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## Environmental pressure in fragmented markets: the fall and rise of bus makers in Poland

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The authors explore differences in the strategies and capabilities of foreign and domestic bus-makers located in Poland, in an attempt to capture the factors behind the radical changes in the structure and geography of this sector in the country. This includes the decline of traditional bus manufacturers and the rise of new foreign and domestic manufacturers, including the successful expansion of Solaris as one of the major European manufacturers of environmentally-friendly buses. Growing environmental pressure along with a need for new technologies in bus manufacturing is interpreted as a window of opportunity for a reconfiguration of the bus manufacturing industry in Europe. The importance of flexibility and willingness to meet specific customer needs in the fragmented national and local markets is emphasized.

Bus Production, Environmental Concern, Transnational Corporations, Indigenous Firms

## Introduction

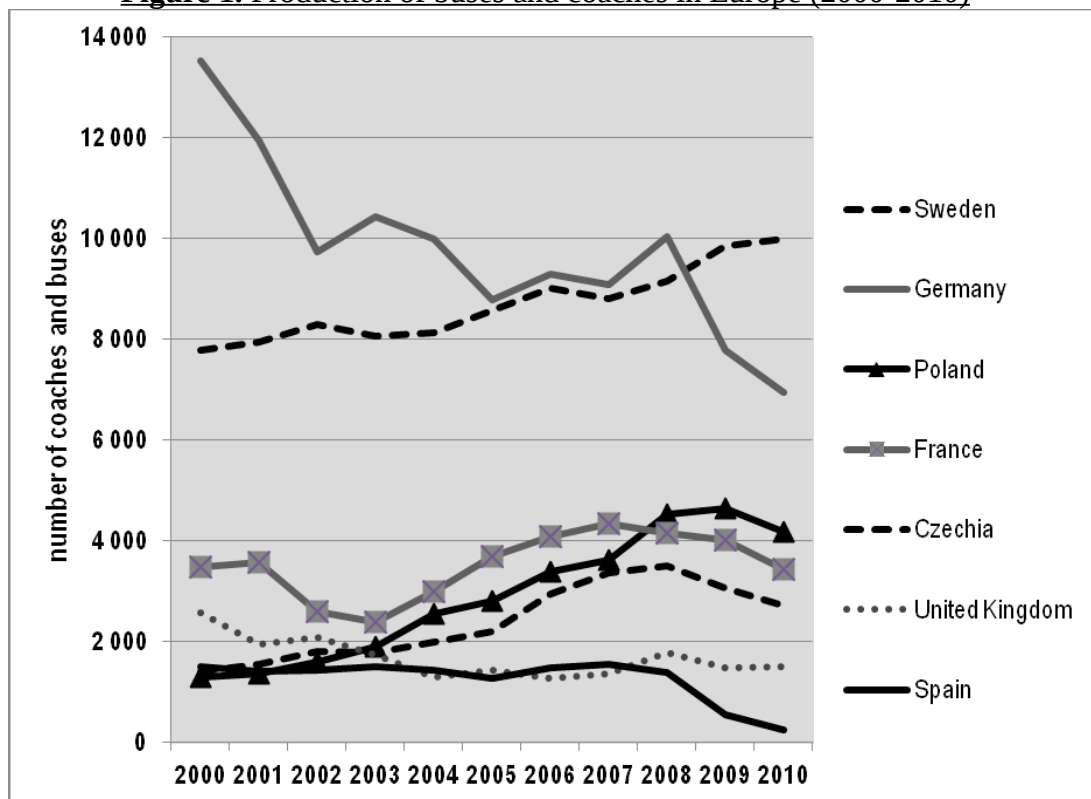
Much of the debate concerning the automotive sector is focused on the passenger car industry; far less attention is given to the manufacturing of trucks and buses. A growing global population together with a rise in environmental awareness and a need for a new mobility policy, which would address environmental concerns, congestion, and high fuel prices create new opportunities and challenges for bus-makers. Worldwide demand for buses in 2010 was more than 350,000 units in comparison to only 238,000 units in 2000 (World Buses 2006). China and Brazil are currently the largest markets.

