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The Role of Company Standards in Supply Chains – The Case of the German Automotive Industry

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The Role of Company Standards in Supply Chains – The Case of the German Automotive Industry

Anne-Marie Großmann and Paul von Gruben

Abstract

Company standards cover aspects such as quality assurance, testing procedures and terms of delivery. They are used not only internally but also imposed on suppliers. In this function, company standards have a potential to facilitate knowledge diffusion along the supply chain as well as assuring supplier's quality and have an impact on the bargaining power equilibrium between the buyer and its supplier. Especially in the automotive industry these aspects play an important role. This article uses a mixed methods approach to explore the employment of company standards in the supply chain of the German automotive industry with a special focus on the company's position within this supply chain. We analyze quantitative data from the German standardization panel to map the usage of company standards on different stages of the supply chain. An extensive qualitative analysis reveals how company standards play a role in the automotive supply chain. By examining the network that company standards span between manufacturers, suppliers and raw material producers we are able to highlight the various ways of diffusion of codified knowledge along the supply chain. This analysis reveals that especially large and powerful downstream players are able to burden their company standards on their suppliers but also upstream producers can provide their standards to their customers. Suppliers use different tactics to deal with heterogeneous external company standards they receive from their buyers. The results show that company standards can be a tool to manage the delivered quality of suppliers in

the automotive industry but the different company standards of multiple buyers can lead to increased efforts on part of the supplier.

Keywords: company standards, standardization management, supplier management, supply chain management

1. Introduction

The automotive industry is characterized by high consolidation, outsourcing of important parts of product development by manufacturers and dense competition. In this context, original equipment manufacturers (OEMs) can force their suppliers to comply with their company-specific standards (Sturgeon et al., 2008). The link between companies along the supply chain does not stop here, however, as suppliers and even upstream raw material producers (RMPs) also set their individual company standards and provide these to other firms. This paper analyzes the role of company standards in a representative part of the automotive supply chains, from the providers of raw materials to the OEMs.

We aim to understand how companies within the German automotive industry deal with their internal company standards and those of other firms. The supply chain “is traditionally characterized by a forward flow of materials but a backward flow of information” (Beamon, 1998, p.281). Our analysis will reveal that the information flow through company standards does not follow this traditional path. Answers reveal that the strong players in the industry at either end of the supply chain, the OEMs and RMPs, are able to impose their internal company standards on the smaller suppliers.

We arrive at this understanding by a quantitative analysis of data on automotive companies from the German standardization panel followed by an in-depth qualitative analysis of 21 deliberately chosen players within the industry. We follow the established procedures in developing a methodologically sound qualitative analysis (Maxwell, 2005; Yin, 2014) of these company standards.

We find that considering company standards can be important for supply chain management. Company standards are an indispensable tool to manage the required quality of a company's supplier and were found to play a significant role in the bargaining process between companies. Also different strategies to deal with the heterogeneity of requirements from different companies in form of external company standards become eminent.

2. Conceptual Framework

2.1 Importance of Company Standards

A company standard is the outcome of the process of standardization carried out by an organization with regard to its own requirements (Düsterbeck et al., 1995). Confining this definition to the internal company perspective is not sufficient, as company standards can be used within one company but also be shared with direct business partners or suppliers to exchange basic information (Vries, 1999). Hence company standards can also be provided to other companies, e.g. suppliers, to request the fulfillment of their requirements. Blind and Großmann (2014) have therefore introduced a distinction between internal and external company standards. They defined internal company standards (ICS) as "documented standards developed within the company that are either used in the company or with cooperating companies, such as suppliers" and external company standards (ECS) as "documented standards developed by other companies (e.g. customers/buyers), excluding standards produced by formal standardization bodies or consortia, that are used within the own firm" (Blind and Großmann, 2014, p. 36).

2.2 The automotive Supply Chain

The three fundamental stages of the supply chain are the upstream acquisition of raw materials, the conversion of raw materials into specified final products and the delivery of final products to retailers (Beamon, 1998; p. 281). A rise in product complexity and a paucity of sufficient industry standards in the automotive

industry has tightened the relationship between buyers and suppliers over the last decade (Sturgeon et al., 2008). On a global level, the supply base has consolidated and outsourcing by OEMs has grown, which led to an increase in value added by suppliers compared to the OEM (Sturgeon et al., 2008). Sturgeon et al. (2008) further stated that “the industry has historically relied on interpersonal interaction and proprietary standards [...] to manage the flow of tacit information” (Sturgeon et al., 2008, p. 308) so the specific role of company standards in this industry is recognized.

