Energy Crises as Obstacles to Housing Affordability: The Case of Germany

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Introduction

The housing affordability crisis has gained much attention in recent years, as an increasing number of households are unable to find adequate, affordable housing in cities, and have become severely cost-burdened. In political science, a growing body of literature is concerned with the causes and consequences of this growing inequality in the housing market, examining both the political and institutional drivers of declining affordability, and how housing burden translates into preference formation and political attitudes. So far, much of this debate centers on the ratio between household income and rental prices as the sole determinant of housing burden, with households considered to be burdened by housing costs when spending on rent exceeds a set percentage of household income. We expand on this literature by focusing on one previously understudied component of total housing costs, household energy burden. Increases in the cost of energy increase the total housing burden placed on households, and can have a negative effect on housing affordability even if rental prices stay stagnant. Employing an instrumental variable design, this paper examines the role of energy poverty in shaping perceptions of the housing market, and citizen's satisfaction with democracy (SWD) in Germany. We exploit granular data on local energy prices as the instrument and draw county-level micro data on household expenditures and characteristics from the German socioeconomic panel to assess 1) whether an increase in energy burden drives household's perceived housing burden, and 2) whether an increase in household energy burden decreases people's satisfaction with democracy. In line with our expectations, our results suggest that rising energy prices contribute to increased perceptions of being housing burdened for large sections of our sample. Moreover, we find support for the hypothesis that increased energy burden drives down individuals' satisfaction with democracy. We make two contributions to the literature. First, by centering the consequences of household energy burden, we contribute to existing lines of

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research investigating the relationship between perceptions of economic well-being and satisfaction with democracy for the specific context of energy markets. Second, leveraging a causal design, we are able to disentangle the effect of energy price from other drivers of household housing burden. This allows for a more nuanced discussion of potential policy interventions in the context of affordability. The political implications of rising energy prices explored in this analysis are likely to become increasingly relevant in the future, as governments tackle the challenge of designing socially just energy transition policies.

Housing and Energy in Germany

Across most advanced democracies, the issue of housing has increasingly garnered attention from scholars and policymakers alike. Rent and mortgage payments constitute a high budgetary priority for households (Haffner and Boumeester, 2015), and rising costs – driven by a number of political and institutional factors – have made housing, particularly in urban centers, increasingly unaffordable for large sections of the population. Declining housing affordability has important political consequences. Research suggests that price anxiety decreases support for housing development (Hankinson, 2018; Hager, Hilbig and Vief, 2022) and support for redistribution (Ansell and Cansunar, 2021), while increasing support for radical right parties (Abou-Chadi, Cohen and Kurer, 2023) and fueling political discontent (Larsen et al., 2019).

In studying how energy prices translate into perceived housing burden and shape political attitudes, specifically, satisfaction with democracy, this study focuses on Germany. This is productive for a number of reasons. For one, the structure of Germany's housing market likely exposes a large share of residents to volatility. Germany has a high proportion of renter households,³ with 58 percent of households renting compared to a 30 percent average in the European Union. Ownership rates differ significantly across space, ranging from 16% in Berlin to 60.1% in Saarland. On average, renter households in Germany spend 27.8% of their income on housing (excluding energy costs), which again differs across space. In addition to regional variation, there is variation in housing costs between rural and urban areas. In 2022, households in midsized to large cities paid an average rental price(exclusive of heating costs) at 30% above what households in small towns and rural areas paid. In recent years, Germany has seen increasing pressure in the country's housing market, with rising rents, a diminishing supply of affordable housing, and political contestation over the feasibility of state intervention in the housing market. According to the Federal Statistical Office, 10.7% of the population was considered overburdened by rent⁴ in 2021, and 10.5% of the population lived in overcrowded dwelling, meaning that the number of available rooms is too small for the number of persons residing

³Data on the German housing market comes from the German Federal Statistical Office https://www.destatis.de/EN/Home/_node.html

⁴Households are regarded as overburdened if their housing cost burden (including all housing expenses) exceeds 40% of household disposable income

in it. In addition, Germany's energy market is characterized by a complex market-state relationship, relatively high prices,⁵ and significant regional variation, allowing us to both spatial and temporal price changes in our analysis. When costs for energy are too high relative to income, the literature uses the term energy burden, or energy poverty (Haffner and Boumeester, 2015). To date, the issue of energy poverty is largely neglected in the political science literature (with Voeten (2023) and Haffner and Boumeester (2015) offering important exceptions)). While considerably lower than spending on rent or mortgages, household spending on energy is a fixed, inelastic expense, and can push the sum of a household's total housing expenses into the realm of unaffordability (Haffner and Boumeester, 2015). Research in economics provides important insights into the prevalence and extent of energy poverty in the US (Teller-Elsberg et al., 2016; Bednar and Reames, 2020), within European countries (Meyer et al., 2018; Aristondo and Onaindia, 2018; Karpinska and Śmiech, 2020), and across the EU (Thomson and Snell, 2013; Bouzarovski and Tirado Herrero, 2017; Recalde et al., 2019), as well as studies on determinants of energy poverty (Churchill and Smyth, 2021; Mohr, 2018; Legendre and Ricci, 2015; Healy and Clinch, 2004). In recent works, Heindl and Schuessler (2019) and Drescher and Janzen (2021) examine the prevalence and drivers of energy poverty in Germany. Utilizing an income-to-expenditure-ratio of 10% as the threshold,⁶ Drescher and Janzen (2021) find that 17% of German households were energy poor 2019, and that 14% of households permanently experience energy poverty (Drescher and Janzen, 2021). In 2017, more than 340,000 electricity customers were turned off because they have not paid their bills (Energy Poverty, N.d.).

High energy burdens are particularly prevalent for low-income households (Frondel, Sommer and Vance, 2015; Heindl, 2015; Moore, 2012), who allocate a disproportionate share of their income to energy costs (Bird and Hernández, 2012; Drehobl and Ross, 2016; Xu and Chen, 2019). For Germany, Wehrmann (2022) finds that "households earning below 1,300 euros per month on average spent 95 euros, or 9.5% of their total consumption expenditures on energy, while households with incomes above 5,000 euros on average spent about 205 euros or 4.7%. This larger energy burden for low-income households is driven by paying bigger housing and energy cost-to-expenditure-ratios than high income households (Drehobl and Ross, 2016; Haffner and Boumeester, 2015), and by lower-income households being more likely to live in dwellings with inefficient heating and cooling (Drehobl and Ross, 2016; Xu and Chen, 2019).⁷

⁷When landlords make energy-saving adaptations, on the other hand, rents are likely to increase, which in turn

⁵In fact, in 2019, German households paid the highest nominal electricity prices of all customers in Europe (*Energy Poverty*, N.d.).

⁶There is currently no agreed-upon definition of energy poverty in Germany. Generally, however, researchers and policymakers use four primary indicators to measure energy poverty, based on the European Energy Poverty Observatory (EPOV) (Drescher and Janzen, 2021). An expenditure-based energy poverty measure, where house-holds are considered energy poor if their share of income spent on energy is greater than twice the national median. The 10% rule, also an expenditure-based measure, where households are energy poor if their share of income High Costs indicator, another expenditure-based measure, where households are considered to be energy poor if the actual energy expenditures are above the median while the residual income net of energy costs is below the official national income poverty line (Drescher and Janzen, 2021).

Schulte and Heindl (Schulte and Heindl, 2017), estimating price and expenditure elasticities of residential energy demand (electricity and heating) in Germany find that price and income elasticities of energy consumption differ across income levels and household types: "Energy demand of households belonging to the upper 25% of incomes is about factor three times more price-elastic when compared to households belonging to the lowest 25% of incomes". This has important implications, as low-income households experience large welfare losses, and carry a larger burden imposed by a given change in energy prices (Schulte and Heindl, 2017). House-holds are forced to make lifestyle cutbacks and sacrifice basic needs in order to pay the utility bills (Xu and Chen, 2019), which exacerbates existing social issues, including lower educational attainment and resiliency (Chen, Xu and Day, 2017; Drehobl and Ross, 2016; Xu and Chen, 2019). Moving to a new dwelling is costly, and lower-rent units are not always readily available, especially considering both location constraints due to employment, as well as tight housing market with limited supply, which increasingly characterizes the reality across major urban centers in Europe and the United States.

Beyond social and moral implications, the disproportionate burden imposed on low-income households is important in the context of German energy and climate policy, which has driven at least some of the price increases in recent years (Schulte and Heindl, 2017; Energy Poverty, N.d.).⁸ The urgency of climate change, and the importance of divesting from fossil fuels and modernizing residential dwellings have spurred debates about how to support individual households, particularly lower-income renters, in the likely costly transition to alternative energy sources and energy efficiency, as demonstrated by discussions on socially inclusive climate adaptation efforts. This speaks to a larger question, namely what consequences arise from increased energy burdens. Providing an important intervention into the literature with his study on energy burden and support for the radical right in the Netherlands, Voeten (2023) shows that when low-income households experience increased energy burdens, they are more likely to vote for parties on the radical right because these parties are able to discursively connect citizen's experience of increased burden to climate transition policies. This illustrates that energy consumption is likely to emerge as a site of social allocation struggle. In Germany, an important part of the transition towards renewable energy is financed via a surcharge on electricity prices,⁹ placing an unequal burden on low-income households (Schulte and Heindl, 2017). While the transition efforts (*Energiewende*) and the promotion of renewable energy technologies enjoys relatively high levels of support among the population, this transition will inevitably lead to further increasing electricity prices (Tews, 2013; Frondel, Sommer and Vance, 2015). How energy burden translates into perceived housing burden, and into political outcomes, is thus

may cancel out any savings derived from the added efficiency.

⁸most recently, of course, stark price increases for households were driven by a rise in energy prices following the Russian invasion of Ukraine. Given that our data does not include the time period after 2021, we do not discuss this in depth here.

⁹The EEG Levy.

increasingly relevant.

