

**Backward Linkages and Buyer-supplier Knowledge Transfer  
in the Polish Automotive Industry**

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**Abstract.** This paper focuses on the impact of vertical knowledge transfer from foreign affiliates of Transnational Corporations (TNCs) to indigenous Polish suppliers. Using firm-level data collected through a survey among foreign affiliates and locally-owned suppliers in the Polish automotive sector, we find that foreign firms contribute to the knowledge base of local firms and that the knowledge that local suppliers receive enables them to enhance their performance. In order to create new knowledge, suppliers' R&D intensity is revealed to be a critical factor. Inter-firm relationships play a relevant role in the process of knowledge transfer and acquisition.

Key words: TNCs, backward linkages, international knowledge transfer, domestic suppliers, automotive industry, Poland

### 1. INTRODUCTION

This paper investigates how foreign transnational corporations (TNCs) contribute to knowledge transfer and upgrading of their local suppliers in the transition economy of Poland. This topic has attracted considerable attention during recent years: the expectation of productivity spillovers from knowledge transfer (Javorcik, 2004, 2008) has given an impetus to policy makers in many countries, particularly less developed economies, to provide FDI-friendly regimes and to introduce policies attracting TNCs with linkages to the local economy (UNCTAD, 2001, 2006).

Development studies' literature has long recognised that the key to beneficial effects from FDI depends on whether or not foreign investors reach out to local industry through the establishment of linkages (Kim and Nelson, 2000; Lall, 2000; Lall and Narula, 2004). Indeed, it has been argued that linkages constitute a 'black box' in the discussion of when and how FDI induces economic development (Scott-Kennel and Enderwick, 2005).

Many researchers see linkages between foreign investors and local industry as essential prerequisites for FDI to have a lasting and sustainable effect (Hansen et al., 2009). Studies have shown that linkages from TNCs to local firms increase demand for local inputs, make advanced intermediate goods available to users and favour specialisation economies (Alfaro and Rodríguez-Clare, 2004; Markusen and Venables, 1999; Rodríguez-Clare, 1996). Through linkages with foreign affiliates, domestic firms can improve their practices by supplying global buyers (Gereffi et al., 2005; Kelegama and Foley,

1999) as well as extend their geographical scope by gaining access to export markets (Stiglitz, 1996) thus contributing to the development of the local supplying industry (Buckley et al., 2002).

While backward linkages may have positive effects on domestic firms, they are by no means automatic results of an influx of foreign TNCs (Görg et al., 2009). In fact, as indicated by Hansen et al. (2009), literature also recognises the limitations to linkage-based development, including the limited upgrading opportunities for developing country linkages' partners in global value chains and the danger of lock-in in low value added functions (Humphrey and Schmitz, 2001).

Research has pointed out that linkages are created and produce benefits only when certain conditions are met (Belderbos et al., 2001; Chung and Kim, 2003).

For example, local suppliers need to be able to supply inputs at a sufficiently high capacity before they can hope to secure the custom of foreign TNCs. Others have pointed out that local suppliers have to be sufficiently advanced technologically to absorb knowledge spillovers and deal with the demand for specialised inputs. To contribute to the upgrading among local suppliers is not sufficient for the knowledge provided by TNCs to flow across the companies but the knowledge must also be diffused and absorbed (Kesidou and Romijn, 2008).

Despite the evidence that backward linkages can contribute to technological upgrading among domestic suppliers, the significance of the assistance provided by foreign affiliates for the development of competences of local suppliers has been relatively under-studied (Ivarsson and Alvstam, 2005). Indeed, many contributions are of a theoretical nature and emphasise the importance of accessing and absorbing international knowledge for acquiring competitiveness and fostering economic growth in developing countries (Blomström and Kokko, 1998; Blomström and Sjöholm, 1999; Dunning, 1993; Kokko, 1994; UNCTAD, 2001). Yet, as indicated by Meyer (2004), research ought to prioritise the study of individual interactions of a multinational firm and a local agent or firm. While there is a plethora of studies from different disciplinary perspectives explaining knowledge transferred by foreign affiliates to their local suppliers (Cantwell and Iguchi, 2005; Duanmu and Fai, 2007; Giroud, 2003; Halbach, 1989; Hansen and Schaumburg-Müller, 2006; Lorentzen et al., 2003; Scott-Kennel, 2004; Wong, 1992), those studies do not distinguish between foreign and domestic-

owned suppliers, probably due to the difficulty in collecting this sort of data (Ivarsson and Alvstam, 2005). Additionally, only a few studies (Halbach, 1989; Cantwell and Iguchi, 2005; Hansen and Schaumburg-Müller, 2006; Duanmu and Fai, 2007) combine data on both foreign affiliates and local suppliers to assess factors related to both types of firms leading to greater capability enhancement of local suppliers as a result of interacting with foreign firms. Furthermore, to our knowledge, there is only a small number of empirical studies on the impact of foreign firms on the capability upgrading of local firms (Crone and Roper, 2001; Giroud, 2007; Ivarsson and Alvstam, 2004, 2005, 2009). Among these studies, only Ivarsson and Alvstam (2004, 2005, 2009) use a local supplier perspective *“explicitly analysing how backward linkages generate a long-term deepening of supplier capabilities to independently improve, and adapt external technology”* (2009:59).

Based on the research relevance and on the outlined gaps, there are three objectives in focus in this paper. Firstly, by looking at both foreign affiliates and locally owned suppliers, we wish to investigate the process of knowledge transfer/acquisition, considering and comparing the views of both foreign affiliates and local suppliers. Secondly, by focusing on locally owned suppliers, we want to assess whether they improve their capabilities and competitiveness as a result of their business interaction with foreign TNCs. Finally, we aim at knowing whether this results in the suppliers’ being able to create new knowledge. This last stage is critical because the ability to create knowledge is a major source of competitive advantage of firms (Grant, 1996; Spender, 1996) and in the long term what matters is what local firms learn and how they are able to develop their own capabilities (Ivarsson and Alvstam, 2005:1326).

This discussion leads to the need for articulating the issue of knowledge transfer from TNCs to local suppliers, moving from the macro level emphasised by research on spillover at micro or firm-level, looking at the ‘foreign affiliate-domestic firm relationship’ aspect. Using this focus, these are the main questions that this research intends to answer:

- 1) To what extent does knowledge transfer occur in the Polish automotive sector and what factors are facilitating it?

- 2) Does knowledge transfer from foreign affiliates to indigenous suppliers enhance their capabilities?
- 3) Does this knowledge have a long-term impact on indigenous suppliers in helping them to create new knowledge?