At the same time, Europe is technologically the world-leading manufacturer of buses and other means of public transportation including trams and light railways (Renner, Gardner 2010). The largest bus manufacturers in Europe have been traditionally Germany and Sweden. Today the production level in Germany represents only half of the total output in the 1970s and 1980s. However, German

companies (Mercedes, MAN) manufacture more buses than they did 20 years ago, thanks to their global expansion. Sweden used to be the largest manufacturer of buses in the world per capita (Volvo, Scania) and today yields the largest production volume in Europe. Rather unexpectedly, Poland has appeared as the third largest bus manufacturer and the second largest bus exporter in Europe in the last decade (Fig. 1).

The purpose of the paper is to shed light on the development of bus manufacturing in Poland in recent years in the context of environmental pressure, economic crisis and other challenges faced by this industry in Europe. The authors explore differences in the strategies and capabilities of foreign and domestic bus-makers located in Poland, in an attempt to capture the factors behind the radical changes in the structure and geography of this sector in the country. This includes the decline of traditional bus manufacturers and the rise of new foreign and domestic manufacturers, including the successful expansion of Solaris as one of the major European manufacturers of environmentally-friendly buses.

**Figure 1.** Production of buses and coaches in Europe (2000-2010)



Source: ACEA, OICA, EUROSTAT – PRODCOM.

## Environmental pressure, characteristics of the bus market and production

There exist profound differences between the passenger car industry and the bus and coach manufacturing industry in terms of market and production characteristics. The latter is characterized by low-volume production, fragmented national and local markets as well as higher labour costs. The key difference is in the scale of output,

which leads to low automation and high labour costs. Bus production involves between 1,500 and 3,000 labour hours per vehicle (HPV) as compared with 12 to 100 HPV in the case of passenger cars (Weyer 2011). The low volume of production is a consequence of the market size, which is around 60,000 buses annually in Europe, with very strong market fragmentation by country, region and city as well as by bus type (city buses, inter-city buses, coaches, school buses). Market practices are strongly affected by public procurement laws affecting city governments, which are the main buyers of city buses, as well as regional authorities, which are often responsible for regional transportation schemes<sup>1</sup>. Most customers attempt to economize via large purchases, which makes the market even more challenging and year-to-year fluctuations in production for a single plant may be considerable (20-50%).

Given the emergence of sustainable mobility policies, which tend to favour public transportation over individual-based transportation by introducing local entry charges, high parking fees and taxes, and support public transportation in a broad sense, the general prospects for bus production appear to be good. However, the same drive for eco-mobility poses new challenges for bus manufactures as sustainable mobility requires the reduction of emissions, search for alternative fuels and powertrains as well as the need for new materials designed to reduce bus weight in order to save energy, not to mention a growing concern for bus accessibility (low-floor) and safety. The environmental pressure, especially with respect to city buses, is far greater than that in car manufacturing. Most developed countries enforce strict environmental regulations. To make things even more difficult for manufacturers, the requirements may differ between regions and even cities within a single country. The implementation of new powertrain solutions makes significant remodelling of bus platforms and bodies necessary in the pursuit of lower bus weight. The new bus constructions are referred to as the 3E model, which stands for environmentally friendly, enhanced comfort and efficiency<sup>2</sup>. There is also a shift towards modularization, combining modules of trucks and buses. All in all, design competences and strategic thinking are vital at a time of key changes and general uncertainty related to the current global financial crisis.

The new pressing requirements in bus production have led to increasing consolidation in the sector as only large companies seem capable of facing all the challenges and growing modularization of production. The number of independent bus manufacturers in Europe has fallen by half since 2000. Some of the old brands are still preserved within large automotive groups which took them over. For example Neoplan was acquired by MAN in 2001, which is in turn controlled by Volkswagen since July 2011. Volkswagen also controls the Swedish manufacturer Scania since 2008. Another example of this strategy is Volvo Bus, which acquired