At the downstream end of the automotive supply chain, the original equipment manufacturers (OEMs) produce final parts and assemble the end product. Recent developments in the industry led to only a small number of OEMs remaining (Sturgeon et al., 2008). Although OEMs have a larger number of direct suppliers, upstream in the supply chain only a small number of raw material producers (RMPs) exist (Agrawal et al., 2014). Due to the low number of OEMs and RMPs, we assume oligopolistic structures on both ends of the supply chain. Due to the resulting increase in purchasing power on the side of the OEM, Sturgeon et al. (2008) found that OEMs can force their suppliers to accommodate their idiosyncratic standards. Unfortunately, Sturgeon et al. do not consider the particular dynamics of company standards within the supply chain in depth. Also, they neglect the importance of the dynamics with regard to the upstream handling of these standards.

As Agrawal et al. (2014) however proposed, the upstream supply chain is worth looking at and a better management of the knowledge residing within the raw material supply chain can help firms to create value. Our objective is therefore to understand the use and implications of company standards along the entire supply chain.

2.3 Company Standards within the supply chain

The requirement to fulfil company standards can be a barrier for some suppliers to enter into trade relations with a particular buyer (von Schlippenbach and Teichmann, 2012). Once a standard is established and a commitment to a

particular interface is made, switching costs arise (Farrell and Saloner, 1985). Hence, if a supplier has chosen to fulfil the company standards of their buyer (e.g. the OEM), they might be “locked-in” this trade relationship, which means that the costs of serving a different buyer and thereby switching to an alternative standard are too high (Farrell and Saloner, 1986). For example, if a suppliers lays out its production to fulfil a very low quality, this can lock them into trade relations with that customer who requires such low quality.

Recently, some studies in the field of food policy have covered the importance of private standards², following a shift from public to private governance in global agri-food systems. Such private standards are issued by retailers to their food growers mainly to assure a particular level of quality. We assume that some findings of that literature are of relevance for our study, where growers bear a resemblance to RMPs and retailers to OEMs³. A recent study by Thompson and Lockie (2013) of the Australian vegetable supply food system shows that the vegetable growers are not just obediently following private standards of their retailers, but that they also employ their own knowledge and power. Here, growers expressed concerns about the costs involved in fulfilling multiple standards from various retailers (Thompson and Lockie, 2013). A further study argues that retailers can exert their power due to their size and position at the top of the supply chain to impose a private quality assurance standards as “de facto condition of market access” (Hatanaka et al., 2005).

These results seem applicable to the automotive industry, although the matter herein seems to be of a different complexity. For once, the agri-food supply chain has less depth than the automotive supply chain. Additionally, in the automotive industry there is no third-party certification required for the fulfilment of private

² In the agri-food industry private standards are developed by one company, bearing close resemblance to company standards. However, certification is required where growers get surveyed by an independent party on their compliance to those private standards.

³ We see retailers in the agri food serving a similar purpose to automotive OEMs as they also need to ensure a high level of quality and compete in an oligopolistic market.

standards, but they rather act as a potential barrier to entering into trade relations with a buyer.

2.4 Research Objective

Due to the very specific power relations within the automotive industry and potential influence of company standards on the dynamics within the supply chain, we formulate our research questions:

- How do companies in the automotive supply chain deal with internal and external company standard?
- Does the supply chain position influence the ability of firms to handle external company standards?

3. Research methodology

To our knowledge, there is a shortage of studies concerning the role of company standards for automotive supply chains. This warrants a careful in-depth analysis for a thorough understanding of the topic as well as data triangulation (Yin, 2014). We hence used a two-step procedure by including both quantitative and qualitative data in our analysis. As we wanted to consider the German automotive industry, we considered the membership list of the German association of the automotive industry (VDA) to be the population for our analysis. Our population therefore comprises 606 companies either classified as OEMs, Suppliers or RMPs. Throughout our analysis we paid close attention to the measures of internal validity, construct validity, external validity and reliability (Gibbert et al., 2008).

