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Changes in the Market of Two and Three-wheeled Motor Vehicles in Europe at the Beginning of the 21st Century

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ABSTRACT

Objective: In recent years, the number of motorcycles in many countries has changed significantly. A particularly diverse situation has taken place in Europe. This diversification has been influenced by both economic and institutional conditions. The study aims to identify the main trends on the Powered Two or Three-Wheelers (PTW) market in the world. The study analyses the distribution of PTW in the world and tracks the changes in the PTW market in particular European countries between 2001 and 2014.

Research Design & Methods: The article is based on the statistical data from the Eurostat and The ACEM. The analysis of the PTW market changes in Europe is based on graphical presentations and simple statistical methods. Due to the availability of data, the analysis refers to chosen European countries (UE+EFTA in 2014). As a result of the lack of availability of comparable data in the article, the data were presented according to the latest available summaries.

Findings: In most countries, the PTW market has been affected by the financial crisis which has influenced the rise of motorcycles in the countries such as Greece and Spain, while the UK has suffered a decline. Economic factors have also been influenced by the factors such as legislative changes, the ageing of population, and the processes of urbanisation and increasing professional activity in developing countries.

Implications & Recommendations: It is necessary to analyse changes in the market of PTW by size of a city, traffic intensity and the level of development of public transport.

Contribution & Value Added: The study complements the topic of PTWs' role in the transportation across Europe (with East Europe) and the changes which have taken place in this vehicle market since the beginning of the 21st century. Additionally, this is a holistic approach combining technical, economic and sociological issues.

Article type: research paper
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INTRODUCTION

Changes in the market of two- and three-wheeled motor vehicles (Powered Two or Three Wheelers – PTW) have various forms and intensities in different parts of the world. The PTW market is influenced mainly by social, economic and demographic changes. The differences in the PTW market changes are visible particularly between developed and developing countries. These differences relate not only to the size of the market itself but above all to the functions these vehicles are used for. Another important criterion distinguishing the PTW market is the tradition and culture of road transport, including the modern attitudes of society referring to environmental protection and the need for greater mobility associated with the increase in the professional activity of women. Another significant factor affecting the development of the two wheeler sector is technological progress influencing new developments in the automotive and road infrastructure industries. The article presents changes in the PTW market in Europe in 2001-2014. The PTW market was mostly affected by the economic crisis, legal conditions and changes in the age and occupational structure of society.

The first part of the article presents global conditions and the structure of the PTW market. Both the dynamics of market changes and the impact of main factors on the number of PTW in different regions of the world were analysed. The next part focuses on the area of Europe. The characteristic of the PTW market was compared among different countries, and then the changes in the number of PTW in Europe and individual countries in the years 2001-2014 were analysed. On the basis of the size and dynamics of the changes in the number of PTW in relation to the population, the typology of European countries was made. Finally, an attempt was made to compile the size of selected socio-economic indicators with the dynamics of changes in the PTW market.

MATERIAL AND METHODS

The article is based on the statistical data from the Eurostat and The European Association of Motorcycle Manufacturers (ACEM) for chosen European countries in the years 2001-2014. Therefore, EU countries (2014) and EFTA countries (2014) have been analysed. Unfortunately, as a result of the lack of availability of comparable data (resulting, among others, from legal differences in individual countries) in the article, the data were presented according to the latest available summaries. The analysis of PTW market changes in Europe is based on graphical presentations and simple statistical methods (mean, proportion, linear dependence).

The study includes Powered Two or Three Wheelers (PTW) which include both moped and motorcycles and scooters (capacity below 50cc), motorcycles and scooters (above 50cc) and a 3-wheel scooter. The analysis does not consider the type of drive, whether it is an internal combustion or an electric one.

LITERATURE REVIEW

So far in the literature of the topic of PTW function changes have been analysed only in the national perspective (Albalate & Fernández-Villadangos, 2010; Lai, Lu, & Chiang, 2006; Lam & Tam, 2002; Marquet & Miralles-Guasch, 2016; Riley, 2002; Yamamoto, 2009). In addition, the articles from Europe have been limited to the case study of one Western

European city and a short period of time. The following study complements the topic of PTWs role in transportation across Europe and the changes which have taken place in this vehicle market since the beginning of the 21st century. Additionally, this is a holistic approach combining technical and sociological issues. The first part of the article presents the theory of changes in the PTW market in the world. The next part of the article shows the detailed changes which have taken place in individual European countries. Unfortunately, the literature on the PTE market in Eastern Europe (post-communist Europe) is very poor. The subject of motorcycles appears only in the aspect of the automotive industry (Komór & Godlewska-Majkowska, 2013; Molnár, 2012) or descriptions of consumer behaviour (Okrzesik, 1999, 2001, 2002; Zawadka, 2015). The following work is therefore the first attempt to analyse the PTW market both in Western and Eastern Europe.

