

# Spatial Differentiation of Demographic Processes in Germany and Poland

**Sławomir Pastuszka**

Jan Kochanowski University in Kielce, Poland

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## Abstract

*The aim of this article is to compare demographic processes in German federal states and Polish voivodships. The analysis covers the period between 2004–2015 and takes into account the data published by Eurostat, the Federal Statistical Office and Poland's Central Statistical Office. The analysis shows that demographic processes in German Länder are more dependent on their level of development and geographic location than in Polish regions. In Germany, the major demographic problems are seen in the less developed eastern Länder, whereas in Poland, unfavorable demographic changes occur in several voivodships of varying levels of development, located in different parts of the country. According to the author, in the case of demographic processes, unlike economic processes, at present there is no justification for clear-cut division of Eastern Poland, akin to Eastern Germany.*

**Keywords:** demographic potential, German federal states, Polish voivodships, regional analyses

**JEL:** J10, J11, J13, J18

## Introduction

A characteristic feature of Europe refers to dynamic and diverse demographic changes (*Population, Ageing in Europe...* 2014). The population is increasing mainly due to the influx of immigrants, while clearly the birth rate is declining, life expectancy is becoming longer, and the proportion of elderly people is gradually increasing. According to experts (Reher 2011), these processes will have serious consequences for the economic development of European countries and regions. The European Commission notes that demographic changes in different European countries proceed with varying intensity (*The 2015 Ageing Report...* 2015). For example, in Germany, Italy and Austria the total population is increasing only as a result of the influx of immigrants whereas in Poland, Portugal and the Baltic countries it is decreasing due to the negative migration balance. Similar conclusions can be drawn from an ESPON report but involve inter-regional differences in demographic processes (De Beer and i inni 2010). These are visible especially in countries with large internal economic disparities and include Germany and Poland due to the significantly lower level of development of their eastern parts against their state economy. For this reason, it is useful to compare and evaluate the spatial differentiation of the potential and the rate of demographic changes in German federal states (Länder) and Polish voivodships. Literature analysis, as well as comparative analysis and descriptive statistical methods were applied for the purpose. Data for the years 2004–2015,<sup>1</sup> published by Eurostat, Central Statistical Office of Poland (GUS), and Federal Statistical Office of Germany (Destatis) were used.

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1. The starting year for the analysis of the population was 2010 because following the National Census conducted in 2011 (the first time since German reunification in 1990) it was discovered that the actual population of Germany is almost 1,6 million smaller than it had been reported by national and EU statistics.

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**E-mail addresses of the authors**

Sławomir Pastuszka: spastuszka@op.pl

This comparative analysis clearly shows the dynamics and complexity of demographic processes at the level of European regions and their expected impact on economic development. The article consists of eight parts. The first part presents the general characteristics of the German Länder and Polish regions. The second part discusses synthetically the most important factors influencing the demographic situation. In the following six sections spatial analysis of the demographic changes in Germany and Poland are discussed. It covers such elements as: population growth, rate of natural increase, fertility rate, net migration rate, population structure according to economic age groups and old-age rate. The article ends with a summary and most important conclusions. The study included 32 administrative regions, including 16 Länder and the same number of Polish voivodships.

## 1 Characteristics of the areas covered by the study

Germany, similarly to Poland, is divided into 16 administrative regions, which, due to their geographical location and level of economic development can be divided into eastern and western parts (East and West Germany and Eastern Poland and the rest of the country). Although in the classification of the European regions, German federal states (Länder) are NUTS 1 units and the Polish regions—NUTS 2, in both cases they fall into the implementation of the cohesion policy and are comparable in size.

West Germany occupies 69,5% of the country and is inhabited by 80,4% of the total population of Germany. The western Länder are more densely populated (an average of 266 persons per 1 km<sup>2</sup>) than the national average. East Germany includes six Länder together with Berlin and they represent the remainder of the country, which previously formed the German Democratic Republic. These are distinguished by markedly lower population density (148 people per 1 km<sup>2</sup>; without Berlin—116,9) and a lower level of urbanization. In West Germany there are 11 cities with a population of over 500 thousand residents acting as major economic centers, whereas in East Germany there are only 3 cities including Berlin.<sup>2</sup> For these reasons, the GDP per capita is higher in West Germany with about 1/3 of this size in East Germany.

In Poland, as in Germany, the eastern part of the country is less developed. It covers five voivodships: Lubelskie, Podkarpackie, Podlaskie, Świętokrzyskie and Warmińsko-Mazurskie. They occupy more than one-third of the country (31,6%) with a population of 21,2% of the entire population. The largest cities are the capitals of the regions: Lublin (340 000 inhabitants), Białystok (295 000 inhabitants), Kielce (198 000 inhabitants), Rzeszów (185 000 inhabitants) and Olsztyn (173 000 inhabitants). None of them, therefore, has a population larger than 400 000 residents. The average population density of the macro-region (82,4 persons per km<sup>2</sup>) is significantly lower than the national average and that of East Germany.<sup>3</sup>

Polish eastern voivodships are among the least economically developed regions in the European Union, which is reflected in the low level of GDP per capita, unfavorable employment structure, inefficient agriculture playing a great role in the economy of the regions, lack of an innovation economy and weak investment attractiveness.<sup>4</sup> Other parts of Poland (almost 69% of the total area of the country) include the main economic centers in Warsaw (1 744 000 inhabitants), Kraków (761 000 inhabitants), Łódź (700 000 inhabitants), Wrocław (635 000 inhabitants), Poznań (542 000 inhabitants), Szczecin (405 000 inhabitants), Trójmiasto—Gdańsk, Gdynia and Sopot and in the heavily industrialized region of Śląsk (Stańczak et al. 2016). Warsaw, in contrast to Berlin, is the seat of almost all central institutions and is home to the largest central enterprises.