In the first step we consider data from the second wave of the German standardization panel. This is an extensive online survey conducted in autumn 2013 with over 1600 participants in Germany (Blind et al., 2014). The questions were developed in collaborations with the authors of this paper. We provide a descriptive overview of answers from companies belonging to the automotive industry only. Based on the revelations of this quantitative analysis as well as our

theoretical considerations we developed a semi-structured interview guideline (Yin, 2014) to gain a deeper understanding of company standards in automotive supply chains. This inductive approach is warranted to understand the meaning and the particular context that surround company standards within the supply chain (Maxwell, 2005).

For the first step of our analysis we extracted answers from the German standardization panel of companies identified as belonging to the German automotive industry. Overall 6 OEMs, 53 suppliers and 9 raw material producers provided answers on their standardization activities within the survey. Although we were able to gain some understanding from these statistics generated, they raise some further issues: First, all of the respondents of this survey were either members of the German Institute of Standardization (DIN) or the German Commission for Electrical, Electronic & Information Technologies (VDE). This could prove problematic because companies involved in formal standardization activities might have a biased approach towards company standardization. Second, the results revealed some particularities that deserved more attention. In the second step we therefore generated a guideline for semi-structured interviews with experts on standardization within German automotive companies to get a more detailed understanding of the findings from the quantitative analysis. The companies were chosen to mirror the spread of companies in the population and we deliberately balanced the sample with regards to membership in the formal standardization organizations, size and product portfolio. We interviewed 4 OEMs, 13 suppliers and 4 RMPs. To construct validity, in each of the companies we interviewed either a member of the standardization departments or, if the company had no such department, an employee responsible for standardization, procurement or quality management. An overview of the companies and interview partners can be taken from table A.1. The telephone interviews with these companies were conducted within a three week time frame. The interview guideline was developed after a review of the literature and the quantitative analysis. Table A.1 in the appendix lays out the instrument for these interviews. All interviews were recorded, transcribed and

coded. We used both attribute coding for the information on the participants as well as structural coding for the content related to each question (Saldana, 2009). Afterwards, we did a within-case (RMPs/Suppliers/OEMs) and between-case analysis (comparison of the three groups) (Yin, 2014) to reveal the evident relationships between the companies in the supply chain via company standards.

4. Findings

4.1 Use of ICS and ECS in the automotive industry

We first provide an overview of the results from the German standardization panel. 68 of the firms in the panel belong to the automotive industry (11.2% of the population). An overview of these firms' characteristics is provided in table 1.

	<i>N</i>	<i>Employees</i>		<i>Turnover (Mio €)</i>		<i>Productivity</i>	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
<i>OEM</i>	6	172907	207581	75556	73329	0.70	0.14
<i>Supplier</i>	53	8908	17868	1241	2229	0.35	0.54
<i>RMP</i>	9	23655	35857	20481	24277	0.52	0.18

Tab. 1: Overview of the companies in the sample

We can observe that the OEM and RMPs have significantly higher numbers of employees, turnover and productivity (measured as turnover per employee) levels compared to the suppliers in the sample. 56% of the companies⁴ have a standardization department, including all the OEMs and roughly half of the suppliers and RMPs. Most standardization departments are anchored within the R&D or QM-Departments and are responsible for the distribution of formal standards as well as the development and diffusion of internal company standards. More than 77% of the companies in the sample have spent above

⁴ Please note that the difference in total observation results from missing observations.

10.000 € (28% above 100.000€) on internal and external standardization activities in 2012. Here, the OEMs spend at least 100.000 € on their standardization activities, up to above 10 Mio €; Suppliers and Raw Material Producers do not spend as much money; but almost all but one spend between 1000 € and 1 Mio €. Standardization hence seems to be a substantial issue in these companies.

The questionnaire also asked the companies how important they assess internal company standards (ICS) and external company standards (ECS) (see table 2). 100% of the OEMs found ICS very important. The RMPs also evaluated ICS highly important whereas the suppliers judged these a little lower. External company standards, however, become more important the further downstream we go – whereas OEMs rate them with little importance, raw material producers assess them with high importance. These differences hint at the need for discriminating between the effects of own company standards compared to external ones and reinforce the importance of our research questions.