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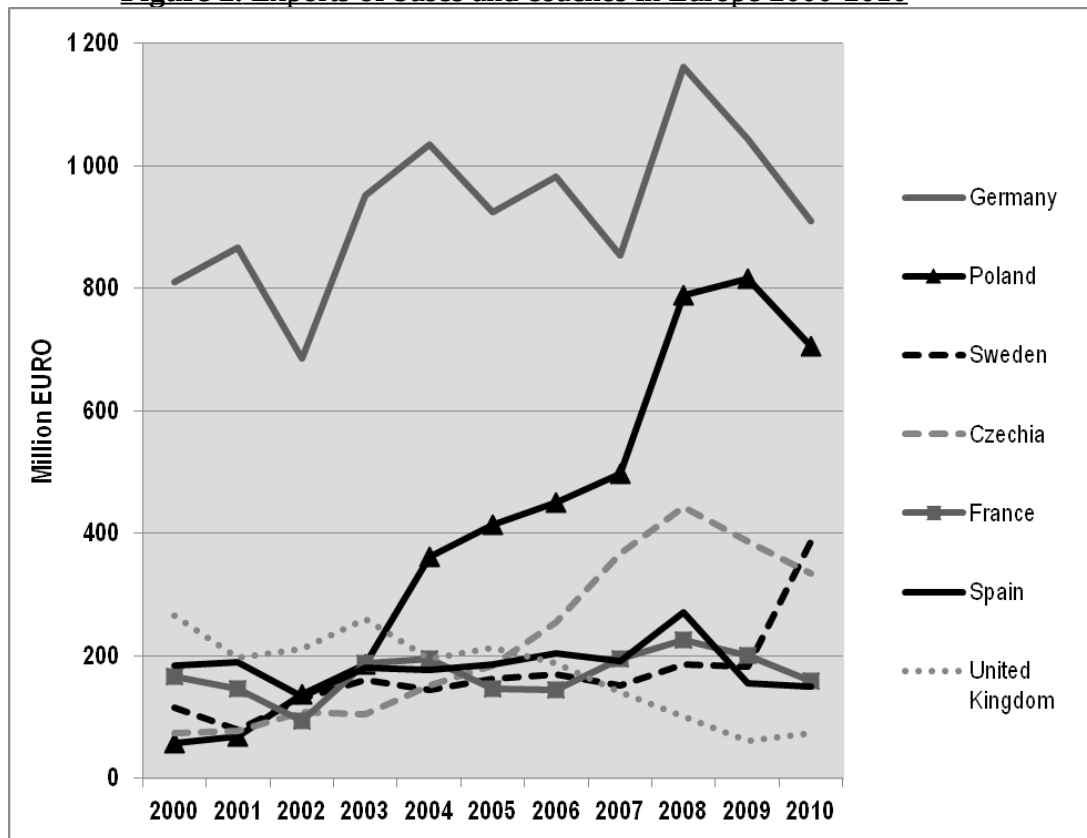
<sup>1</sup> Various bus purchasing strategies are used by local and regional authorities, which often prefer to continue purchasing from manufacturers from whom they had purchased buses in the past, due to the availability of spare parts, repair know-how and general experience with driving a given brand of bus. This puts potential new bus suppliers at a disadvantage.

<sup>2</sup> The construction of buses has become more complicated due to the fact that current requirements are often contradictory, e.g. a hybrid powertrain increases the weight of a bus by about two tons, which means a higher consumption of energy and extra costs, and the location of the batteries is constrained by the required low-floor.

several bus companies around the world. However, in contrast to German companies, Volvo Bus was not interested in maintaining the acquired brands, which ceased to exist as a result, e.g. British Leyland Bus and Finnish Carrus.

Market and cost prerequisites should serve as primary drivers for moving production from high labour cost countries to low labour cost countries, whereas eco-mobility and technological challenges may have the opposite effect because of the location of R&D competences, labour skills and the need for face-to-face contact with customers on a daily basis. Such contradictory needs could be met by bus production in Central Europe, which is geographically close to R&D facilities and key customers, much as it has happened in the case of passenger car production (Pavlínek, Domański, Guzik 2009; Frigant, Layan 2009).

**Figure 2.** Exports of buses and coaches in Europe 2000–2010



Source: EUROSTAT, Swedish Statistical Office SCB, Polish Central Statistical Office.

Several countries in Central Europe used to manufacture buses during the socialist era. Hungary was the top manufacturer (Ikarus) in the region. However, it has by and large lost its position with the advent of capitalism. Strong competition from brand-name Western European manufacturers and volatile domestic markets resulted in the collapse or shrinkage of large formerly state-owned bus-makers across the region. At the same time, new manufacturers have come into existence including foreign investors such as Volvo and MAN. Poland and the Czech Republic have become very important European bus and coach manufacturers. The recent global financial crisis resulted in lower bus production in almost all European countries, however, Central Europe has been affected less significantly and Poland

surpassed France as the third largest European manufacturer of buses (Fig. 1). The newly enhanced role of Poland and the Czech Republic in Europe is even more evident in terms of exports, which have increased more than tenfold for Poland since 2000 and have made it the second largest European bus exporter after Germany (Fig. 2).

