

Sources of regional differences in Poland: identification using decompositions of GDP growth and differences in GVA per capita.

Non-technical summary

I. Introduction: The study is a continuation of the Project entitled *GDP decomposition and GVA method in application to the analysis of the structure of regional differences* done in the previous edition of the program *Statistics for Cohesion Policy*.¹ Parallel to the development of methodology to deepen the interpretation of decomposition results and parallel to the analysis of complementary tools to analyze regional differences, one of the central elements of this Project was to create a prototype of a website synthesizing the decomposition results, allowing easy access to them and allowing the users conducting their own analyzes based on these results.

II. Motivation: Polish provinces differ in their level of economic development. There are many reasons for the diversity while they concern various areas of socio-economic policy. Most important determinants of economic development include, but are not confined to, the proper and efficient functioning of: a) all units producing and creating domestic product or added value, b) the labor market, c) the demographic sphere. Important are both structural factors resulting from the specificity of a given region, as well as factors that can be modified by improving the functioning of a given area (production sphere, labor market, internal migration policy, etc.). The structural factors are distinguished by the fact that they are either impossible to change (as the natural resources of the region), sometimes they require long-term changes (age or population structure), and in some cases their change may be undesirable (e.g. cultural and historical heritage of the region). On the other hand, non-structural factors are a natural target of socio-economic policy intervention. These factors may hinge on the level of resource use (development of infrastructure, technologies, management systems adopted in private and state-owned companies, etc.), on the efficiency of the labor market (activity or employment level within specific population groups) or on the specific functioning of demographic and migration policy that affects the population in a region.

III. Objective: To enable making effective interventions aimed at improving the level of economic development of a region, it is necessary to identify various socio-economic factors affecting this development. The aim of this project is to present the decomposition method, which facilitates such identification. The method is based on commonly available and officially recognized statistical data and indicators. The goal is to provide a synthetic picture of the diversity of regions broken down into components, differing in the specificity of the possible intervention of the region's socio-economic policy. Decomposition results are presented in the form of intuitive and visually attractive graphs prepared in various layouts. They allow clear comparisons of the region's socio-economic diversity as compared to other regions, over the years, in the short-, medium- and long-term.

IV. Method: Two basic decomposition methods are presented: decomposition of growth and decomposition of differences. In both decompositions, the variable/indicator measuring the level of economic development of the region is broken down into components representing various areas of socio-economic policy, i.e. the "manufacturing" sphere, the labor market, and the demography. Decompositions differ in the type of index being broken down: the Gross Domestic Product per capita growth or the difference in the level of *per capita* Gross Value Added of a given region in relation to the country's average. In the decomposition of differences, selected components of the main decomposition are further subdivided into further components. The purpose of such sub-decompositions is to identify structural factors (those cannot be easily changed by socioeconomic policies) and separate them from other factors – those are the natural target of dedicated socio-economic policies. Depending on a component being sub-decomposed, this identification is performed separately for each education group, age group or business section.

V. Website: *Dekompozycje* is a website that was created to present decomposition results. Title page of the site contains brief description of the Project and decomposition methods. The user can choose from

¹ The results of work under this Project are presented at the following address: <http://stat.gov.pl/statystyka-regionalna/statystyka-dla-polityki-spojnosci/statystyka-dla-polityki-spojnosci-2013-2015/badania/dezagregacja-wskaznikow-z-obszaru-rachunkow-narodowych-i-regionalnych/>

three tabs in the top menu: "Decomposition results", "Methodology" and "Analyzes". "Decomposition results" has a side menu to select the type of decomposition and visualization according to the kind of comparative analyzes she or he wishes to perform. There are two types of decompositions in the list, while the second one is broken down into two variants:

A. Decomposition of growth:

- Presents percent changes in time for a given province selected on the map. The layout is dynamic and is suitable for short, medium and long-term comparisons.

B1. Decomposition of differences:

- Presents the percentage differences between individual indicators concerning provinces in relation to the national average. In the dynamic layout this decomposition is suitable for medium or long-term comparisons (i.e. over at least several years).

B2. Decomposition of changes in differences.

- This decomposition presents changes in year to year differences in percentage points. It complements the decomposition of differences – it is used for short-term comparisons (i.e. year to year).

In the case of the decomposition of differences and changes in differences, clicking on a province area on a chart or on a map results in the appearance of three subcompositions of differences (or changes in differences) for that province in a given year.