	<i>ICS</i>			<i>ECS</i>		
	N	Mean	S.D.	N	Mean	S.D.
<i>OEM</i>	6	3.00	0.00	4	0.75	2.63
<i>Supplier</i>	50	2.08	1.35	49	1.86	1.32
<i>RMP</i>	8	2.50	0.76	6	2.50	0.84

Tab. 2: Rating of the importance of company standards for the company from - 3 (very unimportant) to 3 (very important)

We further compiled information on the use of ICS and ECS in our sample, which is reported in figure 1. In our sample ICS are used by around 90% of the companies and also 90% of the companies need to fulfil ECS. Of the 53 companies that use ICS the majority (73%) uses a high number of CS (>11-100). Especially OEMs employ a high number of ICS, ECS a little less.

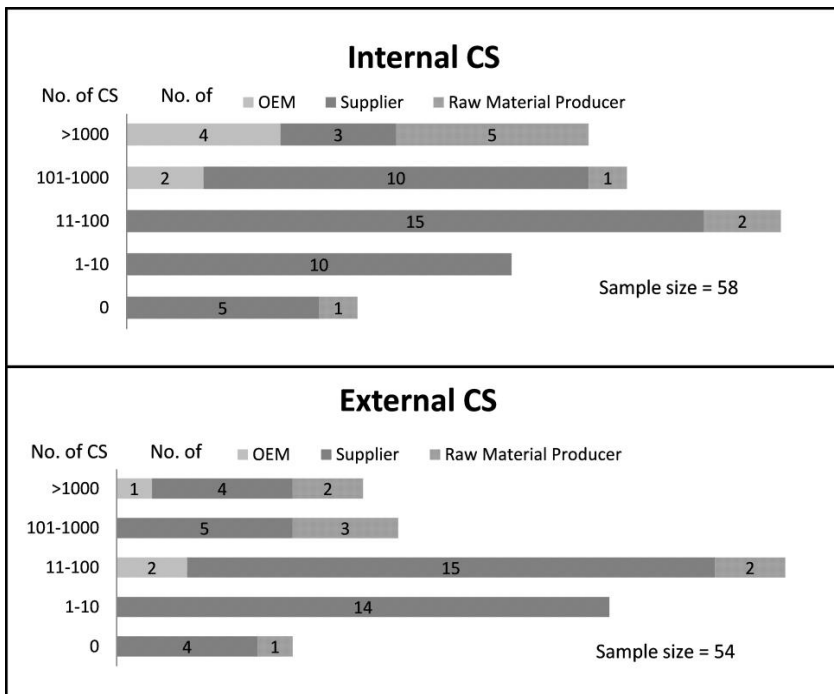


Fig. 1: The number of internal (ICS) and external (ECS) company standards used according to supply chain position

	<i>Internal CS</i>			<i>External CS</i>		
	N	Mean	S.D.	N	Mean	S.D.
<i>OEM</i>	6	2.33	1.21	2	1.50	0.71
<i>Supplier</i>	27	1.48	0.89	28	1.29	1.21
<i>RMP</i>	6	1.00	0.63	6	1.17	0.75

Tab. 3: Impact of company standard on the bargaining position with suppliers and buyers from -3 (very negative) to 3 (very positive)

Finally table 3 provides an overview how the companies judge the impact of company standards on the bargaining position with partners in the supply chain.

This shows that OEMs find their internal company standards to have a higher positive impact on their bargaining position; whereas suppliers and raw material producers judge this lower, although still positive. External company standards seem to have a less positive impact.

From this first descriptive analysis of company standards, additional questions about the use of company standards along the different positions within the supply chain arose. Therefore we carried out a further in-depth analysis by interviewing selected companies from the automotive industry. These findings will help us to understand what role company standards play within the supply chain.

4.2 Interviews

As can be seen in table A.1, all our interview partners were in adequate positions to comment on the role of company standards within their supply chain, as they are responsible for standardization, procurement or quality management in their company. Our sample consists of 4 OEMs and 4 RMPs as well as 13 Suppliers. All but one of the 21 respondents said that they were developing ICS. This supplier (SUP11) however stated that it is issuing testing instructions and other internal documents which can be classified as ICS. We will now review the observations from within the three groups of interest (OEMs, Suppliers and RMP) before we state the diverging results between the three groups.

