Logistics Infrastructure of Automobile Industry Between Germany and Poland

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Abstract. This study reviews the logistical infrastructure of the automotive industry of Germany and Poland; to be specific, the factories in Poland which are run by German automobile companies are studied, in order to assess the benefit in the movement of factories from Germany to Poland. Quantitative data of Poland's logistical structure, German and Polish economies, production output figures and values, etc. are studied under scholarly literature for qualitative assessments. Critical analysis has been made with comparison to each other and Czech Republic as well which is a neighbor and strong competitor of Poland in the industry. Furthermore, data is restructured to assess the economic benefits of German companies and the effect on Polish economy to ascertain the feasibility to produce in a neighboring country in order to save on wages and continue to pay for transportation, rather than producing in the home country of the companies. Findings are drawn in conclusion and a tentative benefit of savings has been noted. Manufacturing volume, vehicular exports, automotive parts exports as well as railway density, carriage of goods and road transport has been analyzed during the process.

Keywords: Logistics · Automobile transportation · Production · Manufacturing

1 Introduction

The purpose of this study is to analyze the logistical infrastructure of automobile industry, comparing case studies from Germany and Poland. The paper provides an encompassing review of the literature, as well as a quantitative analysis. Combined, these approaches allow us to draw some qualitative conclusions about the logistics and infrastructure on automobile industry between those two countries.

The collection of processes involving the management of acquiring resources, storage, and transportation to destination is known as logistics. For manufacturing firms, logistics management includes transportation of goods, identification of distributors, finding most effective solution for accessing destinations and cost effectiveness [1]. Moreover, research shows that the performance of logistical operations is directly related to volume of trade [2]. Naturally, with a smoother transportation of manufactured goods, trade will not be hindered by unneeded disruptions.

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In 2018, with 82.7 million inhabitants, the German GDP per capita was 47,501 USD [3], whereas, Poland's GDP per capita was 15,418 USD for 2018 with 38 million inhabitants [4]. German-Polish border, the Oder-Neisse line is 467 km long [5]. Sharing borders and amicable relationships, capitalizing on each other's advantages is advantageous for both. According to Financial Observer [6], Polish-German trade in 2016 exceeded 100 billion euros [6]. Motivation for both parties remains economical; German companies reach economies of scale by growth in manufacturing considering lower wages in Poland, while Poland receives increased FDI and employment.

German companies such as Volkswagen Group, Opel and Daimler AG produce ready cars and parts in Poland relying on hefty logistical processes for transporting them to various destinations. One quick example can be that Daimler AG recently invested 500 million euro in a manufacturing plant in Poland [7], another could be the Volkswagen manufacturing in Poland as well. However, in order to understand the transportability of goods, manufacturing data based on each factory as well as the industry as a whole must be analyzed.

Research question that this study tends to answer is whether is it beneficial for German automobile companies to move their production plants in Poland, or not, in order to gain economic benefits based on the advantage the logistical infrastructure of the two countries provide between the shared land border.

This paper is organized as follows. After this section of Introduction, Literature Review discusses scholarly work regarding logistics, transportation costs, trade, etc. related to the subject. Afterwards, the methodology is detailed of how this study has been performed. Next is Quantitative Analysis of the German-Polish automobile industry. Results follow showing my findings restructuring aforementioned data for further analysis. Discussion section ensues where a critical analysis of quantitative results is done under the light of scholarly works for qualitative assessment of the German-Polish automotive industry. Among other things, the rationale is also discussed behind German companies' continuous decision of utilizing Polish factories instead of home-based production solutions. All this is concluded in the last section therein, namely Conclusion.

2 Literature Review

Logistics plays a crucial role for a well-functioning business. As Mallik [8] stresses in her 2010 study on page 104, "having the right item in the right quantity at the right time at the right place for the right price in the right condition to the right customer" [8]. Narrowing it down, business logistics and management of supply chain is the process of material flow of goods from the producer to the end user [9]. According to Nyhuis and Wiendahi Hans-Peter [10], logistics, especially related to production is an ever changing process that offers the opportunity of constant improvements. Since this study covers automobile manufacturing plants, therefore, production logistics is mentioned. Nyhuis and Wiendahi [10] elaborate furthermore that new production plants require allocation of machinery and logistical transport of product. Existing plants face recurring renewal of machinery and the routine transport of product [10].

