household energy consumption and mobility by 2040 cannot be achieved without increasing carbon prices. Households that dispose of a low income and/or have high expenses for energy and mobility are particularly affected by increasing carbon prices. The objective of the project TransFair-AT is to develop measures to compensate such particularly vulnerable groups, thus ensuring a socially fair decarbonisation of the housing and mobility sector. As a first step, we identify the criteria under which households can be considered energy poor and mobility poor (section 2) from the standpoint of affordability. In a second step, we analyse how many households in Austria can be classified according to our definition as energy poor and/or mobility poor and are therefore particularly vulnerable to price increases. The analysis presented in this research brief is based on data from a combined mobility and activity and consumer expenditure survey (section 3). In a third step, we analyse the characteristics of energy poor and mobility poor households in relation to their non-energy poor and non-mobility poor counterparts (section **Fehler! Verweisquelle konnte nicht gefunden werden.** to 7). In our analysis, households are characterised by attributes of their socio-demographic status, household location, mobility behaviour and housing situation. In section 8 we describe the commonalities and differences of energy poor and mobility poor households with respect to these characteristics. Our results are summarised in section 9.

2 Definition of mobility and energy poor households

We are aware of the existence of a wide range of definitions for mobility and energy-poverty (EPAH, 2022; Kiss, 2022; Kuttler & Moraglio, 2020; Lucas et al., 2016; Matzinger et al., 2018). Mobility poverty e.g. includes aspects of transport availability, accessibility, affordability, time spent travelling and inadequate transport conditions (Kiss, 2022). Due to the focus on pricing measures, our definitions for mobility and energy poor households are based on affordability, i.e. income and expenditures only. The following definitions are used for the analysis presented in this paper:

- Mobility poor households are households who are in the lowest income quartile and in the highest quartile of share of income allocated to mobility (without car purchase).
- Energy poor households are households who are in the lowest income quartile and in the highest quartile of share of income allocated to energy.
- Mobility and energy poor households are households who fall into both categories.

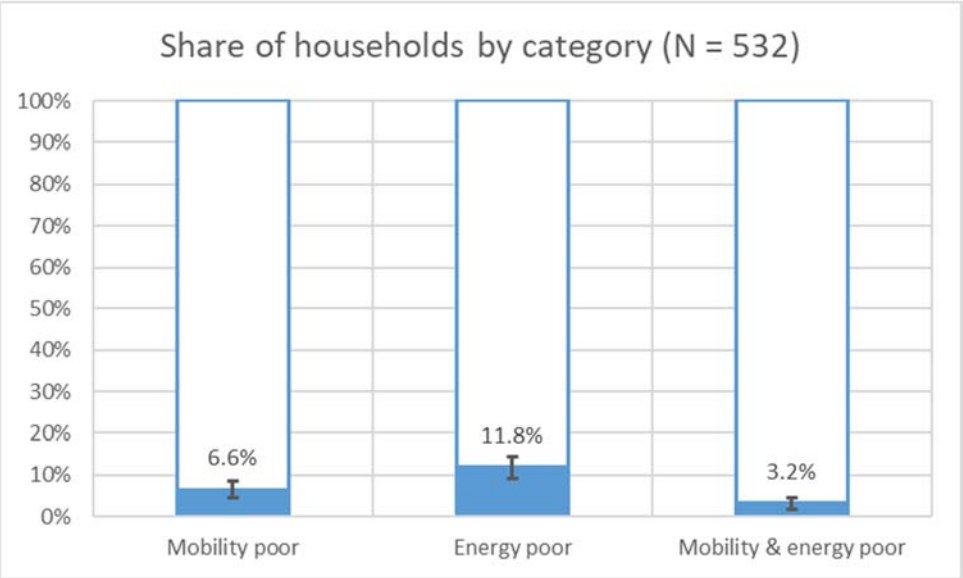
3 Material

The data used for the analysis of mobility and energy poor households originate from a mobility and activity (MAS) survey conducted from September 2019 to August 2020 in Austria (Hartwig et al., 2022). Respondents reported time use and mobility for their activities in a diary over a continuous period of seven days, which represents a typical work-leisure cycle. The survey respondents are a subgroup of participants who completed the national consumer expenditure survey (CES) conducted by the statistical office Statistics Austria from June 2019 to May 2020. From the combined MAS and CES data, it is possible to directly link household expenditures and mobility behaviour. The net sample consists of 908 participants that matches the socio-demographic characteristics of the Austrian population closely. A detailed sample description can be found in (Hartwig et al., 2022).

From the sample of 532 households, 35 (6.6%) fall into the category mobility poor, 63 (11.8%) into the category energy poor and 17 (3.2%) into the category mobility and energy poor. With a 5% confidence interval, the share of mobility poor households ranges between 4.5% and 8.7%, the share of energy poor households between 9.1%

and 14.6% and the share of mobility and energy poor households between 1.7% and 4.7% (Graph 1). These results demonstrate that a significant share of the Austrian population lives in mobility and/or energy poor households.

Graph 1: Share of vulnerable households by category



Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

Table 1 summarises the median income and the mobility and energy expenses per month of the different household types. Mobility poor households have higher mobility expenses per month but lower energy expenses per month than their non-poor counterparts. In contrast energy poor households have lower mobility and energy expenses per month than their non-poor counterparts. Mobility and energy poor households have higher mobility expenses per month but lower energy expenses per month than their non-poor counterparts.

Table 1: Median income and mobility and energy expenses per month by household type

		Income (€/month)	Mobility expenses (€/month)	Energy expenses (€/month)
Mobility	Poor	1,408	253	92
	Non-poor	3,899	189	120
Energy	Poor	1,396	70	104
	Non-poor	4,107	220	120
Mobility & energy	Poor	1,209	200	100
	Non-poor	3,861	195	120

Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

The following analyses attempt to answer the question of whether mobility and energy poverty is more likely to be caused by low incomes or by high mobility and energy expenditures.

In the lowest income quartile about 38% of the households have mobility expenses per income in the top quartile. In the other income quartiles the share of households in the top mobility expenses quartile of is only 22%. The difference is statistically significant ($p < 0.01$). In the highest mobility expenses quartile about 27% of the households are in the lowest income quartile. In the other mobility expenses quartiles only about 15% of the households are in the lowest income quartile. The difference is statistically significant ($p < 0.01$). If the distribution among the quartiles were uniform, this would imply a share of 25% in each case. As the difference from this value is higher with regard to mobility expenditure, mobility expenditure seems to be the more dominant factor.

In the lowest income quartile about 70% of the households have energy expenses per income in the top quartile. In the other income quartiles the share of households in the top energy expenses quartile is only 15%. The difference is statistically significant ($p < 0.01$). In the highest energy expenses quartile about 52% of the households are in the lowest income quartile. In the other energy expenses quartiles only about 7% of the households are in the lowest income quartile. The difference is statistically significant ($p < 0.01$). If the distribution among the quartiles were uniform, this would imply a share of 25% in each case. As the difference from this value is higher with regard to energy expenditure, energy expenditure seems to be the more dominant factor.