The remainder of this paper is organised as follows: the next section presents an overview of the Polish automotive sector. Section 3 reviews previous literature and elaborates a conceptual framework deriving working propositions, Section 4 presents the empirical results and Section 5 illustrates an integrated framework of knowledge transfer, acquisition and absorption. Section 6 concludes the paper.

## **2. POLISH AUTOMOTIVE SECTOR**

The potential for local learning , as a result of inter-firm knowledge transfer , is particularly important for transition economies, as many companies in transition countries still need (or needed) to compensate for systemic defects inherited from the past, requiring an upgrading of capital, technology and management (Dries and Swinnen, 2004). Yet, in the context of Eastern Europe, Jindra et al. (2009) clearly identify substantial TNCs' linkages creation and urge more analysis on the process of inter-firm knowledge flow and absorption by local firms. This study fills this gap and concentrates on the automotive industry in Poland.

Inter-firm interactions and intensive knowledge sharing are particularly important in supply chains in the automotive sector (Hatani, 2009). As the competitiveness of a car manufacturer is highly dependent on the capabilities of its suppliers (Takeishi, 2001), the need to have increased access to technology, innovation and training, which regards all suppliers at the different levels of the supply chain, makes the automotive industry a leading case for inter-firm knowledge transfer. In addition, the automotive industry was a major beneficiary of liberalisation policies and led the growth of FDI in many emerging-market countries (Javorcik, 2008).

Despite the increasing globalisation in the automotive industry, the regionalisation of its production and distribution networks, especially in Europe and North America, is strong (Dicken, 2007) and one of the major regional trends in the past several decades has been the integration of peripheral areas of

Western Europe and North America into the car manufacturing production and distribution networks. By their lower cost bases, these peripheries offer car makers the possibility to shift labour-intensive parts of the automotive production with major cost advantages. *“Since the year 1990 the opportunity to exploit this “spatial fix” opened in Central and Eastern Europe”* (Pavlínek et al., 2009: 354), where the automotive industry has a long history .

As FDI was seen as a key to initiating economic growth and moving towards a market economy, the automotive industry was given high priority by many of the region’s governments which offered a series of lucrative incentives and subsidies to encourage foreign investors (Pavlínek, 2002). Four large car manufacturers are operating in the country, namely Fiat Auto (in Tychy), GM-Opel (Gliwice), Volkswagen (Poznań) and the tarnished national manufacturer FSO (Warsaw). Poland relied heavily on policies that promoted incentives and the entry of TNCs to drive the reorganisation and renewal of the automotive industry. In the country, the automotive FDI represents 8% of the total FDI value and 25% of the FDI in the industry, confirming the attractiveness of the country and of the region as a whole. As an effect of the FDI policies adopted in the automotive industry, the component sector has gained particular importance in the last decade (Pavlínek et al., 2009). Automotive suppliers employ more than 108,500 people, accounting for as much as 81% of the total employment within the motor vehicle industry. Between 2002 and 2007, their exports grew at a rate of more than 27% and, in 2007, more than half of the exports of the local automotive manufacturing was covered by parts and components. Local manufacturing largely concentrates on key and complex systems and not merely on basic subcomponent and accessories. Yet, between 1996 and 2006, the share of high value-added exports increased from 4% to 33.3%, although Poland maintained a higher level of low value added exports (20.5% in 2006).

However, the dependence of the local companies on foreign technology and know-how is not a guarantee of prosperity in the long term. What is essential is the upgrading of the local components industry in order to be able to join the global supplier network of the automotive industry. The need is to improve local firms’ capabilities and make evident how important it is for these companies to take advantage of their interaction with foreign companies. Considering this situation, the Polish automotive industry is considered to be a good case for the focus of this study.

### 3. CONCEPTUAL FRAMEWORK

Debate over the impact of TNCs on host country development is extensive: see Meyer (2004), for a review. One stream of research that has tried to integrate insights from development with the study of TNCs has focused on spillovers (Blomström and Persson, 1983; Blomström and Kokko, 1998). Researchers advocating the benefits of spillovers to developing host countries suggested that foreign firms would bring advanced technology knowledge and skills that would spill over to local individual firms and industries and be used by them to enhance their productivity and increase their knowledge and skills base (Caves, 1974; Teece, 1977). Under the spillover view, TNCs do not need to contribute directly to the development of the host country. Nevertheless, as indicated in the review by Oetzlel and Doh (2009), results have not been encouraging (Görg and Greenaway, 2003) and scholars have begun to shift attention to the potential ‘demand-side’ (local firms) effect of spillover, looking at limits of absorptive capacity (Kokko, 1994), while another group of researchers have looked at the ‘supply-side’ factor, recognising heterogeneity in TNCs’ strategies (Wang and Blomström, 1992).

Indeed, the evolving role of foreign affiliates is critical for the relationships and networks they create in the economies where they are sited (Jindra et al., 2009) and it has been widely described by IB scholars. The configuration of TNC has moved from a hierarchical perspective towards a stance which has replaced the dyadic relationship of parent company-subsidiary with a complex ‘inter-organisational network’ (Bartlett and Ghoshal, 1991). This network of loosely coupled entities gives the foreign affiliate the necessary freedom to develop and shift its own unique resource profile, including human and technological resources, within the host country.

Firms are increasingly engaged in a narrow set of activities which are embedded in a complex chain of inter-firm relationships (Dyer, 1996). In order to manage efficiently the relational sets in which they are embedded, organisations must develop the ability to absorb competences from others (Cohen and Levinthal, 1990) and the ability to combine existing competencies or generate new knowledge (Henderson and Cockburn, 1994). Firm-specific, intangible, non-tradable and inimitable knowledge is the only durable source of competitive advantage of the firm (Spender, 1996).

Organisations seeking to enhance their knowledge base acquire knowledge from external entities. The acquisition of knowledge implies the transfer of knowledge from an external entity but it does not

automatically increase the knowledge base; organisations benefit from externally acquired knowledge only when it becomes integrated with their existing stock of knowledge (Grant 1996). Organisational learning is then a critical capability of the firm.

### *1.1 Foreign affiliate characteristics*

The conventional wisdom on technological externalities from FDI portrays the TNC affiliate as a passive actor in the process, serving as a “leaky container” (Marin and Bell, 2006) between the parent firm, the originator of new technologies and the technology transfer pipeline, and the domestic firms absorbing these technologies through spillovers. This passive view of the affiliate is no longer appropriate and studies recognise a large heterogeneity between TNCs in their role and in the relationships and networks they create in the economies where they are located.

There is today an accepted tendency to conceptualise TNCs as a globally distributed network of differentiated, more or less integrated units (Ghoshal and Bartlett, 1990), the competitive capability of which depends on the sharing of resources inside the network (Gupta and Govindarajan, 2000). Viewing the TNC as a differentiated network of roles and responsibilities implies that affiliates fulfil different tasks. The roles affiliates adopt will determine the extent to which they send knowledge to and receive it from their parent organisations (Gupta and Govindarajan, 2000), their degree of independence, the ability to innovate and the relationships they create in the economies where they operate.

