

IDS Working Paper 156

Global quality standards, chain governance and the technological upgrading of Brazilian auto-components producers

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May 2002

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This paper is an output of the research project ‘The interaction of global and local governance: implications for upgrading’. This project, which is funded by the Volkswagen Foundation, is a joint initiative of the Institute of Development Studies at the University of Sussex and the Institute for Development and Peace of the University of Duisburg, Germany.

Summary

This paper investigates whether and how the adoption of global quality standards (QS) changes inter-firm relationships and enhances the upgrading prospects of local producers in developing countries. It is based on primary research on the diffusion of QS and their effects in the Brazilian automobile value chain. How might these standards affect technical cooperation between global buyers and local suppliers within the chain? Would QS contribute to tightening or loosening technical ties between suppliers and buyers? The research indicates that neither has happened. The certification of local suppliers to global quality standards has not improved the weak technical ties between transnational assemblers and Brazilian-owned suppliers. The buyers have neither made substantial efforts to help local suppliers conform to the quality standards nor has the adoption led to the development of technical collaboration in areas such as product and process design. On the other hand, quality assurance certification has not led to more arm's-length relationships, because certification alone is not enough to give confidence to customers. Previous monitoring of suppliers by customers continues. Moreover, the paper shows that the credibility of QS certification by local institutions has been questioned by customers. The result is ineffective governance of the auto chain and small quality improvements at high cost. The diffusion of global quality standards has contributed to local suppliers' upgrading of quality processes, but it has contributed little to supplier competence in product development.

Acknowledgements

I am very grateful to Rubia Quintão for her dedicated assistance in fieldwork and in data tabulation. I also acknowledge Afonso Fleury and Márcia Leite from whom I received valuable suggestions in the course of research. John Humphrey worked patiently on suggestions for revision. Frank Wältring also gave detailed comments on the first draft. The paper is part of the programme of research on Global and Local Governance carried out by the Institute of Development Studies, Brighton, and the Institute for Development and Peace at the University of Duisburg (INEF). This research programme was made possible by funding from the Volkswagen Foundation. I express my gratitude to Hubert Schmitz, coordinator of the project, for the invitation to participate in such an interesting collective effort. Working with friends has made it even more exciting.

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Abbreviations

ABNT	Associação Brasileira de Normas Técnicas (Brazilian Association for Technical Standards)
ACI	Accredited Certification Institution
ANFAVEA	Associação Nacional dos Fabricantes de Veículos Automotores (National Association of Automotive Vehicle Manufacturers in Brazil)
APQP	Advanced Product Quality Planning
AVSQ	ANFIA Valutazione Sistemi Qualità
EAQF	Evaluation d'Aptitude Qualité Fournisseurs
FMEA	Failure Mode and Effect Analysis
INMETRO	Instituto Nacional de Metrologia, Normalização e Qualidade Industrial (National Institute of Metrology, Standardisation and Industrial Quality)
ISO	International Standards Organisation
PDCA	Plan-Do-Check-Action
PPM	Parts per million
QAS	Quality Assurance Standard
QS 9000	Quality Standard 9000
NBR	Norma Técnica Brasileira (Brazilian Standard)
SEBRAE	Serviço Brasileiro de Apoio às Micro e Pequenas Empresas
Sindipeças	Sindicato Nacional da Indústria de Componentes para Veículos Automotores (National Association of Automotive Component Producers in Brazil)
SMEs	Small and medium-sized enterprises
SPC	Statistical Process Control
VDA	Verband der Automobilindustrie

1 Introduction

The purpose of this paper is to contribute to the understanding of the implications of global quality standards for the upgrading prospects of local producers in developing countries. More specifically, the paper draws on results of an investigation on the diffusion of global quality standards in the Brazilian automobile value chain and its impact on chain governance – that is, the explicit coordination of activities exerted by buyers on suppliers along the value chain.

The requirement for suppliers to meet certain standards and have the standards verified by means of certification has become widespread in the auto industry in recent years. The process started with the ISO 9000 global quality standard, but more recently sectoral and nationally based standards have also become more prevalent, as will be discussed below. How might these standards affect linkages within value chains, and what would this mean for technical cooperation within chains and upgrading possibilities for Brazilian suppliers in the automotive sector? Two contrasting hypotheses can be advanced on this point. On the one hand, large firms in the auto industry (assemblers and first tier suppliers) might view certification as an indication of supplier competence and be prepared to work more closely with certified suppliers, giving them more responsibility and helping them to meet such responsibilities. On the other hand, certification might substitute for direct monitoring of supplier performance, leading to more arm's-length relationships. In this case, buyers would be willing to purchase products from a range of suppliers and not maintain close relationships with any of them. In other words, standards might have quite contrasting impacts on governance in value chains.

The study of governance in global value chains is important for the understanding of the prospects for industrial upgrading and competitiveness for suppliers in developing countries (Gereffi and Korzeniewicz 1994; Humphrey and Schmitz 2000). Globalisation brings increasing competition to developing country producers, both in export markets and also in domestic markets as tariffs are reduced. In the face of such competition, the most sustainable response from developing countries with manufacturing capabilities is to upgrade. Upgrading means to produce more efficiently (process upgrading), to add value to manufactures and exports (product upgrading) and to move into more skilled activities such as product design, marketing and brand development (functional upgrading) (Humphrey and Schmitz 2000). How might quality standards certification affect inter-firm linkages in value chains and the prospects for upgrading for developing country producers?

There is little dispute in the literature on the fact that developing country firms benefit from supplying global chains in terms of improvement of manufacturing processes and attainment of quality consistency (Schmitz and Knorringa 2000). Gereffi (1999) and Dolan and Humphrey (2001) suggest that supplying global chains may also open new opportunities for local producers to upgrade (add value to) their manufactures and services. However, functional upgrading is altogether more problematic. There is research evidence indicating that in some chains global buyers discourage, if not obstruct, design, marketing and branding by local

producers' (Schmitz and Knorringa 2000). Yet, in a country such as Brazil, whose manufacturing sector has already accumulated considerable operational capabilities (Lall 2000), the real challenge is to enhance local innovation capabilities – that is, product development and design, marketing and branding capabilities. What possibilities are there for such upgrading for medium-sized, locally-owned suppliers in the Brazilian automotive industry, and what contribution might certification make to this process, both directly and in terms of the relationships it fosters within the automotive value chain?

In addition the arm's length market relationships, the activities of firms in value chains can be coordinated explicitly (Clemons *et al.* 1993). Explicit coordination can take various forms. One obvious one is vertical integration (hierarchy). Humphrey and Schmitz (2000) draw on the theory of transaction costs to point to two other forms of chain governance involving networks of firms. On one hand, *network* proper refers to the cooperation between firms with complementary competences and considerable equality in terms of power and resources. In networks, both buyer and supplier jointly set parameters. On the other hand, *quasi-hierarchy* is the term they use for 'networks characterised by a marked asymmetry of competence and power between the lead firm and subordinate firms within the chain. The lead firm often specifies what is to be produced, how it is to be produced . . .' (Dolan and Humphrey 2001: 7). The latter form is more frequent in networks involving leading global firms and local suppliers in developing countries. How might certification affect these relationships, and, consequently, upgrading opportunities?

This study explores this issue through an empirical investigation of one of the most significant industrial value chains in Brazil, that is, the automotive value chain. It looks into the type of chain governance which is predominant in the value chain and the type of technical ties which global buyers establish with Brazilian suppliers.

More specifically, the study focuses on one particular set of issues which have raised increasing concern in the literature on global chain governance in developing countries, that is, the role of quality standards in improving coordination in value chains and fostering industrial upgrading:

1. There is convergence in the literature towards the view that process standards – of which quality standards are one example – contribute to lowering transaction costs (David 1995; Nadvi and Wältring 2002). The findings presented in the paper generally confirm this point. Compliance with quality standards provides an entry ticket to supplying the automobile chain and, as a screening tool, it reduces governance costs. However, such economies seem to be quite limited in terms of total transaction costs in the chain. As shown later, quality standards have not eliminated the need for costly individual auditing of suppliers (manufacturing process auditing, for instance). Moreover, there has been a multiplication of quality standards in the chain, which have been introduced by assemblers of different nationalities and have increased the burden of certification on Brazilian suppliers.

