

The dynamics of change in bed occupancy in health establishments in Poland

Paweł Łuka

University of Rzeszów, Poland

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Abstract

The purpose of this study was to examine the dynamics of occupancy in health establishments in Poland over the past decade. The study focuses on changes in the number of overnight guests and the number of all nights spent in health resorts in Poland in the years 2007-2017. For this evaluation, the empirical data from the latest edition of "Tourism in 2017" published by Central Statistical Office in Poland [1], were taken. The total number of overnight visits and the total number of overnight stays include both resident and non-resident guests staying overnight in Polish health resorts. The obtained data pertaining to the changes in the number of all visitors and stays were analyzed in an absolute and a relative (percentage) scales. The results shown in a relative scale provide a better picture of the dynamics of changes in the researched processes as all values are assigned an initial value of 100 percent. They therefore inform us what was the dynamics of changes of the initial 100 visitors who stayed in Polish health establishments in the years 2007-2017. In this study two types of definitions of dynamics were used: an absolute definition of dynamics for continuous series and a relative one of dynamics for these continuous series converted to a percentage scale. Dynamics in both of these cases was seen as momentary velocities and momentary accelerations on a strictly defined path of the process.

Corresponding address:

University of Rzeszów
pavelluka@gmail.com

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health establishments,
health resort
management,
dynamics of change

Characteristics of accommodation capacity in health establishments in Poland

Health resorts, nowadays, play a significant role in Polish and regional economy. They are treated as a specialized branch of health tourism. In recent years, in the world, and also in Poland, the significant growth and the rapid rate of its development is observed. With an increased demand for and supply of establishments offering health oriented products and experiences, the health resorts in Poland are in a crucial stage of their current development process. In addition to many economic advantages, this sector also brings many social benefits. With the changes of the modern lifestyle and the growing demand for a health-oriented services, in the most of Polish health resort destinations, the positive socio-economic trends can be observed. Destroyed aged structures, spa parks and associated architecture are revitalized. Also, new structures are built on the basis of the original, historical assumptions. Treatment rooms in sanatoriums, hospitals, clinics and health spas are enriched with modern facilities. Also, accommodation quality in health establishments do not differ from standardized hotels. According to the Central Statistical Office [1], in 2017 on average, the occupancy rate of bed places in health establishments was at the highest level among all tourist

accommodation establishments in Poland (77,5%). For comparison, the bedspace occupancy rate for hotels in Poland was on average only 42,2% (Fig. 1). The main problem on this market is that not in all health resorts positive actions proceed at a steady pace. The reason is the interaction of supply and demand, which makes the health resort companies, operating in different market structures, both in the public and private sectors, have completely different economic opportunities. But the market for health tourism, like any other market is surrounded by many different environmental forces and will be filled with more efficiently operating mechanisms working for health. Financial support, as well as relevant regulations of local and central authorities are also very important. Increasingly numerous and fully professional facilities for short-term stays of leisure, recreation, climatic or sightseeing are the evidence that the spas definitely change their character. In health resorts, services are effectively combined with other forms of stays. This is one of the most significant competitive advantages in the tourism market. Non-resident tourists willingly visit Polish health resorts, not only because of lower prices, but mainly because of the high standards of treatment and services. Unfortunately, the total number of foreign guests, comparing to the all guests is still at a very low level, on average 6,4% in 2017 [1]. All of these valuable resources should be efficiently and effectively utilized, and the benefits maximized.

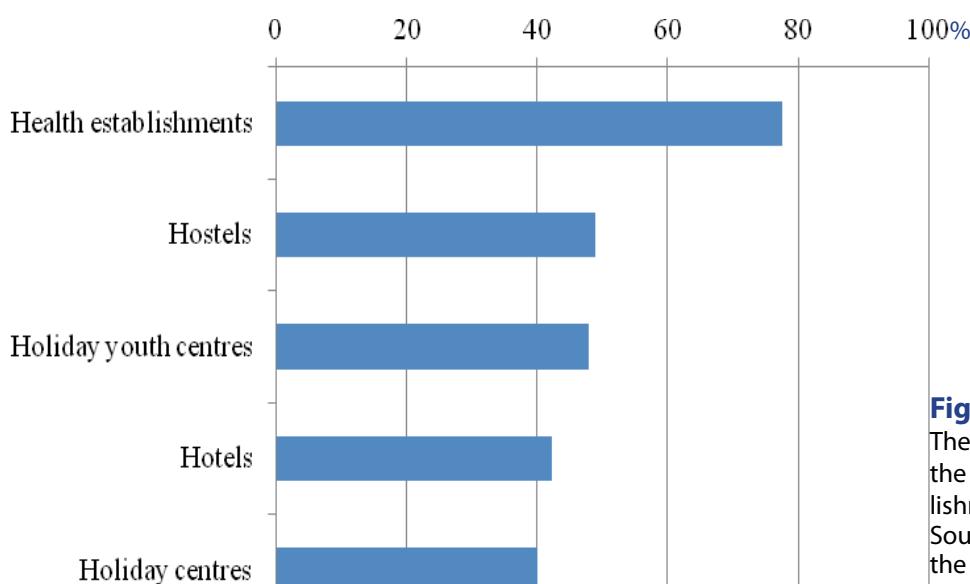


Fig. 1.

