

## THE IMPACT OF MACROECONOMIC INDICATORS ON BROWNFIELD INVESTMENT IN SERBIA

*UDC 330.101.541:330.322(497.11)*

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**Abstract.** *The paper analyzes cross-section data for Serbia in the time period from 2005 to 2013. It applies multiple regression techniques and measures the impact of macroeconomic variables on attracting foreign investments in brownfield sites in Serbia. The research has shown that macroeconomic indicators such as unemployment rate, average annual wages, gross domestic product, consumer price and exchange rate are statistically significant, while real GDP growth, subsidies and other transfers are statistically insignificant.*

**Key words:** *Macroeconomic, unemployment rate, indicators, brownfield sites, liberalization.*

### INTRODUCTION

After the fall of the Iron Curtain, many countries of the Central and Southeast Europe faced a powerful deindustrialization process. Many industries became redundant because they could not be competitive in terms of productivity. State-owned companies were losing their markets, which resulted in privatization of their property. Privatization process failed and led to the companies' property deterioration and creation of brownfield sites (Kurtovic *et al.*, 2014).

Inadequate control of risk, which was present for decades in the global banking sector, during those years, was the main generator of the many crises and instability, which shook both financial and real sector. (Radević and Lekpek, 2010). This is a contribution to the reduction of brownfield investments that could not be traced.

Brownfield sites pertain to urban areas in the Southeast European countries. These countries are characterized by a lack of awareness and relevant data with respect to brownfield sites. Unlike greenfield investments where the situation related to potential

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Received November 16, 2015 / Accepted December 29, 2015

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investment sites and facilities is completely clear, in the case of brownfield investments it is much more difficult to attain information related to current use and status of the site. Also, there is no clearly defined list of brownfield sites, no information on contamination level or a clearly defined program of their economic revitalization (Jackson and Grab, 2002). In most countries of the Central and Southeast Europe brownfield sites include industry, military, railway and transport, agricultural, institutional (schools, hospitals, prisons), commercial (shopping centers, offices), cultural (culture houses, cinemas), leisure (sports grounds, parks, open space) (Ferber, 2010).

In Serbia, due to the slow company privatization process and delay in the adoption of the Bankruptcy Law, some of the state-owned companies “turned into brownfield sites” because legal status of investments into current maintenance of buildings and infrastructure, production and the like was not clearly defined. The solutions for brownfield sites lie in priorities, strategies, legal framework, programs and support to investments. Financing of brownfield regeneration by the state is less likely and it is recommended for the public interventions to be primarily focused on in-kind assistance including creation of legal framework, favourable fiscal benefits, favourable use of land, publishing of contamination data, clear and implementable strategies at all levels, informal assistance upon land consolidation, more flexible licensing and the like. Not all brownfield sites in Serbia have the same status or receive the same treatment. There are several types of brownfield sites. The first type implies the good brownfield sites that are being taken care of by the market itself. The second type includes the brownfield sites that do not occupy such an exclusive location and therefore often require strong public support and financial or in-kind intervention. With respect to the third type, we mainly talk about non-commercial locations that are primarily developed for ecological or social purposes. As for the fourth type, brownfield sites are in such a state that they represent a direct threat to health and environment.

However, lately we also have certain change in the direction in which horizontal forms of foreign direct investments move, towards less developed countries or transition economies. This change can be attributed to the process of economic progress of transition economies. Transition economies that record significant economic results see in horizontal forms a possibility for the accomplishment of positive effects. Those effects are particularly reflected in technological transfer, mobility of workers, process of learning and transfer of business philosophy, etc. The mentioned effects are achieved in almost all those industries where horizontal forms of foreign direct investments existed. (Kurtovic *et al.*, 2012).

Regeneration of brownfield sites in Serbia requires both vertical and horizontal approach. Vertical approach encompasses three aspects: state, regional and local level. At the state level, implementation is performed through regulation of internal strategy and national legislation. At the regional level, instruments and measures that will help attract foreign investors are being implemented. Finally, at the local level, attraction of brownfield investments can be stimulated through urban planning and various fiscal measures and land related policies. Horizontal approach pertains to the activities and cooperation with partners on the local community development (Dulic, 2013).