2. The effectiveness of quality standards is dependent on their credibility (Bido 1999; Nadvi and Wältring 2002). This study provides strong evidence that problems with credibility in quality standards certification in Brazil tend to undermine the achievement of its primary purpose. Lack of trust is one of the reasons for the adoption of multiple standards in the chain, imposed by different buyers. Yet, the prevailing type of relations between buyers and suppliers is also important for explaining the decline in trust in quality standards certification.
3. There are two possible implications of global quality standards for chain governance. Quality standards certification might be viewed by buyers as an indication of supplier capability to assume further responsibilities, in which case the former would be inclined to help the latter enhance competence. Conversely, it can be argued that certification might lead to more arm's-length relationships, as it substitutes for direct monitoring of supplier performance. The results of this research indicate that neither has happened. Local suppliers' compliance with quality standards has not affected at all the (weak) technical ties between customers and suppliers, in the Brazilian automobile value chain. Not only have assemblers and module suppliers *not* made any substantial effort to help local suppliers adopting quality standards requirements (apart from insisting that suppliers meet these standards), but such adoption has not implied the development of technical collaboration in areas such as product and process design. This was mainly due to the fact that buyers provide detailed product design to suppliers, thus the need for asset-specific investment is quite limited.

The empirical evidence presented in this paper comes from an investigation carried out in the components industry in the São Paulo metropolitan area in the year 2000. It comprised the collection of data and documents at Sindipeças, the use of an exploratory postal questionnaire sent to suppliers and, more significantly, visits to ten selected local suppliers and interviews with their managers of quality issues.

The paper is organised in seven sections, including this introduction. The following section (2) outlines the characteristics of the Brazilian automotive value chain. Section 3 is an appraisal of the general diffusion of quality standards in the Brazilian auto components sector, emphasising the problems of multiple standards and the credibility of standards. The fourth section introduces the issue of chain governance, focusing on the business insertion of local suppliers in the chain. Suppliers' trajectories to obtain quality standards certification are discussed in Section 5, as a means of opening up a discussion on technical ties between buyers and suppliers. It reveals how suppliers evaluate and classify the importance of the various sources of information and of technical assistance for adoption: customers, consultants, employer's associations, and so on. Section 6 is the core section of the paper, for it addresses the implications of quality standards for global chain governance. This is done through the analysis of the main aspects of the customer/supplier relations: the asymmetries between them; the features of the supply contract, from customer approaching supplier, to the

nature of contracts and to the forms of control exerted by customers; and, finally, suppliers' evaluation of their ties with customers. The main conclusions are drawn together in Section 7.

2 Background: the Brazilian national components industry

Brazilian-owned component producers are one part of an industry which is dominated by transnational assemblers and increasingly transnational first tier suppliers. The automotive suppliers are organised in three tiers. The first tier comprises suppliers of high value-added components and their sales are almost exclusively to assemblers. These are large, global firms, most of them owned by foreign capital. In the 1990s increasing global integration and trade liberalisation led to denationalisation and pressure on costs and profits. A massive wave of acquisitions transferred ownership of most Brazilian producers of major components to foreign businesses. Moreover, some of the largest first tier suppliers have moved to the supply of complete, assembled modules, instead of single components (modular assembly). In doing so, they have created an intermediary level of transactions between suppliers of single parts and assemblers. Some authors call it tier 0.5 (Humphrey 2000).

The second tier is composed by producers of light¹ components, most of them being owned by Brazilians, as are the ones studied in this paper. The majority of these firms are small and medium-sized enterprises (SMEs). They supply both to first tier suppliers and directly to assemblers. Finally, suppliers to the second tier constitute the third layer. These have not been considered in this study. Most of them supply either commodities like fasteners or specialised metal processing services and thus have little contact with lead firms and with the design of components.

In addition to the process of concentration and de-nationalisation, the Brazilian automotive industry experienced other substantial changes in the 1990s, which are relevant to the understanding of the economic environment of the firms studied in this paper. They can be summarised as follows. After a decade of stagnation, there was strong growth in sales of cars and commercial vehicles, from 1994, pulling output and plant scales upward.² Automobile production in Brazil is primarily oriented to the local market, with exports varying between 16 per cent and 25 per cent of output in the 1990s. As a result of trade liberalisation and regional integration, imports increased substantially. In the case of assembled vehicles, imports have stabilised at approximately 20 per cent of total sales, since the government reintroduced tariff protection for finished vehicles. However, in the federal incentive scheme for trade adopted from 1995 to the year 2000, Brazilian auto components producers received little (if any) protection. This led to greater penetration of imported components. From a share of 9.7 per cent in the local market for car components, in 1990, imported parts reached the share of 27.4 per cent in 1998, introducing strong competitive pressures on local producers.

¹ In this paper light components refer to simple, low value-added components.

² The exchange rate crisis of 1998/99 reduced sales in the domestic market, but they recovered substantially in 2000/2001 (1.5 and 1.6 million units sold per year, respectively).

The growth scenario of the 1990s, in a context of industry globalisation, had important implications for the major players' strategies. Seen as a large market and one of the growth frontiers of the business, the Mercosur area³ and Brazil in particular, experienced a period of increasing investment in new plants and in the renewal of old plants. The face of the industry changed in terms of: (1) competition, due to entry of at least one important new player, Renault; (2) complete renewal of product lines: 21 new platforms launched in the 90s, against seven in the 80s; and (3) the geography of the car industry, with the development of three new regional automotive poles.⁴

Investment growth has accelerated intra-firm and inter-firm restructuring in the Brazilian component industry. The pace of diffusion of new manufacturing technologies and of new organisational forms has increased. Assemblers reviewed their supply policy, in many respects. While further transferring assembly operations and services to suppliers, they reduced the number of total suppliers they deal with. Increasing competitive pressure in the domestic market and the need to sustain exports has led firms to move closer to global product standards and production practices. A remarkable aspect of firm restructuring was a large and rapid diffusion of quality management practices. In this context, assemblers and major suppliers introduced the requirement of certification in quality assurance standards in order to qualify suppliers.

3 The diffusion of quality standards in the Brazilian auto components industry

ISO quality assurance norms were introduced in Brazil by the ABNT (Associação Brasileira de Normas Técnicas), in the early 1990s, and registered as NBR ISO 9000 at INMETRO (Instituto Nacional de Metrologia, Normalização e Qualidade Industrial), which is the Brazilian national standards body and accounts for the accreditation of ISO certification institutions. The diffusion of quality standards in Brazil was rapid. The annual growth rate of accredited ISO 9000 certificates was above 100 per cent, between 1990 and 1998 (Melo 1999: 44). According to ABNT, the number of valid ISO certificates rose to 6,500, in December 2000 from only 18 in 1990. Such a large increase in quality certification is a good indicator of the broader and widespread diffusion of quality awareness in the business sector in Brazil and, to a certain extent, also in the public sector. The dissemination of quality awareness was reflected in the high interest displayed by the media.

The 1990s “wave of quality” can be largely credited to important changes which took place in the Brazilian economic environment, some of which have been already mentioned in the previous section. These spurred the restructuring of firms and of value chains. The adoption of quality practices and norms have been at the centre of the adoption of new management techniques in Brazil. Government incentive schemes have also been crucial for accelerating the dissemination of quality standards. Since the early 1990s, ISO quality

³ The Mercosur free trade area comprises Argentina, Brazil, Paraguay and Uruguay.

⁴ In the states of Paraná, Rio Grande do Sul and Rio de Janeiro.

certification has become a requirement for eligibility for most federal industrial incentive and credit programmes.

Diffusion started amongst large firms and moved towards their suppliers. Large firms soon realised that their effort to attain systemic quality improvements would only be successful if quality management practices were also adopted by their suppliers (Melo 1999). The adoption of ISO quality assurance standards was perceived by buyers as a simple, less costly means of dissemination a common concept of quality and quality practices amongst firms in the Brazilian market. According to Souza (1995), as ISO 9000 certification increasingly became one of the criteria adopted by large firms in supplier selection, the number of certified local, medium sized firms boomed.

As quality standards certification gradually became an “entry ticket” for supplying to motor vehicle assemblers and to their major suppliers, in both domestic and export markets, Brazilian auto component producers, en masse, sought to obtain accredited quality certification. Information collected at Sindipeças⁵ in August 2000 confirm that the rate of certification among members was high. A total of 340 firms (70 per cent of members) held an ISO quality certificate (either 9001 or 9002).⁶ In addition to this, member firms have also been certified to a range of other quality standards, which will be discussed below. Almost half (46 per cent) of all members held a QS 9000 certificate (Table 3.1). Still, a considerable number of non-certified firms remained. Interviews revealed that most non-certified firms were SMEs catering for the low end of the replacement market, in which competition is driven by price rather than quality.

Table 3.1 Sindipeças members Quality Standards certification by type of certificate (August 2000)

Type of certification	Number of certified firms
ISO 9001	139
ISO 9002	201
QS 9000	220
VDA	39
EAQF	23
AVSQ	13

Source: Sindipeças

⁵ Sindipeças/Abipeças is the Brazilian national association of auto components producers. The majority of associates are producers of metallic, electro-electronic and plastic components, in this order of importance. However, it also includes producers of components based on other materials, like glass and fabrics. A(n unknown) share of its associates also belong to other sectoral associations. Associates comprise both firms controlled by local capital and firms controlled by foreign capital.