The top five bed occupancy rates in the tourist accommodation establishments in Poland in 2017
Source: Own work based on data of the Central Statistical Office [1]

Table 1 presents the data on health establishments, in particular the number of accommodation facilities and the number of bed places in those facilities in the years 2007-2017. During this period, a general increase of all facilities and bed places was observed in Poland, but this growth was the most dynamic since 2011 [see figures 2, 3, 4].

On 31 July 2017, there were 211 registered health establishments in Poland, where accommodation services for patients were provided. In all accommodation facilities of health establishments 38276 bed places were prepared, which was 1355 more than in the previous year. In the year 2017, comparing to the year 2016, although the total number of facilities decreased by 1,9%, the total number of bed places increased by 3,7% While compared to 2007, those

changes were, respectively 35,3% for facilities and 37,3% for bed places [1].

There was an overall increase for accommodation facilities in the health resort market in the researched years. In the years 2007-2011 there was a slight increase in the total value (1,3%), but since 2011 there was a rapid increase in the number of accommodation facilities by 33,5% (Table 1, Fig. 2). The number of bed places has also increased in the years 2007-2017 (37,3%), but in 2011 this value declined by 5,4%, comparing to the previous year. In the years 2007-2011, the marginal values of the number of bed places have decreased significantly, and in 2011 it has reached a negative value (Table 1, Fig. 3). In subsequent years, there was an initial decrease in the marginal values in 2014, but in 2015 there was an increase of dynamics.

Table 1.

The number of facilities and bed places in health establishments in Poland in the years 2007-2017

| Years | Facilities | Bed places |
|-------|------------|------------|
| 2007 | 156 | 27 871 |
| 2008 | 159 | 29 112 |
| 2009 | 158 | 30 987 |
| 2010 | 158 | 31 815 |
| 2011 | 158 | 30 103 |
| 2012 | 190 | 33 681 |
| 2013 | 198 | 34 154 |
| 2014 | 197 | 33 874 |
| 2015 | 205 | 35 671 |
| 2016 | 215 | 36 921 |
| 2017 | 211 | 38 276 |

Source: Own work based on data of the Central Statistical Office [1]

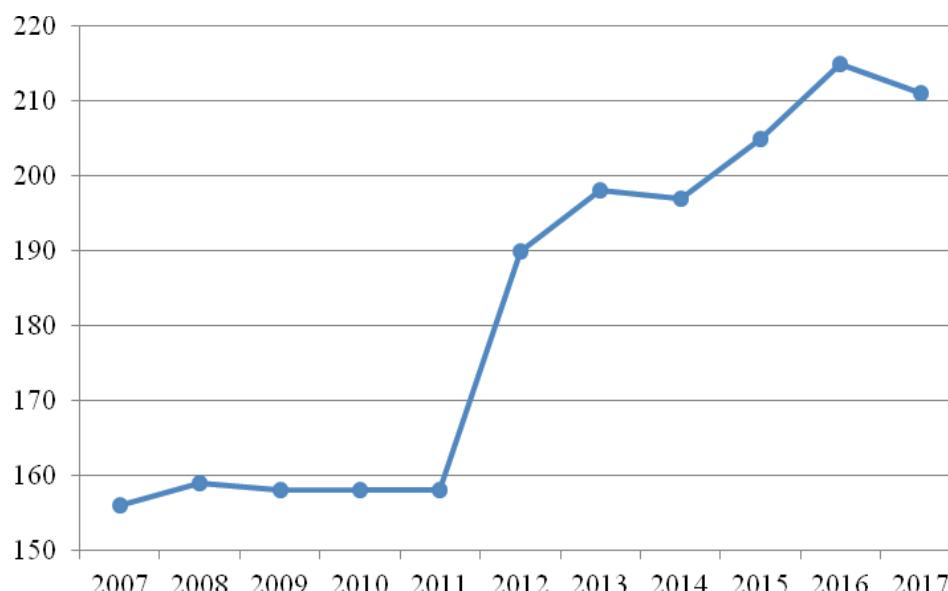


Fig. 2.

The number of health establishments in Poland in the years 2007-2017

Source: Own work based on data of the Central Statistical Office [1]

However, the overall trend was maintained as a positive value. Furthermore, on the figure 4, the development of the total number of health establishments and the total number of bed places in Poland in the years 2007-2017 were provided. The initial value for the year 2007 is 100 percent. There was a general increase in those values, but from 2012 to 2016, the development of the number of health establishments was more dynamic than the development of the number of bed places. In 2017, however, the development of the number of bed places was more dynamic than the number of health establishments.

Methods

The aim of this analysis is evaluation of the dynamics of change in the number of overnight guests and the number of nights spent in health establishments in Poland in the years 2007-2017. In this study, empirical data published by the Central Statistical Office of Poland [1] was applied. The values of overnight visits and stays relate to the total numbers of domestic and foreign overnight visitors in health establishments in Poland in the years 2007-2017.