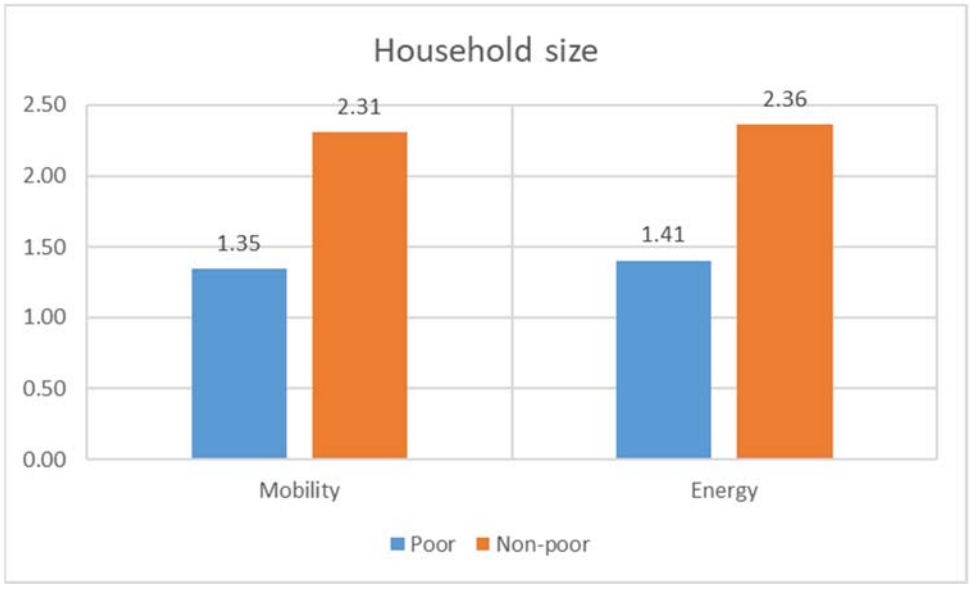
The following chapters presenting detailed results of our analysis each begin with a brief description of some hypotheses about potential relationships between the attributes under consideration and mobility or energy poverty. Subsequently, these hypotheses are tested based on the data from the survey.

4 Socio-demographic characteristics

4.1 Household size

For larger multi-income households it is easier to cover the fixed costs of living. Therefore, the probability that the budgetary situation is tighter is higher in smaller households, which then can lead to mobility and/or energy poverty. The findings from our survey sample confirm this hypothesis. The average size of mobility as well as energy poor households is significantly smaller than that of their non-poor counterparts (Graph 2). A t-test shows that the difference is statistically significant in both cases ($p < 0.01$).

Graph 2: Average household size

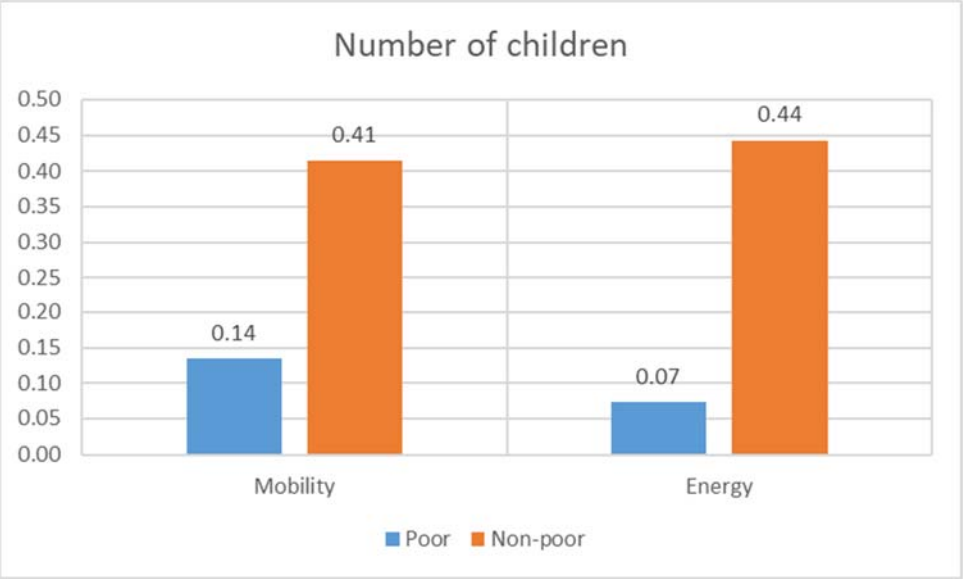


Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

4.2 Number of children

The number of children living in a household can potentially affect energy and mobility poverty in different ways. If the cost of living for children is higher than the child allowance, then a higher number of children can increase the risk of mobility poverty. On the other hand, it is more likely that households with children are in a productive phase of their life. Thus, reducing the risk of mobility poverty compared to childless households living on retirement pay. For our sample we found that, on average, there are fewer children living in mobility as well as energy poor households than in their non-poor counterparts (Graph 3). A t-test shows that the difference is statistically significant in both cases ($p < 0.01$). The data from the survey sample therefore confirm the second hypothesis while the first hypothesis can neither be confirmed nor rejected.