2. See: Statistisches Jahrbuch. Deutschland und Internationale. Statistisches Bundesamt, Wiesbaden 2016, page 30, [@:] [https://www.destatis.de/DE/Publikationen/StatistischesJahrbuch/StatistischesJahrbuch2016.pdf?\\_\\_blob=publicationFile](https://www.destatis.de/DE/Publikationen/StatistischesJahrbuch/StatistischesJahrbuch2016.pdf?__blob=publicationFile).

3. [In the journal European practice of number notation is followed—for example, 36 333,33 (European style) = 36 333.33 (Canadian style) = 36,333.33 (US and British style).—Ed.]

4. See: Informacja o realizacji Strategii rozwoju społeczno-gospodarczego Polski Wschodniej do roku 2020 za rok 2015. Ministerstwo Rozwoju, Departament Strategii Rozwoju, kwiecień 2016 r., pages 8–15, [@:] [https://www.miir.gov.pl/media/19808/Informacja\\_o\\_realizacji\\_SRPW\\_do\\_2020\\_z\\_2015\\_rok.pdf](https://www.miir.gov.pl/media/19808/Informacja_o_realizacji_SRPW_do_2020_z_2015_rok.pdf).

**Tab. 1.** Basic data related to the German federal states and Polish voivodships in 2015

| Germany                          |                  |                 | Poland                        |                  |                 |
|----------------------------------|------------------|-----------------|-------------------------------|------------------|-----------------|
| State                            | GDP <sup>a</sup> | UR <sup>b</sup> | Voivodship                    | GDP <sup>a</sup> | UR <sup>b</sup> |
| Germany . . . . .                | 36,9             | 4,6             | Poland . . . . .              | 18,8             | 7,5             |
| Baden-Württemberg . . . . .      | 42,4             | 3,1             | Dolnośląskie . . . . .        | 22,1             | 7,0             |
| Bavaria . . . . .                | 42,8             | 2,9             | Kujawsko-Pomorskie . . . . .  | 16,1             | 7,9             |
| Bremen . . . . .                 | 45,8             | 5,6             | Lubelskie . . . . .           | 13,6             | 9,3             |
| Lower Saxony . . . . .           | 32,7             | 7,9             | Lubuskie . . . . .            | 16,5             | 6,4             |
| Hamburg . . . . .                | 59,5             | 4,3             | Łódzkie . . . . .             | 18,5             | 7,7             |
| Hesse . . . . .                  | 42,7             | 4,0             | Małopolskie . . . . .         | 16,6             | 7,1             |
| North Rhine-Westphalia . . . . . | 36,2             | 5,2             | Mazowieckie . . . . .         | 31,6             | 6,4             |
| Rhineland-Palatinate . . . . .   | 32,6             | 4,1             | Opolskie . . . . .            | 16,0             | 6,5             |
| Saarland . . . . .               | 34,1             | 5,6             | Podkarpackie . . . . .        | 14,0             | 11,6            |
| Schleswig-Holstein . . . . .     | 29,1             | 4,2             | Podlaskie . . . . .           | 14,1             | 7,0             |
| Berlin . . . . .                 | 34,4             | 9,4             | Pomorskie . . . . .           | 19,0             | 6,6             |
| Brandenburg . . . . .            | 25,6             | 5,7             | Śląskie . . . . .             | 20,6             | 7,2             |
| Mecklenburg-Vorpommern . . . . . | 24,0             | 7,8             | Świętokrzyskie . . . . .      | 14,3             | 10,1            |
| Saxony . . . . .                 | 27,6             | 6,3             | Warmińsko-Mazurskie . . . . . | 14,1             | 9,5             |
| Saxony-Anhalt . . . . .          | 24,3             | 8,0             | Wielkopolskie . . . . .       | 21,5             | 5,8             |
| Thuringia . . . . .              | 25,4             | 5,8             | Zachodniopomorskie . . . . .  | 16,8             | 7,5             |

*Source:* Own elaboration based on data published by Eurostat, as on 29 June 2017

<sup>a</sup>GDP per capita (EUR thousand)

<sup>b</sup>Unemployment rate (%)

## 2 Factors determining the demographic situation

At the core of the demographic change are complex and mutually reinforcing causes of cultural, economic, political and geographical nature (Okólski 2010). As early as in the mid-twentieth century families with four or more children, especially in rural areas and among working-class families, were a normal phenomenon in various European countries. At present, the norm is to have one child, rarely two, and this occurs both in Germany and in Poland (Testa 2007).<sup>5</sup> It is a common trend that the increase in education and standard of living of parents leads to the decrease in the number of children. Young people are increasingly inclined to first achieving a certain level of education and economic stabilization and then, usually after age 30, having children. This phenomenon is referred to as “postponing of births” (Coleman 2007). It is obvious that having children leads to higher alternative costs by limiting opportunities for professional development, lowering wages and reducing leisure time. In the past, these factors had less influence on decisions concerning having children.

Migratory movements of the population, mainly from rural to urban areas or from smaller cities to large agglomerations, are one of the economic factors in demographic processes. The general mobility of the population related to education, more opportunities to work, efficient communication and easy change of the place of residence is also noticeable. European integration and globalization processes are also conducive to international migration. Directions of migration are determined by the attractiveness of the area as places to work and live. People move to the centers of modern industry and the services sector. This phenomenon is beneficial to both the centers, due to the possibility of obtaining a sufficient number of employees, as well as to migrants, because they can find a satisfying job. In this way, the demographic structure improves in the regions with greater development potential and depopulation occurs in the weaker regions. The in-flow of population reduces the statistical age of residents, increases the fertility rate, improves the economic structure

5. See also: Europe the continent with the lowest fertility. Human Reproduction Update, Vol. 16, No. 6 pp. 590–602, 2010, The ESHRE Capri Workshop Group, [@:] <https://academic.oup.com/humupd/article/16/6/590/743745>.

of age, reduces labor shortages and thus creates the basis for future economic development.<sup>6</sup> On the other hand, in regions where out-migration occurs the aging of society occurs resulting in a reduction of the labor and birth rates as well as the share of working-age population. The dependency ratio and the relationship between budget revenue and social spending deteriorate. The financial viability of pension systems becomes unstable and costs of health care and social assistance increase. As a result of these factors, further reduction in the dynamism of the economy and the decline in income might be expected (Chawla, Betcherman, and Banerji 2007).

