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**French mega-suppliers' trajectories during the modular era:
some evidences on Faurecia, Valeo and Plastic Omnium**

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Les trajectoires des méga-fournisseurs français durant la période modulaire: quelques faits empiriques sur Faurecia, Valeo et Plastic Omnium

Résumé

Le mouvement de désintégration verticale amorcé dans l'automobile de manière massive dans les années 1980 s'est soldé par la constitution de méga-fournisseurs qui réalisent l'essentiel des productions au premier rang de la pyramide d'approvisionnement. Ce texte entend apporter des éléments empiriques sur le développement des principaux fournisseurs français. Après avoir mis en avant le rôle des constructeurs dans l'émergence de ces méga-fournisseurs à partir de la moitié des années 1980, nous resituons les fournisseurs français parmi les 100 plus importants fournisseurs mondiaux. A partir de la section 3, nous nous focalisons sur les trois principaux fournisseurs modulaires dont nous étudions la croissance et ses sources, la rentabilité et l'internationalisation. Les éléments empiriques rassemblés ici mettent à jour un travail antérieur (Frigant, 2009) et alimentent la thèse d'une co-évolution entre l'architecture organisationnelle des chaînes d'approvisionnement et l'architecture industrielle desdites chaînes.

Mots-clés : modularité, architecture industrielle, automobile, chaîne de valeur, Faurecia, Valeo, Plastic Omnium.

French mega-suppliers' trajectories during the modular era: some evidences on Faurecia, Valeo and Plastic Omnium

Abstract

The purpose of this paper is to present factual elements concerning the rise (decline) of French mega-suppliers. The study will focus on France's three main mega-suppliers, all actors that have had a stake in carmakers' modularisation strategies: Faurecia, Plastic Omnium and Valeo. Section 1 returns to the late 1980s and shows that the emergence of today's mega-suppliers is rooted in this era and was piloted by French carmakers. Section 2 positions French mega-suppliers in a global hierarchy and distinguishes between two varieties: suppliers of simple parts; and module suppliers, with the latter constituting the focus for the rest of this text. Section 3 shows how module suppliers' rise is rooted in their aggressive mergers and acquisitions (M&A) strategies. It also demonstrates differences between suppliers in terms of the two leading acquisition strategies that were observed. Section 4 explains why these companies' profitability continues to disappoint, developing the idea that modular strategies imply a big rise in fixed costs, something that suppliers cannot knock onto sales prices. Finally, section 5 returns to companies' internationalisation strategies and offers a typology for the different entities that mega-suppliers consolidate

Keywords: modularity, supply chain, industrial architecture, automobile.

JEL: L23, L24, L62, N84

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<p>http://ideas.repec.org/p/grt/wpegrt/2011-20.html.</p>

Introduction

Towards the late 1980s, Western carmakers embarked upon a vast vertical disintegration trajectory. The first signs had been given in the 1970s but the movement only really began to amplify when the actors in question started trying to imitate organisational practices commonly associated with the so-called Japanese model (Lamming 1993; Helper, Sako, 1995; Sako, Helper, 1999; Boyer et al., 1998).

Externalisation processes are characterised by two intrinsically related aspects that we will try to dissociate so as to improve the analysis thereof. The first pertains to the organisation of vertical relationships and refers to the way in which companies coordinate with one another. Economic analysis often emphasizes such aspects since it deals with questions that are very meaningful for this academic discipline, including forms of governance, alternatives between market and hierarchy. Williamson's study (1985) on governance structures offers a dramatic example of this type of research. Coordination issues also raise a number of salient questions that we will be looking to mobilise, relating to theoretical representations of the firm (Helper, MacDuffie, Sabel, 2000). A second aspect is the industrial architecture of the supply chain. In our vocabulary, industrial architecture indicates the structural characteristics of firms and the strategies they deploy. It also refers to the way in which different levels of a supply chain mesh with one another. It should be repeated that both of these aspects are interlinked yet merit separate analysis.

The text intends to provide evidence concerning the restructuring of the French automotive supply chain's industrial architecture. It offers empirical elements about the way in which leading French suppliers restructured their operations in the wake of a generalised move towards vertical disintegration. The analytical usefulness of this study resides in its postulate that understanding changes in the functioning of vertical inter-firm relationships requires an understanding of supplier strategies. In turn, understanding changes in organisational architecture implies understanding changes in industrial architecture. Indeed, it is often written that suppliers and subcontractors have had to adapt in response to carmakers' new demands. This is not untrue but it does constitute a top-down analysis that we find insufficient - which is not to say that we are advocating an overly passive analysis ourselves. After all, suppliers are also proactive and contribute actively through their industrial strategies to the forging of new supply chain organisations. Thus, many suppliers have anticipated certain modularity trends and used their innovation capabilities to resolve several of the problems that carmakers face. By so doing, they have transposed the notion of modularity to the automotive sphere. After all, the automobile remains a deeply systemic product (Clark, Fujimoto, 1991; Takeishi, Fujimoto, 2003), meaning that the concept of modularisation can only be transferred to this sphere via the intermediary of macro-components (Volpato, 2004) if large suppliers play an active role (Sako, 2003; Fourcade, Midler, 2005).

One key characteristic of the current era is the advent of mega-suppliers. These are firms that were able to transform themselves in a way that allowed them to occupy the first tier of the supply pyramid (Frigant, 2009; Klier, Rubenstein, 2008). Clearly, the OEM market is not totally controlled by such mega-suppliers. They are dominant firms but alongside of them there still exists a whole fabric of SMEs with direct access to carmakers (Herrigel, 2010). The supply pyramid has less of the Egyptian form that is commonly represented, and probably more of an Aztec form that is less hierarchical than generally believed and much less static in terms of the way different tiers are structured - with some SMEs retaining a possibility of becoming first tier suppliers themselves (Frigant, 2011). All in all, there is no doubt that these actors have an important role to play.

The purpose of this paper is to present factual elements concerning the rise of French mega-suppliers. The study will focus on France's three main mega-suppliers, all actors that have had a stake in carmakers' modularisation strategies: Faurecia, Plastic Omnium and Valeo. This is essentially an empirical study that will try to update a 2009 study and apply it to French suppliers. The former study will be mobilised on occasion to position the French suppliers within a more global context. Most of the data produced covers recent years (2009 and/or 2010, or even 2011 for production sites - section 6) enabling the study to also account for the severe crisis from which Tier 1 suppliers suffered in 2008/2009.

From a methodological perspective, the text is mainly based on analysis of annual reports produced by companies that we have been studying for years. It is also supplemented by studies of the business press and by ad hoc interviews. Lastly, data provided by Automotive News will be used to account for OEM sales to carmakers.

Section 1 returns to the late 1980s and shows that the emergence of today's mega-suppliers is rooted in this era and was piloted by French carmakers. Section 2 positions French mega-suppliers in a global hierarchy and distinguishes between two varieties: suppliers of simple parts; and module suppliers, with the latter constituting the focus for the rest of this text. Section 3 shows how module suppliers' rise is rooted in their aggressive mergers and acquisitions (M&A) strategies. It also demonstrates differences between suppliers in terms of the two leading acquisition strategies that were observed. Section 4 explains why these companies' profitability continues to disappoint, developing the idea that modular strategies imply a big rise in fixed costs, something that suppliers cannot knock onto sales prices. Finally, section 5 returns to companies' internationalisation strategies and offers a typology for the different entities that mega-suppliers consolidate. To sustain this typology, we produce factual data on staff numbers and entities for suppliers such as Faurecia, Plastic Omnium and Valeo.

1. 1980/1990s: French carmakers' help in developing supportive suppliers

Today's mega-suppliers took a long time to emerge. Their rise is the result of a long transition, particularly in Europe. As explained by T. Fujimoto (1999), the Japanese pyramid architecture had already enabled the advent of suppliers imbued with a capacity for development and more extensive competencies than those found in Europe. Japanese suppliers' greater structuring allows them to adapt better to changes resulting from the different forms of externalisation that arose in the 1990s. At more of an upstream level, however, this appeared to be a corollary of the Japanese pyramid architecture. Once Western carmakers decided to go down the path of vertical disintegration, they had to be sure that they possessed the requisite suppliers' fabric. The problem is that companies of this sort were almost non-existent in Europe. The Fordian subcontracting model caused subcontractors to atrophy (Chanaron, 1995). This is because the economic and technological domination linked to this subcontracting model was incompatible with the development of suppliers endowed with significant tangible and intangible resources.

According to L. Laigle (1996), it was after 1985 that French carmakers decided to fully commit to restructuring their suppliers. The aim here was both to modify procurement practices and restructure the suppliers themselves. Towards this end, Peugeot and Renaults implemented performance criteria that worked both as objectives and standards. They were objectives for suppliers in the sense that these actors now had targets to reach and needed to establish an organisation to do this. They were standards since the carmakers announced that over time, only suppliers that satisfied their demands could work with them. Criteria pertaining to issues such as *"quality; equipment's technical performance of (safety, reliability, durability, etc.); delivery and stock*

management times; productivity; delivery of pre-assembled functions; and innovativeness of functional sub-assemblies” (Laigle, 1996, p.221).

One symbol of Peugeot and Renault’s takeover of the supply chain organisation was the creation of a common standard in 1987 called “Supplier Insurance Quality” (*Assurance Qualité Fournisseur*, or AQF).

“This standard includes supplier selection criteria (ordered by priority) helping to rank suppliers in a grid reflecting their progress and quality levels; the value of the executive team; price competitiveness; ability to export products or to work for foreign carmakers (notably Japanese transplants); ability to deliver just-in-time and ensure the technical development of new equipment - and more recently, whether they can manage complete functional systems and set up operations abroad; participate in co-development; and work by price objectives” (criteria that Renault added in 1993) (Laigle, 1996, p.221).

The advent of these standards was supplemented by the implementation of a dual control and assistance system. Carmakers created management tools that would serve as operational instruments implementing the aforementioned standards. On one hand, these tools helped to audit supplies and verify whether they met the established objectives. On the other, suppliers appropriated these tools and used them to reorganise themselves and ensure that their factories and organisations fit the new system. In certain cases, carmakers seconded personnel to suppliers to guide them in their modernisation drive.

This normalisation process did not benefit all suppliers (and actually discriminated against some). On one hand, a distinction can be made between high potential suppliers capable of responding to the new demands vs. others to be excluded from carmaker shortlists. Things would not change too quickly over the short run because contracts cannot be terminate right away and because it takes time to replace a supplier considered insufficient. However, the direction of travel was given. Later, this period would appear as an era of supplier selection. After all, it was at this point that carmakers sowed the seeds for future mega-suppliers.

In a similar vein, research from this era narrates the different strategies that suppliers adopted in response – strategies that would ultimately determine their supply-chain positioning.