Graph 3: Average number of children per household

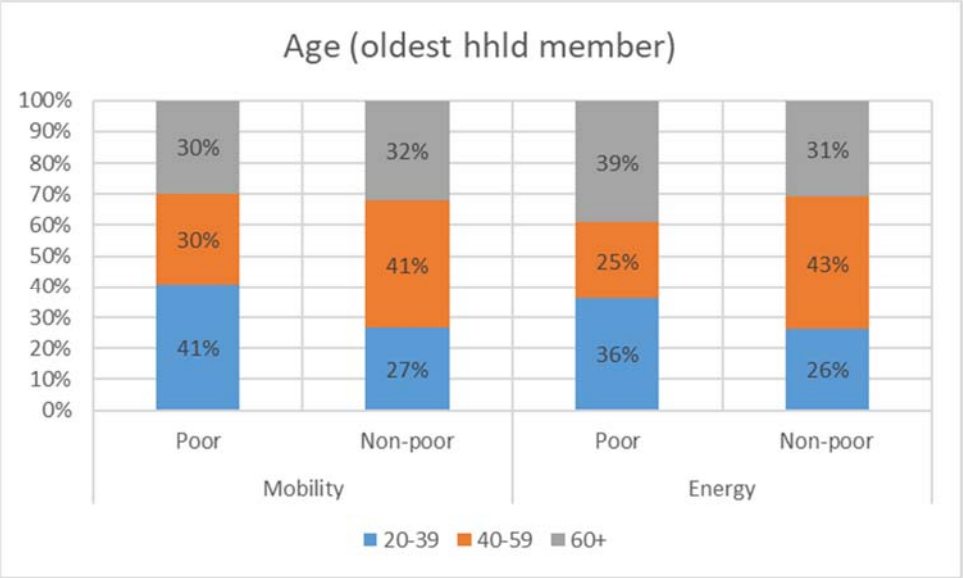


Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

4.3 Age of oldest household member

There are two different potential explanations for the relationship between age and mobility respective energy poverty. Older people predominantly live on relatively low retirement payment, which can cause mobility or energy poverty. On the other hand, younger people early in their career earn less money and have to make substantial investments. This tightens their budgetary situation and can lead to mobility or energy poverty. Our analysis shows that the oldest household members in mobility poor households tend to be younger than in their non-mobility poor counterparts (Graph 4). Nevertheless, a chi square test shows that the difference is not statistically significant ($p = 0.17$). Therefore, concerning mobility poverty neither of the two hypotheses is supported by the data from the survey sample. In energy poor households senior members are more often in the youngest and oldest age cohort than in their non-energy poor counterparts (Graph 4). A chi square test shows that the difference is statistically significant ($p = 0.02$). Therefore, concerning energy poverty both hypotheses are supported by the data from the survey sample.

Graph 4: Age of the oldest household member

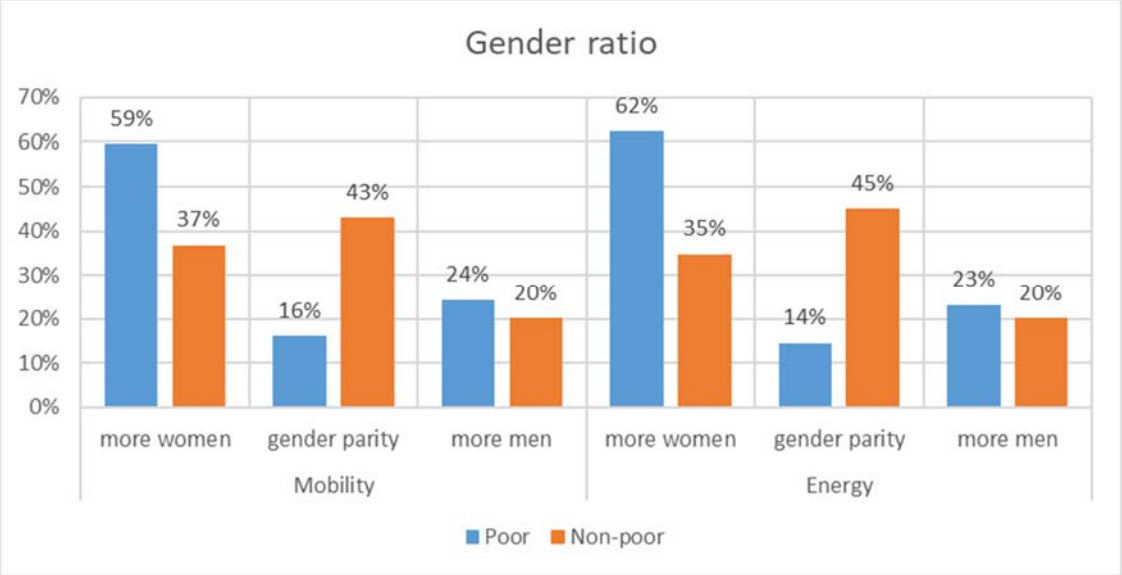


Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

4.4 Gender ratio including children

Even in 2023 female persons in Austria still earn significantly less than their male counterparts (Böheim et al., 2023; OECD, 2022; Statistik Austria, 2023). This tightens the budgetary situation in predominantly female households, which increases the risk of mobility and/or energy poverty. We found that mobility poor as well as energy poor households are more likely to have a majority of female members than their non-poor counterparts (Graph 5). A chi square test shows in both cases that the difference is statistically significant ($p < 0.01$). Therefore, the data from the survey sample confirm the hypothesis.

Graph 5: Gender ratio

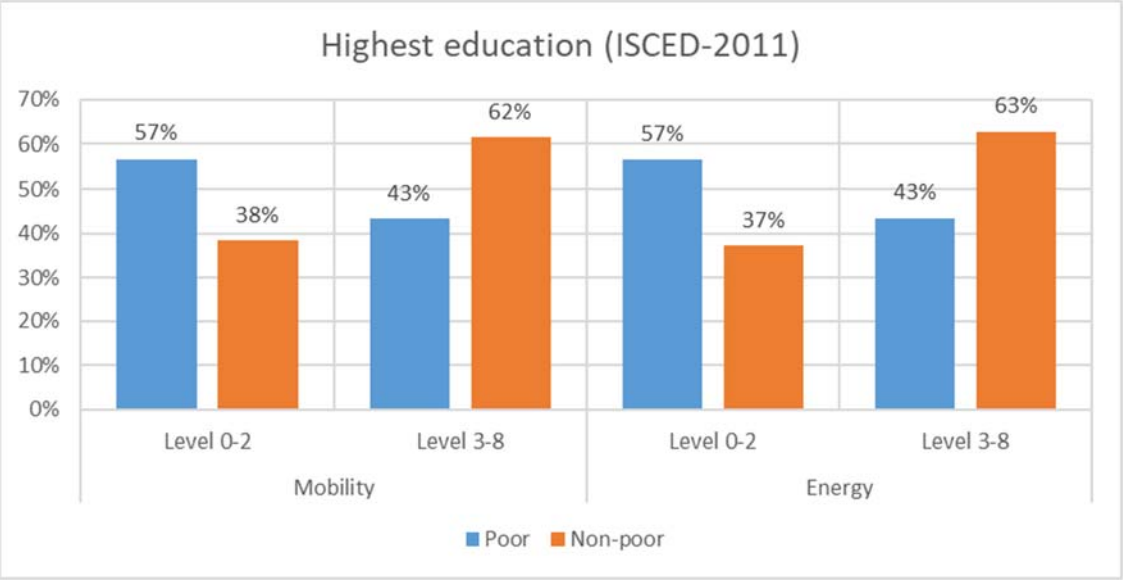


Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

4.5 Highest education

Income is strongly correlated with the level of education (OECD, 2022; Rechnungshof Österreich, 2022). A lower level of formal education leads to lower income, which increases the risk of mobility poverty. Mobility and energy poor households in our sample tend to have a lower education level[1] than their non-mobility poor counterparts (Graph 6). A chi square test shows that the difference is statistically significant ($p = 0.04$ respectively $p < 0.01$). Therefore, the hypothesis is supported by the survey sample data.

