THESIS - Vol. 9, No. 2, Autumn 2020

International Research Journal

ISSN: 1848-4298 (Print) ISSN: 2623-8381(Online)

Analyzing business environment- Power outages as an obstacle for firms

Pranvera Dalloshi, Shkumbin Misini, Arta Hoti

How to cite this article:
Pranvera Dalloshi, P., Misini, Sh., Hoti, A. (2020). Analyzing business environment- Power outages as an obstacle for firms. *Thesis*, 9 (2), 263-280.

Published online: December 23, 2020.

Article received on the 28th of September, 2020.
Article accepted on the 3rd of December, 2020.

Conflict of Interest: Authors declare no conflict of interest.

Original Article

Analyzing business environment- Power outages as an obstacle for firms

Pranvera Dalloshi, Shkumbin Misini, Arta Hoti

AAB College, Pristina, Kosovo
E-mail: shkumbin.misini@aab-edu.net

Abstract
An efficient firm infrastructure is considered as one of the key factors of the firm performance considering its impact on time and cost savings. The positive impact of the quality of infrastructure on firm performance is very cognitive, but the lack of adequate infrastructure remains an important obstacle especially on transition economies. Thus, primary objective of this paper is to provide information regarding the power outages as an obstacle to firm's performance. This paper focuses on the cross-country comparison with the intention to show the progress done by governments in improving this obstacle to the private sector using survey data provided by World Bank in partnership with EBRD. This is the Business Environment and Enterprise Performance Survey (BEEPS) database which offers a wide range of topics of business environment. The results show that Kosovo leads regarding the average hours without electricity, number of power outages in a typical month and the percentage of sales loses due to electricity insufficiency. The panel data techniques, respectively the fixed effect model, show a negative and significant impact of the average number of power outages on the sales growth.

Keywords: quality of infrastructure, power outages, capacity utilization, performance.

Introduction

Public infrastructure in the Western Balkans is of low quality as consequence of some factors which are transmitted over the years. The Western Balkan countries (Albania, Bosnia and Herzegovina, FYR Macedonia, Kosovo, Montenegro and Serbia) are continuing at a slow pace, among others due to the political history that this region has. As pointed out by Atoyan et al. (2018), in most of these countries, such as Kosovo, Macedonia and Serbia, public investment, especially during the 1970s, was part of a plan adopted by the former Yugoslavia. After 1990, there were conflicts in some of these countries that affected the destruction of public infrastructure, and limited public investments, hence in general there was an economic stagnation for most of the countries in the region. After the conflicts, the "Stability Pact"[1] was created by international organizations with the main aim to support the growth of public investment in these countries. Public investment in these countries supported by international initiatives has been large, but the region is still lagging behind compared to the European Union (Atoyan et al., 2018).

Western Balkans countries have a low density of railways, highways, airports, etc. On the other hand, the electricity generation capacity is a key problem for these countries. The situation is slightly better in Serbia and Bosnia and Herzegovina, where electricity supply is at a better level compared to other Western Balkan countries such as Kosovo, Albania and Macedonia. Electricity as a key factor to production can contribute to the firm performance also by reducing the operational costs.

[1] For more information on The Stability Pact for South Eastern Europe see authors such as: Bendiek (2004), Watanabe (2010) etc.

The main objective of this paper is to present a theoretical viewpoint, supported by quantitative evidence on how infrastructure affects firm performance. Therefore, we hypothesize that power outages have a negative impact on firm growth. For this purpose, we use cross-country methodology. Cross-country comparisons for different indicators have been a long-standing interest for many researchers. This methodology enables the examination of different phenomena between different countries. Kosovo and other Balkan countries are facing low-quality infrastructure which combined with other factors has a great impact on firm growth. Here we refer to infrastructure as access to electricity, water supply and telecommunication channels. The quality of infrastructure is especially important for manufacturing companies taking into account the losses caused during the production process which have a large impact on firms' performance and capacity utilization. Our research's main focus is on indicators which express the perception by firms of the impact of electricity outages on capacity utilization or firm performance. The physical infrastructure consists of electrical connection, water supply, telephone connection, and information and communications technology (ICT), but in this paper we are limited to the problems caused by electrical outages.