Lamming (1993) has come up with long details of suppliers’ emergence strategies, identifying four different categories: 1) leader key players with a strong automobile specialisation and whose objective was to become first tier suppliers with major automobile-specific R&D activities 2) follower key players comprised of large companies for whom the automobile was one product in a broader portfolio; 3) loyal collaborator leaders who would develop production and innovation capabilities working closely together with their main carmaker; and 4) loyal collaborator followers who seemed destined to slip to the bottom of the pyramid. The strategies may have differed but the consequence was always to divide suppliers’ roles between those who were destined to occupy the carmaker’s first tier versus others whose destiny was to be relegated to the second or even third tier.

At the supply chain’s first tier, adaptation strategies were notably be comprised of corporate concentrations. From the mid-1980s through the mid-1990s, the world witnessed a whole host of M&A operations and company divestments, all in a bid to develop coherent productive entities. It remains that most of these operations were run on a domestic scale, with the main purpose being to take units with which carmakers were familiar and recombine them in larger entities. Indeed, in some cases carmakers played an advisory (and even matchmaking) role. Moreover, by reselling a particular subsidiary to particular supplier, they were also helping to forge future mega-suppliers. One example is when Renault resold seating manufacturer Sotexo to Bertrand-Faure, spawning what

later became Faurecia. Renault also helped future leading equipment suppliers such as Siemens (through the sale of Renix) or Hayes (resale of FASS foundry). It was this period that paved the way for mega-suppliers.

2. French mega-suppliers' position in the global ranking

In the late 1990s, the pyramid architecture became highly structured with actors seemingly struggling to progress towards further externalisation (or more prosaically, to tighten the top of the pyramid). This is because progress in this direction implied an ability to reach a higher level of the component aggregation process. Relevant solutions were rooted in modular production, which in the automotive sector involved breaking the modularity concept down into macro-components (Volpato, 2004). It remains that much like the pyramid architecture was constructed on the basis that suppliers could provide sufficient output, transitioning to macro-components assumed the existence of actors capable of playing this role. It is this status that the mega-suppliers would come to occupy.

The rise of mega-suppliers thoroughly changed the landscape for the world's leading suppliers. Table 1 uses Automotive News rankings to portray a number of major shifts. Firstly, note the decline of American suppliers, replaced by their Asian counterparts. Whereas this category had accounted for nearly half of the world's 50 top suppliers and 43% of its 100 leaders in 1999, by 2009 Americans accounted for only 24% of the top 50 and 27% of the top 100. This downgrading is mainly explained by the rise of Asian suppliers, notably Japanese. This latter group accounted for 18% of the top 50 and 16% of the top 100 in 1999 - figures that rose respectively to 42% and 34% within a decade.

Table 1 – Nationality of the TOP 50 and TOP 100 world auto suppliers

		TOP 50				TOP 100			
		1999	2005	2008	2009	1999	2005	2008	2009
North America	USA	23	16	13	12	43	28	29	27
	Canada	1	1	1	1	4	2	2	2
	Mexico	0	0	0	0	1	1	1	1
Asia	South Korea	0	1	2	2	0	2	4	4
	Japan	9	16	17	19	16	26	25	30
Europe	Other European countries	0	0	0	0	2	3	4	3
	Spain	0	0	0	0	0	1	2	2
	UK	2	1	1	0	6	4	2	2
	Italy	1	1	1	1	1	2	1	1
	Sweden	1	1	1	1	2	3	1	3
	France	5	3	3	3	8	7	5	6
	Germany	8	10	11	11	17	21	24	19

Source: Author from Automotive News data

In general, America's decline did not benefit Europe, since the percentage of suppliers present in both rankings remains identical over the decade in question. The European continent was the theatre of some major disparities, however. Firstly, the displacement of automakers to Eastern Europe was not accompanied by the rise of local suppliers (with European countries' weight having evolved very little). Thus, whereas the Czech Republic became Europe's main producer of automotive components in relative value and local industrial employment terms, there was no particular creation of local companies capable of rivaling with major Western equipment suppliers (Pavlínek, Ženka, 2010). This was followed by an observable decline or stabilisation in the older industrialised countries' position - with one noteworthy exception, to wit, Germany, whose suppliers accounted for 16% of the Top 50 and 17% of the Top 100 in 1999, versus 22% and 19% respectively 10 years later.

Table 2 – French auto suppliers in the Automotive News' TOP 100 ranking

1999			2005			2008			2009		
Rank	Enterprise	Auto sales	Rank	Enterprise	Auto sales	Rank	Enterprise	Auto sales	Rank	Enterprise	Auto sales
10	Valeo	7719	9	Faurecia	14000	8	Faurecia	17656	7	Faurecia	13000
16	Faurecia	4807	10	Valeo	12200	16	Valeo	10800	13	Valeo	10400
19	Michelin	4230	30	Michelin	4747	41	Michelin	4290	40	Michelin	3651
40	Saint-Gobain	2300	62	Saint-Gobain	2450	64	Saint-Gobain	2861	56	Saint-Gobain	2362
48	Sommer Allibert	2100	71	Plastic Omnium	2152	68	Plastic Omnium	2556	59	Plastic Omnium	2247
62	Labinal	1585	76	Hutchinson SA	1887				95	Inergy Automotives Systems	1184
68	Hutchinson SA	1390	85	Inergy Automotives Systems	1600						
77	Plastic Omnium	1010									

- (1) Inergy is created in 2000, it's a 50/50 joint-venture between Solvay Automotive and Plastic Omnium. In 2010, PO takes full ownership of INERGY after acquiring Solvay's 50% stake
- (2) In 2000, Labinal has been sold in two parts. SNECMA (now Safran) bought the Aircraft division and Valeo bought the automobile division.
- (3) In 2000/2001, Faurecia bought the automobile branch of Sommer Allibert, SAI Automotive.

In this vast reshuffle, French suppliers' performance was medium at best, with two interpretations possible for this outcome. Optimistically, it might be said that France was in fact able to develop first tier suppliers possessing a global reach. The country's slight decline in terms of companies featuring in the Automotive News rankings can be explained by mergers between French suppliers and is something that was compensated by strong growth in the number of companies represented overseas (see above). More pessimistically, it might be said that in contrast to Germany, France was unable to spawn new companies powerful enough to feature in these rankings. Without being adamant, the second interpretation seems more accurate to us.

Along these lines, questions must be raised about French automakers' role during the era when mega-suppliers were being formed. We have seen that they played an active role in the preceding era through their contributions to the selection of "future" first tier suppliers. Our interpretation is that French carmakers were not sufficiently interested to spawn top-level suppliers during the modular era. Afterwards, they seemed to feel that competition should prevail. Our explanation for this behavior is that carmakers felt that they already had enough potential actors playing a first tier suppliers role.

One fact supporting this argument is the remarkably strong presence of non-French companies in the fabric of French suppliers. Different studies undertaken by France's Ministry for Industry demonstrate that since the first rationalisation efforts in the mid-1980s, France has attracted quite a few foreign suppliers. Using a narrow definition of the supply industry, the Ministry has estimated that foreign groups employed two-thirds of all automotive supply sector employees in 2007. The foreign companies in question mainly came from the US or Germany. From the carmakers' perspective, there was no need to promote national companies to a mega-supplier status given that the opening of borders already allowed foreign actors occupy this space. The contrast with the German and Japanese economies is noteworthy at this level. Indeed, following different mechanisms, carmakers from the latter two countries relied on traditional suppliers, helping them to restructure

and internationalise. Takeishi and Noro's data (2007) on Japanese carmakers has shown that their dependency on kereitsu members persisted, despite falling somewhat over the years.

Another reason resides in the very strong growth of France's two leaders, Valeo and Faurecia, who have bought a lot of their domestic competitors that were for sale. The status of a national champion is essential in the French business context and has once again been verified. The two companies' desire to achieve a certain level of consolidation helped to impede the emergence of other, more specialist industrial actors. This explains the disappearance of Sommer-Allibert and Labinal from the Automotive News rankings following their acquisition by Faurecia and Valeo (see notes for Table 2). Conversely, whenever these two companies abandoned a given automotive sub-sector, this would allow the emergence of reasonably sized suppliers (Plastic Omnium) and/or the survival of existing firms: Michelin for tires; Saint-Gobain Sekurit for glass products; and Hutchinson for very high-tech products and components such as sealing systems, fluid transfer systems, vibration and acoustic insulation or transmission systems.

3. Mega-suppliers' acquisition-driven growth

Tables 1 and 2 reveal a small number of French mega-suppliers. Two profiles co-exist at this level.

Firstly, there were the historic automotive companies that produced basic parts. Note that this is not synonymous with simple parts since such components are all subject to real innovation efforts. Examples include glassmaker Saint-Gobain Sekurit and tires manufacturer Michelin. Like their foreign counterparts, these two companies tended to descend the rankings, translating the reshuffling of the OEM market around the complex sub-assemblies that, by definition, they did not produce. Note that for a certain period of time, Michelin had the ambition of powering up its production of complete ground contact systems. This would have imitated the things that its German competitor Continental was doing via its ContiTech subsidiary. In the end, Michelin dropped most of these ambitions, if only temporarily - with its Active Wheel project (involving attraction systems inserted directly into a car's wheelbase) remaining on the back burner, like the company's electric vehicle activities.

Secondly, there were the manufacturers of complex sub-assemblies and modules: Faurecia, Plastic Omnium and Valeo (see Frame 1). These are the module suppliers that grew the most since the late 1990s. This is because the vertical disintegration during what we might call the modular era encouraged growth in this particular market. The three module suppliers who still featured in the 2009 rankings have regularly reaffirmed in their narratives a desire to build up their offer of modules. Moreover, analysis of post-2000 strategic discourses of executives from these companies indicates that they justified their strategic choices through this modular logic - whether this involved choices made in regards to internal organisational structures; external alliances; mergers/acquisitions; or divestments from certain activities.

Frame 1 – Main business divisions of French modular-suppliers

Faurecia

- 1) Automotive Seating
- 2) Emissions Control Technologies
- 3) Automotive Exteriors:
 - front ends including engine cooling systems-
 - Exterior systems (bumpers, design elements...)
 - Shock absorption systems)
- 4) Interior Systems (instrument panels, center consoles, door panels and door modules, and acoustic modules).

Valeo

- 1) Powertrain Systems:
 - Electrical Systems
 - Transmission Systems
 - Engine Management Systems
 - Air Management Systems
 - Hybrid and Electric Vehicle Systems
- 2) Thermal Systems
 - Climate Control
 - Powertrain Thermal Systems
 - Compressors
 - Front-End Modules.
- 3) Comfort and Driving Assistance Systems
 - Driving Assistance
 - Interior Controls
 - Interior Electronics
 - Access Mechanisms
- 4) Visibility Systems
 - Lighting Systems
 - Wiper Systems
 - Wiper Motors

Plastic Omnium Automobile^(*)

- 1) PO Auto Exterior: body components and modules
- 2) Inergy Automotive Systems: fuel systems (full stake since 2010)

^(*) Plastic Omnium has two divisions PO Automobile (sales 2010: 2778.0M€) and PO Environnement (sales 2010: 471.6M€)

There are many examples of such disengagements and there is no reason to attempt an exhaustive survey when a few illustrative strategies suffice. In 2007, Valeo announced the sale of its entire cables division to German supplier Leoni for €255 million (a division employing 11,700 persons in 12 plants, including nine in low-cost countries such as Morocco, Tunisia, Romania and Slovakia). The sale of this historic group division is a good illustration of the refocusing strategies pursued by mega-suppliers concerned with offering increasingly complex sub-assemblies that could potentially produce greater value-added. At the time, the operation's aims were presented as refocusing the company on its core business of providing modules. Long before this, Faurecia had already adopted a similar refocusing strategy by selling other historic group activities: its steering wheel operations in 1999; and Peugeot Motorcycles and Delsey, both in 1998.