The role affiliates play with respect to R&D is important for host country firms, as the assignment of R&D responsibilities to an affiliate is an investment in its capacity to create new technical knowledge through internal efforts but also to absorb spillovers of external knowledge from competitors’ R&D activities (Feinberg and Gupta, 2004). Given this reasoning, it can be argued that the greater the extent of knowledge resources in the affiliate network, the greater is the opportunity for firms in the network to access knowledge (Gulati, 1999) and therefore to innovate through merging their own knowledge with acquired knowledge.



Additional affiliate-level literature suggests that the greater the extent of affiliate autonomy, the better the ability of the affiliate to form favourable external network linkages with other companies and institutions in its local environment (Andersson and Forsgren, 2000; Birkinshaw et al., 1998). Foss and Pedersen (2002) find that affiliate autonomy has a positive impact on knowledge outflow from local affiliates. Therefore:

*Proposition 1: Affiliate level characteristics (strategic role, R&D activity and degree of autonomy) influence the transfer of knowledge to locally owned suppliers*

### *1.2 Inter-firm relationships' characteristics*

When looking at the process of inter-organisational knowledge transfer, buyer-supplier relationships move centre stage (Squire et al., 2009). In fact, to transfer knowledge from one firm to another, the relationship must be of such significance that the knowledge residing in one firm can be converted into concepts significant for the other firm (Cavusgil et al., 2003).

The buyer-supplier relationship as a mechanism facilitating knowledge transfer is particularly important in the automotive industry, where many components must be combined to create a final product and where technological change is constant (Martin et al., 1995:597).

Scholars analysing buyer-supplier relationships and inter-organisational learning, as well as strategic alliances, have identified some factors which are critical in influencing inter-firms knowledge exchange. They emphasise the importance of trust (McEvily et al., 2003; Squire et al., 2009), shared vision (Dyer and Singh, 1998; Nahapiet and Ghoshal, 1998; Yli-Renko et al., 2001), commitment (Muthusamy and White, 2005; Muthusamy et al., 2008), social interaction (Carr and Pearson, 1999; Kocabasoglu and Suresh, 2006; Nahapiet and Ghoshal, 1998) and communication (Kotabe et al., 2003; Prahinski and Benton, 2004).

Yet, inter-organisational trust plays an important role for the accessibility of knowledge. Trust facilitates knowledge-sharing by creating a sense of security that the knowledge will not be exploited beyond what is intended (Squire et al., 2009). Shared vision is a necessary condition for exchange to occur because identification and combination of strategic resources can only be realised if the firms have systems and cultures that are compatible enough to facilitate coordinated action (Dyer, 1998).

Looking at knowledge transfer in buyer-supplier alliances, Muthusamy (2008) found that, together with trust, reciprocal commitment and socialisation are also important factors for successful learning and knowledge transfer. Reciprocal commitment reduces the uncertainty for the parties and enhances the scope for mutual adjustments in the relationship, thus providing a basis for meaningful communication (Muthusamy et al., 2005). Moreover, numerous researchers have found that when buyers and suppliers effectively communicate and share information relating, for instance, to materials' procurement and product design issues, they are more likely to (1) improve the quality of their products, (2) reduce customer response time, (3) reduce the costs of protecting against opportunistic behaviour and (4) improve cost savings through greater product design and operational efficiencies (Kotabe et al., 2003; Prahinski and Benton, 2004).

In addition, theories taking an evolutionary perspective on technology development (Driffield and Noor, 1999) stress that long-term relationships are important ingredients for close inter-firm learning between customers and suppliers. Recent studies from Ivarsson and Alvstam (2005) on the heavy truck sector and bus plant of AB Volvo in Brazil, China, India and Mexico confirm this view.

Therefore, to summarise, it can be posited that:

*Proposition 2a: Inter-firm relationships' characteristics influence the transfer of knowledge from foreign affiliates*

*Proposition 2b: Inter-firm relationships' characteristics influence the acquisition of knowledge from locally owned suppliers*

### *1.3 Suppliers' characteristics*

Research has shown that how fast and successfully local suppliers internalise and translate transferred knowledge into their own capability through learning will be largely determined by their capacity to absorb the knowledge and their ability to upgrade it regularly (Ernst and Kim, 2002). Cohen and Levinthal (1990) call this capability *absorptive capacity*.

This concept is particularly important in the case of transition economies because in those countries local firms need to improve their capabilities, allowing transfer of knowledge from foreign companies (Tihanyi and Roath, 2002).

Despite the empirical operationalisation of the concept of absorptive capacity not having been focused (Schmidt, 2008) and now proving to be difficult (Becker and Peters, 2000), scholars agree that absorptive capacity is not a one-dimensional concept but consists of various firm-level characteristics that allow locally owned suppliers to deal with the knowledge transferred from foreign affiliates and to use it at a commercial level. Studies have identified many dimensions of absorptive capacity that could have a potential influence on the acquisition of knowledge. These include R&D activity (Cohen and Levinthal, 1989), the development of skills and training (Giuliani and Bell, 2005; Narula, 2004), the ability to stimulate and organise the transfer of knowledge across departments, functions and individuals (Daghfous, 2004) and technological capabilities and level of technical influence (Lorentzen et al., 2003; Petroni and Panciroli, 2002), understood as critical resources to generate technical change.

Building on those elements, the following proposition is derived:

*Proposition 3: Absorptive capacity of locally owned suppliers influences the acquisition of knowledge from foreign affiliates.*

#### *1.4 Knowledge absorption and impact*

Although the impact of TNCs on host country development has been studied in the literature for more than forty years, studies on the impact of foreign firms on the capability upgrading of local firms have surged only recently.

In studies of both developed and emerging economies (Cantwell and Iguchi, 2005; Crone and Roper, 2001; Dries and Swinnen, 2004; Duanmu and Fai, 2007; Giroud, 2007; Ivarsson and Alvstam, 2004, 2005; Lorentzen et al., 2003; Wong, 1992), and mostly looking at suppliers' improvement from the foreign affiliate point of view (with the exception of Duanmu and Fai, 2007; Ivarsson and Alvstam, 2004, 2005), knowledge transfer through the establishment of linkages between TNCs and local suppliers provides learning opportunities to supplier firms and has a positive impact on their

competitiveness in terms of price, quality or delivery conditions, increased investments or improved access to finance.