Inadequate transport networks limit the connection between producers and consumers in regional and global markets, while electricity and water shortages have a direct impact on firm production performance. The other sections of this paper are organized in function of the main objective continuing with literature review, data and methodology, an overview of the electricity infrastructure in Kosovo compared to some other Western Balkan countries and conclusions.

Literature review

The empirical literature for many countries states that infrastructure is an important factor for firm growth. The infrastructure-performance relationship has been analyzed in many studies (Olawale and Garwe 2010; Barringer, Jones & Neubaum, 2005; Sambamurthy et al. 2003; Hellriegel et al. 2008; Herrington and Wood, 2003), distinguishing which variables have been used for infrastructure. It is worthy to say that most of the empirical evidence of the importance of infrastructure on either economic development in general (Akan, Doğan & Işık, 2010) or firm growth or firm performance in particular, is concentrated in the regions such as Africa or Asia for whom it is a great obstacle (Commander and Svejnar, 2011; Reppen, 2015, Oseni and Pollitt, 2015.; Ekene & Mbobo, 2019). Modeling the firm performance and infrastructure relationship is a hard task. To measure the direct impact of infrastructure on firm's performance we should bear in mind the large number of factors which impact it, such as internal factors related to firms' financial factors, management behavior, product and process organization etc., and external factors such as competition, public infrastructure, customer demand and so on, thus all of the factors which represent the business environment (Beck and Demirguc-Kunt 2006). To construct a model which involves all these factors is not possible. Another constraint on reaching concrete results is the impossibility of measuring each variable in the appropriate way. The first problem is related to firm performance measures. There are many indicators to express firm performance. Olawale and Garwe (2010) show that firm growth may be measured using absolute or relative changes in sales, assets, employment, productivity, profits and profit margins. Sales data are usually readily available and business owners themselves attach high importance to sales as an indicator of business performance. In addition, sales growth is

also easier to measure compared to some other indices and is much more likely to be recorded. Sales may also be considered a precise indicator of how a firm is competing relative to their competitors (Barringer, Jones & Neubaum, 2005). Additionally, the growth of firms and their performance is also affected by lack of experience and management skills (Hellriegel et al., 2008; Herrington and Wood, 2003).

The empirical models used to quantify the impact of improved quality infrastructure on different business indicators are wide-ranging. Using a seemingly unrelated regression (SUR) technique Iimi (2008) uses the cost function to show the importance of the quality of infrastructure (electricity, water supply and telecommunications) on operational costs. Using firm level data collected by BEEPS database, he shows that a one-hour reduction in electricity outages could provide firms savings on operating costs of 1.5 percent on average. Moreover, USAID report (2015)[2] on the impact from irregular electricity supply on Kosovar businesses finds an average of four percent increase in the prices of products due to usage of alternative sources of energy supply. Many companies cannot quantify the direct losses from the lack or low-quality infrastructure, therefore when asked by surveyors they hesitate to answer. Considering this, some researchers use a country level indicator considering it as a public good which should be equal for all firms (Carlin et al. 2006), while on the other side researchers express infrastructure variable as a component built on firms' perceptions of the degree of constraint that infrastructure inadequacy causes to them (Reppen, 2015).

[2] Valmira Rexhëbeqaj, Berat Abdiu and Valon Feka (2015) Follow-up assessment on impact from irregular electricity supply on Kosovar businesses. USAID report

An overview of the electricity infrastructure in Kosovo as compared to some Western Balkan countries

Frequent and long power outages are an obstacle specially to manufacturing companies. Frequent interruption of the production process due to interruption of electricity causes an increase in production costs due to loss of time, breakdown of the product in the production process, use of power generators as a replacement, etc. When asked about the electricity as an obstacle to the current operations, companies in the respective countries gave the answers as presented in Table 1. Looking at Kosovo, we see that for most respondents, about 47%, the electricity was a very severe or major obstacle in 2013. While comparing the same data with year 2019 we see a worsened situation, where about 63% declare that the electricity was a very sever or major obstacle. Compared to other analyzed Western Balkan countries Kosovo is the top country with the biggest electricity problem for the private sector.