In addition to support for climate adaptation efforts, emerging literature on the relationship between housing and political preferences further suggests a relationship between burden and first- and second order political preferences more broadly (Ansell et al., 2022; Abou-Chadi, Cohen and Kurer, 2023; Hankinson, 2018; Hager, Hilbig and Vief, 2022; Larsen et al., 2019)). We aim to link this literature on consequences of inequality in the housing market to research on economic pressure and political attitudes here by estimating the relationship between energy burden and one proxy for political attitudes, satisfaction with democracy (SWD). Research suggests that citizen's perception of their own economic status, and the government's capacity to steer the national economy is fundamental to SWD (De Simone et al., 2022; Loveless and Binelli, 2020; Nadeau, Daoust and Arel-Bundock, 2020). Citizen's satisfaction with democracy in turn are crucial for its endurance and sucess, making it important for political scientists to understand the factors that may shape perceptions of democracy (Han and Chang, 2016).

By centering energy burden as a driver of satisfaction with democracy, we contribute to the literature on the linkages between SWD and evaluations of social protection. Existing scholarship suggests that redistributive policies matter in citizen's assessments of democracy (Nadeau, Daoust and Arel-Bundock, 2020), as income inequality breeds discontent (Schäfer, 2012), and people expect their democratic government to provide social protection (Lühiste, 2014). We follow this literature specifically by building on the premise that citizens base their evaluations of the functioning of democracy on the scope and quality of social protection because modern democracy is intertwined with social rights (Lühiste, 2014). The question of how democratic satisfaction is related to the quality of social protection builds on a long tradition in political science of understanding the relationship and interdependencies between welfare, and social protection, and democratic stability (Spicker, 2008; Lühiste, 2014; Wilensky, 1974; Acemoglu and Robinson, 2006).

Examining to what extent energy burden must be considered a driver of (perceived) housing affordability independently of rental price, and may thus affect attitudes and policy preferences, first necessitates estimating a causal relationship between household energy expenditure and perceived housing burden. To test this, we examine the relationship between energy price, household expenditure, and perceived housing burden in Germany, exploiting spatial and temporal variation in price levels. We then expand on this analysis by including satisfaction with democracy as an additional dependent variable in the model to estimate its relationship with household energy burden. Following from the discussion of the literature above, we formulate the following two hypotheses:

- 1. An Increase in Energy Expenditure leads to an Increase in Households' reported Housing Burden.
- 2. An Increase in Energy Expenditure leads to a Decrease with People's Satisfaction with Democracy.

Empirical Strategy: Studying the Effect of Energy Burden

Our discussion above suggests that energy burden is an important component of household total housing expenditure. To date, few studies investigate how energy burden shapes households' experience of the housing market, and how it translates into political attitudes. The prevalence of energy poverty, and the likely further rise in energy costs for households in the future, as well as the documented relationship between household economic standing and political outcomes, however, make this an important question to study. We contribute to this literature by analyzing the causal relationship between local energy prices, households' reported housing burden, and satisfaction with democracy in Germany for the time period 2016-2020.

Data

We use proprietary data on energy price level and price change at the county level. This dataset includes data on electricity and gas prices for consumers supplied by the local "Grundversorger" (basic supplier) for the years 2016-2023.¹⁰ We focus on this group of providers here for a number of reasons. In the German energy market, households can choose their provider from among a given number of providers at their location. If a household does not proactively select a provider, the basic supplier acts as the default, and, by law, because every household is entitled to a basic provision of energy, the basic supplier may not turn households away expect for under a narrowly defined set of circumstances.¹¹ Finally, the basic supplier is always the energy supply company that supplies the most households with electricity and/or gas locally within the general supply network, allowing us to increase external validity of our measure.

In studying the effect of energy costs on perceived housing burden, we focus on the household expenditure for both electricity and heating, and control for whether households using gas as the main heating source (data only available in 2020).¹² For both electricity and gas, the price

¹⁰In Germany, there approximately 700 basic suppliers and around 800 are gas basic electricity suppliers.https://www.zdf.de/nachrichten/wirtschaft/ strom-gas-preise-sinken-grundversorger-100.html.

¹¹Energiewirtschaftsgesetz https://www.erneuerbare-energien.de/EE/Redaktion/DE/ Standardartikel/energiewirtschaftsgesetz.html.

¹²According to the German Federal Statistical Office (Destatis https://www.destatis.de/EN/ Press/2022/12/PE22_N071_12_63.html), 51% of households in Germany use gas as their primariy energy source for heating. appendix A includes an overview of the distribution of energy sources across households. The focus on gas as the energy source for heating is further reasonable given that in most cases when households use a different energy source for heating, such as district heating (*Fernwärme*)they are connected to

dataset includes the "Grundpreis" (base rate), as well as the "Arbeitspreis" (kilowatt-hour-rate). For gas, the dataset additionally includes a "Gesamtpreis" (total rate).¹³ The base rate is the amount consumers pay regardless of how much energy they consume, while the kilowatt-hour-rate is based on household consumption. The kilowatt-hour-rate is multiplied by the amount of energy used, and added to the Grundpreis to calculate total energy cost. We include all price components in our analysis with one as instrument for each specification to avoid violation of ignorability. We report our main specifications based on the first stage tests results with the rest of the specifications shown in the appendix.

Our data on households comes from survey data from the German Socioeconomic Panel (SOEP), provided by the German Institute for Economic Research (DIW Berlin) through a data use agreement. The SOEP is a longitudinal pandel data set of private households in Germany that offers micro-level data for every year since 1984. We use the county-level version of the data available through remote access, allowing us to match households to the granular spatial data on energy prices. The county-level data from the SOEP also include county-level population and umemployment rate that we used as geographical controls. We also add three additional geographical controls (settlement density, urban permeation and residential building density) from GeoBasis-DE matched at the county level. ¹⁴ The SOEP household level data provides rich information on households' expenses on rent, energy consumption, and other housingrelated costs, as well as information on spending habits and household income. It also provides information on household composition, dwelling quality and related factors. In addition to micro-data at the household level, the SOEP provides data on individuals within households. This data includes information on education and occupation of individuals, policy preferences, attitudes, and satisfaction. We are able to match the head of household to the household-level data to control for preferences in the model.

The data reveal that household energy prices in Germany are marked by significant temporal, and, even more so, spatial variation. Figure 1 displays the county-level total gas price (*Gesamtpreis*) over the time period 2016-2021. appendix A includes corresponding displays of spatial and temporal variations for the other gas price components (*kilowatt-hour-rate* and *base rate*). To illustrate the patterns of energy expenditure in our sample of German households, table 1 displays descriptive statistics for the percentage of household income spent on energy (includ-

a larger central grid (e.g., one for all apartments within the building), and heating costs are thus included in the rental payment. Each district heating network operates as a local monopoly, meaning households cannot easily switch providers.

¹³The prices reflect household consumption of an average annual amount, namely 3500 kwh of electricity or 20000 kwh of gas respectively, which is considered a standard consumption pattern.

¹⁴There are 400 counties in Germany, 106 municipalities and 294 "Landkreise". The has 191.500 residents and average county 1.163 square kilometers (average population density of 208 residents/km2 https://www.landkreistag.de/publikationen/ 3236-die-294-deutschen-landkreise-ihre-kreistage-und-landraete-2022-23



Figure 1: Temporal and Spatial Variation in county-level total gas price, 2016-2021.)

ing both gas and electricity spending) by household tenure and years. To further motivate our analysis of the relationship between energy expenditure and households' perceived housing burden, table 2 presents descriptive statistics for reported housing burden by level of energy expenditure (as before, this includes both gas and electricity spending). As previously discussed, the literature uses different indicators as burden thresholds. Here, we follow Voeten (2023) in setting a threshold for energy expenditure at 10% of household income. The data reveals that on average, households that spend 10% or more of their income on energy report a higher perceived housing burden, and this holds across both renters and owners.

Tenure	Year	N	Mean	Min	Max	Std. Dev
Owners	2016	5,640	.0706663	.0018817	.6410257	.0504506
Owners	2017,18,20	12,897	.0681976	.0005	.875	.0480938
Renters	2016	6,327	.0802199	.00325	.5463917	.0477718
Renters	2017,18,20	20,115	.0756851	.0018571	10.9	.0906009

Table 1: Percentage of household income spent on Energy, by household tenure and years.

Instrumental Variable Design

Building on this, we estimate the causal effect of energy burden on households' perception of being housing burdened using an instrumental variable design, which allows us to causally identify the effect of energy burden on overall housing burden and on satisfaction with democracy (SWD). Rather than choosing from among the different expenditure-based threshold measures, our treatment variable is the exact self-reported euro amount of energy expenditure experienced by members of the households. This self-reported measure allows us to contextualize

Tenure	Year	# of Households	# of Households	Level of Re-	Level of Re-	
		with $\text{EE} \ge 10\%$	with $\text{EE} < 10\%$	ported Housing	ported Housing	
				Burden (mean)	Burden (mean)	
				for $\text{EE} \ge 10\%$	for EE < 10%	
Owners	2016	995	4,645	2.164824	2.450161	
Owners	2017-20	2,139	10,758	4.887798	4.000651	
Renters	2016	1,631	4,697	1.932557	2.299553	
Renters	2017-20	4,410	15,706	4.756236	3.38081	

Table 2: Level of Reported Housing Burden by Household Energy Expenditure. Note that scales differ for 2016 and 2017-20, respectively. The SOEP survey asks the burden question separately for renters and owners. In 2016, the question was asked in a three-point format where "1" represents "high financial burden", "2" represents "low financial burden", and "3" represents "no problem". This differs from the survey question asked in 2017, 2018 and 2020, where the burden is formatted reversely on a ten-point scale where "1" represents "not a problem at all", and "10" represents "very high financial burden".

the results in the general trend of rising energy prices, and link housing burden and potential changes in SWD back to household energy expenditure. Our study focuses on the household head who fills out the household questionnaire. We do not distinguish specifically regarding the size of households but so control for general household income.