The disengagement from certain economic activities was accompanied by the **acquisition of many others**. Faurecia was a singularly active in this regard. Note that the company itself derived from a 1999 merger between two leading French suppliers: Bertrand Faure and ECIA, a subsidiary of

Peugeot. Contrary to Valeo and Plastic Omnium, which had a long industrial history and was constituted via organic growth and a few (relatively) smaller external acquisitions. All in all, Faurecia's emphasis was on major acquisitions.

In sum, the acquisition strategies pursued by the three companies obeyed **two kinds of logic**.

- **Acquisition of new competencies and penetration of new areas of activity.** The goal here was to acquire corporate divisions endowed with complementary competencies enabling the production of modules. At a time when producers were structuring their module products, another aim was to restructure traditional components divisions in such a way as to create new areas of activity focused on a modules orientation. With this in mind, the creation of joint ventures seemed like an alternative solution capable of federating competencies between industrialists and allowing companies to embark upon a modular trajectory but with lower sunk costs. In the early 2000s, for instance, Valeo was particularly active along these lines. In the year 2000 alone, the company started a front modules cooperation with Plastic Omnium while also working with Textron on cockpit modules and with BorgWarner on driving systems. Pursuing the same logic (and asides from the aforementioned association with Valeo), Plastic Omnium joined with the Belgian company Solvay in 2000 to create a joint venture entitled Inergy that within a few short years had built itself into a major actor in the fuel systems market. Similarly, in July 2004 Plastic Omnium got together with German suppliers Hella and Behr to create HBPO, a front modules specialist in which each of the three owners held a one-third share.

In the traditional manner, these joint ventures - which were mainly developed to penetrate new markets - would often be purchased after a few short years by one of the founding partners. A good example of this trajectory was Inergy's total consolidation into Plastic Omnium in 2010.

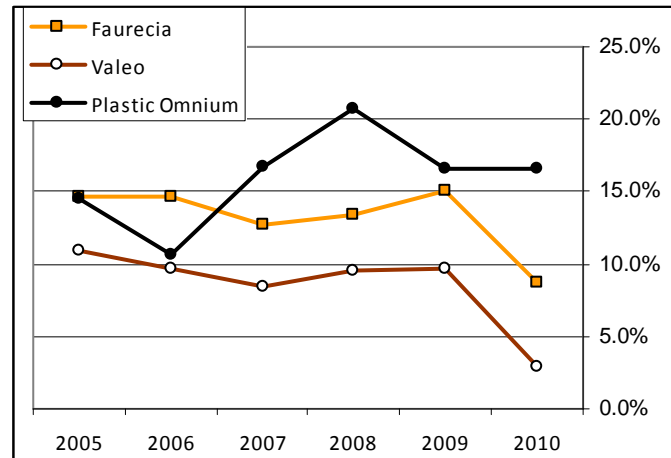
- **Extension of production capacities via acquisition of competitor companies.** The idea here was to acquire companies positioned in similar markets to take over their customer portfolio. As seen above, Faurecia was particular proactive in this arena, notably deploying strategies of this kind in the developed countries that it wanted to penetrate. However, its major acquisitions had the effect of sharply increasing its financial debt, which rose on an cumulative basis to 19.9% in 2000. Following this, Faurecia's parent company (Peugeot Citroën) had to recapitalise or guarantee its recapitalisation on several occasions over the ensuing decade in a bit to cyt debt levels (Figure 1). Four major Faurecia operations illustrate this strategy.
 1. In 1999, Faurecia paid €340 million to buy APAS and enter the US exhaust system market;
 2. It considerably reinforced its presence in Germany in 2001 by acquiring Sommer-Allibert's automotive components activities there for €1.5 billion;
 3. It announced the takeover of US company, Emcon Technologies, in November 2009¹;
 4. In February 2010, it took advantage of Plastal's liquidation to reinforce its position as Germany and Spain at a cost of €49.9 million

Valeo tended to proceed via "small" acquisitions and around the year 2000 began relying on joint ventures to access new markets (Japan, notably). The company also founded Zexel (jointly with Bosch in Japan) to work on automatic temperature control; Unisia Jecs (Japan) on transmissions; Iran Khodro & Sabco on air-conditioning systems, etc.

¹ Emcom Technologies exemplifies the equity activities that have shaken up the automotive supply sector. In 2004, global mega-supplier ArvinMeritor sold Emcom to One Equity Partners, an investment fund – this being a category that has raised its strategic profile in recent years through frequent acquisitions in the automotive supply sector (Frigant, 2009). Investment funds tend to purchase divisions that suppliers want to divest but not sell to the direct rivals. This often results in the funds reselling the divisions to other suppliers seeking to acquire competencies or access new markets. Profits from such resales can be substantial, one example being One Equity Partners' purchase of Emcom for something like \$310 million before reselling the company at \$350 million.

Given its smaller size, Plastic Omnium's operations were less spectacular. Having acquired Inergy as part of its first strategic move, the company notably went on to acquire Inoplast for €6 million in 2007, using this as a platform to found a new company called IPO (iNo Plastic Omnium) in 2008 – once again, on a joint venture basis. More recently (May 2011), Plastic Omnium acquired Ford's US fuel tank divisions. Given the company's smaller size, the proximity of these two major operations caused a rapid rise in debt levels. Conversely, Valeo's prudent attitude concerning major acquisitions enabled it to keep its debt levels under control. (Figure 1).

Figure 1 – Net financial debts/sales of Faurecia, Valeo and Plastic Omnium



Source: author from enterprise data

Table 3 – Evolution of sales 1998-2006 (Group level; 100=1998)

FTS	1998	1999	2000	2001	2002	2003	2004	2005	2006
Aisin Seiki	100	97,1	107,0	120,7	130,7	150,6	171,7	195,7	226,9
ArvinMeritor	100	116,0	134,3	177,4	179,4	203,0	209,4	232,1	239,7
Autoliv	100	109,3	118,0	114,4	127,4	151,9	176,1	177,9	177,4
Bosch	100	108,4	122,6	132,2	135,9	141,3	155,5	161,1	169,7
Bridgestone	100	93,2	89,7	95,4	100,5	103,0	108,0	120,3	133,7
Continental	100	135,4	150,0	166,6	169,2	171,1	186,8	205,2	220,8
Dana	100	105,0	98,6	82,2	75,2	63,0	71,7	68,1	67,3
Delphi	100	102,5	102,3	91,6	96,3	98,7	100,5	94,6	92,7
Denso	100	107,1	114,6	136,5	132,6	145,7	159,2	181,3	205,2
Faurecia	100	177,4	243,0	400,0	410,6	421,3	446,1	456,9	484,8
Freudenberg	100	106,3	122,0	117,7	115,0	113,5	129,7	142,0	148,4
GKN PLC	100	124,8	138,8	115,5	111,2	112,2	117,2	122,7	122,3
Johnson Controls	100	128,2	136,3	146,4	159,7	179,9	211,0	218,3	256,1
Lear	100	137,2	155,3	150,4	159,2	173,8	187,2	188,6	196,9
Magna	100	155,8	176,6	183,6	216,0	255,5	343,9	379,8	402,6
Michelin	100	110,2	123,3	126,3	125,3	123,1	125,7	124,9	131,2
TRW	100	88,7	92,5	85,5	88,0	96,2	101,8	107,1	111,4
Valeo	100	128,2	151,5	170,0	162,9	153,4	156,8	165,0	165,6
Visteon	100	105,1	109,6	100,5	103,6	99,4	105,0	95,6	64,3
ZF Friedrichshafen	100	102,4	121,0	133,8	181,5	176,7	195,9	214,4	230,8

Source: Frigant, 2009, p.438

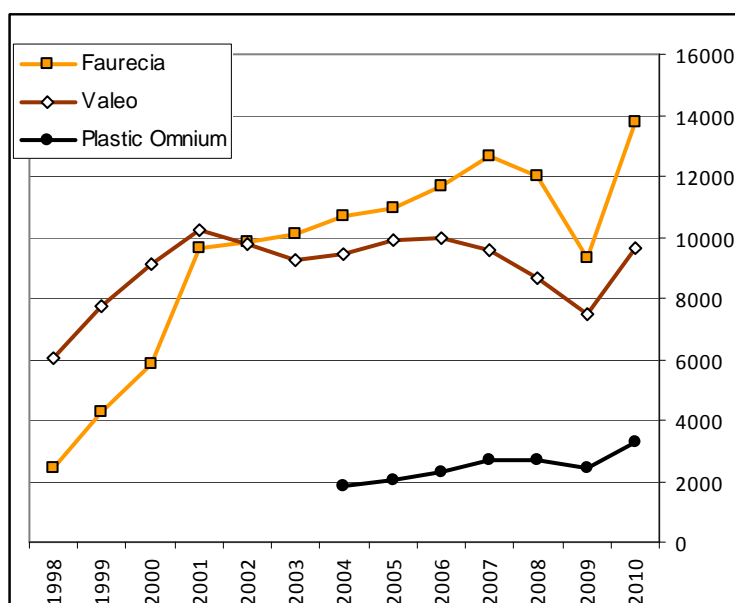
The goal but also the consequence of these successive mergers/acquisitions was a considerable acceleration in the three groups' organic growth. Clearly, given the magnitude of these operations, Faurecia's growth appears spectacular, whether in comparison with its French counterparts (Figures 2 & 3) or global mega-suppliers (Table 3). Between 1998 and 2006, Faurecia

experienced the fastest growth rate of any of the world's main suppliers (baseline 2006, Table 3). This result, calculated using group level consolidated revenues, is congruent with Automotive News rankings of OEM automotive sales, which estimate that Faurecia went from number 16 globally in 1999 to number seven by 2008. As for Valeo, despite a remarkable 65.6% growth in consolidated revenues, the company went from 10 in 1999 to 13 in 2009, with much of this decline explained by the sale of its cables activity.

After experiencing relatively modest growth, Plastic Omnium benefited from later acquisitions to ascend the global hierarchy of suppliers. Its revenues grew by 79% between 2004 and 2010 and according to the Automotive News, between 1999 and 2009 it rose in the ranking from 77 to 59 globally (Table 2). Having taken a 100% stake in Inergy in 2010, Plastic Omnium is likely to see renewed strong growth in 2011, with higher revenues and further ascension up the Automotive News rankings.