Each type of decomposition can be presented in two layouts (static and dynamic) and for each of these layouts in two views (basic and collective). Thus, four options are distinguished:

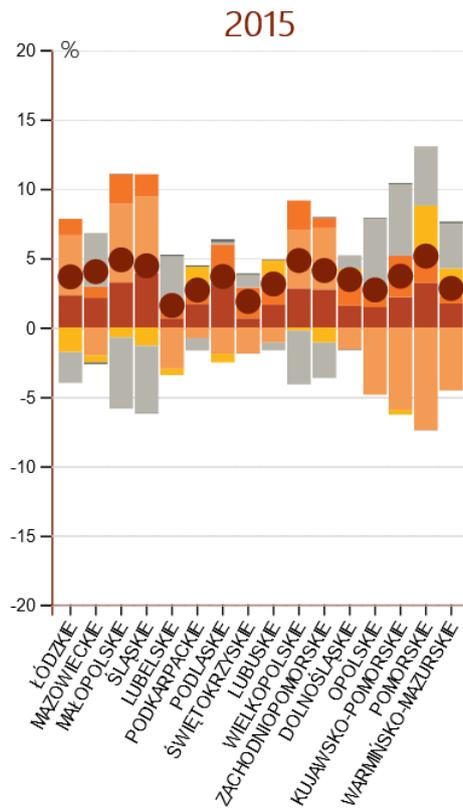
- a) Comparison of provinces - 1 year
 - Suitable for comparisons of the structure between provinces;
- b) Comparison of provinces - all years:
 - Suitable for analyzing evolution of the relative position of the province compared to other provinces;
- c) Evolution in time - 1 province:
 - Suitable for analysis of the structure dynamics for a given province;
- d) Evolution in time - all provinces:
 - Suitable for comparisons of the evolution of the structure of differences between provinces.

This gives a total of 12 possible layouts (four options for each of the three types of decompositions). The thirteenth option is to present all three types of decomposition in one chart: the growth, differences and changes in differences decompositions all at once. This option is available both in the static (comparison of provinces in a given year) as well as the dynamic (evolution in time for one province) layout, but only in the basic (individual) view.

VI. Sample results: Below are exemplary results of decompositions for Polish provinces in 2015 in form of the graphs.

VI.i. Decomposition of growth: Figure 1 shows an example of growth decomposition. The dynamics of the Gross Domestic Product per capita has been decomposed into the dynamics of: the labor productivity, commuting, employment index broken down into the dynamics of the share of employed population in labor force and the dynamics of the economic activity rate, age structure index and differences in statistical methodology concerning LFS and demography. The decomposition makes it possible to identify the main determinants of economic growth and to analyze its structure.

Figure 1: Decomposition of growth of per capita Gross Domestic Product in Polish provinces in 2015.

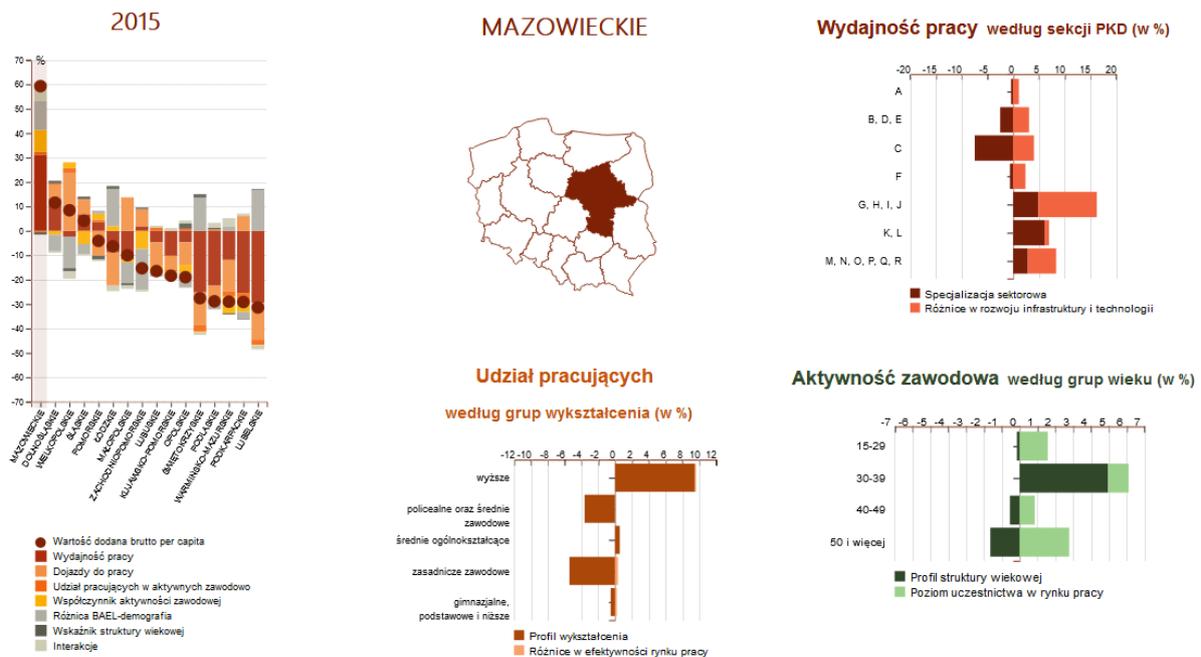


Legend: circle: GDP per capita, squares: brown – labor productivity, dark orange – working to labor force population ratio, light orange – net commuting, yellow – labor participation rate, dark grey – age structure coefficient, light grey – LFS/demography methodological coefficient.