To address H1, we start with the effect of our treatment D_{it} , a vector recording the household's self-reported energy expenditure in euros for electricity and heating, on the sense of burden from housing expenses Y_{it} , reported by the respondent in the household-level questionnaire. Consider household head i in the geographical unit j at time t.¹⁵ The instrumental variable Z_{it} is the quarterly county-level electricity or gas price measured at the referenced geographical unit. We include household and individual level controls X_{it} including household income, gender, employment status and employment sector, parental country of origin, dwelling size, rent, whether the tenant lives in social housing, and educational history of the head of household. To alleviate additional concerns of the ignorability assumption of the instrument, we include geographical controls \mathbf{X}'_{it} to capture the cross-sectional variation in energy prices. We include county-level total population and unemployment rate for all specifications in the first stage, but choose to include other three geographical variables aggregated to the county-level from GeoBasis-DE based on the test results of over-identification: settlement density capturing the number of residents per settlement and transport area; urban permeation describing the proportion of settlement areas per spatial unit and how strongly these are scattered; residential building density capturing the number of residential building in the referenced area through the quotient of residential buildings. We label these three variables as "Geo Controls" in all regression tables. With all the variables described above, we estimate our model specifications

¹⁵Not all households use gas as their source of energy for heating. We describe in more detail later in this section and in the robustness checks how we address the diverse heating sources in the data.

in the following form

$$Y_{iit} = \beta_0 + \beta_1 \mathbf{D}_{it} + \mathbf{X}_{it} + \epsilon_{iit} \tag{1}$$

$$\mathbf{D}_{it} = \gamma_0 + \gamma_0 Z_{jt} + \mathbf{X}_{it} + \mathbf{X}'_{jt} + e_{it}$$
⁽²⁾

We then address H2 by replacing the dependent variable in the model. We estimate effect of our treatment D_{it} , the vector recording the household's self-reported energy expenditure in euros for electricity and heating, on satisfaction with democracy, Y'_{ijt} , reported by respondents in individual-level questionnaires that we matched to households.

Due to the endogeneity in both electricity and gas (heating) treatment variables, and given the differences in coding of the housing burden variable discussed above, we run the IV analyses separately for each treatment variable with the first dependent variable. The general analysis is first divided into four sub-samples by housing tenure and by the measurement of the dependent variable, *housing burden*. We use a question on housing tenure to determine whether a given households is in the *owners* or the *renters* sub-sample. The assignment is consistent with the design of the separate questionnaires for renters and homeowners for households' perceived housing burden and household energy expenditure. The survey questions regarding our second dependent variable, satisfaction with democracy, are coded consistently across survey years and hence only divided based on housing tenure and treatment variables.

The instrumental variable design is primarily motivated by the endogeneity in the euro amount of household expenditure on energy. Observing the overall budget constraint, mortgage payments and rent, prices for energy and other expenses, households are bound to consume energy to fulfill basic needs while retaining some flexibility in their overall energy spending, as discussed in the previous sections. Exploiting how energy prices are set in Germany, where households have less control in the supply-side of price-setting, the over-time regional variation in energy prices serves as a good instrument for the analysis.

To ensure the validity of our causal claims, we assume that both the conditional ignorability assumption and the exclusion restriction hold in our instrumental variable strategy. The exclusion restriction is only violated when energy prices by geographical units can affect the sense of burden and satisfaction with democracy not through the process of energy expenditure. For instance, if the additional income resulting from a price drop relieves the financial burden of the household, then without adjusting the energy consumption, burden should be lower, and this direct effect would violate the exclusion restriction. However, given that we focus on price change variation in small geographical units at the local level, the level of price changes should not result in a sufficient income to alleviate other financial burdens. Instead, we argue that the burden is felt mostly along with price increases, and remains stable during minor price drops.

Under a similar logic, we argue that the fluctuations in regional energy prices should not directly shape political preferences by heads of households outside of the household energy bills.

For the conditional ignorability assumption, we use a set of geographical controls that capture the price variation across counties, as outlined above, and argue that the rest of the price fluctuations should be considered ignorable. To further validate the IV strategy, we conduct first stage tests of overidentification and endogeneity, with both p-values reported in each table in the results section. We report main empirical results with valid instruments that pass both tests with endogenous treatment variable. The remaining specifications are included in the appendix.

Results

Housing Burden

In this section, we present our empirical findings of the effect of energy burden on both housing burden and satisfaction with democracy. Table 3 displays results of the owner sub-sample with self-reported estimates of electricity costs in the past year as the treatment, and reported housing burden as the dependent variable.¹⁶ All four specifications use the Arbeitspreis for electricity at the same country-survey-year-level as the household. We match the individual panel with the household panel through household ID and the person-number in the household. The individual controls are not displayed due to the large number of factors included. Electricity spending, household income, dwelling size, and household expenses on food are reported in the household survey. We also include individual-level controls, including type of education, employment status, gender, parental country of origin, and sector of employment. All individual level controls are categorical variables coded as factors. We present results with and without three additional county-level controls calculated from the GeoBasis-DE data. Note that potential correlation with the errors of the burden variable leads specifications (3) and (4) to fail the over-identification tests. In all following model specifications, we include the geo-controls when the model passes the first-stage overidentification test, and report the omitted specifications with/without the three additional geographical variables in the appendix. In the Two-Stage-Least-Square estimates, the second-stage coefficients of electricity represent the "complier effect", where increased electricity expenditure is associated with higher perceived housing burden. From the results of specification (2). At an annual average of 1074 euros in electricity expenditure, a one standard deviation increase in 527 euros of electricity expenditure causes the household head to feel 2.07 points more burdened financially, which is consistent with our predictions. With the first owner subsample with the electricity spending, we find

¹⁶As we omit all missing dependent variables in the household panel, the missing treatment and household-level controls are coded as "-99", with a separate indicator variable added to indicate whether the variable is missing. The factor control variables have one category of "-99", representing the missing status of controls. In this version, we omitted *Grundpreis* as county-level instruments because of the failed overidentification tests. We report full results panel in the appendix.