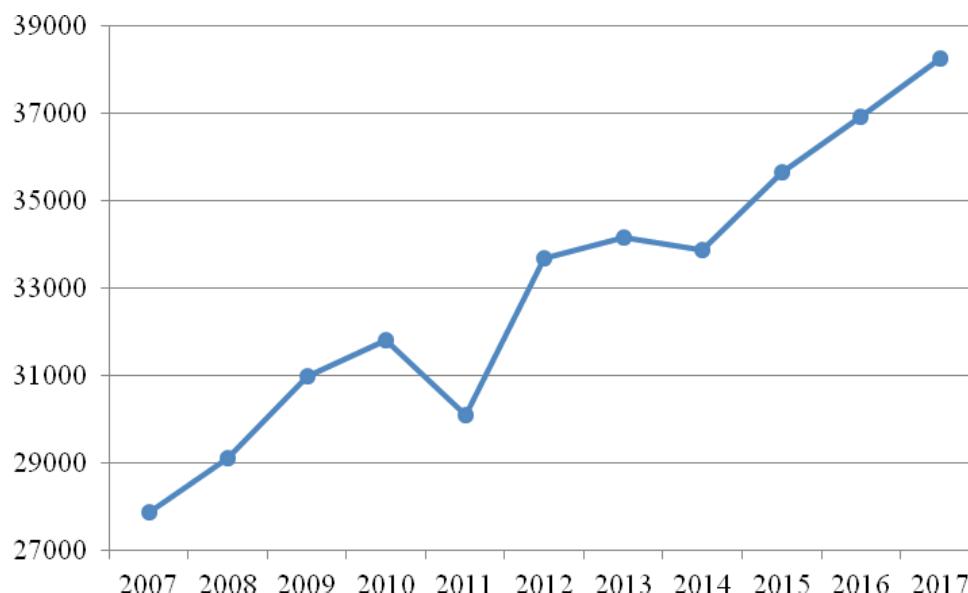


Fig. 3.

The number of beds in health establishments in Poland in the years 2007-2017
Source: Own work based on data of the Central Statistical Office [1]

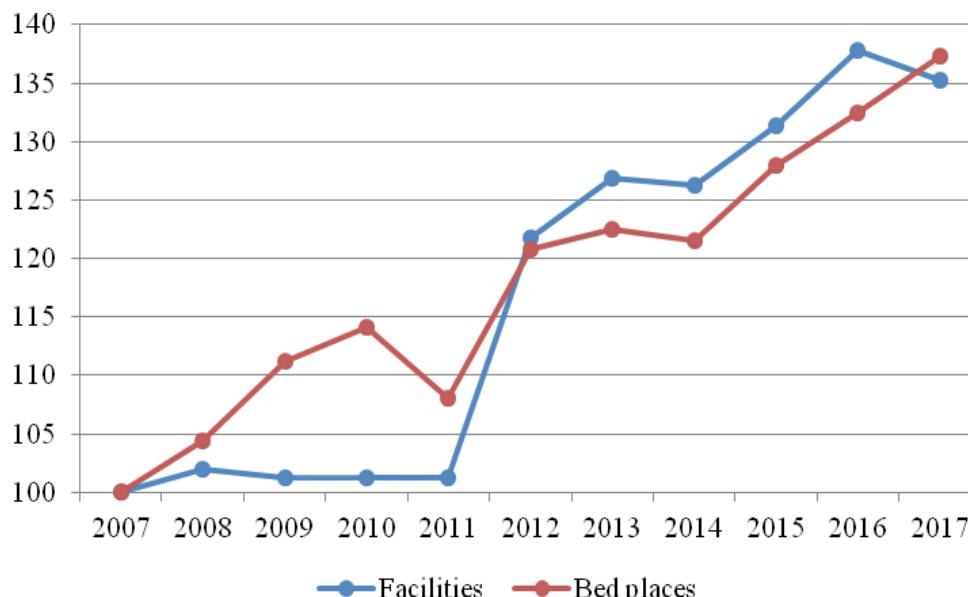


Fig. 4.

The development of the number of facilities and bed places in health establishments in Poland in the years 2007-2017 (2007 = 100%).
Source: Own work based on data of the Central Statistical Office [1]

Symbols used in this study:

- t – time expressed in appropriate units, e.g. years;
- J_t – general symbol for a value in time t , expressed in an absolute scale, in time series considered to be discrete time series (for example the general number of overnight guests in health establishments in year t);
- J_0 – initial value in time t (value in the year 2007), in an absolute scale, in discrete time series, $t = 0$;
- J_k – final value in time t (value in the year 2017), expressed in an absolute scale, in discrete time series;
- M_t – general symbol for a value in time t , expressed in an absolute scale, in continuous time series;
- M_0 – initial value in time t , (value in the year 2007), in continuous time series, $t = 0$;
- M_k – final value in time t , (value in the year 2017), in continuous time series;
- P_t – value in time t , expressed in a relative scale, where $P_0 = 100\%$, percentage values are obtained through a linear transformation of the M_t value. P_t informs us about an increase or a decrease in the initial 100 units of the value, it is a normalised scale;
- P_0 – initial value in time t , (value in the year 2007), expressed in a relative (percentage) scale, $P_0 = 100\%$;
- P_k – final value in time t , (value in the year 2017), expressed in a relative (percentage) scale;

P_k – relative (percentage) change of a final value of a time series as in regard to the initial value (eg. M_k to M_0 , where $M_0 = 100\%$).