⁶ The ISO quality standards series comprise three types of certifiable standards. ISO 9001 and 9002 apply to manufacturing industries. The most complete standard, ISO 9001, comprises quality procedures related to both product design and manufacturing, whereas ISO 9002 is meant for firms which carry out only manufacturing activities (design supplied by third party). The ISO 9003 standard applies to firms which exclusively carry out quality tests and inspection (Bido 1999). ISO 9000 certification in this paper refers to both 9001 and 9002.

The Sindipeças data bank does not indicate the degree of overlap of these certificates, that is, the percentage of firms which accumulate two or more certificates of different types. However, we found further evidence that firms tend to accumulate two or even three certificates, in a *pattern of certification* which goes from the initial widespread adoption of ISO 9000 certification to an overlapping diffusion of QS 9000 certification (originating from the USA) and, more recently, to an increasing number of other nationally originated standards certification (VDA – Germany, EAQF – France and AVSQ – Italy). The evidence is provided by responses to an email questionnaire sent to approximately 180 Sindipeças members. Responses, which were received between June and August 2000 (31 responses, or 17 per cent), revealed that the dominant tendency was for firms to accumulate two or three different certificates (Table 3.2).⁷

Table 3.2 Status of firms in terms of quality standards certification – postal questionnaire (August 2000)

Firms holding both the ISO 9000 certificate and the QS 9000 certificate	20
– of which holding or preparing for a third certificate (mostly the VDA certificate)	9
Firms holding only the ISO certificate and preparing for a second certificate (mostly the QS 9000)	6
Firms holding only one certificate (either ISO 9000 or QS 9000) and <i>not</i> preparing for a second	3
Firms holding no certificate but preparing for the ISO 9000 or the QS 9000 certificate	2
Total	31

Source: Email questionnaire replies

The tendency towards the multiplication of standards is related to another important finding of research – problems with the credibility of standards. Both issues will now be discussed.

The evidence above reveals that component firms are facing a proliferation of quality standards and different certification requirements from assemblers, which increases the cost of qualifying for supply. This tendency is partly related to decreasing credibility of the most disseminated certificates issued by Brazilian accredited certification institutions (ACI), which undermines the economic benefits (the lowering of transaction costs) of quality assurance certification and raises the issue of its regulation and control.

3.1 Multiple standards

Until 1996/97, the possession of an ISO 9001/9002 certificate was a truly competitive differential in the Brazilian auto components supply market, not only because the number of certified suppliers was small, but also because the ISO 9000 certificates were a respected novelty. Since then, and as competition has brought

⁷ Our sample of responses was certainly biased, as firms which had not acted at all to obtain any type of quality assurance certificate were less motivated and less likely to respond to a questionnaire about certification. However, other source (Bido 1999) confirmed the rate of certified firms and the pattern of accumulation of certificates.

tougher quality requirements, the global standard (ISO) has tended to be superseded (in terms of credibility) in the automobile industry by nationally originated, sector-based standards, like QS 9000 and VDA 6.1. Initially, the earlier diffusion of QS 9000 in Brazil (as compared to VDA and the others) and its acceptance by European assemblers operating in the country seemed to place it as the new “global” standard. Later, the introduction of new car platforms, often associated with new plants and, sometimes, with new entrants (like Renault, VW Audi and the Mercedes Benz’s car division) entailed the demand for other “national” quality standards certificates related to the auto industry.

The emergence of specific quality standards for the automobile industry is an international phenomenon, which has developed simultaneously within the context of the leading national automobile industries (QS in the US, VD, EAQF and AVSQ in Europe), and its growing importance in Brazil reflects this more general tendency. These standards are based on the ISO 9001 standard, but have incorporated a number of new requirements, such as more restrict norms for the planning of product quality in design and for the development of suppliers. Yet, in spite of some overlapping, they differ among themselves substantially. The unification of quality standards for the auto industry is a goal which has been pursued by the International Automotive Task Force, which comprises the major North American, German and French assemblers, with support from the International Standards Organisation. By 1999, the task force managed to approve its proposal for a unified standard – the ISO/TR 16949 – Automotive Quality System, which is currently in the phase of definition of norms for accreditation.

The clash between the global/generic standard (ISO 9000) and national/sector-based standards (QS, VDA, etc.) and the simultaneous imposition of the latter on local suppliers is most clearly perceived in a very internationalised context such as in the Brazilian car industry, where all problems and costs derived from conflicting quality requirements are borne by local suppliers. In few countries are firms faced with the cost of obtaining three different certificates. In an increasingly global business, such as the motor vehicle industry, *the proliferation of national and competing quality standards undermines the very concept of a global, generic standard (as the ISO 9000 series was meant to be) and its potential benefit of reducing transaction costs.* The need of suppliers to get certified twice or three times in order to attend to distinct customer requirements substantially increases the cost of certification and narrows the range of customers served by each certificate.

3.2 The credibility of quality standards undermined

In the Brazilian case, an additional and very significant reason for assemblers’ increasing demand for suppliers to obtain nationally originated certificates is related to the decreasing reliability of ISO 9000 and QS 9000 certificates issued by Brazilian ACIs. These have been undermined by recent developments which will be discussed in the remainder of this section. ISO and QS certificates can be issued by ACIs which have been accredited by national accreditation bodies (in the Brazilian case, the ABNT and INMETRO). Doubts have

been raised about the reliability of ACIs accredited locally. VDA 6.1 and EAQF certificates can only be issued by international ACIs.

A recent problem has brought to light the lack of reliability in the process of certification and has provoked direct intervention of ANFAVEA,⁸ in a way which is an interesting illustration of the governance pattern in relation to quality standards. The ANFAVEA Committee for Quality Issues⁹ recorded mounting complaints by its members regarding the occurrence of faulty components within modules supplied to the assembly line. This has particularly affected new entrants, but the concern has also been shared by the long established assemblers, as product recalls have increased. When assemblers traced the flawed parts, they were led to suppliers which were QS certified. Being quality assurance certified, these suppliers should supposedly have kept the level of quality consistency which has allowed them to supply directly to the assembly line. The ANFAVEA Committee concluded that Brazilian ACIs had not been doing their job properly.

A common perception raised by assemblers and suppliers' representatives in their respective association quality groups is that, in the search for expanding their share in a very disputed market, some ACIs have reduced costs to the point at which the quality of auditing has suffered. They argued that some ACIs have been hiring only young auditors with little experience in the automotive industry (which is in conflict with QS 9000 requirements); moreover, auditors face excessive and demanding work loads for inadequate pay. As a result, some certification processes are carried out too hastily, with the consequent risk to the quality of audits (particularly regarding processes concerning the maintenance of quality consistency and continuous improvement). Quality professionals from the sample firms we visited agreed with the fact that some ACIs are not doing an adequate auditing job, even though they also stressed that the squeezing of margins imposed by assemblers has led to reducing investment which, in turn, harms quality (see Section 4). Interviewees were particularly critical of the procedures of Brazilian ACIs. In some firms, quality managers reported that they have sought a first class certificate, implying that certificates awarded by some local ACIs are second class, a situation similar to that found by Nadvi in Pakistan (Nadvi 2000).

Another important development from this situation is that the ANFAVEA Committee decided to intervene in the process of auditing and certification of quality standards. At the time of field work, this intervention was in the phase of planning and negotiation with Sindipeças for joint action. The core of ANFAVEA's action was to deliver a document, approved with minor changes by Sindipeças, containing *Guidelines for the Qualification of Auditors and Preparation of External Auditing for Quality Standards Certification*. The

⁸ ANFAVEA is the national association of motor vehicle manufacturers. Major associates are the large assemblers of cars and trucks in Brazil: VW, FIAT, General Motors, Ford, Renault, Mercedes Benz, Scania and Volvo. Given the small scale of their operations in Brazil, Japanese assemblers are members but exert little influence in the association.

⁹ This committee is composed by representatives from the assemblers who are specialists in the area of quality of supply.

document states that auditors must fulfil certain requirements in order to obtain an auditor's credential, namely:¹⁰

- five years work experience in the automotive industry;
- specific experience of the industrial process to be audited (machining, stamping, welding, etc.);
- good knowledge of continuous improvement tools;
- other requirements related to experience of quality management.

The problems regarding the trustworthiness of quality standards auditing and certification in the Brazilian automobile industry and the resulting intervention by manufacturers associations (and consequent costs) raise some questions about the limits and uncertainty of the governance exerted by global quality standards. As proposed by Wältring (2000), international quality standards like the ISO 9000 series are coordinative norms which are decided at a public/private level. They combine the participation of private industry associations from OECD countries and government institutions (mainly from non-OECD countries) in the decision-making process and in the process of accreditation of ACIs. Firms, private associations and government institutions promote the definition and adoption of quality standards (and respective certification) considering that this will eventually reduce transaction costs. The *sine qua non* for this is that the entire process of auditing and certification is transparent and reliable.