In the European context there are a number of definitions and interpretations, with the most common one suggested by the working group CLARINET (Contaminated Land Rehabilitation Network for Environmental Technologies), which states: "The brownfield are sites that had previously been under the influence of their users and the surrounding

areas, which are neglected or underutilized, which may have potential problems with lack of maintenance, which are located mainly in developed urban areas and require intervention to bring them back to beneficial use and may have real or perceived contamination problems" (CABERNET, 2006; Oliver, *et al.*, 2005). Brownfield sites revitalization in Serbia is at a very low level. One of the reasons for such a state is the rather late adoption of the brownfield definition. Brownfield site is defined in Serbia as the "(...) land which was previously built and used, but in the meantime, due to financial or other economic reasons became abandoned" (Peric and Furundzic, 2014).

Serbia grants high direct incentives to foreign investors in the form of subsidies (EUR 4,000-10,000 per job created, where the average incentive approved so far per job created per foreign company has been 4,693 million euros). Even though Serbia is not alone in giving incentives to foreign investors, since incentives are a method of attracting FDI in other CEE countries as well, it is evident that it is the indirect incentives that are predominant in other countries, such as tax benefits, giving free land, creating infrastructure on the land, and these are mostly offered to large investors only (Gligoric, 2013). In 2014, there were 449 brownfield sites registered in Serbia (SIEPA, 2015). Serbian military and Ministry of Defense own the majority of brownfield sites. The Master Plan, adopted as early as June 2006, foresaw the sales of most of the military complexes, the estimated value of which was around one billion euros at the time. In the meantime, a small part of the property was sold for only 10 million euros, while a number of local self-governments became owners of the former military facilities and put them up for sale or lease to interested investors. At the moment, the military owns 3,942 buildings with total area of 2 833 406 m<sup>2</sup> and 21,773 ha of land (Reactivation of brownfield in Serbia, 2011). From 2000 to 2014, Serbia achieved the inflow of FDI in the amount of 21 billion euros. Based on the World Investment Report of 2012, 50% of greenfield investments in the SEE region pertained to Serbia. Brownfield investments during 2012 and 2013 were dominantly made in the energy sector 48%, production sector 20% and trade 7% (Invest in Serbia, 2013).

The main subject of this paper is identifying the current state and the potential of brownfield sites with the aim of attracting FBI in Serbia. It is evident that brownfield sites in Serbia have not been fully utilized during the last two decades and that transitional processes, reflected in the privatization and changes to legislation, have not been sufficiently efficient and fast to enable brownfield sites to attract FBI. To that effect, this paper aims to demonstrate the potential of brownfield sites in Serbia to attract FBI and enhance economic competitiveness. The main objectives of this paper are to study the individual effect of macroeconomic variables on attracting foreign brownfield investments in Serbia. The starting point of this study is the main hypotheses, which we have proven using the multiple regression model. The research hypotheses are as follows:

*Hypothesis H<sub>0</sub>: Positive macroeconomic indicators do not have a significant impact on attracting foreign brownfield investments in Serbia or H<sub>0</sub>: β<sub>1</sub> = 1. We have also set an alternative hypothesis stating that macroeconomic indicators have an impact on attracting foreign brownfield investments in Serbia or H<sub>1</sub>: β<sub>1</sub> ≠ 1.*

The paper consists of sections as follows: the introductory section provides the subject, research objectives and research hypotheses; Section 2 provides an overview of literature or research closely related to this paper's research subject; Section 3 describes

econometric techniques and databases used in the research; Section 4 provides the empirical results of the research and, finally, Section 5 contains the Conclusion.