Of transport costs, Limao and Venables [11], in 2001, suggest that while international trade fundamentally relies on logistics affecting countries and companies, many studies focus on geographical characteristics or those regarding the product, instead of added transportation costs [11]. To encompass it all, I discuss Polish volume of goods, transport cost as well as added transport costs in the form of toll taxes and the ownership of heavy duty vehicles (HDVs). Interestingly, the same point about added transport cost has been raised by W. F. Wong [12] in 2017 as well, that in trade based studies, cost is usually exhibited exogenously and is understood based on distance [12].

It must be noted that according to research, the ownership taxes are actually paid on the route itself [13] while adding to the benefit of Polish economy, but increasing in German companies' transport cost. According to Limao and Venables [11], transport costs may reach up to 60% of landlocked countries with poor logistical infrastructure. For countries connected to sea, Martínez-Zarzoso et al. in 2014 [14] suggest that transport cost and aggregate trade value is inversely proportional; trade value includes volume and variety of products [14]. Limao and Venables [11], in 2001, state the same but from another semantic that countries with coastal lines but poor infrastructure of logistics may see a hike of transport costs for as much as 40%. Since Poland is not landlocked, however, the trade between Germany and Poland and most of the Europe (except Scandinavia) is done through land, therefore, the rail and road based infrastructure is of utmost importance.

According to the report by Arvis, Ojala, Wiederer and Shephard [15], logistics infrastructure is of crucial value for cross-border trade, the same report also stresses on the importance of scheduling and timely deliveries based on their study and rankings of Logistics Performance Index (LPI). High LPI score countries in top quintile report that shipments almost always reach on time. Poor LPI score countries in low quintile report only half of the shipments to be on time [15]. Barbero et al. [13] also emphasize on distance and time related costs (e.g. maximum speed, traffic lights, curvature of roads, etc.) that affect delivery scheduling directly [13]. Another hindrance may be the customs and delays caused by processes or complicated regulations. According to the 2016 study by Martincus, Carballo and Graziano [16], delays caused by customs in arrival of goods may be accumulated in trade costs for the particular transaction [16]. The same study states that, if each exported item is checked and takes up to 2 days, then all 2011 exports would have been reduced down 16.4%. The same would be reduced 8.4% provided that Ordinary Least Squares (OLS) methodology is used [16].

Based on LPI data in the 2018 report by Arvis et al. [15], countries in top and bottom quintile scored almost the same (62% and 61% respectively) for Customs as the determinant, but the middle countries (3rd quintile) scored the least, (44%) [15]. It shows that while laws have not dramatically changed in either the top or bottom countries group, they still exhibit improvement in logistics environment (since 2015), but not as such in 3rd quintile [15]. Poland has 83.5% highest performance, and Germany has 100%, therefore, both fall in the 1st quintile.

Zarzoso and Suarez-Burguet [17] in their 2015 study state that trade, based on the gravity model is directly proportional to the economic size of the countries and negatively to the geographical distance between them [17]. Similar to Germany and Poland, using Spain and France as neighbors' example, Matinez-Zarzoso et al. [17]

indicate that Spanish regions near France export more to it. Distance effect is further validated with comparatively lesser export volume from Spanish regions to third countries. However, according to Barbero et al. [13], tolls, which add up to transport costs, are also directly proportional to the geographical distance, and since Poland and Germany use roads that require tolls, such transport costs are added.

3 Methodology

In order to assess the logistical infrastructure of German automobile companies that manufacture their products (vehicles or vehicular parts) within Poland for economic benefits, Volkswagen is used as a sample case study. Nevertheless, since Poland also houses factories of other companies as well, therefore, general automobile industry's manufacturing in Poland are considered as well. In order to ascertain the volume of automobile products, production volume is also recorded. Data has been collected of total production, passenger cars, commercial vehicles, etc. as well as of production of German companies namely Opel and Volkswagen. This is corresponded to export of Polish goods to the rest of Europe and contrasted with Germany only as well, in order to exhibit the share of automobile industry which may utilize land based logistical solutions such as truck fleets, railways, etc. The export volume to the said countries (and Russia) are noted as well. Furthermore, the logistics infrastructure of Poland is observed with land based solutions currently in the infrastructure, motorways and railways.