The empirical data on the total number of overnight visitors in Polish health establishments in the years 2007-2017 are presented in table 2. The table also shows the total number of nights spent in those establishments in the same years. Comparing the number of overnight guests and the number of overnight stays will estimate the average stay of all guests in health resorts in Poland. The total number of guests relates to both, Polish residents and non-residents. Obtained original data are marked with set J_t , where t is the time given in years from 2007 to 2017. They are of a discrete nature.

The values in this form do not allow to evaluate the dynamics of change [2,3,4,5,6]. Therefore, they were transformed into continuous time series M_t , by adding up consecutive sets according to the formula (1):

$$M_t = \sum_{t=0}^t J_t \quad \text{and} \quad J_t = M_t - M_{t-1} \quad (1)$$

The M_t values inform how many resident and non-resident overnight visitors stayed and how many nights were spent in Polish health establishments during a given period of time t . Thus, the M_t

Table 2.

The number of overnight visitors and the number of overnight stays in health establishments in Poland in the years 2007-2017 (in thousands)

| Year | Visitors | Overnight stays |
|------|----------|-----------------|
| 2007 | 551,5 | 7 142,2 |
| 2008 | 605,8 | 7 739,2 |
| 2009 | 633,0 | 8 335,2 |
| 2010 | 612,2 | 7 641,4 |
| 2011 | 619,7 | 7 792,9 |
| 2012 | 617,1 | 8 607,6 |
| 2013 | 634,9 | 8 841,5 |
| 2014 | 661,3 | 9 226,4 |
| 2015 | 719,8 | 9 735,9 |
| 2016 | 763,6 | 10 150,2 |
| 2017 | 823,6 | 10 407,3 |

Source: Own work based on data of the Central Statistical Office [1]

sets show how the number of overnight guests and nights spent changed on a long-term scale. They allow to estimate the dynamics of change in the examined processes in an absolute scale for consecutive years. In order to estimate this dynamics also on a relative scale the sets were subjected to a linear conversion into a relative (percentage) scale P_t , according to the following formula (2):

$$P_t = \frac{M_t \cdot 100}{M_0} [\%] \quad (2)$$

where: $P_0 = 100\%$,
 $M_0 > 0$,

M_0 – the initial value of the set,

M_t – the value in time t .

On the P_t scale all sets are assigned the initial value $P_0 = 100\%$. Likewise, the discrete J_t sets were converted into a percentage scale $P_t [\%]$ according to the formula (3):

$$P_t = \frac{J_t \cdot 100}{J_0} [\%] \quad (3)$$

where: $P_0 = 100\%$,

$J_0 > 0$,

J_0 – the initial value of the set,

J_t – the value in time t .

P_t series allow for the most accurate comparison of the dynamics. They show at what dynamics level, the number of the initial 100 overnight guests or the number of initial 100 overnight stays changed in Poland in the years 2007-2017. To compare different dynamics it is necessary to start with the same initial value of the compared processes. And for this purpose, the relative percentage scale P_t is so well suited for Stokłosa [5,6].

Two definitions of dynamics are used in this study: an absolute dynamics for the J_t and M_t sets and a relative one for the P_t sets. The absolute dynamics is defined as the changes in momentary velocity and momentary acceleration on a precisely defined path of the process. Relative dynamics, on the other hand, is defined by the changes in specific momentary velocity and specific momentary acceleration on a precisely defined path of the process. The path of

a given process is the mechanism of an elementary event, repeated over and over in time, and in effect a cause-and-effect descriptive function which takes into account the elementary mechanism [7,8].

All J_t sets, the obtained M_t sets and the calculated sets of percentages P_t for both discrete and continuous series are presented in tables 3 and 4, which also contain the values of the $P_K [\%]$ parameter calculated according to formulas (4), (5) and (6):

for discrete sets J_t :

$$P_K = \frac{J_k \cdot 100}{J_0} [\%] \quad (4)$$

where: $J_0 > 0$,

J_0 – the initial value,

J_k – the final value;

for continuous sets M_t :

$$P_K = \frac{M_k \cdot 100}{M_0} [\%] \quad (5)$$

where: $M_0 > 0$,

M_0 – the initial value,

M_k – the final value;

for discrete and continuous sets P_t :

$$P_K = \frac{P_k \cdot 100}{P_0} [\%] \quad (6)$$

where: $P_0 > 0$,

P_0 – the initial value,

P_k – the final value.

The P_K values show what is the percentage change of the final (2017) values comparing with the initial (2007) values. The P_K values are not appropriate for assessing the dynamics of processes. However, they provide interesting information on the changes of the value at the end of the process compared with the initial value at the one set of the process [8,9]. The results of the above calculations are presented in tables 3 and 4.

Furthermore, the average length of stay of overnight visitors in health resorts in Poland in the years

2007-2017 were estimated. The average length of stay of overnight visitors in the reference period was obtained by dividing the total number of overnight stays by the total number of overnight visitors during the reference period, according to formula 7 [10]:

$$AS = \frac{OS}{OG} \quad (7)$$

where:
 AS – the average length of stay,
 OS – the number of overnight stays,
 OG – the number of overnight guests.

Results and discussion

In tables 3 and 4 the dynamics of changes in the number of overnight visitors and the number of overnight stays in health establishments in Poland in the years 2007-2017 were provided. The numbers represent discrete empirical data referring to the total number of overnight guests and overnight stays in health establishments. They have been assigned the symbol J_t . They also presents the values of this process converted linearly into continuous sets – they are marked with the symbol M_t . Moreover, tables 3 and 4 also

Table 3.