In the following sections, we delve into the complex and conflicting processes associated with the decline of traditional bus manufacturers and the expansion of new foreign and domestic manufacturers as well as the factors associated with each process.

## The decline of traditional bus manufacturers in Poland

There were only two bus and coach manufacturers in Poland under the pre-1989 socialist system: Jelcz<sup>3</sup> and Autosan<sup>4</sup>. The two bus companies enjoyed a monopoly as Jelcz manufactured city buses, whereas Autosan manufactured intercity buses and tourist coaches. There was no foreign competition, though insufficient domestic supply was supplemented by imports from Hungary (Ikarus). Bus production in Poland, especially that of city buses, was based on foreign licensing agreements: Škoda-Karosa (1960s) and Berliet (1970s).

At the beginning of the 1990s, Poland appeared to have significant market potential with a total of 38 million inhabitants. There was the old low-quality vehicle stock in the country, which had to be gradually replaced by new buses and coaches. Consequently, traditional Polish bus manufacturers adopted a strategy oriented towards low-cost vehicles for the domestic market. The domestic bus makers were privatized using Polish capital in 1994-1995 and became part of the Sobiesław Zasada Group.

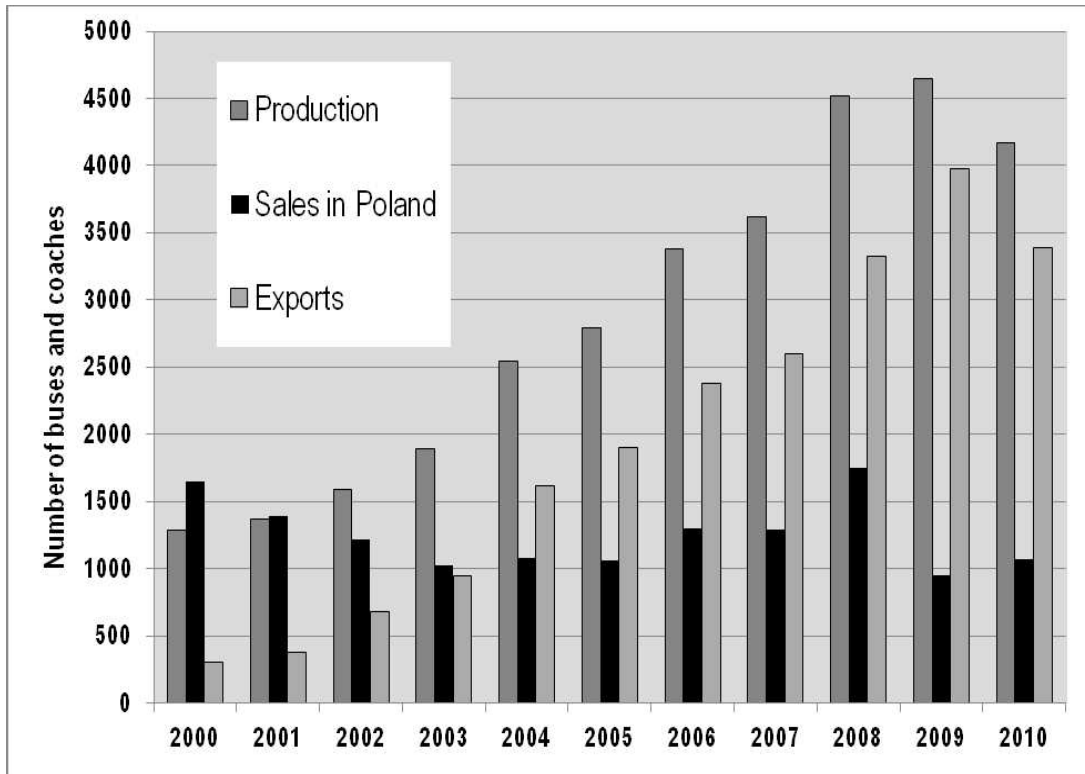
However, the domestic market proved to be volatile. Limited financial resources of municipal authorities and public carriers responsible for intercity transportation meant that orders for new buses were irregular and much lower than expected (Fig. 3). Bus sales in Poland were at a level similar to that in other European countries such as Belgium, Sweden and Norway –each with a much smaller population. At the same time, there was growing foreign competition in the domestic market due to buses being imported from abroad and foreign buses increasingly being assembled in Poland.

