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# Reported Utility Service Satisfaction: The Case of Electricity in Transition Economies

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# **Reported Utility Service Satisfaction: The Case of Electricity in Transition Economies**

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## **Abstract**

Since the end of the Soviet Union, the power sector in the countries resulting from its disintegration has evolved from a context of central planning towards independent regulation. There is great heterogeneity in reform progress in transition countries, with consequences to service quality and prices in utilities and also the view the population has of such services. This paper conducts an overview of the modern power sector in transition economies and analyses drivers of reported household satisfaction with the quality of electricity services in 27 countries using cross-sectional survey data from the EBRD Life in Transition Survey II, in a context of improving regulatory and infrastructural frameworks, using an ordinal random effects model with a probit link function. Key drivers of reported satisfaction are the uses of electricity within the household and some characteristics such as age, economic conditions and general life satisfaction. However, there is no evidence of the effect of power sector reform on the opinion of households. This points that the general life experience in transition can be the key driver of how households feel about utilities, as reform brings conflicting effects that stem from increasing cost sustainability, competition, transparency and quality of the service.

JEL Codes: P21, P28, C25

Keywords: Electricity, Transition Economies, Household Satisfaction, Ordinal Probit

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## **1. Introduction**

The purpose of this study is to empirically explore the drivers of reported household satisfaction with electricity supply services in transition economies, in a context of improving regulatory and infrastructural frameworks. The end of central planning implied that many of these economies implemented broad market-driven reforms as a part of thoroughgoing economic and political changes since the early 1990s. Throughout the last twenty five years, the transition economies that emerged from the fall of the Soviet Union faced many parallel challenges, from reforming their economic systems to creating an appropriate institutional framework for future growth and stability. Some countries in Eastern Europe adopted a “shock therapy” approach to fully open and liberalize the economy as soon as possible. In other countries, reforms were implemented at a slower pace, particularly in the Commonwealth of Independent States (CIS). As such, some heterogeneity in service provision, socio-economic characteristics and opinion about service quality is expected across transition economies. More specifically, this paper aims to assess if the perceived quality of service is indeed being influenced by the state of power sector reforms that have been put in place throughout the transition period. The key motivations of this paper are based on the analysis of the power sector in transition economies and the need to understand what drives household satisfaction in the specific context of transition economies, where a large share of the population lived a part of their lives in centrally planned economies or has a cultural and social heritage stemming from that economic system. This empirical study is conducted using survey data from the European Bank of Reconstruction and Development (Life in Transition Survey II, 2010) and applies an ordinal model with random effects to account for unobserved heterogeneity. The findings show that the opinion of households about electricity supply is mostly driven by general socio-economic characteristics of the household, with large variation across respondents, and that there is no significant evidence of a link between power sector reforms and household opinions about the electricity service.

The remainder of the paper is structured as follows. Section 2 presents a literature review related to the research question. Section 3 presents an overview of the power sector in transition. Section 4 outlines data analysis and econometric methodology. Section 5 presents results and a discussion of results. Section 6 concludes.

## 2. Literature Review

Since the very early stages of the Soviet Union, there was a strong political and economic focus on electricity and the power sector. Lenin (1920) declared that “Communism is government by the Soviets plus the electrification of the whole land”, as a sign of the effort to transform the Soviet Union into a modernized world power with focus on heavy industry. The structure of the power sector in soviet economies was deeply influenced by the way the economy was organized. Besides the frequent use of price controls, supply side policies were applied in the energy sector whenever changes in demand were observed (Cooper and Schipper, 1992). While the oil shocks of the 1970s pressured countries in the western hemisphere to push towards macroeconomic reforms, the Soviet Union was mostly isolated from such shocks and made shy reforms efforts. Williams and Ghanadan (2006) conducted an extended analysis of electricity reforms in development and transition countries. Pre-reform electricity sectors in such countries were characterized by universal access through a state owned and highly bundled sector. With tariffs set by the ministry, cross subsidizing was common for agricultural, residential and public agencies. The authors also refer limited use of utility meters and inappropriate bill collections. However, after 1990, the need for revenue made utilities an attractive sector to privatize and commercialize, in order to keep state accounts balanced during serious economic turmoil. Also, the World Bank gave power sector loans on the condition that reforms were put in place (World Bank, 1993). While the first plan of action was mostly to follow the conclusions of the Washington Consensus to liberalize and reform ex-USSR countries, such efforts had wide variation in time and intensity across countries. The different paces of reform after the break of the USSR ultimately meant that the situation in the power sector is dramatically different between transition economies well into the transition period. Kennedy (2003) reviewed the progress in regulatory reform in the specific case of transition economies. The author states that while progress in reforms in the power sector has been achieved in most countries, there are still issues with the independence of regulators, meaning that problems like government influence (through decision making or reliance on central funding) can still arise. Government commitment is necessary as simply importing pricing mechanisms from western countries is not enough. Transition economies face specific challenges, such as significant exchange rate risks. The authors also point that in countries where regulation and commitment are weak, strategic investors leave the sector. In this context, the sector can face lack of investment and trust, and perpetuate lack of competition and price distortions.