	Kosovo			Albania			Serbia			N. Macedonia		
Electricity an obstacle to the current operations	2013	2019	Change	2013	2019	Change	2013	2019	Change	2013	2019	Change
No obstacle	20	6	-70%	30	25	-17%	67	52	-22%	30	40	33%
Minor obstacle	9	7	-22%	13	15	15%	10	12	20%	9	7	-22%
Moderate obstacle	11	15	36%	20	17	-15%	10	17	70%	8	5	-38%
Very severe obstacle	21	22	5%	8	29	263%	0	5	500%	4	7	75%
Major obstacle	15	26	73%	22	7	-68%	5	6	20%	11	3	-73%
TOTAL	76	76		93	93		92	92		62	62	

Table 1. Electricity an obstacle to the current operations of this establishment?
Source: Authors calculations using BEEPS data. Panel data 2013 and 2019

To have a clearer overview of the situation regarding power outages, BEEPS in the 2019 round go further by asking companies about the duration of power outages in hour or minute. Thus, making possible to calculate the average duration of power outages during a month. Compared to the region, North Macedonia and Kosovo also lead with 17.1 hours without electricity during a month, respectively 15.91. These results show once again the bad situation regarding the electricity infrastructure in Kosovo.

Country	**Number of power outages in a typical month**	**Average duration of power outages**	**No. of hours without electricity during a month.**
Kosovo	*8.02*	*1.98*	*15.91*
North Macedonia	*5.49*	*3.12*	*17.10*
Albanian	*3.79*	*1.66*	*6.28*
Serbian	*2.03*	*2.12*	*4.31*

Table 2. Average hours without electricity in a typical month – 2019 survey
Source: Authors calculations using BEEPS data

We go deeper in our analysis by showing the average number of power outages in a typical month. Compared to 2013, power outages are 7.6 time lower in Kosovo. We see a noticeable improvement in 2019, but still we are far from other regional countries, who have done a great improvement in this regard.

Country	2013	2019
Kosovo	*11.4*	*3.8*
Albania	*4.2*	*1.5*
Serbia	*0.6*	*0.7*
North Macedonia	*1.6*	*1.1*

Table 3. Power outages in firms in a typical month (number)
Source: https://databank.worldbank.org/source/world-development-indicators#

Considering that electricity is essential to run the daily operations, and that unexpected outages can lead to potential losses, companies tend to compensate this by self-generation. When electricity is insufficient, power generators are a good option, especially for electricity dependent businesses (Attigah and Mayer-Tasch, 2013). Losses due to downtime are different for companies. To eliminate or at least lower these losses and due to the long power outages, many companies are driven to buy a generator. Generators have long been a fixture in states with frequent power outages as shown in the table below. Even if the situation improves, companies will find it difficult to resell these fixed assets considering their depreciation and low demand due to the regulation of the problem with electricity. Also, as shown in many items of evidence, sometimes self-generation is more expensive than public electricity (Foster & Steinbuks, 2009; Rentschler at al. 2019).

Country	2013	2019
Kosovo	*42*	*29*
Albania	*51*	*50*
Serbia	*15*	*13*
North Macedonia	*7*	*0.00*

Table 4: Companies that have a generator
Source: Authors calculations using BEEPS data

Having a generator is directly related to the lack of electricity as we see higher rates of self-generation in Kosovo and Albania.

The impact of power outages on firm capacity utilization

Capacity utilization is a ratio of the actual level of output to a sustainable maximum level of output, or capacity (Corrado & Mattey, 1997). Capacity utilization rate may be different for different industries. It is determined by many factors, including power outages. What is the relationship between capacity utilization and power outages? If the maximum utilization of a machinery which works based on electricity is to produce a defined number of outputs, then the electricity interruption will disable reaching the maximum. Rentschler et al. (2019) find that interrupted activity due to power outages reduces the utilization rate by about $38 billion a year and sales losses by about $82 billion a year. A positive and significant impact of power supply on capacity utilizations is also found by Mojekwu and Iwuji (2012). Similarly, the expenditure incurred by companies in generating power supply for productivities (output) constitutes nearly 36 percent of the total cost (TC) of production (Enang, 2010; Udeajah, 2006).

Analyzing the BEEPS data, we see an increase of capacity utilization of firms in Kosovo, Albania and Serbia. This increase

may occur due to many factors, including improvement in power supply.

