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Estimating Economic Regional Effects of Euro 2012: *Ex-ante* and *Ex-post* Approach

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Abstract

Purpose: In this paper we evaluate both *ex-ante* and *ex-post* macroeconomic impact of EURO 2012™ on Polish regions.

Methodology: We start with modifying the Keynesian-style multiplier model to investigate the effects of Euro 2012-related spending on local economies. This specification permits us, on the one hand, to easily investigate the impact on each demand component, and, on the other hand, to calculate the magnitudes of these multipliers in order to judge the credibility of potential regional welfare benefits. This analysis is strengthened by taking into account the regional supply constraints. The second part of our study is devoted to an econometric estimation of long-run macroeconomic impact.

Findings: Our study does not provide a strong evidence of EURO 2012- specific effects. We find the regional multipliers' values ranging from 1,13 to 1,33 for four hosting regions. This translates into an uncommon statement of rather evenly developed regions. The *ex-ante* study also testifies of an importance of public expenditure in convergence process. In case of *ex-post* analysis, the estimates of regional production function reveal a modest positive effect of EURO 2012-related infrastructure spending. However, this effect is small, and there is no statistical evidence that hosting regions recorded an event-specific growth boost.

Research limitations: Both *ex-ante* and *ex-post* studies are sensitive to regional data, therefore, some calculations may suffer from disaggregation error. Additionally, *ex-post* analysis needs to be repeated in order to gain more insights from historical data. Finally, authors plan to complement the analysis by the Ukrainian study.

Originality: This is the first paper to date addressing the EURO 2012 macroeconomic impact from the regional perspective.

Keywords: economic impact, sport economics, mega-events

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Motivation

After long discussions, UEFA narrowed in November 2005 the field of attribution of EURO 2012™ to three possible host regions: Italy, Croatia–Hungary and Poland–Ukraine. In April 2007 the final decision was made by UEFA concerning location of EURO 2012™ retaining Poland and Ukraine. The attribution of EURO 2012™ to those two countries was highly political, and had its own objective: to integrate Ukraine with European space (in situation of impossibility for Ukraine to become the EU member). Only in Spring 2009, the definitive number of cities elected to host this mega-event in Poland was known: Warsaw, Poznan, Wroclaw and Gdansk. The choice of Ukrainian cities to host the event was more problematical due to the macroeconomic situation of the country and existing delays in infrastructure preparation.

Public opinion has quickly become seduced by the optimistic view of large economic spillovers supposed to blast hosting regions and communities. On the contrary, economists are usually skeptical of arguments about beneficial impact of the public provision of infrastructure for sporting events. Most frequently, "agents that endorse the construction of new sports stadia or the staging of mega-events usually do so out of naivety or self-interest", Rose (2008). In most cases regions hosting mega-events end up with substantial costs that are only partly compensated by event related revenues (tickets, broadcasting rights, etc.) and with sport facilities to take care of.

In this paper we have decided to take a closer look at Polish regions hosting EURO 2012™. Although we are convinced that the only one, cent percent relevant economic impact study is *ex-post* audit, we do however believe in the importance of *ex-ante* like simulations and early *ex-post* econometric simulations, as they become extremely useful to ground event-related organizational choices. We have therefore chosen to calculate the Keynesian multipliers and estimate the Regional Production Function for each hosting region in Poland: if the concept is simple, it was quite difficult to gather specific information at a high level of spatial disaggregation. The paper is organized in the following way: section one presents a review of both mega-events and multipliers literature; section two describes our model while the next section focuses on data and estimation procedure; further section in turn, presents the results which are discussed and commented; section 7 describes *ex-post* econometric model and the last section concludes.

Literature Review

- Literature on 'mega events'

There exists a substantial number of studies analyzing the economic impact of mega events[3] (the literature covers not only sport-related events, but also the impact of cultural manifestations,

[3] For an exhaustive review of economic impact literature and techniques see Matheson (2006) and Weinmann and Monnin (1999).