There is an increasing literature about broad aspects of the power sector in transition economies. Nepal and Jamasb (2012) assess the impacts of reforms in transition economies and highlight the interdependency of power sector reforms and wider market reforms, with the failure to harmonize multiple reforms leading to ineffective power sector reforms. Pollitt (2009) makes an analysis of the South Eastern Europe electricity markets, concluding that power sector reform should be a part of wide institutional reforms and that progress in that wide range of reform is necessary to achieve success in power sector reform. However, there is no link between this literature and the opinions of customers about the utility services.

According to EBRD data on regulation up to 2010, countries like Azerbaijan and Belarus failed to make any significant improvements in the establishment of a regulator and the participation of private companies in the supply of electricity, while many countries in Eastern Europe (particularly those who joined the EU and thus its guidelines) have achieved a framework of independent regulation and cost-reflective pricing policies, with higher bill collection rates. As such, the experiences and opinions of the population with their utility services and public services in general are expected to be very varied. Besides depending on the socio-economic characteristics of the customers, the opinion about the electricity service can also depend on the state of the infrastructure reform in the power sector. While there is a series of studied connections between service quality and customer satisfaction and loyalty (Ardabili et al., 2012), customer satisfaction with services and their quality is an often discussed and contradictory issue in the marketing literature (Reketye and Pintér, 2006). However, the specific context of transition economies needs to be considered, as in many countries there is no large-scale competition between private companies. Besides that, the historical and economic background of these countries implies that the focus of the power sector was placed on viability and attractiveness to investors instead of consumer concerns, as deteriorating national and sector finances were a driver of reforms (Williams and Ghanadan, 2006).

One of the key issues in assessing consumer satisfaction with utilities is the existence of conducted surveys. A study conducted by Ipsos (2007) for the European Commission assessed consumer satisfaction in all EU member-states, including some of the transition economies. In the new member states (mostly transition economies), there is a higher percentage of both satisfied and dissatisfied consumers than in the EU15, and the average percentage of satisfied customers for transition economies is noticeably higher than the EU15 average, and especially when compared against southern Europe. Lithuania is the country with the highest percentage of satisfied customers in EU25.

In transition economies, such efforts to retrieve opinions from customers are scarce. A clear exception is the effort conducted in Hungary to evaluate what is the opinion of customers about the utility services in the country, where a consumer satisfaction survey was conducted from 1996 (Rekettye and Tersztyánszky, 2001). Rekettye and Pintér (2006) conducted a survey in Hungary to explore the relationship between satisfaction and price acceptance in electricity supply. This was done using an ordered probit ordered response model, as the dependent variable was discrete. Another more general example of analysis of discrete consumer satisfaction is an analysis for Spanish mobile internet services (Muñoz et al., 2012).

The major efforts in understanding citizens' concerns and problems in transition economies have been conducted through the Life in Transition Surveys, done in 2006 and 2010 in a collaborating between EBRD and the World Bank. The second survey (LiTS II) surveyed around 39000 households in 34 countries in late 2010, as the effects of the world crisis were impacting the population in the ex-communist bloc. This survey also asked additional questions when compared to the first one, such as what was the level of satisfaction with utility services, allowing researchers to look into consumer satisfaction with electricity supply all across the transition bloc.