Global PTW Market Conditions

At the beginning of the 21st century, an increase in the number of two-wheeled motor vehicles was observed in most European countries. In spite of the fact that two-wheeled mobility has a long tradition in many Western European countries, including mainly the south of the continent (Nishitateno & Burke, 2014), there has been a noticeable increase in the number of two-wheelers in developing countries of Central and Eastern Europe (Paviotti & Vogiatzis, 2012; Marquet & Miralles-Guasch, 2016). The increase in the number of two-wheeled and three-wheeled motor vehicles (PTW) in Europe is mainly related to socio-economic conditions (De Jong *et al.*, 2004) and legal issues. The main factors influencing the popularity of PTW are an increase in urbanisation and transport problems (Ballart & Riba, 1995; Broughton *et al*., 2009; Albalate & Fernández-Villadangos, 2010; Kopp, 2011; Pinch & Reimer, 2012; Karathodorou, Graham, & Noland, 2010; Ng, Schipper, & Chen, 2010), and urban density-related increase in population density which raises the cost of car use (Yamamoto, 2009; Lam & Tam, 2002; Clark, 2007, 2009; Khan & Willumsen, 1986; Hess & Ong, 2002; Riley, 2002; Haworth, 2012). The increase in urbanisation and population density also affects the efficiency of public transport (Dargay & Gately, 1999; De Jong & Van de Riet, 2008; Schwanen, Dijst, & Dieleman, 2004), which affects the decision of resigning from cars in cities. However, it should be emphasised that many European societies possess and use individual means of transport, unlike public transport which determines the psychosocial benefits (self-control, self-esteem and the sense of independence and prestige) (Ellawaya, Macintyrea, Hiscockb, & Kearnsc, 2003). Therefore, having a more economical motorbike is an alternative which in many cases provides more psychosocial benefits than owning a car. Urban development and suburbanisation processes have also influenced an increase in commuting time which contributed to the PTW role in suburban communication (Pucher, Korattyswaropam, Mittal, & Ittyerah, 2005; Banister, 2011; Sanko *et al.,* 2009). Another factor influencing the PTW market is the growing prosperity of a society (Lai *et al.*, 2006; Yamamoto, 2009; Chiou, Wen, Tsai, & Wang, 2009; Pongthanaisawan & Sorapipatana, 2010) which, depending on the level of social development and car saturation, may influence an increase or decrease in the number of two-wheeled vehicles (Law, Hamid, & Goh, 2015). The impact of the global financial crisis on the PTW market has also confirmed the importance of the financial sector in this branch of economy. Legal conditions also affect the use of PTW vehicles. This is noticeable when changing the criteria to drive the vehicles up to 125cc (equivalent to licenses B and A1) (Perez, Borrell, & Nebot, 2009). An important factor seems to be the policy of national and local government authorities to limit the movement of motor vehicles and adapt the road infrastructure for the needs of two wheelers

(Muzira, Chesheva, Banjo, & Marquez, 2009; Albalate & Fernandez-Villadangos, 2010; Pinch & Reimer, 2012). Top-down policy is also seen in terms of limiting traffic due to the reduction of pollutant emissions (Uherek, 2010; Mashayekh *et al.*, 2012). Introducing new technological solutions for small engines (including carburettor replacement) and greater fluidity of PTW driving reduce emissions of exhaust fumes by about 20% in comparison with cars (Muslim, Selamat, Alimin, Rohi, & Hushim, 2014; Uberti, Copeta, Baronio, & Motyl, 2017). Operating costs are another important element. Increasing fuel prices and top-down taxes and tolls can significantly reduce the use of cars for PTW.

Another issue is an increase in the professional activity of women (Rogers, 2008). Also, the process of increasing the age of newlyweds and primiparas in many European countries (Buchmann & Kriesi, 2011) affects the reduction in demand for 'family means of transport'. At the same time, technological development allows us to look for new construction solutions which increase the popularity of PTW vehicles by increasing their safety, economy and driving comfort. Last but not least important elements influencing the diversification of the PTW market are natural conditions determining the possibility of year-round comfort of two wheelers. However, for cities where road infrastructure allows year-round traffic, even in areas with heavy snow and low air temperatures, two wheelers can be year-round. An additional factor influencing the seasonal decline of the PTW traffic in urban areas is technological advancement to improve the comfort of two-wheeled driving in winter (e.g. winter tires, heated seats, handles and clothes, warm air) (Figure 1).

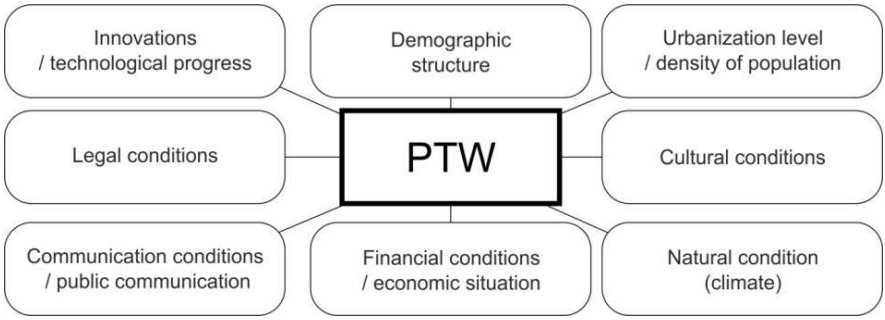

Figure 1. Conditions of PTW development
Source: own elaboration.

Tracking the changes in the use of two wheelers, one can distinguish four phases of their use (Figure 2). The first phase (A) is where the lack of availability of a car (financial or technological constraints) affects the use of PTW as the main means of transport. This situation occurs in developing countries in Asia and Africa. The second phase (B), related to the general availability of cars, is conditioned by the development of industry and an increase in the wealth of society. Two wheelers are mainly used in areas with poor road infrastructure (e.g. Australian agricultural areas). They are also used by poor social groups in areas with insufficient public transport (e.g. rural areas of Poland). In addition, motorcycles of smaller-capacity are used by young people (legal and financial reasons). Driving a motorcycle is also a form of entertainment. With an increase in prosperity and socio-economic progress of developed countries, the urbanisation process increased, changing the proportion of urban and rural population. Nowadays, in developed countries (e.g. Western Europe)

there has been a marked increase in the share of inhabitants of the largest agglomerations, with only about 25% of the population living in rural areas. For the people in cities, PTW have become an alternative to a car (phase C). As a fast and cheap (and ecological) means of transport, it responds to the current problems of urban transport and the rise in fuel prices. Two wheelers more than cars fit in with the idea of 3F (Fun, Freedom, Fashion). They are seen both as practical and carrying 'joy and style' vehicles.

It seems that further development of cities with an increase in public transport and the limitation of car traffic leads to the evolution of two wheelers towards motorcars (phase D). The new hybrids of cars and scooters will be a part of the policy of road traffic flow and environmental protection. Therefore, in addition to improving the conditions of use (e.g. three wheeled vehicles, equipped with a roof, etc.) they will be equipped with a hybrid or electric drive. So the history of using PTW will go round to the point where PTW vehicles are more popular than cars. It should be noted that the above-mentioned phases largely depend on the legal conditions and communication culture prevalent in different regions of the world.