Drawing on these earlier studies, the following proposition is formulated:

*Proposition 4: Knowledge acquired from foreign affiliates leads to improvement in locally owned suppliers' performance.*

None of the studies on linkages and knowledge transfer analyses the impact of knowledge transferred to local suppliers in terms of new knowledge creation from the side of local suppliers. Yet the ability to absorb technology and knowledge from external sources is no less important than that of generating new knowledge and is recognised to be a major source of sustainable competitive advantages for firms (Grant, 1996; Kogut and Zander, 1992; Prahalad and Hamel, 1990).

In the actual context where firms interact, potentially sharing and creating knowledge, with a host of players up and down the value chain, the issue of externally acquired knowledge and its relationship to the creation of new knowledge is critical. This is particularly relevant for the automotive industry where customers have increasing requirements on quality and individualisation of products and, at the same time, exert an upcoming pressure on product prices. Therefore:

*Proposition 5: Knowledge acquired from foreign affiliates influences local suppliers' creation of new knowledge*

#### **4. EMPIRICAL STUDY**

Primary data were collected through a field survey in Poland, between April and August 2006, among the 380 manufacturers of parts and components (141 foreign affiliates and 239 locally owned suppliers) included in the database of the Polish Chamber of Automotive Industry, the most updated and reliable source of information in the sector.

A questionnaire was sent by mail to all companies in the sample. Two different questionnaires were constructed, one for foreign affiliates and one for locally-owned suppliers. This enabled inclusion of firm-specific factors related to both types of firms involved in the knowledge transfer. Instructions provided in the questionnaire indicated that when referring to suppliers foreign affiliates should only

refer to locally owned suppliers and when talking about customers, local suppliers should only refer to foreign affiliates. A list of the 3 main suppliers/customers provided by foreign affiliates and locally owned suppliers as part of the questionnaire allowed to verify if instructions were followed.

The final return consisted of 41 responses, a representative sample of 17% of firms in the total population. Similarly, a total of 23 responses were received from foreign affiliates, representing 17% of the total population. Both samples were treated and analysed separately but overlapping questions between both versions of the questionnaire allowed cross-comparison of the results.

The questionnaire for the foreign affiliates focused on affiliate role and autonomy, reasons for investment in Poland, local procurement strategy, knowledge transferred to local suppliers and perception of local suppliers' improvement as a result of working with the foreign affiliate. The questionnaire for the local suppliers explored the kind of relationship with foreign customers, the technology level of the supplier, the knowledge received from foreign customers, the improvement achieved as result of working with foreign companies, the supplier's R&D activity, its innovation capabilities and skills development. Data were analysed by means of a series of four linear regression models, testing relationships between firm-level and relationships-level characteristics, knowledge transfer/acquisition and impact on suppliers.

#### *4.1 Measurement of variables*

The dependent variables in the empirical analysis include knowledge transferred (KH\_TRA) by foreign affiliates, knowledge acquired (KH\_ACQ) by locally owned suppliers, performance improvement of indigenous suppliers (IMPR) and local suppliers' new knowledge creation (NEW\_KH). KH\_TRA and KH\_ACQ refer to technical and managerial knowledge, including: informational support, product-related support, process-related support, and organisational and managerial know-how. Based on previous research, IMPR measures different elements of improved capabilities of suppliers: process improvement, product quality improvement, reduction of lead time, increase in sales, improvement in productivity and decrease in price. NEW\_KH includes three dimensions: the introduction of new products, of new services or of new technology as a result of the relationship with foreign affiliates.

Independent variables refer to characteristics of foreign affiliates, local suppliers and relationships.

Variables concerning foreign affiliate characteristics include MULTI\_DO and MULTI\_RE, indicating, respectively, the affiliate's mandate to produce and market some of the parent's existing products for the local market and to produce some sets of component parts or final products for the regional/global market. AUTO refers to the extent to which supply-related decisions (amount of local sourcing, selection of new suppliers, change of suppliers, terms of agreement, price determination, participation in supplier development schemes, knowledge transfer) are taken by the foreign affiliate. R&D\_INTA refers to the intensity of R&D (R&D spending/sales) of the foreign affiliate.

Measures of inter-firm relationships include REL\_QUALA and REL\_QUALS, looking at, respectively, the quality of the relationship as evaluated by foreign affiliates and local suppliers. This measure evaluates the relationships in terms of trust, shared vision, communication, information sharing and commitment among the parties.

An additional measure is included only for locally owned suppliers, considering the need of transition economy firms to move from the mindset of short-term advantage, adversarial buyer-supplier relationships (Whitley, 1996), inherited from the past, to long-term cooperative buyer-supplier relationships. REL\_ST and REL\_LT measure the duration of the contractual relationship between locally owned suppliers and foreign affiliates looking at, respectively, short-term and long-term relationship.

The variables concerning local suppliers' characteristics include the dimensions of absorptive capacity previously identified. These include: TECH\_PE, which measures the use of advanced and manufacturing techniques by domestic firms and TECH\_INF, which measures supplier influence on foreign affiliates in terms of product design, manufacturing process, procurement of materials and product quality control. Additionally, KH\_EXCH measures suppliers' activities to stimulate knowledge exchange within their firm in joint development of innovation strategies, open communication of ideas among departments, regular meetings of department heads to discuss innovation, seminars and workshops involving several departments and monetary incentives to develop own ideas. TRAIN refers to the training activities (formal, informal and continuous training) by suppliers while R&D\_INTS refers to their level of R&D intensity.

Age of the affiliate (AGE\_A) and of the supplier (AGE\_S), their size (SIZE\_A and SIZE\_S) and the supplier tier level (TIER) are included as control variables. Variables are listed in Table 1.

**Table 1: List of variables**

<i>Dependent variables</i>	
KH_TRA	Knowledge transferred by foreign affiliates to domestic suppliers
KH_ACQ	Knowledge acquired from foreign affiliates by domestic suppliers
IMPR	Performance improvement of domestic suppliers
NEW_KN	Local suppliers' new knowledge creation
<i>Independent variables</i>	
MULTI_DO	Foreign affiliate mandate to produce and market some of the parent's existing products for the local market
MULTI_RE	Foreign affiliate mandate to produce some sets of component parts or final products for the regional/global market
AUTO	Foreign affiliate autonomy in supply related decisions
R&D_INTA	R&D intensity of foreign affiliates
REL_QUALA	Quality of inter-firm relationships as evaluated by foreign affiliates
REL_QUALS	Quality of inter-firm relationships as evaluated by domestic suppliers
REL_ST	Short term contractual relationship between domestic suppliers and foreign affiliates
REL_LT	Long term contractual relationship between domestic suppliers and foreign affiliates
TECH_PE	Use of advanced and manufacturing techniques by domestic suppliers
TECH_INF	Foreign affiliates' influence on domestic suppliers in terms of product design, manufacturing process, procurement material and product quality control
KH_EXCH	Domestic suppliers' activities to stimulate knowledge exchange within the firm
TRAIN	Training activities of domestic suppliers
R&D_INTS	R&D intensity of domestic suppliers
<i>Control variables</i>	
AGE_A	Age of foreign affiliates
AGE_S	Age of domestic suppliers
SIZE_A	Size of foreign affiliates in terms of number of employees
SIZE_S	Size of domestic suppliers in terms of number of employees
TIER	Tier level of domestic suppliers

#### 4.2 Empirical analysis

Using a sample of 64 companies (23 foreign affiliates and 41 locally owned suppliers), we found empirical evidence that, as result of the establishment of contractual linkages, foreign affiliates transfer knowledge to locally owned suppliers and these acquire knowledge from their foreign owned customers. Table 2 shows the results indicating the type of knowledge transferred and acquired. We

find similarities in responses, although foreign affiliates assess knowledge items higher than suppliers.