On the other hand, attention is paid to some positive aspects associated with a decrease in population and its aging: decline in housing prices, less congestion and pollution, wage growth or decline in the unemployment rate (Coleman and Rowthorn 2011). The causes of migration are also related to political factors and threats to human security. This phenomenon is clearly visible in the migration of people from the countries of North Africa and Asia to Italy, and in Poland in the inflow of the population mostly affected by the crisis in Ukraine (Brunarska 2014).

### 3 Regions of population growth and decline

In 2015 Germany had a population of 82,2 million people and compared to 2010 there was an increase in population of 1,95 million (i.e., 2,4% of the total population).<sup>7</sup> At the same time, the population of Poland decreased by 95,5 thousand (i.e., 0,3%) and at the end of 2015 reached 38,0 million people.<sup>8</sup> In Germany, the largest percentage increase in population was recorded in Berlin (7,4%). With the exception of Saarland, a high percentage of population growth occurred in all the western Länder, especially in the most developed: Hamburg (4,8%), Baden-Württemberg (3,8%), Bavaria (3,7%) and Hesse (3,5%). In absolute terms, the highest increase was recorded in Bavaria (460,1 thousand people) and Baden-Württemberg (401,1 thousand). The areas which are populating fastest include metropolitan areas and university cities: Munich, Frankfurt, Hannover, Stuttgart, Leipzig, Münster, and Cologne. In contrast, there has been a decrease in the number of inhabitants in Saxony-Anhalt, 51,9 thousand people (−2,3%) and in Thuringia, about 24,6 thousand people (−1,1%) and 2,4 thousand people in Mecklenburg. Small East German towns, whose economies are dominated by the coal industry (lignite) and heavy industry, which are becoming less significant, have been particularly affected by the demographic drain. The loss of population in the eastern Länder has been observed continuously since the reunification of Germany in 1990, however, the dynamics of this process in recent years has decreased.

In Poland, population growth occurred in only four voivodships: Mazowieckie (1,6%), Pomorskie (1,4%), Małopolskie (1,1%) and Wielkopolskie (0,8%). The other regions recorded a drop in population. The fastest depopulating regions include Opolskie and Świętokrzyskie (both −2,1%), then Łódzkie (−2,0%) and Lubelskie (−1,8%).

As in the case of the East German federal states, further depopulation will continue in the Polish regions in the future. The regions with declining population and an increasing proportion of older

6. See: Bevölkerung und Erwerbstätigkeit. Bevölkerung mit Migrationshintergrund – Ergebnisse des Mikrozensus 2015. Statistisches Bundesamt (Destatis), 2017, [a:] [https://www.destatis.de/DE/Publikationen/Thematisch/Bevoelkerung/MigrationIntegration/Migrationshintergrund2010220157004.pdf?\\_\\_blob=publicationFile](https://www.destatis.de/DE/Publikationen/Thematisch/Bevoelkerung/MigrationIntegration/Migrationshintergrund2010220157004.pdf?__blob=publicationFile); Immigration: Integration and fundamental rights. Edition 2012. European Economic and Social Committee, “Visits and Publications” Unit, European Union, 2012, [a:] <https://www.eesc.europa.eu/sites/default/files/resources/docs/qe-30-12-822-en-c.pdf>.

7. According to the forecasts of the Federal Statistical Office (see: Bevölkerung Deutschlands bis 2060. 13. koordinierte Bevölkerungsvorausberechnung. Statistisches Bundesamt, Wiesbaden 2015, [a:] [https://www.destatis.de/DE/Publikationen/Thematisch/Bevoelkerung/VorausberechnungBevoelkerung/BevoelkerungDeutschland-2060Presse5124204159004.pdf?\\_\\_blob=publicationFile](https://www.destatis.de/DE/Publikationen/Thematisch/Bevoelkerung/VorausberechnungBevoelkerung/BevoelkerungDeutschland-2060Presse5124204159004.pdf?__blob=publicationFile)) the demographic trend of steady increase in the population of Germany since 2019 will be reversed. Following a systematic decline in the number of births in Germany in the years 2013–2050 the population will decrease by 9,4 million. A different view on the matter was expressed by Weber (Weber 2015) suggesting that annual net migration of 300 thousand people can prevent the depopulation process and may lead to the stable size of the population of approximately 80 million.

8. According to the forecast of the Central Statistical Office of Poland (Waligórska et al. 2014, 113) the population of Poland will decrease by 4,5 million people in the years 2013–2050.

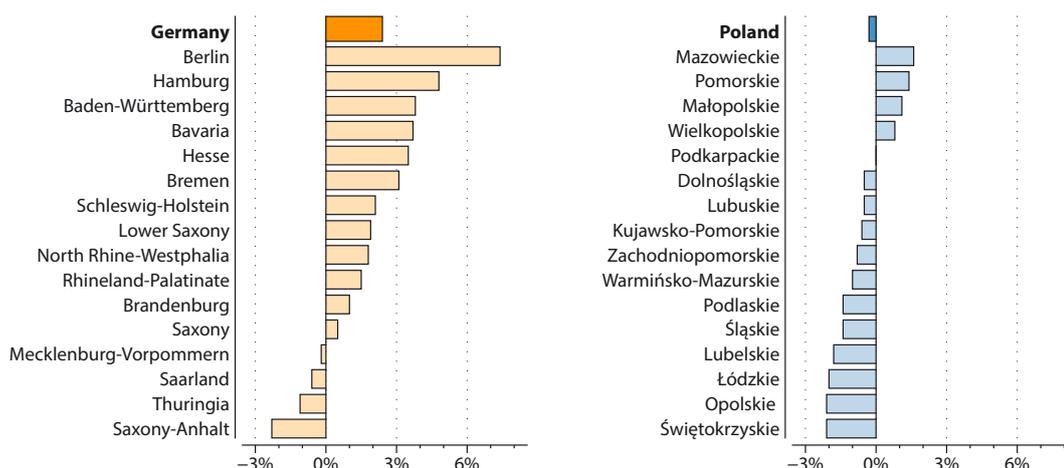


Fig. 1. Changes in population in the German federal states and Polish voivodships in 2010–2015