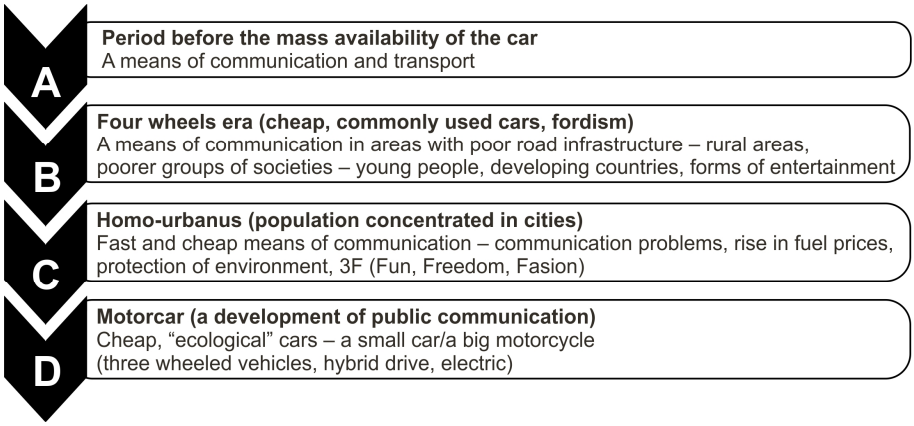

Figure 2. Periods of use of PWT
Source: own elaboration.

Today, the main factors influencing the change in the interest in PTW vehicles are an increase in transportation problems in developed countries and the professional activation of women in developing countries, which is associated with the socio-economic progress of these countries. In 2016, the Americans spent an average of 42 hours in traffic jams, consuming 11.7 billion litres of fuel. It cost about 160 billion dollars. This process can also be seen in the countries with lower levels of economic development. In Poland in 2016, the annual cost of traffic jams per driver increased on average to 70% of the monthly salary (64% in 2014): and the average monthly time spent in traffic jams in major cities per driver was nearly 15 hours. The situation is caused mainly by economic development and the growth of the professional activity of society.

According to the Department of Labor, the Texas Transportation Institute, there is a close relationship between the number of actively working professionals and the travel time (Travel Time Index). Analysing the number of PWT registrations by type in India in 2006-2011, there was a noticeable increase in scooter registration (with

a smaller increase in motorbike and motorcycle registration). This is the result of the progressive professional activation of women.

As shown by Law *et al.* (2015), the number of motorcycles is linked to the level of economy. Analysing the relationship between GDP and the number of cars and motorcycles, it was shown that once GDP in developing countries went up, the share of cars increased (with a large number of PTW). On the other hand, in developed countries an increase in the level of economic growth has an impact on the share of motorcycles (with a large number of cars). This was due to both: the growth of the wealth of a society (a motorbike as a symbol of luxury) and urbanisation. This relationship is confirmed by statistical data (Worldmapper). The countries with the highest number of motorcycles in terms of population in 2002 were the Asian countries (Malaysia 4.20, Thailand 5.76, Cambodia 7.46, Japan 9.41) and Europe (Greece 4.55, Italy 8.03, Switzerland 9.86). Taking into account the share of motorcycles in relation to the number of cars, South East Asia, Indonesia and Central Africa dominate. Over 90% of motorcycles out of all the vehicles are used in such countries as: Armenia, Central African Republic, Tajikistan, Nepal, Afghanistan, Somalia and Papua New Guinea. In Europe this share was below 20% (only in Greece 46% and in eastern countries like Belarus and Lithuania about 25%) (Figure 3).

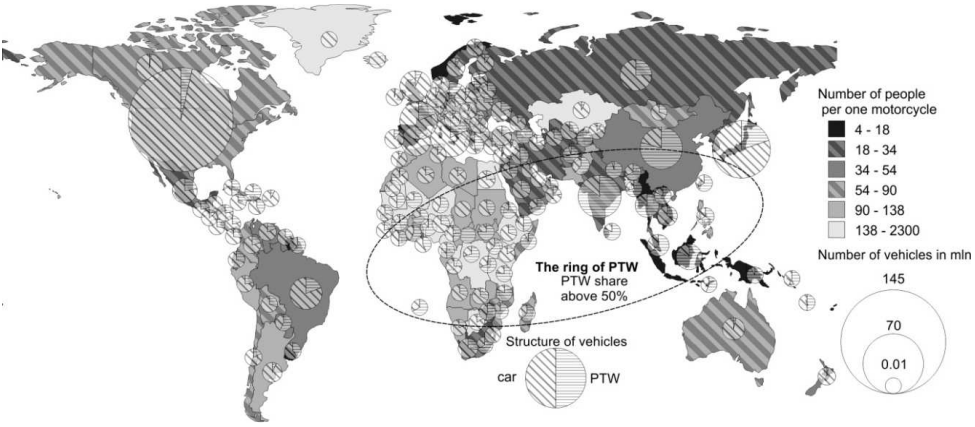

Figure 3. Distribution of motorcycles in the world in 2002
Source: own compilation based on Worldmapper.

It is estimated that in 2015, 313 million motorcycles were used all over the world. However, on the global scale, there was a great diversity of them. The highest number of motorcycles was used in Asia and Australia (77% in 2009): and what is more, over 80% of households had PTW. The next continent was Europe (14% of motorcycles). In South America there were 5% and in Africa and North America 2% of motorcycles. Small motorbikes and scooters were dominant in developing countries, while larger motorcycles were used in developed countries. This regional specificity resulted from economic determinants, infrastructure and cultural factors. One example is Australia, which owes its infrastructure to the world-class sales of Moto Cross motorcycles (50% of sales). Similarly, large motorcycles for recreation and tourism dominate in the United States. However, there are

global changes in the two wheeler market. The number of PTW in cities and their production is increasing in Asian countries: China, India, Indonesia, Japan, Taiwan, Thailand, Vietnam and Malaysia. This production, which so far has been allocated to the domestic market, has currently users all over the world (Figure 4).

