Clusters and competitiveness of automotive companies in Slovakia

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ABSTRACT

Slovakia has recently become a world leader in terms of the number of cars produced per capita, producing around half a million cars per year and being the sole production location for global brands such as Audi Q7 SUV. We document the rise of the automotive clusters in this young Central European nation and their impact on competitiveness of firms located there. While clusters are found to have an impact on competitiveness, it does not seem to be the transnational dimension of the cluster that matters in spite of a close proximity of plants and suppliers in Slovakia, Hungary, the Czech Republic and Poland. Shared suppliers and personnel are the two main channels of transmission of the cluster effects on competitiveness. Linkages with firms in the same group (Volkswagen, Kia/Hyundai etc.) seem to still matter more than geographic proximity *per se* and shared institutions arising from it. However, geographic concentration of affiliated and allied plants in the Central European region is considered a definite source of competitive advantage in European and global competition.
INTRODUCTION

While globalisation and the continuing technological revolution provide a number of challenges to firms today, they also provide many opportunities. This is particularly true for companies in smaller countries that may lack the domestic market necessary for growth, and for companies in emerging economies with weaker infrastructure and limited supporting industries. Recognizing these insufficiencies and potential weaknesses, many countries have promoted development of regional clusters where firms can develop their competences and competitive advantages against the world’s best competitors by sharing resources, innovative capabilities, and knowledge.

A number of researchers (e.g. Piore and Sabel, 1984; Saxenian, 1994; Schmitz, 1996; Porter, 1998) have acknowledged the value of clusters in high technology industries pointing to the advantages they provide for the development, transfer, and application of knowledge necessary for continued innovation. By clustering together, firms are able to pull from a common and accessible pool of resources, information, and demand for innovation to build competences and create competitive advantages to compete globally.

Successful development of such clusters, however, may prove problematic in many countries. This study focuses on automotive clusters in Central Europe and particularly in Slovakia. While clusters in the new EU members from Central and Eastern Europe have been analyzed before (Solvell et al., 2008; OECD, 2005) and so was the automotive industry in the region (Dyker, 2006; Rhys, 2004), there is so far no study that would tackle both of these issues together in sufficient depth. Moreover, while the clusters in the automotive industry have been analyzed rigorously in the North American context (Rutherford et al., 2008; Sturgeon et al., 2008), there is so far limited literature tackling this issue in the European context and having strong theoretical underpinnings (Lung, 2004; MacNeill and Chanaron, 2005). The Central European automotive clusters are important and interesting because new EU members account for a rising share of EU car production (20% in 2009, according to European Automobile
Manufacturers Association). Slovakia, Slovenia and the Czech Republic were the world’s leading car producers per capita in 2009. My study explains evolution of the Slovak automotive cluster(s) and their impact on competitiveness. In addition to filling a gap in the literature on this specific topic in a Central European context, I also contribute to the emerging debate on the changing face of the European periphery in the automotive industry (Domanski and Lung, 2009) in economic geography literature and a more long-standing debate on regional vs. global strategy in the automotive industry in strategic management literature (Schlie and Yip, 2000; Rugman and Collinson, 2004).

THEORY

The relationship between clusters and competitiveness has been theoretically explained by Porter (1998), who defined clusters as geographic concentrations of interconnected companies and institutions in a particular field. In an alternative definition, he suggested that clusters are critical masses – in one place – of unusual competitive success in particular fields. These two definitions reveal a tension between an economic geography definition of a cluster and a strategic management definition, as mere geographic concentration of firms and institutions in a region may not guarantee competitiveness of firms located there.

Porter (1998) suggests a number of channels by which geographically concentrated firms may obtain a competitive boost:

- Better access to employees and suppliers
- Access to specialized information
- Complementarities between industries
- Access to institutions and public goods
- Better motivation and measurement
- Impact of clusters on innovation
- Impact of clusters on new business formation
While Porter discusses clusters in an international context and uses examples ranging from California to Portugal, his framework does not provide a complete explanation of the emergence and competitiveness of what we term ‘transnational clusters’—defined as geographic concentrations of interconnected companies and institutions spanning national borders—that have been arising in the European Union recently. In its treatment of the ‘transnational’ concept, the cluster theory has so far focused on the relationship between transnational corporations and regional clusters, but failed to focus on the potentially transnational aspect of the cluster itself (Karlsson, 2008). Recent policy initiatives from the European Commission are encouraging these transnational clusters (and use the terminology of ‘transnational cluster’) with a new 2009 initiative on Trans-national Alliance for Clusters Towards Improved Cooperation Support (TACTICS). The Baltic Sea Region Stars Programme—spanning Scandinavia, northern Germany and the Baltic countries from the former Soviet Union—is a flagship cluster cooperation of this type.