Graph 6: Highest education level



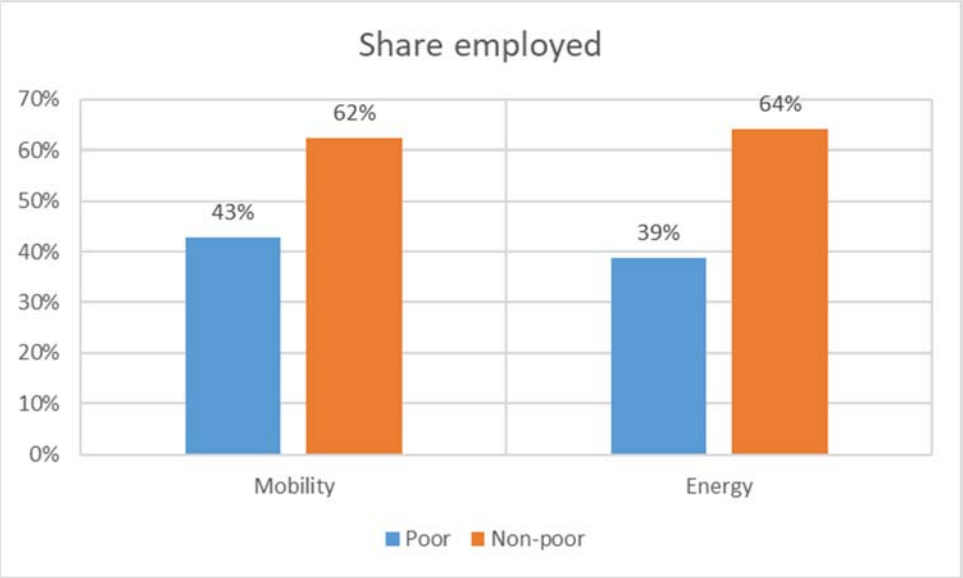
Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

4.6 Employment

It is obvious that despite transfer payments, like unemployment benefits or pensions, employed persons have in average higher financial resources than their un-employed counterparts. Therefore, higher employment rates ease the budgetary situation, which in turn reduces the risk of mobility and/or energy poverty. As expected, mobility and energy poor household have significantly lower employment rates than their non-mobility poor counterparts (Graph 7). A chi square test shows that the difference is statistically significant ($p = 0.03$ and $p < 0.01$ respectively). Therefore, the hypothesis is supported by the data from the survey sample.

[1] The classification refers to the International Standard Classification of Education (ISCED) which was developed by the UNESCO (Eurostat, n.d.).

Graph 7: Employment rate



Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

5 Characteristics of the household location

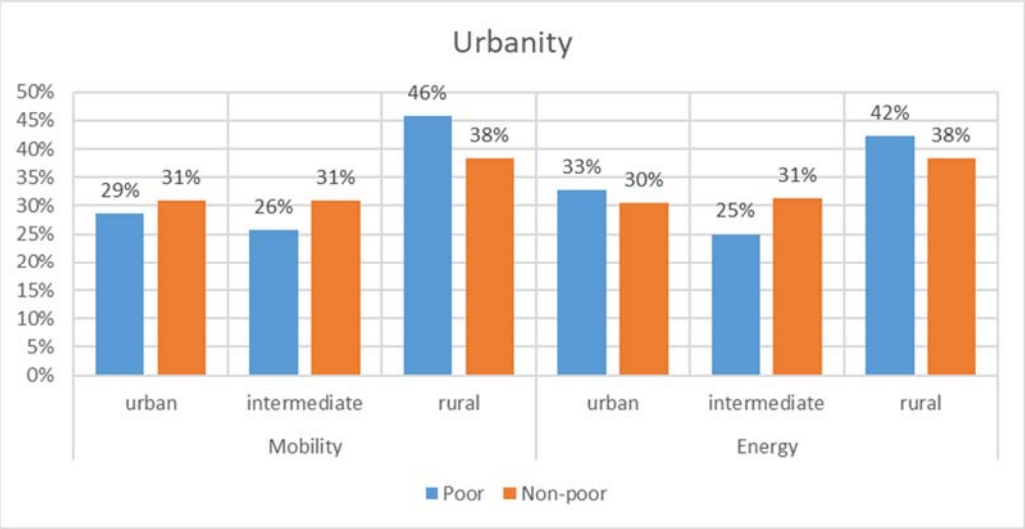
5.1 Degree of urbanity

Lower density, longer travel distances and therefore a higher dependence on the mode car in rural areas causes higher mobility expenditures than in urban areas (BMVIT, 2016). As a consequence, households in rural areas might be more susceptible to mobility poverty. This might tighten the budgetary situation of households. As a consequence, households in rural areas might be more susceptible to energy poverty too. On the other hand, housing costs are generally lower in rural than in urban areas. This might ease the budgetary situation and make households less susceptible to energy poverty.

A slightly higher share of the mobility poor households live in rural areas than their non-mobility poor counter-parts (Graph 8). Nevertheless, a chi square test shows that the difference is not statistically significant ($p = 0.67$). The hypothesis that living in rural areas increases mobility poverty is not supported by the data from survey sample.

A slightly higher share of the energy poor households live in rural areas than their non-energy poor counter-parts (Graph 8). Nevertheless, a chi square test shows that the difference is not statistically significant ($p = 0.59$). Therefore, none of the two competing hypotheses concerning energy poverty could be supported by the data from survey sample.

Graph 8: Degree of urbanity of household location



Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

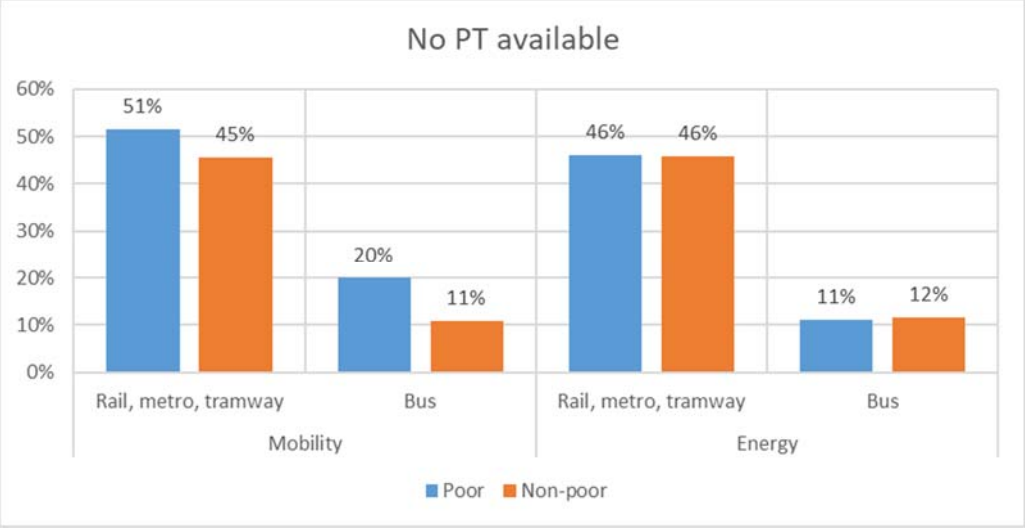
5.2 Public transport availability

People living in areas without adequate public transport services are more dependent on the more expensive mode private car. This tightens the budgetary situation of households and can cause mobility and energy poverty.