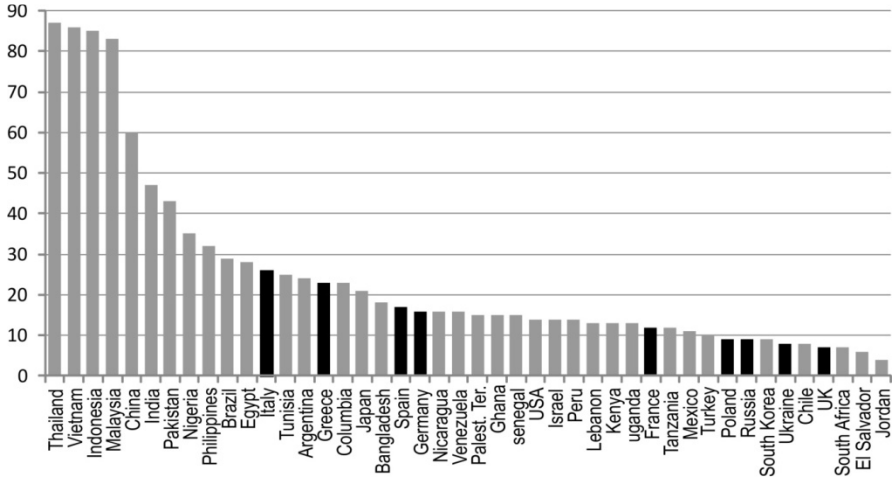

Figure 4. Share of households holding PTW in 2015
Source: own compilation based on Pew Research Center – Pew Global Attitudes Project.pdf.

At the beginning of the 21st century there were significant changes in the structure of vehicles in the world. In the years 2001-2010 there was an increase in the number of motorcycles in relation to the number of cars in developed countries, such as the US and Sweden. However, in poorer countries like Greece and The Czech Republic this growth was higher than an increase in the number of cars, and remained close to it (Table 1). Out of all the analysed countries, an increase in the number of mopeds occurred only in the case of Sweden and Spain. In Sweden motorised vehicles are available for driving at speeds up to 30 km/h, they do not require registration and tolls and they use cycle paths. An increase in the number of these vehicles is associated with the urbanisation process. In the case of Spain, in 2008, the crisis changed the habits of transport of the inhabitants. In Barcelona the inhabitants are using cars less and less and the number of people travelling by bike or on foot has increased by 40%. In the case of motorcycles, an increase of nearly 18.6% was recorded, especially for scooters (Marquet & Miralles-Guasch, 2016). Also the number of women using scooters and motorcycles increased. The greatest growth of motor owners occurred in the years 2004-2008. During that period, the number of women using motorcycles increased by 43.6%. It can therefore be claimed that the current situation in the two wheelers market is mostly influenced by economic conditions. However, the level of satisfaction of two wheelers users is also taken into consideration. Regardless of a country, it is usually higher than in the case of car users.

PTW Market in Europe

In Europe, the PTW market is very diverse. This is due to both economic and legal conditions, but also to climate diversification. An additional factor is the history of the continent, which for over 40 years functioned in two different economic and political systems. According to ACEM data, in Europe in 2016 about 1.206.000 motorcycles were used and their number grew rapidly. The popularity of two wheelers in Europe was mainly due to the growing demand for urban mobility and the prosperity of Eastern European citizens. However, due to the growing transportation problems in European cities, PTWs seem to be perceived as the future of transport. This is caused by the fact that in comparison to cars two wheelers are characterised by low operating costs, lower exhaust fumes emission (about 20%) and fewer parking problems. Moreover, it is assumed that the growth of 10% of two wheelers users increases the flow of traffic and decreases the time spent in traffic jams by 63%. The research conducted in European agglomerations has shown that a car travelling 30 kilometres needs on average 88 minutes and another 16 minutes to find a parking space, while a motorcycle needs only 44 minutes (ACME Industry Report, 2015). In recent years, there have also been changes in the structure of the users of two-wheelers. Apart from an increase in the share of women, the average age of motorcyclists also changed: from 27 years in 1985 to 41 years in 2003. The age group of over 40s increased from 28% to 48%. It is related to the ageing process in Europe, but also to the attractiveness of PTW among the older generation. Social transformations, i.e. an increase in the number of single people, high need for mobility, an increase in the professional activity of women and rising traffic problems in cities affect the number of PTWs in Europe.

Table 1. Changing number of vehicles between 2001 and 2010 in selected OECD countries

Country	Passenger cars	Mopeds (<50cc)	Motorcycles	PTW growth relative to car growth (car growth = 100%)
USA (excl. SUV)	5%	—	67%	1340.00
Sweden	8%	84%	91%	1137.50
France	11%	−22%	48%	436.36
Spain	22%	27%	82%	372.73
Australia	25%	—	88%	352.00
UK	13%	−27%	28%	215.38
Greece	52%	−14%	76%	146.15
Japan	11%	−20%	14%	127.27
Czech Rep.	29%	1%	35%	120.69

Source: own compilation based on (Van Elslande *et al.*, 2014).

On the other hand, the accident rate and climatic conditions remain the factors which inhibit the development of two-wheelers. However, the research conducted in Western Europe shows that 40% of PTW accidents are caused by poor infrastructure (mostly bad roads) and another 33% of accidents happening at crossroads and caused by car drivers ('The Safe Ride to the Future', 2014). Regardless of the factors affecting the accident rate of PTW, 27% are fatal (compared to less than 10% for car passengers). However, it should be noted that 125cc motorcycles have the highest fatality rate, while in the case of lower capacity vehicles

the accident rate is about 7% and they are statistically safer than bikes (mainly due to better helmet protection – helmet and clothes). As technology advances, the safety of PTW users improves. Even small vehicles are equipped with ABS, and drivers can count on better protection, such as air vests for motorcyclists. Therefore, considering that 87.9% of all the accidents are determined by a human factor (the drivers' skills): many countries promoting PTW transport introduce special training. Get On, Bike Safe or Scooter Safe Projects can be good examples. PTW currently accounts for about 30% of vehicles in European cities, but the transport policy of large agglomerations is aimed at limiting the traffic of cars which in turn can affect the popularity of two wheelers. In many cities, top-down decisions are made to promote the PTW traffic, for example: lockers in front of intersections for motorcycles, parking spaces for two wheelers or the access to bus lanes, exemption from parking fees and entry to paid zones. The growth of the popularity of motorcycles in society also influences the development of many branches of economy. One example is motorbike tourism which generated 600 million EUR profit in the UK in 2016 and created 13.200 workplaces.