However, the question arises of “*who certifies the certifier*”, that is, the problems of reliability are related to the control of ACIs. Certifiers are accredited by national accreditation bodies, such as the ABNT in Brazil and the British Standards Institute in the UK. On the one hand, in the absence of real sanction power, it does not seem possible that the ISO can exert an effective control of national accreditation bodies. On the other hand, it can be hypothesised that state controlled accreditation bodies (as in the Brazilian case) may find it difficult to enforce accreditation norms in the absence of legal regulation. The result can be a perception of the unreliability of quality standards certification, as it has occurred, to a certain extent, in the Brazilian automotive industry in regard to the ISO 9000 certification. *The consequence is an economic loss for the industry, as the investment in quality certification will have little return and transaction costs are not reduced by the certification.*

This situation becomes more complex in the case of nationally originated, sector-specific standards – like QS 9000, AVSQ, EAQF and VDA 6.1. Most of them are standards issued by national associations of automobile manufacturers in the leading industrialised countries, which also take care of the accreditation of certification institutions. In this case, government/public accreditation bodies apparently have little control over third party auditing and certification. As the recent developments in Brazil suggest, in given institutional contexts only the direct intervention of the lead firms seems to guarantee that ACIs will respect the requirements established for accreditation. Still, the effectiveness and economic benefit of such an

¹⁰ According to an interviewee, some of these requirements are in fact already considered in the QS 9000 series.

intervention remains to be seen, as the industry apparently can not rely on (and benefit from) the self-control of the existing network involving local ACIs and the national accreditation body. In the Brazilian case, an additional problem, which will be further explored below, is *the cost penalty imposed on suppliers by the multiplicity of "global" standards* (which are in fact regional, if not national) and respective certificates. This suggests that, when facing with problems of credibility, *the expected lowering of transaction costs yielded by quality standards may vanish*.

A final and broader conclusion could be drawn from this episode, in connection with the feasibility of truly global and general (cross-sector) quality standards. The movement of national automotive industries from ISO norms towards standards which are specific to the industry in itself suggests that *the idea of global quality standards which should apply across any type of industry and production process has suffered a setback*. The emphasis put by ANFAVEA on the need for Brazilian ACIs hiring auditors with industry- and process-specific experience reinforces this point.

4 The experience of sample firms in the automotive chain

Having examined the problems faced in the adoption of quality standards in the Brazilian automobile chain, the following sections of the paper address its implications for chain governance. Interviews and visits carried out in a sample of ten Brazilian auto component firms are the empirical source for this undertaking.¹¹ The purpose of this section is to introduce the sample firms, with an emphasis on their position in the chain and on their business ties with buyers. Knowledge of the latter allows the assessment of the degree of transactional dependence between buyers and suppliers. If a supplier has a high level of transactional dependence on one or a few buyers, this may encourage the buyer(s) to establish closer technical ties with supplier because transactional dependence lowers the risk of supplier opportunistic behaviour.

The main features of the suppliers investigated and the reasons for their inclusion in sample are as follows. First, as the focus of research is on the ties between global buyers and *local suppliers*, the sample comprises only components manufacturers which are 100 per cent owned by Brazilians. Second, the majority of sample firms are *medium sized*, in order to keep in line with the size characteristic of the second tier in the auto chain.¹² The exceptions are the two plastic components firms which are on the limit between medium and large,¹³ and Washers, which is on the limit between small and medium. Third, it is important that sample firms should vary in terms of products and processes, as much as possible, so that the technical diversity of the industry is taken into account. Finally, the sample was restricted to firms located in the Metropolitan São

¹¹ The interviews were completed in the second half of 2000 and were based on a questionnaire focusing the main issues of the IDS/INEF research programme.

¹² See Section 2 for definition of first, second and third tiers.

¹³ According to the author's own research experience, in the context of the Brazilian auto components industry a medium firm is the one with annual sales between US\$3 million and US\$15 million. Most sample firms presented average annual sales between US\$5 million and US\$10 million, in 1999/2000.

Paulo area, the main area for automotive components production. A detailed account of individual sample firms is presented in Appendix 1.

In order to conceal the identity of firms, but at the same time to facilitate the reader's memorising of individual situations, the paper has given firms the name of their products. Firms in the sample comprise a variety of car components, from very small parts like washers and fasteners, to larger parts such as clutch disks and dashboards. These products are referred to in the paper as light components, meaning that they correspond to low value-added components. All but two of the firms (Plastics A and B) produce metallic parts, but a variety of technologies and processes are used: stamping, welding, forging, machining and sinterising.

The sample firms present some similarities regarding the characterisation of their major customers (Table 4.1). First, most of them combine, among their five main customers, a majority of auto assemblers producing in Brazil and a minority of components producers.¹⁴ The bulk of the latter are in fact suppliers of complete modules, such as Dana, M Marelli, Delphi, Bosch and so on. Second, eight out of ten sample firms are VW suppliers, whereas six of them are also GM suppliers. The strong presence of these two assemblers amongst the sample firms' customers reflects their importance in the auto industry in the State of São Paulo. The limited importance of Fiat, the second-largest car producer in the country, among the sample firms' customers is possibly because it has successfully encouraged suppliers to locate near its plants in the state of Minas Gerais.

Table 4.1 Sample firms, five largest customers and respective share of sales (1999/2000)

Firms	Main customers				
	1°	2°	3°	4°	5°
Hose Clamps	15% VW	9% Ford	6% Cummins	3% Scania	2% GM
Stamped A	47% Fiat	18% GM	17% VW	5% ATH Dana	5% Hoesch
Stamped B	25% Scania	10% VW	10% GM	7% Cofap	xxx
Washers	17% M. Marelli	9% VW	8% TI	5% ZF	5% M. Benz
Forge	30% Honda	18% VW	10% M. Benz	Eaton	Bosch
Plastics A	8% Ford	7% GM	7% Johnson Con	VW	Toyota
Plastics B	16% VW	10% Scania	6% Behr	5% GM	3% Delphi
Sinterised	8% TRW	6% WEG	Tenneco	Bosch	DHB
Clutch Disks	JAMM	Gradinotec	Jorliba Diesel	Viação Bristol	ViaçãoB.Branca
Fasteners	36% Fiat	12% GM	12% VW	11% Ford	7% M. Marelli

Source: Interviews

¹⁴ Clutch Disks is the exception, as it caters exclusively for the domestic replacement market.

It is important to look at the distribution of sample suppliers' sales between their major customers. A large proportion of sales going to one or two customers implies great business dependence of the supplier on this (these) customer(s). This is one critical aspect for understanding governance in the chain. High dependence on few customers diminishes the bargaining power of supplier in contract negotiation and its prospects for customer diversification. On the other hand, customers may perceive such supplier dependence on them as lessening the likelihood of opportunistic behaviour on the part of suppliers. Thus, in theory, they would be more inclined to incur the costs of closer technical collaboration with suppliers with a higher transactional dependence on them. Conversely, customers would be less inclined to invest in technical collaboration with suppliers which display a low degree of transactional dependence on them.

In this paper, it is considered that high sales dependence on major customers occurs when the share of sales to the *two major* customers is 40 per cent or above.¹⁵ As can be seen in Table 4.1, the preponderance in the sample is the absence of concentration of sales to one or two clients. The exceptions are Stamped A (65 per cent sales to Fiat and GM), followed by Fasteners (48 per cent to Fiat and GM) and Forge (48 per cent to Honda and VW). What are the implications of this pattern for chain governance? Taking into account sales dependence on major customers, only Stamped A, Forge and Fasteners could be classified as being dependent. The majority of sample firms benefit from considerable room for manoeuvre in the market, which suggests that, in terms of transactional relations with buyers, their *insertion in the automobile value chain is not of the type which would encourage buyers to invest in closer technical collaboration with them*. However, transactional dependence *per se* does not necessarily lead to close technical collaboration. Even in the case of Stamped A and Fasteners, technical ties between them and their customers were weak, in spite of relatively high dependence. In fact, it seems that the most important factor explaining close technical collaboration is the need for asset-specific investment by buyer and/or supplier needed for the production of customised products. This point will be discussed in the following sections of this paper.

Low transactional dependence in the Brazilian automotive chain is in part rooted in the historical development of the industry. The long period of relative stability and protection, from the middle 1950s until the early 1990s, led to the development of a considerable base of local suppliers, with which assemblers established rather arm's-length, market relationships. There were a number of reasons for this type of relationship. Firstly, changes in vehicle models were rare, and designs were stable and well-known. Auto parts producers could compete openly in the market for supply orders and assemblers seemed to be happy with this type of chain organisation. Second, the simplicity of light components enables the assemblers to provide detailed component drawings to suppliers without suffering a high design cost penalty.¹⁶ Third, such simplicity

¹⁵ The parameter adopted initially by the IDS/INEF project (IDS/INEF Project 2000) defined high transactional dependence as 50 per cent of sales to the largest customer. Only one firm in the sample (Stamped A) approached this level. Therefore, a lower threshold has been adopted.