Figures 2 and 3 help to measure the magnitude of the 2008/09 crisis. Faurecia's growth was suddenly interrupted in 2007 by a crisis that began to produce its effects in 2008² before worsening in 2009. Faurecia's sales fell by 22.6% between 2008 and 2009 after dropping by 5.7% in 2008. For Valeo - which lost revenues and especially jobs after spinning off its labour-intensive cables activity - the falloff accelerated in both 2008 (-9.2%) and 2009 (-13.6%). Plastic Omnium was able to maintain its year-on-year performance in 2008 (+0.4%) but began to suffer in 2009 when sales fell by 8%. Confirming this general statistical trend, France's three module suppliers began to recover in 2010, with sales rising at Faurecia by 48.5%, Valeo by 28.4% and Plastic Omnium by 32.2%. Similarly, staff numbers started to grow again (Faurecia +29.6%³, Valeo +11.2%, Plastic Omnium +30.6%) ultimately allowing the three suppliers to surpass their pre-crisis levels.

Figure 2 – Sales (group level) of Faurecia, Valeo et Plastic Omnium (Million Euro)

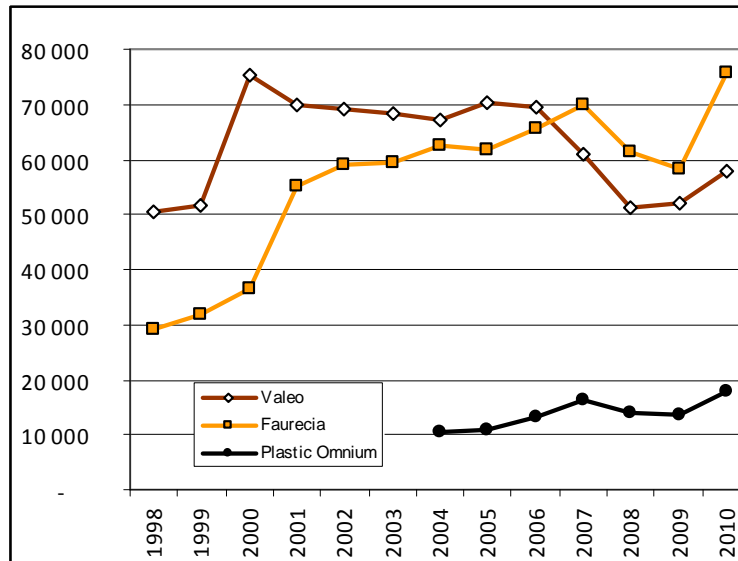


Source: author from enterprise annual reports

² In our statistics, the sharp fall in staff numbers in 2008 is explained by our use of end-of-year figures. This is significant because it was in 4Q 2008 that carmakers decided upon massive factory shutdowns.

³ The rise in Faurecia's staff numbers included its acquisition of Emcom in 2010 (+2,250 employees) and Plastal. All in all, 9,367 employees joined the company in 2010 as a result of acquisitions (excluding temporary personnel), totalling an increase of 23.3% in staff numbers or plus 5.3% without changing the size of the firm.

Figure 3 – Number of employees at year-end (including temporary workers) of Faurecia, Valeo and Plastic Omnium



Source: author from enterprise annual reports

4. Pressure on profits

The larger suppliers were hoping to see an improvement in profits at the beginning of the modular era. Margins had been squeezed during the Fordist period due to strong competitive pressure from carmakers. The first era of vertical disintegration – marked by its general narrative about the wonders of partnerships - had sparked much hope and even a few concrete achievements. This is because carmakers realised that they had to let suppliers achieve sufficient margins to undertake the tangible and intangible investments necessitated by the growing delegation of responsibilities. In suppliers' minds, providing a broader range of modules should have confirmed this tendency, mainly for two reasons. Firstly, the sub-assemblies in question were complex, with suppliers therefore hoping that they could bolster their total margins by aggregating individual mark-ups on components that had previously been dealt with in isolation. Secondly given the increase in market size resulting from actors' platform policies, they expected to achieve economies of scale and above all economies of scope in both their R&D activities and production of certain hidden components (i.e. ones that did not play a role in the modules' ultimate differentiation). They also hoped that they could sell these components to a number of identical customers. It remains that these hopes were never completely fulfilled, for three main reasons.

4.1. Pressure on prices

One, because the carmakers were relatively quick to perceive the profit opportunities associated with modularity. As a result, they reacted by increasing pressure on prices. French carmakers set price targets that were systematically revised downwards whenever car models were rejuvenated. Each new module (generally comprised of components) was sold at a lower price than its predecessor. In addition, productivity gain targets lasting for the contract's duration were introduced, forcing suppliers to agree to price decrease stipulations (usually on an annual basis) supposedly justified by expected productivity gains. These "progress contracts" were subject to tough negotiations and rarely worked to suppliers' advantage.

4.2. Increasing competition

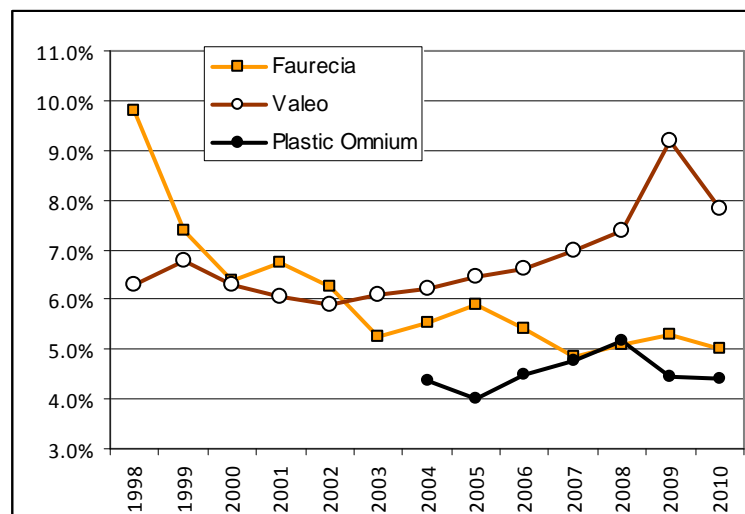
Two, these negotiations were particularly disadvantageous to suppliers, whose internationalisation strategies intensified overall competition in the sector. This is because suppliers' search for new customers caused them to invest the world's leading markets, increasing the number of potential producers in each of the main automotive spaces. Thus (and as demonstrated above), the French market ended up hosting most of the world's leading equipment manufacturers. As a result, where situations of quasi-monopoly arose, carmakers would trigger competition by not hesitating to source the inputs for their different modules from a range of suppliers.

4.3. The rise of fixed-cost

Three, mega-suppliers suffered rapidly rising fixed costs. This was felt at three levels.

Firstly, **R&D expenses** rose sharply. Developing a new module became an expensive venture for suppliers, who had to conceive the new product in its entirety, designing a module's architecture and developing competencies in its constituent components. Valeo was particularly active over the decade and engaged in significant autonomous research (with R&D expenses - after adjustment for carmaker reimbursements – hovering around 5.5% of revenues over this period)⁴. This led to a number of highly publicised innovations that would sustain the brand's innovative image (Start-Stop system, Directional Lighting system, etc.).

Figure 4 – Gross RD expenditure of Faurecia, Valeo et Plastic Omnium (% of sales)



Source: author from enterprise data

Secondly (and recycling vocabulary used in transaction cost economics - Williamson, 1985), **internal governance costs** rose. The straightforward inflation in these cost items (including staff numbers, number of sites, product lines, etc.) implied a complexification of companies' internal organisation. Moreover, the pyramidisation of the supply chain forced module suppliers to manage an increasing number of suppliers. This was particularly significant given that the suppliers in question had to be found in the different spaces where they were located.

⁴ According to the CIB study, Valeo filed 5,200 initial patents over 1996-2005, ranking second in France (behind Alcatel-Lucent but ahead of Renault, L'Oréal and PSA) and tenth in Europe (led by German companies Siemens, Daimler, Bayer and Volkswagen). On a global scale, Valeo is among the top 100 most inventive companies, ranking 97th overall in the CIB study (source: Valeo Website)

Thirdly, the principles of just-in-time delivery coupled with modules' intrinsic characteristics caused an **expansion in the number of production sites** (Frigant, Lung, 2002; Larsson, 2002)⁵. Automakers also continued to pressure suppliers into delocalising to low-cost countries. Although this was denied for a while, it is commonly accepted now that carmakers' procurement managers would ensure that their supplier selection criteria included a quota for production in low-cost countries. This objective would be established mechanistically, to the extent that in certain cases, carmakers would actively prefer (for reasons relating to this internal objective) a supplier with operations in a low-cost country – sometimes going as far as to impose a delocalisation strategy on a supplier - even if the decision's economic viability was inconclusive⁶. Public recognition of this delocalisation constraint can be found in the measures adopted within the framework of the “Etats généraux de l'industrie automobile”⁷ that was held in France, where public sector actors and equipment suppliers demanded that the “Code of performance and good conduct” drafted on the occasion explicitly include an article touching on this topic:

“The customer [understood here as the carmaker] agrees not to require that any proportion of the supplier or subcontractor's output - or its own purchases -necessarily occur in a low-cost country without providing an objective economic justification for this based on actual price. In particular, the customer agrees not to apply any criteria specifying a minimum proportion of its internal processes for accessing and defining partners' fixed and variable remuneration. ”
(Source: Code of performance and good conduct relating to the customer-supplier relationship within the automotive sector, Paris, 9 February 2009, p. 2.)

By yearend 2006, we estimate that 17.5% of Faurecia employees allocated to the European market worked out of peripheral low-cost countries in North Africa and Eastern Europe. As for Valeo, 24.6% of its European staff members worked out of these countries, which accounted for 20% of its total production sites.

The sum total of suppliers' fixed costs rose considerably due to carmakers' disintegration activities. A keen observation by Salerno (2001) states that one important motivation for carmakers' vertical disintegration drive was the desire to transfer their fixed costs to suppliers.