Slightly more mobility poor households have no public transport available at their location of residence than their non-mobility poor counterparts (Graph 9). Nevertheless, a chi square test shows that the difference is neither for rail based public transport nor for all public transport in total statistically significant (p = 0.61 resp. 0.17).

More or less the same share of energy poor and non-energy poor households have no public transport available at their location of residence (Graph 9). A chi square test shows that the difference is neither for rail based public transport nor for all public transport in total statistically significant (p = 1.00 in both cases).

Graph 9: Supply with public transport services at household location



Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

6 Mobility behaviour

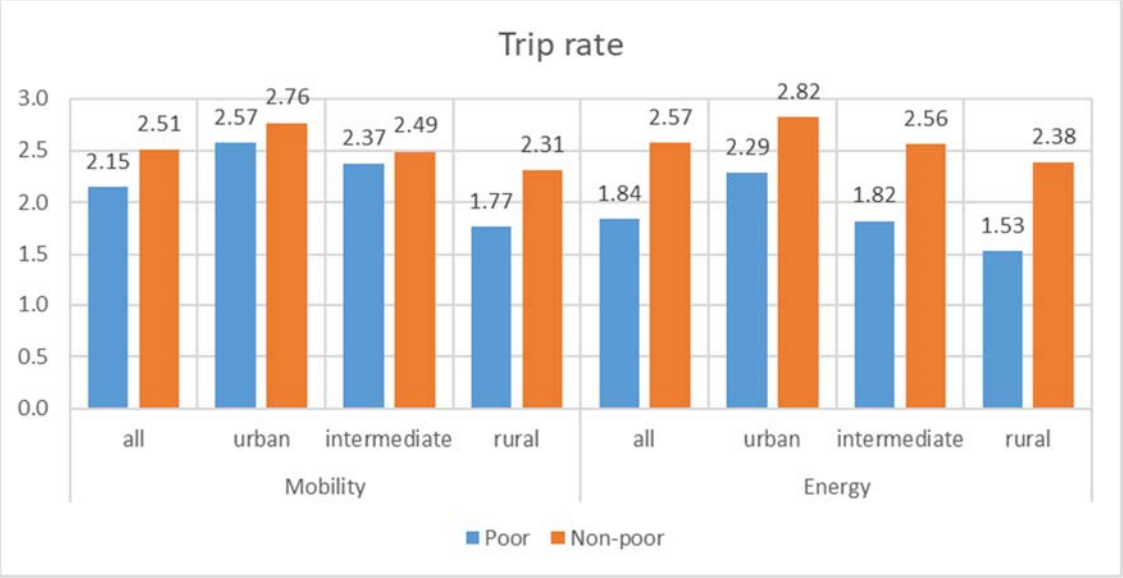
6.1 Trip rates

One hypothesis is that mobility and energy poverty is the result of external circumstances which force people to undertake more trips per day that cause costs than other non-affected people. Another competing hypothesis is that mobility and/or energy poor households already have to reduce the number of daily trips to reduce mobility costs to make ends meet.

In the survey sample, people from mobility poor households actually make fewer trips per day on average than people from non-mobility poor households (Graph 10). An explanation might be that mobility poor households already have to restrict their mobility due to their budgetary situation. Nevertheless, an ANOVA shows that the difference in trip rates is not statistical significant (p = 0.632).

In the survey sample, people from energy poor households on average make fewer trips per day than people from non-energy poor households (Graph 10). A statistical test (ANOVA) shows that the difference in the trip rate for all regional types combined is statistically significant (p = 0.02). Therefore, the second hypothesis is supported by the data from the survey sample. The differences in the trip rates by regional type are not statistical significant (p = 0.17-1.00).

Graph 10: Daily trip rates



Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

6.2 Travel distances

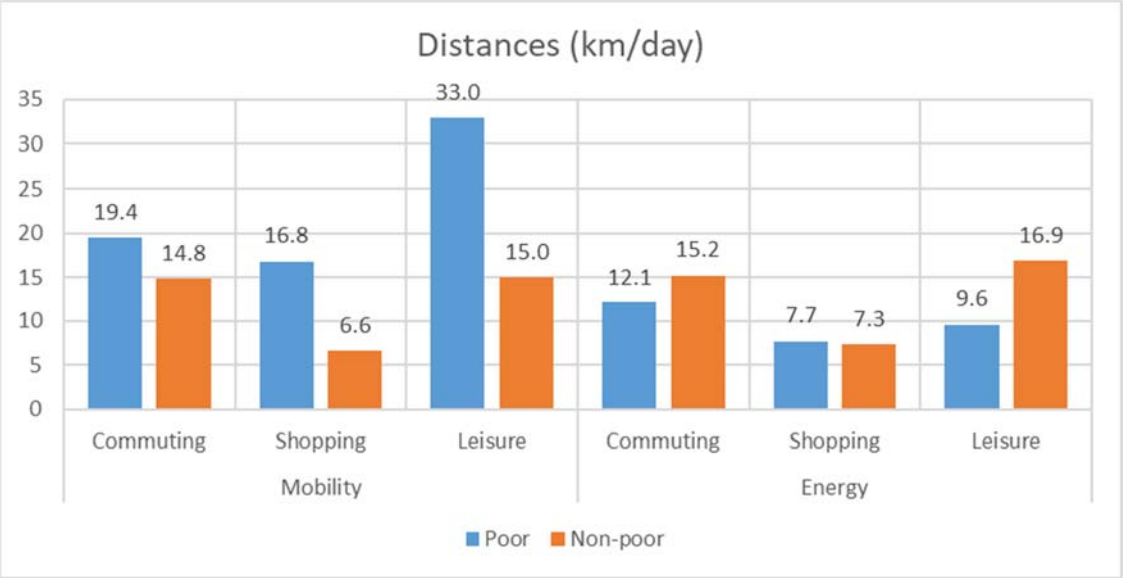
A potential explanation for mobility and energy poverty is that external circumstances, like living in low density regions, force people to travel longer distances per day than other non-affected people. Another explanation might be that mobility or energy poor households already have to restrict their mobility due to their budgetary situation and therefore travel shorter distances.

In the survey sample, people from mobility poor households actually report longer average distances travelled per day than people from non-mobility poor households (Graph 11). This applies to all three trip purposes commuting, shopping and leisure. But, statistical tests show that only the difference for the trip purpose leisure is

statistical significant (p = 0.03) while the differences for commuting and shopping are not statistical significant (p = 0.31 and 0.24 respectively).

In the survey sample, people from energy poor households actually report shorter average distances travelled per day for commuting and leisure trips than people from non-energy poor households (Graph 11). The average length of shopping trips is more or less the same in both groups. But, statistical tests show that all differences are not statistical significant (p = 0.32-0.90). None of the hypotheses concerning energy poverty is supported by the data from survey sample.