The dynamics of changes in the number of overnight visitors in health establishments in Poland in the years 2007-2017 (in thousands)

| Year | t | Jt | PJt [%] | Mt | PMt [%] |
|--------|----|-------|---------|--------|---------|
| 2007 | 0 | 551,5 | 100,0 | 551,5 | 100,0 |
| 2008 | 1 | 605,8 | 109,8 | 1157,3 | 209,8 |
| 2009 | 2 | 633,0 | 114,8 | 1790,3 | 324,6 |
| 2010 | 3 | 612,2 | 111,0 | 2402,5 | 435,6 |
| 2011 | 4 | 619,7 | 112,4 | 3022,2 | 548,0 |
| 2012 | 5 | 617,1 | 111,9 | 3639,3 | 659,9 |
| 2013 | 6 | 634,9 | 115,1 | 4274,2 | 775,0 |
| 2014 | 7 | 661,3 | 119,9 | 4935,5 | 894,9 |
| 2015 | 8 | 719,8 | 130,5 | 5655,3 | 1025,4 |
| 2016 | 9 | 763,6 | 138,5 | 6418,9 | 1163,9 |
| 2017 | 10 | 823,6 | 149,3 | 7242,5 | 1313,2 |
| PK [%] | | 149,3 | 149,3 | 1313,2 | 1313,2 |

Source: Own work based on data of the Central Statistical Office [1]

Table 4.

The dynamics of changes in the number of overnight stays in health establishments in Poland in the years 2007-2017 (in thousands)

| Year | t | Jt | PJt [%] | Mt | PMt [%] |
|--------|----|---------|---------|---------|---------|
| 2007 | 0 | 7142,2 | 100,0 | 7142,2 | 100,0 |
| 2008 | 1 | 7739,2 | 108,4 | 14881,4 | 208,4 |
| 2009 | 2 | 8335,2 | 116,7 | 23216,6 | 325,1 |
| 2010 | 3 | 7641,4 | 107,0 | 30858,0 | 432,1 |
| 2011 | 4 | 7792,9 | 109,1 | 38650,9 | 541,2 |
| 2012 | 5 | 8607,6 | 120,5 | 47258,5 | 661,7 |
| 2013 | 6 | 8841,5 | 123,8 | 56100,0 | 785,5 |
| 2014 | 7 | 9226,4 | 129,2 | 65326,4 | 914,7 |
| 2015 | 8 | 9735,9 | 136,3 | 75062,3 | 1051,0 |
| 2016 | 9 | 10150,2 | 142,1 | 85212,5 | 1193,1 |
| 2017 | 10 | 10407,3 | 145,7 | 95619,8 | 1338,8 |
| PK [%] | | 145,7 | 145,7 | 1338,8 | 1338,8 |

Source: Own work based on data of the Central Statistical Office [1]

contain the relative (percentage) values for discrete series – P_{jt} and for continuous series – P_{Mt} . Additionally, for every set in an absolute and a relative scale, the tables provide the calculated changes of the final values as compared with the initial values (P_K). Using the data from tables 3 and 4, figures from 5 to 9 were created. They show the total numbers of overnight guests and overnight stays in health establishments in Poland in the years 2007-2017 and the dynamics of change in the total number of visitors and stays in health establishments in Poland in those years. The dynamics was presented with M_t values.

The total number of overnight guests in all health establishments in Poland in the years 2007-2017 went up over time, which means that there was a general increase in the value ($PK = 149,3$ percent). It was a gradual process of rather low dynamics (Fig. 5 and 6).

During the period from the year 2007 to 2010 and again in 2012, the velocity of the process went down, while in the years 2012-2015, it clearly increased. It is also worth noting that in the year 2010 the value of the velocity rate was at relatively low level. In 2016 the velocity rate fell again while in 2017 it was the largest one. (Table 3, Fig. 5 and 6).

The total number of nights spent in all health establishments in Poland in the years 2007-2017 rose over the researched period. There was an overall increase in the P_K value (145,7 percent) with a gradual process of a rather slow dynamics (Fig. 7 and 8). During the period from the year 2007 to 2010 and again from 2012 to 2017, the velocity of the process went down. In 2010 the value of the velocity rate was at extremely low level.