Source: Own elaboration based on data published by Eurostat, as on 29 June 2017

people will have to face the need to increase public spending on health, social care, urban land use, and transport services, which will have a significant impact on economic growth.<sup>9</sup>

#### 4 Natural movement of population

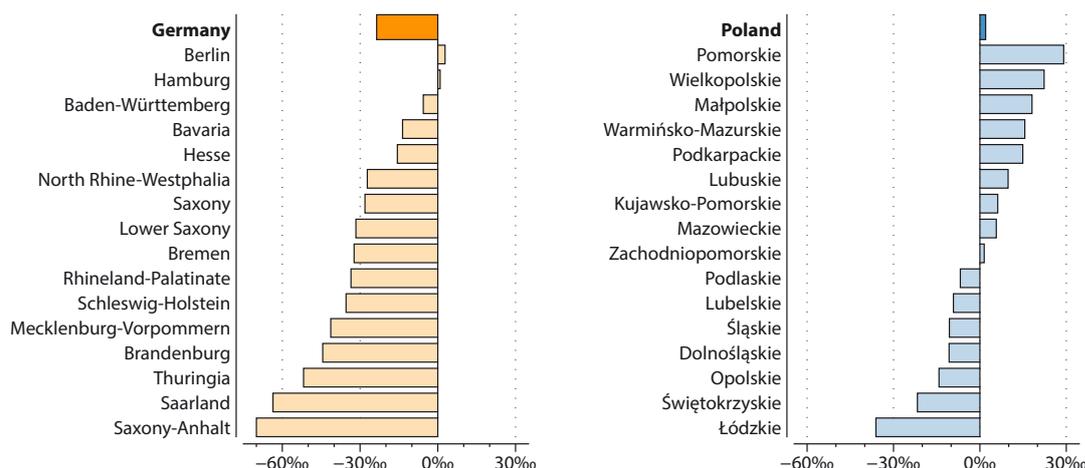
An essential factor in the shaping of demographic phenomena is natural population growth. In the years 2004–2015, Germany as a whole and the majority of Länder recorded a total negative natural increase. The worst situation in this respect occurred in Saxony-Anhalt (−70,0 per 1 000 people in the years 2004–2015), Saarland (−63,6), Thuringia (−51,8), Brandenburg (−44,4) and Mecklenburg (−41,3). Negative values of the natural increase rate result from a simultaneous decline in live births and the mortality rate. The positive natural growth rate was recorded only in the capital city of Berlin (2,8 ‰) and in Hamburg (0,9‰). It is estimated that in the future that negative natural growth will be a deciding factor in demographic development, as the decline of births in the generation born after the reunification of Germany will lead to a decreasing number of births in the next generations. This problem occurs mostly in the eastern Länder, with the exception of Berlin. Negative demographic trends there will not only lead to a general decline in population but also affect the deterioration of the age structure and labor supply. This, on the one hand, will lead to an increased demand for workers in occupations related to the care of the elderly and, on the other hand, to the need to reduce employment in the education of children and youth.<sup>10</sup> Therefore, it should not be taken for granted that the population decline will always lead to a decrease in unemployment. It will depend also on a sufficient number of working age people and their proper qualifications. The European Commission has recognized this problem noting that since 2017 the total number of people in employment will gradually decrease.<sup>11</sup>

In Poland, due to the lower number of deaths and a slight increase in the birth rate in the years 2004–2015 a positive natural growth rate was recorded (2,0‰). In the analyzed period the highest increase was recorded in the Pomorskie Voivodship (29,1‰) as well as Wielkopolskie (22,3‰) and Małopolskie (18,1‰). The least favorable situation occurred in Łódzkie region, which suffered from the collapse of the textile industry, which played a significant role in the regional economy, followed by the Świętokrzyskie, Opolskie, Śląskie, and Dolnośląskie voivodships (less than 10‰).

9. See: The impact of ageing on public expenditure: projections for the EU25 Member States on pensions, health care, long-term care, education and unemployment transfers (2004–2050). Report prepared by the Economic Policy Committee and the European Commission (DG ECFIN). Special Report no 1/2006, [at:] [https://europa.eu/epc/sites/epc/files/docs/pages/ageingreport\\_en.pdf](https://europa.eu/epc/sites/epc/files/docs/pages/ageingreport_en.pdf).

10. See: Statistischer Bericht B III 1 – j/13. Studierende an Hochschulen in Berlin. Wintersemester 2013/2014. [at:] [https://www.statistik-berlin-brandenburg.de/publikationen/stat\\_berichte/2014/SB\\_B03-01-00\\_2013j01\\_BE.pdf](https://www.statistik-berlin-brandenburg.de/publikationen/stat_berichte/2014/SB_B03-01-00_2013j01_BE.pdf).

11. See: The impact of ageing on public expenditure..., op. cit., pages 40–45.



**Fig. 2.** Total natural increase per 1000 population in the German federal states and Polish voivodships in the years 2004–2015

Source: Own elaboration based on data published by Eurostat, as on 29 June 2017

The decreasing number of births in these regions, as well as in the eastern federal states of Germany, leads to decrease in the share of young people in the total population and, consequently, to the deterioration of the age structure and the accelerated ageing of the population with its negative consequences for the regional labor market and the economy.<sup>12</sup>