Source: Statistics Poland own research

VI.ii. Decomposition of differences: Figure 2² presents the results of exemplary decomposition of differences together with sub-decompositions of selected main components of the basic decomposition, i.e. differences in labor productivity are further decomposed by section groups according to the Polish Classification of Activities, differences in the share of employed population in the labor force are divided into education groups and differences in the economic activity coefficient divided into age groups. It should be noted that while the decomposition of differences diagram applies to all provinces, the sub-decomposition diagrams are presented for one province (Mazowieckie in this case) at a time.

Figure 2: Decomposition of differences in the level of per capita Gross Value Added for Polish provinces in 2015. Sub-decompositions are presented here for Mazowieckie province in 2015.



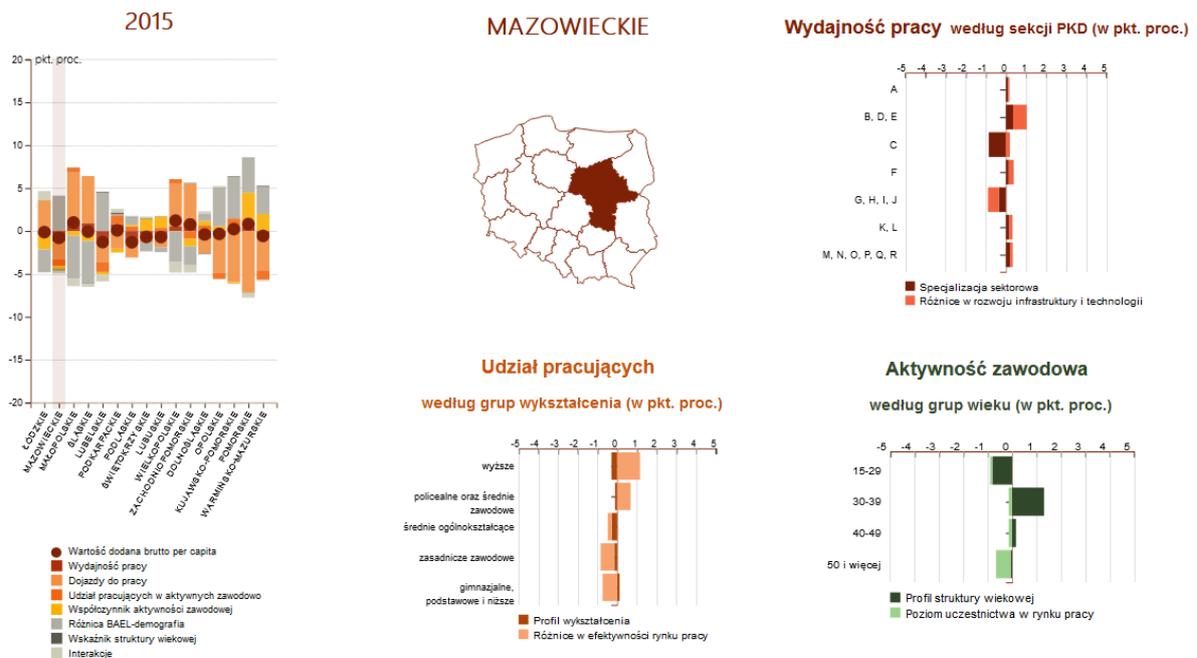
Legend: All amounts are given in percent amounts. Left panel – decomposition of differences: circle: GVA per capita, squares: brown – labor productivity, dark orange – working to labor force population ratio, light orange – net commuting, yellow – labor participation rate, dark grey – age structure coefficient, light grey – LFS/demography methodological coefficient, very light grey – interaction terms. Middle panel below – subdecomposition of differences in the ratio of working to labor force according to groups of attained education: brown square – education profile, light orange square – differences in labor market efficiency. Right panel above – subdecomposition of differences in the labor productivity according to economic section: purple square – sector specialization, orange square – differences in the development of infrastructure and technology. Right panel below – subdecomposition of differences in the participation rate according to age groups: dark green square – age structure profile, light green square – labor market participation level.

Source: Statistics Poland own research

² Figures are print-screens taken from the website. The website is prepared in Polish only. English version is thus presented in the form of a detailed legend appearing directly underneath the figures.

VI.iii. Decomposition of changes in differences: The decomposition of differences is supplemented by decomposition of changes in differences suitable for short-term year-to-year comparisons. An example of such decompositions is presented in Figure 3. The layout of the diagrams for this decomposition is identical to that of the decomposition of differences. Values are given in percentage points and represent the differences between the corresponding percentages of differences in the current year (in this case it is 2015) and in the previous year (in this case it is 2014). The values of changes in differences inform about short-term trends and serve to capture longer-term changes early enough.

Figure 3: Decomposition of changes in differences in the level of per capita Gross Value Added for Polish provinces in 2015. Sub-decompositions are presented here for the Mazowieckie province in 2015.



Source: Statistics Poland own research