### **Figure 3. Production, sales and exports of buses and coaches for Poland 2000-2010**

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<sup>3</sup> The bus factory in the town of Jelcz (29 km SE of Wrocław in southwestern Poland) was opened in 1954 at the site of the formerly German Krupp military factory, which was shipped off to the Soviet Union in 1945-1947. The Jelcz factory also produced trucks starting in 1968.

<sup>4</sup> Autosan started as a small machinery workshop in Sanok in southeastern Poland in 1832 and became a major manufacturer of railway stock at the beginning of the 20<sup>th</sup> century. The production of buses began in 1952.



Source: JMK, Polish Central Statistical Office.

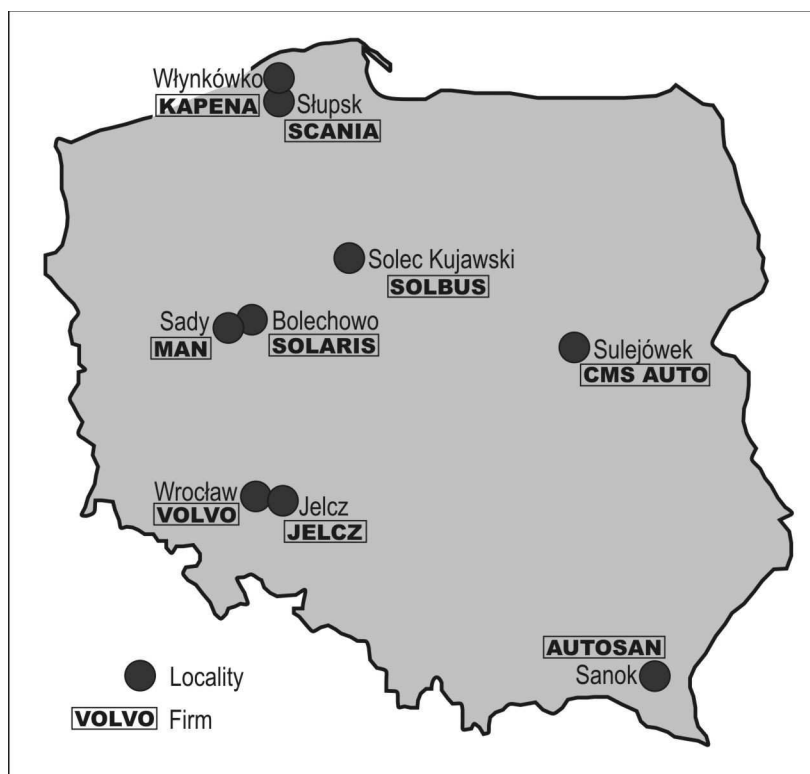
The two domestic companies had limited financial capabilities, lacked modern know-how and access to foreign markets. In addition, large factories from the socialist era suffered from high fixed costs related to underutilized assets, relatively high employment and limited economies of scale in low-volume, fluctuating and cheap production. This was especially true of Jelcz, which combined the production of buses and heavy trucks for many years but gradually lost its position in both markets.

In 2008 the formerly socialist monopolistic manufacturer of city buses Jelcz finally went out of business after a long struggle. Autosan remains a small manufacturer with a broad product range including city buses since 2008. It started upgrading efforts in order to enter foreign markets in recent years. Production is based on conventional diesel engines, with no alternative powertrain.

## The expansion of foreign manufacturers

Foreign bus manufacturers were attracted to Poland by the size and potential of the domestic market and began to assemble buses and trucks in the 1990s. At first, joint ventures with local companies were established. For example, Scania partnered with the bus repair company Kapena in Słupsk in northern Poland. The joint venture was fully taken over by Scania in 2003. Greenfield plants were built in major cities and their environs in western Poland: Volvo in Wrocław in 1995 (assembly of buses since 1996) and MAN in Sady near Poznań in 1998. In 2000 Kapena, which built a plant in a special economic zone in Włynkówko near Słupsk, was acquired by the Italian bus maker Cacciamali (Fig. 4).