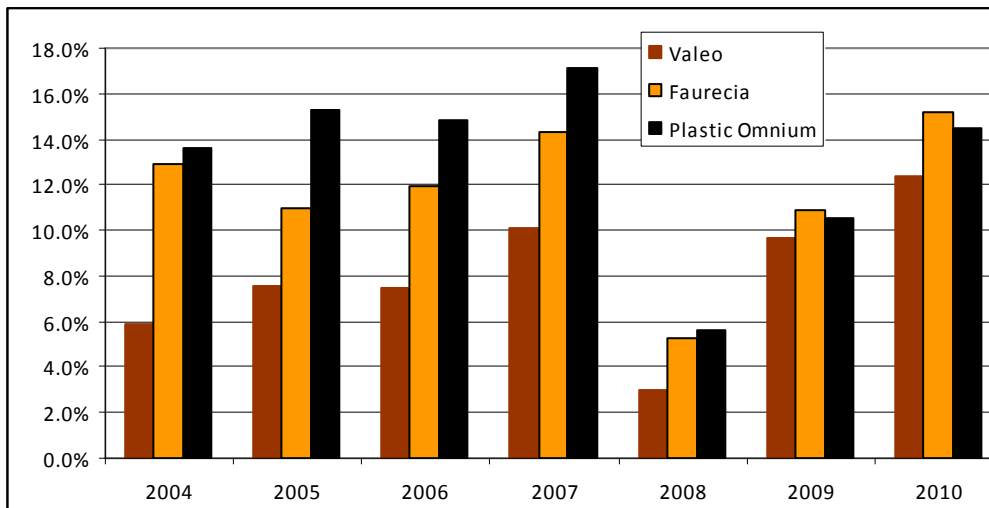
One response to the strategy adopted by French suppliers consisted of regaining flexibility while limiting wage-related fixed costs. To achieve this, suppliers did not hesitate to resort massively and increasingly to temporary personnel (see Figure 5). Of course, during the 2008/2009 crisis, such employees were the first to be fired, as confirmed in 2008 and to a lesser extent in 2009 by the collapse in the number of temporary workers (remember that we are using yearend data).

⁵ See, next section.

⁶ The same behaviour can be observed in Germany: “[...] OEMs [carmakers] call on their suppliers to increase low cost sourcing and to make use of second and third tier suppliers from Central Eastern European countries. To some extent, OEMs impose precise LCC procurement quotas on their suppliers, forcing them to relocate even though the required priced reductions could also be achieved by introducing innovative forms of work at home (Jürgens, Blöcker, Hildermeier, 2010, p.53).

⁷ The “General automotive conference” was a French government initiative aimed at relaunching the country's industrial policy in the aftermath of the economic crisis. It materialised through a widespread consultation of companies (mainly) that were sometimes structured by branches. The automotive supply chain was involved in this exercise and adopted the code of good conduct to which we refer in the text.

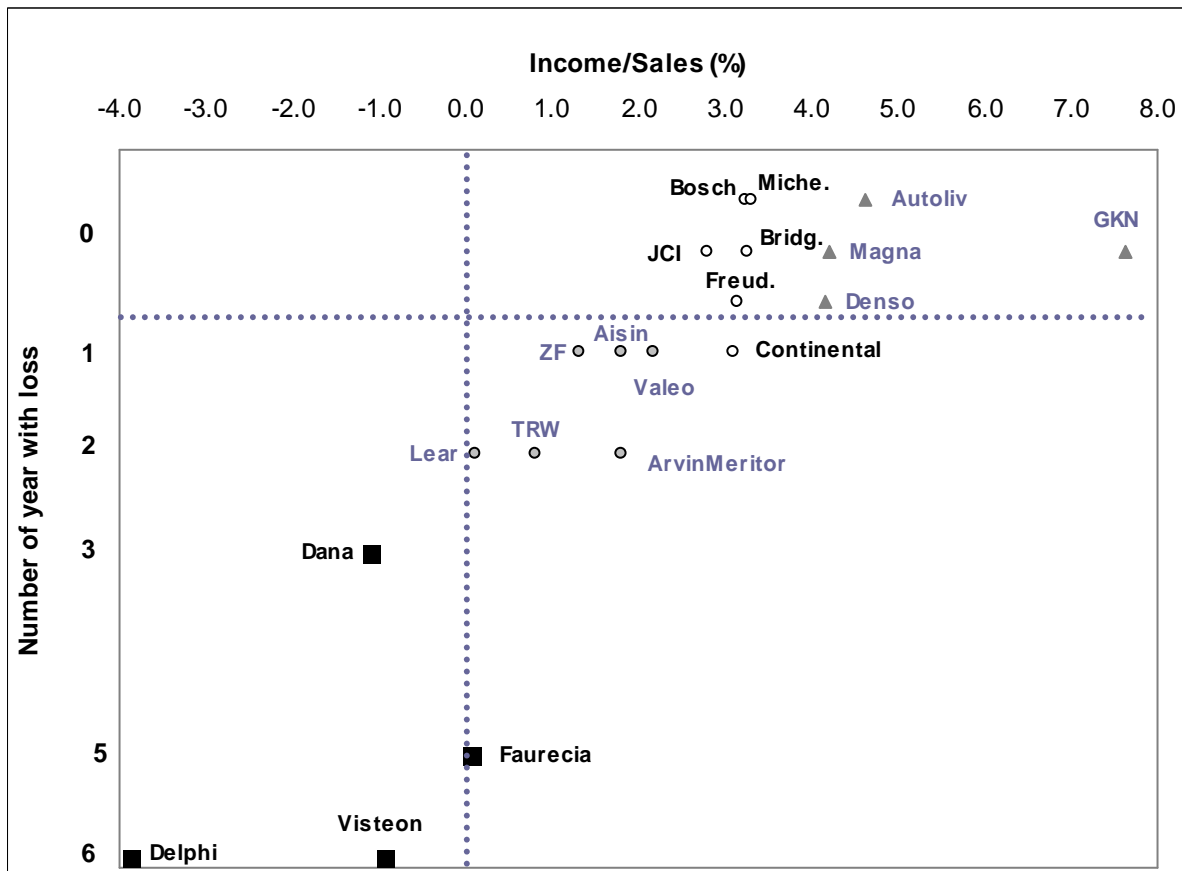
Figure 5 – Percentage of temporary workers at year-end - Faurecia, Valeo and Plastic Omnium (%)



Source: author from enterprise annual reports

In the end, French mega-suppliers were caught in a scissors effect. One hand they were suffering higher fixed costs. On the other, they were in no position to increase sales prices as much as they wanted to. In this respect and as demonstrated by Figure 6, their situation was not very different from other leading global suppliers.

Figure 6 – Average income/sales and number of years of losses (over 1997-2006)



Source: Frigant, 2009

Note the clear difference in Faurecia and Valeo's performances (see Figure 7). This is because Valeo's three years of losses corresponded to a period when the automotive business was suffering

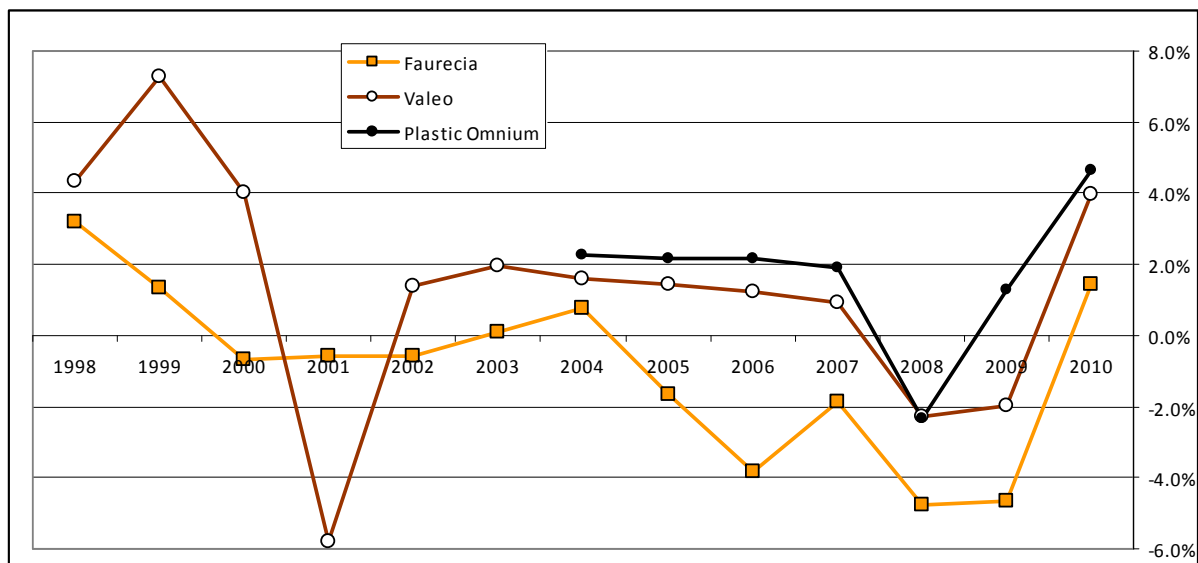
overall. Conversely, Faurecia lack of profitability seems to have been structural in nature, with the company having lost money for eight of the past 13 years. In our opinion, there are two explanations for this difference.

Firstly, Faurecia pursued a major external growth strategy that increased its debt levels, causing a considerable rise in interest charges over the period (see Figure 1).

Secondly, the two companies differed greatly in **shareholding** terms. Faurecia remained under the control of PSA Peugeot-Citroën, which is itself under family control. Valeo, on the other hand, is under pressure from the financial community, specifically the Pardus investment fund. In 2007, Pardus took a 10.57% equity stake in Valeo and increased pressure by demanding greater profitability. It forced Valeo to disengage from peripheral activities and reduce R&D spending. For a while, it even considered forcing the company to merger with US mega-supplier Visteon (also controlled by Pardus). Indeed, for most of the late 2000s, recurring conflicts between the group executive run by T. Morin (who wanted to prioritise industrial development) and Pardus was headline news at Valeo. Despite certain concessions that T. Morin was able to wrangle (including the sale of Valeo's cables activities to Leoni in 2007), he ultimately had to resign on 23 March 2009 because of a divergence of opinion with the Board of Directors, which criticised him for not having sufficiently refocused on the group's core business. Still, looking at figures 7 and 6, it is not at all clear that T. Morin did anything wrong in this respect.

Although there is less to be said about Plastic Omnium, the fact remains that this is the supplier that performed relatively best over the past seven years. Like with Valeo, it is the sudden fall in volumes that explains its 2008 losses. The adaptation measures implemented in 2009 enabled Plastic Omnium to already return to profitability that year, something that relatively few other global equipment suppliers were able to do. In shareholding terms, like Faurecia Plastic Omnium was under indirect family control, with the majority of shares held by the Burelle SA holding company, controlled in turn by the Burelle family (which according to the 2010 Burelle SA annual report had an equity stake of 77.1% and 90.4% of all voting rights). The holding company said that its aimed to pursue "a long-term strategy of building subsidiaries". In this instance, the announced policy seemed to correspond to reality.

Figure 7 – Ratio Net Income/Sales of Faurecia, Valeo and Plastic Omnium (%)



Source: author from enterprise annual reports

5. Commercial and productive internationalisation

It would have been impossible for the mega-suppliers to develop to the same extent within a narrow framework defined by national borders. Thus, their development was also a question of internationalisation. This topic can be broached from two angles: commercial internationalisation; and productive internationalisation.