In order to assess the economic aspect of the collected data, freight transport costs in the region are collected for light and heavy duty vehicles as well as for the rail. Infrastructure of Germany and Poland is also noted for comparison. Based on factories' location within Poland, and the destination of products, the distance and cost ratio is assessed.

A tentative calculation is also performed in order to understand the savings made by the sample Volkswagen factory in Poland had it been Germany based instead of Poland, based on the minimum wage, production and employees' data. The savings made based on remuneration for employed labor is calculated. Next is the calculation for the transportation of cars from the Volkswagen Poznan to Berlin, as an example. The mode selected for transportation is HDV fleet and toll is also calculated. Later, the transportation cost is subtracted from the saving made through the difference in labor salaries in Germany and Poland, and a tentative figure is calculated. Naturally, learning business secrets would be impossible, therefore, a general idea is constructed to exhibit the usage of logistics and its effect on the logistical infrastructure.

Data has been collected from reliable sources such as Government of Poland's statistics office, Polish Automotive Industry Association's released data, European Commission's published reports, etc. Vehicles are considered to be used for public transport for at least ten persons seating capacity.

4 Automobile Industry Between Germany and Poland; A Quantitative Analysis

After examining the findings of the literature concerning the relationship between logistics and international trade, this section will focus on a preliminary data research based on the logistics of the automobile industry between Germany and Poland. With many German factories, Poland receives FDI from Germany and employment increases. In 2019, unemployment in Poland was 5.1%, coming from 12% in 2015 [18]. Minimum monthly wage in Poland is 523.09 EUR [19], whereas the minimum hourly wage in Germany is 9.19 EUR [20]. With 160 average working hours a month, it amounts to 1470.4 EUR/month; the difference (947.31 EUR) per employee might be highly beneficial for German companies.

Poland produced 662,000 cars in 2016 resulting in 3.5% market share of EU with 8th position in the production output ranking. (Czech had 7% market share and acquired the 5th position. Slovakia had 4.9% market share and acquired the 7th position, while Hungary acquired the 9th position). Between 2013–16, automotive sold production in Poland had an almost 26% increase, which amount to 71% if compared against 2008 (beginning of global crisis). This is one of the highest figure in Europe w. r.t. the 2008 crisis. In 2011, the value of produced car parts and accessories exceeded the value of manufactured ready cars. In 2016, 57% production output based on parts and accessories, coming up from 42% from 9 years ago [21].

Table 1. Production of motor vehicles in Poland (in thousands)

Year	Total	Type of vehicles				Selected German brands	
		Passenger cars	Commercial vehicles			Opel Poland	Volkswagen Poznan
			Total commercial	Lorries, tractors	Public transport		
2007	791.7	697.7	94	–	–	–	–
2008	947.1	841.7	105.4	–	–	–	–
2009	880.5	818.8	61.7	–	–	–	–
2010	871.3	785	86.3	–	–	–	–
2011	839.7	740.5	99.2	–	–	–	–
2012	647.8	540	107.8	–	–	–	–
2013	590.2	475	115.2	–	–	108.5	170.9
2014	593.5	472.6	120.9	115.9	5	88.9	175.5
2015	660.6	534.7	125.9	120.9	5	169	170.8
2016	681.8	554.6	127.2	–	–	201.2	187.4
2017	689.7	514.7	175	–	–	165.2	238
2018	659.6	451.6	208	–	–	106.5	266.8

Total (2nd column) = passenger + commercial vehicles. Public Transport = vehicles for of at least 10 persons

Sources: 2014/15 passenger and commercial vehicles: [22]. Selected German brands and Types of Vehicles: [23].

We see passenger cars leading against lorries/tractors; production of public transport vehicles remains minuscule in comparison. This data does not exhibit exports. Let us analyze Polish exports in general as well as to the EU and specifically to Germany (Table 2).

Table 2. Export of Polish Goods to EU, Germany and in total

2014		2015		Countries
Thousand tons	Million t-km	Thousand tons	Million t-km	
61075	53594	63601	53252	Total
56446	47346	60497	49229	European Union
23897	15447	25923	16125	Germany

t-km is ton kilometer – Data source: Road Transport in Poland [22]

8% of Polish GDP comes from automotive production which is 13% of Polish exports creating 1.1 million jobs [24]. Volkswagen has 1 factory in Wrzesnia, and another near Poznan [25]. Opel Manufacturing Poland, a subsidiary of the German company Opel Automobile GmbH in Rüsselsheim, Germany runs 2 factories in Poland. One in Gliwice to assemble passenger cars, the largest foreign investment in Silesia. It achieved a milestone building 1.5 million vehicles in 2011 [26]. Tychy factory, for engines only, achieved a milestone by producing 2 million engines in 2009. Engines from here are to be delivered to a factory in Trnava, Slovakia [27]. Daimler AG has a production facility in Warsaw [28]. Besides this, Mercedes-Benz Cars has been building a battery factory in Jawor [29]. Since there is a strong emphasis on the production of car parts, etc. as well, therefore, the following data is presented (Table 3).