Other specific issues of transition economies need to be accounted for. For example, the issue of the age of customers, as a large part of the citizens of these countries was educated in the soviet system and a smaller share worked and lived a part of their adult lives in the soviet system, implying an exposure to a completely different electricity supply, that was characterized by very low tariffs and extensive subsidizing. This perspective might lead customers to adopt a hostile attitude for a reformed power sector as that implies cost-reflective prices, even if quality has improved. The next sections develop the framework of analysis further.

### **3. The Energy Sector in Transition**

After more than twenty years of economic transition, the political and economic choices create very clear differences in the way utilities are managed across countries.

One of the facts about the current state of the power sector in transition is that the highest residential electricity prices are located in the countries where a fully independent regulator is established, as there is no government pressure to maintain low, non-cost reflective prices. In countries where privatization efforts were small, the percentage of household expenditure on electricity and water is small, as those countries still have a centralized power sector with no independent regulator and the control of prices by the government and subsidizing are still frequent. However, this can also mean that the quality of the service is poorer than in other countries. The countries with full independent regulation are clearly clustered in the EU, with the exception of Croatia (that became a EU member in 2013). This is related to the European guidelines on utilities. Table 1 shows the very different situations of the power sector across transition economies and also the correlation between the level of independent electricity regulation and electricity prices.

Table 1. Power sector regulation and general statistics across transition economies

	<b>Independence of electricity regulator</b>	<b>Household expenditure on power and water</b>	<b>Cumulative Privatization Revenue in % of GDP (last year of available data)</b>	<b>Residential Electricity Tariff in USD cents (last year of available data)</b>
<b>Albania</b>	partial	5 per cent	16 (2009)	9.6 (2008)
<b>Armenia</b>	partial	6.8 per cent	10.2 (2004)	7.9 (2008)
<b>Azerbaijan</b>	no	3.5 per cent	3.2 (2005)	7.5 (2009)
<b>Belarus</b>	no	4 per cent	6.3 (2008)	6 (2009)
<b>Bosnia and Herzegovina</b>	partial	4.9 per cent	2.6 (2004)	9.1 (2008)
<b>Bulgaria</b>	full	11.2 per cent	24.3 (2009)	10.9 (2008)
<b>Croatia</b>	full	13.1 per cent	17.4 (2009)	12.4 (2008)
<b>Estonia</b>	full	6.1 per cent	7.2 (2004)	11.5 (2008)
<b>FYR Macedonia</b>	partial	6.6 per cent	21.2 (2009)	6.7 (2009)
<b>Georgia</b>	partial	11 per cent	41.8 (2008)	10.3 (2008)
<b>Hungary</b>	full	10.9 per cent	33.1 (2008)	18.3 (2009)
<b>Kazakhstan</b>	partial	3.7 per cent	30.6 (2010)	5.3 (2008)
<b>Kyrgyz Republic</b>	partial	4.4 per cent	7.5 (2010)	1.6 (2009)
<b>Latvia</b>	full	3.8 per cent	10.8 (2008)	11.8 (2008)
<b>Lithuania</b>	full	3.8 per cent	16.6 (2008)	11.1 (2009)
<b>Moldova</b>	partial	9.6 per cent	0 (2008)	10.1 (2008)
<b>Mongolia</b>	partial	9.4 per cent	11.1 (2009)	5.5 (2008)
<b>Montenegro</b>	partial	11.7 per cent	n.a.	12.4 (2008)
<b>Poland</b>	full	6.8 per cent	14.2 (2007)	20 (2008)
<b>Romania</b>	full	3.7 per cent	n.a.	14.5 (2008)
<b>Russia</b>	partial	6.6 per cent	6.5 (2009)	6.7 (2008)
<b>Serbia</b>	partial	9.3 per cent	23.1 (2009)	8.8 (2008)
<b>Slovak Republic</b>	full	9.5 per cent	35.2 (2007)	22.8 (2008)
<b>Slovenia</b>	full	9.1 per cent	6.5 (2009)	18.4 (2008)
<b>Tajikistan</b>	no	6.0 per cent	8.6 (2008)	1.1 (2008)
<b>Turkmenistan</b>	no	0.3 per cent	0.6 (2005)	0.3 (2008)
<b>Turkey</b>	full	28.4 per cent (2007)	8.2 (2008)	15.5 (2009)
<b>Ukraine</b>	partial	9.1 per cent (2008)	15.5 (2008)	4.6 (2008)
<b>Uzbekistan</b>	no	5.2 per cent	6.3 (2008)	3.4 (2007)