Solvell, Ketels and Lindqvist (2008) use Porter’s cluster mapping approach to measure industrial specialization and agglomeration in regions of the ten new EU members states, but also fail to recognize that clusters often span borders and the economies of external scale that Porter (1998) suggested as a key factors boosting competitiveness of cluster firms often arise in transnational regions where opportunities for learning can be greater because of diversity of the firms and countries (although there are also hindrances to cluster effects due to national cultural differences).

Sturgeon, Biesenbroeck and Gereffi (2008) have applied cluster and global value chain theory to the world automotive industry and suggested a nested geographic and organizational structure with four levels:

- A global industry
- Regional production systems (several nations—ie NAFTA or EU)
- National production systems
- Local clusters
They suggest that national production is still very strong in this industry, and still dominates many national markets, with intra-regional (say inside of the European Union or the Asia-Pacific) finished vehicle and parts flows being the dominant operational pattern in this industry. Their discussion suggests regional networks matter as much for competitiveness as local clusters do, and that both are best to be analyzed as two aspects of the global value chain. While we agree that the global value chain context matters in this industry, at the plant level it is also worth investigating the changing importance of ties within a cluster and ties with firms outside of the cluster, whether they are members of the company group or not. In concentrated and well developed clusters, the relations within the cluster may matter more than relations with firms from farther afield. This potential effect of the cluster depth is also related to the cluster life cycle, as we need to take into account the fact that most of the clusters in Central and Eastern Europe are relatively young. Menzel and Fornahl (2009) present a model that explains how the emergence, growth, decline and renewal of cluster depend on the technological heterogeneity of firms in the cluster. They argue that linkages to other knowledge flows outside the cluster (say through the corporate group network or global value chain relationships) can pull the clustered firms apart and create new technological distances that can prevent the emerging cluster from growing and maturing.

**HYPOTHESES**

Hypothesis 1: A firm’s location in an automotive cluster has increased its competitiveness.

Hypotheses 2: Shared suppliers and personnel were the main channels of cluster’s impact on competitiveness.

Hypotheses 3: Firms located in transnational automotive clusters have performed better than firms not located in transnational clusters between Slovakia and neighboring countries.

Hypotheses 4: In highly developed clusters, linkages within cluster matter more for competitiveness of cluster firms than linkages with organizations outside of the cluster.
METHODS

To refine and test the hypotheses and explain the relationship between clusters and competitiveness, we have conducted a pilot field trip to Slovakia and the Czech Republic to investigate the rise of two automotive clusters centered in Slovakia. Slovakia was chosen because there are three major automotive producers located there: German Volkswagen and French PSA Peugeot Citroen located in Western Slovakia and Kia Motors in Northern Slovakia. It was also chosen because of its location in the center of Europe, with a potential to study transnational clusters spilling over from Slovakia to neighboring Hungary, Austria, the Czech Republic and Poland. Taking into account the fact that clusters involve firms as well as institutions, we have not only interviewed representatives of key car companies and cluster directors, but also the Slovak Automotive Association, a mayor of Trnava where PSA Peugeot Citroen and Automotive Cluster Western Slovakia is located, and a director of the Automotive MBA Programme at the Slovak Technical University, which is a joint degree with a sister institution in neighboring Austria:

Interviews

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Organisation</th>
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<tr>
<td>Vladimir Machalik</td>
<td>Public Relations, Manager</td>
<td>Volkswagen Slovakia</td>
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<tr>
<td>Dusan Dvorak</td>
<td>Public Relations, Senior Manager</td>
<td>KIA Slovakia</td>
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<tr>
<td>Dr. Lesinsky</td>
<td>Director of Automotive MBA Programme</td>
<td>Slovak University of Technology</td>
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<td>Maria Novakova</td>
<td>Vice President</td>
<td>Slovak Automotive Association</td>
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<td>Stefan Bosnak</td>
<td>Mayor</td>
<td>City of Trnava</td>
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<td>Stefan Chudoba</td>
<td>Director</td>
<td>Automotive Cluster Western Slovakia</td>
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<td>Ladislav Glogar</td>
<td>Director</td>
<td>Automotive Cluster Moravia-Northern Slovakia</td>
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Car makers in Slovakia