**Table 2: Knowledge transferred/acquired**

Knowledge type	Affiliates (n=23)		Suppliers (n=41)	
	Mean <sup>a</sup>	S.D.	Mean	S.D.
<i>Product technology</i>				
Product know-how	3,43	1,037	3,33	1,328
Product design	2,65	1,027	2,49	1,267
Technical consultation	3,09	,996	3,00	1,132
R&D cooperation	3,73	,985	3,70	1,043
<i>Process technology</i>				
Machinery*	3,48	,898	4,00	1,177
Technical support***	2,87	,968	4,15	1,040
Visits***	2,70	,926	4,25	,954
Cooperation club	3,82	,733	-	-
<i>Organisational and managerial know-how</i>				
Inventory***	3,13	1,014	4,03	1,310
Quality system	2,43	,896	2,37	1,090
New practice***	3,74	,752	4,41	,880
<i>Informational support</i>				
Information exchange	3,22	,795	3,43	1,083
Purchase order	3,67	,730	3,64	1,387
Market information	3,62	,669	3,64	1,038
Business association	3,95	,605	-	-

<sup>a</sup> Mean=1: very frequently – 5: never

\* significant difference between samples under 2- tailed t-test (\*p<0.10 ; \*\*p<0,05 ; \*\*\*p<0,01)

The type of knowledge most frequently transferred/acquired is organisational and managerial know-how and product technology support. More specifically, both samples coincided in defining assistance in implementing the quality assurance system, product design and technical specifications as the typologies of knowledge most frequently transferred/acquired.

Additionally, we found that locally owned suppliers, independently from their tier level, are able to improve their capabilities as a result of knowledge acquisition. The most significant improvement is in the field of quality. This result confirms the information on the type of most frequently transferred/acquired knowledge, namely quality assistance.



Finally, with regard to the impact of on indigenous suppliers' capacity of creating new knowledge, results of the survey indicate that locally owned suppliers, particularly those with a higher degree of technological penetration, were able to create new knowledge as a result of their business interaction with foreign owned customers. The creation of new knowledge consists principally of the development of new products, followed by the introduction of new technologies and new services.

In order to identify those factors explaining the transfer/acquisition of knowledge and the impact of knowledge acquisition on the local suppliers, regression analysis was carried out. Model 1 focuses on foreign affiliates and relationships factors explaining the transfer of knowledge to locally owned suppliers. Model 2 focuses on local suppliers and relationship-related factors explaining knowledge acquisitions from foreign affiliates. Models 3 and 4 concentrate on those factors impacting on local suppliers' performance improvement and creation of new knowledge.

The correlation analysis between independent variables indicated no strong correlations, thus rejecting the possibility of multicollinearity. Results of the analysis are reported in Tables 3 and 4.

**Table 3: Results of regression analysis on knowledge transferred. Foreign affiliate sample (n=23)**

<b>Variables</b>	<b>Model 1</b>
<b>Dependent variable</b>	<b>KH_TRA</b>
<i>Control variables</i>	
AGE_A	,292*
SIZE_A	,061
<i>Affiliate characteristics</i>	
MULTI_DO	-,157
MULTI_RE	,221*
AUTO	,388**
RD_INTA	-,282*
<i>Relationships characteristics</i>	
REL_QUALA	,337**
R <sup>2</sup>	,780
Adjusted R <sup>2</sup>	,677
F	7,587***

\*\*\*p<0,01 \*\*p<0,05 \*p<0,10

**Table 4: Results of regression analysis on knowledge acquired, suppliers' improvement and new knowledge creation (n=39)**

<b>Variables</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
<i>Dependent variables</i>	<b>KH_ACQ</b>	<b>IMPR</b>	<b>NEW_KH</b>
<i>Control Variables</i>			
AGE_S	-,261*	,256	,300
SIZE_S	-,399***	-,115	-,104
TIER	,082	-,031	-,010
<i>Relationships characteristics</i>			
REL_ST	,080	-,068	-,091
REL_LT	,432**	-,150	-,221
REL_QUALS	,257*	,169	,379**
<i>Supplier characteristics</i>			
TECH_PE	,050	-,143	-,119
TECH_INF	,057	,192	,011
TRAIN	-,362**	-,003	-,085
KH_EXCH	-,155	,344*	-,453**
RD_INT	,038	,199	,351**
<i>Knowledge acquisition</i>			
KH_ACQ		,487**	-,005
R <sup>2</sup>	,567	,524	,551
Adjusted R <sup>2</sup>	,403	,305	,344
F	3,452***	2,389**	2,657**

\*\*\*p<0,01 \*\*p<0,05 \*p<0,10

According to the empirical results, there are many influential factors identified.

#### 4.3 Foreign affiliates' characteristics

Foreign affiliates' characteristics do play an important role in the process of knowledge transfer to locally owned suppliers and are critical for the developmental impact of TNCs in transition economies

According to Model 1, the autonomy in supply-related decisions is the factor with the highest level of influence in the transfer of knowledge to locally owned suppliers. This result confirms and complements other recent studies on backward linkages, some of them looking at transitional economies (Jindra et al., 2009). Results show that MULTI\_RE influences the transfer of knowledge to locally owned suppliers. Thus, foreign TNCs which produce in Poland for the regional market

(Europe, Eastern Europe) are more likely to transfer knowledge to locally owned suppliers than affiliates oriented to the local market.

R&D\_INTA is negatively related to knowledge transfer to locally owned suppliers. As R&D tend to be higher in those firms involved in competence-creating functions and which have gained a higher degree of strategic independence (Cantwell and Mudambi, 2005), it could be argued that those foreign affiliates are likely to demand well-developed supply capabilities (Hansen et al., 2009) and make use of technology-intensive proprietary components often produced in developed countries or by highly performing foreign owned suppliers operating in Poland. AGE\_A is positively related to knowledge transfer. It can be argued that age is a good predictor of acquaintance with local context as taking roots in the host economy is by and large a function of time. This confirms the notion of “vintage effects” found by Kyota (2008) in a recent study on local procurement in South-East Asia. Foreign affiliates that have long been operating in the country have developed a certain degree of embeddedness and are likely to have established a base of indigenous suppliers.