5.1. Commercial internationalisation

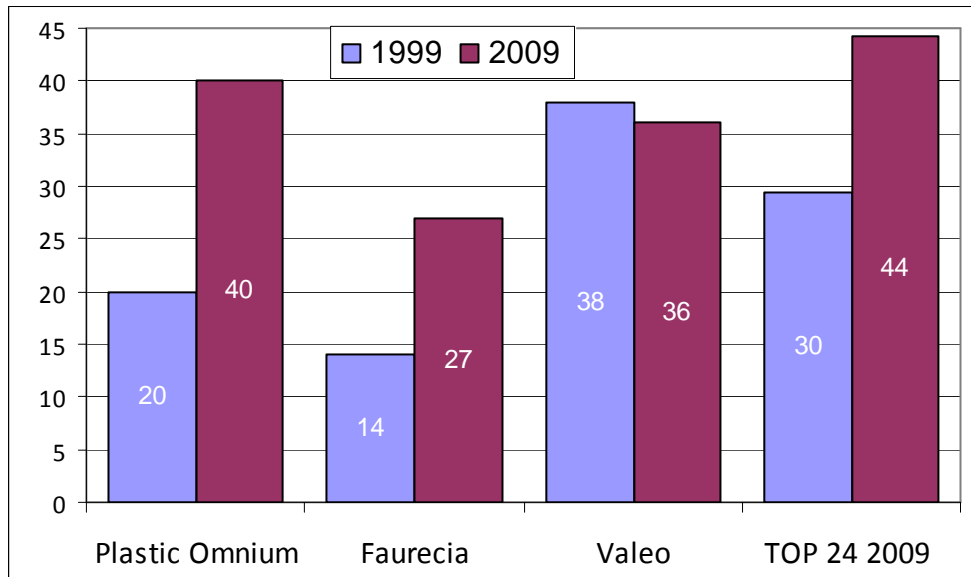
The mega-suppliers' growth required growth in their market spaces. These were firms committed to internationalisation trajectories for two main reasons.

The first involved their **following traditional customers abroad**. Carmakers were also starting to develop their markets by building new plants in target spaces. This internationalisation was largely based on a reduction in the number of platforms – a policy aimed at increasing the number of components shared between different models built using one and the same platform (Lung et al, 1999). One consequence of this platform approach was to encourage reliance on global sourcing, which involves turning to one and the same supplier and making this party responsible for delivering the same component to all of a company's sites worldwide. Since export is not always feasible (for reasons of productive coordination or due to entry barriers such as customs duties and/or local contents ratios), mega-suppliers had to duplicate their production sites. Such follow sourcing may have been one of the causes of productive internationalisation but it also explains the internationalisation of sales.

The second mechanism was the **conquest of new markets**. Mega-suppliers would more or less attack markets that they considered useful. Clearly, this was a recursive interaction, in the sense that the arrival of a new competitor X on Y's domestic space would increase the latter's vulnerability and cause it, in response, to set up its own operations in the new country (possibly X's home country). By narrowing the domestic market and (conversely) by developing sales abroad, this would lead to a major reduction in each large supplier's proportion of domestic sales - to such an extent that mega-suppliers began to disseminate less and less information about national sales. This is because henceforth, most were starting to reason on a macro-regional scale. Like carmakers whose internationalisation was organised among integrated regional zones (Carrillo, Lung, van Tulder, 2004), mega-suppliers began to apprehend their different markets on a similar scale. It remains that performances continued to vary markedly

Taking a snapshot, French module suppliers apparently remained relatively focused on their domestic zone (i.e. Europe). Comparing their international rate with the average for the 24 largest global suppliers in 2009, French numbers were quite a bit lower (Figure 8). Plastic Omnium, which made 40% of its automotive sales outside of Europe, is the supplier that depended least on its domestic zone. Faurecia only made 27% of its sales outside of Europe. At the same time, these two suppliers did double their internationalisation rates between 1999 and 2009. Valeo, on the other hand, started with a high level of internationalisation (38%) but fell back over the period in question to the point that its figures fell clearly below those of its counterparts elsewhere in the world.

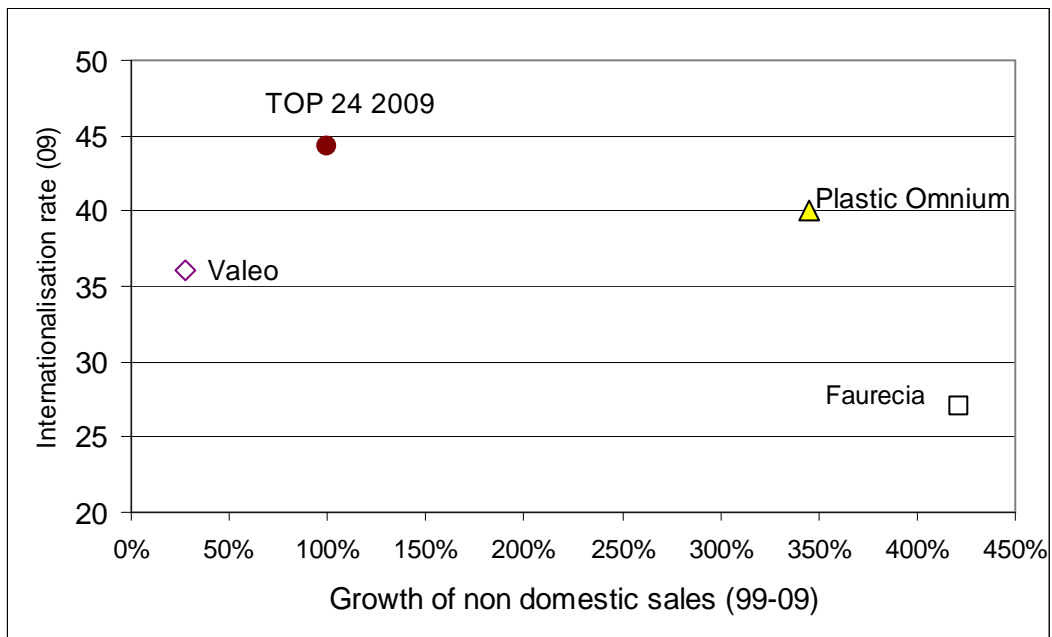
Figure 8 – Auto sales outside domestic area (%)



Note: TOP24 is a panel of the biggest suppliers in 2009 who appear also in the Automotive News ranking in 1999.

Source: Author from Automotive News

Figure 9 – Growth rate of non-domestic auto sales (horizontal) and % of sales outside domestic area (vertical)



Note: TOP24 is a panel of the biggest suppliers in 2009 who appear also in the Automotive News ranking in 1999.

Source: Author from Automotive News

Figure 9's horizontal axis shows the rise in ex-Europe sales. Its vertical axis replicates the internationalisation rate in 2009. Faurecia and Plastic Omnium experienced spectacular growth in non-European sales, explaining the latter's higher internationalisation rate. With respect to Faurecia, the very strong expansion in its European sales (notably in Germany) mechanically limited any growth in its internationalisation rate. Valeo is between the two. In value terms, it experienced clear

growth in ex-European sales (28%) but given even faster growth within Europe, the company's internationalisation rate fell by two points.

All in all, the three French module suppliers still seemed relatively focused on their domestic market in 2009, despite strong progress by Plastic Omnium and Faurecia in absolute and relative value. Valeo, and the other hand, had not advanced as far with its international process, despite this strategy's dominance among leading global module suppliers.

5.2. Productive internationalisation

It is difficult to dissociate the issue of suppliers' productive internationalisation from questions relating to location. Over the past few years, knowledge about automotive industry location mechanisms has improved notably. Accelerating geographic mutations have sparked interest from many researchers (economists, geographers etc.) and a significant accumulation of empirical material about both carmakers and suppliers. Focusing on literature concerning the latter group, three main families co-exist.

A first corpus attempts to analyse mega-suppliers' localisation behavior. What has been noted here is that internationalisation tends to pursue a triple objective: follow sourcing; penetration of new markets; and delocalisation (Frigant, 2007). The latter relates to the international fragmentation of production processes, something observed in several sectors (Berger, 2005) but featuring a number of specificities where the automobile is concerned, due to the burdensome coordination constraints weighing on certain kinds production (Frigant, Layan, 2009; Sturgeon, Van Biesebroeck, Gereffi, 2008). Notwithstanding this, a fragmentation logic does exist and continues despite everything to contribute to the expansion of production capacities in the world's more peripheral spaces. As aforementioned, this is partially an objective imposed by the carmakers themselves.

One effect of these delocalisations has been the rapid creation of production capacities in low-cost countries in line with a regional integration logic. Each major automobile manufacturing zone is surrounded by a periphery housing particular types of activity. This schema can be found in North America, where Mexico plays a supporting role for the production of components (Contreras, Carrillo, Estrada, 2010). In Europe, countries from Eastern Europe – especially Poland, the Czech Republic and Slovakia (Pavlínek, Domanski, Guzik, 2009; Domanski, Gwosdz, 2009) – along with North Africa and Turkey (Layan, Lung, 2009) play a similar role. Research demonstrates that within an international division of labour framework, such countries become production centres for certain elements – although there is also some local production aimed at supplying domestic carmakers' local sites.

A third body of research starts with the outlook in the historic automobile production countries. Such studies converge to describe a restructuring process that has culminated in the closure of entities producing certain elements that were generally (but not only) relocated towards the periphery, along with other activities that remained embedded in their original spaces (Klier, Rubenstein, 2008; Rutherford, Holmes, 2008; Jürgens, Krzywdzinski, 2009). Here again, mega-suppliers were particularly active in this geographic restructuring trend.

All in all, literature on changing supply chain geography has converged around three main ideas.

- ✓ The geography of supply chains has evolved rapidly and deeply based on an international division of labour logic that mega-suppliers often organise as international division of productive processes.

- ✓ One logical consequence is that companies arbitrate between different activities. We are not witnessing a generalised process of deindustrialisation but a selective process that could lead to certain activities being reinforced in core countries.
- ✓ This process is complex to dissect due to the fact that countries hosting the production of certain vehicle elements may also be vehicle production locations. Certain elements are produced in peripheral countries not to cut production costs but because cognitive or productive coordination constraints must be respected.

The combination of these different mechanisms has expanded the number of locations where global mega-suppliers run operations. This explains the vast network of entities that they have established across the world (Table 4).

Table 4 –Facilities, Production, and Research Sites as of End 2006 (Units)

Number of...	... Countries	... Facilities	... Manufacturing sites			... RD, Design, Technical centers		
			World	Domestic	Foreign	World	Domestic	Foreign
Aisin Seiki	19	146 (70 Japan, 76 overseas)	und.	und.	58	und.	und.	6
ArvinMeritor	28	142	121	46 (NA)	und.	21	6 (NA)	und.
Autoliv	28	103	80	6	74	20	2	18
Bosch	und.	> 350	270 est.	60 est.	und.	und.	und.	und.
Bridgestone	25	180	165	58	107	15	4	11
Continental	und.	159	137	48	89	22	6	16
Dana	28	121	110	65 (NA)	und.	11	10 (NA)	und.
Delphi	36	300	159	und.	und.	und.	und.	und.
Denso	32	197	143	48	95	26	19	7
Faurecia	25	232	171	37	134	25	12	13
Freudenberg	53	398	214	30	184	und.	und.	und.
GKN	>30	222	132	9	123	18	6	12
Johnson Controls	und.	191	170	48	122	14	10	4
Lear	33	265	215	und.	und.	46	und.	und.
Magna	und.	291	229	62	167	62	8	54
Michelin	19	80	69	15	54	5	1	4
TRW	26	211	147	41 (NA)	und.	19	7 (NA)	und.
Valeo	29	206	129	56 (EO)	und.	68	42 (EO)	und.
Visteon	29	206	87	15	72	und.	und.	und.
ZF Fried.	25	158	95	28	67	6	und.	und.