All suppliers in our sample have OEMs as their direct customers, and some are additionally sub-suppliers to OEMs. Nearly all of the supplying companies reported to provide at least a significant share (more than 50%) of their ICS to external companies, which are mostly sub-suppliers or cooperation partners. Only SUP11, a manufacturer of chemicals, provides only a minor share (0.1%) to their outsiders (their customers). If a company provides only part of their ICS portfolio to external companies, they usually keep those ICS that consider internal process requirements, lead time and knowhow confidential. Topics regarding connecting elements, technical requirements (e.g. material requirements), testing and quality requirements are provided externally to

suppliers or cooperation partner. All of the suppliers, to some extent, have to fulfil ECS from their customers, which are either OEMs or direct suppliers to the OEMs. The ease with which the companies can fulfil ECS varies between the suppliers, for example SUP5, SUP7 and SUP8 stated that they already produce to the highest quality level covering the quality requirements laid out in their ECS. Further, suppliers know that they have to fulfil ECS of their customers in order to overcome the market entry barriers: “If we do not fulfil the quality requirements of our ECS we will lose our position as supplier” (SUP6).

Many interviewed suppliers brought up the copyright issue which becomes problematic in case they need to pass on their ECS to sub-suppliers. The way some suppliers deal with this problem is to convert external requirements in the form of ECS into their own ICS. In some cases this means that the content of the requirements stays the same, but the formal appearance changes. Some suppliers are also able to bundle ECS of their different customers into one ICS. In other cases, ECS have to be split up into different ICS which can be passed on to different suppliers. One example: SUP5 reported difficulties with varying company standards for documentation: “Our customers demand different sampling documentation. Despite the fact that this is the same procedure, we have to do the documentation differently according to each of the ECS”.

The Suppliers see company standards as an important contractual basis and mandatory to enter into trade relations. We find that the goal for suppliers to provide their own company standards to their suppliers is for quality assurance. As with the copyright issue in passing on ECS, the issue of knowledge revelation is also apparent in ICS, as SUP9 states: “ICS are a transfer of knowhow and this can be dangerous, as our suppliers could provide our ICS to our competitors.”

The OEMs in the sample all provide their ICS to their suppliers. Two of the four OEMs in our sample even let suppliers access nearly all of their ICS (above 90%) while OEM3 permits suppliers to access all their ICS. Only OEM4 provides only 50% of their ICS to suppliers, as the other half are testing requirements for internal use only. The OEMs have to fulfil ECS only in exceptions, for example if they act in turn as suppliers to other OEMs (OEM3 and OEM2) or if they

cooperate in specific projects. All of the OEMs explained that company standards have a high influence on their supplier relationship management, as they can provide transparency on the technical requirements and a contractual basis and lead to cost reductions. In providing their ICS, the OEMs want to ensure that their suppliers fulfil their quality requirements. OEM1 states: “with topics concerning quality, we develop internal company standards. This cannot be done externally [e.g. in formal or consortia standardization], because then everybody would be required to fulfil our standard and this might be too expensive for some”. Knowhow, however, does not seem to be such an issue in the external provision of the OEM's ICS, as OEM 1 states “if something is standardized in our company this is usually already known by industry insiders”⁵.

The upstream RMPs themselves develop ICS that in parts are provided to their customers, RMP2 even states that they sometimes develop their ICS in accordance with their customers. The RMPs however also stated that they fulfil some ECS from their customers. An interesting aspect raised by RMP1 and RMP4 is that frequently information asymmetries between the RMP and its customers exist; for example do the suppliers demand testing procedures in their company standards that cannot be fulfilled by the RMP or where this leads to higher costs. This can lead to increases in costs. RMP3 also stated that they usually fulfil the highest quality that is required in their ECS, regardless of lower requirements in other ECS.

Comparing the three types of companies is the heart of our analysis, as we are interested in the links in the supply chain through company standards. Figure 2 provides an overview of the three types of cases how company standards diffuse through the supply chain we encountered.

⁵ Industry insiders refers to the technical experts in the industry, especially in other OEMs.