Country	2013	2019	Change
Kosovo	*56.91*	*71.45*	*26%*
Albania	*64.12*	*83.93*	*31%*
Serbia	*71.85*	*82.69*	*15%*
North Macedonia	*76.67*	*70.00*	*-9%*

Table 5. Capacity utilization rate
Source: Authors calculations using BEEPS data

Additionally, we compare the average losses due to electrical outages, as a percentage of total annual sales. Once again, comparing 2019 with 2013, we find the same order led by Kosovo, but with an improved situation.

	2013	2019
Kosovo	*9.8*	*3.7*
Albania	*5.7*	*1.9*
Serbia	*0.8*	*0.9*
North Macedonia	*2.9*	*1.9*

Table 6. Value lost due to electrical outages (% of sales for affected firms)

Source: https://data.worldbank.org/indicator/IC.FRM.OUTG .ZS

As we pointed out earlier, sales are a very important indicator on firm performance, therefore analyzing the impact of a very important factor of a business environment, such as insufficient electricity, is very useful.

Data and methodology

We used cross-country comparisons methodology with special focus on comparing Kosovo with other region countries. The data used for this purpose are those conducted by surveys of the World Bank in partnership with EBRD. The Business Environment and Enterprise Performance Survey (BEEPS) offers a wide range of business environment topics. The best about this database is that it is developed in rounds enabling panel data analysis. We use the data of firms from six countries: Kosovo, Albania, Serbia, North Macedonia, Bulgaria and Bosnia and Herzegovina. We also comment on different indicators representing electricity infrastructure problems for companies. For observations that at least one of the variables included in the model is missing, we applied the cleaning data procedure. This reduced the dataset but we have strongly balanced panel data which consist of 494 observations of 247 groups.

Modeling the impact of infrastructure on firm performance is a very complex process, considering the wide range of other factors impacting it. We are aware that using panel data analysis techniques, such as panel regression which controls for fixed and random effects, gives a more comprehensive view. Using the data on annual sales we computed the growth measures.

We run the equation model as follow:

$$\log Y_{jt} = a_i + a_c logP_{jt+} a_i G_{jt+} a_s logS_{jt} + a_o O_{jkt} + u_{jt}$$

$$u_{jt} = \varepsilon_{jt} + w_{jt}$$

ε- is the fixed or random effect, while w- is the residual, where, Y is annual sales growth, which is a dummy variable taking the value of 1 if the firm sales in the respective year show an increase

and zero otherwise. Our main variable of interest is Pjt. P is the infrastructure variable represented by the average number of power outages in a typical month, **G** - stands for generator**,** while ***S*** - denotes the firm sector. The variable ***O-*** stands for other factors such as management behavior considering the number of years on the respective sector. ***j***-observation and ***t***-time

We run panel regression and control for fixed and random effects.

$$\text{Fixed effect model: } y_{it} = (a + u_i) + X_{it}\beta + v_{it}$$
$$\text{Random effect model: } y_{it} = a + X_{it}\beta + (u_{i+} v_{it})$$

Fixed effects models intend to show the relationship between time-varying predictors and outcomes. It shows the heterogeneity across countries (or entities) and heterogeneity across years. On the other hand, random effects models estimate the effects of time-invariant variables. We used the Hausman specification test (Hausman, 1978) to compare the random effect model to its fixed counterpart. The null hypothesis is that the preferred model is random effects. Based on the result of the Hausman test, Prob>chi2 =0.0115 we reject the null and accept that the right model for this dataset is the fixed effect model.

Results

The following table presents the conducted model results. As we have already discussed, the applied model is the fixed effect model. The coefficient signs are in accordance with our expectations, while the significance for some of the variables is not.

As expected, the results show a negative impact of the average number of power outages on the probability of having a sales growth in the respective year. The p-value of the variable

which expresses the infrastructure of power supply is small enough to reject H0, so we conclude that the increase of power outages for 1 time will have a negative impact on the probability of having a better performance for the firm.

Dependent variable: Sales change	**Fixed Effect Model**
The average number of power outages	-.0296 (0.033) **
Generator	-.1125 (0.158)
Sector	-.0902 (0.349)
Management experience (years)	.0016 (0.622)
F-test (model)	0.0048
Number of groups	247
Number of observations	494
rho	.44127

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Table 7. Presenting Analysis Results

Having a generator as self-energy generation shows a negative impact, as expected, but its p-value is not small enough to reject H0. The same stand for being in the Manufacturing sector compared to other sectors, such as Retail or other sectors. Considering the large number of factors which impact the sales growth, we controlled for management years of experience working in respective sector. The results show a positive but not significant impact.