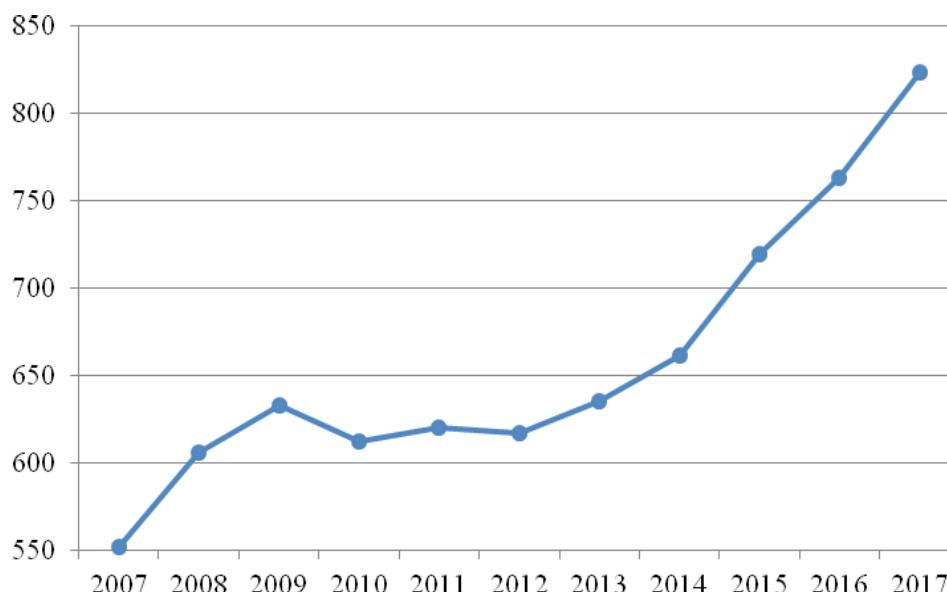


Fig. 5.

The number of overnight visitors in health establishments in Poland in the years 2007-2017 – P_{jt} values

Source: Own work based on data of the Central Statistical Office [1]

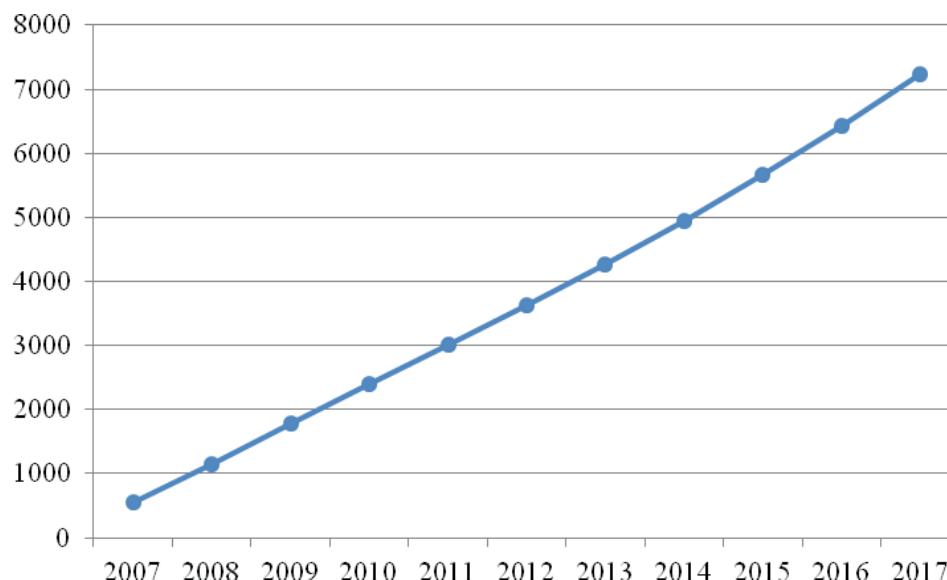


Fig. 6.

The dynamics of the number of overnight visitors in health establishments in Poland in the years 2007-2017 – P_{Mt} values

Source: Own work based on data of the Central Statistical Office [1]

When comparing the discrete sets J_t with the continuous sets M_t , both of which refer to the numbers of overnight tourists who stayed in Polish health resorts, one can clearly notice that the picture of a continuous process is a far better way of presenting a trend over time (Fig. 5 and 6).

Analyzing the continuous processes, both in an absolute scale – M_t and the relative (percentage) scale – P_p , one can see a big difference in the dynamics of change in the number of tourists between the years 2007-2010 and 2010-2017. The increasing trend of 2010-2017 probably will continue in the coming years due to the relatively high economic growth in Poland, which is greater than the EU average. Thus, the growth rate of income and wealth in Poland is also higher than the EU average. This gives the

opportunity of attracting not only a growing number of visitors from the domestic market, but also there is a real chance to increase demand from EU countries.

Figure 9 shows the development of the number of overnight visitors and nights spent in health establishments in Poland in the years 2007-2017 (2007 = 100%). A general increase for both values over the researched period was observed. In the recent years, especially between the year 2014 and 2017 the dynamics of change in the number of overnight guests in health establishments in Poland was greater than the dynamics of change in the number of overnight stays. This means that the visitors spent on average fewer days in health resorts.

Figure 10 presents the average length of stay of overnight visitors in health resorts in Poland in the years