$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Table 5: Owners	with Frevious	Tear Electricity	/ Expenditure	as Treatment
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		(1)	(2)	(3)	(4)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		Burden	Burden	Burden	Burden
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Arbeitspreis	Arbeitspreis	Arbeitspreis	Arbeitspreis
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		2016	2017,18,20	2016	2017,18,20
$\begin{array}{c c c c c c c c c c c c c c c c c c c $					
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Electricity Spending	0050165	.0039406*	0003413	.0020479***
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Treatment	(.0041348)	(.0016963)	(.000239)	(.0006311)
$\begin{array}{c ccccc} Household Heather & (.0001007) & (.000039) & (8.43e-06) & (.0000349) \\ \hline Dwelling Size & .0122585 &0118746^* &0000485 &0062077^{**} \\ (.0108946) & (.0054408) & (.000485) & (.0022267) \\ \hline Employed Sector & .0000111 & -4.13e-06^* & 1.77e-06 & -4.24e-06^* \\ (.0000111) & (2.10e-06) & (1.91e-06) & (1.78e-06) \\ \hline Most Recent & .3394521 & .2889975 &1529404 & .1257596 \\ \hline Education & (.5904014) & (.3201371) & (.1471233) & (.2420097) \\ \hline Vocational Education & .0711698 &0380047 &0197784 &0255991 \\ \hline (.0933311) & (.0445211) & (.0177984) & (.0355572) \\ \hline General Education & 1.0876 & .6169835 &1044537 & .3105583 \\ \hline General Education & (.3448467) & (.1808626) & (.0721819) & (.1323046) \\ \hline High Education & .1827246 & .0572565 &0293762 &0344554 \\ (.3448467) & (.1808626) & (.0721819) & (.1323046) \\ \hline Employment Status & .0164498 &0220211^+ & .0297212^{**} &0217073^* \\ \hline Origin & omitted & (.0033834) & omitted & (.0025904) \\ \hline Parent Country of & 0 & .0002582 & 0 & .0013321 \\ Origin & omitted & (.0033834) & omitted & (.0025904) \\ \hline Gender & (.1234639) & (.24622^{***} &0956838^{***} & 2.660048^{***} \\ (.1009703) & (.0005292) & (.0000773) & (.0002586) \\ \hline Food Expenses & .0011196 &0009895^+ & .0000448 &0005401^* \\ (.0009703) & (.0005292) & (.0000773) & (.0002586) \\ \hline Intercept & 6020 & 13870 & 6020 & 13870 \\ \hline Observations & Endogeneity Test & 0.0002 & 0.0118 & 0.5469 & 0.0071 \\ Overid Test & 0.6433 & 0.2336 & 0 & 0.0128 \\ Parial R^2 & 0.1224 & 0.1471 & 0.1279 & 0.1505 \\ \end{array}$	Household Income	.0001857+	0002129***	.0000748***	0001556***
$\begin{array}{llllllllllllllllllllllllllllllllllll$	Household meome	(.0001007)	(.0000639)	(8.43e-06)	(.0000349)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Dwelling Size	.0122585	0118746*	0000485	0062077**
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Dwelling Size	(.0108946)	(.0054408)	(.0006822)	(.0022267)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Employed Sector	.0000111	-4.13e-06*	1.77e-06	-4.24e-06*
$\begin{array}{llllllllllllllllllllllllllllllllllll$	Employed Sector	(.0000111)	(2.10e-06)	(1.91e-06)	(1.78e-06)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Most Recent	.3394521	.2889975	1529404	.1257596
Vocational Education.0711698 (.0933311).0380047 (.0445211).0197784 (.0177984).0255991 (.0355572)General Education1.0876 (.1441346).6169835 (.4982406).1044537 (.3888507).3105583 (.3597105)High Education.1827246 (.3448467).0572565 (.1808626).0293762 (.0721819).0344554 (.1323046)Employment Status.0164498 (.0147899).0202011 ⁺ (.0126119).0297212** (.0028907).0086994)Parent Country of Origin0 .0002582 (.020859).0013321 (.0028907).0013321 (.0025904)Gender.020859 (.1234639).2241622*** (.019969).0025904) (.019969)Food Expenses.0011196 (.0009703).0009895 ⁺ (.0009703).0000448 (.0002586)Intercept -3.28695 (6.467737).2413870 (1.055414).000214883*** (4.502344)Geo ControlsNo 6020No 13870Yes YesNumber of Observations602013870602013870 0.00218Partial R20.,0002.0,0118 0.12790,5469 0.0071.0,0128 0.1224	Education	(.5904014)	(.3201371)	(.1471233)	(.2420097)
Vocational Education $(.0933311)$ $(.0445211)$ $(.0177984)$ $(.0355572)$ General Education 1.0876 $.6169835$ 1044537 $.3105583$ High Education $.1827246$ $.0572565$ 0293762 0344554 Employment Status $.0164498$ 0220211^+ $.0297212^{**}$ 0217073^* $(.0147899)$ $(.0126119)$ $(.0028907)$ $(.0086994)$ Parent Country of0 $.0002582$ 0 $.0013321$ Originomitted $(.0033834)$ omitted $(.0025904)$ Gender $.020859$ $.2241622^{***}$ 0956838^{***} $.2660048^{***}$ $(.0009703)$ $(.0009895^+)$ $.0000448$ 0005401^* food Expenses $.0011196$ 0009895^+ $.0000448$ 0005401^* Intercept -3.28695 24.03864^{***} 2.621468^+ 29.81883^{***} Mumber of 6020 13870 6020 13870 ObservationsEndogeneity Test $0,0002$ $0,0118$ $0,5469$ $0,0071$ Overid Test $0,6433$ $0,2336$ 0 $0,0128$ Partial R^2 0.1224 0.1471 0.1279 0.1505	Vocational Education	.0711698	0380047	0197784	0255991
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	vocational Education	(.0933311)	(.0445211)	(.0177984)	(.0355572)
$\begin{array}{llllllllllllllllllllllllllllllllllll$	General Education	1.0876	.6169835	1044537	.3105583
$\begin{array}{c ccccc} \mbox{High Education} & .1827246 & .0572565 &0293762 &0344554 \\ (.3448467) & (.1808626) & (.0721819) & (.1323046) \\ \mbox{Employment Status} & .0164498 &0220211^+ & .0297212^{**} &0217073^* \\ (.0147899) & (.0126119) & (.0028907) & (.0086994) \\ \mbox{Parent Country of} & 0 & .0002582 & 0 & .0013321 \\ \mbox{Origin} & omitted & (.0033834) & omitted & (.0025904) \\ \mbox{Gender} & .020859 & .2241622^{***} &0956838^{***} & .2660048^{***} \\ (.1234639) & (.0608492) & (.019969) & (.0429426) \\ \mbox{Food Expenses} & .0011196 &0009895^+ & .0000448 &0005401^* \\ (.0009703) & (.0005292) & (.0000773) & (.0002586) \\ \mbox{Intercept} & -3.28695 & 24.03864^{***} & 2.621468^+ & 29.81883^{***} \\ (6.467737) & (7.055414) & (1.647226) & (4.502344) \\ \mbox{Geo Controls} & No & No & Yes & Yes \\ \mbox{Number of} & 6020 & 13870 & 6020 & 13870 \\ \mbox{Observations} & & & \\ \mbox{Endogeneity Test} & 0,0002 & 0,0118 & 0,5469 & 0,0071 \\ \mbox{Overid Test} & 0,6433 & 0,2336 & 0 & 0,0128 \\ \mbox{Partial R}^2 & 0.1224 & 0.1471 & 0.1279 & 0.1505 \\ \end{array}$	General Education	(1.441346)	(.4982406)	(.3888507)	(.3597105)
High Education $(.3448467)$ $(.1808626)$ $(.0721819)$ $(.1323046)$ Employment Status $.0164498$ 0220211^+ $.0297212^{**}$ 0217073^* Parent Country of0 $.0002582$ 0 $.0013321$ Originomitted $(.0033834)$ omitted $(.0025904)$ Gender $.020859$ $.2241622^{***}$ 0956838^{***} $.2660048^{***}$ $(.1234639)$ $(.0608492)$ $(.019969)$ $(.0429426)$ Food Expenses $.0011196$ 0009895^+ $.0000448$ 0005401^* $(.0009703)$ $(.0005292)$ $(.0000773)$ $(.0002586)$ Intercept -3.28695 24.03864^{***} 2.621468^+ 29.81883^{***} Geo ControlsNoNoYesYesNumber of 6020 13870 6020 13870 ObservationsEndogeneity Test $0,0002$ $0,0118$ $0,5469$ $0,0071$ Overid Test $0,6433$ $0,2336$ 0 $0,0128$ Partial R ² 0.1224 0.1471 0.1279 0.1505	High Education	.1827246	.0572565	0293762	0344554
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Tingii Education	(.3448467)	(.1808626)	(.0721819)	(.1323046)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Employment Status	.0164498	0220211+	. 0297212**	0217073*
$\begin{array}{llllllllllllllllllllllllllllllllllll$	Employment Status	(.0147899)	(.0126119)	(.0028907)	(.0086994)
$\begin{array}{cccc} \mbox{Origin} & \mbox{omitted} & (.0033834) & \mbox{omitted} & (.0025904) \\ \mbox{Gender} & .020859 & .2241622^{***} &0956838^{***} & .2660048^{***} \\ (.1234639) & (.0608492) & (.019969) & (.0429426) \\ \mbox{omodel} & .0011196 &0009895^+ & .0000448 &0005401^* \\ (.0009703) & (.0005292) & (.0000773) & (.0002586) \\ \mbox{omodel} & .3.28695 & 24.03864^{***} & 2.621468^+ & 29.81883^{***} \\ (6.467737) & (7.055414) & (1.647226) & (4.502344) \\ \mbox{Geo Controls} & No & No & Yes & Yes \\ \mbox{Number of} & 6020 & 13870 & 6020 & 13870 \\ \mbox{Observations} & & & \\ \mbox{Endogeneity Test} & 0,0002 & 0,0118 & 0,5469 & 0,0071 \\ \mbox{Overid} Test & 0,6433 & 0,2336 & 0 & 0,0128 \\ \mbox{Partial } R^2 & 0.1224 & 0.1471 & 0.1279 & 0.1505 \\ \end{array}$	Parent Country of	0	.0002582	0	.0013321
Gender.020859.2241622*** 0956838^{***} .2660048^{***} $(.1234639)$ $(.0608492)$ $(.019969)$ $(.0429426)$ Food Expenses.0011196 0009895^+ $.0000448$ 0005401^* $(.0009703)$ $(.0005292)$ $(.0000773)$ $(.0002586)$ Intercept -3.28695 24.03864^{***} 2.621468^+ 29.81883^{***} (6.467737) (7.055414) (1.647226) (4.502344) Geo ControlsNoYesYesNumber of 6020 13870 6020 13870 ObservationsEndogeneity Test $0,0002$ $0,0118$ $0,5469$ $0,0071$ Overid Test $0,6433$ $0,2336$ 0 $0,0128$ Partial \mathbb{R}^2 0.1224 0.1471 0.1279 0.1505	Origin	omitted	(.0033834)	omitted	(.0025904)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Condor	.020859	.2241622***	0956838***	.2660048***
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Gender	(.1234639)	(.0608492)	(.019969)	(.0429426)
$\begin{array}{c ccccc} & (.0009703) & (.0005292) & (.0000773) & (.0002586) \\ \hline & & & & & & & & \\ \hline Intercept & & & & & & & \\ \hline & & & & & & & & \\ \hline & & & &$	Food Expanses	.0011196	0009895+	.0000448	0005401*
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	r oou Expenses	(.0009703)	(.0005292)	(.0000773)	(.0002586)
Intercept (6.467737) (7.055414) (1.647226) (4.502344) Geo Controls No No Yes Yes Number of 6020 13870 6020 13870 Observations Endogeneity Test 0,0002 0,0118 0,5469 0,0071 Overid Test 0,6433 0,2336 0 0,0128 Partial R ² 0.1224 0.1471 0.1279 0.1505	Intercent	-3.28695	24.03864***	2.621468+	29.81883***
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	шегсері	(6.467737)	(7.055414)	(1.647226)	(4.502344)
Number of Observations 6020 13870 6020 13870 Endogeneity Test $0,0002$ $0,0118$ $0,5469$ $0,0071$ Overid Test $0,6433$ $0,2336$ 0 $0,0128$ Partial R ² 0.1224 0.1471 0.1279 0.1505	Geo Controls	No	No	Yes	Yes
Observations 0,0002 0,0118 0,5469 0,0071 Overid Test 0,6433 0,2336 0 0,0128 Partial R ² 0.1224 0.1471 0.1279 0.1505	Number of	6020	13870	6020	13870
Endogeneity Test $0,0002$ $0,0118$ $0,5469$ $0,0071$ Overid Test $0,6433$ $0,2336$ 0 $0,0128$ Partial \mathbb{R}^2 0.1224 0.1471 0.1279 0.1505	Observations				
Overid Test 0,6433 0,2336 0 0,0128 Partial R ² 0.1224 0.1471 0.1279 0.1505	Endogeneity Test	0,0002	0,0118	0,5469	0,0071
Partial R ² 0.1224 0.1471 0.1279 0.1505	Overid Test	0,6433	0,2336	0	0,0128
	Partial R ²	0.1224	0.1471	0.1279	0.1505

 Table 3: Owners with Previous Year Electricity Expenditure as Treatment

* p <0.05, ** p<0.01, *** p <0.001

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evidence supporting the existence of energy burden that even small increases in energy costs could drive up the perceived housing burden.

Next, we turn to energy burden for the renters' group. Table 4 displays results of the renter sub-sample with self-reported monthly electricity expenditure as the treatment variable, and perceived housing burden as the dependent variable. For renters, in addition to household and individual-level controls, we include a set of controls indicating whether electricity is included in rent, the monthly rent value, and whether the household lives in social housing. ¹⁷ All four specifications use *Arbeitspreis* as the main price instrument. Given that some renters reported that electricity payment is included in rent, specifications (2) and (4) consider only the group of renters making electricity payments outside of the rent payment. Although we presume that landlords generally take energy price levels into account when setting the rent, excluding renters who have their electricity included in rent allows us to isolate energy burden without confounding effects from rent. In these specifications, we do not find evidence supporting hypothesis 1.