Analysing the changes in the PTW market in Europe (EU+EFTA), the research shows the changes in the structure and the number of motorcycle registrations in 2001-2014. Both in the mopeds (<50cc) and motorcycles (>50cc) market: there was a marked decrease in the number of registrations during the economic crisis, after a period of high growth since 2004. During the crisis, the PTW market decreased by 54.9%, which was mostly visible in terms of population. However, the PTW market reacted differently to the crisis in different European countries. Taking into account the number of PTW registrations in relation to the number of car registrations, it is significant to note that the countries where the crisis was most noticeable (e.g. Greece, Spain) the number of PTW registration increased. A two wheeler as a cheaper means of transport in favourable climatic conditions was more often chosen than a more expensive car. Analysing the number of PTW registrations per 1.000 people, it can be seen that in rich countries (e.g. Switzerland, Luxembourg) the number of registrations did not decline during the crisis period. Another factor affecting the number of registrations are legal and financial conditions (taxes, fees). There has been a significant increase in the registrations of 50cc motorcycles in Slovakia since 2012. This resulted from a change in the law which allowed motorcyclists to drive up to 125cc motorcycles with a driving licence category B. On the other hand, in Denmark since 2007 there has been a marked decline in PTW registrations with a capacity of over 50cc. This was caused not only by the crisis, but also by the government policy which raised the fees for high-capacity vehicles (Figure 5).

The impact of the crisis can also be seen by analysing a change in the number of two wheelers in Europe. During the crisis there was a noticeable increase in their number, which lasted until 2011. The structure of PTW also changed. In the period 2001-2014, with the exception of a small growth at the beginning of the crisis, the number of motorbikes fell (<50cc). It was mainly related to a process of society ageing (Figure 6).

Analysing the deployment of PTW in Europe in 2014, it can be seen that these vehicles were concentrated in three countries: Italy (8.5m): Germany (5.9m) and Spain (5m). However, taking into consideration their number per 100 people, the leaders were: Greece (16.5), Italy (14.0), and Spain (10.8). The high rate of PTW was also found in the countries with high urbanisation, e.g. Lichtenstein (11.5), but also Benelux, Germany, the Czech Republic and the Alpine countries. Finland had a high share of PTW in terms of population (10.4) (Figure 7). However, in this case they were mainly mopeds (54.8%). In Finland, mopeds are a traditional means of

transport for people who are too young or too old to be able to drive a car. It is precisely the ageing process of a society and compulsory medical examination at the age of 70 for drivers (Karthaus & Falkenstein, 2016) which reduce the number of cars and motorcycles for mopeds. In addition, the government policy is to limit the movement of cars in cities. One example is Helsinki, which by 2025 plans to eliminate private cars from the city.

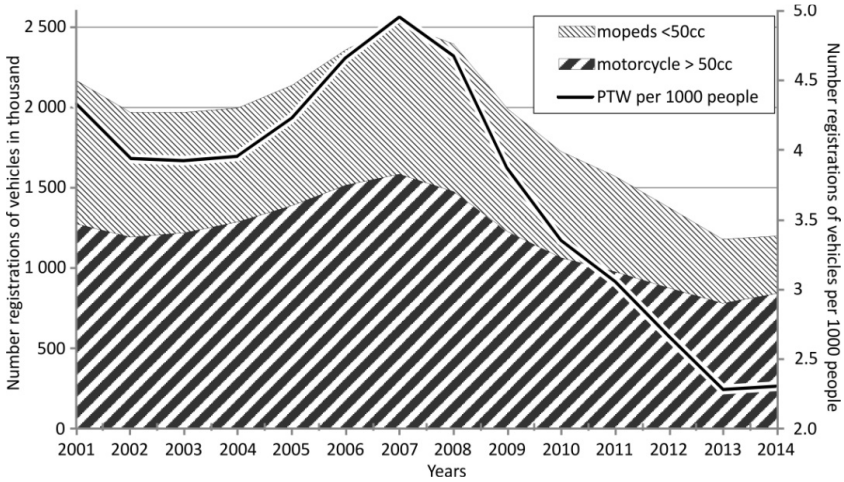

Figure 5. PTW registration in Europe between 2001 and 2014
Source: own compilation based on Eurostat and ACEM data.

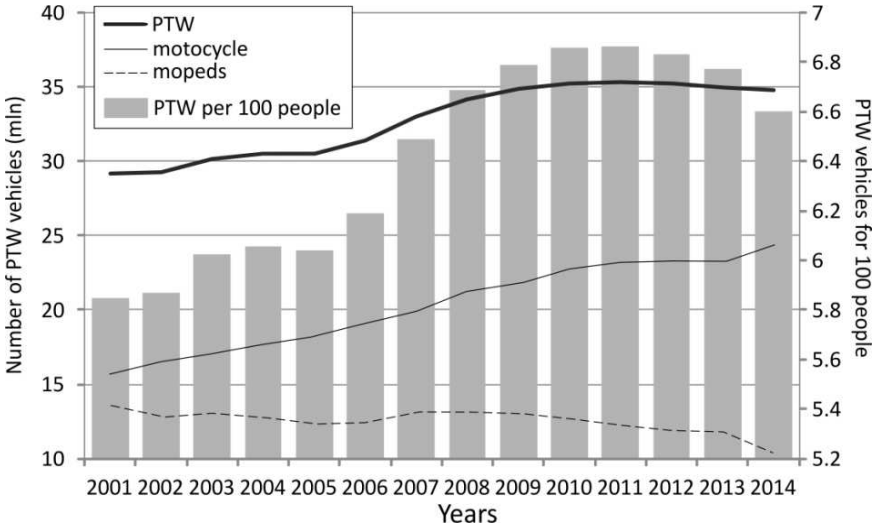

Figure 6. Changes in the number of PTW in Europe in the years 2001-2014
Source: own compilation based on Eurostat and ACEM data.