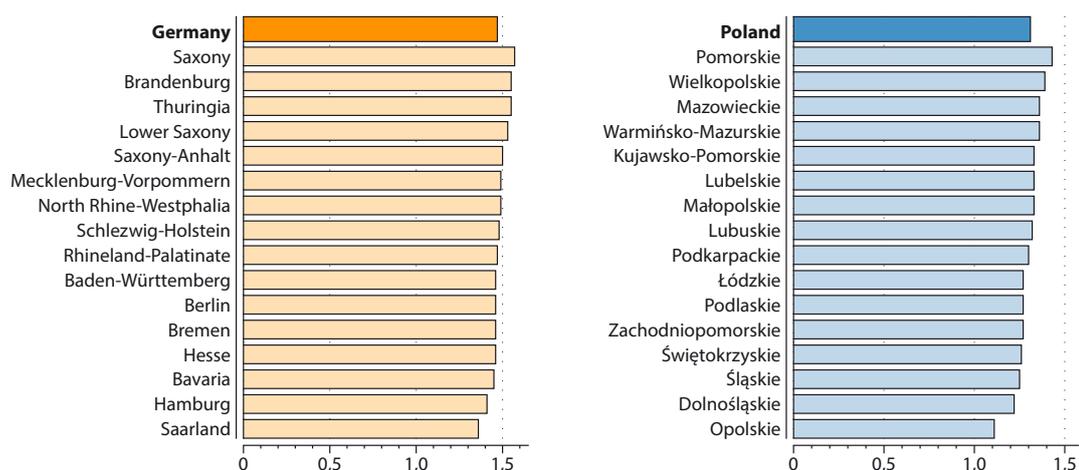
## 5 Low birth rate

Population growth is determined by the fertility rate. In the years 2004–2014 the average level of fertility in the German federal states ranged from 1,36 (Saarland) 1,57 (Saxony) while in the Polish regions it was significantly lower—in the range of 1,11 (in the Opolskie Voivodship) to 1,43 (in Pomorskie) (fig. 3).<sup>13</sup> The situation in this respect is more favorable in the German Länder than the Polish regions, which is confirmed by the fact that the low birth rate in Saarland is equal to the high fertility rate—in Polish terms—in the Mazowieckie Voivodship together with the whole potential of Warsaw as a capital of the country. The higher number of births in Germany results primarily from the relatively high fertility of immigrant women, who, in contrast to German women, often opt for two or more children. The consequences of low fertility in Poland will probably be more severe due to the negative balance of migration (Kotowska et al. 2008). In both countries, the intensity of fertility has changed over time. In Germany, until the end of the 1990s, fertility was systematically decreasing due to the tendency to postpone the decision to have a child. Then, for four consecutive years, it remained at a similar level, and from 2004 to the present time a slight increase has been recorded. In contrast to Germany, in Poland the fertility rate increased to 2009 and then began to decline (Podgrodzka 2011).

Throughout the analyzed period, despite the introduction of financial support for families with children, the level of fertility in both German federal states and Polish regions was significantly below the replacement rate of 2,1. The authors of the study published by the Vienna Institute of Demography (Lutz, Skirbekk, and Testa 2006) draw attention to the ensuing demographic threat. In their view, the longer the fertility rate will remain at such a low level, it will be less likely to

12. See: Arbeitsmarkt 2014. Amtliche Nachrichten der Bundesagentur für Arbeit, 62. JAHRGANG, Sondernummer 2, Bundesagentur für Arbeit, [a:] <https://statistik.arbeitsagentur.de/Statistikdaten/Detail/201412/ama/heft-arbeitsmarkt/arbeitsmarkt-d-0-201412-pdf.pdf>.

13. According to the demographic forecast of researchers from the Vienna Institute of Demography taking into account the assumptions of Eurostat, the value of the total fertility rate in 2050 in both countries will remain low: 1,47 in Germany and 1,62 in Poland (see: Probabilistic Population Projections for the 27 EU Member States Based on Eurostat Assumptions. By Sergei Scherbov, Marija Mamolo, and Wolfgang Lutz, European Demographic Research Papers 2, Vienna 2008, pages 41, 61, [a:] [https://www.oew.ac.at/fileadmin/subsites/Institute/VID/PDF/Publications/EDRP/edrp\\_2008\\_02.pdf](https://www.oew.ac.at/fileadmin/subsites/Institute/VID/PDF/Publications/EDRP/edrp_2008_02.pdf)).



**Fig. 3.** Average fertility rates in the German federal states and Polish voivodships in 2004–2014

Source: Own elaboration based on data published by Eurostat, as on 29 June 2017

increase this in the future in the absence of an influx of immigrants. Regionally, the lowest fertility rates in Germany are recorded in the western lands. In Poland, the voivodships characterized by particularly low fertility rates do not constitute a spatially compact area as they are situated in different parts of the country. A lower fertility rate than the national average is recorded in the voivodships in both the south-western part of Poland (Opolskie, Dolnośląskie and Śląskie), the north-west (Zachodniopomorskie) as well as in central Poland (Łódzkie) and eastern Poland (Podlaskie, Podkarpackie and Świętokrzyskie).

