RESIDENTIAL COAL DEMAND IN KAZAKHSTAN

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Overview

In Kazakhstan, similar to many countries, proper development and effective implementation of residential sector energy policies have the potential to address key economic, social and environmental issues. In particular, policies directed at reducing the dependence of household use of coal for space heating need to be highlighted. Households in Kazakhstan consume over 11 million tons of coal for space heating – or on average 5 tons per household. Effective policies need to address the household use of coal for space heating for three critical reasons. First, space heating accounts for 35% of the average household's energy budget. Second, the OECD estimates the subsidies on coal at over 60% of full cost. Third, in 2013 the Kazakhstan government adopted a Green Economy Strategy which stipulates that by 2050 50% of all energy in Kazakhstan will be produced by renewable and alternative energy sources. As a result, coal prices may be expected to increase and their impact on the households needs to be evaluated. Our analysis focuses on the factors that influence decisions regarding space heating by households that directly use coal in small-scale furnaces. Our research question is what factors contributed to the growth of residential coal demand and what factors dampened this growth? What recommendations on policies of household energy use may be made regarding the implementation of the Green Economy and Kazakhstan 2050 strategies?

Methods

We analyze determinants of demand for coal for space heating using Kazakhstan's 2012 Household Budget Survey (HBS). The HBS provides a rich dataset on household income and spending behavior as well as their demographic and dwelling characteristics. The household is assumed to take all prices and income as given and maximize utility subject to its budget constraint and expectations regarding the requirement of the space-heating service during the upcoming heating season. Therefore, household coal demand depends on the length and outdoor temperature during the heating season (HDD), coal price, income, observed dwelling characteristics, and other unobserved characteristics of the household. We assume that the household's furnace has been completely capitalized and, therefore, there are no annualized capital costs or 'rental prices' of the heating system. The empirical model is estimated for the two parts of the country, North and South.

Results

Income elasticity of coal demand is approximately 0.3 for both the North and the South. However, the estimates of price elasticity for the two regions differ at a 5% level of significance. The estimated coal demand price elasticities equal -0.80 in the North and -1.00 in the South. The differing values are consistent with coal prices being higher and coal substitutes being more available in the South. The size and type of the dwelling, HDD, rural location, and presence of elderly household members are important determinants of coal demand in the North. Furthermore, both northern and southern households with access to central heat or natural gas tend to purchase 28% and 64% less coal, respectively. The estimates of building age dummies from both subsamples are negative as expected. They are statistically significant in the case of four out of ten dwelling age dummy variables in the North model. Statistical significance of coefficient estimates of these dummies is low in the case of the South model. These results suggest that thermal insulation of the buildings may have been an important aspect of building construction and maintenance in the North of the country but less so in the South. However, it is noteworthy that in the South, households that made renovations or are the owners of the dwelling tend to purchase less coal. This finding may be indicative that some energy efficiency improvements have taken place in the South irrespectively of the age of the dwelling.

Conclusions

In this study we analyzed the relationships between household demand for coal and the coal price, household income, energy efficiency of the dwelling, availability of alternative heating systems as well as climatic, regional, and demographic factors. We find that in the absence of any new policies addressing wide-spread residential consumption of coal, continued economic growth will be associated with increasing rates of coal use. In addition, we show that increases in prices will lead to greater reductions in coal use if households have access to alternative sources of heat. We find that households with an access to alternative heating systems consume 28-64% less coal. Furthermore, those households that have undertaken recent renovations consume, on average, 13% less coal. Households residing in newer buildings consume up to 34% less coal than those whose dwellings that were built 60 years ago or more. This suggests that even with the current options of heating energy choices, households have considerable potential to reduce coal use through energy efficiency improvements.