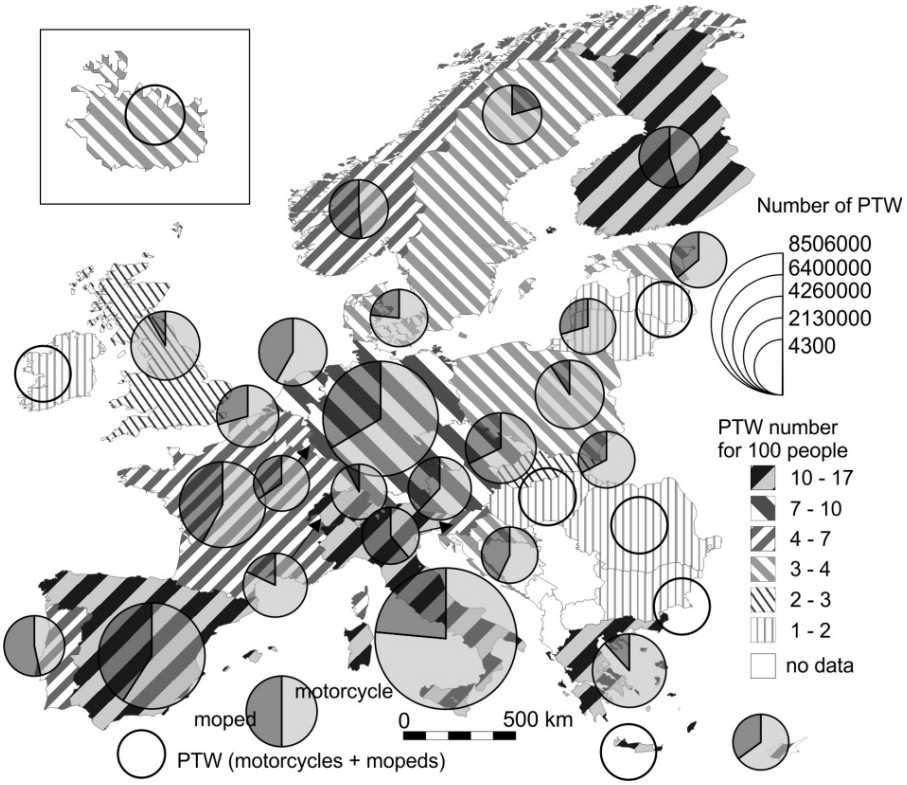

Figure 7. Deployment of PTWs in Europe in 2014
Source: own compilation based on Eurostat and ACEM data.

Different trends in the change of the number of PTW per 100 people can be observed in different countries. The countries which recorded a steady increase in the number of PTWs in 2001-2014 were Norway, Finland, Hungary, Estonia, Greece and Spain. However, even in the indicated countries, the increase at that time was varied. An example may be Greece, where the period of crisis influenced a sharp increase in the number of PTWs, or Spain, where the growth slowed down during the crisis. In the Netherlands, Iceland, Germany, Slovakia, Austria and the Czech Republic there was also a positive trend of changes in the number of PTWs per 100 people.

However, in those countries in 2001-2014 there were periods of decline in the PTW number, both during the financial crisis and in the preceding period. However, in all these countries there was a marked increase in the number of PTWs in the last five years of the study period. There was a noticeable increase in the number of two wheelers during the crisis in France and Malta. In the case of the UK and Latvia, the crisis influenced a decrease in PTW number (Figure 8). The countries which experienced a downward trend in the study period were Sweden, Italy and to a lesser extent Ireland, Romania and Portugal.