Table 3. Exports of components, parts and accessories (EUR billion)

2010	2011	2012	2013	2014	2015	2016	2017	2018
12.6	14.5	14.5	15.8	16.8	18.2	19.7	21.1	22.3

Accessories include tires, glass, batteries, engines, electric equipment and mechanical parts of combustion engines – Source: KPMG Poland [23]

Table 4 presents Polish exports of the automobile branch. The value of exports to various destinations in Europe are presented and the production is subdivided between final products and components.

Table 4. Destination focused Polish exports (Vehicle, trailers and semi-trailers as well as components, parts and accessories) – 2018 (EUR billion)

Country	Vehicles, trailers and semi-trailers	Components, parts and accessories
Czech	0.33	2.34
Germany	3.4	7.03
France	0.81	1.44
Great Britain	0.94	1.37
Hungary	0.34	0.79
Italy	1.02	1.43
Russia	0.06	0.1

Source: KPMG Poland [23]

Railway lines, railway density and motorways are important for land logistics. Poland and Germany share Oder-Neisse line, and their logistics is mainly land based. Referring back to the study by Hausman et al. [2] published in 2012, logistical performance is directly related to the volume of trade [2]. Therefore, the following data is crucial to understand the network spread for land based logistics. Czech, being a neighbor and a strong CEE competitor of Poland in the EU automobile industry is kept for comparison.

Table 5. 2018 – Railway density, carriage of goods, total length of motorways and railway lines and toll cost.

Country	Railway density	Carriage of goods (million ton-kilometers)		Total length of motorways and railway lines (kilometers)		Toll cost (eur/km)
		Rail	Road	Motorways	Railway lines	
Poland	61.5	59388	315874	1637	19235	0.27
Germany	107.6	128816	316767	13141	38416	0.19
Czech	121.4	16564	41073	1252	9572	0.18

Unit for Railway Density: Kilometers of Lines Operated per 1000 km^2. Source for Railway Density, Carriage of Goods, Total Length of Motorways and Railway Lines: [30]. Source for Toll Costs: Estimating Road Transport Costs Between EU Regions by [13].

Table 6. Average freight transport operating costs in NSM-5 EU

Mode (t-km)	HDV	LDV	Rail freight
Cost (EUR)	0.07	1.81	0.06

Source: Schade et al. [31] – NSM-5 means nations newly added to EU; Czech Republic, Hungary, Poland, Slovenia, and Slovakia

In light of the average freight costs, it should also be noted that factories have been placed strategically for economic benefits of their owner companies. E.g. Opel's factory in Gliwice (Poland) and headquarters in Rüsselsheim (Germany) are 888 km away from each other (8 h by road, more by rail). And the factory in Tychy (Poland) which sends engines to Trnava (Slovakia) is 308 km away from it (less than 4 h by road and slightly more by rail). Such strategic placement may help control freight costs better. Based on data from Table 5 and Table 6, average HDV transport operation from Gliwice to Russelsheim would cost 62.16 and 239.76 for toll, amounting to a total of 301.92 euro. And from Tychy to Trnava would total to 104.72 euro. This calculation is tentative and naturally does not include additional practical costs.