Sources: EBRD Structural Change Indicators, EBRD Transition Development Snapshots

The situation of the power sector in transition is incredibly diverse, with a wide set of issues and states of reform, as discussed next. Romania is an example of a country within the space of the European Union that has a fully independent electricity regulator (Romanian Energy Regulatory Authority, ANRE). In fact, joining the EU had a series of consequences to



the power sector in Romania, as it facilitated both the creation of an appropriate regulatory framework and applied pressure to decommission and refurbish generation plants in order to comply with EU requirements. The market was liberalized in 2007 (the same year Romania joined the European Union), and by October 2011, 56% of the market was fully open to competition (mostly industrial customers), and the rest of the market, mostly composed by households, was still regulated (KPMG, 2012).

The ANRE was established in 1998 and is a self-financed institution with many regulatory powers. It issues and approves technical and commercial regulations for companies, establishes the contracting framework, sets tariffs for captive consumers and natural monopoly segments and monitors the power market, among other powers (Diaconu et al., 2009). As a result of such framework, tariffs are mostly cost-reflective and electricity prices are amongst the highest in ex-communist countries. Regulated tariffs are related to incentive regulation schemes, with a revenue cap for transport and tariff basket cap for distribution networks. Romania is a net exporter of electricity and has an unconstrained transmission network. However, other countries experience issues linked to the lack of reforms. Ukraine is a case of a country that had significant reforms efforts at the beginning of the transition process, effectively becoming the first country in the Former Soviet Union with a competitive electricity market, but still lacks the institutional framework and regulatory framework typical of a developed market economy. Tariffs are still amongst the lowest in the region as can be seen in Table 1., giving poor incentives for rational energy consumption, and have consistently been below cost covering levels, even after several tariff increases (Dodonov et al., 2004). The history of the power sector in Ukraine is dominated by overcapacity issues and a long history of bill collection issues, from non-payment to a large amount of non-monetary settlements. Lack of investments due to lack of cash have aggravated some network issues. Tariffs have not suffered significant increases for years after 2006. Electricity customers are separated in two groups: non-regulated (companies with special permits) and regulated (including all households) (Park, 2011). One of the regulating bodies is the Ministry of Fuel and Energy that implements state policy, regulates and restructures the power industry and the energy market. This ministry nominates the executive director of the state company that administrates the payment system of the electricity market and nominates the director of Ukrenergo, a company that incorporates the state supervision bodies for electricity, electric power stations and networks (Tsarenko, 2007). Other regulating bodies are the National Electricity Regulation Council (NERC) and the General Board of Wholesale Electricity Market. Ukraine has experienced an energy crisis after 2006, as problems with imports from Russia and an ageing infrastructure have caused

problems. Other (more extreme) examples can be found in transition economies, such as Tajikistan, where outages are frequent and users ultimately cannot rely on the service. Tajikistan faces a whole different set of problems and challenges within the regional framework of Central Asia and is an example of a country lacking significant economic reform efforts. The first is supply shortages and climate issues. Demand is particularly high in the winter, as households use electricity for heating, and demand is higher than supply, causing frequent shortages (around a quarter of electricity demand) that cause economic losses valued at 3% of GDP every year. The hydropower output is low during the winter due to low river flows and is an expensive source of energy (Fields et al., 2012). Blackouts force households to burn solid fuels to keep warm and cause damage to household equipment, besides hurting businesses. The second issue is related to relationships with neighbours. The Central Asia Power System (CAPS), designed in the 1970s, is an electricity network covering five countries in the area. However, it was designed considering the area as a single unit, leading to problems after the collapse of the Soviet Union, as each country has specific needs and wanted to secure the reduction of dependence from its neighbours. This led to disagreements and Tajikistan left the CAPS system, stopping the imports of electricity from the system and aggravating the situation of supply shortages. Thirdly, the country is one of the ex-Soviet republics with the least advances in reform efforts according to the EBRD transition indicators. The economy is still highly centralized and suffers from different kinds of inefficiency. The only power utility company in the country (Barki Tajik) is fully owned by the state and needs significant investments to solve the serious issues of electricity supply in the country. With tariffs of 2.25 cents/kWh among the lowest in the world, some surveys still find that household expenditure with energy is as high as 15% although expenditure while electricity is as low as 2% (World Bank, 2012), and the possibility of raising tariffs raises concerns about household budget constraints and the decrease in demand caused by an increase in prices to cover for supply costs. While the increase in tariffs appears unavoidable to assure the sustainability of the power sector in Tajikistan (although different tariff structures are possible), protecting the poor is a sensible issue and a comprehensive safety net would have to be built (Coady et al., 2005). In other countries, the experience of power sector reforms was equally diverse, with several experiences of independent regulation and increasing competition, but also cases of stalling reforms, perpetuation of cross-subsidizing, investment problems and lack of competition. Such examples imply the need to account for such heterogeneity in the power sector in the estimation efforts.