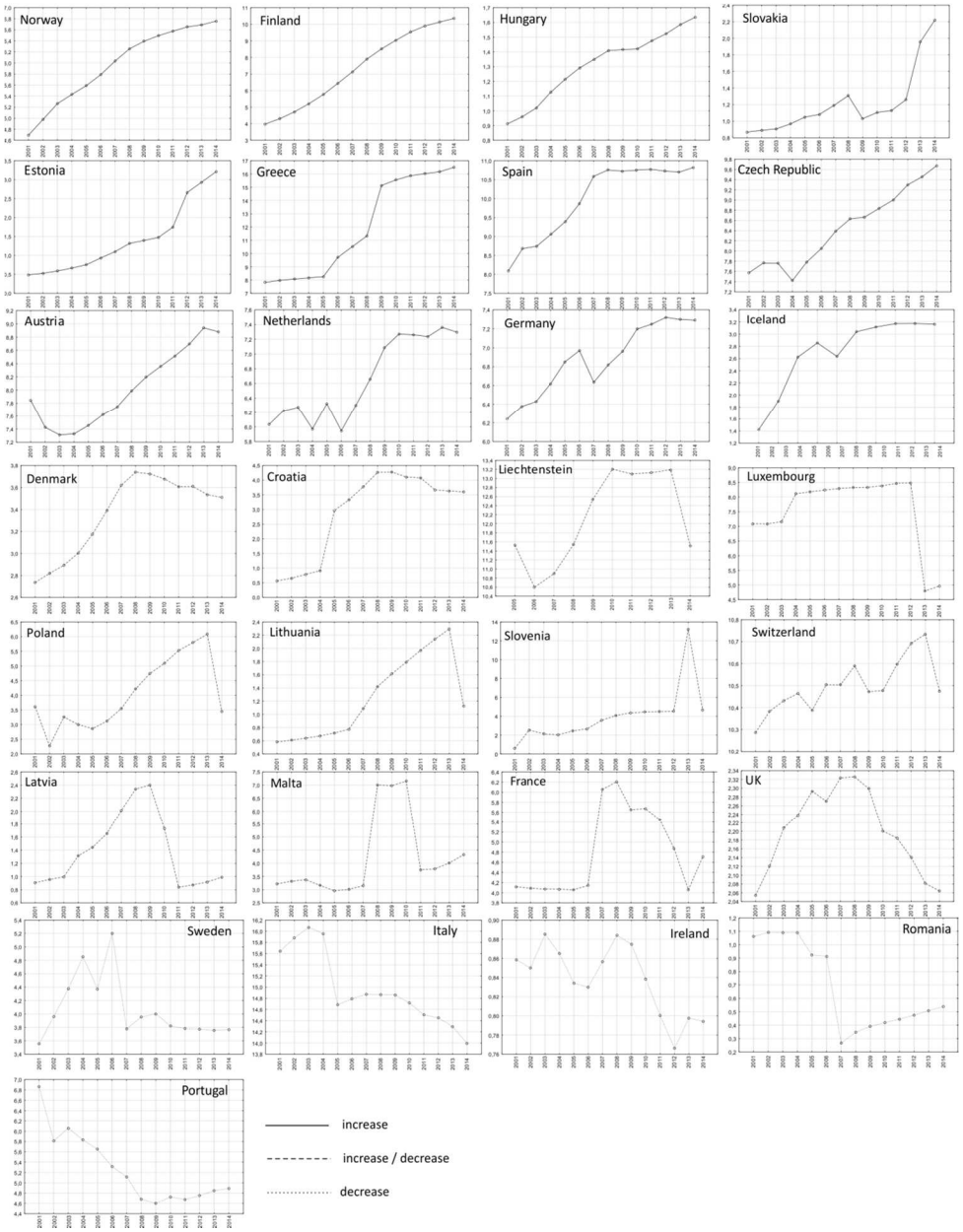

Figure 8. A change in the PTW number per 100 people in selected European countries between 2001 and 2014
Source: own compilation based on Eurostat and ACEM data.

Analysing changes in the number of PTWs per 100 people in comparison to 2001, a negative relationship can be observed. The countries with the highest PTW number per capita

in 2001 recorded a decrease or increase of several percent in comparison to the beginning of the study period. Italy, Liechtenstein and Switzerland are the examples. These are rich countries where the market for two wheelers is well developed and reached a saturation level (10 PTW per 100 people). On the opposite side there are the countries with low market saturation (<0.6 PTW per 100 people) which in the period considered had a marked increase of over 500%, i.e. Slovenia (695.9%), Estonia (557.7%) and Croatia (536.9%) (Figure 9).

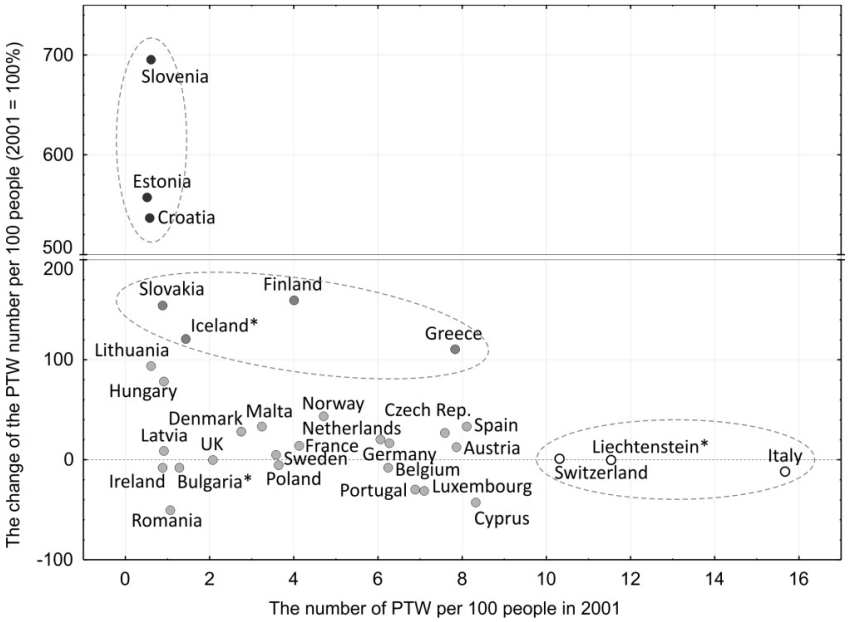

Figure 9. A change in PTW number per 100 people in selected European countries between 2001 and 2014
Source: own compilation based on Eurostat and ACEM data.

These are developing countries which in the case of Slovenia and Croatia also have favourable climatic conditions for PTW transport. In Estonia, the high growth rate of foreign investment in the high technology industry (Meyer, 2004) and the development of the motorbike industry were significant factors. The reactivation of the pre-war Renard brand is an example. High growth of over 100% was also recorded in Slovakia, Finland, Iceland and Greece. It was caused by legislative changes (Finland, Slovakia), the level of the wealth of society (Iceland, Slovakia) or the impact of the financial crisis (Greece).

Among the countries where the increase in comparison to 2001 was over 100% were Hungary and Lithuania where the increase in the number of PTWs was influenced by both legal changes – the ability to drive 125cc vehicles by category B drivers and the growth of the wealth of society. The biggest decrease was recorded in Romania where after a marked decrease in the number of PTWs in 2004-2007 related to the economic development (Hunya, 2002) there was a slow increase linked to the economic crisis (Constantin, Goschin, & Danciu, 2011).

The absolute increase in the number of PTWs is mainly due to the increase in the number of motorcycles with a decrease in the number of vehicles below 50cc. This is related both to

legal changes and to the ageing of society, as vehicles with a capacity of 50cc remain largely the domain of young people. However, as statistics show, the share of motorcycles in Europe increasing from around 53% to 71% PTW was very different in various countries. The largest number of motorcycles (over 50cc) was recorded by the countries such as Romania (an increase of nearly 55% from the level of 43% in 2001): Cyprus (35% increase from 29%): Italy (increase by 34% from 42%): Slovenia (33% from 24%) and Poland (32% from 58%).

The growth of motorcycles number therefore occurred in the countries with a high rate of PTWs (Romania and Poland): as well as in the countries with low participation (Slovenia and Cyprus). In the first case, the legislative changes and the rise in the wealth of society were decisive, and in the second case the development of PTW transport in the countries of high urbanisation level and favourable climatic conditions. A high increase in motorcycles (over 20%) was also noted by rich countries, like Denmark and Luxembourg. A decrease in vehicles above 50cc was observed in the Czech Republic (45% from 97% in 2001), Finland (down by 5% from 50%) and Germany (down by 3% from 69%). In case of the Czech Republic, such a high decline could be linked to the deep economic growth (the urbanisation process) (Hindls, Hronová, & Čabla, 2011; Borowiec, 2016), whereas in Finland, the increase is mainly a result of the ageing process, as is the case of Germany.