The automotive industry in Slovakia is clustered around three major car makers, each producing over 100,000 cars per year:

(1) Volkswagen produced 106,000 cars in 2009 with revenues of 2.94bn euro. Its Slovak plants are the sole global producers of SUV flagship products of the VW Group such as Audi Q7 and Volkswagen Touareg (with most of Porsche Cayenne produced in Slovakia as well);

(2) PSA Peugeot Citroen produced over 203,000 cars in 2009 with revenues of 1.8bn euro, about half of cars were Peugeot 207 for the EU market and half Citroen C3 Picasso for the world;

(3) KIA produced 150,000 cars in 2009 with 1.68bn revenues, mostly their cee’d model designed specifically for the EU market, but also Hyundai ix35 SUV for Europe and other regions.

Volkswagen has been in Slovakia from 1991, gradually increasing its production from a couple thousand to over 200,000 cars per year in early 2000s, when PSA and KIA made a decision to locate in Slovakia. Stefan Bosnak, the mayor of Trnava, where PSA Peugeot Citroen decided to locate its plant after considering competing locations in Hungary and Poland, recalls that one of the factors influencing PSA’s decision was a visit to Volkswagen’s plant in Bratislava organized by Jozef Uhrik, then CEO of Volkswagen Slovakia but also the President of the Automotive Association of Slovakia. The French executives were impressed with the quality of workers and the proactive approach of the Slovak government and municipal officials, who offered French investors tax holidays, free land and various other assistance in setting up their plant in Trnava. Many of the employees of Volkswagen, PSA and KIA were graduates of the Slovak Technical University and students of Dr. Lesinsky, who made himself famous in the media by suggesting that Slovakia can accommodate more than one and perhaps three major car factories that might potentially benefit from clustering benefits of supplier proximity and access to pools of qualified labour, such as the graduates of the Automotive MBA Programme offered jointly by the Slovak Technical University and the Austrian Economic University.
“Cluster is a state of mind,” says Dr. Lesinsky, “it’s about institutions that bind companies with an invisible social glue.”

KIA arrived in Slovakia in 2004 and started its full year of production in 2007. Dusan Dvorak, its senior PR manager, says that there are limits to the benefits of proximity to other car plants, as PSA has asked for a special clause in its investment contract with the Slovak Republic that asked for no other major car manufacturer to be located within 100 km of Trnava, PSA’s Slovak location. Indeed, Mr Dvorak admits that Koreans were happy to locate further north to benefit from relatively high unemployment rates in northern Slovakia that fed its 3,000-strong workforce. “We have definitely reaped benefits of joint negotiations (of the three car makers) with the Slovak government about the business environment and other joint issues of concern.” KIA has also benefited from a proximity to its sister Hyundai plant across the border in the Czech region of Moravia (less than 100 km from Zilina, where KIA Slovakia is located).

Automotive clusters in Slovakia

The three major car makers in Slovakia can be grouped into two major clusters. Volkswagen and PSA, about 100 km from each other, are both located in Western Slovakia and are close to Hungarian automotive clusters in the Szekesfehervar and Gyor regions as well to Austria that is home to a number of car suppliers such as Magna. Trnava, the seat of PSA, is also the location of the office of the only official cluster facilitator in the Slovak automotive industry: Automotive Cluster Western Slovakia. The cluster institution was a brainchild of Trnava’s mayor Stefan Bosnak, who wanted to see more development in the supply sector to the automotive industry and in small and medium-sized enterprises that can link and benefit in various ways from the anchor foreign investor. Stefan Chudoba, a veteran of the Slovak automotive industry who was in the management of a 5,000-person utility vehicle plant in Trnava during the communist times, took on the job after assignments with the Volkswagen group in Slovakia and Russia. Mr Chudoba says that his vision for the cluster is to encourage more start-up firms with innovative potential and to link the cluster to other European clusters through the automotive network and autoclusters.eu project that he runs as well.
He also thinks across the industries, suggesting that the plastic materials cluster in the neighboring Czech Moravia region can serve as an inspiration and potential partner to his members in the Slovak automotive supply sector. Indeed, Western Slovakia’s cluster seems to be more about suppliers, who make up for about 40% of the Slovak car industry sales, rather than producers. Notably, PSA is not a member of the Western Slovak cluster and also decided not to participate in this research project. Mr Chudoba says that PSA Group is not shy to be a member of cluster initiatives in France, but that it still views Slovakia as more of production site rather than a place where innovative technologies are born out of joint collaborative initiatives. “The only chance of innovative breakthroughs being developed in Slovakia is to do it in the supplier sector, perhaps in collaboration with some of the research institutes or centres of excellence such as the Institute of Welding or Trnava’s Applied Materials Department of the Slovak Technical University,” says Mr Chudoba.