conventions, etc. commonly labeled 'hallmark events' (Ritchie, 1984)). The methodologies used in economic impact analysis depend on timing (*ex-ante*, *ex-post*), time horizon (short-term/long term), space dimension (local, regional, national) and frequently on particular assessment needs of study commissioners. Some commissioned studies often predict large economic spillovers. Even if this kind of work is not designed for the academic audience, its conclusions remain very often influential. For example, Humphreys and Plummer (1995) estimate the short-term economic benefits for Atlanta (host city of the 1996 summer Olympic Games) to be $5.1 billion. Similarly Fuller and Clinch (2000) estimation of total economic impact of hosting the 2012 Olympic Games on Washington-Baltimore metropolitan area would have been $5,3 billion. The biggest booster effect to date comes from the Dentsu Institute for Human Studies which estimated benefits of hosting the 2002 World Cup for Japan and South Korea to be, $24,8 and $8,9$ billion, respectively (as recalled by Baade and Matheson (2003)).

Some academic studies are skeptical of economic benefits of hosting mega-events. For example, Baade and Matheson (2002) found that the cities hosting 1994 World Cup recorded $4 billion drop in growth compared to their growth forecast in case the event would not have taken place. Owen (2005) takes an example of Beijing to show that benefits from hosting Olympic Games result from the huge investments that the city would engaged independently of the games. It was also noticed that one should not expect consumption boost from spending of local residents, the idea being that event-related spending is just a substitute of other leisure activity or consumption good (Siegfred and Zimbalist (2000), Coates and Humphreys (2003)). It is also claimed that projects associated with sporting events seem to be white elephants, because in most of cases, exclusively event devoted and costly facilities remain unserviceable shortly after a one-time peak demand of just a couple of weeks (Rose and Spiegel (2009)).

The first attempt of evaluation EURO 2012^{TM} has already been made by Humphreys and Propokowicz (2004), showing that a simple cost benefit analysis indicates that the costs of hosting the event will exceed the direct economic impact related to increased tourist spending by a wide margin and the presence of positive benefits depends on benefits from factors like improvements in the transportation infrastructure. More recently, Borowski et al. (2011) have undertaken a simulation of the possible macroeconomic effects of the championship on Poland's economy using a dynamic general equilibrium model (GEM) where the organization of the championship is treated as an exogenous shock that provides growth impulses. Authors estimate the event-related growth boost for Poland to be of PLN 21.3 billion (over 2008–2020 period) that will mainly result from massive investments in the transportation infrastructure (highways, railways, and airports) and investments related to the construction or renewal of stadiums. Others important stimulus come from the expected increase in FDI flows and the expected inflow of foreign tourists visiting Poland both during the championship and afterwards. It is important to mention that the main effect of EURO 2012^{TM} remains a 'speed up' effect of infrastructure investment: the transportation infrastructure has been accomplished at least two years earlier due to Championships.

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- The concept of Keynesian Multipliers and its Use in Economic Impact Analysis

Keynesian multipliers represent a fundamental concept in economic theory. The idea of applying multipliers to regional context was originally manifested by Isles and Cuthbert (1956). Generally speaking, models frequently used by regional economists have little changed since Tiebout (1962). Although much criticized since 70s, multiplier analysis remains a powerful tool, especially when input-output approach fails due to data unavailability or simply the particular aim of analysis concerns horizontal regional disparities rather than national view. Regional multipliers are used to help evaluate the total impact on a region of an exogenously stimulated change in demand. They have been widely used in the UK and the US to help understand the consequences of governmental intervention in a region through transfer payments or investment; and to understand the wider economic impact of tourism, cultural, political or sport manifestation on a region. In the context of sport, economic impact is defined as the economic change in a host community that results from spending attributed to a sport event or facility (Turco and Kelsey, 1992). In most cases, impact analysis were commissioned and undertaken to justify spending of public money; very often those studies report inaccurate results, overestimating wealth effect on local communities[4]. The economic base, sales and employment are among the most commonly used techniques to evaluate the economic impact of a given manifestation.

The Regional Multiplier: *ex-ante* analysis

The equation describing regional economy is given below:

$$Y = C + I + G + X - M \quad (1)$$

where Y is regional income, C is regional consumption, I is regional investment; G is government expenditure, X stands for regional exports and M is regional imports. Some behavioral assumptions are usually made concerning relationships between variables within the model. In our case, the first behavioral relationship is the consumption function, which postulates the consumption dependent on income:

$$C = cY \quad (2)$$

If we take into consideration the disposable income, consumption function becomes:

$$C = cY_{dis} \quad (3)$$

where Y_{dis} is disposable income and is given by the following function:

[4] The rationale for economic impact analysis as well as impact analysis errors are presented by Crompton (1995).

$$Y_{dis} = Y - t_d Y \quad (4)$$

where t_d is the rate of direct tax (mainly income tax).