**Figure 4.** Bus and coach production plants in Poland



Source: prepared by author

The disappointing growth of the domestic market and the positive experience of production in Poland led foreign investors to a gradual shift towards exports to Western Europe. This was aided by Poland's geographical proximity to the manufacturers' main target markets –Germany and Sweden. The economic advantage of production in Poland rested on lower costs than in Western Europe and rising labour productivity. It was also accompanied by good product quality and the willingness and ability to meet specific customer requirements<sup>5</sup>, a significant advantage in a fragmented market. This was underlain by local technical skills and industrial traditions, a high level of motivation of employees and managers in Poland, the close cultural proximity to West European companies as well as political stability and EU membership.

All this led to growing investment and increasing production capacity of foreign-owned factories (Tab. 1). Polish production and exports include hybrid buses: MAN since 2009 and Volvo since 2010. At this point, all MAN and Volvo hybrid buses are made in Poland. MAN established its prototype facility for hybrid buses at its Polish plant near Poznań and expanded the production of bus frames in a former truck factory in Starachowice in central Poland, including frames for premium Neoplan coaches (relocation from Plauen in Germany).

**Table 1.** Bus and coach manufacturers in Poland 2009-2010

| Company | Origin | Production | Exports | Employment |
|---------|--------|------------|---------|------------|
|---------|--------|------------|---------|------------|

<sup>5</sup> Greater flexibility and adaptability of manufacturers located in Poland in comparison to Western European manufacturers were generally considered the vital advantage of the former by the managers of foreign-owned automotive companies operating in Poland (Domański, Guzik, Gwosdz 2008).



|                          |          | (volume) |      | (volume) |      | 2009  |
|--------------------------|----------|----------|------|----------|------|-------|
|                          |          | 2009     | 2010 | 2009     | 2010 |       |
| MAN Bus                  | Germany  | 1532     | 1267 | 1504     | 1169 | 1398  |
| Solaris Bus & Coach      | Domestic | 1095     | 1022 | 836      | 630  | 1562  |
| Volvo Polska             | Sweden   | 739      | 855  | 739      | 845  | 1645* |
| Scania Production Słupsk | Sweden   | 729      | 658  | 722      | 636  | 760   |
| CMS Auto                 | Domestic | 150      | 159  | .        | 28   | 50    |
| Autosan                  | Domestic | 193      | 112  | .        | 17   | 786   |
| Kapena                   | Italy    | 136      | 83   | .        | 60   | 220   |
| Solbus                   | Domestic | 73       | 12   | 4        | 0    | 240   |
| Total                    |          | 4648     | 4168 | 3977     | 3385 | 6661  |

\* bus division only in 2008

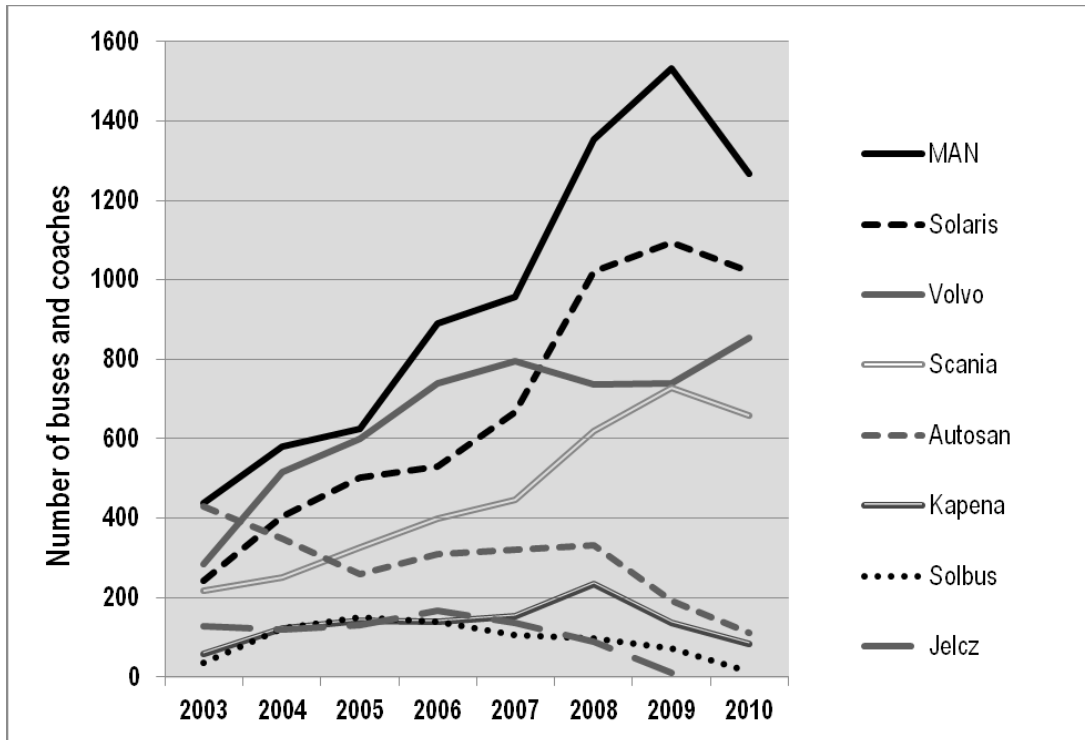
Source: JMK Analizy rynku transportowego and company data