The F-test, which is a test to see whether all the coefficients in the model are other than zero, confirms that the specification and fixed effect model is appropriate. Rho shows that 44.1% of the variance is due to differences across panels.

Similar results for Western Balkan countries are found by Kresic, Milatovic and Sanfey (2017). They find a negative impact

of electrical issues and some other factors on annual sales in countries such as: Kosovo, Albania, Bosnia and Herzegovina, Macedonia, Montenegro and Serbia.

Conclusions

This paper provides an overview of the situation of the main infrastructure factor, such as power outages and its relation to sales growth. Using descriptive panel data, this study concludes that comparing years 2013 and 2019, the situation has improved. This conclusion applies to all countries included in the analysis. With the improvement of electricity supply we also see an improvement on capacity utilization and the percentage of sales lost due to electrical outages. This paper points out many implications for business environment as a key element in global competition. On the other side, the results of the fixed effect model show a negative and significant impact of the average number of power outages on the sales growth. This is an indicator of the business environment and shows that the power outage is an obstacle for firms in the Balkan countries.

We are aware that the expansion of the model with other variables, as well as the inclusion of more countries, would give even more accurate and meaningful results, therefore we recommend this to other interested researchers in the field.

References

Akan, Y. Doğan, M & Işık, C (2010). The Causality Relationship Between Energy Consumption and Economic Growth: The Case of Turkey. *Enerji, Piyasa ve Düzenleme* (Cilt:1, Sayı:1, 2010, Sayfa 101-120)

Allcott, H., Collard-Wexler, A., and D.O'Connel, S. (2014). How do electricity shortages affect industry? Evidence from

India. *Technical Report Working Paper 19977, National Bureau of Economic Research*

Attigah, B. and Mayer-Tasch, L. (2013). Productive Use of Energy (PRODUSE): The Impact of Electricity Access on Economic Development: *A Literature Review. GIZ, Eschborn*.

Baltagi, Badi H. 2001. Econometric Analysis of Panel Data. Wiley, John & Sons.

Barringer, B. R., Jones, F. F., & Neubaum, D. O. (2005). A quantitative content analysis of the characteristics of rapid-growth firms and their founders. *Journal of business venturing, 20*(5), 663-687.

Beck, T., & Demirguc-Kunt, A. (2006). Small and medium-size enterprises: Access to finance as a growth constraint. *Journal of Banking & finance, 30*(11), 2931-2943.

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2007). Finance, inequality and the poor. *Journal of economic growth, 12*(1), 27-49.

Bharadwaj, A. S., Bharadwaj, S. G., & Konsynski, B. R. (1999). Information technology effects on firm performance as measured by Tobin's q. *Management science, 45*(7), 1008-1024

Carol Corrado & Joe Mattey, (1997). Capacity Utilization. *Journal of Economic Perspectives, American Economic Association, vol. 11*(1), pages 151-167, Winter.

Castro, R., Faias, S., and Esteves, J. (2016). The cost of electricity interruptions in Portugal: Valuing lost load by applying the production-function approach. *Utilities Policy, 40*(Supplement C):48 – 57.

Commander, S., Svejnar, J. (2011), Business environment, exports, ownership, and firm performance. The Review of Economics and Statistics, 93(1), 309-337.

Enang, B. U. (2010). Industrial Development, Electricity Crisis and Economic Performance in Nigeria. *European Journal of*

Economics, Finance and Administrative Sciences. Retrieved from www.eurojournals.com.

Fisher-Vanden, K., Mansur, E. T., and Wang, Q. (2015). Electricity shortages and firm productivity: Evidence from China's industrial firms. *Journal of Development Economics,* 114:172–188.

Foster, V. and Steinbuks, J. (2009). Paying the Price for Unreliable Power Supplies. In-House Generation of Electricity by Firms Africa. *World Bank Policy Research Working Paper 4913*

Hagel III, J., & Singer, M. (1999). Unbundling the corporation. *Harvard business review, 77*(2), 133-134.