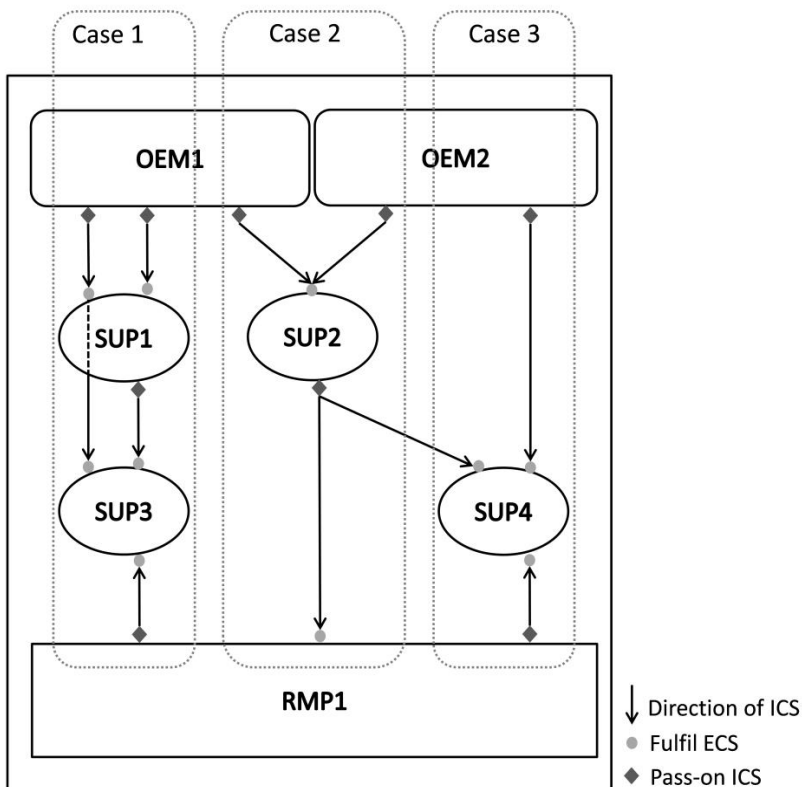


Fig. 2: Exemplary cases of the diffusion of company standards through the automotive supply chain

In the first case, the dashed line through SUP2 is an illustration of what in earlier talks with a development engineer of a major OEM has been called a “standard worm”: the fact that one standard is rarely applicable on its own but usually draws a whole “tail” of additionally references of applicable standards; which might themselves reference additional standards. Although some suppliers conceal the origin of their ECS to their sub-suppliers (therefore the dashed line), they pass the requested standard from the OEM upstream. As the RMP also pass their company standards to their own customers, the suppliers that are in the middle

of the supply chain have to deal with both the information codified in upstream and downstream ECS, as is exemplified in supplier 3 in the figure. Especially suppliers with lower power see the fulfillment of ECS as mandatory in order to be in trade relations with their buyers.

Case two provides an example of the fact when the supplier bundles ECSs of their different customers together and issues them as ICS to their sub-suppliers. E.g. as SUP9 states: “if we have similar standards that are requested by more than 70% of our clients it makes sense to incorporate them in our own standard rather than making a special solution for all the others”. This means that the requirements stated in ECS of different customers are combined into one ICS which is set at the highest requirement level. Hence, all customers receive the same level, even if they have asked for a lower requirement level. They might only pay for the lower requirement level but with the simplification or cost reduction issues during the production process, they still get the higher level requirement. This unified standard is then also provided to sub-suppliers or even RMPs. Some requirements in form of ECS of customers need to be divided into many different ICS which than can be passed on to the respective sub-supplier. The third case illustrates how ECS can contain codified information from various stages of the supply chain. As the suppliers in the automotive industry state not only to deliver to the OEM directly but also to suppliers of OEMs, the same supplier can act as both a direct supplier and a sub-supplier within the supply chain. This means that the ECS come from various stages and hence knowledge transfer is taking place from these various stages of the supply chain.

5. Discussion

Our objective was to identify how companies in the automotive supply chain deal with company standards. We discriminated between internal and external company standards. From the quantitative analysis, we found that OEMs rate the importance of internal company standards for their company highest. External company standards, however, seem to be more important upstream with RMP

than downstream with OEMs. There was also an indication that company standards have a positive impact on the bargaining power with customers and suppliers, regardless of the supply chain position. From this analysis we can infer that company standards seem to play a role for managing a firm's supply chain. A more finely granulated analysis reveals that especially technical and quality issues are codified in ICS and passed on for quality assurance.