Note: EO: Western Europe. NA: North America. und: undetermined

The table is built along the following lines (sources: Website/10-k form/Annual Report):

- Column 2 & 3: Company statements.

- Column 4-Manufacturing: survey of sites by author, except where the firm has provided a summarize table.

- Column 5 (R&D, design, Technical centers): same compilation principles as Manufacturing uses. The data here has been aggregated since firms have various ways of accounting for these three types of sites. When a production and a R&D site are associated, they are only accounted for once, as a production site.

Source: Frigant, 2009

Qualitative analysis of these entities has identified five types (Frigant, Layan, 2009):

- Core R&D centres that perform an autonomous research and development activity on all carmakers' behalf (in the sense that the activity is not dedicated to any particular make).
- R&D centres located in carmakers' vicinity. These are often twinned with commercial offices and tend to be developed to a greater or lesser extent depending on the suppliers and carmakers in question.

- Just-in-time or ILS (in-line-sequence) production centres making dedicated modules for one particular carmaker. These tend to be located in supplier parks (Larsson, 2002).
- Production centres delocalised to low-cost countries and responsible for output manufactured on a broad scale and generally requiring an abundant workforce.
- Plants located in the main automobile production countries (regardless of the location, i.e. including developing and emerging economies) and given responsibility for production that is either highly technical in nature or conducive to economies of scale.

The three French modular suppliers studied in this text have followed a similar logic.

5.2.1. Faurecia

Faurecia began its productive internationalisation relatively belatedly, with France having remained key to its production system for a long time – something that has changed markedly in recent years (see staff numbers, Table 5). This decline is not only relative in nature, with Faurecia having eliminated nearly 10,000 jobs in France since its 2003 peak when the firm employed 24,966 persons there (vs. 14,663 in 2010). Germany was the first country where Faurecia pushed hard to grow its activities. Moreover, it has been largely protected from the current wave of geographic restructuring since it still employed 11,283 persons in Germany in 2010, a figure that has been very stable since major acquisitions made in 2000 (with German staff members amounting to 5,784 in 1999, 10,958 in 2001 and peaking at 11,355 in 2002).

Table 5 – Employees of Faurecia

	2002		2005		2010	
	Units	%	Units	%	Units	%
Europe	51,663	87.7%	49,497	80.2%	49,967	66.0%
<i>of which</i>						
<i>France</i>	24,628	41.8%	22,148	35.9%	14,663	19.4%
<i>Germany</i>	11,355	19.3%	10,050	16.3%	11,283	14.9%
North America	4,958	8.4%	6,958	11.3%	12,571	16.6%
South America	1,192	2.0%	1,924	3.1%	4,770	6.3%
Asia	153	0.3%	2,068	3.4%	6,598	8.7%
Other countries	912	1.5%	1,275	2.1%	1,770	2.3%
Total	58,878	100.0%	61,722	100.0%	75,676	100.0%

Source: Author from Faurecia annual reports

Table 6 – Main customers of Faurecia (% of sales)

	2000	2005	2010
PSA	24.7	26	18.2
VW (Group)	24.8	22	24.3
Renault-Nissan	15	14	11.9
Ford (Group)	12.4	10	11
GM (Group)	6.7	8	9.8
Daimler (Chrysler)	5.5	8	4.3
BMW	4	6	9.2
Toyota	0.9	2	1.7
Hyundai/Kia	nc	1	1.1
Fiat Chrysler	-	-	3.7
Autres	6.0	3	4.8

Source: author from Faurecia annual reports

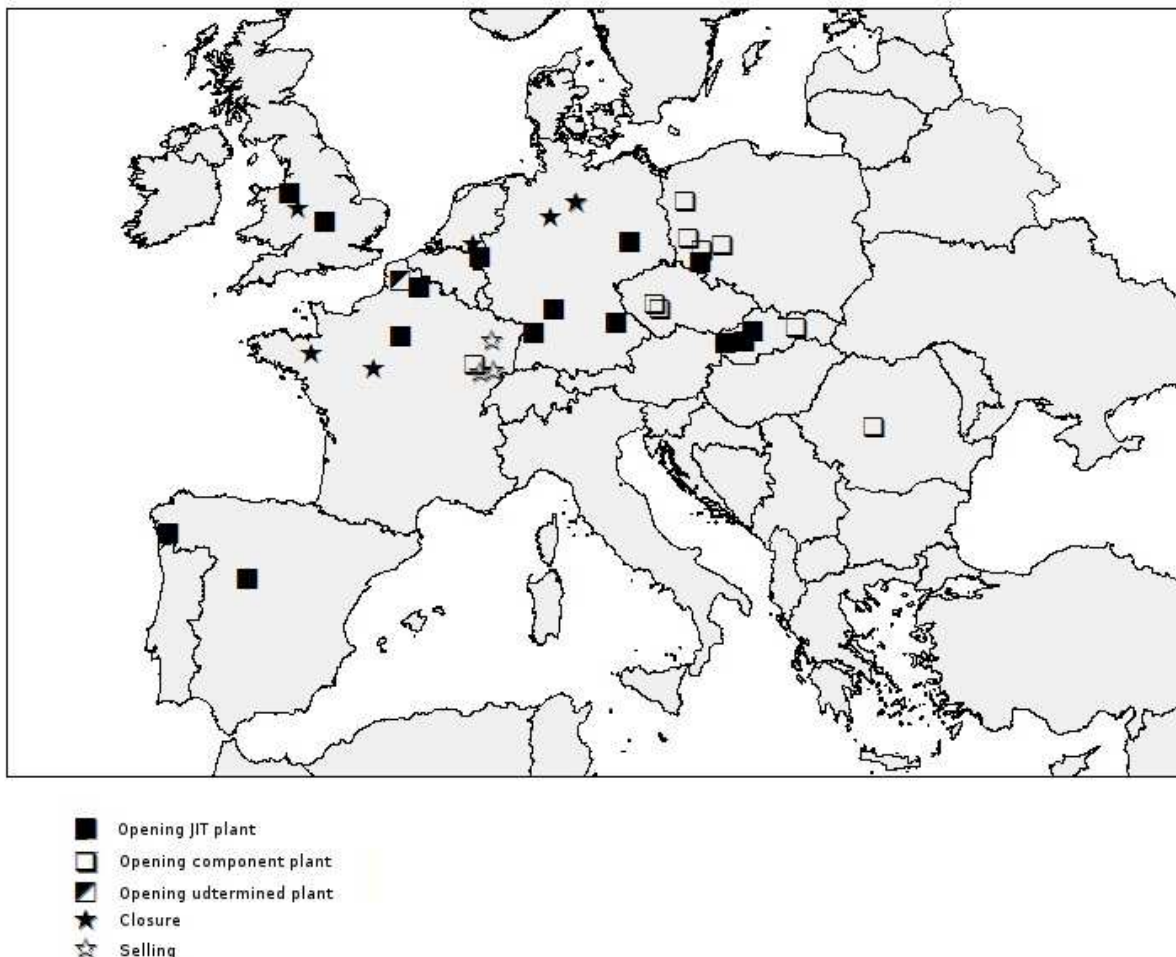
The displacement of Faurecia's centre of gravity towards Germany translates a common feature of these mega-suppliers, to wit, the need to gain proximity to customers (with Volkswagen

having become Faurecia's number one client and French carmakers declining, Table 6). This is because cognitive and productive coordination needs remain strong in this industry - as do the forces of agglomeration/clustering.

It also explains why Faurecia's global staff figures are characterised by much higher numbers in North America where the group has tried to gain proximity to US carmakers (mainly via acquisitions, as aforementioned) and more recently in Asia (first and foremost, China). Like many Western carmakers, China is increasingly perceived as a strategic priority for many suppliers. Faurecia is totally committed to this strategy and whereas it only employed 153 people in Asia in 2002, it now has 6,598 employees. Note that in 2011, Faurecia was running 18 production plants in China, one research and development centre in Minbei and one commercial office in Shanghai.

One of Faurecia's attributes is that it has made relatively lesser use of delocalisation as a strategy, meaning that its productive apparatus seems to have remained relatively focused on developing countries. For instance, Faurecia has 20 production plants in North America, five R&D centres, one commercial office in the USA (plus one production plant in Canada) but "only" 9 production plants in Mexico. In the same way, Faurecia has only one production plant in Morocco and one in Tunisia (2011 data).

Map 1 - The location of new Faurecia plants (2002–2006) or closed plants (2002–2005) in Europe



Note: Faurecia opened another components plant in Romania after acquisition of a local supplier in 2006. It is not shown on the map as we could not find its exact coordinates.

Source: Frigant, Layan, 2009

Faurecia's internationalisation strategy is not particularly focused on the search for low-cost production sites per se. The supplier is trying to combine several objectives in its expansion policy. This explains why it expanded so rapidly in Eastern Europe. Map 1 shows Faurecia's relocation strategy over 2002-2006. Its priority was to open production plants in Eastern Europe to make components there that would feed into the group's other factories. Conversely, equivalent factories in Western Europe tended to be closed or sold off. Alongside of this, Faurecia would open factories in both parts of Europe capable of delivering to carmakers just-in-time (proximity constraint). The net effect of these moves exemplifies a strategy that consisted of combining delocalisation with responsiveness to productive and cognitive constraints, thereby constructing a coherent spatial international division of productive sites model on a scale appropriate for a multinational firm (Frigant, Layan, 2009).

5.2.2. Valeo

Valeo's productive internationalisation came earlier than Faurecia's. As far back as 1995, the supplier was already saying that 47% of its employees worked outside of France – a figure that has fallen to 25% at present. One thing that Valeo does have in common with Faurecia is the diminishing importance of France, translating an absolute fall in the number of domestic jobs it offers in this country, after eliminating 10,758 positions here between 2000 and 2010 (table 7).

For a long time, Valeo's localisation trajectory seemed to differ from Faurecia's. This is because Valeo began very early on to engage in a significant delocalisation trend involving North Africa (Morocco and Tunisia). In 2002, 11.1% of all group employees worked in the Africa zone (including a few activities run out of South Africa). The group's overall geography suddenly changed in 2007, however, when it sold its cables activities to Leoni. This is because many of Valeo's delocalised wiring-related activities were very-labour intensive. By selling these sites, the group's centre of gravity automatically shifted towards the developing world, to the point that its geography is closer now to its French counterparts, combining:

- Production sites located in low-cost countries. These are relatively few in number but they do employ many staff members (Table 7). Like Faurecia, Valeo has turned to Eastern Europe where it can satisfy several objectives at once (proximity to European industrial centres and low production costs).
- Production plants located in developed or emerging countries. The function of some of these units is to deliver customers on a just-in-time basis. In parallel, some highly sophisticated production remains located in developed countries - one example being the Start-stop system that continues to be manufactured in French plants.
- R&D centres and offices located to follow in carmakers' footsteps. Note that in a context characterised by a reduction in the group's overall size, the number of research or development centres has increased, rising from 54 in 2002 to 58 in 2011. This is because Valeo considers that it must operate in carmakers' immediate vicinity to improve its understanding of (and response to) customers' specific local demands (G. Devauchelle, Valeo Director for R&D).