## 1. LITERATURE REVIEW

Jankovych (2005) studied the factors based on which a mechanism is created for the selection of sites for reuse or regeneration. The analysis was focused on Germany and France, which have criteria for classification of brownfield sites in place. These countries' experiences were suggested as a possible solution for the Czech Republic. Groenendijk (2006) researched the importance of brownfield revitalization and concluded that this process faces certain problems that require consideration. His research also covered benefits and costs of brownfield revitalization, four models of public-private partnership financial initiatives, legislation, etc. Ganser and Williams (2007) studied the issue of brownfield sites in England and Germany. They particularly tackled quantification of objectives for the development of brownfields at the national level and pointed out the significance of regeneration of urban brownfield sites and the reduction in use of greenfield sites. In his research, Paull (2008) quantified the effect of brownfield reuse on the environment, economy and community. In the economic sense, brownfield reuse helps create new jobs, encourages investments and enhances the environment. Additionally, it prevents total land contamination, gas emissions and creation of greenhouse gases, improves quality of water, etc. Chilton *et al.* (2009) studied the impact of brownfield revitalization in Charlotte, USA on the social, economic and natural environment. They determined a positive effect of brownfield revitalization in all mentioned areas applying ordinary least squares method.

Estrin and Meyer (2010) studied the importance of brownfield acquisition as a way of searching for innovative resources on the fast-growing markets. They applied regression analysis and concluded that many companies that were purchased in the growing markets went through a certain level of reorganization, while simultaneously retaining key competencies that made them recognizable and combining them with the new skills and techniques brought in by the companies that took them over. In his research, Tang (2011) developed a framework for defining brownfield sites for the purpose of enhancement of brownfield revitalization and then analyzed qualitative and quantitative data pertaining to the land use and sustainability. The subjects of his analysis were England and Taiwan i.e. their brownfield revitalization policies and the conclusion was that their policies differed depending on the population density and the level of economic development. Frantal *et al.* (2013) studied the impact of location and specific factors on the successful regeneration of brownfield sites. Using the case of South Moravia they analyzed the spatial and functional distribution of brownfield sites and tested the correlation between the potential of municipalities and brownfield sites that had already been regenerated. Finally, they concluded that regenerated brownfield sites were located in municipalities with greater economic potential. Frank (2014) carried out a research on economic and fiscal benefits, availability of information on brownfields, as well as on benefits for the environment. Based on several case studies on American cities, he determined advantages and disadvantages of brownfields. Frantal *et al.* (2015) performed a comparative study on interest groups or stakeholders from the Czech Republic, Germany, Romania and Poland. The main objective of their research was to study the main factors impacting regeneration of brownfield sites and detect the barriers negatively affecting the

given process. They found that, apart from the total costs, the process of regeneration of contaminated land in Poland and Romania were also affected by the ownership issues, local self-government, legislation, etc.

## 2. THE ECONOMETRIC MODEL AND DATA

Our economic analysis is based on the application of the multiple regression model and the ordinary least squares (OLS) method. We have used cross-section data for the period from 2005 to 2013. The data has been acquired from the World Bank database (World DataBank/World Development Indicators), National Bank of Serbia, [www.naled-serbia.org/search](http://www.naled-serbia.org/search) and Eurostat.

Applying the multiple regression model we have measured the impact of macroeconomic factors on the inflow of foreign brownfield investments in Serbia. Within the quantitative approach, we set up brownfield investment as a dependent variable, while independent variables include unemployment rate, GDP, real GDP growth, average annual wages, consumer price, exchange rate and subsidies and other transfers. We chose the mentioned variables based on the relevance of their impact and data availability.

Through application of the multiple regression method we shall attempt to determine the impact of macroeconomic factors on the inflow of foreign brownfield investments in Serbia. Our multiple regression method shall be introduced through the following equations

$$BROWI = \beta_0 + \beta_1 GDP + \beta_2 RGGDP + \beta_3 WAGE + \beta_4 SUBT + \beta_5 UNEPL + \beta_6 CP + \beta_7 ER + \dots + \varepsilon$$

Where:

- BROWI* – ownfield investment
- GDP* – gross domestic product
- RGGDP* – real GDP growth (in %)
- WAGE* – average annual wages
- SUBT* – subsidies and other transfers
- UNEPL* – unemployment rate
- CP* – consumer prices (in %)
- ER* – exchange rate
- $\varepsilon$  – residual or error.