5.1 Supply chain position and company standards

It is striking that both OEMs and RMPs pass on ICS to suppliers in the mediating position between them. This also contradicts traditional theory, which suggests that knowledge flows one-directionally backwards in the supply chain (Beamon, 1998). This could be related to the issue that ICS have a positive impact on the bargaining power of firms; at the same time, especially strong player, located at either end of the supply chain (OEMs and RMPs) are able to burden their standards on the weaker players in the middle. The results suggest a positive two-way relationship between the bargaining position in the supply chain and therefore the market power and the impact of exercising ICS. One possibility suggests that strong players in the market (e.g. OEMs, RMPs and large suppliers) exercise such standards to keep the weaker players weak. This link should therefore be carefully considered in the management of the supply chain. The results however also suggest, that generally all suppliers have the chance to accumulate heterogeneous information from both upstream and downstream positions, thereby providing power residing in the holding of information on part of the supplier.

5.2 Quality levels and company standards

We further found that some suppliers fulfil the ECS with the highest requirement and thereby meet the required quality of all other ECS automatically. For the suppliers, this reduces complexity, as they do not have to take care of each individual ECS, and increases the production volume. But this comes at the expense of higher production costs for the supplier. On the other hand this

reveals that if OEMs set a lower quality standard for their components (e.g. to save costs) and provide this to their supplier, they could potentially provide an advantage and get hold of a supplier that also sells to other OEMs with potentially higher quality requirements. This would mean that despite asking for a lower quality, their components fulfil a higher standard. SUP7 for example provides a case where the customers (OEMs) of a supplier did not know that they were getting the same standard as their competitors. But, as pointed out by OEM1, however, general industry insiders are already aware of the demands of their competitors at the OEM level.

5.3 Copyright issues and company standards

When part of the production is outsourced, ICS are passed on to sub-suppliers but also ECS of customers. To conceal for which customer the product is produced, companies change the formal appearance of ECS but leave the content the same. This needs the approval of the customer. Copyright issues might even forbid the passing on of ECS altogether. In this case the sub-suppliers might need to obtain the ECS from the original customer (e.g. OEM) themselves.

5.4 Implications for supply chain management

As the handling of ECS by suppliers varies, this can have important implications for supply chain management. Some suppliers are able to use their bargaining strength to discuss ECS and eventually manage to alter them in their favor, while others have to fulfill the requirements of ECS without such a possibility. Some suppliers are able to bundle multiple ECS into one ICS thereby making use of economies of scale as a matter of variety reduction.

We also found that some information asymmetries exist on the content of company standards. ICS might include redundant testing procedures, for example, which unnecessarily raises the costs of the products. It is therefore important to consider the benefit of imposing certain ICS on suppliers, if the supplier themselves have a better understanding of the matter. As OEM1 said: “you should not restrict your supplier too much through tight requirements, so

that too little flexibility is left for him to realize own ideas. He might find a material which leads to lower production costs [and further to a lower price].”

6. Conclusion

This paper analyses the usage of company standards along supply chains in the German automotive industry. By considering existing studies, for example on the agri-food supply chain, the purpose of this paper was to explore how companies in the automotive supply chain deal with internal and external company standards. The main reason for imposing company standards on supply chain partners is to assure quality. The study also sought to identify how the position within the supply chain matters for the dealing with such standards. We find that the bargaining strength of larger companies has a positive impact on the ability to put forward its requirements in supply chain relations through company standards. We further find that the position in the supply chain matters: rather than a one-directional flow of company standards from downstream to upstream companies of the supply chain, the suppliers in the middle are the weakest players that have to consider company standards of the OEM as well as of the RMP.

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Appendix

A.1 Overview of the interview respondents

Abbr.	Position in company	No. employees	Type of company	Business description
<i>OEM 1</i>	Manager; standard. department	100,000-150,000	Producer of premium cars	Design, assembly, manufacture and distribution of premium cars on a global scale
<i>OEM 2</i>	Manager; standard. department	250,000-500,000	Producer of premium cars and trucks	Design, assembly, manufacture and distribution of cars and trucks on a global scale under different brands
<i>OEM 3</i>	Manager; Standard., Technical Translation	25,000-50,000	Producer of trucks and commercial vehicle	Design, assembly, manufacture and distribution of trucks and commercial vehicles on a global scale
<i>OEM 4</i>	Manager; standard. department	>500,000	Producer of small, medium and premium cars	Design, assembly, manufacture and distribution of cars on a global scale under different brands
<i>SUP 1</i>	Staff member; purchasing dept.	1,000-5,000	Manufacturer of car body parts and engineering apparatus	Production of system solutions and ready-to-fit components for the body panel