#### *4.4 Inter-firm relationships’ characteristics*

Confirming previous research, empirical results emphasise the importance of inter-firm relationships. Model 1 shows that REL\_QUALA influences the transfer of knowledge to indigenous suppliers. The stronger the ties with locally owned suppliers, particularly in terms of commitment and trust, the most likely foreign affiliates will transfer knowledge to local firms.

The same results appear on the suppliers’ side. REL\_QUALS and REL\_LT significantly influence the acquisition of knowledge, confirming the importance of relation-specific assets as a source of competitive advantage (Dyer et al., 1998) and emphasising the importance of long-term relationships. The establishment of a long-term relationship is particularly relevant for indigenous suppliers in transition economies. In fact, the transition of Central and Eastern Europe towards a market economy is affording many changes, most of which are conditioned by an ideological shift in thinking with regard to doing business in a free-market economy.

Yet, given the dependence of many large enterprises on the state and the continuing levels of market uncertainty and change, generated by the transition process, adversarial and opportunistic relationships have initially predominated in local firms as managers tended to compete for political support and short-term advantages (Whitley et al., 1996).

Moreover, it would be a mistake for a supplier to make major investments in dedicated assets to suit a customer's requirements in the absence of long-term contractual agreements about future business. Yet, if a skill is specific to one buyer, then a supplier should make sure in advance that the buyer is willing to assure the supplier of a return on its investment in learning (Pérez and Sánchez, 2001).

Relationships characteristics do not show any relevance when considering supplier performance improvement. This may depend, as noticed by Kotabe et al. (2003), on the scale of knowledge exchanges. The authors argued that simple technology exchanges can enhance supplier performance and are independent of whether a buyer and supplier have established familiarity through a long-term relationship.

The situation is different when looking at suppliers' new knowledge creation. In fact, REL\_QUALS shows a positive level of significance in NEW\_KH. Yet inter-organisational closeness promotes a common understanding between foreign affiliates and locally owned suppliers which can be expected to facilitate mutual learning and so the creation of new knowledge. Through the relationship, locally owned suppliers learn from the interaction with foreign affiliates about each other's need, resources and strategies and both become committed to the relationship and have common interest in its development. This is confirmed in a recent study by Chang and Gotcher (2008). The authors investigate the relationship between relationship learning and dyadic knowledge creation in 118 Taiwanese supplier-international buyer relationships and find that relational capital based on mutual trust and respect facilitates a mutual exchange of information that works to develop information exchange and enhance dyadic knowledge creation.

#### *4.5 Suppliers' characteristics*

Results of Model 2 show that only a few locally owned suppliers characteristics have a significant influence on knowledge acquisition and all these relationships show a negative sign.

As far as the negative influence of SIZE\_S and AGE\_S is concerned, arguably this may be justified with the characteristics of Poland as a transition economy.

Firm size has a number of implications for the importance of external knowledge. On one hand external knowledge offers a potential for small firms whose internal knowledge base may be small; on the other, gathering external knowledge requires the commitment of resources which small firms may not be able to expend. In this case, the issue that size has a negative effect on the acquisition of knowledge could mean that, possibly, economies of scale are negated by organisational inefficiencies in large Polish firms. Larger ventures do not have more resources to devote to key customer relationships, while small firms may show a higher degree of flexibility to respond to the requirements of foreign affiliates.

Looking at the negative relationship between AGE\_S and KH\_ACQ, it could be argued that the youngest companies, which have been mostly operating in a market economy system, may have a higher capacity to take in new knowledge, while older firms, due to their longer years of activity in a context of planned economy, may be less used to taking in new knowledge, even if they could profit from an experience advantage. Additionally, it can be supposed that older firms are more experienced than younger firms and, therefore, perhaps require the foreign knowledge less.

The third firm-level characteristic showing a negative level of significance is TRAIN. This result contrasts with the findings from Minbaeva et al. (2003), according to which employee training within the recipient organisation plays a vital role in the recipient's employee capability building and the degree of knowledge transfer. A justification could be that the type and effectiveness of training organised by suppliers may not be appropriate and perhaps more concerted efforts between foreign affiliates and local suppliers may result in enhanced ability by suppliers to acquire knowledge and to use it to greater positive benefit.

#### *4.6 Knowledge absorption and impact*

KH\_ACQ shows the highest level of significance in local supplier performance improvement (IMPR), indicating that knowledge acquired from foreign affiliates can be a powerful driver of improvement of local suppliers' capabilities .

Model 3 shows, additionally, that KH\_EXCH is also significant for local suppliers' performance improvement. As this variable indicates the ability of an organisation as a whole to stimulate and organise the transfer of knowledge across departments, functions and individuals, the result indicates that, to have an effect, information acquired should be transferred to the organisation and then transformed through an internalisation process that requires dissemination and assimilation.