The next series of tables focuses on heating expenditure as the treatment variable. We use this as a proxy for gas payment, as a significant percentage of survey takers use gas as the main energy source for heating. Table 5 displays results of the owner sub-sample with self-reported past year heating cost as the treatment. Here the treatment variable is heating expenditure in euros reported by the household. In addition to Arbeitspreis, this model also includes Gesamtpreis. In addition to the household and individual controls already included previously, we include an additional control variable indicating whether the household used gas as the heating source in model in specifications (2) and (4) (only available in 2020 cross-sectionally). However, based on first stage tests of over-identification and endogeneity, the owners sub-sample in 2017, 2018 and 2020 fails the tests. Hence we present those results in the appendix of the paper, along with an alternative missing data strategy that creates indicators for each missing treatment outcome. For Table 5 we dropped all observations with missing dependent and treatment variables. As discussed earlier, in the 2016 sample, a lower number is associated with higher perceived burden. It follows that, in line with our prediction, the statistically significant negative results in specification (2) and (4) causally identify an increased burden from an increase in heating expenditure paid by households.

Table 6 displays results of the renter sub-sample with self-reported monthly heating expendi-

¹⁷We also again account for negative reporting of electricity costs by coding these as "-99" and including a "missing" indicator. We specifically choose to add the missing data strategy because the missing reporting of electricity costs cannot be accounted for by whether electricity is included in rent. In other words, many households that have utility costs included in rent still report it in the survey, and some households who do report paying for electricity on their own do not have their monthly electricity expenditure recorded. The missing indicator specifications are all reported in the appendix.

	(1)	(2)	(3)	(4)
	Burden	Burden	Burden	Burden
	Arbeitspreis	Arbeitspreis	Arbeitspreis	Arbeitspreis
	2016	2016	2017,18,20	2017,18,20
Electricity Spending	.0231416	.0141292	.0070883	.003149
Treatment	(.013561)	(.0080731)	(.0114829)	(.0122198)
** 1 11*	.0001256***	.0001311***	0005458***	0005405***
Household Income	(.0000206)	(.0000235)	(.0000459)	(.0000496)
a 111 -	.277352**	.2197507**	4293782***	4516811***
Social housing	(.1106852)	(.0813848)	(. <u>1136999)</u>	(.1188441)
T 1 1 1' D .	0468779	-	.1623668*	-
Included in Rent	(.0470743)	-	(.0707076)	-
D 11' '	0126327	0090124 [*]	0017062	.0004325
Dwelling size	(.0067332)	(.00431)	(.0056376)	(.0065919)
E	3.45e-06	0599086	6.92e-07	1.24e-08
Employed Sector	(2.09e-06)	(.093837)	(1.59e-06)	(1.80e-06)
Most Recent	.018526	0067418	.1290228	.1516178
Education	(.1049182)	(.0137585)	(.1546012)	(.1595581)
Energland ent Status	0190883 ^{**}	0155272**	.0193289*	.0237632**
Employment Status	(.0074309)	(.0052721)	(.0088921)	(.0096663)
Parental Country of	-	-	.0020592*	.0017469
Origin	omitted	Omitted	(.0008926)	(.0009914)
D (000637***	.0599086	.0028543***	.0028439***
Rent	(.0000865)	(.093837)	(.0001372)	(.0001467)
Candan	1125291**	- .0005974***	.2511063***	.2797326***
Gender	(.0392202)	(.0000817)	(.0496498)	(.0510958)
E a d E-manuar	0008079	0004849	0001206	0000328
rood Expenses	(.0004703)	(.0002863)	(.0003504)	(.0003659)
Intercent	1.464217^{*}	1.344847**	20.90027***	23.01082***
Intercept	(.6479938)	(.5486883)	(6.315198)	6.859839
Geo Controls	No	No	No	No
Sample	All	Subgrouped	All	Subgrouped
Number of	7447	6490	24257	21588
Observations				
Endogeneity Test	0,005	0,0109	0,9087	0,6394
Overid Test	0,6025	0,4251	0,0009	0,0018
Partial R ²	0.2331	0.2404	0.2142	0.2256

Table 4: Renters with Previous Year Electricity Expenditure as Treatmen

	(1)	(2)	(3)	(4)
	Burden	Burden	Burden	Burden
	Arbeitspreis	Arbeitspreis	Gesamtpreis	Gesamtpreis
	2016	2016	2016	2016
Heating	000476	0006655***	0005407	000669***
Expenditure	(.0002528)	(.0001948)	(.0002442)	(.0001931)
Household	.0000731***	.0000759***	.000074***	.0000759***
Income	(7.79e-06)	(8.01e-06)	(7.91e-06)	(8.01e-06)
Dwelling Size	.0010584	.0018369*	.0013218	.0018512*
Dweining Size	(.0010811)	(.0008677)	(.0010492)	(.0008612)
Employed Sector	3.39e-07	3.25e-07	3.34e-07	3.25e-07
Employed Sector	(1.86e-06)	(2.02e-06)	(1.91e-06)	(2.02e-06)
Most Recent	0988303	0777633	0917021	0773746
Education	(.1436656)	(.1491895)	(.1453753)	(.1493413)
Vocational	0202092	0161944	0188507	0161203
Education	(.0180285)	(.0187708)	(.0182931)	(.0187936)
Com em 1	2001260	2466206	3158651	3474978
General	3001269	3466396	(.3091402)	(.2918462)
Education	(.3177211)	(.2923304)	. ,	
II: - h T decention	0151546	0012058	0104349	0009485
High Education	(.0648933)	(.0651668)	(.0649833)	(.06517)
			.043565***	.0466072***
Employment	.0420515***	.0465246***	(.0064177)	(.0054705)
Status	(.0065852)	(.0055107)	· · · · ·	
	104127***	104497***	1042523***	1045039***
Gender	(.0202326)	(.0218791)	(.0207335)	(.0219138)
Food	.0000606	.0000999	0000739	0001006
Expenditure	(0000768)	(0000734)	(0000767)	(0000733)
Expenditure	3 343338**	3 455813**	3 381395**	3 457888**
Intercept	(1, 346588)	(1, 266794)	$(1 \ 317733)$	(1.265424)
GeoControls	No	(1.2007)4) Ves	No	(1.205424) Yes
Num Obs	6254	6254	6254	6254
Endogeneity	0.0966	0.0005	0.041	0.0004
Overdid	0.6238	0.0971	0.5013	0.1011
Partial R ²	0.0878	0.0897	0.0881	0.0898
i ai tiai ix	0.0076	0.0097	0.0001	0.0020

 Table 5: Owners with Previous Year Heating Expenditure as Treatment

	(1)	(2)	(3)	(4)	(5)	(6)
	Burden	Burden	Burden	Burden	Burden	Burden
	Arbeitspreis	Arbeitspreis	Grundpreis	Grundpreis	Gesamtpreis	Gesamtpreis
	2016	2017,18,20	2016	2017,18,20	2016	2017,18,20
Heating	0126147**	0125229	0157605***	0200205***	0125096***	0220606**
Evnonditure	0120147	.0155228	0137003	.0309393	0133986***	(0070884)
Experiance Howehold Income	(.0040602)	(.010555)	(.004/393)	(.0065254)	(.0042557)	(.00/9884)
Household Income	.0001396	0003484	.0001422	0003688	(00002(2))	0003606***
Coniel Housing	(.0000239)	(.000051)	(.0000268)	(.0000525)	(.0000262)	(.0000516)
Social Housing	.06/4493	3/94639	.0646035	3443/34	.0665592	3584161***
T1	(.04/6/19)	(.08/24/4)	(.0509058)	(.0911241)	(.0486221)	(.0885979)
Electricity	0150346	.150554	0168586	.1859273	0156051	.1/1//15*
Included in Rent	(.0360901)	(.0/06232)	(.0395484)	(.0/5306)	(.03/1108)	(.0/211/2)
Dwelling size	.005/399	0048087	.00/4499	0145699	.0062747*	0106637*
F 1 1 4	(.0023544)	(.0059374)	(.002/385)	(.0051028)	(.0024543)	(.004/509)
Employed sector	8.34e-07	3.90e-07	7.70e-07	9.34e-07	8.14e-07	7.16e-07
T ((T1)	(1.39e-06)	(1.56e-06)	(1.52e-06)	(1.67e-06)	(1.43e-06)	(1.61e-06)
Latest Education	112791	.1630261	14/582/	.2565132	123673	.219101
· · ·	(.09/93/5)	(.1717372)	(.1080768)	(.1797139)	(.1007531)	(.1732365)
Vocational	0042418	014488	0041461	0046113	0042119	0085638
Education	(.0133823)	(.0239631)	(.0144771)	(.0254906)	(.0137031)	(.0245319)
General Education	0301553	.0599132	0470088	.0925334	0354267	.0794793
	(.1021083)	(.1555204)	(.10/1591)	(.1593359)	(.1035538)	(.1564481)
Higher Education	.0054883	.0355609	.0121192	.0001178	.0075623	.0143015
	(.0545125)	(.0892798)	(.0601433)	(.1006403)	(.0561985)	(.0946426)
employment status	0053224	.0168907	0044572	.0062567	0050518	.0105122
	(.0040621)	(.0099401)	(.004397)	(.0096455)	(.0041612)	(.0092645)
Parental Country	0	.0024175*	0	.0025786*	0	.0025141*
of Origin	(omitted)	(.0011064)	(omitted)	(.0011777)	(omitted)	(.0011349)
Rent	0002562	.0023724***	0001624	.0018452***	0002269	.0020562***
	(.0001458)	(.000334)	(.0001658)	(.00029)	(.0001505)	(.0002693)
Gas for heating	-	4.175433***	-	3.688905***	0468555	3.883606***
	-	(.8629857)	-	(.894999)	(.0253629)	(.8661191)
Gender	0483314*	.2495935***	0436127	.2205738***	-	.232187***
	(.0247028)	(.0514899)	(.0270909)	(.0533967)	-	(.051676)
Food expenses	.0003718*	000072	.0004574**	0003623	.0003986*	0002461
	(.0001514)	(.0002581)	(.0001728)	(.0002573)	(.0001568)	(.0002441)
Intercept	2.551482***	23.99215***	2.661378***	21.31397***	2.585855***	22.38573***
	(.448948)	(4.376162)	(.4847052)	(4.52038)	(.4592956)	(4.373757)
GeoControls	Yes	No	Yes	Yes	Yes	Yes
Num.Obs.	6563	21009	6563	21009	6563	21009
Endogeneity	0.0017	0.3897	0.0002	0.0008	0.0007	0.0102
OverID	0.0523	0.0146	0.2609	0.2107	0.137	0.021
Partial R ²	0.2302	0.2494	0.2298	0.2503	0.2301	0.2506