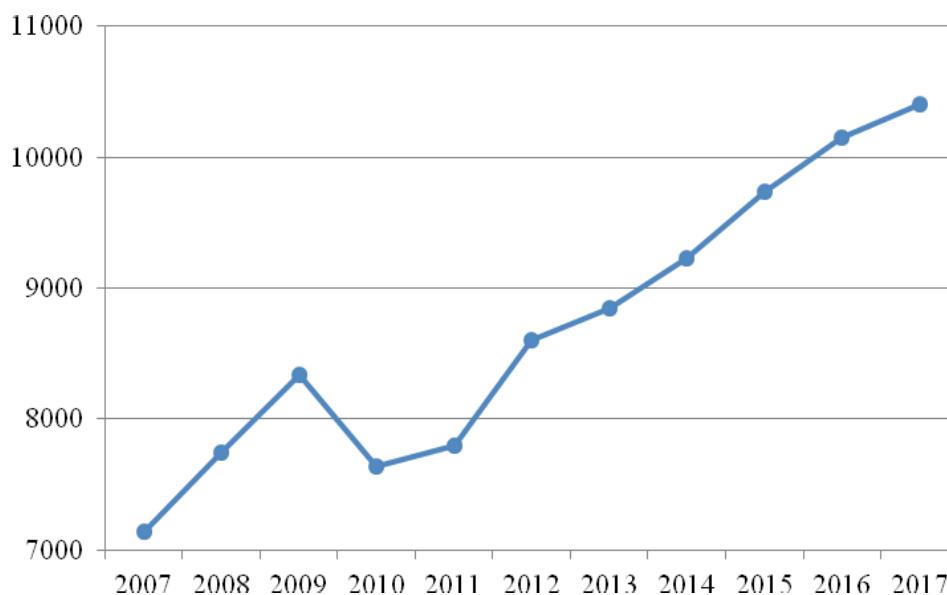


Fig. 7.

The number of overnight stays in health establishments in Poland in the years 2007-2017 – P_{jt} values

Source: Own work based on data of the Central Statistical Office [1]

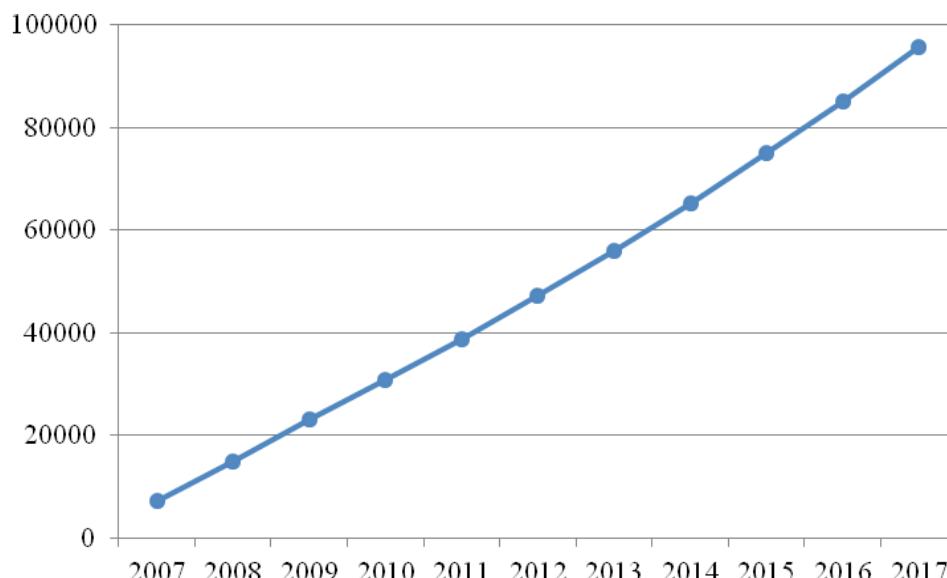


Fig. 8.

The dynamics of the number of overnight stays in health establishments in Poland in the years 2007-2017 – P_{Mt} values

Source: Own work based on data of the Central Statistical Office [1]

2007-2017. The average length of stay of overnight guests in health resorts in Poland in the researched period was 12,03 days and it increased gradually in the years 2007-2016. In the year 2017, however, the rapid decrease was observed. On average, overnight visitors stayed almost the same number of days in health resorts in Poland since 2007. Their stays were the longest in 2014 (13,95 days) and the shortest in 2010 (12,48 days). This is mainly due to the length of rehabilitation and treatment stays, which last usually 21 or 28 days.

Conclusion

Continuous sets, particularly when expressed in a relative (percentage) scale P_t allows us to see the dynamics of economic processes in much better way.

In the researched case, the discrete sets, converted to continuous sets clearly show the difference in the dynamics of change in the number of overnight guests and overnight stays in health resorts in Poland in the years 2007-2017.

The values in the relative (percentage) scale allow accurate comparison of the dynamics of economic processes. They inform, in the case under examination, at what dynamics of change the number of initial 100 overnight travelers or nights spent in health resorts in Poland in the years 2007-2017 were. To compare dynamics it is necessary to consider the same initial values of compared processes, and that is what provides the relative (percentage) scale, because all the values on a relative scale acquire a common initial value.