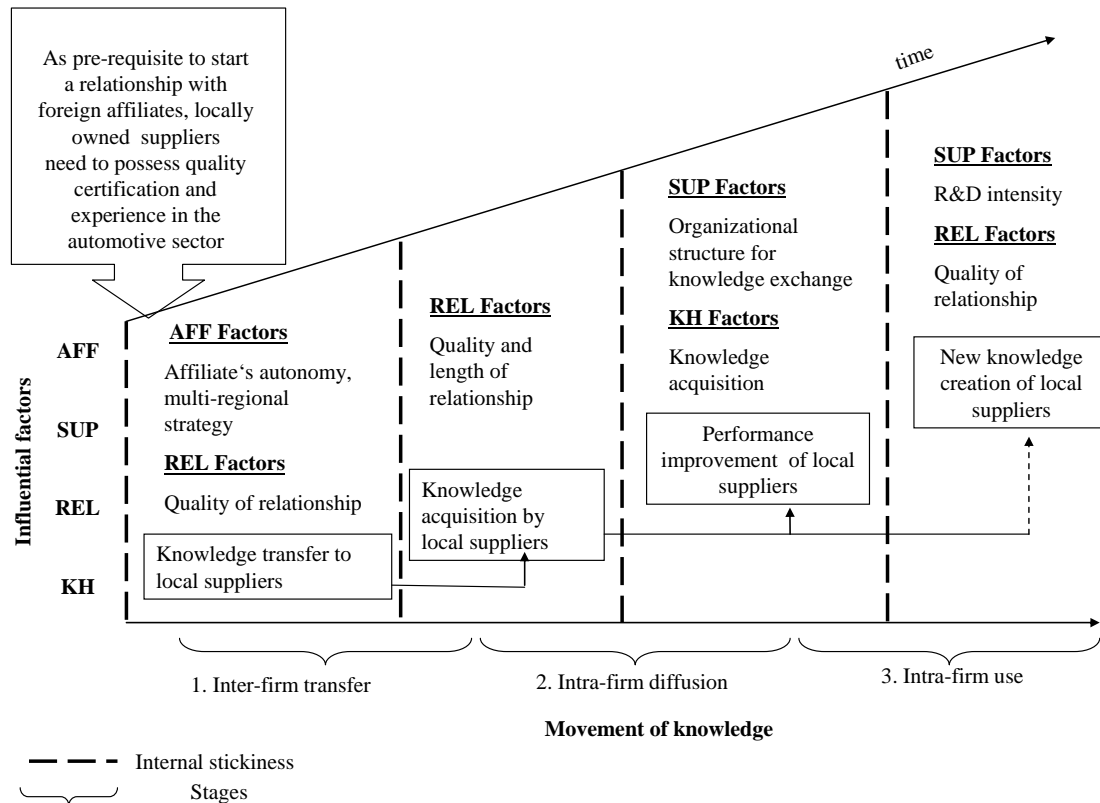
While KH\_ACQ is significant in influencing performance improvement of locally owned suppliers, it does not influence locally owned suppliers' creation of new knowledge (NEW\_KH), showing a negative sign in Model 4. It could be argued that constantly recognising the external supply of new knowledge consumes managerial time, energy and resources of the firm that cannot be devoted to the absorption or integration process, leaving fewer resources for the actual innovative endeavour (Ahuja and Katila, 2001). Model 4 shows that the variable which is significant against new knowledge creation is R&D\_INTS. This is in line with the literature on absorptive capacity affirming that knowledge recipient firms will better absorb acquired knowledge when they have their own innovatory capabilities

### **5. AN INTEGRATED FRAMEWORK OF KNOWLEDGE TRANSFER; ACQUISITION AND ABSORPTION**

In this section, results discussed above are integrated in a conceptual framework for knowledge transfer between foreign affiliates and Polish owned suppliers in the automotive sector, which brings an important contribution to the literature. The framework identifies on one side the movement of knowledge, distinguishing its external and internal movement (inter-firm transfer; intra-firm diffusion, intra-firm use) and, on the other, foreign affiliate-level (AFF), local suppliers-level (SUP),

relationship-level (REL) and knowledge-level (KH) factors influencing transfer, diffusion and use of acquired knowledge, as shown in Figure 1 .

**Figure 1: Integrated framework of knowledge transfer, acquisition and absorption**



Before deciding on the transfer of knowledge, foreign affiliates make a series of tests and visits at the local suppliers' sites to evaluate facilities and firm potential. In the specific case, foreign affiliates verify if locally owned suppliers possess ISO quality certification (for most foreign affiliates, ISO TS is a must) and if they have experience in the automotive industry. Due to the peculiar functioning and requirement of the automotive industry in terms of quality and delivery times, previous experience in the industry is considered by all foreign affiliates as a pre-requisite. Once these requirements, which

could be called 'relative absorptive capacity', are satisfied, affiliates' characteristics and relationships' characteristics facilitate the transfer of knowledge to local suppliers

Affiliates with a higher degree of autonomy in supply-related decisions and with a multi-regional configuration are more likely to transfer knowledge to locally owned suppliers. Moreover, a good quality of inter-firm relationships motivates the transfer.

Once these conditions are met, relationship-related factors acquire more importance than suppliers' own characteristics in influencing the acquisition of knowledge from foreign affiliates. As knowledge acquisition mostly requires an investment in resources and time, relationships need to be strong and long-term oriented.

Once the knowledge is acquired, the absorptive capacity of locally owned firms gains importance, contributing to the diffusion and use of the acquired knowledge.

To have an impact on the performance of local suppliers, acquired knowledge needs to be diffused within the recipient firm. In that way, locally owned firms are appropriately equipped to exploit the potential of the acquired knowledge and to fulfil the contractual obligations with foreign affiliates. While knowledge acquisition is influential in improving the performance of locally owned suppliers, it is not significant in generating innovativeness. In order to exploit external knowledge effectively, to generate new products and product/services innovations, it is necessary that local firms show a higher degree of R&D intensity. External acquisition of knowledge and internal R&D can then be considered as complements and not as substitutes. This implies that managers have to integrate tightly the internal and external knowledge to capture the effects each type of innovation has on the marginal return of the other.

Additionally, the quality of relationship is also important for innovativeness, as it could help to carry out joint R&D activity and to facilitate mutual learning. When foreign affiliates ask locally owned suppliers to develop new products, it is important for local suppliers to know that the relationship is strong and that the investment can count on a solid relationship.

The integrated framework shows how important relationships are between foreign affiliates and locally owned suppliers. They are fundamental in generating not only the initial transfer of knowledge



from foreign affiliates but they also influence the acquisition of knowledge and the use of knowledge to create new knowledge.

Arguably, it could be affirmed that relationships factors may be stronger in the case of a transition economy where companies have been operating for a long time with a different mentality.

By combining issues of foreign affiliates' strategy, suppliers' absorptive capacity and relationship characteristics with knowledge transfer, this research complements and extends past literature on backward linkages and inter-firm knowledge transfer. It follows the suggestion of recent research that the *"..inclusion of both foreign affiliate and local firm in dyadic relationships, as well as the complexities of multiple relationships is necessary to fully understand the influence of linkages on firm development"* (Giroud and Scott-Kennel, 2009:564).

## 6. CONCLUSIONS

This paper has focused on the debate on how TNCs facilitate firm-level upgrading in transition economies through the establishment of linkages and the transfer of knowledge to locally owned suppliers. We concentrated our analysis on the factors facilitating knowledge transfer/ knowledge acquisition and on those factors influencing the impact of acquired knowledge on local firm capabilities and degree of innovativeness. Empirical results showed that foreign affiliates contribute to the knowledge base of local firms. Knowledge acquired enables local firms to enhance their performance and raises their ability to create new knowledge if the local company has its own innovative capabilities. This confirms the evolutionary perspective on technology development (Kim and Nelson, 2000; UNIDO, 2002) that emphasises that technology transfer from industrialised to developing economies is mostly based on local inter-firm linkages arising from the manufacturing and assembly activities of foreign TNCs, where local suppliers can learn product and process technologies as well as managerial techniques

Results of the empirical analysis have many implications for managers of both foreign affiliates and locally owned firms, as well as for Poland as a country which is strongly promoting the attraction of FDI in the automotive sector.