5 Results

Poland's 662,000 automotive output in 2016 with 3.5% EU market share may not seem astounding at large scale, but Volkswagen Group with a big share in Polish automotive manufacturing industry curtails 24.5% EU market share between January and November of 2019 considering new registrations only [32]. The difference with predecessor PSA Group was almost 9%. This important because Volkswagen has two factories in Poland. The output of one of these is exhibited in the following chart (Fig. 1):

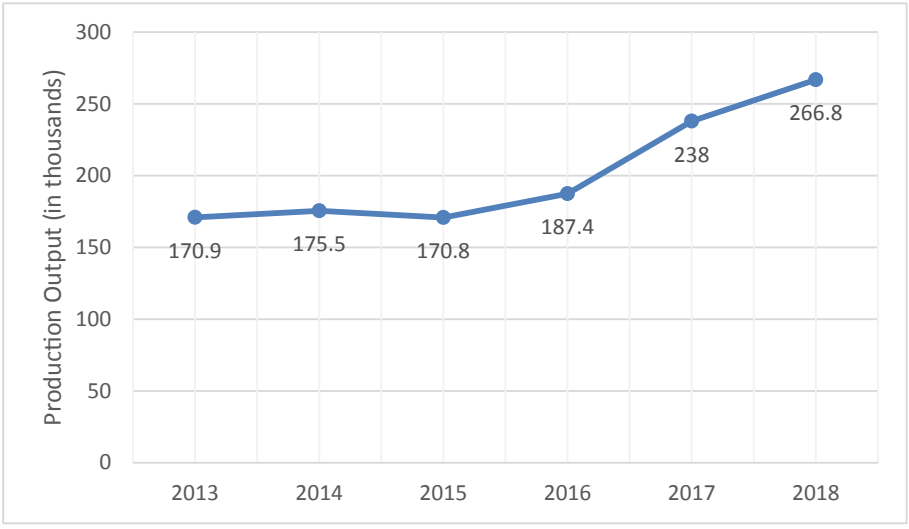

Fig. 1. Volkswagen Poznan production plant's production output (in thousands)

Increase in sold-production in the automotive industry in Poland (26% between 2013–16 and 71% in comparison to 2008) is promising for Germans to increase their manufacturing output in Poland, and useful for Polish economy. Similarly, the

production of car parts exceeding ready cars is also hopeful for the same purpose, that componential production is as well equally promising. In 2015, in comparison to the previous year, total motor vehicles production had an 11.3% increase, passenger cars had a 13.1% increase, lorries/tractors saw a 4.4% increase and public transport vehicles had no change at all. Separately, Polish exported goods were unloaded in Germany amounting to 25,923,000 tons, 40.7% of all Polish exported goods unloaded everywhere.

In Volkswagen Poznan, 750 vehicles are produced daily; 1 every 2 min. Września plant can produce up to 420 vehicles a day. Recently, Volkswagen opened a new factory in Białężyce. Volkswagen Poland employs 11000 people [33] (Fig. 2).

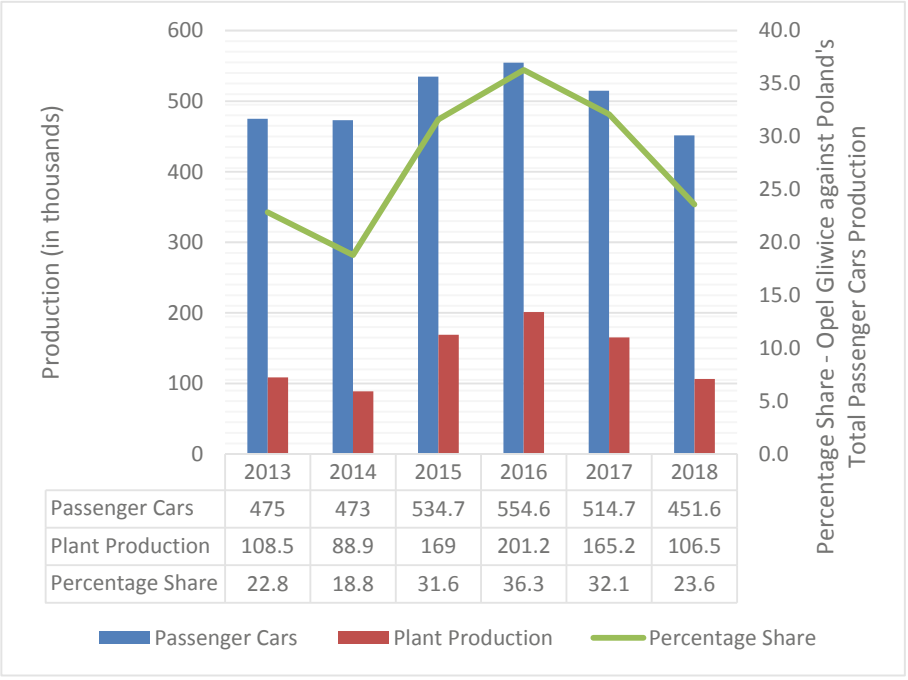

Fig. 2. Poland's total production of passenger cars with respect to Opel's production plant in Gliwice's production share (Self restructured data). Source: Own reproduction of data from Table 1's data