Consumption is also partly affected by indirect taxation. If t_i stands for indirect tax rate, the consumption function becomes:

$$C = C - t_i C \quad (5)$$

Our simple model considers imports M as imports for consumption from abroad. This is described by the following function:

$$M = mC \quad (6)$$

where m is the marginal propensity to import. Finally, we assume that investment, government expenditure and exports are exogenously determined:

$$I = \bar{I}, G = \overline{G}, X = \overline{X} \quad (7)$$

By substituting equations (2) to (7) into the regional income-expenditure identity (1), we obtain:

$$Y = \frac{\bar{I} + \overline{G} + \overline{X}}{[1 - c(1 - t_d)(1 - t_i - m)]} \quad (8)$$

Thus, the regional multiplier (k_R) is given by:

$$Y = \frac{1}{[1 - c(1 - t_d)(1 - t_i - m)]} \quad (9)$$

Data and Estimation Procedure

Our goal is to propose an estimation of aggregate regional multipliers for the four Polish regions to host EURO 2012™ event. In order to estimate the regional multiplier as expressed in equation (9), we are about to fit each single component of this equation, i.e. the regional marginal propensity to consume, marginal propensity to import, as well as direct and indirect tax rates. The quality of the Marginal Propensity Method (MPM) relies on the use of reliable data. We were aware of the fact that the ease of the MPM procedure may be compromised by the use of doubtful data. Therefore, we decided to only use the original statistics from the National Statistical Office (GUS – Główny Urząd Statystyczny), and the Polish Ministry of Economy. By taking this precaution, the data cohesion is preserved. A detailed description of the variables used for calculation is given below.

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Description of variables

- **Regional Income and Consumption Expenditure**: In order to guarantee the comparability across regions we have used both national and regional accounts provided by GUS. The national accounts were compiled according to 'European System of Accounts ESA 1995' recommendations. This system of national accounts consists of the number of mutually linked macroeconomic accounts, which permit to achieve coherent data on income, i.e., sources of financing expenditures with data concerning production and its distribution between final consumption expenditure and gross capital formation (defined as domestic demand) as well as the external balance of goods and services. Regional accounts are based on the same 'ESA 1995' basis. The following positions were compiled in the regional accounts system for each voivodship: the production account and the generation of income account by institutional sectors and kind of activity, as well as the allocation of primary income account and the secondary distribution of income account in the households sector. The following categories were calculated for regions: gross domestic product (GDP) and gross value added (GVA) by kind-of-activity groups[5]. The regional consumption expenditure comes also from regional accounts and refers to final consumption expenditure of households residing in the region.
- **Direct and Indirect Taxes**: We have made distinction between direct (affecting income) and indirect taxes (affecting consumption). The Polish National Statistical Office does not dispose of tax-related data. in order to collect missing information, we apply the following computation procedure: first, we have collected the revenues-side data from the state budget (provided by the Ministry of Finance; state revenues consist of direct taxes: income taxes and corporate taxes); second, we have calculated a percentage of direct and indirect taxes on GDP to get direct and indirect tax rate.
- **Imports**: In order to calculate regional trade flows (and implicitly the Marginal Propensity to Import) we have applied the following two-stage procedure: first, we used the GUS data on overall export-import dynamics for Poland; afterwards, we used Gawlikowska-Hueckel and Umiński (2008) calculation[6] of each voivodship share in Poland's external trade to compute their importations.
- **Marginal Propensity to Consume (MPC):** The MPC is calculated as the ratio between average consumption expenditure of households in the region and their average disposable income. The idea is that the average consumption is a proxy for the marginal one. This assumption excludes the MPC greater than 1, which would mean that the increase in consumption is only partly financed by the increase in income (the other part being financed by credits).

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5 The grouping of data by voivodships according to kind of activity of the Polish Classification of Activities was conducted applying the local kind-of-activity unit method, i.e., by the place of residence and main kind of activity of the local unit of the enterprise.

6 Export/import flows are classified on exporting/importing enterprise's location basis.

The Results on Regional Multipliers in Poland and Discussion

Values of the regional multiplier from equation (9) are presented in Table 1 below.