The opinion about the quality of the service crucially depends on a number of factors. The first one is price, as electricity can be seen as an essential good and poorer households might drain a significant part of their household budget to be able to pay their utility bills. As such, particularly in poorer transition economies, the increase in prices associated with increasing regulation in the power sector can translate into worse opinions about the service. The survey question that links to the dependent variable of this study is “How satisfied were you with the quality of the electricity service?”, but the views of consumers can be distorted if they are dissatisfied with the costs associated to the service, particularly if they see that the quality of the service does not correspond to the associated price (although this can be a misinterpretation of the survey question). Another factor is the quality of the service itself and service interruptions: the household can suffer from frequent power cuts, damaged household items or other issues with the service. This is another source of dissatisfaction, although it can be argued that countries that have such problems in persistent manner can present more sympathetic opinions towards quality of the service, as no better state of the service has been known in the past (consumers “are used” to the problems). However, this is not consistent with existing data. For example, consumers in Tajikistan are clearly amongst the most dissatisfied, in a situation of extremely low energy prices and an on-going energy crisis with power cuts when the water levels in dams are very low – this is especially serious in the winter when households demand significant amounts of electricity for heating purposes. Another opinion vector to consider relates to the competition environment created by power sector reforms. The opinion of households about the electricity service can be linked to their views on how the sector advanced, a visible increase in choice, competition and transparency, and a more professional and dedicated communication channel between customers and utility firms.

In that sense, increased service quality, transparency and competition could lead to improved conditions and a significant positive effect of power sector reforms on the opinion of households about the service. A negative driver is the link between electricity prices and power sector reforms, as reforms often aim to cover costs and reach a level of sustainability of the sector. However, there is a series of personal and economic characteristics to take into account when evaluating reported satisfaction with electricity services. The next section discusses the methods and the data that will answer the research question.

#### 4. Econometric Methods and Data Analysis

The data used in this study is from the Life in Transition II Survey, conducted in late 2010. The survey was designed with a two-stage clustered stratified procedure to select the households in the sample. For the purpose of this data analysis, the data was filtered to remove answers from countries outside the transition bloc (all countries with no power reform index measure from EBRD plus Turkey), households that did not have electricity supply, households that did not pay electricity bills and other outliers<sup>1</sup>. Respondents were asked to state their level of satisfaction with the quality of the utility services, including electricity supply, with possible levels being 1 (very dissatisfied), 2 (dissatisfied), 3 (not satisfied nor dissatisfied), 4 (satisfied) and 5 (very satisfied). Other questions involve the existence of a utility meter, estimated expenditure in utilities, overall life satisfaction and other questions involving key social and economic issues. There is no clear correlation between customer satisfaction and those two variables. There is also no clear relationship between the state of power sector reforms and consumer satisfaction, as satisfaction levels are very high in Azerbaijan with no regulator in the country and Lithuania has one of the lowest average satisfaction levels with a fully independent regulator established. In the IPSOS (2007) study for the European Commission, Lithuania was the country with the highest percentage of satisfied customers in the EU25. This does not seem to be the case in this survey, as Latvia and Poland (other EU members) have considerably higher satisfaction levels. However, the Life in Transition II survey was conducted four years later, as the world was recovering from a serious recession that also had severe impacts in Eastern Europe and Asia. The amount of respondents that state they are “very dissatisfied” with the service is below 3% of the sample. The percentage of people that are very dissatisfied with their lives is particularly high in Georgia, Serbia and Ukraine, even if satisfaction with utility services is not amongst the lowest in transition economies.