According to a study by KPMG Poland which was published by Polish Automotive Industry Association in 2019 [23], more than 7 billion euro's worth car parts and almost 3.4 billion euro's worth of vehicles were exported to Germany. Comparing to another neighbor of Poland, Russia (Poland-Russia border is 210 km long while Poland-Germany border is 467 km long [5]), we see that 0.1 billion euro's worth of car parts and 0.06 billion euro's worth of vehicles were exported to Russia.

Surprisingly, Polish railway density is almost half the size of Czech's, another major car manufacturer in Central and Eastern Europe. For logistics, carriage of goods, in 2018, Poland compounded to 59,388 million ton-kilometers in rail far above Czech and almost half that of Germany. For road, Poland and Germany stand very close to each other, surprisingly, at 315,874 for the former and 316,767 for the latter. Czech remains far below in this category. Poland has a more thorough spread out network of motorways and railways (exact figures in Table 5) compared to Czech but stands far below Germany. It may be noted that the land area of Poland is 312,679 km^2, of Germany is 357,386 km^2 and of Czech is 78,856 km^2.

Railroad, and motorways are also important because transportation industry used for logistics stands separate from automotive industry but together adds up to Polish economy, giving Poland a very strong economic intake from German investment besides direct foreign investment and direct job creation.

Table 7. Tentative savings calculation of Volkswagen Poland (Self restructured data)

Country	Monthly minimum wage	Salary for 11000 employees	Specification
Germany	1470.4	16,174,400	Salary in Germany
Poland	523.09	5,753,990	Salary in Poland
Difference	947.31	10,420,410	Savings in Poland

Source: Minimum wage: Germany [20], Poland [19]. Employees of Volkswagen employees: [33]. Calculation: Own reproduction of data

And as mentioned earlier, Volkswagen Poznan produces up to 750 cars per day. 5 days a week, 20 days a month, 15,000 cars would be produced. Poznan to Berlin is 272 km [34]. Considering the Poznan to Berlin distance bracket for the sake of the case example, and considering the more expensive cost for HDV transport operation and toll costs, the following table is generated (Table 8).

Table 8. Tentative Poznan to Berlin HDV transport operating cost

		Cost for 1 HDV operation	Cost of 15000 cars
Distance (km)	272	–	–
HDV (per km)	0.07	19.04	285600
Toll (per km)	0.27	73.44	1101600
Total			1387200

Subtracting this transportation total cost from the Difference (Savings) computed from Table 7.

$$10{,}420{,}410 - 1{,}387{,}200 = 9{,}033{,}210\,(\text{euro})$$

A very tentative calculation suggests that producing cars in Poznan (Poland) and transporting them to Berlin (Germany) allows Volkswagen to save more than 9 million euro per month. Please note that this calculation does not cover additional costs of logistics, safety, taxation, legalities, insurance, administration, management, etc. Introducing such costs would reduce the savings significantly.

6 Discussion

In 2016, Polish-German Chamber of Commerce conducted a study for investment attractiveness among German companies interested in investment in CEE. Poland came 2nd, after leading for 3 previous years, replaced by Czech Republic at number 1 in the report. It is promising that Germans have not decided to step back in last 3 years, on the contrary, Daimler AG has recently invested 500 million euro in a factory in Lower Silesia, Poland [6]. This phenomenon probably works swiftly because it fits to Oliver and Webber's [9] material flows of goods theory; Polish subsidiaries producing goods that utilize Polish land network access to various destinations depicting a practical of business logistics and supply chain management.

With the aforementioned investment attractiveness drop of Poland, the contemporary situation brings to light Nyhuis and Wiendahi Hans-Peter's [10] concept that logistics of production changes constantly, constant improvements are needed [10]. As shown in Table 5, Czech's motorways and railway network is not much smaller than that of Poland's while Czech being one quarter to the size of Poland by land area.