Expanded production was followed by a transfer of some non-production functions to Polish subsidiaries, including financial, purchasing and IT services (shared service centers). The broadest non-production competences can be found at Volvo Poland. The Wrocław subsidiary of Volvo has concept ownership of city buses, that is all the design and testing of city bus bodies is done in Wrocław, whereas the design and production of the chassis for all bus types is done in Sweden. This exemplifies a move towards a 'product specialist' role of the subsidiary within a corporation, combining the design and production of certain products.

## The emergence of new domestic bus manufacturers

Not only foreign companies but also new domestic companies attempted to enter Poland's bus market. It started with simple low-volume assembly for the domestic market in the 1990s. Just a few of these companies have proved to be successful – most of them ending up as small manufacturers of minibuses (CMS Auto, Solbus). However, one company did become really successful (Solaris Bus & Coach) and deserves broader analysis.

**Figure 5.** Production of buses and coaches in Poland by key manufacturers 2003-2010



Source: JMK Analizy rynku transportowego

Solaris started as a family business run by Krzysztof Olszewski, a Polish émigré from Germany, who had been a manager at the Neoplan bus plant in Berlin. The company began assembling Neoplan buses with just 36 employees at a leased facility in Bolechowo in the suburb of Poznań in 1996, after winning a contract for the city of Poznań, which required the assembly to be located in the city or its vicinity. In 1999 the production of a new city bus called the Solaris Urbino was launched. This was designed in the technical department of Solaris and would become the first low-floor bus in Poland. This new product helped start an export expansion of the company, which abandoned its links with Neoplan two years later and changed its name to Solaris Bus & Coach. Alternative powertrains were introduced: Solaris Urbino CNG appeared on the market in 2004 and Solaris Urbino Hybrid in 2006 as the first hybrid bus in serial production in Europe. Two years later, Solaris was the third largest bus supplier in the German market after Mercedes and MAN, with a particularly strong position in the hybrid bus segment. France, Switzerland and Norway soon became other key markets for Solaris. The company product range has been broadened by inter-city and airport buses, trolley-buses and electric trams. The growth has been financed by long-term bank loans mainly by BPH (currently owned by General Electric), at the early stage it was also supported by the European Bank for Reconstruction and Development and more recently by the EU structural funds for innovation (3.9 million euro).

The spectacular rise of Solaris from a small local assembler to an important European manufacturer was based on a careful observation of changing market trends and a willingness and ability to meet customer needs. This led to an innovative strategy oriented towards a new rapidly growing 'green' niche in the bus market: environmentally friendly vehicles. Solaris plans to launch a fully electric

bus in 2015. The company has been building its brand step by step in the German bus market, resting on the personal knowledge and business relationships of the company's owner, the adaptability of the company, its original design competences, technological prowess and search for innovative solutions<sup>6</sup>. The high quality of its products rests on the quality of its local workforce and the top European suppliers of the chassis modules, electrical equipment and powertrain, e.g. Vossloh Kiepe and Voith. Consequently, Solaris does not compete with major European bus-makers in terms of price. At the same time, it is still a family business owned by its founders, Krzysztof and Solange Olszewski, with about 2,000 people on its payroll, including about 100 people in the technical department.