Table 6: Renters with Previous Year Heating Expenditure as Treatment

 $\frac{partial R^2}{p < 0.05, **p < 0.01, ***p < 0.001}$

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ture as the treatment variable. We again include a set of renter-specific controls that include whether heating is included in rent, whether the household lives in social housing, and whether gas is used for heating for the 2017, 2018 and 2020 renter sub-sample. ¹⁸ Specifications (1) and (2) use the Arbeitspreis as the main instrument, (3) and (4) use the Grundpreis, and (5) and (6) use the Gesamtpreis. The results in all specifications except for specification (2) are consistent with our prediction in H1 that increased energy expenditure for heating are associated with a greater level of perceived burden. All specifications except for specification (2) and (6) fulfill both the over-identification and endogeneity tests, we can thus assume that the treatment variable is endogenous, and the instruments are valid. Note that since the greater number represents a smaller burden in 2016, the negative coefficient means that greater spending for renters in the 2016 sub-sample is associated with greater housing burden. To put the coefficients into context, at an average of 90 euros monthly heating expenditure, renters in the 2017, 2018 and 2020 sub-sample would feel their housing burden to increase by between 1 to 1.5 points on a 10-point scale with an one-standard deviation increase of 50 euros in the monthly payment. In the 2016 sub-sample, where housing burden is measured on a 3-point scale, a one-standard deviation increase of 50 euros would cause the housing burden to increase by around 0.7 point. Compared to owners, we find stronger evidence that the energy burden causes housing burden to increase.

The final analysis in Table 7 compares renter households who pay for heating outside of rent to the general sample, considering the fact that some renters have their heating payments included in rent and this might affect household perception of the energy burden. We still control for heating sources and follow the same model specification as in Table 6, but only run the models with the subgroup. Compared to electricity, it is more common to have heating included in rent so the subgroup contains about one third of the entire renters sub-sample for each survey year. We only included those who explicitly expresses that heating is not included in rent. The inclusion of three geographical variables is consistently determined by the results of first stage tests. Based on the first stage endogeneity tests, although for specification (2) and (6) the p-value is only significant at the p < 0.1 level, we still have strong evidence that household heating expenditure is endogenous to the housing burden. The first stage over-identification tests suggest that our instruments are valid and are unlikely to correlate with the errors of the dependent variable. Similar to the general sample in Table 6, we find strong evidence that an increase in energy expenditure is associated with greater housing burden, consistent with our expectations in hypothesis 1.

	(1)	(2)	(3)	(4)	(5)	(6)
	Burden	Burden	Burden	Burden	Burden	Burden
	Arbeitspreis	Arbeitspreis	Grundpreis	Grundpreis	Gesamtpreis	Gesamtpreis
	2016	2017,18,20	2016	2017,18,20	2016	2017,18,20
Heating	0109301*	.0239336*	.0162485	.0304982**	0128395*	.0352773*
Expenditure	(.0047336)	(.0113664)	(.0108706)	(.0109518)	(.0051755)	(.0175898)
Household Income	.0001681***	0005089***	.0001081**	0005235***	.0001723***	0005341***
	(.0000331)	(.0000799)	(.0000366)	(.0000818)	(.0000343)	(.0000887)
Social Housing	.1238072	3971259*	.1618765	4193724*	.1211326	4355679*
	(.0888387)	(.1659407)	(.1106301)	(.1700599)	(.0923421)	(.1795573)
Electricity	-	_	-	-	-	-
Included in Rent	-	-	-	-	-	-
Dwelling size	.0050626	0132073	0115432	0172683*	.0062292	0202247
	(.0030445)	(.0073979)	(.0067192)	(.0072179)	(.0033242)	(.0112538)
Employed sector	1.07e-06	-2.52e-06	5.69e-06	-2.16e-06	7.44e-07	-1.90e-06
	(2.54e-06)	(2.72e-06)	(3.64e-06)	(2.82e-06)	(2.69e-06)	(3.01e-06)
Latest Education	2593697	.184385	.2919078	.2539488	2980995	.3045913
	(.1738446)	(.3303533)	(.2895103)	(.3423642)	(.1848794)	(.3844372)
Vocational	0154007	03028	0067651	0218464	0160074	0157068
Education	(.0237547)	(.0445659)	(.0307804)	(.0461709)	(.0249545)	(.0507426)
General Education	1122966	.2495918	0727994	.2705185	1150715	.2857532
	(.1512326)	(.2970117)	(.1791279)	(.3069469)	(.1560052)	(.3174484)
Higher Education	0364915	.0129273	0727276	.0228872	0339457	.030138
8	(.0937372)	(.1677198)	(.086533)	(.1755501)	(.0970306)	(.1841682)
emplovment status	.0042832	.0163448	0261458	.0096091	.006421	.0047054
	(.0079553)	(.0176202)	(.0137491)	(.0176889)	(.0085209)	(.0225855)
Parental Country	0	.0009292	0	.0010151	0	.0010777
of Origin	(omitted)	(.0015897)	(omitted)	(.0016937)	(omitted)	(.0017946)
Rent	0005829***	.0025593***	0009678***	.0025233***	0005558***	.0024971***
	(.0001484)	(.000241)	(.0002088)	(.0002544)	(.0001564)	(.0002711)
Gas for heating	-	5.387255***	-	5.271357***	-	5.186982***
0	-	(1.428857)	-	(1.476345)	-	(1.545372)
Gender	0680309	.3206462***	1306762*	.3139473***	0636298	.3090705***
	(.0395887)	(.0852244)	(.0543225)	(.0880658)	(.0418518)	(.092105)
Food expenses	.0002379	000375	0005877	0005229	.0002959	0006306
	(.0002108)	(.0004092)	(.0003789)	(.0004195)	(.0002286)	(.0005355)
Intercept	2.961772***	29.9238***	1.573522	29.19813***	3.059303***	28.66984***
1	(.7348741)	(7.201064)	(.952424)	(7.431516)	(.7711838)	(7.832976)
GeoControls	Yes	Yes	No	Yes	Yes	No
Num.Obs.	2336	7329	2336	7329	2336	7329
Endogeneitv	0.0271	0.0959	0.0145	0.0145	0.0103	0.0735
OverID	0.0575	0.0734	0.6301	0.0809	0.1638	0.2348
Partial R ²	0.2368	0.2401	0.2348	0.2406	0.2365	0.2387

 Table 7: Renters with Previous Year Heating Expenditure as Treatment

 $\frac{1}{p < 0.05, **p < 0.01, ***p < 0.001}$

Satisfaction with	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Owners	Owners	Owners	Owners	Renters	Renters	Renters
	Electricity:	Heating:	Heating:	Heating:	Electricity:	Electricity:	Heating
Democracy	Arbeitspreis	Arbeitspreis	Gesamtpreis	Grundpreis	Grundpreis	Grundpreis	Arbeitspreis
Treatment	0278879	0056816***	0055801***	0084869*	1235061***	1132746***	1194124
	.0228974	.0013216	.0013087	.0037788	.0361459	.0303692	.0970937
Household	.0002595	.0000492*	.0000489*	.0000574*	.0001614***	.0001371***	.0002954
Income	.0002582	.0000199	.0000197	.0000273	.0000416	.0000376	.0001741
Social Housing	-	-	-	-	6037902* .2757452	5921548* .2610522	.7950992 .6487584
Electricity Included in Rent	-	-	-	:	.0113194 .1554489	-	-
Dwelling size	.0949759	.0284517***	.0280136***	.0405601*	.0573541***	.0571293***	.0731027
	.0747821	.0060152	.0059277	.0163846	.0171379	.0156335	.0601254
Employed sector	.000037	4.35e-06	4.35e-06	4.19e-06	-7.39e-06	-7.91e-06	0000182
	.000038	8.05e-06	7.94e-06	.0000112	5.03e-06	5.16e-06	.0000202
Latest Education	0442818	.5941945	.5812125	.9521014	0491981	1173621	-1.784103
	1.714019	.5187596	.5131264	.8338789	.2950755	.2945122	1.689166
Vocational	.2293651	.0417099	.0406367	.0715062	0731551	0719008	3066323
Education	.2994584	.074137	.0732638	.1087637	.0468535	.0465461	.223129
General	-4.242324	-1.565476	-1.552306	-1.933756	.2172188	.2153579	.011489
Education	4.076057	.9934801	.983198	1.36841	.3423572	.3392444	.4942633
Higher	1115319	.2651781	.2614477	.3680041	2054805	2514142	288411
Education	.9452559	.2206196	.218141	.3198293	.1407081	.1405412	.3748797
Employment	1246317	.0760275**	.0742084**	.1263518	0097624	0157884	.0369847
status	.0980764	.0265078	.0261947	.069998	.0194671	.01704	.1017507
Parental Country	.0072371	.0027401	.0027118	.0035454	.0025013	.0039772*	0012234
of Origin	.01441	.0034041	.003361	.004831	.001892	.0018328	.0052823
Rent	-	-	-	:	.0010012*** .0002228	.000726*** .0002137	.0018296 .0010035
Gas for heating	-	1802976** .0702103	1758426* .0692895	3037189+ .1739586	:	:	-1.702011 .9802966
Gender	.1482225	.0460964	.0450928	.099497	0065234	0590918	.0172319
	.3993409	.1178477	.0861486	.1797742	.1294585	.1238588	.351326
Food expenses	.0080303	.0015174***	.0015002***	.0019921**	.0036619***	.0033365***	.0029973
	.0061973	.0003312	.0003267	.0007407	.001042	.0008699	.0026375
Intercept	19.78968	14.43798	14.1471	20.15084	16.85471	15.8991	1.59825
	15.61541	12.31488	9.118442	18.36376	12.70167	12.00993	4.341449
Geo Controls	No	No	No	No	No	No	No
Num.Obs.	13,200	13,200	13,200	13,200	15,623	13,712	4,647
Endogeneity	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0031
OverID	0.4100	0.1905	0.1721	0.6748	0.0567	0.1294	0.6626
Partial R ²	0.1247	0.2702	0.2702	0.2691	0.2165	0.2256	0.2344