¹⁶ I am grateful to John Humphrey for calling my attention to this point.

allows suppliers to produce light components (and shift to new product drawings) with no need to invest in costly specific assets.¹⁷ This can explain why it can be economically feasible for suppliers to live with buyers' continued practice of multiple sourcing even in a market situation characterised by more frequent product change. This finding is similar to the situation described by Helper (1993) in regard to the US auto industry before the 1980s. The smallness of investment in costly specific assets for the supply of light components helps understand why both buyers and suppliers conduct their relations with "one eye on the market".

Therefore, prior to globalisation, trade liberalisation and the entry of new competitors the assembler used to rely on many suppliers for the same component while, on the other hand, components producers used to supply to a diversified customer base. This situation has been changing since the early 90s (though not radically). Customers have reduced the number of suppliers, and they have become more demanding in relation to supplier's capabilities to attain enhanced product quality, reduced production costs and improved flexibility to adjust to changing output volumes.

The interviews revealed that these changes were not welcomed by many of the sample firms. They complained that the new relationship proposed by assemblers is too costly for suppliers. They are required to invest in modernisation of technology, in quality standards certification and in logistics for Just-in-time delivery. At the same time assemblers are assuming tighter control of their cost structure and acting to squeeze their profit margins. Moreover, the entry of new, foreign producers of light components introduces further instability in the relationship. The defensive response of some of the sample firms (Stamped B, Plastics A and B and Sinterised) has been to look for new markets outside the automobile chain, or to increase their transactions in these markets. In this connection, customers in the electrical appliances chain and in the electronic/telecom equipment chain have been regarded by these firms as a better bet than their customers in the auto chain.¹⁸ Nevertheless, it is important to bear in mind that changes in supplier/buyer relations have not been radical. The nature of the components supplied by the sample firms favour multiple sourcing and limited transaction-specific investments.

5 Quality standards certification and chain governance

This section goes further in examining governance in the Brazilian automobile value chain, particularly the issue of whether the adoption of quality standards contributes to the strengthening of ties between buyers and suppliers. The section addresses the sample firms' trajectories in the process of attaining quality standards certification, focusing the types of technical support they have obtained and used in order to prepare for

¹⁷ This point will be discussed further in Section 6, in a more detailed account of the typical supply contract found amongst sample firms.

¹⁸ It could be hypothesised that in the electronic/telecom equipment chain quality requirements for suppliers are as high as in the automobile chain (if not higher), whereas the pressure towards cost reduction is lower. If this is true, buyers would be willing to accept suppliers' current profit margins, as long as the latter match quality requirements.

certification audits. It might be expected that lead firms in the chain (assemblers or module suppliers) would be inclined to invest in the short term to assist suppliers in adopting quality standards requirements, on the grounds that the resultant reduction in monitoring/inspection of suppliers would reduce transaction costs. The results of research show that this is not the case in Brazil.

The situation of the sample firms in terms of certification in quality standards follows closely the pattern for the multiple standards in the Brazilian auto components industry described in Section 3. Eight out of ten firms in the sample had achieved both ISO 9000 and QS 9000 certification (Table 5.1). Moreover, with the exception of Hose Clamps, QS 9000 certification occurred from two to three years after ISO 9000 certification. Fasteners and Plastics B had already moved towards a third certification: the former had obtained the Italian certification (AVSQ), whereas the latter was preparing the German, VDA 6.1 certification. Although in the phase of ISO 9000 certification half of the firms opted for the simpler certification (9002), the shift to QS 9000 has meant that firms with such a certificate had to adopt quality assurance procedures for process design (APQP).

How did the component manufacturers acquire the know-how and systems required to attain certification? To what extent did their customers assist in this process? Knowledge about how to implement standards could come from three different sources: (i) from important customers (i.e. from within the value chain), (ii) from business associations and the public sector and (iii) from market mechanisms (consultants and ACIs). The interviews revealed important aspects about knowledge sources which help to explain the issue of technical ties between customers and suppliers.

Table 5.1 Sample firms, status of quality standards certification^a

	ISO 9001	ISO 9002	QS 9000	VDA 6.1	AVSQ
Hose Clamps	1999		1999		
Stamped A		1997	1998		
Stamped B		1995	1997		
Washers		1997	2000		
Forge		1995			
Plastics A	1997		1998		
Plastics B	1995		1998	Prep.	
Sinterised	1996		1999		
Clutch Disks		2000			
Fasteners	1995		1997		1998

Source: Interviews

^a The occurrence of each type of certification is marked by the inclusion of the year of certification in the respective box.

When asked about the importance of sources of technical support and information for preparing for the auditing process necessary for quality standards certification, the sample firms pointed to the following hierarchy, which is based in Table 5.2 below:

1. Consultants and consulting firms
2. Accredited certification institutions
3. Customers
4. Sindipeças
5. Other institutions
6. Public research institutions (universities and research institutes) and government institutions
7. Other employers' associations

The classification of sources in Table 5.2 clearly reflects the relative importance of the actors involved in the process of diffusion and certification of quality assurance standards in the Brazilian auto components industry. For most firms in the sample (except for Plastics B and Clutch Disks), consultants had been by far the main source of information and technical support (Table 5.2), followed in second place by ACIs. These two actors were often related. In firms such as Forge, Hose Clamps, Clutch Disks and Washers, the consultants were themselves either auditors of ACIs or had been indicated by ACIs, while in Stamped B, training had been provided by an ACI. The fact that ACIs had been involved in the preparation for certification may have contributed to the problems of legitimacy and reliability of certificates (see Section 4) resulting from conflicting interests. This problem is also highlighted by Nadvi (2000) for the Pakistani surgical instrument industry.

The role of customers, and particularly of assemblers, is ranked third by the firms in the sample (Table 5.2). However, the importance given to assemblers was justified by two reasons other than the direct technical collaboration with suppliers in order to prepare them for certification. The most frequent mention of assemblers, in relation to this question, had to do with their pressure on suppliers to achieve certification. According to Washers' Quality Manager, being certified in quality assurance today (and this means a specific certification for the automobile industry, such as QS 9000) is an entry ticket for any supplier wishing to continue in the chain, rather than a competitive differential, as it used to be five years ago. 'It is either have it and keep it or give up supplying to the assemblers.' The second point, raised by two firms (Stamped A and B), relates to supplier collaboration schemes that assemblers put into practice at the beginning of the quality wave in the late 1980s, but gave up later. The firms referred specifically to programmes developed by GM (the Ótimo programme) and by Fiat (the Sol Programme), which aimed at the technical collaboration with and training of suppliers in order to disseminate concepts and tools of quality management, such as Statistical Process Control and problem-solving techniques. The assemblers' collaborative approach in the past seemed

Table 5.2 Rank of sources of technical support and information in preparation for certification^a

	Consultants and consulting firms	ACIs	Customers	Sindi-peças	Other	Public Research	Government Institutions	Other Associations
Hose Clamps	5							
Stamped A	5	3	4	1		2		
Stamped B	5	4	2	3				3
Washers	5	4		3				
Forge	5	3	4					
Plastics A	5	4	3					
Plastics B				5	4			
Sinterised	5			4				
Clutch Disks	4				2	3	5	
Fasteners	5		4					
Total Score	39	18	17	16	6	5	5	3

Source: Interviews

^a The rank is based on a scoring by order of importance, in which the highest score is 5. Thus, the higher the score, the more important the source.

important to help small firms' restructuring, as suggested by Addis for the case of the Ford-VW joint venture at the end of the 1980s (see Box 5.1) and is in sharp contrast with the situation found in this study. This sort of cooperative scheme was discontinued by the middle of the 1990s. As was emphasised by the General Manager of Stamped A, at a time of increasing liberalisation of auto components imports and the arrival of new foreign suppliers, the assemblers had gained the power to threaten local suppliers with a shift to imported products or to new suppliers, were local suppliers not able to meet their quality, price and delivery requirements. From this moment on, the assemblers transferred the entire technical and financial burden of quality assurance to the suppliers, as was emphasised by many of the interviewees.

This is why the firms in the sample suggested, in general, that the assemblers' only contribution to their effort to obtain quality standard certification was, at the end of the day, the pressure to obtain certification. This finding is in line with the fact that most suppliers stated that the technical support provided by the assemblers was quite limited, as it will be seen further in next section. The only exception to this picture is the case of Forge, which indicated that assemblers had collaborated in the process of certification by allowing this firm to learn from the assemblers' own experience in training and preparation for the adoption of quality standards.