Table 7 – Employees of Valeo

	2002		2010	
	Units	%	Units	%
Western Europe	40,700	58.9%	24,200	41.8%
<i>Of which France</i>	<i>23,600</i>	<i>34.2%</i>	<i>14,440</i>	<i>24.9%</i>
Eastern Europe	4,800	6.9%	9,592	16.6%
North America	9,600	13.9%	6,212	10.7%
South America	2,700	3.9%	4,383	7.6%
Asia	3,600	5.2%	12,115	20.9%
Africa	7,700	11.1%	1,428	2.5%
Total	69,100	100.0%	57,930	100.0%

Source: Author from Valeo annual reports

Table 8 – Locations of Valeo in 2002 and 2011

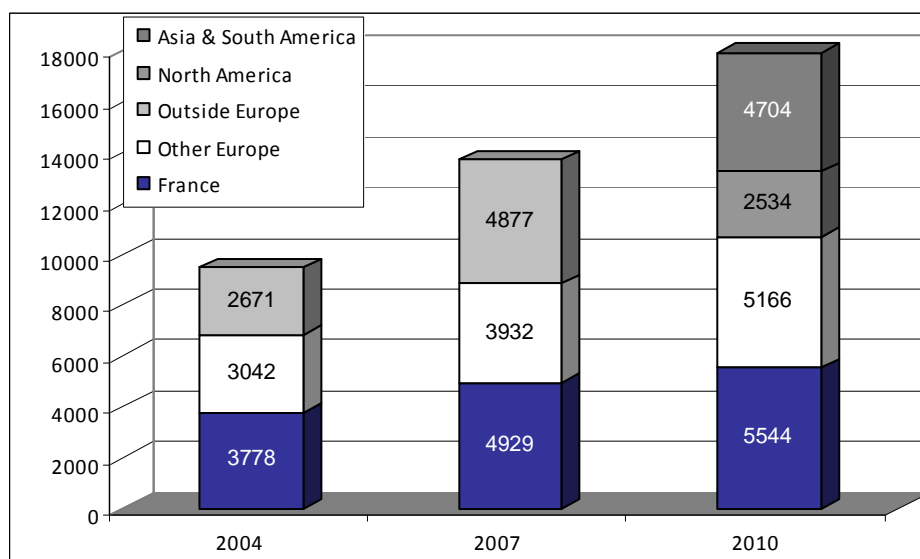
As of 31 march 2011						As of 31 december 2002				
	Country	Employees	Prod. plant	Center of Dev. & R.	Distri. center	Country	Employees	Prod. plant	Center of Dev & Research	Distri. center
North America	USA, Mexico	7,006	13	6	0	USA, Mexico	9,600	17	11	0
South America	Argentina, Brazil	4,402	8	4	1	Argentina, Brazil	2,700	12	0	1
Asia	China, South Korea, India, Japan, Thailand	12,301	29	12	1	China, South Korea, India, Japan	3,600	16	4	0
Africa	Egypt, South Africa, Tunisia	1,552	3	1	0	Egypt, South Africa, Tunisia, Morocco	7,700	11	0	0
Eastern Europe	Czech Rep., Hungary, Poland, Romania, Russia, Slovakia, Turkey	10,552	14	4	3	Czech Rep., Hungary, Poland, Romania, Turkey	4,800	11	0	2
Western Europe	Austria, Belgium, France, Germany, Greece, Italy, Netherlands, Spain, Sweden, UK	25,087	42	31	5	Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Portugal	40,700	73	39	6
Total	29	60,900	109	58	10	25	69,100	140	54	9

Source: Author from Valeo website

6.2.3. Plastic Omnium

It is almost impossible to compare Plastic Omnium to its counterparts, given - as aforementioned – that this company has only recently embarked upon a growth trajectory. For the moment, Plastic Omnium remains strongly embedded in Europe, where 60% of its employees work. France accounts for about one-half of this number. Moreover, unlike Faurecia and Valeo, Plastic Omnium, is still recruiting in France (Figure 10). Even so, temporary jobs account for 13.9% of its total French employees (versus a global average of 12.6%, with a maximum temp rate of 15.2% in a very vast zone that it calls “Asia & South America”).

Figure 10 – Employees of Plastic Omnium



Note: "Asia & South America" is including Turkey and South Africa

Source: author from Plastic Omnium Financial Report

Table 9 – Locations of Plastic Omnium (automobile division, 2011)

		Production plants	RD Centers
Western Europe	Belgium	2	1
	France	13	3
	Germany	4	1
	Spain	8	0
	United Kingdom	2	1
	Western Europe	29	6
Eastern Europe	Czech Republic	1	0
	Romania	1	0
	Poland	1	0
	Russia	1	0
	Slovakia	3	1
	Eastern Europe	7	1
North America	Canada	1	0
	USA	5	2
	Mexico	8	0
	North America	14	2
South America	Argentina	2	0
	Brazil	2	0
	South America	4	0
Africa + Turkey	South Africa	1	0
	Turkey	1	0
	Africa + Turkey	2	0
Asia	China	12	1
	India	3	0
	South Korea	5	1
	Japan	1	1
	Thailand	1	0
	Asia	22	3
Total	78	12	

Note: Plastic Omnium declares 77 plants but PO seems to forget Turkey

Source: author from Plastic Omnium website

Study of Plastic Omnium's productive apparatus (summarized in Table 10) shows that it develops a localisation strategy based on proximity customers. This is because Plastic Omnium's output imposes his cognitive and productive proximity constraints. Note, however, that the presence of eight factories in Mexico suggests that Plastic Omnium also intends to control production costs and is fully aware of the possibilities offered by delocalisation strategies. It remains that globally there is a relatively clear correlation between the map of the main locations of Plastic Omnium's leading automotive customers (Table 10) and the map of its own production locations.

Table 10 – Automobile's clients of Plastic Omnium 2010

	Sales (k€)	%
PSA Peugeot Citroen	483,063	17.4%
Renault/Nissan	368,622	13.3%
General Motors	478,807	17.2%
BMW	382,155	13.8%
Volkswagen	337,839	12.2%
Others	727,561	26.2%
Total Automobile	2,778,047	100%

Source: Plastic Omnium Financial Report, 2010

Conclusion

The past 20 years have witnessed major upheavals in the automotive supplies industry. The construction of a supply chain characterised by a pyramid organisation has specifically led to the creation of first tier suppliers that many of us have come to qualify as mega-suppliers. When we reconstruct French mega-suppliers' trajectory, what becomes clear is that their initial growth were the result of conscious decisions made by France's domestic carmakers. At the same time, from the late 1990s onwards, the very same carmakers were no longer looking to spawn new actors – a change in behavior that caused consolidation on a national basis and culminated in fewer French mega-suppliers figuring among the world's top 100⁸. Among those who did survive, module suppliers are useful to study since their growth derived directly from the structural transformations that had accompanied carmakers' externalisation.

We have demonstrated that the suppliers in question based much of their growth on an aggressive M&A policy. Even so, due to a significant rise in fixed costs, this growth did not necessarily translate into profitability. Contrary to the predictions of certain modularity studies, market power has not developed in a way that benefits the mega-suppliers suffering from rising fixed costs. In response, these actors have squeezed employees' working conditions (patterns of labour and precariousness) and engaged in rapid delocalisation and internationalisation. Despite this, a number of proximity constraints still remain. Ultimately, these are productive networks that can be described as networks of factories and R&D centres geared towards (hence determined by) suppliers' main automobile customers. Note that French module suppliers seem to have increasingly organised their European productive apparatus in a way that centres on Eastern Europe. By so doing, they are seemingly falling in line with their German competitors who have put together a veritable East-West sourcing system by building factories in Eastern Europe and relying heavily on subcontractors coming from these countries (Jürgens, Blöcker, Hildermeier, 2010).

From an analytical perspective, the French example demonstrates that changes in industrial architecture reflect interactions between four elements. Firstly, there is carmakers' strategic desire

⁸ Nevertheless, they continue to cater to tier 2 suppliers on an ad hoc basis. During the 2008/09 crisis, France's carmakers took part in the creation (and co-funding) of a state-managed relief fund benefiting equipment suppliers. This fund, which has been renewed despite the "end of the crisis", takes equity stakes in allegedly strategic suppliers to help them survive.

to disintegrate vertically. Secondly, there is the role that they have played in structuring their suppliers fabric - with French carmakers moving in the late 1980s to select the future winners from their externalisation drives but doing the exact opposite in the late 1990s when they disengaged from the market and let it follow its own direction. This is quite different from their German or Japanese counterparts, which might explain why cumulative forces soon gained the upper hand to benefit suppliers who were in a position to reinforce their existing positions and impede the arrival of credible new rivals. Thirdly, the pyramid structure required a modification in the object of exchange, given that components were now being aggregated. This is a function that modularity has performing by enabling the constitution of macro-components for which mega-modular suppliers have assumed responsibility. Lastly, such mega-suppliers became very proactive in the sense that they were not passive subjects of modularity or of supply chain transformations. Quite the contrary, to structure the supply of modules they engaged in major R&D spending programmes, working imaginatively and proactively to propel this modularity trend. The direct consequence of this succession of events has been to limit the number of the happy few and encourage a tightening of the sector's supply pyramid - a trend that has tended to generalise on a global scale given suppliers' engagement, alongside carmakers, in major internationalisation drives.

It remains that this co-evolution in carmaker and mega-supplier strategies might well be questioned in the future. There are three reasons for this. Firstly, the renewal of technologies - and notably the advent of electric vehicles - could reshuffle the deck. In the past, the development of modules helped to rearrange equipment suppliers' structure and it is possible that new entrants will arise in time, with today's well-established firms finding it difficult to adapt. Secondly, some carmakers have started asking questions about the excesses of externalization (Parry, Roehrich, 2009; Zirpoli, Becker, 2010; Frigant, In Press). Issues such as reliability (of products but also of increasingly fragmented supply chains) or control over product-related competencies have raised doubts about certain choices. Lastly, the great unknown is the state of equipment suppliers from emerging countries. For the moment, people tend to talk about the rise of Indian or Chinese carmakers but possess very little information about suppliers originating in these countries. Yet historically, every time a national carmaker has developed, it has carried national suppliers in the wake. We already know that domestic capacities are expanding in China (Herrigel, 2011) but cannot be sure how this will play out in the future. This then becomes a worthy topic for further research.

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