Table 1 | Regional Multipliers for Poland's regions hosting EURO 2012

Region	Indirect Tax Rate (t_i)	Direct Tax Rate (t_d)	MPC (c)	MPM (m)	Regional Multiplier (k_R)
Mazowieckie	0,12	0,05	0,46	0,61	0,13
Wielkopolskie	0,12	0,05	0,44	0,41	1,24
Dolnośląskie	0,12	0,05	0,49	0,34	1,33
Pomorskie	0,12	0,05	0,53	0,48	1,25

Source: authors' calculation.

The multipliers' values lie within the range 1.13 to 1.33, so that the injection impact is rather unified across regions. The common interpretation of Keynesian multiplier is as follows: the multiplier value for capital region (Mazowieckie) indicates 1.13, which is a 1 million increase in government spending raises regional income by 1.13 million. Because tax rates do not vary (same country), the multiplier is sensitive to changes in consumption and especially to changes in consumption of imported goods (or, analogically, to changes in consumption of locally produced goods). Our results on MPM are in line with the literature in the sense that rich regions tend to import more, while poor seems to be more 'self-contained'.

We found interesting the idea of comparing the multipliers values for regions hosting EURO 2012™ with two other Poland's regions that were also candidate to host the event (the regions of Śląskie and Małopolskie with cities of Chorzów and Kraków have not finally been retained by UEFA). The multipliers values for these regions are presented in Table 2.

Table 2 | Regional Multipliers for Poland's regions not retained to host EURO 2012

Region	Indirect Tax Rate (t_i)	Direct Tax Rate (t_d)	MPC (c)	MPM (m)	Regional Multiplier (k_R)
Śląskie	0,12	0,05	0,7	0,3	1,61
Małopolskie	0,12	0,05	0,45	0,78	1,04

Source: authors' calculation.

This time, the multiplier value for the Silesian region is very large. On the contrary, its value is barely significant for the Kraków area. The high multiplier for the Silesian region is partly explained by the high propensity to consume and it is partly due to low per capita income level in this locality. The Silesian region has also a strong mining heritage and a lot of households are

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financially dependent on this sunset industry. Finally, we believe that the multiplier values are not correlated with the size of regions, as long as all six regions are similar in terms of population.

| Further Analysis

Having commented the multipliers values for Poland's regions, we wish to make some more general comments on proper way of interpreting multipliers' values. As it was stated by theory, the assumption behind the multiplier is that when injection of money is made into economy it circulates again, increasing the economic impact of the initial spending. But during each of these rounds, only a part of the money received will be spend on the regional economy, the rest will leak out. Although we have made hypothesis about local tax rate and propensity to consume from abroad, we cannot exclude some important leakages due to intermediate consumption or capital transfers. It should be remembered that evaluating multiplier effect have to be based on net value of initial injection. Clearly, one have to take into account only spending that would not have occurred in the absence of the mega-event perspective. Thus, only 'fresh money' raise and expand the local economy.

Another important issue related to the evaluation of multiplier effect is that the impact size should be corrected by incorporating the value of opportunity cost (Crompton, 1995); economic impact studies frequently consider all factors of production as having zero opportunity costs to the community in terms of what they could produce if invested elsewhere in the economy. Therefore, the multiplier effect become overestimated. Consequently, it seems that every time the decision to invest money is made, the value of the best alternative should be accounted for.

The particular attention must also be made while forecasting the shift in consumption during the event. The raise in internal demand is very often overestimated by attributing the consumption peak during the event to spending made by supporters from abroad and occasional tourists. It seems rather that local residents are very active during the event taking place in their region, spending more but still 'local' money. More generally, measuring event-related spending remains complicated also because of the fact that it is impossible to exclude 'time-switchers' (people who cancel their trip to a destination because of the mega-event taking place there) and 'casuals' (people who already are in the region hosting a mega-event and decide spontaneously to take part in the event instead of doing something else). These examples of crowding-out mixed up with other supply constraints associated with visitor's displacement may however be partially ignored due to the very particular characteristics of the mega-events: Firstly, mega-events are well-known so far in advance that all other manifestations can easily be rescheduled to avoid any conflict with these mega-events; In addition, even if some displacement will occur, it is likely to be ''sufficiently small so that it will be counterbalanced by the existence of local residents who will divert into the region some spending that they would otherwise do outside of the area as a result of being attracted to these mega-events occurring in their back yard" (Seaman, 2004).