## 6 Outward and inward migration of people

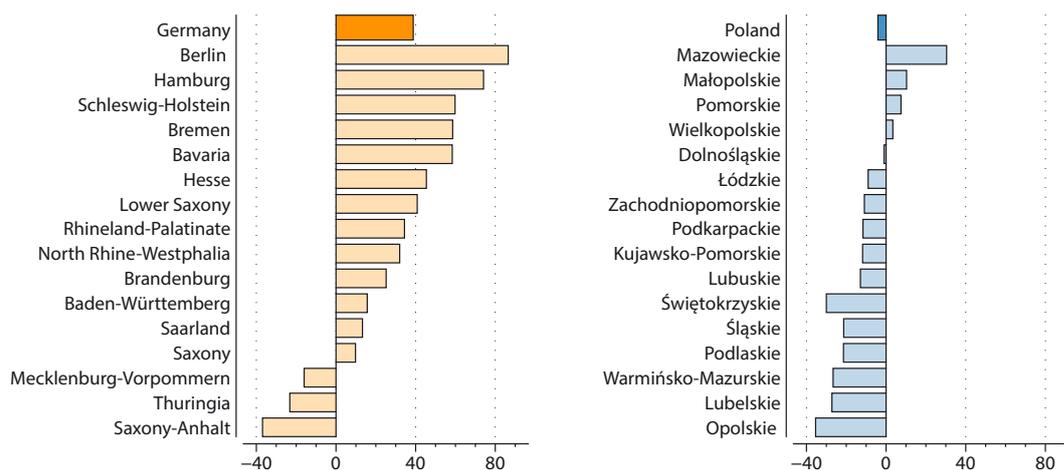
Since the mid-twentieth century Germany has been a country of net immigration. In the last 25 years it was a positive migration balance that had a decisive influence on the increase in the population of Germany. In 2015 out of 82 million of its population 17 million inhabitants came from other countries. Among them the largest foreign community are Turks (16,6% of all immigrants), followed by Poles (9,9%) and Russians, (7,1%) and also citizens of Kazakhstan, Romania and Italy.<sup>14</sup> The migration in Germany is spatially diverse. The positive migration balance is recorded in thirteen Länder. The largest occurred in Bavaria and amounted to 750,2 thousand people, followed by North Rhine-Westphalia, Baden-Württemberg, Saxony, Lower Saxony and Berlin. However, in relative terms, the highest migration rates were recorded in Berlin (86,5 immigrants per 1 000 citizens) and Hamburg (74,1). The target area of intense migratory movements is primarily large cities and their immediate surroundings as they are an attractive place to live, work and study. The negative migration balance caused mainly by the outflow of the Germans to the western Länder occurred in the three East German states. The biggest drain of human capital was reported in Saxony-Anhalt, where the ratio of net migration in the analyzed period amounted to  $-37\%$ , Thuringia ( $-23,2\%$ ) and Mecklenburg-Western Pomerania ( $-16,0\%$ ) (Jeziarska-Thöle 2016). The outward migration of residents from the eastern part of Germany, with the exception of Berlin, has been reported continuously since the reunification, whereby since 2009 the growth of this process decreases.<sup>15</sup> The most popular places of migration are western lands (e.g., from Saxony Anhalt to Lower Saxony and from Thuringia to Bavaria).<sup>16</sup> Particularly worrying is the fact that it is mainly young people aged up to 30 years, especially women, who emigrate, which no doubt leads to reducing the proportion of young people in the population and consequently to low fertility or its decline.

14. See: Bevölkerung und Erwerbstätigkeit. Bevölkerung mit Migrationshintergrund..., op. cit, page 62.

15. See: Bevölkerung Deutschlands bis 2060. op. cit.

16. See: 25 Jahre Deutsche Einheit. Statistisches Bundesamt, Wiesbaden 2015, [@:] [https://www.destatis.de/DE/Publikationen/Thematisch/Regionales/25JahreDeutscheEinheit0007028159004.pdf?\\_\\_blob=publicationFile](https://www.destatis.de/DE/Publikationen/Thematisch/Regionales/25JahreDeutscheEinheit0007028159004.pdf?__blob=publicationFile).

Poland, in contrast to Germany, is a country of net emigration mainly to Germany and the UK.<sup>17</sup> In the years 2004–2015 a negative migration balance was recorded, which amounted to  $-4,1$  per 1 000 people. The negative migration balance in the period 2004–2015 resulted in a decrease in the population of 155 thousand people, despite the positive balance of natural increase (Stańczak et al. 2016). The loss of population due to emigration is partly compensated by the increasing influx of immigrants (an increase from 10 thousand in 2006 to 157,1 thousand in 2011 and 268,3 thousand in 2014). As a result of these processes, the largest negative balances of foreign migration were recorded in 2006 ( $-36$  thousand people) and 2007. In subsequent years, the balances decreased to almost  $-11$  thousand people in 2014 and  $-12,7$  thousand in 2015.<sup>18</sup>



**Fig. 4.** Total migration balance per 1 000 population in the German federal states and Polish voivodships in 2004–2015

Source: Own elaboration based on data published by Eurostat, as on 29 June 2017

The negative balance of migration, in contrast to Germany's federal states, occurred in most Polish voivodships. Its largest scale was reported in the regions adjacent to the Czech Republic: Opolskie ( $-35$  people per 1 000 in the years 2004–2015), followed by Lubelskie ( $-27,2$ ), Warmińsko-Mazurskie ( $-26,6$ ), Podlaskie ( $-21,4$ ), Śląskie ( $-21,3$ ) and Świętokrzyskie ( $-21,0$ ). The emigration in Poland mainly includes the movement within the country, mainly from small towns to large urban centers (Warszawa, Kraków, Gdańsk, and Poznań). These cities quickly joined the network of European cities and they have developed modern services offering attractive jobs and career prospects for young and educated people. As a result, only the four regions, whose capitals are listed above, indicate higher inward migration than outward.

## 7 Changes in the populations' age structure

The result of demographic processes in the years 2004–2015 was changes in the age structure of the population. In Germany, there was a decline in the number of people of pre-working age by 1 043 thousand people (i.e., 8,7%), and the increase of post-working age of 1 214 thousand (i.e., 2,2%). At the same time, there was an increase in retirement age by up to 1 933 thousand (i.e., 12,6%). The percentage of population of pre-working age decreased in all western Länder with the exception of Hamburg, while it increased in the eastern Länder. Still, at the end of 2015, the share of this group in the total population (about 13%) was higher in the western part of the country.

17. According to the estimates of the Central Statistical Office of Poland in the years 2004–2012 more than 2 million people emigrated from Poland (see: Informacja o rozmiarach i kierunkach emigracji z Polski w latach 2004–2012. GUS, Warszawa, październik 2013, [a:] <https://stat.gov.pl/obszary-tematyczne/ludnosc/migracje-zagraniczne-ludnosc/informacja-o-rozmiarach-i-kierunkach-emigracji-z-polski-w-latach-20042012,2,6.html>).

18. See: Podstawowe informacje o rozwoju demograficznym Polski do 2014 r. Notatka informacyjna, GUS, Warszawa 27 stycznia 2015, [a:] <http://stat.gov.pl/obszary-tematyczne/ludnosc/ludnosc/podstawowe-informacje-o-rozwoju-demograficznym-polski-do-2014-roku,12,5.html>.