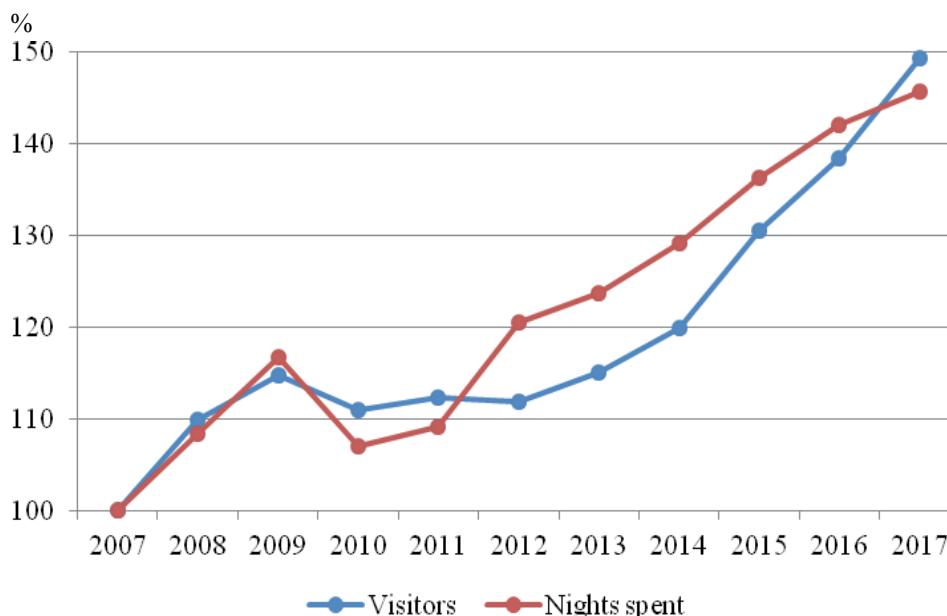


Fig. 9.

The development of the number of overnight visitors and nights spent in health establishments in Poland in the years 2007-2017 (2007 = 100%).

Source: Own work based on data of the Central Statistical Office [1]

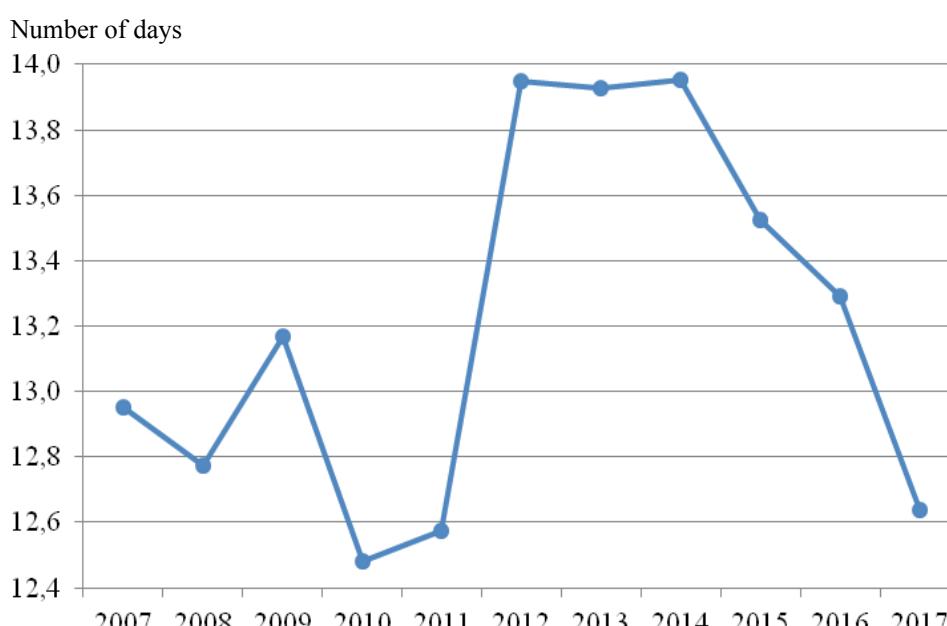


Fig. 10.

The average stays of visitors in health resorts in Poland in the years 2007-2017

Source: Own work based on data of the Central Statistical Office [1]

When comparing the dynamics of the processes for the discrete as well as continuous values, in an absolute and a relative scale for overnight visitors and nights spent in Polish health resorts, one can notice a general upward trend in both cases, even in spite of the drop in 2010.

The velocity rate of overnight guests in Polish health resorts fell gradually during the period from the year 2007 to 2010, then it was an increase in 2011 and again in 2012 it went down. In the years 2012–2015, it clearly increased. It is also worth noting that in the year 2010 the value of the velocity rate was at relatively low level. In 2016 the velocity rate fell again, while in 2017 it was the largest one.

The total number of nights spent in all health establishments in Poland in the years 2007–2017 rose over the period. There was an overall increase in the P_K value (145,7 percent) with a gradual process of a rather slow dynamics (Fig. 5 and 6). During the period from the year 2007 to 2010 and again from 2012 to 2017, the velocity of the process went down. In 2010 the value of the velocity rate was at extremely low level.

In the recent years, especially between the year 2014 and 2017 the dynamics of change in the number of overnight guests in health establishments in Poland was greater than the dynamics of change in the number of overnight stays. This means that the visitors spent on average fewer days in health resorts.

The average length of stay of overnight guests in health resorts in Poland in the researched period was 12,03 days and it increased gradually since 2007. On average, overnight visitors stayed almost the same number of days in health resorts in Poland since 2007. Their stays were the longest in 2014 (13,95 days) and the shortest in 2010 (12,48 days). This is mainly due to the length of rehabilitation and treatment stays, which last usually 21 or 28 days.

In addition, by comparing the changes in the number of overnight guests and nights spent on the one hand a, the number of facilities and the number of bed places on the other, one can see the immediate response of quantity supplied to changes in quantity demanded in this market. Observing the health establishments, which operate in a market economy, supply and demand forces are very visible. This market mechanism, however, is a human driven one. It is

always understood as economic interaction. This is, because all tastes, preferences, trends, opportunities, and other values always come from human needs, wants and desires. According to human needs, supply and demand are created. and people always try to make good economic decisions.

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