Vladimir Machalik of Volkswagen is a bit more upbeat about the potential of the participation of car makers in the development of Western Slovak automotive cluster. Mr Machalik, who was previously an intern in the European Commission with an assignment related to cluster projects, admits that Slovak clusters are still in their early stages but that all the car makers are benefiting from the arrival of major international car suppliers that were attracted by the high concentration of car makers in Slovakia and Central Europe in general. The cluster concentration also pushes upwards the standards of education and although not much formal collaboration is being done by Volkswagen and PSA Peugeot Citroen so far, the two car companies will increasingly see many intersecting interests and benefit from shared services.

The second major automotive cluster in Slovakia is located in its northwestern corner, where KIA has its plant. This cluster has potentially a transnational dimension, as Hyundai’s plant is across the border in the Czech Republic and a number of car producers in the Polish Katowice region are located less than 200 km from both KIA’s and Hyundai’s plants. However, this cluster seems to be better developed from the Czech side, where Dusan Glogar, a former executive of Ford’s Czech component factory, runs a Moravian automotive cluster. The Slovak side is still looking more to VW and PSA to the south rather than GM and Fiat in Poland to the north of them, according to Mr Dvorak.
Hypothesis 1: Clusters and competitiveness

Both Volkswagen and KIA representatives have agreed that their location in a cluster has had a positive impact on their companies’ competitiveness (compared to other plants of their automotive group and compared to competing Europe-based automotive producers not located in their cluster). The hypotheses 1 was thus weakly confirmed in the interviews, but will require further testing on the sample of suppliers in the Slovak automotive industry. Maria Novakova, the vice president of the Slovak Automotive Association, said that the Slovak automotive suppliers have been rising from strength to strength in the 2000s, especially following PSA and KIA’s arrival. Volkswagen, for example, sourced 37.7% of its purchases from Slovak based suppliers (most of them in Western Slovakia), more than from Germany (34.4%), Hungary (9.8%) or the Czech Republic (5.5%). However, the Slovak automotive industry is still dominated by car producers, who account for about 60% of the industry’s revenues, according to Mrs Novakova. The Czech Republic, on the other hand, has about a 60% share of suppliers on the car industry’s production, according to Mr Glogar of the Moravian Automotive cluster. This could have made the country more resilient in the face of financial crisis, which has depressed car production in Slovakia by 20% from 575,000 in 2008 to 461,000 in 2009. The Czechs produced almost a million cars in 2009 and were one of the few countries in Europe that did not see an annual drop in car production (Romania and Slovenia being two other exceptions).

Mr Glogar notes that a cluster membership only rarely has a concrete short term material impact on competitiveness, being able to show only one of his members that he could confidently say that they benefited significantly from a joint R&D project with the local technical University in Ostrava, facilitated by the cluster. “Many of cluster events, such as vocations training in an ‘automotive academy’ bring positive impacts on competitiveness, but the impact is only occasionally dramatic,” according to Mr Glogar.

Hypothesis 2: Channels in the link between clusters and competitiveness

Representatives of Volkswagen and KIA have both put sharing resources (mostly suppliers) and knowledge (more specifically personnel) as the channels of effect of the cluster on competitiveness.
Mr Dvorak of KIA has also stressed the improved negotiating position with the Slovak government when it came to talks about the labor code and other labor issues and issues related to the improvements in the business environment. Mr Machalik of Volkswagen has also suggested that the concentration of car makers and suppliers in Western Slovakia and nearby regions has put an upward pressure on the quality of technical and vocational training education in this region, benefiting both Volkswagen and PSA. The companies did not mention the sharing of innovative capabilities as an important channel linking clusters and competitiveness. Hypotheses 2 was thus confirmed, and seems to suggest that Slovak clusters are still not reaching the highest value added aspect of the value chain.