Box 5.1 Local support for small firms in auto industry value chains

A novel programme by the Brazilian Support Service for Small Firms, SEBRAE, shows that with mentoring, small firms dramatically improve their performance. Curiously, although one of the first experiments with this program was in the motor vehicle industry itself, it has not gone very far in this sector. In response to competition from imports, the now defunct Autolatina [a short-lived fusion of the assets of Ford and VW in Brazil], in conjunction with a Brazilian subsidiary of a Big Eight consulting firm, Andersen Consulting, the state-level SEBRAE in São Paulo (SEBRAE/SP), and a group of small suppliers devised a programme that cut consulting costs while teaching small firms how to restructure. Most of these small family firms have become ISO 9000 certified. Since much of the consulting was done in groups, costs were lower. Simultaneously, the group dynamic encouraged firms to undertake painful restructuring and also created an often informal, but constant process of benchmarking among the small firms where each encouraged and helped the other Regardless of the exact format, the SEBRAE experiences show that when a large firm accompanies the progress of its suppliers and when they learn collectively, restructuring, productivity improvements, and the like are quite successful. (Addis 1999: 223)

Sindipecas follows fourth in importance as a source of technical support for quality assurance in the view of the sample firms (Table 5.2). Its main contribution, according to the interviewees, related to dissemination of information, particularly through specific training courses (such as SPC, FMEA and PDCA) and through the exchange of information between firms participating in its Quality and Productivity Group and firms participating in the Sindipecas' benchmarking initiative (*Benchmark Magazine*). It is also important to mention that the support of Sindipecas was particularly praised by the firms which had decided to drop their consulting firm and become self-reliant at some point in the process of preparing for QS 9000 or ISO 9000 certification. This happened in the cases of Stamped A, Sinterised and Washers. For Plastics B, Sindipecas was the crucial source (Table 5.2), because this firm had decided not to rely on consultants from the outset.

If consulting firms were the main source of support seeking certification, how effective were they in enabling the component firms to meet certification requirements? How did the sample firms assess their relationship with consultants and the quality of the latter's work? The simple ranking of sources alone can not say much about this and it is necessary to put forward other findings related to the trajectories followed by the sample firms – from the initial decision to become involved with quality assurance standards through to the final achievement of certification and (in some cases) re-certification. In order to simplify this point, the trajectories towards ISO and QS certification will be bundled together.

The sample firms had generally undertaken some other form of information search in response to the assemblers' demand for supplier certification. At this stage, Sindipecas' (low cost) courses and meetings were important sources for initiating the process. However, in most cases (eight out of ten), contracting a consulting firm was the first step that involved substantial spending during the process of preparing the firm for the certification audit. In six of these eight cases, the firms reported major problems with the first, and

sometimes, a second consulting firm. This problem was particularly acute when the sample firms sort the services of leading consulting firms with an established reputation.

For instance, Stamped A started its preparation by hiring a well known and expensive consulting firm, only to learn at some point in the process that the consulting package was such that it would create long-term dependence on the consultant for the maintenance of certification. Another example was technical consulting for quality assurance at Washers. This firm complained that, in spite of the high cost of the consulting work, the servicing firm used to send students rather than experienced professionals to implement the required procedures and documentation. In both cases, the firms decided to drop the consultants and to continue the process alone. Sinterised followed a similar pattern. In some cases, it was only at the second (Hose Clamps and Clutch Disks) or even in the third attempt (Plastics A) at contracting a consulting firm that this solution worked. In other words, a substantial amount of money was spent by these firms with unsuccessful consulting schemes, before they found an acceptable and effective way to prepare for the certification audit. Such a waste of money and time is an indicator of poor coordination in the chain, a point which will be better explored below. In fact, the best assessed consulting experiences, which occurred in the cases of Forge and of the third attempt by Plastics A, were provided by individual consultants instead of firms. These are the only cases in which the consulting service had continued up until the date of interviews, albeit on the basis of fortnightly or monthly visits.

Concerns with the quality of support from consultants also led to decisions to internalise certification capabilities. In the cases of Washers and Stamped A, the decision to abandon the consulting scheme was combined with a decision to hire an experienced professional to take responsibility for the whole process of preparation. This also happened at Hose Clamps, following the second and successful consulting experience which led to the firm's first certification. As has been stated before, Plastics B provides a completely different example, as this firm decided, from the beginning, to rely only in its internal capability and quickly hired the necessary staff for this. On the whole, most firms, even the ones which still utilise consulting services today, have increased (in quantity and quality) their own professional staff involved with quality procedures and quality assurance. This is the most important and evident effect of quality standards in terms of functional upgrading.

The more general conclusion to be drawn in this section is that leaving the provision of information and technical assistance for quality certification to the market may be problematic. As the role of customers, the public sector and the relevant business associations (ANFAVEA and Sindipeças) in helping local suppliers to adopt quality standards has been secondary, suppliers turned to services provided by the private sector. Yet, the evidence in this study suggests that sourcing from private consultants is not a magic solution.

6 Standards and technical collaboration between buyers and suppliers

This section addresses in detail the issue of technical collaboration between Brazilian auto components suppliers and their main customers. Would certification contribute to tightening or loosening the technical ties between suppliers and buyers? It was hypothesised at the beginning of this paper that standards might have contrasting impacts on governance in value chains. On one hand, large customers in the auto industry might take certification as a sign of supplier capability, and as a result be inclined to tighten technical linkages, giving suppliers more responsibility and helping them to meet these responsibilities. On the other hand, to the extent that certification acts as a substitute for direct monitoring of supplier performance, it might lead to more arm's-length relationships. The results of the research substantiate neither of these hypotheses. This section presents evidence that certification does not lead to close technical relationships between buyers and local suppliers in the automotive value chain. This is because the nature of product design does not require it. At the same time, this section also shows that quality assurance certification does not lead to more arm's-length relationships, because certification alone is not enough to ensure customer confidence in supplier capabilities and direct monitoring of supplier capabilities and performance has been maintained.

The findings of Section 5 have already indicated that leading firms in the Brazilian automobile chain have dispensed little effort (either in technical or financial assistance) to assist suppliers in their trajectory toward the adoption of quality standards. The assemblers have been more concerned with controlling the quality and reliability of ACI auditing, than with giving direct support to local suppliers. In this section, this argument is developed further. It is shown that, with one exception (Forge), suppliers do not acknowledge their major customers as technical or financial partners, even less so in regard to the development of design capabilities. The division of labour in the chain is such that the most significant capabilities in product and process design are developed by and contained within the assemblers and the large firms producing modules and high value components. There is little room left for local suppliers of light components to intervene in design. The diffusion of quality standards in the chain has not altered this picture.

In order to facilitate the development of the argument, this section is organised in three items. First, the division of labour within the chain in regard to design and technological activities is discussed. The characteristics of the supply contract between sample firms and their major customers is the second point to be explored. This sets the ground for the third point, that is the understanding of the main features of technical ties within the chain. Some conclusions on the nature of the automobile value chain in Brazil and on the limitations of the governance exerted by lead firms are presented at the end of the section.

6.1 Division of labour in product and process design

Assemblers, module suppliers and suppliers of high value-added components control product design in the Brazilian automotive industry. Co-design between assemblers and suppliers, a current tendency in the automobile chain, does not encompass the participation of local suppliers of light parts. All but one of the

sample firms reported that the design of light component was carried out entirely by their customers, which provided designs (detailed drawings) for them. The one exception was Clutch Disks, which catered for the replacement market (thus, this firm attempted to reproduce designs and specifications from the original parts). Stamped A mentioned that it had had an experience of product design of a component supplied to Mitsubishi, and the interviewee expected that the tendency would be for greater involvement of suppliers in product design, in the future. The situation in Brazil is in contrast with the recent experience in the German automobile chain, in which there has been evidence of the involvement of small- and medium-sized local suppliers in product co-design (Jürgens 2001).

So far, in Brazil, the design activities of local firms are restricted to process design, which occurs at the beginning of the supply relationship for a new component. Process design here means preponderantly the design of tools for the manufacturing of the component, like moulds for castings, dies, etc. In order to do so, all sample firms keep a technical or engineering unit with a few process engineers. The average number of process engineers in the sample firms is 3.2 – Stamped A and Washers present the smallest number (one engineer each), while Plastics A presents the highest (seven engineers). In some cases (Sinterising and Washers), process design and quality management are bundled in one unit. The average share of design engineers in total employment in the sample firms is 1.2 per cent. The comparable figures for two large suppliers of higher value-added components, one locally-owned and one sold to the transnational company, is above 3 per cent. Therefore, the share of design engineers in the sample firms seems to reflect their very limited design activity.

6.2 Inside the supply contract

How do customers approach suppliers in the automobile chain? What is the basis for the assessment of a new supplier? How does QS certification influence in this choice? When asked to rank factors which have accounted for the development of customers' trust in suppliers, the sample firms considered two situations: the initial approach and the continuation of the supply relationship. Reputation was ranked by most suppliers as the most important factor in attracting new customers and contracts. Reputation is developed through long term dependability. It is spread in the market and yields both new customers and new contracts with current customers. For instance, Stamped A reckoned that its reputation with GM was crucial for French entrants approaching the firm.