The vector of explanatory variables contains: a) a dummy variable that has value 1 if the household uses electricity for cooking purposes and 0 otherwise; b) a dummy variable that has value 1 if the household uses electricity for heating purposes and 0 otherwise, as the possible uses of the service in both cooking and heating show increased dependence of the service for multiple purposes; c) a dummy variable that has value 1 if the household can make savings after paying utility bills and 0 otherwise, as those bills can seriously drain the resources

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<sup>1</sup> The countries included in this sample are Albania, Armenia, Azerbaijan, Belarus, Bosnia, Bulgaria, Croatia, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Macedonia, Moldova, Mongolia, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Tajikistan, Ukraine and Uzbekistan.

of households and keep them from purchasing other goods; d) the life satisfaction index (ranging between 1 and 10) that represents how happy the respondent is regarding life in his transition country, as the general opinion about the state of society and the economy can influence the opinion about specific services and utilities; e) the age of the respondent, as the experiences of the transition process dramatically vary in age groups – younger people never experienced a fully centralized, soviet-style economy, while older people fully experienced both regimes and thus have a different perspective; f) a dummy variable that takes value 1 if the respondent is female and 0 otherwise, to account for gender differences in answers – gender can affect views and uses of the electricity service; g) the EBRD index of power sector infrastructure reform in transition<sup>2</sup>. This variable is of particular interest in this study as it is related to the research question and the possibility of the state of power sector reform ultimately driving (or not) the level of satisfaction of users in the service across transition economies. Finally, h) a dummy taking value 1 if the household has a utility meter and 0 otherwise, i) a dummy variable taking value 1 if the interviewed member of the household was a member of a communist party up to 1990 and 0 otherwise and j) a measure of the relative share of income, denoted by the sum of reported expenses and reported savings in the survey, divided by the average of that measure for the country where the interview was conducted. The particular variable of interest in this study is the state of power sector reform, which might be linked to different effects as discussed in previous sections.

Observations where the interviewed member of the household refuses to answer if he/she can make savings (and how much) are removed (and also observations where the interviewed person answers “don’t know”). The same approach applies to the questions related to spending. The number of people refusing to answer or saying they don’t know is particularly high in Baltic States and Ukraine. However, across the sample, the age, share of females and life satisfaction characteristics of the group that refused to answer that question or did not know the answer are similar to those who did answer, which ensures that there is no risk that a specific group of people is being removed from the sample and losing weight in the sampling. After all observations are removed, individual observations were re-weighted according to the original regional weights within each country to ensure that all countries in the analysis have equal weights (instead of weighting the sample by population). This means that equal weighting is given across countries, and the original weight structure among regions is preserved,

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<sup>2</sup> This data refers to 2010. Expert assessment is usually conducted mid-year, while the survey used in this paper was conducted in late 2010. The indexes only changed between 2009 and 2010 for two countries (decreasing for Hungary and increasing for Montenegro), showing the stability of the indexes on the latter years of the transition process.

preventing regions where more people refuse to answer questions from becoming negligible in the final results. Also, because of the low amount of respondents of the lowest category (1), these answers are aggregated with category 2 (as a general “dissatisfaction” category). This prevents estimation problems caused by a category with too few observations.

Table 2. Descriptive statistics

	Mean	Std. Dev	Min	Max
Satisfaction with electricity service	3.913851	0.77214	2	5
Uses electricity for cooking dummy	0.396405	0.489162	0	1
Uses electricity for heating dummy	0.16908	0.374831	0	1
Has a utility meter dummy	0.967177	0.178177	0	1
Savings dummy	0.231187	0.421601	0	1
Satisfaction with life in transition	5.196065	2.074433	1	10
Age	45.66864	17.33703	18	99
Female Dummy	0.613203	0.487028	0	1
Power Reform Index	2.967057	0.555283	1	4
Communist Party membership dummy	0.066382	0.248954	0	1
Relative income compared to country average (in the sample)	1	1.14729	.0010037	105.7943

Total number of observations: 21753

The overwhelming majority of households have utility meters, and the percentage that uses electricity for heating purposes is low, as gas is a popular alternative in many transition economies. The average age of respondents is over 45 years old and most of the respondents are females. The share of users of electricity for cooking purposes is considerably higher than the share for heating. Only 23.1% of the individuals answer that they can make savings at the end of the month after paying all their bills, which is a sign of economic comfort and higher ease to pay such obligations. The life satisfaction index is much more centred on the average level (around 5) than the satisfaction with the electricity service, which shows that many people

are still dissatisfied with their life experience in transition economies. Almost 97% of people have utility meters. Almost 7% of the respondents were affiliated with a communist party before the transition process started. Also, there is very wide variation in within country relative incomes when the average income is considered to be equal to the sample average (with a median of 0.87). The average power sector reform index across the sample is close to 3, indicating reasonable progress, but with some clear outliers<sup>3</sup>.