Table 8: Satisfaction with Democracy

Satisfaction with Democracy

Turning to H2, we ask how increases in energy burden affect individual satisfaction with democracy, which is consistently measured in the SOEP panel from 2016 to 2020 on a 10 point scale. We follow similar analysis procedures as outlined for the housing burden dependent variable regarding the inclusion of three additional geographical controls by considering the first stage results and dividing the analysis by housing tenure and treatment expenditure. This information is included in the results table 8 below the specification number. ¹⁹ Considering model specifications 2-6, we find evidence that energy burden from both electricity and heating causes the individual who answers the housing questionnaire to report decreased satisfaction with democracy. To contextualize these results, a "-0.0056" coefficient in specifications (2) and (3) suggests that at a mean level of annual electricity expenditure of 1430 euros, a onestandard deviation increase in electricity expenditure for owners of 744 euros would cause their satisfaction with democracy to drop by 4 points on a 10-point scale. For renters with a -0.12coefficient (specification (5), using Grundpreis), at an average of 66 euros monthly expenditure on electricity, a one-standard deviation increase of 36 euros would cause the satisfaction to drop by 4.32 points. Note that compared to owners, renters are more susceptible to small monthly increases in energy spending and respond with increased housing burden and drop in satisfaction with democracy. While we acknowledge that the annual increase may not be as large as this amount, it is crucial to connect this finding to the present energy crisis in Germany and consider how involuntary spending on energy might exacerbate the housing burden and cause dissatisfaction with democracy.

As with our housing burden results, our preliminary analysis of satisfaction with democracy suggests a consistent trend that increases in energy burden lead to increases in housing burden, and reduced satisfaction with democracy. We find the expected housing burden with owners for both energy expenditures in the 2017, 2018 and 2020 sub-samples, and for renters with nearly all price instruments with heating expenditure. We want to highlight that the energy burden that we are considering is not a large amount in euro terms compared to rent. For renters, the mean spending on heating is about 90 euros, which is significantly lower compared to rent payment. Our analysis on energy burden sheds light on the broad picture of how households endogeneize energy and housing burden in the current housing affordability crisis on spending outside of energy.

¹⁸Similarly, we also again follow our strategy of accounting for a negative reporting of heating costs through "-99" coding, and include a "missing" indicator as the alternative missing strategy, which can be found in the appendix.

¹⁹We present preliminary results here. The most recent wave of the SOEP remote access data was released last week. Once we have access to this data, we will add additional data points to the "Satisfaction with Democracy" dependent variable.

Discussion

Using an instrumental variable design, this paper examines the relationship between energy expenditure, housing burden, and satisfaction with democracy. In doing so, we center a previously neglected element of housing cost that has the potential to significantly shape a) people's perception of the housing market, and b) political attitudes. We find evidence suggesting that increases in energy expenditure lead to increases in reported housing burden, and that increased energy burden decreases satisfaction with democracy. Future analyses will refine this further to disentangle differences between groups in our samples, and to investigate what might drive these differences between groups, as well as how households respond to different price components. Understanding the consequences of energy burden in the larger context of housing inequality is important as it has a number of direct policy implications we discuss below, and because it sheds light on how moving beyond rental price can reveal different layers of inequalities both across groups and across space.

We contribute to the literature on housing burden by considering energy as a composite part of overall housing burden allows for a more nuanced discussion of policy interventions targeting housing affordability amidst the housing crisis across advanced democracies. Further, our study makes an important contribution to the literature on the relationship between social protection and citizen's satisfaction with democracy. We test this relationship for a specific economic shock, namely household energy burden. Going forward, policymakers will need to consider how to navigate socially inclusive yet bold climate transition policy amidst concurrent crises (Tews, 2013). How energy burden shapes satisfaction with democracy, and through that, regime stability in advanced democracies (Spicker, 2008) will thus be important for political scientists to understand, specifically as this tension is already being coopted by radical right parties (Voeten, 2023). Building on the findings presented here, future research should include an analysis of heterogenous effects. Existing work suggests that the association between perception of social protection and satisfaction with democracy is more pronounced among economically vulnerable and among left-leaning individuals(Lühiste, 2014; Anderson and Singer, 2008; Nadeau, Daoust and Arel-Bundock, 2020; Chang, 2018).

Further, our work has very direct policy implications for the energy transition in Germany and beyond, specifically with regard to how governments manage energy supply, and steer societies through this potentially contentious transition phase. For the Netherlands, Voeten (2023) shows that right-wing politicians were successfully able to coopt the issue of energy burden, allowing them to "win voters who otherwise would not have voted for them". This illustrates the relevance of the relationship between energy prices, household's experience of this burden, and politics. The distributional implications of the energy transition (Frondel, Sommer and Vance, 2015; Bardt and Niehues, 2013; Neuhoff et al., 2013) make apparent the need to a) understand

how citizens navigate energy burdens, and how these translate into perceptions of housing affordability and into political attitudes, and b) design policy interventions that are socially aware, avoid potential social drawbacks of the energy transition, and avoid forms of regressive taxation that place disproportionate burdens on low-income households (*Energy Poverty*, N.d.).

Finally, understanding the effect of energy burden is important given that this brings the housing crisis to those previously considered more insulated. In addition to lower-income households, energy burden is likely to matter for households otherwise less affected such as rural households and, as some evidence suggests Voeten (2023), households who own their place of residence. For one, while rents are likely to increase particularly in urban centers, energy prices tend to be more expensive in rural areas²⁰ For homeowners, who are more isolated from volatile rental markets, or even benefit from decreasing housing affordability, fluctuations in energy costs and an increased energy burden may diminish their ability to rely on their property as a means of security.

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²⁰Households in more rural, less dense areas pay higher energy prices because a portion of the consumer price offsets the cost of the grid. As such, when more households access the same grid in denser (urban) settings, the individual households pay less.

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Appendix





	(1) Burden Arbeitspreis 2016	(2) Burden Arbeitspreis 2016	(3) Burden Arbeitspreis 2017,18,20	(4) Burden Gesamtpreis 2016	(5) Burden Gesamtpreis 2016	(6) Burden Gesamtprei 2017,18,20
Treatment	0006522 .0003557	0009739** .00035	.0004816 .0005387	0007462* .0003523	000979** .0003442	.0005194 .0005422
income	.0000777*** 9.57e-06 0015919	.0000835*** .0000103 .0028277*	000028 [*] .0000125 - 0031323	.0000794*** 9.76e-06 001953	.0000835*** .0000102 .002847*	000028 [*] .0000125 - 0033021
dwelling size	.0014028	.0014038	.0025101	.0013934	.0013816	.0025278
emplmt. sector	4.35e-07	4.64e-07 2.31e-06	.0000201*** 6.08e-06	4.43e-07 2.05e-06	4.65e-07 2.31e-06	0000201** 6.09e-06
latest edu.	0157008 .165591	.0510205	1450795 .3452219	.1693736	.1806275	14653 .3460217
vocational training	0201665 .0186409	0151049 .0207952	0487414 .0548162	0186872 .019182	0150256 .0208269	0484672 .0548747
general edu	3159538 .3141616	382022 .2931952	1608015 .2981026	3352631 .306361	383057 .2926083	1600162 .3017081
higher edu	0103586 .0664735	.0094787 .0702683	0372662 .225317	0045609 .0672361	.0097895 .0702539	0374895
employment status	.0453528 .0084547	.0085432	.012363	.0084118	.0084105	.012411
country of origin	0 omitted	0 omitted	.0027872 .0022707	0 (omitted) 0	0 (omitted) 0	.0027622 .0022716
rent	omitted	omitted	.0317292	(omitted)	(omitted)	.0319817
gas_missing	9950358 .5354895	-1.477616** .5273186	.9130783 .8447854	-1.136076* .5306048	-1.485177** .5186471	9717144 .8499499
gender	.0876563*** .0227007	080142	0 omitted	.0235238	.0258747	0 (omitted)
food expenses	.0000734 .0000852	.000129 .0000924	0002359 .0001885	.0000896 .0000867	.0001299 .0000919	0002381 .0001894
cons	3.262082** 1.329482	3.363943** 1.275445	6.944313*** 1.164686	3.291852** 1.306363	3.365538** 1.27482	6.928034** 1.169934
GeoControls	No	Yes	Yes	No	Yes	Yes
Num.Obs. Endogeneity OverID	6254 0,0851	6254 0,0013	4860 0,6205	6254 0,0352	6254 0,001	4860 0,5734
Partial R ²	0,8304	0,0695	0,0035	0,325	0.2445	0.2611

Table A.1: Owners with Previous Year Heating Expenditure as Treatment, with indicator for missing gas payment

* p <0.05, ** p<0.01, *** p <0.001 $\,$ n/a = no overidentifying restrictions.