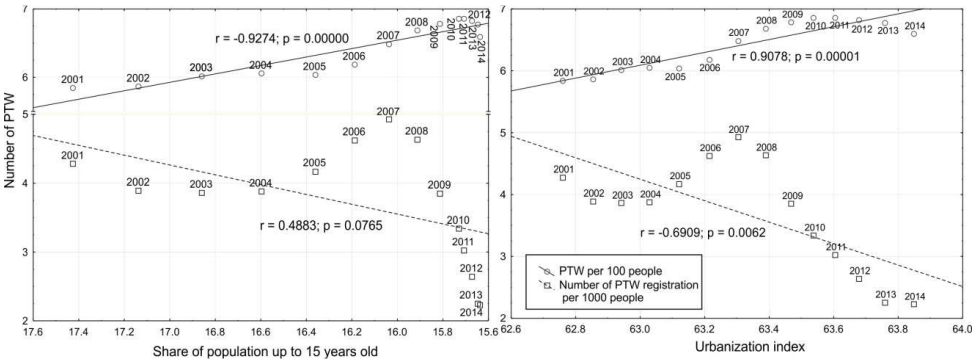

Figure 10. The change in the PTW number per 100 people in selected European countries between 2001 and 2014
Source: own compilation based on Eurostat and ACEM data.

Comparing the number of PTWs and the number of their registrations with the population of Europe to the age of 15 (indicating the average age of the population) and the urbanisation index, it can be seen that in both cases the dependence is not clear. However, in both cases the impact of the crisis on the number of vehicles registered can be noticed (Figure 10). However, despite the high correlation between PTWs and the level of urbanisation and the age structure of societies, these conditions are not the only factors influencing the level of development of the PTW market. It should be emphasised that the number of PTWs is also strongly related to the level of development of the automotive industry located in a given country. In Eastern Europe, in the countries where motorcycle production was historically developed, after a period of economic transformation, a slow return to domestic brands is noticeable, even if today these vehicles, or their components, are produced outside the continent. An example is Polish Romet, Czech Java or East German Motorenwerke Zschopau (MZ). Another important factor affecting the popularity of

two-wheelers is the wealth of the society (Dorosz, 2016) and the model of public transport organisation (also in rural areas) (Guzik, 2015).

CONCLUSIONS

As shown in the above text, the PTW market in Europe refers to global trends. It should be agreed with other researchers (Law *et al.,* 2015) that it is mainly dependent on economic conditions. However, non-economic factors are also important, including mainly legal conditions and communication policy of the (local) authorities. Climate conditions cannot be forgotten. These factors are interdependent with the age structure of society or the degree of urbanisation. As shown by the region and socio-economic and legal conditions, the same factors may have a different impact on the PTW market. An example of this is the ageing process of society. On the one hand, this should affect the reduction in the number of mopeds (<50cc) but on the other hand an increase in the number of motorcycles. However, legal restrictions in allowing older people to road traffic may affect the growth of the sales of mopeds. Similarly, the process of urbanisation may affect an increase in the number of PTW (communication difficulties in the city), but also the progressing suburbanisation process may force an increase in the number of two-wheeled vehicles by increasing the number of daily shifts. Currently, PTW is both a luxury good and a car substitute depending on the region of Europe. Therefore, the analysis of the two-wheeler market is very complicated. In addition, the diversification of legal conditions in individual countries and the related difficulties in obtaining comparable statistical data allows to make an analysis with a large degree of generalisation. An example is the diversity in the rights of the holders of category B driving license. For those people in such countries as Poland, Portugal, Spain or Italy it is allowed to drive vehicles up to 125 cc. In the Czech Republic and Slovakia it is allowed to drive vehicles up to 125 cc but only with automatic transmission. While in Austria, Hungary and Switzerland additional training should be provided for the B125 category. However, in some countries, for example Germany or the UK, driving vehicles over 50cc must have category A1. Analysing the PTW market in Europe between 2001 and 2014, the following trends can be observed:

- In Europe there is an increase in the number of PTWs, which, however, varies considerably from country to country;
- Some countries reacted very strongly to the global economic crisis in the PTW segment; this led to an increase in the number of vehicles in poorer countries with good climatic conditions (e.g., Greece, Spain): while in developed countries (PTW as a luxurious item) there was a decrease (e.g. UK, Denmark);
- The largest increase in the number of PTWs was recorded in the countries with low saturation of the PTW market, where social wealth is growing (Slovenia, Croatia, Estonia, Slovakia);
- Other factors which strongly influence the PTW market are legal conditions (e.g. facilitating the management of so-called lightweight A1 motorcycles) and local government policies (e.g. limiting urban car traffic);
- PTW vehicles, which have been the domain of young people so far, are becoming a means of transport for mature and elderly people;
- Among PTW users there is a growing share of women;
- Despite numerous technical facilities, one of the determinants of the PTW development is the climate;

- An important element of the PTW market development are cultural conditions, including the traditions of the motor industry development;
- The structure of the PTW market in Europe is very diverse and depends mainly on legal and economic conditions.

The PTW market in the period analysed showed a great dynamics associated with the economic and social changes which were occurring in both Western and Eastern Europe. It is to be expected that in the future this market will continue to grow dynamically, which will be influenced by the economic development of Eastern Europe and the processes of urbanisation and demographic ageing. Also global policies to reduce air pollution and local policies to tackle urban transport problems can have a dramatic impact on the number of two wheelers on the streets of Europe.

Summing up the changes on the PTW market in Europe, it should be stated that it is very diverse and depends on many factors. It seems therefore necessary to carry out additional detailed studies, including the analysis of sociological and cultural conditions in individual countries or regions of Europe. Increasing communication problems and increasing mobility needs will in many cases force significant changes in transportation systems. It seems that PTW vehicles will be one of the important elements of the future transport of Europe. Therefore, further research into the development of the PTW market and its determinants should be undertaken. The following questions arise if the distance of daytime shuttle services can have an impact on the choice of PTW or the road infrastructure dedicated to PTWs has a significant impact on their popularity and how individual transport will develop in the so-called smart city.

It seems that the issue should be continued in detailed studies carried out in individual countries or regions of Europe.

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