Three models that include the aforementioned variables are considered. First, a simple ordered regression (OR) is considered, which is biased if there is unobserved heterogeneity that is correlated with the observed variables and leads to efficiency losses if that heterogeneity is not correlated with the observables. Secondly, a random-effects ordered model is considered in order to account for unobserved heterogeneity (REOR), but assuming that the regressors are uncorrelated with the random effects (the standard RE assumption). However, this might be a restrictive assumption given that the unobserved heterogeneity might be correlated with factors like age or others. Thirdly, a random-effects ordered model with means of regressors that vary across regions to relax the assumptions of the random effects model that the regressors are uncorrelated with the random effects (REORM). There is information on both country and region where the interviews were conducted. Much more unobserved heterogeneity is captured at the regional level, indicating that it is important to consider differences within countries (for cultural, socio-economic and also urbanization reasons). Therefore, results are presented with the unit for random effects being the 420 regions present in the data. Thresholds are allowed to be estimated flexibly without any symmetry or equidistance assumptions which are likely to be restrictive. Estimation is conducted in R 3.02 using the “ordinal” package, with the model fitting done by adaptive Gauss-Hermite quadrature approximation with six quadrature points to ensure precision of the estimates. The chosen link function is Probit. Although a Logit link function renders similar coefficients and significance results, it also leads to unreasonably large variance of the random effects and distances between estimated thresholds. A complementary log-log link function was also considered, as the more appropriate method for a distribution of answers that is skewed to the right towards better reported values in the scale (Norušis, 2005). However, the fit of the model was poorer when compared to a Probit.

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<sup>3</sup> The EBRD refers that the level 3 of power sector reforms corresponds to “Law passed providing for full-scale restructuring of industry, including vertical unbundling through account separation and set-up of regulator. Some tariff reform and improvements in revenue collection. Some private sector involvement.”

## 5. Results and discussion

Results from all aforementioned specifications are presented below. Besides the coefficients and the standard errors of the coefficients of interest (in brackets), the variance of the random effects in each case is also presented, as well as a likelihood ratio test between REOR and REORM models. Coefficients for the cross-sectional means in REORM are omitted.

Table 3. Estimation results

	<b>OR</b>	<b>REOR</b>	<b>REORM</b>
Uses electricity for cooking dummy	-0.0436 (0.0168)***	0.0667 (0.0219)***	0.0873 (0.0224)***
Uses electricity for heating dummy	-0.2242 (0.0215)***	-0.1325 (0.0253)***	-0.1205 (0.0256)***
Has a utility meter dummy	0.0725 (0.0408)*	0.0604 (0.0475)	0.0557 (0.0480)
Savings dummy	0.1361 (0.0188)***	0.1304 (0.0214)***	0.1281 (0.0216)***
Satisfaction with life in transition	0.0512 (0.0039)***	0.0453 (0.0043)***	0.0452 (0.0043)***
Age	0.0055 (0.0005)***	0.0021 (0.0005)***	0.0020 (0.0005)***
Female Dummy	0.0360 (0.0162)**	0.0339 (0.0172)**	0.0325 (0.0173)*
Power Reform Index	0.2067 (0.0131)***	0.1447 (0.0510)***	0.0693 (0.0554)
Communist Party membership dummy	-0.0564 (0.0342)*	-0.0276 (0.0365)	-0.0208 (0.0367)
Relative income compared to country average (in the sample)	0.0234 (0.0078)***	0.0189 (0.0070)***	0.0187 (0.0070)***
Log. Lik.	-21265.36	19501.34	-19484.10
Akaike Information Criteria (AIC)	42556.73	39030.67	39014.21
Var. RE	-	0.354	0.3242
Likelihood ratio test REOR vs REORM (p-value)	-	0.0001***	

\*\*\*, \*\* and \* represent significance at the 1%, 5% and 10% levels respectively.