The Role of Company Standards in Supply Chains

Abbr.	Position in company	No. employees	Type of company	Business description
<i>SUP 2</i>	Staff member; standard. department	10,000-50,000	Manufacturer of vehicle parts	Develops, produces and distributes mechatronic components and systems for vehicle doors, seats and body
<i>SUP 3</i>	Manager; Standard. department	150,000-200,000	Manufacturer of automotive components	Develops and produces tires, brake systems, automotive safety, powertrain and chassis components
<i>SUP 4</i>	Staff member; standard. department	1,000-5,000	Gearing and brakes manufacturer	Develops and produces brakes and gearing systems
<i>SUP 5</i>	Manager; Standard. department	1,000-5,000	Manufacturer of electric components	Researches, develops, manufactures and distributes electronic connectors and fittings
<i>SUP 6</i>	Responsible for standardization	10,000-50,000	Manufacturer of car parts and vehicle lighting	Production of vehicle lighting and electronics systems and development of vehicle diagnostics and thermal management

Abbr.	Position in company	No. employees	Type of company	Business description
<i>SUP 7</i>	Manager; Standard. department	500-1,000	Manufacturer of car communication systems	Develops and produces telecommunication technology and radio systems
<i>SUP 8</i>	Staff member; standard. department	50,000- 100,000	Manufacturer of engine components	Researches, develops and manufactures system solutions for engine parts as well as air and liquid management for vehicles
<i>SUP 9</i>	Responsible for standardizati on	5,000- 10,000	Manufacturer of radiator systems	Develops and produces radiator systems for vehicles
<i>SUP 10</i>	Standard. responsible; Engineering dept.	10,000- 50,000	Manufacturer of engine components and radiator systems	Develops and produces exhaustion systems and engine components
Abbr.	Position in company	No. employees	Type of company	Business description
<i>SUP 11</i>	Quality management officer	10,000- 50,000	Manufacturer of chemicals	Production of chemical components for bonding, reinforcing and protection

The Role of Company Standards in Supply Chains

Abbr.	Position in company	No. employees	Type of company	Business description
<i>SUP 12</i>	Responsible for standardization	5,000-10,000	Producer of structural components and assemblies	Manufacture of large metal stampings as well as exterior surfaces
<i>SUP 13</i>	Responsible for standard.; product marketing	50,000-100,000	Wholesaler of screws and installation material	Producer of metal equipment and development of storage solution
<i>RMP 1</i>	Head; technical product management	10,000-50,000	Producer of coatings, sealants and polycarbonates	Develops and manufactures materials and polymers
<i>RMP 2</i>	Responsible; testing procedures	1,000-5,000	Manufacturer of lubricants	Produces lubricants, hydraulic and biodegradable products
<i>RMP 3</i>	Head; technical product management	10,000-50,000	Producer of steel and components	Producer of steel products and steel components
<i>RMP 4</i>	Head; technical product management	5,000-10,000	Manufacturer of carbon and ceramic components	Researches, develops and produces composites, ceramics and sintered metal

Tab. A.1 Overview of the interview respondents

A.2: Semi-Structured Interview Instrument

1. Respondent and company information (closed questions)
 - Company name
 - OEM /Supplier/RMP
 - Number of employees
 - Name of the interviewee
 - Position of the interviewee
2. Short introduction and overview of content.

Introduce research. Explain the terminology of the study: Internal Company Standards (ICS) and External Company standards (ECS). Try to capture their confidence with the topic.
3. Use of ICS and ECS in the company (open-ended questions)
 - Is your company developing ICS?
 - What share of ICS is passed onto external organizations?
 - Who are these external organizations?
 - What is the topical difference between confidential internal company standards and those provided to these organisations?
 - Does your company comply with ECS?
 - What kind of organizations provides ECS to your company
4. Handling of ECS in the company (open-ended questions)
 - What is the effect of compliance to ECS of different organizations?
 - What hindrances and possibilities results from the compliance to ECS?
 - How does your company deal with these?
 - What influence do ECS have on the ICS developed in your company?
 - Are you providing your ECS also to your suppliers? If so, are you altering the topics in these ECS?
5. Company standards and supplier relationships (open-ended questions)
 - What influence do company standards have on your relationships with your suppliers?
 - What aims is your company trying to reach in passing in providing ICS to other organizations?