In other words, reputation is more important than QS 9000 or any other certification for securing new business. Certification was ranked second, on the grounds that it is a necessary condition for inclusion in the supply chain. 'No certification, no business'. Yet, certification was said to be less relevant for the new French and Japanese customers. According to the General Manger of Stamped A, Peugeot, Renault and Toyota do not take notice of QS 9000. They have their own questionnaire and methods for assessing potential suppliers. The Japanese said that for them QS 9000 means nothing. It seems that QS 9000 is more significant for the

North Americans'. Moreover, suppliers in general revealed that new customers only make a decision on pre-qualifying the supplier after they have carried out an initial audit. Suppliers call this a "process audit", in which the main focus is on process design capabilities, production equipment and the organisation of production. Many suppliers stressed the fact that QS certification only reduces monitoring of quality procedures. Monitoring of process capabilities is carried out in the beginning of the relationship and some customers do it periodically with all suppliers. Certification is not a substitute for monitoring, audit and pre-qualification of suppliers.

How do customers re-assess suppliers? According to many of the sample firms, the continuity of the supply relationship depends on the maintenance of dependability. This is periodically assessed through performance monitoring. Customers monitor performance by giving scores to suppliers' deliveries, which refer to indicators such as PPM (faulty parts per million), punctuality of deliver, flexibility in meeting change in supply orders, and so on. Some customers (VW and Mercedes Benz) also carry out annual process audits.

The continuity of customers' auditing and monitoring of suppliers' manufacturing processes and product/delivery performance is a critical finding for the purpose of this paper. It shows that, although it is true that quality standards contribute to reducing transaction costs, this benefit is limited. The current practices in the automotive chain involve other (costly) forms of supplier assessment/selection which are not affected by quality standards.

Do these processes mean that the supply relationship formalised in a contract? Not all supply relations are based on a formal contract. It depends on the customer and on the component to be supplied. For instance, Fiat has a formal contract for the parts supplied by Stamped A and the same occurs in the cases of Plastics A (supplying GM) and Forge (supplying Honda and Mercedes). Yet, Plastics A also mentioned that its supply relationship with Visteon had no formal contract. Washers, which supplies very light components, reported that it had no formal contract for the supply of its major customers. With or without a formal contract, it seems that the actual contracting procedures follow similar stages in most supply relationships reported by sample firms:

1. first, component manufacturers are qualified to become potential suppliers of the customer (when the customer is new); this is achieved through audits, questionnaires and so on, as shown above;
2. once qualified, suppliers receive an invitation to bid for the supply of a given component (providing a quote); in doing so, the customer sends the component specification and drawings to the supplier;
3. the nature of the supplier' proposal depends on the size and complexity of the component; the common point in all proposals is a price quote; in the case of very light parts, like washers and some fasteners, the supplier is also expected to produce samples of the component to be assessed by the customer; in the case of more complex parts, this is not necessary, but the customer may request a technical specification of the process;

4. if the proposal is approved, a formal contract may follow; the contract comprises a technical specification of the component, the frequency of delivery, specifications regarding transportation of the component and the property of the tools which will be developed by the supplier; Plastics A, Stamped A and Forge reported that the contract also indicates that supply orders will be placed weekly, following a rough estimate for three months and a more precise one for one month, which are revised monthly; however, there is no warranty in the contract against losses suffered by the supplier if a major reduction in the volume of orders occurs.

Nevertheless, certain risk-sharing mechanisms do exist, particularly in relation to the property of tools and the financing of tool development. Most customers only pay for the tools when the actual supplying of the component starts. Thus, the supplier has to face the initial cost related to tool development. In the case of more important components (in terms of value-added), the customer pays for and owns the tools developed for the process, which reflects the greater level of investment and risk for the supplier. General Motors has a distinct policy: once the supplier proposal is approved, it pays in advance a share of the estimated tool development cost. This cost is increased in the case of components for platforms which have been designed in Brazil (Fiat Palio and GM Celta), for the building and testing of component prototypes is required by the customer in these cases.

6.3 The (weak) technical collaboration between customers and suppliers

As seen before, suppliers view customers primarily as a source of pressure and tension rather than of technical assistance for quality certification. When asked to indicate the areas in which they had received collaboration from major customers, the firms in the sample indicated that, in general, technical collaboration from customers was limited and, more importantly, it was rarely systematic. In the cases of Washers, Plastics A, Sinterised and Clutch Disks, the interviewees declared that they had no collaborative technical linkages with their customers (Table 6.1). Two of these firms mentioned programmes previously run by GM and Fiat to help suppliers with quality issues, but these had been discontinued some years previously. Hose Clamps claimed clear technical collaboration in product design, but it was referring to the fact that customers provide detailed drawings to the supplier. Stamped B indicated that one of the major customers provided samples of a component sent by its parent company in Sweden, as this customer was going to localise the supply of component. Stamped B, Plastics B and Fasteners mentioned collaboration from customers in quality management, but they were alluding to the possibility of accessing detailed information on QS 9000 standards.

Table 6.1 Sample firms: types of collaboration received from customers

	Quality management	Product/process design	Finance	Customer lends skilled staff
Hose Clamps		X		
Stamped A				X
Stamped B	X	X		
Washers				
Forge	X	X	X	X
Plastics A				
Plastics B	X			X
Sinterised				
Clutch Disks				
Fasteners	X			

Source: Interviews

Stamped A referred to having had an experience with a Fiat’s programme of technical assistance in cost reduction (the RC-5 programme). Through this programme, Fiat used to send professionals to look for cost reduction opportunities at the supplier’s plant. However, this supplier eventually refused to continue in the programme, since it regarded it as having an audit and control purpose and because the customer appropriated all the benefits.¹⁹

Forge was again the only exception to this picture. It praised the assemblers’ collaborative programmes, mentioning as the most significant example the technical assistance provided by Honda for the implementation of Kaizen groups. Moreover, the Forge interviewee suggested that, based on the manufacturing experience of a given component, the supplier provided important inputs to customer in order to improve the component design. There are some reasons for the distinct situation of this firm. First, the mentioned example may imply that Honda has a distinct policy for supplier development, as compared to other assemblers. In another work, focusing on the policies of Japanese firms for supplier development in Brazil, the distinctiveness of Honda (in this case its motorcycle factory) was also detected (Quadros *et al.* 1996). Second, in comparison with the other sample firms, Forge seemed to have accumulated greater technological capabilities. This is due to the fact that Forge had had a contract for technology transfer with a leading German forging company for quite some time.

On the whole, the sample firms’ responses suggest that little technical collaboration has developed between suppliers and their major customers. The scope for potential collaboration in product design is

¹⁹ This is a common complaint of automotive suppliers in Brazil.

necessarily limited, due to the fact that suppliers have no role in product design. But even in terms of process design (tool design), suppliers seem to rely very little on their customers.

A contrast to this situation was provided by the Quality Manager in Sinterised, who praised the programme for supplier development offered by Embraco, a leading firm in the white goods sector: 'In terms of supplier development, Embraco/Whirlpool is miles ahead of any of the major automotive customers. They provide free training courses to suppliers' staff, in areas such as quality management and new process techniques.' Embraco/Whirlpool is the largest manufacturer of refrigerators and electrical motors in Brazil. A similar statement was made by the manager in Stamped B, referring to the more substantial policy for suppliers which has been carried out by Xerox.

At this point, it is useful to sum up our research findings, in the light of the initial hypotheses and questions proposed in the paper. *The evidence is strong that local suppliers' compliance with quality standards has not affected at all the (weak) technical ties between customers and suppliers, in the Brazilian automobile value chain.* Not only have assemblers and module suppliers not made any substantial effort to help local suppliers adopting quality standards requirements (apart from pressuring them to do so), but such adoption has not led to the development of technical collaboration in areas such as product and process design. In fact, there is collaboration in product and process design, but it is restricted to the relations between assemblers and the large suppliers of high value-added components, which are mostly transnational companies.

At the same time, medium-sized, locally-owned suppliers have not benefited from the decreasing transactions costs. *While coordination of activities in the value chain is predominantly based on arm's length market relations, customers continue to directly monitor and supervise suppliers, in spite of widespread certification requirements. This imposes costs on both sides.*

The investigation has shown that transactional dependence is very limited and both buyers and suppliers have considerable room for seeking new partners in the market. Second, the occurrence of asset-specific investment is also limited. In terms of the definition of product parameters, the fact that customers provide detailed designs to suppliers (in all sample firms) exempts suppliers of any kind of expenses in product design. As argued before, the simplicity of the product (light components) contributes to the continuation of this practice, since the cost benefit for the buyer of transferring product design to the supplier would not be large. It also explains why there is no motivation for buyers to engage in technical collaboration with suppliers in order to promote the development of design capabilities in the latter. However, continuing direct monitoring of suppliers processes means that there is in fact some kind of asset specific investment. On the side of customers, there are costs related to the monitoring (auditing) of suppliers' manufacturing processes. On the side of suppliers, there are costs referring to the design and manufacture of specific tools. Nevertheless, the predominant finding is that technical collaboration between buyers and suppliers is weak.