Brownfield investments mostly occur in the form of acquisitions. These investments are essential to the revitalization and economic enhancement of derelict and abandoned sites. Gross domestic product represents a very important macroeconomic indicator showing the value of final goods and services produced in the country within a given year, expressed nominally. Its increase or reduction is a powerful indicator considered by the investors when deciding upon site selection. Also, real GDP growth is an indicator that illustrates the real growth rate of economic activity with respect to produced goods and services. Its positive or negative value plays an important role in the potential investors' decision-making process. Average annual wages is an important factor in the process of attracting foreign brownfield investments. Lower average annual wages means less costs and more profit for a foreign investor, but that is not the case when it comes to vertical investments. Subsidies and other transfers have a powerful impact on attracting foreign investment. It is on their character and scope that the inflow of brownfield

investment, FDI and other forms of investment largely depend. Unemployment rate informs us about the state of macroeconomics. For foreign investors high unemployment rate means access to cheaper labour force. Consumer price pertains to the rate of increase in prices in the host country i.e. inflation rate. High inflation rate poses potential risk for a foreign investor. Exchange rate represents the value of local currency expressed in foreign currency. Undervalued or overvalued exchange rate can have positive or negative implications on the inflow of foreign investment.

### 3. THE EMPIRICAL RESULTS

Our research resulted in several findings. After the analysis of the correlation between independent variables, we concluded that there is a high correlation between gross domestic product (GDP) and subsidies and other transfers (SUBT) i.e. that their  $p$  - values are 0.938199% and 0.987257%, respectively. In addition, there is a high correlation between the average annual wage (WAGE) and subsidies and other transfers (SUBT), where  $p$  - value amounts to 0.890134% (see Table 1). In other cases, there is a moderate negative correlation between independent variables. Based on the above stated, we can conclude that our model does not have a problem with multicollinearity.

**Table 1** Correlation between the independent macroeconomic variables

	RGDPG	SUBT	WAGE	UNEPL	GDP	CP	ER
RGDPG	1.000.000	-0.555951	-0.297025	-0.158183	-0.387101	0.245759	-0.661231
SUBT	-0.555951	1.000.000	0.890134	0.120935	0.938199	-0.645457	0.791440
WAGE	-0.297025	0.890134	1.000.000	-0.165814	0.987257	-0.582294	0.532819
UNEPL	-0.158183	0.120935	-0.165814	1.000.000	-0.098945	0.037356	0.489258
GDP	-0.387101	0.938199	0.987257	-0.098945	1.000.000	-0.636118	0.619675
CP	0.245759	-0.645457	-0.582294	0.037356	-0.636118	1.000.000	-0.319250
ER	-0.661231	0.791440	0.532819	0.489258	0.619675	-0.319250	1.000.000

Source: Author's

Note: \*\*\*, \*\*, and \* represent statistical significance at the 1%, 5%, and 10% level, respectively.

Through application of multiple regression method, we have concluded that in most cases the increase in macroeconomic variables positively affects the growth of inflow of brownfield investments in Serbia (see Table 2). In order to determine the effect of macroeconomic variables on the inflow of brownfield investments in Serbia, we have attempted to observe the individual effect of independent variables on the dependent variable. Thus, the average annual wage (*WAGE*) has a  $p$  - value of 0.0167%, which is statistically significant or lower than the determined value of 0.05%, i.e. positively affects the inflow of brownfield investments; therefore, we reject  $H_0$  hypothesis and accept the alternative  $H_1$  hypothesis. There has been no significant increase in the average annual wage in Serbia during the considered time period, which had a positive impact on the inflow of brownfield investments. Lower average annual wage represents a stronger motive for the investor in terms of gaining profit. Unemployment rate (*UNPL*) has a  $p$  - value of 0.0321%, which is statistically significant or lower than the determined value of 0.05%, i.e. positively affects the inflow of brownfield investments in Serbia; therefore, we reject  $H_0$  hypothesis and accept the alternative  $H_1$  hypothesis. Unemployment

rate in Serbia constantly grew in the given time interval, which is the result of the poor state of industries within which there was no restructuring of enterprises, as well as of the negative elasticity of demand both in the local market and by the main trade partners. High unemployment rate positively impacted the inflow of investments in brownfield sites and created better conditions for foreign investors.

