IMPACT OF INSTITUTIONAL QUALITY ON PERFORMANCE OF NETWORK UTILITIES: EVIDENCE FROM THE ITALIAN ELECTRICITY SECTOR.

Golnoush Soroush, Politecnico di Torino, golnoush.soroush@polito.it, +39 (0) 110907206
Tooraj Jamasb, Durham University Business school, tooraj.jamasb@durham.ac.uk, +44 (0) 1913345463
Carlo Cambini, Politecnico di Torino, carlo.cambini@polito.it, +39 (0) 110907292
Manuel Llorca, Durham University Business School, manuel.llorca@durham.ac.uk, +44 (0) 1913345741

Overview

In addition to the firm-level structural, environmental and managerial differences, the discrepancy between performance of firms active in competitive sectors of a country, can be also explained by state-level factors such as regional economic and political endowments. In other words, institutions impact quality of the business environment and consequently, impact how firms use their resources. However, whether also performance of network utilities across a country is affected by state-level institutional quality, is yet to be investigated thoroughly. We aim to close this gap by investigating how quality of local institutions impact performance of the Italian electricity distribution utilities.

Method and Data

By applying a stochastic frontier analysis approach and by estimating cost functions, we examine the performance of 108 electricity distribution utilities located in 15 Italian regions from 2011 to 2015. To examine our hypothesis that quality of institutions impact performance of electricity distribution utilities, we estimated a multi-input multi-output cost function. The dependent variable is the utility's total distribution cost (Totex). Three outputs, including the amount of energy delivered by each utility as well as number of customers and an output which measures service quality of each utility, are included in the model. Price of labour and price of capital are the two input price measures. Control variables include center, south, mountain side and private ownership. Eight variables that account for both economic and institutional factors are included as determinants of inefficiency. All the inefficiency determinants are at state-level.

To examine the impact of these inefficiency determinants, we use SFA models with scaling property. In these models, the inefficiency term can be rewritten as:

$$u_{it}(z_{it}, \delta) = h(z_{it}, \delta) \cdot u_{it}^{*} \qquad (1)$$

In models with the scaling propert, u_{it}^{*} is the raw inefficicency which does not depend on z_{it}. $h(z_{it},\delta)$ adjusts the level of inefficiency by moving upwards or downwards. In this analysis, we used the model by Reifschneider and Stevenson (1991), Caudill and Ford (1993) and Caudill, Ford and Gropper (1995) (RSCFG).

The general form of our adopted *translog* specification that also incorporates the scaling property is as follows:

$$\ln\left(\frac{Totex_{it}}{LPR_{it}}\right) = \alpha + \sum_{n=1}^{3}\beta_n \ln y_{nit} + \beta_L \ln\left(\frac{KPR_{it}}{LPR_{it}}\right) + \sum_{n=1}^{3}\sum_{m=1}^{3}\beta_{nm}\ln y_{nit}\ln y_{mit} + \frac{1}{2}\beta_{LL}\left[\ln\left(\frac{KPR_{it}}{LPR_{it}}\right)\right]^2 + \sum_{n=1}^{3}\beta_{nL}\ln y_{nit}\ln\left(\frac{KPR_{it}}{LPR_{it}}\right) + \beta_{Centre}Centre_i + \beta_{South}South_i + \beta_{Own}Own_i + \beta_{Mount}Mount_i + v_{it} + exp\left(\sum_{r=1}^{8}\delta_r z_{rit}\right)u_{it}^{*} \qquad (2)$$

where α is the intercept, y represents the outputs and z corresponds to the efficiency determinants included in our analysis.

Results

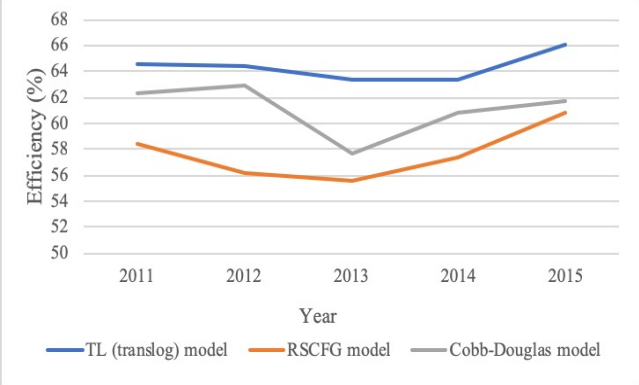
Regarding the inefficiency determinants, all the variables except the time trend show significant results with the expected signs. The parameter estimate for the regional gross value added per capita (GVA), is significant and negative, which means that inefficiency decreases with higher GVA values. Employment rate is another macro-economic factor that we consider to have an impact on efficiency of distribution utilities. The parameter estimate of this variable in the inefficiency term is positive and significant. This result suggests that when, as a result of increased economic activities, the employment rate increases, inefficiency increases as well.

Coefficient of the control variable, North, which controls how being located in north can affect efficieny of a utility, is positive and significant, indicating that utilities which are located in northern regions are more efficient than those in central and southern regions. The time trend, T, is positive, however, it does not seem to have a significant impact on efficiency of the utilities in our sample.

Looking at the institutional quality measures included in the efficiency term, the results are all significant and with the expected negative signs. The parameter estimates of the institutional quality measures (voice and accountability, government effectiveness, control of corruption and rule of law) are all significant with negative signs. Overall, our results confirm that institutional quality has a significant impact on efficiency of electricity distribution utilities.

Figure 1 shows how the average efficiency scores in the estimated models change from 2011 to 2015. While the efficiency scores of these models follow the same pattern, there exists a wide gap between the level of efficiency scores. Through the whole period of the analysis, the RSCFG model, which includes inefficiency determinants and is the preferred model, shows lower efficiency measures than the translog model. The average efficiency score for the whole period is equal to 58% which is lower than the 78% efficiency score of distribution utilities owned by Enel from 2004 to 2009, reported by Cambini et al. (2014).

Figure 1. Changes of annual average efficiency scores through time.



Conclusions

While the literature on how institutions impact performance of non-regulated firms is quite rich, there is not sufficient empirical evidence on whether institutions affect performance of network utilities as well. Our findings add to the literature by providing empirical evidence on the importance of good institutions in improving cost efficiency of electricity distribution utilities.

Our results suggest a strong link between quality of regional institutions and performance of network utilities. In particular, utilities located in regions with better institutional measures tend to be more efficient. Out of the four governance indicators that we considered as institutional quality measures, control of corruption has the highest impact on performance of the utilities. Apart from emphasizing on the importance of institutions from an economic point of view, the results suggest that network regulators need to take regional institutional diversity into account when comparing performance of the utilities across a country under the benchmarking methods.