The awareness of the potential impact of affiliates on the development of the host country industry may benefit TNCs themselves. Where foreign affiliates succeed in establishing a relationship with locally owned suppliers and transferring knowledge to them, they can also develop their own competences and, in the long run, these competences of the foreign affiliate can be beneficial to the TNC by sharing knowledge accumulated and adapted to local environments (Jindra, et al., 2009).

Considering that suppliers represent a critical resource for foreign firms, these should increasingly adopt supplier development programmes, extending their long-term cooperative efforts with their suppliers (Watts and Hahn, 1993). There is strong evidence that organisations today are increasingly implementing such programmes to improve supplier performance and remain competitive (Modi and Mabert, 2007). Our findings tend to support recent research arguing that collaborative relationships based on a customer-initiated assistance programme are likely to facilitate learning and knowledge transfer for suppliers (Dyer and Hatch, 2006; MacDuffie and Helper, 2006).

Looking at the implications for locally owned suppliers, empirical analysis confirms that knowledge acquisition from foreign affiliates can be associated with supplier performance improvement, at every tier level, while suppliers' own innovative capabilities are critical to create new knowledge.

To maximise the effects of their interaction with foreign firms, Polish companies need to make efforts to cultivate and maintain good buyer-supplier relationships. Long-term buyer-supplier relationships, based on trust and mutual satisfaction, imply loyalty on both sides and the involvement of buyers and suppliers, regardless of their size, in a long-term relationship based on clear and reciprocal agreements on goals.

The future development of locally owned suppliers will depend, above all, on the capabilities of domestic firms to absorb new knowledge. The process of learning is not automatic and as well as identifying the learning potential these firms need to invest in related internal capabilities that will increase the potential for increased performance and knowledge generation. Regarding site training activity, more concerted efforts between foreign affiliates and local suppliers may result in enhanced ability to use acquired knowledge to greater positive benefit.

While locally owned companies in the automotive sector have already achieved a good level of quality standard, independent domestic research should be developed, as it determines the fate of absorptive capacity in the long run. Internal research capabilities are indispensable to exploit external know-how effectively as internal R&D spurs a more effective monitoring and use of external knowledge resources and networks.

Additionally, local suppliers need an active approach to maximise their benefits from participating in a foreign affiliate network. A development initiative that could help locally owned suppliers to move towards world class standard could be, for instance, the creation of a supplier association based around major buyers with the objective to disseminate relevant technologies and best practices through the local supply chain.

Given these results, how should policy makers in Poland maximise the benefits of TNCs' investment for their local economy? This issue is critical as FDI has played a pivotal role in the transformation of post-communist economies of Central and Eastern Europe for more than a decade now. However, even though some OEMs are considering new projects or the expansion of existing ones in Poland, the wage increase of recent years and the shortage of qualified personnel are becoming serious limitations to further growth of the industry. The rising value of the Sloty and the increasing wages may undermine the advantages of low-cost production in Poland and car manufacturers may decide to relocate their production further East. In such a context, the ability to offer advantages other than costs would be a crucial determinant of competitiveness for Poland.

The results of the analysis provide policymakers with the confirmation that foreign investors are not all good linkages' creators and sources of potential spillover. These findings support the differentiation of FDI policies among governments in developing countries based on the principle that different policy instruments apply to different TNC strategies.

The Polish government could maximise the benefits to be gained from foreign firms' operation in the automotive industry by supporting the external technological environment in which locally-owned firms operate. This will allow more development of local channels of knowledge transmission, which is fundamental to the development of Poland's competitive advantage (Manolopoulos et al., 2005). Ties to universities appear as strongly and positively associated with product upgrading. Scholars from

a variety of disciplines are increasingly finding that such public-private institutions are often key sources of supplemental resources for smaller firms as well as forums for the nurturing of collaboration and knowledge diffusion (McEvily and Zaheer, 1999).

More general, policies should be pursued which benefit domestic firms in strengthening their absorptive capacity as this is what allows firms to have a long-term benefit from linkages with foreign firms. As indicated by Kesidou and Romjin (2008:2024), policies should emphasise the importance of a 'pro-capability' approach to the stimulation of innovation.

Human capital investment, for instance, could constitute an effective long-term policy for taking advantage of foreign capital and for favouring linkage creation and knowledge transfer. As indicated by Rodriguez-Clare (1996), insufficient and /or inadequate human capital could determine a shortage of local manufacturing abilities as well as a lack of variety of goods in the local markets, which will increase the likelihood that TNCs displace local activities and will generate limited or no backward linkages at all.

This objective could be achieved through direct subsidies to firms investing in knowledge and through country-wide policies, as emphasised by Bell and Pavitt (1993: 201-2), aiming at favouring intra-firm training in the activities of design, production engineering, quality control and R&D. These measures could contribute to facilitating cooperation between foreign investors and domestic firms in R&D. This is particularly appropriate for Poland which, in relation to other EU countries, shows a low level of R&D and for the automotive sector, as the innovative capacity of suppliers is a critical factor of their ability to respond to the increasing demands and challenges expressed by customers.

An instrument to help indigenous companies to respond to the challenges of foreign firms could also be a government-sponsored National Supplier Development Programme (NSDP). This could provide funding and technical assistance for small and medium-sized enterprises that supply large companies.

We recognise some limitations of our empirical studies. Firstly, since this study was in the specific automotive sector and in the particular context of supply firms, comprehensive generalisation is precluded. Second, even though reliability analysis shows that respondents display internal consistency, use of a single informant for each firm might introduce some biases. Nevertheless, the

majority of the respondents for both surveys were top executives and more than half of the respondents in each sample had been with their firms for more than 5 years. Hence, most of the respondents were probably the most qualified people in their firms to provide the information required. Finally, the study's small sample size, although consistent with many studies of knowledge transfer (Bresman et al., 1999; Lane and Lubatkin, 1998; Szulanski, 1996; Zander and Kogut, 1995), limits the generalisability of the findings.

Overall, results of this study allow suggestion of avenues for future research. We consider that, at the methodological level, more longitudinal applications need to be investigated, in a structured way, allowing an understanding of the dynamics of knowledge acquisition, knowledge absorption and new knowledge creation. Additionally, in-depth case studies of domestic suppliers could generate a deeper understanding of the relationship with foreign affiliates, the significance of the knowledge acquired from foreign customers and the process of knowledge absorption and creation.

Future research is also needed to explore knowledge transfer and impact in different phases of the supplying relationship. This study did not differentiate at which stage of the supplying relationship firms were, while it is likely that the relationship quality differs on the basis of the relationship phase. Finally, as the results presented within this study focus on one industry only, future research ought to focus on other industries, particularly on the service industry, as there is little evidence in the literature on the impact of TNCs in transition countries on local firms, despite the rising level of FDI in the service sector worldwide.

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