Hellriegel, D., Jackson, S.E., Slocum, J., Staude, G., Amos, T., Klopper, H.B., Louw, L and Oosthuizen, T. (2008). Management: third South African edition. Cape Town: Oxford University Press.

Hitt, L. M., & Brynjolfsson, E. (1996). Productivity, business profitability, and consumer surplus: three different measures of information technology value. *MIS quarterly,* 121-142.

Kresic, A., Milatovic, J. and Sanfey, P. (2017) Firm Performance and Obstacles to Doing Business in the Western Balkans: Evidence from the BEEPS, European Bank for Reconstruction and Development. doi: 10.2139/ssrn.3119154.

Mojekwu, J. N. & Iwuji, I. I. (2012). Factors Affecting Capacity Utilization Decisions in Nigeria: A Time Series Analysis. *International Business Research Vol. 5*, No. 1; January 2012

Mukhopadhyay, T., Rajiv, S., & Srinivasan, K. (1997). Information technology impact on process output and quality. *Management Science, 43*(12), 1645-1659

Narasimhan, R., & Kim, S. W. (2001). Information system utilization strategy for supply chain integration. *Journal of business logistics, 22*(2), 51-75.

Ekene, E. O. & Mbobo, E. U. (2019). The Impact of Power Outages on the Performance of the Manufacturing Sector in Nigeria. (1980-2018). *Sumerians Journal of Economics and Finance, 2019, Vol. 2,* No. 12, pp. 169-177 ISSN(e): 2617-6947, ISSN(p): 2617-7641

Olawale, F., & Garwe, D. (2010). Obstacles to the growth of new SMEs in South Africa: A principal component analysis approach. *African journal of Business management, 4*(5), 729-738.

Orford, J., Wood, E., Fischer, C., Herrington, M., & Segal, N. (2003). Global entrepreneurship monitor: South African executive report. University of Cape Town.

Oseni, M. O. and Pollitt, M. G. (2015). A firm-level analysis of outage loss differentials and self-generation: Evidence from African business enterprises. *Energy Economics, 52*(Part B):277 – 286.

Rexhëbeqaj, V. Abdiu, B and Feka, V (2015). Follow-up assessment on impact from irregular electricity supply on Kosovar businesses. *USAID report*

Rentschler, Jun; Kornejew, Martin; Hallegatte, Stephane; Braese, Johannes; Obolensky, Marguerite. (2019). Underutilized Potential: The Business Costs of Unreliable Infrastructure in Developing Countries. *Policy Research Working Paper;No. 8899*. World Bank, Washington, DC. © World Bank.

Reppen, S. (2015). Finding Obstacles to Growth: Is Infrastructure a Binding Constraints on African Light-Manufacturing Firms? *International Journal of Economics and Financial Issues, 5*(3), pp. 820-832

Ruben V Atoyan ; Dora Benedek ; Ezequiel Cabezon ; Giuseppe Cipollone ; Jacques A Miniane ; Nhu Nguyen ; Martin Petri ; Jens Reinke ; James Roaf (2018). Public Infrastructure in the Western Balkans Opportunities and Challenges. *IMF Departmental Paper No. 18/02*

Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. *MIS quarterly*, 237-263

Sanders, N. R., & Premus, R. (2005). Modeling the relationship between firm IT capability, collaboration, and performance. *Journal of business logistics, 26*(1), 1-23.

Wei-Ming Wu (2012). Capacity utilization and its determinants for a container shipping line: theory and evidence. Applied Economics, 2012, 44, 3491–3502

H. Youn Kim (1999). Economic Capacity Utilization and its Determinants: Theory and Evidence. *Review of Industrial Organization Vol.15,* NO.4, pp.321-339

Iimi, A. (2008). Effects of Improving Infrastructure Quality on Business Costs: Evidence from firm-level data. *The World Bank, Policy Research Working Paper 4581*

Carlin, W., Schaffer, M., Seabright, P., 2006. What are the real bottlenecks? A Lagrangian approach to identifying constraints on growth from survey data. CEPR Discussion Paper, 5719

Wooldridge, Jeffrey M. 2010. Econometric Analysis of Cross Section and Panel Data. 2nd ed. Cambridge, MA: MIT Press.