Finally, it is important to emphasise that these relationships take place within a context characterised by clear asymmetries between buyers and suppliers, in terms of technological and financial capabilities and in

terms of control of information. Such asymmetries are reflected in the characteristics of supply contracts, which follow conditions primarily decided by the customers. This asymmetry also enables the buyers to impose costly, multiple certification requirements on their suppliers.

7 Conclusions

What conclusions could be drawn of the findings of this research in the face of the main issues raised at the beginning of this paper? The objective of this section is to sum up the responses to the question of whether the diffusion of quality standards would strengthen or not the technical ties between buyers and suppliers in the automotive chain.

The portion of the global automobile value chain which is located in Brazil is made of two groups of firms which are not only very distinct animals, but animals living in worlds apart. By distinct animals I refer to the considerable asymmetries between assemblers and large components suppliers, on the one side, and local suppliers on the other. This is not a surprising result, as the literature in Brazil and elsewhere has frequently pointed to asymmetries between large companies and SMEs. Perhaps the most relevant finding is that relations between large, powerful customers and their local suppliers are restricted in scope, unstable and distant. Private coordination within the value chain is not strong and effective enough as to allow the sustainable progress of the entire chain, including the group of local suppliers.

How has the diffusion of global quality standards affected this situation? It has certainly contributed to local suppliers' upgrading of quality processes. But it has done little either to promote the suppliers' functional upgrading or to develop closer ties between the two groups. Apart from putting pressure on them, customers have not really invested to help local suppliers meet quality standards requirements. Technical support for quality upgrading has come predominantly from private sector consultants. Moreover, the adoption of QS has not prompted technical collaboration in product and process design. Co-design is restricted to the relations between assemblers and transnational suppliers of high value-added components.

Governance in the Brazilian automobile value chain is based predominantly on a market, arm's length type of relationship, characterised by significant power asymmetries. While there has been some development of closer control over suppliers in recent years, such as the tighter monitoring of supplier quality systems, the absence of technical collaboration and the customer's recurrent threat of supplier replacement indicate the continuity of arm's length market relationships. The prospect for closer, long-term relations is not firmly established yet. Further, continuing de-nationalisation of the components industry only adds to the undermining of the supplier base. Thus, coordination exerted by lead firms in the value chain does exist, but it is feeble because they still rely on arm's length market relations. On the side of local governance, local suppliers can only rely on *Sindipeças* to obtain low-cost technical assistance for the adoption of quality

practices. However, Sindipeças' initiatives have limited effectiveness. They have been unable to save the sample firms from many troubles in the adoption of quality standards certification.

Feeble coordination has an economic cost which is a burden for the entire chain, therefore undermining competitiveness. The paper provides various examples of waste of money and time on the part of local suppliers, ranging from the cost of the supplier's winding trajectory through many different consultants in the search for certification, to the cost of meeting simultaneously the different (and sometimes conflicting) requirements of different systems of quality standards. As long as well established assemblers and new entrants continue to introduce their own (national) quality standards, the cost of achieving and keeping certification is increasing for Brazilian local suppliers. As the coordinator of the Sindipeças Quality Group has summarised, 'One has to invest in a second, virtual plant just to produce and keep all the documents required by the various auditing processes'. To put it bluntly, the lead firms in the value chain have little understanding of and sensitivity to the upgrading concerns of local firms.

The implications for the inefficiency in the chain are only perceived when the quality of the final product is affected. Then customers blame the low quality of certification auditing. However, local suppliers emphasised that quality is suffering primarily because the extreme pressure to reduce costs in the short term is leading local suppliers to degrade their skills and accumulated capabilities (for instance, by replacing skilled with less experienced workers, receiving lower pay). Although the entire chain would profit from the strengthening of long term, technical ties between customers and suppliers, the former are not concerned with this.

These problems have been reinforced rather than offset by the policies of the Federal government towards the automotive industry. In a previous work (Quadros *et al.* 2000), we concluded that the Brazilian government had mismanaged the federal incentive scheme for the automobile industry, which was valid until 2000. By participating in such a scheme, transnational assemblers and suppliers received benefits according to their export performance, but the contribution of these firms to local technological capability (for instance, by performing local product design and R&D) received no reward. The findings of this research can be better understood in the light of this general lack of public concern with industrial upgrading. Upgrading, either technological or organisational, is left to the market. It does not receive proper federal or state level attention. Unfortunately, the market does not seem to fill in the gap either.

Appendix 1 Characteristics of sample firms

Hose clamps

Established in 1967 and 100 per cent controlled by Brazilian owners, like all firms in this table. Produces many different sizes and forms of cramps. Domestic reposition market accounts for 70 per cent of sales; the balance refers to OEM sales to local assemblers. Five main customers of OEM are VW (15 per cent), Ford, Cummins, Scania and GM, in this order. Located in the city of São Paulo. Medium size: 170 employees and US\$4 million sales in 1999. QAS certificates: ISO 9001 and QS 9000.

Stamped A

Established in 1968. Manufactures stamped parts and welded sets. 100 per cent sales are OEM to local assemblers. Five main buyers are Fiat (47 per cent), GM, VW, ATH/Dana and Hoesch 5 per cent. One of lead firms in medium and light stamped parts. Located in Ribeirão Pires (ABC area). Medium size: 226 employees and US\$7.5 million in 1999. Certificates: ISO 9002 and QS 9000.

Stamped B

Established in 1979. Main products are light and medium stamped parts/sets. Sales of OEM to local assemblers are 95 per cent; 5 per cent are exports of OEM to foreign assemblers. Main customers are: Scania (25 per cent), Xerox (25 per cent), VW, GM and Cofap/M. Marelli. Location: São Bernardo do Campo (ABC). Medium size: 188 employees and US\$6.4 million in 1999. Certificates: ISO 9002 and QS 9000.

Washers

Established in 1959. Produces washers, bushes and other light stamped components. Five major customers are M. Marelli (17 per cent), VW, TI, ZF and Mercedes-Benz. OEM sales to local customers are 65 per cent; reposition market sales are 30 per cent and OEM exports, 5 per cent. Located in São Paulo. Small size: 70 employees and US\$2.7 million in 1999. Certificates: ISO 9002 and QS 9000.

Forge

Established in 1932. Forges and machines light parts for engines, gear boxes, suspension and vehicle bodies. Five main clients: Honda Motorcycles (30 per cent), VW, Mercedes-Benz, Eaton and Bosch. Lead firm in forged light parts. Sales are 100 per cent OEM, 90 per cent to local customers and the balance are exports. Located in Osasco, São Paulo metropolitan area. Medium to large size: 482 employees and US\$10 million sales in 1999. Certificate: ISO 9002.

Plastics A

Established in 1967. Manufactures plastic air hoses, tanks and other dashboard components. Major customers are Ford (8 per cent), Johnson Controls and VW. Sales are 100 per cent OEM to local manufacturers. Situated in Barueri, São Paulo metropolitan area. Large size: 550 employees and US\$15 million in 1999. Certificates ISO 9001 and QS 9000.

Plastics B

Established in 1937. Main products are injected plastic components (dashboards and bumpers) and flexible cables. Principal client is not in the automobile business. Five major customers auto industry: VW (16 per cent), Scania, Behr, GM and Delphi. Sales of auto components are 100 per cent OEM for local buyers. Located in São Paulo. Large size: 652 employees and US\$14 million in 1999. Certificates: ISO 9001 and QS 9000.

Sinterised

Established in 1967. Manufactures various types of metal components based in a technology called sinterisation (fusion of compressed metallic powder). Two major clients are from home appliances industry (white line). Main clients are: TRW (8 per cent), Monroe/Tenneco and Bosch. Sales are 95 per cent OEM to local producers and 5 per cent in the reposition market. Located in São Paulo. Medium size: 148 employees and US\$6.4 million sales in 1999. Certificates: ISO 9001 and QS 9000.

Clutch Disks

Established in 1974. Produces clutch plates and disks for trucks and buses. In contrast to the other companies of the sample, this firm only caters for the domestic reposition market. Main customers are auto components wholesale dealers and large urban bus services. Located in São Paulo. Small to medium size: 118 employees and US\$5.4 million in 1999. Certificate: ISO 9002.

Fasteners

Established in 1965. Manufactures fasteners of different forms and sizes for various applications. Lead firm in fasteners. Sales are 100 per cent OEM to local producers (93 per cent to assemblers) Main clients include Fiat (36 per cent), VW, GM and Ford. Located in São Paulo. Medium size: 288 employees and US\$8.4 million sales in 1999. Certificates: ISO 9001, QS 9000 and AVSQ.

Source: Interviews

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