The point raised by Limao and Venables [11], mentioned earlier, about added transport costs is seen in practice because within EU, due to lack of trade barriers, it is the characteristics regarding the product or the transport costs in the context of geographical distances that affect the logistics. Same as the suggestion by W. F. Wong [12], transport costs being exogenous. The study by Bensassi, Martínez-Zarzoso and Suárez-Burguet [14] suggest the relationship between transport costs and aggregate trade value to be inversely proportionate [14], which we see to be utilized by Opel in transporting the engines produced in the production plant in Tychy, Poland to Trnava, Slovakia by reduced costs and increased transport value.

The logistical infrastructure of railway density in Poland as shown by Table 5 is mediocre, when contrasted against that of Czech, primarily because Czech being significantly smaller than Poland comprises of a railway density of 121.4 kms/1000 km^2, as of 2018, whereas, Poland stands with 61.5 kms/1000 km^2. Not to forget that Germany comprising of a similar area than that of Poland surprisingly shows the railway density of 107.6 kms/1000 km^2 as depicted in Table 5 as well. And economic advancement of Germany may not stand as a strong reason alone if the economic condition of Czech is also considered for one variable such as railways density, per se.

This mediocrity of structure is contrasted by the report by Arvis et al. [15] where it is mentioned that infrastructure is very important for cross-border trade [15]. The report continues about scheduling, timely deliveries and so on, however, as for the infrastructure, and the aforementioned drop in CEE investment attractiveness ranking [6], Poland appears weak in the logistical infrastructure. Since land logistics are used by various industries, it must effect other industries as well.

Zarzoso and Suarez-Burguet [35] emphasize on the positive relationship of trade and economic size and the negative one of trade and distance [35]. We witness this between Germany and Poland (for distance), since they share Oder-Neisse line and many important cities lie very close to each other, for instance the distance between Berlin and Poznan is almost 270 km only [34], however, the economic size differs. Polish GDP per capita (15,418 USD [4]) is far less than that of Germany (47,501 USD [3]), however, trade has been positive, this phenomenon may be explained by the fact that the production facilities of German companies within Poland are direct subsidiaries of their German corporations. Trade, nevertheless, between Germany and Poland is quite high, for comparison, German-Polish trade is almost double than German-Russian trade [6], validating Zarzoso's and Suarez-Burguet's [35] distance based.

The minimum wage gap, as shown earlier, between German and Polish labor market is 947.31 euro/month. Volkswagen Poland employs 11,000 people. As earlier tentative calculation exhibited a profitable margin, we notice the German companies' motivation. For Poland, the increased employment, FDI, are crucial. Besides these, many industries are influenced positively, such as raw material suppliers, construction companies for factories and roads, even housing, stores or other small business near the factories, etc.

7 Conclusion

Logistics and logistical infrastructure are crucial to augment efficiency in production and returns to trade (both domestic and international). This study utilized economic, logistical and geographical data of automotive factories in Poland run by German companies producing ready vehicles as well as parts, etc., in order to understand the logistical infrastructure and gain some economic insight to the German-Polish automotive industry. Analyzing growth, recent competition with Czech, distinction between producing ready vehicles vs parts, etc., the comparisons are done over quantitative data and qualitative assessments have been made regarding scholarly work by various authors to understand the economic benefit of German companies in producing in Poland and economic benefit of Poland by German investments. Data has been restructured for comparisons in order to reach qualitative judgments backed by quantitative reasoning.

The research question for this study to investigate and see if it was beneficial for German automobile companies to movie their production plants in Poland in order to gain economic benefits based on the advantage the logistical infrastructure of the two countries provide between the shared land border is conclusively answered positively. German companies benefit in profit maximization by reallocating their production to where wages are lower and distance is not very far to be infeasible. Even adding transportation cost, they are still benefitting from the wage gap. The Polish automotive industry seems to run on the path like the automotive industry of UK and Spain where many local names were acquired by foreigners, however, Poland's automotive industry differs by manufacturing for others as of now, therefore, the strong requirement of logistics is of utmost importance. While the foreign investment seems to be growing and the industry continues to thrive creating employment and even allowing local

entrepreneurs new opportunities. However, the infrastructure of rail and road has room for improvement, especially when compared against Czech, which is considerably smaller in geographical size but enjoys the same competitive advantage as Poland of having central location within the EU. Poland, nevertheless, has been called among the fastest growing economies of EU [4], and with the overall infrastructure, transportability and manufacturing outcome, the logistics infrastructure of automobile industry between Germany and Poland is successfully on the right track.

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