**Hypothesis 3: Cluster transnationality and competitiveness**

Both Volkswagen and KIA have noted that the proper dimension of the cluster is transnational/transregional. For Volkswagen, their vision of the cluster stretches from Western Slovakia (where PSA has a plant) to Central Slovakia (where Volkswagen has a dedicated transmission factory in Martin) to Hungary (where Audi, a part of the VW Group, produces engines for VW’s Slovak Bratislava site). For KIA, they definitely see themselves as members of the cluster with their sister Hyundai plant in Czech Nosovice, with some linkages southward to central Slovakia (a large base of suppliers for all Slovak car makers) and Poland (with car makers and suppliers such as French Saint Gobin that supplies glass for KIA’s windows). Both Mssrs Machalik and Dvorak agree that automotive networks are transnational today and Central Europe is perhaps the proper dimension for linking cluster transnationality and competitiveness. However, they still see the transnational effect more in their own group and do not see cluster transnationality *per se* as an advantage. Hypothesis 3 was thus very weakly confirmed by the car makers. Mr Glogar from the Czech Moravian automotive cluster agrees, saying that he is focusing on his cluster members in the Czech Republic to deliver concrete results for them rather than on a grander vision pursued by Mr Chudoba of the Western Slovak cluster who is trying to reach out to fellow clusters in Central and Southeastern Europe and encourage learning and cooperation between them.
Hypothesis 4: Intra-cluster linkages vs linkages outside of the cluster

Neither of the two companies interviewed has agreed with the last hypothesis, highlighting the continued importance of network relationships within their own business group rather than with firms from the cluster. Volkswagen’s vision of the cluster is more of a picture of affiliated plants and suppliers of the VW Group in Central European area rather than a closely knit Western Slovakia cluster. KIA and Hyundai also see themselves as twin plants of the same group with a number of dedicated suppliers and some non-exclusive suppliers being conveniently located in relative proximity. Comments from both companies seem to suggest that intra-cluster linkages are not strong enough yet and clusters in Slovakia are still in their juvenile years so that intra-cluster linkages can’t be assigned a major role in firm’s competitive strategies and and competitiveness. However, when forced to rank these intra-cluster linkages in terms of their contribution to competitiveness, VW has stressed linkages to other plants of their group and to their suppliers, while KIA has highlighted linkages to suppliers (no. 1) and governments and other institutions (perhaps seeing its twin Hyundai plant as the same entity as themselves). On a micro-regional level, which is often associated with clusters in high-tech industries (such a life sciences cluster around the Massachusetts Institute of Technology and the Massachusetts General Hospital in Boston), there are first signs of co-location of related institutions and firms in business incubators in Czech Ostrava or in the new Science and Technology Park to be opened in Slovak Trnava, but these are still taking shape and do not have significant effects yet. Hypothesis 4 was thus not confirmed given the low level of development of Slovakia’s clusters.

Other results

Both companies saw their respective clusters focusing on vehicle assembly and parts production rather than R&D and design. More interestingly, while VW saw the Slovak government and the Association of Slovak Car Industry as key non-business actors shaping their cluster competitiveness, KIA put the Slovak government as no. 1 but stressed the European Commission as no. 2 influence, with reference to tariffs and anti-dumping legislation which concerns the Korean producer significantly.
CONCLUSIONS

Volkswagen’s Slovak production site was established in 1991 and was a part of the company’s strategy to manage unknowable futures following the fall of the Berlin Wall in 1989. It was not clear how fast Eastern Europe will develop and what parts of the Western car maker’s production processes will be moved there. VW initially used the Slovak site as a back-up for meeting peaks in demand. Twenty years later, VW Slovakia is the only production location for the group’s flagship SUVs such as Audi Q7 or Volkswagen Touareg. Moreover, the first versions of VW’s hybrid SUVs will be produced in Slovakia and the new “Small Family” generation of eco-friendly city concept cars of Volkswagen will be produced there to prepare the group for another turbulent decade following the great recession of 2009. VW’s first-mover strategy was brave and improved its competitiveness.