## Conclusions

Despite a relatively small and volatile domestic market as well as the decline of its traditional domestic bus makers, Poland has become an important bus manufacturer and a major bus exporter in Europe. It has achieved a particularly strong position in the manufacturing of city buses, especially hybrid vehicles that meet growing environmental expectations.

Former socialist monopolistic manufacturers, foreign manufacturers and domestic manufacturers established in the 1990s all had different development strategies and resulting development paths. The conservative defensive strategy of the old domestic bus makers oriented towards the low-end, low-cost segment of the market failed and resulted in the bankruptcy of the former monopolistic manufacturer of Jelcz city buses. The same was true of Ikarus in Hungary – the largest bus maker in Central Europe until the 1980s. At the same time, several foreign manufacturers (MAN, Volvo, Scania) proved to be successful in Poland. Their business strategy evolved from initial small-scale assembly for the domestic market to large-scale export-oriented production as well as increasing non-production competences including design and testing. The most surprising story is that of the new domestic bus manufacturer –Solaris– with a full set of competences from design up to after-sale services. The company is the only important newcomer in this business in Europe in recent years.

The general growth of production and exports of buses and coaches in Poland in the last decade can be interpreted in a broader context of the expansion of the automotive industry in Central Europe, which offers relatively low labour costs, high quality and close proximity to West European markets (Pavlínek, Domański, Guzik 2009). This may be interpreted in terms of localized capabilities, which are a product of the interaction of a company's business activity and a changing local environment. This interaction is a dynamic process with learning on the part of both large foreign and domestic companies and various local agents, including the labour force, suppliers and various public and private institutions. Localized capabilities include generic and specific skills, attitudes and reliability of local employees, firms and institutions, and hence represent location-specific advantages, which may reduce uncertainty and improve the efficiency of businesses. Manufacturers gradually build up their local knowledge in order to combine local assets into

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<sup>6</sup> The series hybrid bus was introduced in 2010 in addition to a parallel hybrid vehicle produced since 2006.

desired local competences such as product quality and economic efficiency (Domański, Gwosdz 2009). Thus, they both modify their earlier strategies and significantly change the economic environment of the area in which they are investing. This may support Lung's (2004) claims that learning processes proceeded more rapidly in Central European automotive production than they did in Spain and Portugal in the 1980s.

The explanation of the unique success of Solaris can be sought in the concept of the window of opportunity (Boschma 1997, 2007). Growing environmental pressure along with a need for new technologies in bus manufacturing have opened a window of opportunity for a reconfiguration of the bus manufacturing industry in Europe. This window was used by a newcomer such as Solaris, which adopted an aggressive, high-risk strategy of targeting a new unexplored market niche for buses with an alternative powertrain. This strategy has proved to be successful despite certain financial and know-how constraints, the general consolidation and modularization trend in the bus manufacturing industry in Europe (i.e. the disappearance of independent manufacturers) and difficult access to Western European markets dominated by a few major manufacturers. The company managed to develop its design competences and enter the German market, among other things, thanks to the personal connections of its founder. The high level of flexibility and willingness to meet specific customer needs in terms of design, technology and time of delivery, were crucial in an extremely fragmented bus market with varying technical and environmental requirements being put forth by different customer cities. This was possible for a new family-owned company characterized by direct contact with customers and rapid decision-making, far more than for large centralized companies with rigid structures and practices. Thus, Solaris is able to provide not only high quality but also a better response to changing customer needs in the European bus market. All things considered, Solaris has combined adaptability, strategic thinking as well as a drive for innovation and design competences, which has proved instrumental in its ongoing expansion in Europe.

The future of bus manufacturing in Poland will still largely depend on exports, as domestic sales may remain at a relatively low level with significant fluctuations over time. The strong specialization in city buses makes the sector vulnerable to future demand in Western European cities. The sector's prospects will also be determined by a possible expansion of bus assembly for the European market in Turkey and North Africa. However, economies of scale at the relatively large factories run by Volvo, MAN and Solaris, together with accumulated local expertise and competences may contribute to a strengthening of Poland's position in the bus industry in Europe. The future of Solaris will be strongly affected by developments in alternative powertrain technologies. The company may be a target for a takeover by one of the major European or non-European bus manufacturers in the future.

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