The exception was Saarland, which, together with Saxony-Anhalt has the smallest share of people aged up to 14. In varying degrees all Länder recorded the growth of population aged 65 and more, resulting in an increase in the percentage of this group in the total population. The best situation involving the elderly representing less than 20% of the local population is observed in Hamburg, Berlin, Baden-Wuerttemberg and Bavaria. The least favorable situation in this respect occurs in the eastern Länder, in particular in Saxony and Saxony-Anhalt, where, in 2015 more than 25% of the population exceeded the age of 65.

In Poland, the percentage decrease in the number of people in pre-working and working age was higher than in Germany and amounted to 10,0% (−668,3 thousand people) and 2,0% respectively. Higher than in Germany was also an increase in the population of post-working age (i.e., 20,8%). The largest percentage decline in population in pre-working age was recorded in the voivodships of: Opolskie (−21,8%), Podlaskie (−20,0%), Świętokrzyskie (−19,8%) and Podkarpackie (−19,1%). At the end of 2015, the smallest percentage of people of pre-working age was recorded not only in the Świętokrzyskie region (13,5%) and Opolskie (13,6%), but also in Łódzkie, Śląskie, and Dolnośląskie voivodships. The most favorable situation in this respect is observed in the regions with positive migration balance—i.e., Pomorskie (16,4%), Wielkopolskie (16,1%), Małopolskie and Mazowieckie (15,8%). The percentage of the population of post-working age in the years 2004–2015 grew fastest in the Pomorskie (31,1%), Zachodniopomorskie (30,1%), and Lubuskie regions (28,7%). However, the largest proportion of older people in the population occurs in the voivodships with the lowest rate of natural increase—i.e., Łódzkie (17,7%), Świętokrzyskie (17,3%), then Opolskie (16,9%), Śląskie (16,8%), Lubelskie (16,5%), and Dolnośląskie (16,4%). Despite this, in 2015 the “oldest” Polish voivodships were better off in this respect than Hamburg, “the youngest” among the German Länder.

Changes in the population structure will have a negative impact on economic and social development, because with the decreasing participation of young and better-educated people the professional activity and territorial mobility of the population, entrepreneurship as well as innovation and productivity decrease while social spending in favor of the growing number of older people increase (Prskawetz 2005).

## 8 The ageing of the population

Low fertility rate together with a positive phenomenon, which is longer life expectancy,<sup>19</sup> results in an increase in the proportion of older people (i.e., the aging of the population). To evaluate this process various indicators are used (Abramowska-Kmon 2011). These include median age, the proportion of very old people in the population and the proportion of the very old people in the population of the elderly. To assess the severity of aging of the inhabitants of the German Länder and Polish voivodships, a demographic old age index was used, which describes the relationship between the number of people of post-working age per 100 people of pre-working age.<sup>20</sup> Index values above 100 indicate more older people than children and young people aged up to 14.

Germany is generally characterized by a high index of old age as at the end of 2015 out of 100 people of pre-working age there were 159,0 people of post-working age (i.e., 30 more than in 2004). A significantly larger number of people 65 and older than the number of children and adolescents below the age of 15 was observed in every federal state. The worst situation in this respect was reported in Saxony-Anhalt, Thuringia, Saxony and Saar (see table 2). The least advanced aging of the population is observed in two cities-federal states: Hamburg and Berlin as well as in Baden-Württemberg.

19. In the 35 years between 1990 and 2015 life expectancy at birth in Germany increased from 75,4 to 80,7 years, while in Poland from 70,7 to 77,5 years (see: Mortality and life expectancy statistics, Data extracted in June 2017, data published by Eurostat, [a:] [http://ec.europa.eu/eurostat/statistics-explained/index.php/Mortality\\_and\\_life\\_expectancy\\_statistics](http://ec.europa.eu/eurostat/statistics-explained/index.php/Mortality_and_life_expectancy_statistics)).

20. See: World Population Ageing: 1950–2050. Annex I. Definition of the indicators of population ageing. United Nations, New York 2001, [a:] <http://www.un.org/esa/population/publications/worldageing19502050/pdf/95annexi.pdf>.

In Poland, the process of aging population is less advanced. In 2015 the demographic old age index was 106,5 people and increased compared to 2004 by more than 27 people. It should be noted, however, that the pace of change in Poland was, however, higher by 50% than in Germany. The highest values of the index (over 120 people) are reported in Łódzkie, Świętokrzyskie, and Opolskie voivodships. The lowest values are observed in Pomorskie, Wielkopolsce, and Warmińsko-Mazurskie voivodships. According to the United Nations report,<sup>21</sup> Eurostat (*People in the EU...* 2015, 158–172), and Statistical Office of Poland (Waligórska et al. 2014, 131–141) the growth rate of people over 65 years old will intensify, which could result in 2050 in similar values of demographic aging in Poland and in Germany.

The aging population in individual Länder and regions has a number of consequences for the labor market (Ciura and Szymańczak 2012). Firstly, labor supply decreases, which simply means less “manpower.” Secondly, employees will be older and that means that they often will not be able to perform work requiring a high level of physical fitness. Thirdly, the demand for professional qualifications will change. The demand for occupations defined as “white collar” directly related to the provision of care services, nursing and physiotherapy will increase. At the same time, the demand for occupations related to the care and upbringing of children and education will decrease. According to the forecast of the European Commission the costs of aging will lead to lower structural balances of countries and thus the risk of excessive public debt will be greater (*The 2015 Ageing Report...* 2015). Weber (2015) believes that in the future the main challenge for the labor market in Germany will probably be related to the increase in the number of pensioners accompanying the decrease in the size of the population of working age and not simply a reduced number of the total population.