Graph 11: Average distance travelled per day by purpose



Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

6.3 Mode choice

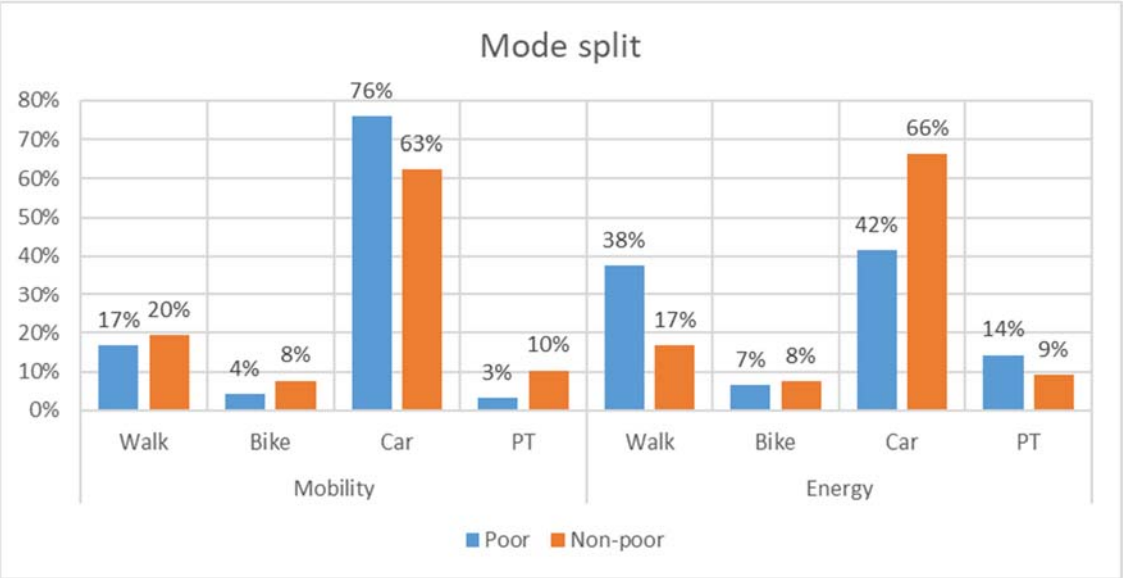
Concerning mode choice there are two possible explanations for differences. Mobility and energy poverty might be caused by the fact that a lack of alternatives like adequate public transport (see section 5) forces households to use a cost intensive mode of transport, like private car. Thus, resulting in a higher share of car use than in non-poor households. On the other hand, it might be possible that budgetary restrictions do not allow mobility or energy poor households to use a car. Thus, resulting in lower shares of car use than in non-poor households.

Concerning mobility poverty, data from the survey sample support the first hypothesis (Graph 12). The share of car use in mobility poor households is higher while the share of walking, cycling and public transport is lower than in their non-mobility poor counterparts. A statistical test (MANOVA) shows that the differences concerning car use and public transport use are statistically significant (p = 0.03 in both cases). The differences concerning walking and cycling are not statistically significant (p = 0.52 and 0.23 respectively).

Concerning energy poverty, data from the survey sample support the first hypothesis (Graph 25). The share of car use in mobility poor households is higher while the share of walking and public transport is lower than in their non-mobility poor counterparts. No difference could be observed concerning the share of bicycle use. A statistical test (MANOVA) shows that the differences concerning walking, car use and public transport use are

statistically significant (p <0.01 for walking and car use, p = 0.04 for public transport use). The difference concerning cycling is not statistically significant (p = 0.66). The first hypothesis is supported by the survey sample data.

Graph 12: Mode split



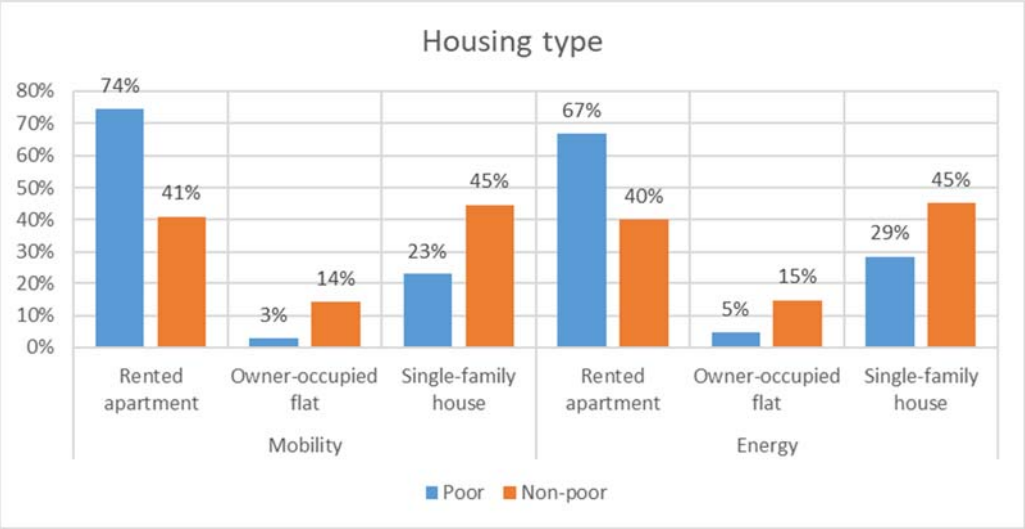
Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

7 Housing situation

7.1 Housing type

Due to their budgetary situation, it is difficult for mobility or energy poor households to afford different forms of owner-occupied housing. In the survey sample the share of mobility and energy poor households living in rented apartments rather than in owner occupied housing is much higher than with their non-poor counterparts (Graph 13). A chi square tests shows that the difference is statistically significant (p <0.01).

Graph 13: Type of housing



Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

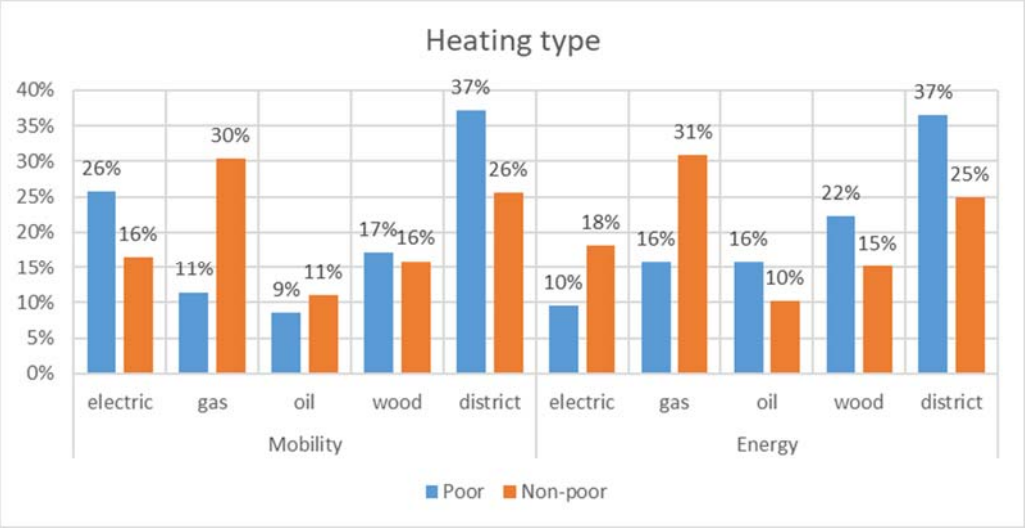
7.2 Heating system

Due to their budgetary restrictions mobility and energy poor households might not be able to afford certain types of heating systems. As mobility and energy poor households predominantly live in rented apartments (see section 7.1), they usually cannot choose the heating systems themselves.