The REOR model shows a large variance of the random effects, as well as many differences in coefficients when compared to OR model. However, the cross sectional means of the explanatory variables are (strongly) jointly significant in REORM, indicating that the latter is the preferred model for analysis. The other models suffer from the fact that they do not account for unobserved heterogeneity and the correlation of this heterogeneity with the explanatory variables. The power sector reform index has a positive coefficient across all specifications, but is not significant in the REORM model. This is a key result: advances in power sector reforms don't appear to translate to a significantly better opinion about the service in transition countries, with the drivers of that opinion being personal and economic characteristics of the household. This could be due to the conflicting effects between increasing quality and competition and increasing prices, as they are contradictory forces driving the sign of the coefficient. If the argument is that most of the effect of power sector reform is driven through price changes in the service and that is the most visible aspect for households, a negative sign could be expected. Increasing transparency, self-sufficiency and improvement of the sector in terms of quality would drive a positive result. Therefore, the result of neutrality can be seen as an absence of any of those effects, or the lack of dominance of one of them over the others. This is an important result for policy making as further power sector reforms are implemented in transition economies. However, it should be noted that across all models, the coefficient of power sector reform is positive.

Other coefficients give interesting insights into the electricity services in transition economies, with some policy making implications. Although using the service for cooking and heating leads to increased dependence on the service, only the use for heating purposes has a negative effect while the use for cooking has the opposite effect. This might be due to the fact that heating constitutes a much larger portion of spending for households that do use it. There is no evidence that the use of electricity meters in the household leads to an effect on the opinion about the service. Clearly, the strongest socio-economic links to the dependent variable are established by age, life satisfaction, the savings dummy variable and the relative income variable. Older people tend to be more satisfied with the service, and there is no significant impact with communist party membership up to 1990. This implies that historical political affiliation does not play a role in reported satisfaction with the service, although the sign is negative (historical affiliation with communism could be associated with lower levels of satisfaction reported in a modern market structure). Higher levels of relative income compared to other people in the country are also associated with reporting of higher levels of satisfaction. Including this variable in the model decreases the magnitude of the savings dummy coefficient,

but does not remove its significance. For all of these coefficients, the expected signs are present, even if some are not significant. There is also light evidence that interviewed females report higher levels of satisfaction with the service, keeping all other factors constant, although the coefficient is rather small.

As a robustness check, the life satisfaction variable is removed from the specification due to endogeneity concerns (if a household is extremely unhappy with the electricity service, this could feed into reported life satisfaction). Removing the variable does not change key results for other variables. The same result occurs if electricity uses for cooking and heating are ignored in the specification. In other specifications attempted, a utility spending variable (share of income spent on many utilities, from electricity to gas and phone expenses) is added to the regression. The power sector reform coefficient becomes slightly less positive and still non-significant. The same happens if the square of age is added to the specification, with the noticeable change being the lack of significance of both age coefficients, although both have a positive sign. The results are in general very robust to the specification changes above, reinforcing the conclusion of lack of evidence for the significance of the power sector reform variable.

## **6. Conclusion**

This paper presents a study on several Eastern Europe and ex-USSR countries to assess what explains the opinion that households have of their electricity supply service. This is done through the use of extensive survey data from the EBRD Life in Transition Survey II within the context of random effects ordered Probit estimation. There is no evidence that gender or the state of power sector reform are key drivers to the satisfaction of the service. Instead, key drivers appear to be characteristics of the respondent, such as their use of electricity, their age, their savings and overall satisfaction with life. This might be a sign that there is no strong opinion about the service in itself and its related characteristics, as most of the key drivers are personal characteristics linked to economic condition and age, leading to a situation where the satisfaction with the service can be driven by general satisfaction with life and the economy in general. Different aspects of power sector reform generate conflicting effects that become neutral out on aggregate. This curtails policy implications for the future, as new generations

seem to have a more negative attitude about the service even when across the sample younger ages correlate with higher life satisfaction, and general happiness, economic conditions and specific use of the service drive opinions more than the state of power sector reform itself. Future work paths in this field include further analysis of the relationship of electricity prices and reported outcomes by households, as well as a more disaggregated analysis. These and other paths could be facilitated by upcoming surveys to be conducted in transition countries by the EBRD and other institutions.

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