**Tab. 2.** Ageing index (% population aged 65 years and over as a share of the population aged 0–14)

| State                            | Germany |       | Poland                        |            |
|----------------------------------|---------|-------|-------------------------------|------------|
|                                  | 2004    | 2015  | Voivodship                    | 2004 2015  |
| Germany . . . . .                | 128,9   | 159,0 | Poland . . . . .              | 78,7 106,1 |
| Baden-Württemberg . . . . .      | 111,8   | 143,9 | Dolnośląskie . . . . .        | 87,3 116,1 |
| Bavaria . . . . .                | 115,5   | 150,1 | Kujawsko-Pomorskie . . . . .  | 70,2 102,5 |
| Bremen . . . . .                 | 150,3   | 164,9 | Lubelskie . . . . .           | 81,0 112,0 |
| Lower Saxony . . . . .           | 119,3   | 159,8 | Lubuskie . . . . .            | 67,8 98,4  |
| Hamburg . . . . .                | 136,8   | 138,3 | Łódzkie . . . . .             | 96,9 126,6 |
| Hesse . . . . .                  | 123,0   | 150,4 | Małopolskie . . . . .         | 74,0 97,5  |
| North Rhine-Westphalia . . . . . | 121,8   | 153,0 | Mazowieckie . . . . .         | 90,2 103,4 |
| Rhineland-Palatinate . . . . .   | 125,8   | 161,7 | Opolskie . . . . .            | 84,7 124,9 |
| Saarland . . . . .               | 149,4   | 197,8 | Podkarpackie . . . . .        | 67,8 99,0  |
| Schleswig-Holstein . . . . .     | 123,5   | 172,7 | Podlaskie . . . . .           | 82,0 113,0 |
| Berlin . . . . .                 | 136,2   | 143,0 | Pomorskie . . . . .           | 66,3 90,6  |
| Brandenburg . . . . .            | 170,7   | 186,1 | Śląskie . . . . .             | 84,9 118,9 |
| Mecklenburg-Vorpommern . . . . . | 171,3   | 187,2 | Świętokrzyskie . . . . .      | 88,5 125,1 |
| Saxony . . . . .                 | 204,0   | 197,9 | Warmińsko-Mazurskie . . . . . | 62,4 92,4  |
| Saxony-Anhalt . . . . .          | 197,8   | 215,6 | Wielkopolskie . . . . .       | 67,4 91,5  |
| Thuringia . . . . .              | 186,5   | 198,0 | Zachodniopomorskie . . . . .  | 71,7 108,0 |

Source: Own elaboration based on data published by Eurostat, as on 29 June 2017

21. See: World Population Ageing 2015. United Nations, New York 2015, page 142, [@:] [http://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2015\\_Report.pdf](http://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2015_Report.pdf).

## Conclusions

Spatial demographic changes in Germany and Poland have more differences than similarities. In Germany, population growth is observed in twelve federal states and the decline in four whereas in Poland the population increased in only four voivodships and decreased in twelve. In both countries, population growth is recorded in the economically most developed regions. The population growth in the German Länder is directly linked to a high positive migration balance, which compensates for the negative or low rate of natural increase, while the increase in population in the Polish regions is the result of positive net migration and a positive natural increase. Intense influx of immigrants in both countries is observed in the areas of metropolitan centers, which thus maintain a favorable economic structure of the population with a relatively large proportion of people of working age. The problem of outward migration, mainly of young people, and population decline in Germany is present in the eastern lands whereas in Poland in Opolskie, Łódzkie, Świętokrzyskie, and Śląskie voivodships located in different parts of the country. Understandably, then, these lands and regions experience a generally higher percentage of the population in older age. Although the severity of the demographic of old age in Polish voivodships is much lower than in the Länder, an observed higher rate of aging population in the Polish regions is likely to result within the next few decades in the similar value of their old age index to the level of the German federal states.

Generally, it can be concluded that in Germany the most favorable demographic situation is observed in Berlin, Hamburg and highly developed Länder with diversified structure of the economy: Baden-Wuerttemberg and Bavaria, situated in the south of the country. Among the western Länder an unfavorable demographic situation occurs only in the Saarland which, due to the very high negative birth rate, the lowest fertility rate in the country and low positive net migration, is characterized by a very high old-age rate. The biggest demographic problems are faced by lagging eastern lands, especially Saxony-Anhalt and Thuringia, wherein problems resulting from the negative birth rate are increased by the strong migration outflow to the western states. The outflow of the population of these Länder is at the same time both the cause and the result the result of the lower level of development of these parts of the country.

In Poland, the regions characterized by both good and bad demographic situations are located in different parts of the country. The best demographic situation is observed in the voivodships with the highest population growth and positive net migration: Małopolska (south of the country), Mazowieckie (center of the country), Pomorskie (northern part of the country) and Wielkopolska (western part). The worst situation in this regard occurs in less-developed voivodships of Opolskie (south-western part of the country) and Świętokrzyskie (central-eastern part) as well as in the highly industrialized regions of Łódzkie (central part of the country) and Śląskie (south of the country) where the lowest birth rates are accompanied by a high negative migration balance. In the last two regions, similarly to the land of Saarland, the unfavorable demographic trend is associated with the decline of the previously dominant heavy and textile industries.

In summary, the analysis confirmed the findings of other studies, that in Germany the most unfavorable demographic processes occur in the less developed eastern Länder.<sup>22</sup> Whereas in Poland, the demographic situation is not so clearly determined by geographic location and the level of economic development. Although the eastern voivodships are less urbanized and less developed economically, their current demographic situation is varied and often better than in the more developed and urbanized regions of Śląskie, Łódzkie and Opolskie, situated in different parts of the country.

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22. See: 25 Jahre Deutsche Einheit. op. cit., pages 18–19; Annual Report of the Federal Government on the Status of German Unity in 2016. Federal Ministry for Economic, Affairs and Energy (BMWi), Task Force on the New Federal States, PRpetuum GmbH, Munich, September 2016, [@:] [https://www.bmwi.de/Redaktion/EN/Publicationen/jahresbericht-zum-stand-der-deutschen-einheit-2016.pdf?\\_\\_blob=publicationFile&v=4](https://www.bmwi.de/Redaktion/EN/Publicationen/jahresbericht-zum-stand-der-deutschen-einheit-2016.pdf?__blob=publicationFile&v=4).

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