While mobility poor households use electric and district heating more often than their non-mobility poor counterparts, they use gas heating less often (Graph 14). Nevertheless, a chi square test shows that the observed differences are not statistically significant (p = 0.26).

Energy poor households use electric and gas heating less often and oil, wood and district heating more often than their non-energy poor counterparts (Graph 14). Nevertheless, a chi square test shows that the observed differences are not statistically significant (p = 0.26).

Graph 14: Heating system used in household



Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.

8 Commonalities and differences of mobility and energy poor households

Mobility poor and energy poor households share many of the same characteristics, but still differ significantly in some aspects. The following sections describe the commonalities and differences as identified in the analysis of the sample data in chapter 4 to 7. An overview of the statistical tests could be found in the annex.

8.1 Commonalities

8.1.1 Socio-demography

The ***household size*** of both groups, the mobility and energy poor households, tends to be statistically significant smaller than that of their non-poor counterparts (1.4 to 2.3 persons and 1.4 to 2.4 persons respectively). Mobility and energy poor households have both statistically significant less ***children*** (0.14 to 0.41 children and 0.07 to 0.44 children respectively). Furthermore, as well mobility poor as energy poor households are statistically significant more ***female*** than their counterparts. The share of households with more female members is significantly higher in mobility and energy poor households than in their counterparts (60% to 37% and 62% to 35% respectively). The ***education level*** is also lower in both groups than in the average population. The share of people with secondary education or an apprenticeship as their highest level of education is 57% among the mobility and energy poor households. In the non-mobility or non-energy poor households, on the other hand, this share is only 38% and 37% respectively. ***Employment rates*** are also lower in both the mobility poor and the energy poor households. While about 62% of the persons from non-mobility poor households are employed, only about 43% of the mobility poor are employed. Concerning non-energy poor and energy poor households the ratio is 63% to 39%.

8.1.2 Household location

The share of households living in ***rural areas*** is in both groups, the mobility poor and energy poor households, slightly higher than in their non-poor counterparts. Nevertheless, these differences are not statistically significant.

8.1.3 Mobility

Trip rates are in both groups, the mobility poor and energy poor households, lower than in their non-poor counterparts (2.2 to 2.5 trips/day and 1.8 to 2.6 trips/day respectively). Nevertheless, the difference is only statistically significant for the energy poor households and not the mobility poor households.

8.1.4 Housing situation

The share of households living in ***rented apartments*** is in both groups, the mobility poor and energy poor households, higher than in their non-poor counterparts (74% to 41% and 67% to 40% respectively). The observed differences are statistically significant.

8.2 Differences

8.2.1 Socio-demography

Concerning the socio-demographic indicators we looked at, there are no significant differences between the mobility and energy poor households when compared to their non-poor counterparts. The only exemption is the ***age*** of the most senior household member. The age group 20-39 years is overrepresented in both groups. The age group 60+ years is also overrepresented in the energy poor household group but not in the mobility poor

household group. The differences are not statistically significant for the mobility poor households and statistically significant for the energy poor-households.

8.2.2 Household location

Public transport availability is lower at the housing locations of mobility poor households than at the housing locations of their non-mobility poor counterparts (rail 49% to 54% and all public transport 80% to 91%). Nevertheless, this difference is not statistically significant. On the other hand, there is not difference on public transport availability between the groups of energy poor and non-energy poor households.

8.2.3 Mobility

With the exception of trip rates there is no commonality between the mobility and energy poor households with respect to the indicators related to their mobility behaviour. ***Commuting distances*** are higher in the group of mobility poor households and lower in the group of energy poor households (19.4 to 14.8 km/day and 12.1 to 15.2 km/day respectively). Nevertheless, the differences are not statistically significant. ***Shopping distances*** are higher in the group of mobility poor households and more or less equal in the group of energy poor households (16.8 to 6.6 km/day and 7.7 to 7.3 km/day respectively). Nevertheless, the differences are not statistically significant. ***Leisure distances*** are higher in the group of mobility poor households and lower in the group of energy poor households (33.0 to 15.0 km/day and 9.6 to 16.9 km/day respectively). While the difference for the mobility poor is statistically significant, it is not statistically significant for the energy poor.

Also ***mode choice*** differs between the mobility poor and energy poor households. While mobility poor households ***walk*** less than their non-mobility poor counterparts, energy poor households walk more than their non-energy poor counterparts (16.7% to 19.5% and 37.5% to 16.8% respectively). While the difference for the mobility poor is not statistically significant, it is statistically significant for the energy poor. While mobility poor households ***cycle*** less than their non-mobility poor counterparts, energy poor households cycle more or less as often as their non-energy poor counterparts (4.2% to 7.7% and 6.6% to 7.6% respectively). Nevertheless, the differences are not statistically significant in both cases. While mobility poor households use a ***car*** more often than their non-mobility poor counterparts, energy poor households use a car less often than their non-energy poor counterparts (76.0% to 62.5% and 41.6% to 66.4% respectively). This differences are statistically significant in both cases. While mobility poor households use ***public transport*** less often than their non-mobility poor counterparts, energy poor households use public transport more often than their non-energy poor counterparts (3.1% to 10.3% and 14.3% to 9.2% respectively). This differences are statistically significant in both cases.

8.2.4 Housing situation

Concerning ***heating***, mobility poor households on the one hand heat more often with electricity, wood and district heating and less often with gas and oil. Energy poor households on the other hand heat more often with oil, wood and district heating and less often with electricity and gas. While the difference for the mobility poor is not statistically significant, it is statistically significant for the energy poor.