	(1)		(2)	(1)		
	(1)	(2)	(3)	(4)	(5)	(6)
	Burden	Burden	Burden	Burden	Burden	Burden
	Arbeitspreis	Arbeitspreis	Grundpreis	Grundpreis	Gesamtpreis	Gesamtpreis
	2016	2017,18,20	2016	2017,18,20	2016	2017,18,20
treatment	0011685	.0259328**	.0015227	.024956*	0034508	.011989
	.0049903	.0082725	.0092721	.0118828	.005163	.0096891
income	.0001299***	0005629***	.0001277***	0005618***	.0001319***	0005467***
	.0000236	.0000519	.0000246	.0000525	.000024	.0000506
social housing	.077804	3544607***	.0802385	3564288***	.0757393	382554***
0	.0428749	.0892936	.0441129	.0903178	.0429143	.0867666
electricity incl.	008398	.1757587*	0068377	.1737748*	0097213	.1474389*
•	.0302019	.0729992	.0310569	.0744782	.0303723	.0700309
dwelling size	0004822	0117639*	0019451	0112165	.0007584	0039491
0	.0027755	.0049222	.0050704	.0068344	.0028664	.0055788
emplmt, sector	1.07e-06	7.78e-07	1.12e-06	7.47e-07	1.02e-06	3.42e-07
	1.19e-06	1.63e-06	1.23e-06	1.64e-06	1.19e-06	1.55e-06
latest edu.	.0137994	.2296387	.0435621	.2243956	011442	.1547931
	.0948178	.1750408	.1294699	.1801077	.0955523	.1702908
vocational training	0045899	0074505	0046718	0080044	0045205	0153578
0	.0116359	.024775	.0118536	.0251864	.0116484	.0238234
general edu	.0311669	.0831562	.0455844	.0813267	.0189396	.0570406
-	.0975876	.1571239	.1071531	.1577834	.0976494	.1554704
higher edu	0186388	.0103064	0243113	.0122943	013828	.0386821
C	.0447977	.0962321	.0482552	.0974114	.0453422	.0883089
employment status	0084702^{*}	.0093136	0092102*	.00991	0078425*	.0178272
• •	.0036442	.0094093	.0043151	.0107516	.0036909	.0096682
country of origin	0	.0025323*	0	.0025232*	0	.0024033*
	(omitted)	.0011452	(omitted)	.0011424	(omitted)	.0011053
rent	0005976***	.0019968***	0006778*	.0020263***	0005295**	.0024188***
	.0001647	.0002762	.0002814	.0003875	.0001699	.0003174
gas for heating	-	3.828765***	-	3.856052***	-	4.218278***
	-	.8744665	-	.9033967	-	.8553778
gender	0655004**	.2289159***	069537**	.2305435***	062077**	.252149***
	.0213838	.0521734	.0245464	.0538984	.0216189	.0510367
food expenses	.0000603	0002789	0000129	0002626	.0001224	0000464
	.0001587	.0002489	.000264	.0002852	.0001638	.0002505
intercept	2.151624***	22.08385***	2.057613***	22.23406***	2.231354***	24.228***
	.4147742	4.417301	.499113	4.590404	.4185803	4.332606
GeoControls	No	Yes	No	No	No	No
Num.Obs.	6563	21009	6563	21009	6563	21009
Endogeneity	0,9315	0,0058	0,7319	0,0784	0,7177	0,4506
OverID	0,336	0,0333	0,0645	0,0551	0,4593	0,0138
Partial R ²	0.2290	0.2504	0.2281	0.2490	0.2290	0.2496
* <0.05 ** <0.01	*** <0.001					

Table A2: Renters with Previous Year Heating Expenditure as Treatment

* p < 0.05, ** p < 0.01, *** p < 0.001

	(1)	(2)	(3)	(4)	(5)	(6)
	Burden	Burden	Burden	Burden	Burden	Burden
	Arbeitspreis	Arbeitspreis	Grundpreis	Grundpreis	Gesamtpreis	Gesamtpreis
	2016	2017,18,20	2016	2017,18,20	2016	2017,18,20
	subgrouped	subgrouped	subgrouped	subgrouped	subgrouped	subgrouped
treatment	000686	.0308548	0069215	.0424349*	009816	.0256825*
	.0084498	.0172215	.0041745	.0171524	.0134534	.0116025
income	.0001455***	0005243***	.0001593***	00055***	.0001657***	0005128***
	.0000327	.000086	.0000312	.0000893	.0000423	.0000811
social housing	.1381562	4205809*	.1294221	4598243 [*]	.1253677	4030524*
	.0817614	.1763537	.0835405	.1858476	.0884228	.166953
electricity incl.	-	-	-	-	-	-
	-	-	-	-	-	-
dwelling size	0011964	0174889	.0026134	0246526*	.0043819	0142892
	.0052127	.0110115	.0026741	.0111251	.0082864	.0075362
emplmt. sector	2.81e-06	-2.14e-06	1.75e-06	-1.51e-06	1.26e-06	-2.43e-06
	2.53e-06	2.92e-06	2.31e-06	3.16e-06	3.25e-06	2.75e-06
latest edu.	051584	.2577274	178061	.3804399	2367722	.2029173
	.2160934	.3728529	.1598121	.40063	.3046172	.3346512
vocational training	0121458	0213883	0141271	0065114	0150468	0280332
0	.0211632	.0491743	.021882	.0530541	.0234256	.0450937
general edu	0974095	.2716553	1064711	.3085705	1106776	.2551667
0	.140866	.3099872	.1438433	.3300471	1503091	.299633
higher edu	0501495	.0234282	041836	.0409977	0379768	.0155807
	.0819274	.1775941	.087582	.1946739	.0941295	.169837
employment status	- 007186	0092431	- 0002048	- 0026389	0030359	0145504
	0107483	0219552	0071915	0224559	0161177	0179449
country of origin	0	.0010198	0	.0011714	0	.0009521
country of origin	(omitted)	0017082	(omitted)	0019592	(omitted)	0016139
rent	- 000728***	0025213***	- 0006396***	0024578***	- 0005986**	0025497***
Tent	0001659	0002633	0001341	0002879	0002314	0002438
gas for heating	-	5 265061***	-	5.060613**	-	5 356379***
gus for neuring	_	1 500555		1 614741		1 44239
gender	- 091643*	3135834***	- 0772706*	3017663**	- 0705988	3188616***
Sender	0382346	0894387	0361076	0962649	0484349	0860282
food expenses	- 0000733	- 000531	0001161	- 000792	0002041	- 0004144
1000 expenses	000281	0005216	000182	0005537	0004359	0004143
intercent	2 438518***	20 15871***	2 757017***	27 87862***	2 00/866**	20 73047***
mercept	7436888	7 605162	6813236	8 160638	0541668	7 271160
GeoControls	.7450666	7.005102 No	.0815250	No.	.5541008	Voc
Num Obs	2226	7220	2226	7220	2226	7220
Fodoconcity	2550	/329	2330	1329	2550	1329
OverID	0,9103	0,1295	0,1800	0,0150	0,5024	0,0/19
Dartial P2	0,7838	0,2/18	0,0011	0,2352	0,9844	0,0070
rafual K~	0.2344	0.238/	0.23/3	0.2390	0.2338	0.2400

Table A3: Renters with Previous Year Heating Expenditure as Treatment

	(1) Satisfaction	(2) Satisfaction	(3) Satisfaction	(4) Satisfaction	(6) Satisfaction	(8) Satisfaction
	Domoornov	Democracy	Democracy	Domooroov	Domoornov	Democracy
	Democracy	Democracy	Democracy	Democracy	Democracy	Democracy
	Arbeitspreis	Arbeitspreis	Arbeitspreis	Arbeitspreis	Grundpreis	Grundpreis
treatment	.0238136 .0299993	.0089435* .00408	.0152212 .0240464	.0128539** .0043153	.0083378* .0040673	.0115215** .0042825
income	.000113*** .0000196	.0001179*** .000018	.0001135*** .0000193	.0001139***	.0001181***	.0001142*** .0000191
social housing	.3486238 .2130445	.2524893** .0892567	.3197419	.3029418**	.2485735** .0891457	.2934864** .0958591
electricity incl	3450783*** .0998893	3091043*** .0664589	-	-	307639*** .0663586	-
dwelling size	0117451	0047704* .0021007	008407 .0123095	0071996** .0024168	0044863* .0020937	00652** .002397
emplmt. sector	5.31e-06	4.03e-06	5.44e-06	5.19e-06*	3.98e-06	5.05e-06
latest edu	1105135	1043244	2577318	2551454	1040724	2536904
voctl training	0245076	029418 0266342	0175339	0185355 0284496	029618	0190992 0283494
general edu	.6377808*** 189438	.5953303***	-	.5646843***	.5936011***	.5609941***
higher edu	1230903	1314065	1395574	1416182	1317453	142778
employmt status	0722246*** 0142999	0659198*** 0064836	0694977*** 0120879	0685082*** 0069795	065663*** 0064742	0679513*** 0069548
country of origin	.0040177**	.0038646**	.0039662**	.0039664**	.0038584**	.0039665**
rent	.0007426*** .0001094	.0007687***	.0008613***	.0008588***	.0007698***	.0008574***
gender	2888805*** .0860252	26038*** .0616946	3046586*** .0814512	3001344*** .0670229	2592191*** .0616238	2975882** .066816
food expenses	0004194	-7.42e-06	000124	0000603	9.36e-06	0000244
intercept	-15.60673+ 8.651972	-12.33015* 5.426469	-13.87419 8.013778	-13.32567* 5.849033	-12.19668* 5.417393	-13.01695* 5.825122
Geo Controls	No	Yes	No	Yes	Yes	Yes
Num.Obs.	15,623	15,623	13,712	13,712	15,623	13,712
Endogeneity	0.3120	0.0007	0.3954	0.0000	0.0012	0.0001
OverID	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Partial R ²	0.2160	0.2324	0.2251	0.2427	0.2324	0.2428

Table A4: Satisfaction with Democracy among Renters, with Previous Year Electricity Expenditure as Treatment

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001