**Table 2** Impact of macroeconomic variables on the inflow of brownfield investments

Dependent Variable: BROWI

Method: Least Squares

Sample: 1 9

Included observations: 9

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDP	45793.45	3703.911	12.36354	0.0514
SUBT	-2138.512	759.1479	-2.816990	0.2172
WAGE	-48810.31	1281.234	-38.09634	0.0167
UNEPL	69910.66	3525.894	19.82778	0.0321
GDP	851.4499	21.73882	39.16725	0.0163
CP	100588.6	2981.566	33.73684	0.0189
ER	-39137.83	1559.063	-25.10344	0.0253
C	-6094815.	287162.6	-21.22427	0.0000
R-squared	0.999530	Mean dependent var		238073.3
Adjusted R-squared	0.996240	S.D. dependent var		343148.9
S.E. of regression	21041.87	Akaike info criterion		22.32697
Sum squared resid	4.43E+08	Schwarz criterion		22.50228
Log likelihood	-92.47136	Hannan-Quinn criter.		21.94865
F-statistic	303.7976	Durbin-Watson stat		1.947094
Prob(F-statistic)	0.044149			

Source: Author's

Note: \*\*\*, \*\*, and \* represent statistical significance at the 1%, 5%, and 10% level, respectively.

Gross domestic product (*GDP*) has a *p* – *value* of 0.0163%, which makes it statistically significant when compared to the determined value of 0.05%, i.e. it positively affects inflow of brownfield investment in Serbia; hence, we reject  $H_0$  hypothesis and accept the alternative  $H_1$  hypothesis. In terms of *GDP*, Serbia registered cumulative growth of *GDP* within the time period under consideration, albeit with a certain fall during 2009 and 2010, which nevertheless had no negative impact on the inflow of brownfield investments. Consumer prices (*CP*) have a *p* – *value* of 0.0189% that is statistically significant when compared to the determined value of 0.05%, i.e. positively affects the inflow of brownfield investments in Serbia; therefore we reject  $H_0$  hypothesis and accept the alternative  $H_1$  hypothesis. Consumer prices i.e. inflation rate was moderate, which had a positive impact on the inflow of brownfield investments. Exchange rate (*ER*) has a *p* – *value* of 0.0253%, which makes it statistically significant when compared to the determined value of 0.05%, i.e. it positively affects the inflow of brownfield investments in Serbia; hence, we reject  $H_0$  hypothesis and accept the alternative  $H_1$  hypothesis. In the case of exchange rate, frequent devaluation of the national currency (dinar) resulted in significant inflow of brownfield investments due to a

positive effect of devaluation on the increase in exports. However, in the case of real GDP growth (*RGGDP*) and subsidies and other transfers (*SUBT*) *p* – values are 0.0514% and 0.2172% respectively, which renders them statistically insignificant because they exceed the determined value of 0.05% and they do not positively affect the inflow of brownfield investments; therefore, we cannot reject the  $H_0$  hypothesis. Finally, a slow real GDP growth and low subsidies and other transfers have a negative impact on the inflow of brownfield investments in Serbia. This is because majority of subsidies and transfers are aimed at FDI, portfolio investments, mergers and, to a small extent, brownfield investments. In the case of *R – squared* and *Adjusted R – squared* *p* – values are 0.999530% and 0.996240% respectively, which means that the observed dependent variable is strongly explained by independent variables. Durbin-Watson statistic has a *p* – value of 1.947094%, which is within optimum limits i.e. there is no serial correlation. Finally, *Prob(F – statistic)* has a *p* – value of 0.044149% that is statistically significant and demonstrates that the applied model is significant i.e. that the majority of independent variables positively affect or explain the dependent variable; therefore, we reject  $H_0$  hypothesis and accept the alternative  $H_1$  hypothesis.