Its followers from France (PSA Peugeot Citroen) and South Korea (Kia), who came to Slovakia in the 2000s, were hoping to jump on the bandwagon and perhaps benefit from some cluster effects, given the unprecedented concentration of car production in such as small country/region. Cluster effects did seem to have positive effects on competitiveness, according to interviews with company representatives. However, in spite of two formal automotive cluster facilitators established in Slovakia and the neighboring Czech Republic, and nearby clusters in Hungary and Poland, the transnational dimensions of the clusters do not seem to be very strongly related to competitiveness so far. Traditional cluster-competitiveness channels such as sharing suppliers and personnel seem to matter more than sharing innovative capabilities, suggesting that the clusters are still in their early stages of development and linkages within them are still relatively weak and don’t matter than much for competitiveness yet. Geographic proximity matters, but at the moment more in terms of group or other (supplier) affiliations than rather than in terms of traditional cluster linkages and institutions.

This study has reported preliminary results of field research on the increasing agglomeration and cluster growth in the automotive industry in Slovakia and its growing international competitiveness. We are planning to use the interview results to refine the questions and supplement the study with a survey of suppliers. It is possible that cluster effects will be stronger at this level.
REFERENCES


APPENDIX

Interview Questions

How does your company assess/measure its ‘global competitiveness’ compared to other subsidiaries of the Group worldwide? Can you please provide data/information on any of these measures/metrics?

- Revenues of your plant(s)/total Group revenues
- Productivity (e.g. revenues per worker of your plant(s) vs. your other plants or all Group)
- Profitability (e.g. net profit and return on assets or investment of your plant vs. Group)
- Other (e.g. quality, flexibility, specialized know-how and/or innovative capability)

What is the share of your firm’s production/sales going to each of these regions?

- Europe (please provide a more detailed breakdown if available)
- North America (or the Americas)
- Asia (or the Asia-Pacific)
- Elsewhere (or specify what geographic distribution of sales you use)

Which of these dimensions of the ‘cluster’ (defined as a geographic concentration of interconnected companies and institutions) seems most appropriate to you in a study of the impact of cluster(s) on (your company’s) global competitiveness?

- National (say the Slovak automotive cluster)
- Transnational (say the Slovak-Hungarian or Central European automotive cluster)
- Regional (say the Bratislava region auto cluster)
- Transregional (say the Bratislava-Trnava region or ‘Western Slovakia’ cluster)

Do you agree with this statement: Our location in a cluster (specify whether national/transnational/regional or transregional) has increased competitiveness of our firm (compared to other plants/firms of our automotive group).

- Strongly agree
- Agree
- Don’t agree
- Strongly disagree

Do you agree with this statement: Our location in a cluster (specify whether national/transnational/regional/transregional) has increased competitiveness of our firm (compared to competing Europe-based automotive producers not located in our cluster).

- Strongly agree
- Agree
- Don’t agree
- Strongly disagree
In what ways did your location in a cluster (specify whether national/transnational/ regional/transregional) affect (if at all) your global competitiveness?

- Sharing resources (please specify which resources)
- Sharing innovative/other capabilities (please specify which capabilities)
- Sharing knowledge (please specify what kind of knowledge)
- Other (please comment)

Do you agree with this statement: the recent recession of 2008 has affected differently global competitiveness of automotive companies located/not located in a cluster (specify whether national/transnational/regional or transregional)

- Strongly agree
- Agree
- Don’t agree
- Strongly disagree

What linkages within cluster (please specify whether national/transnational/regional or transregional) matter most for your firm’s global competitiveness and how (please explain)?

- Linkages with other plants of our group
- Linkages with our suppliers
- Linkages with government(s) and other institutions (please specify)
- Other linkages (please specify)

Which of non-business actors contribute most significantly (if at all) to competitiveness of the cluster (specify whether national/transnational/regional or transregional) you are located in?

- EU authorities
- National authorities
- Regional authorities
- Non-governmental organisations/others (please specify)

Which value chain activities have been most concentrated in your cluster?

- R&D and design
- Vehicle assembly
- Parts production
- Other (please specify)

Do you agree with this statement: cluster depth (linkages within cluster) matter more for competitiveness of cluster firms than cluster breadth (linkages between clusters and their firms).

- Strongly agree
- Agree
- Disagree
- Strongly disagree