9 Summary

- **Socio-demography**: Regarding the deviations from the non-mobility and non-energy poor households, no significant differences between the mobility and energy poor households could be observed. Both, mobility and energy poor households are smaller, have less children, are predominantly female and have lower educational levels and employment rates. The only difference is that the age group 20-39 years is overrepresented in both groups while the age group 60+ years is also overrepresented in the energy poor household group.
- **Household location**: In both groups, there is a slight but not statistically significant tendency towards rural residences. While residential locations of mobility poor households have (statistically not significant) poorer access to public transport, no difference could be observed for energy poor households.
- **Mobility behaviour**: The mobility behaviour of mobility and energy poor households differs significantly. All indicators except trip rates show an opposing tendency. Commuting, shopping and leisure distances are all longer in the mobility poor household group than for its non-mobility poor counterparts (only the latter is statistically significant). Energy poor households have shorter commuting and leisure distances and about the same shopping distances as their non-energy poor counterparts (none is statistically significant). Mobility poor households have lower shares of walking, cycling and public transport trips and a higher share of car trips (only the latter two are statistically significant). Energy poor households on the contrary have higher shares of walking and public transport, a lower share of car trips and about the same share of cycling trips (all except cycling being statistically significant).
- **Housing situation**: There is not difference concerning the housing type. Both, mobility poor and energy poor households live statistically significant more often in rented apartments than their counterparts. Mobility poor and energy poor households are different concerning their heating system. Mobility poor households heat (not statistically significant) more often with electricity, wood and district heating and less often with gas and oil. Energy poor households heat statistically significant more often with oil, wood and district heating and less often with electricity and gas.

10 Acknowledgements

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11 References

BMVIT. (2016). *Ergebnisbericht zur österreichweiten Mobilitätserhebung „Österreich unterwegs 2013/2014“*. https://www.bmk.gv.at/dam/jcr:fbe20298-a4cf-46d9-bbee-01ad771a7fda/oeu_2013-2014_Ergebnisbericht.pdf

Böheim, R., Fink, M., & Zulehner, C. (2023). *Lohnunterschiede zwischen Frauen und Männern in Österreich von 2005 bis 2021*. https://www.wifo.ac.at/jart/prj3/wifo/resources/person_dokument/person_dokument.jart?publikationsid=70674&mime_type=application/pdf

EPAH. (2022). *Introduction to the Energy Poverty Advisory Hub (EPAH) Handbooks: A Guide to Understanding and Addressing Energy Poverty Energy*. https://energy-poverty.ec.europa.eu/discover/publications/publications/introduction-energy-poverty-advisory-hub-epah-handbooks-guide-understanding-and-addressing-energy_en

Eurostat. (n.d.). *International Standard Classification of Education (ISCED)*. Statistics Explained. Retrieved August 9, 2023, from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=International_Standard_Classification_of_Education_(ISCED)

Hartwig, L., Hössinger, R., Susilo, Y. O., & Gühnemann, A. (2022). The Impacts of a COVID-19 Related Lockdown (and Reopening Phases) on Time Use and Mobility for Activities in Austria—Results from a Multi-Wave Combined Survey. *Sustainability (Switzerland)*, *14*(12). https://doi.org/10.3390/su14127422

Kiss, M. (2022). *Understanding transport poverty*. https://www.europarl.europa.eu/thinktank/en/document/EPRS_ATA(2022)738181

Kuttler, T., & Moraglio, M. (2020). Re-thinking Mobility Poverty. In *Re-thinking Mobility Poverty*. Routledge. https://doi.org/10.4324/9780367333317

Lucas, K., Mattioli, G., Verlinghieri, E., & Guzman, A. (2016). Transport poverty and its adverse social consequences. *Proceedings of the Institution of Civil Engineers: Transport*, *169*(6), 353–365. https://doi.org/10.1680/jtran.15.00073

Matzinger, S., Dawid, E., & Heitzmann, K. (2018). *Studie zur Eruierung einer Definition von Energiearmut in Österreich aus Sicht der sozialwirtschaftlichen und energiewirtschaftlichen Praxis*. https://www.wu.ac.at/ineq/forschung/projekte/archiv/energiearmut/

OECD. (2022). *Education at a Glance 2022: OECD Indicators*. https://doi.org/10.1787/3197152b-en

Rechnungshof Österreich. (2022). *Allgemeiner Einkommensbericht 2022*. https://www.rechnungshof.gv.at/rh/home/home_1/home_1/AEB_2022_Webversion-barrierefrei.pdf

Statistik Austria. (2023). *Gender pay gap remains above EU average in spite of slight decrease*. https://www.statistik.at/fileadmin/announcement/2023/03/20230303GenderStatistikEN.pdf

12 Annex – Summary of statistical tests

Table 2 summarises the results of the statistical tests, which were carried out to identify the characteristics of mobility and energy poor households.

Table 2: Summary characteristics of mobility and energy poor households

Area	Element		Mobility poor households	Energy poor households
Socio-demography	Household size		Smaller (t-test p = 0.00)	Smaller (t-test p = 0.00)
	Children		Less (t-test p = 0.00)	Less (t-test p = 0.00)
	Age		Higher share 20-39 years, (**n. s.!** chi² p = 0.17)	Higher share 20-39 and 60+ years (chi² p = 0.00)
	Gender		Female (chi² p = 0.00)	Female (chi² p = 0.00)
	Education		Lower (chi² p = 0.00)	Lower (chi² p = 0.00)
	Employment		Lower (t-test p = 0.00)	Lower (t-test p = 0.00)
House-hold location	Urbanity		More rural (**n. s.!** chi² p = 0.67)	More rural (**n. s.!** chi² p = 0.59
	PT availability		Lower (**n. s.!** chi² p = 0.61)	Equal (**n. s.!** chi² p = 1.00)
Mobility	Trip rates		Lower (**n. s.!** ANOVA p = 0.62)	Lower (ANOVA p = 0.02)
	Distance	Commuting	Higher (**n. s.!** ANOVA p = 0.31)	Lower (**n. s.!** ANOVA p = 0.32)
		Shopping	Higher (**n. s.!** t-test p = 0.24)	Equal (**n. s.!** t-test p = 0.90)
		Leisure	Higher (ANOVA p = 0.03)	Lower (**n. s.!** ANOVA p = 0.35)
	Mode choice	Walking	Less (**n. s.!** MANOVA p = 0.52)	More (MANOVA p = 0.00)
		Cycling	Less (**n. s.!** MANOVA p = 0.23)	Equal (**n. s.!** MANOVA p = 0.66)
		PT	Less (MANOVA p = 0.03)	More (MANOVA p = 0.04)
		Car	More (MANOVA p = 0.03)	Less (MANOVA p = 0.00)
Housing	Type	Rented ap.	More (chi² p = 0.00)	More (chi² p = 0.00)
		Single family	Less (chi² p = 0.07)	Less (chi² p = 0.07)
	Heating		Less gas & oil (**n. s.!** chi² p = 0.26)	Less gas & electric (chi² p = 0.00)

Legend: n. s. = not significant; PT = public transport; Rented ap. = Rented apartment

Source: Consumer expenditure and mobility survey Austria 2019-2020, own calculations.