#### CONCLUSION

After 2000, Serbia initiated certain reforms in the area of opening of the economy, state property privatization and other structural reforms aimed at attracting foreign investors. Implementation of these reforms did not proceed to the desired speed, which led to a failure to achieve significant results in the area of brownfield sites revitalization i.e. to attract investments as an important driver of the economic growth of the country and squalid economies of local communities in particular. One of the main obstructions to the process of revitalization of brownfield sites in Serbia are the unresolved property-legal relations. Apart from this, the process of privatization is rather inefficient and time-consuming, which has caused over 30% of state-owned companies to remain unprivatized. In order to resolve the issue of brownfield sites, Serbia must develop a clear strategy, legal framework and stimulative investment support programs. To that effect, Serbia, as well as other Central and Eastern European countries, has undertaken clear measures as to classify all brownfield sites and it gives primacy to acquisitions as a form of foreign brownfield investment. The proposed measures pertain to the application of fiscal incentives, favourable measures for the use of land and sites, formal assistance in land revitalization, better access to the information on contamination levels, transparent and implementable strategies at all levels, more flexible and shorter time periods for licensing and implementing procedures. During 2006, Serbia adopted the Bankruptcy Law and carried out necessary reforms that brought results in the area of enhancing macroeconomic indicators of business operations. These changes positively affected the inflow of investments in brownfield sites, but their scope remains unsatisfactory having the existing potential in mind.

In our research paper we have applied the multiple regression model and measured the effect of macroeconomic on the inflow of brownfield investments in Serbia. Within the quantitative approach, we set up brownfield investment as a dependent variable, while independent variables include unemployment rate, GDP, real GDP growth, average annual wages, consumer price, exchange rate and subsidies and other transfer. Our research has shown that macroeconomic indicators such as unemployment rate, average

annual wages, GDP, consumer price and exchange rate are statistically significant i.e. that they positively affect the inflow of brownfield investments in Serbia, while real GDP growth and subsidies and other transfers are statistically insignificant i.e. do not have a positive impact on the inflow of brownfield investments in Serbia.

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## APPENDIX A

**Table 3A** Variable definitions

Variable	Data sources
BROWI – brownfield investment	<a href="http://www.naled-serbia.org/search">www.naled-serbia.org/search</a>
GDP – gross domestic product at market prices (million euros)	Eurostat
RGDP - real GDP growth (in %)	National Bank of Serbia
WAGE – average annual wages	National Bank of Serbia
SUBT – subsidies and other transfers	World Development Indicators
UNPEL – unemployment rate	National Bank of Serbia
CP – consumer prices (in %)	National Bank of Serbia
ER – exchange rate	National Bank of Serbia

**Table 4A** Data pertaining to Serbia

Country	Year	GDP	% RGGDP	% Unpel	Browi	Wage	CP	ER	Subt
SRB_	2005	21.103	5.54	20.80	604.910	209.7	17.7	85.50	0
SRB_	2006	24.435	4.90	20.90	0	260.0	6.6	79.00	0
SRB_	2007	29.452	5.89	18.10	292.000	347.1	11.0	79.23	602.8
SRB_	2008	33.705	5.37	13.60	202.000	400.5	8.6	88.60	675.1
SRB_	2009	30.655	-3.12	16.10	23.000	337.4	6.6	95.88	656.8
SRB_	2010	29.766	0.58	19.20	33.000	330.1	10.3	105.49	654.5
SRB_	2011	33.424	1.40	23.00	979.000	372.5	7.0	104.64	695.8
SRB_	2012	31.683	-1.02	23.90	8.750	364.5	12.2	113.72	691.8
SRB_	2013	34.263	2.57	22.10	0	388.6	2.2	114.64	0

## UTICAJ MAKROEKONOMSKIH POKAZATELJA NA BRAUNFILD INVESTICIJE U SRBIJI

*U radu se analiziraju podaci preseka za Srbiju u vremenskom periodu od 2005. do 2013. godine. Uz primenu višestruke regresivne tehnike, meri se uticaj makroekonomskih varijabli na privlačenje stranih investicija u braunfild lokacije u Srbiji. Istraživanje je pokazalo da makroekonomski indikatori, kao što su: stopa nezaposlenosti, prosečne godišnje plate, bruto domaći proizvod, cene potrošačkih proizvoda i deviznog kursa su statistički značajni, dok pravi bruto domaći proizvod opada dok su ostali transferi statistički beznačajni.*

Ključne reči: *makroekonomski, stopa nezaposlenosti, indikatori, braunfild lokacije, liberalizacija*