| Econometric model: *ex-post* analysis

The practice of constructing econometric models intended to evaluate possible mega-event's spillovers on economic activity is common in literature, ranging from GEM to regional simulations. These models are evaluated *ex-post*, i.e. once the event has finished and there exists, already historic data to implement them. The most often authors privilege assessing the impact of a mega-event on either regional revenue or employment. There is also a substantial amount of studies investigating the impact of infrastructure investment on economic activity. In this paper, we employ the Regional Production Function to see whether there is a EURO 2012^{TM} effect for regions hosting the championships.

Our main goal is to investigate whether there is a statistically significant difference between hosting and non-hosting regions. The additional question is to evaluate the effect of event-related infrastructure spending on regional economies. From the methodological point of view our procedure consists of fitting the RPF with regional data and running the estimation. The Regional Production Function is described below:

$$Y = Af(K,L,G) \quad (10)$$

where Y stands for regional output, K: stock of capital in the region, L: employment and G: infrastructure stock. This specification follows the usual format of a Cobb-Douglas production function. An additional capital, infrastructure, enters into the production function as G. The assumption is that such capital is complementary to private capital and that it exhibits the usual decreasing returns to scale. Because our data consist of longitudinal panel data, the logarithmic expression of our equation becomes as follows:

$$lnY_{i,t} = lnA + \alpha lnK_{i,t} + \beta lnL_{i,t} + \gamma G_{i,t} + a_i + u_{i,t} \quad (11)$$

where a_i describes the unobserved heterogeneity across regions and $u_{i,t}$ error (how unobserved factors that change over time affects y_{it}).

- Data

Our data set is compiled upon the annual GUS data for 16 voivodships. Covered period ranges from 2005 to 2012. In case of some regions, there is still missing data for the last two quarters of 2012. We have therefore applied the statistical method of interpolation to deal with this problem and their goodness-of-fit is satisfactory. The list of variables includes:

- GRP: disaggregated GDP by voivodship;
- K: aggregated capital accumulation in each voivodship;
- L: aggregated quarterly data on employment in each voivodship;
- ER: km of express roads within a voivodship;
- HGW: km of highways within a voivodship;

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- RAIL: km of rails within a voivodship (both new and revitalized);
- FLY-IN: number of passengers flying-in a region (in case the voivodship has an airport).

The descriptive statistic table is presented in Table 3.

Table 3 | Descriptive statistics

Variable	Obs.	Mean	St. Dev.	Min.	Max
K [in *K* PLN]	112	12 240 024	9 715 376	2 678 970	47 314 453
L [real nb of legally employed]	112	762 008,5	333 662,7	231 519	1 777 419
HGW [in *km*]	112	48,38	62,55	0	222,3
ER [in *km*]	112	29,17	33,87	0	139,5
RAIL [in km per 100 km^2]	112	6,9	3,1	3,4	17,5
FLY-IN [real nb of passengers]	111	567 518,4	1 064 973	0	4 710 454

| Econometric procedure

Our data enable us to construct a balanced panel data set (cross-sectional time-series data). The 'individuals' are Polish voivodships observed through 2005 to 2012. Consequently, we apply four estimation procedures. The first two procedures are based on an OLS fixed-effect (FE) estimation while clustering for EURO 2012™ host and non-host regions. This is achieved with applying dummy variable that equals *1* if region hosted the competition and *2* otherwise. FE model explores the relationship between predictor and outcome variables within an entity (in our case, the voivodship). Each entity has its own individual characteristics that may or may not influence the predictor variables (like the fact of hosting the EURO championships). When using FE we assume that something within the individual may impact or bias the predictor or outcome variables and we need to control for this. This is the rationale behind the assumption of the correlation between entity's error term and predictor variables. FE removes the effect of those time-invariant characteristics from the predictor variables so we can assess the predictors' net effect. One side effect of the features of fixed-effects models is that they cannot be used to investigate time-invariant causes of the dependent variables. Technically, time-invariant characteristics of the individuals are perfectly collinear with the entity's dummies. Substantively, fixed-effects models are designed to study the causes of changes within an entity. But, on the other hand, we may also believe that variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model. That is why, our third procedure consists of an OLS random-effect estimation (RE). The last specification is based on a Maximum Likelihood estimation (MLM). Table 4 presents the estimations results:

Table 4 | Regression results

Dep. Var.	FE[a]	FE[b]	RE	MLM
logK	.15301377	–.02825617	.06140235	.06513278
logL	1.0226239	.16727878*	-.14202476	.03226579
logHGW	.14161075	.21734286**	.36426881*	.21061324
logER	.10330213	.06779806***	.08061823**	.06854933***
logFLY-IN	.10723754*	.26097821	.16986665**	.19414118***
logRAIL	.53859536	–1.212251**	.29150391	.36891681**
EURO			-.15949582	–.04914211
Const	-8.4064021	7.7264536*	7.691743*	5.4498282*
legend: *p<0.05; **p<0.01; ***p<0.001				

The FE^a model clusters the voivodships effectively hosting the UEFA EURO 2012™. Apart from a small statistically significant effect of express road infrastructure, we cannot see a booster effect on economic activities in these regions. On the other hand, the FE^b specification clusters all the remaining voivodships. The statistically significant effect is visible mainly for road infrastructure, which suggest that these regions have probably the smallest stock of them; therefore it should be considered a further increase in road construction spending, as they yield a positive effect on regional output. For instance, the predicted β for HGW is 0.22, which is an additional 1% increase in highway coverage is predicted to raise the regional output by 0.2%. Surprisingly, the effect of rail is negative and significant. That unexpected funding would suggest that spending on rail sector faces some kind of inefficiencies. In case of OLS RE and MLM models we are 99% and 95% confident about the overall positive effect of express road and airport infrastructure. Within these specifications, the dummy variable *EURO* turned out the negative, but statistically insignificant effect on regional output. Therefore, we cannot confirm the existence of a statistically significant EURO 2012™-related spillovers. In other words, we do not find the empirical evidence supporting the view that EURO 2012™ has significantly influenced the regional growth dynamic.

| Conclusion

In this paper we have undertaken the multiplier analysis applied to Poland's regions. This is the first calculation to date focusing on the regional level of disaggregation. Aiming at presenting the alternative way of discussing possible beneficial effects of EURO 2012™ to take place in four Polish regions, we have also found an interesting proof of Poland's regional development patterns.
In case of *ex-ante* study, we have found the multiplier value ranging from 1.13 to 1.33 for all four regions hosting EURO 2012™. In addition to multiplier mechanism, these values show

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rather surprising view of Polish regions with small interregional disparities. This is rather unexpected finding, which changes the vision about country's development (rich and developed West versus poor and underdeveloped Est.). This seems to testify that public expenditure does play a role in the convergence process (that has become substantially strengthened after Poland's entry to the E.U., making the country enjoy the access to the structural funds). The low values of multiplier neither denies beneficial effects of additional spending nor doubts on utility of investing in these regions; small multiplier does not tell us that it is not worth investing money in a particular region, but only that it is less probable that the effects of an additional spending will remain in this particular region where projects are precisely undertaken. As pointed out by Faggian and Baggi (2003), the regional spillover effects are likely to be important because of the higher degree of globalization of the whole economic system.

In addition to the optimistic message expressed above, we wish to close with some cautions. First, a bit of carefulness is required regarding the push effect caused by supporters and tourists' spending during the event. Second, if the massive investing in general infrastructure is highly desirable, there is no doubt that clear plans about using the post-event special infrastructure heritage (like stadia, sport villages, etc.) have to be made long in advance so as they have no chance to become a pitfall for public purse's spending. Finally, claims of non-economic benefits are indeed extremely difficult to verify, therefore, they should not been used as a valid argument of gaining public support by regions competing for the right to host a mega-event.

The early *ex-post* analysis supports the *ex-ante* study. There is no clear evidence of an "EURO" effect. Nevertheless, investing in hardware infrastructure, mainly roads, is predicted to positively influence the regional development. However, in the future, we intend to supplement this study with the structural break analysis. This should provide us with a clear and precise evidence of real EURO spillovers.

Undoubtedly, it is visible how Poland regions have been transformed prior to EURO 2012™. However, we must wait to see whether this "visual" effect is also detectable in data.

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