Chapter 15.

Supply networking in middle-tech sectors: contrasting patterns among emerging economies

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15.1. Introduction: supply networking and innovation in emerging economies

One of the signal and universal failures of socialism, in all its Soviet and post-Soviet forms, was the failure to build rational supply networks. Factories in the Soviet Union, in China in the early phase of industrial development, and in most of the Central-East European (CEE) countries, were organised on a crude Fordist model, with the bulk of ancillary activities clustering around the main production line, but usually organised on a very low technological base, and showing very poor productivity indicators. To the extent that there was outsourcing, it was usually done through the hierarchies of industrial ministries and their subdivisions, which tended to result in irrational location patterns and, again, weak technological bases and low productivity. The market socialist countries (Yugoslavia and Hungary) managed a partial break with this pattern in the reform period from the 1960s onwards, but many of the classical features of Soviet-industrial organisation survived in these countries right up until the beginning of the transition period.

Against this background, it is not surprising that the building of technologically dynamic, high-productivity supply networks has been one of the priorities of post-socialist economic reconstruction.[1] Developments driven by foreign direct investment (FDI) have been particularly rich in this regard. Concentrated in middle-tech areas like consumer electronics and the car industry these invest-

[1] We should not, strictly, include contemporary China under the post-socialist rubric. In economic terms, however, to do so does little violence to the facts.

ments have spawned powerful hierarchies of supply, running from design- and technology-intensive first-tier suppliers down to second- and third-tier component suppliers. Some elements in these hierarchies have managed to develop independent export capability. And while FDI has often provided the impetus, some sectors, like the bicycle sector in China, have been notably successful in supply network building without any significant element of foreign ownership.

However, for all its undoubted dynamism, supply network development in the emerging economies has been at best uneven, at worst spotty, and incoherent. In only a few cases have fully-fledged supply hierarchies emerged. In the great majority of cases, one tier or another is missing. Multinational companies have devoted large-scale resources to supply-network-building, but in many cases have ended up bringing their existing suppliers with them, or sourcing from the 'home' country. The precise pattern of unevenness varies widely from one emerging economy to the next. The present paper seeks to use those contrasts and inconsistencies as a basis for understanding the underlying problems of supply-network-building in emerging economies. Before attempting that, we pause to examine in greater detail the way in which supply networks have developed in three different contexts – in CEE, a region dominated by the agenda of accession to the EU, in Kazakhstan, as a typical Soviet successor state, and in China, the pioneer of a uniquely Asian form of what should properly be called 'market socialism'.

15.2. Industrial supply networks in CEE

All of the CEECs have large and well-developed manufacturing sectors, producing a wide range of mechanical-engineering-based, electrical and electronic goods and components. Not all of these sectors and sub-sectors have formalised supply hierarchies, but the general pattern in manufacturing as a whole is clear-cut: CEE does not have first-tier suppliers capable of competing on global markets (Dyker *et al.*, 2003; Dyker, 2004). The exception to this rule is Slovenia, which also has the most developed economy of the region in terms of GDP per head, and it is tempting to explain the contrast between Slovenia and the rest of CEE simply in terms of general levels of economic development. There does, however, appear to be a significant microeconomic side to the story as well.

What kinds of firms are these Slovenian first-tier suppliers? They are mostly electrical and electronic firms, many of them serving the automotive industry. But the most interesting thing about them is that are all daughter-firms of *Iskra*. Iskra was a big electronic conglomerate, which emerged as the leading exporter of the old Yugoslavia. After Slovenian independence, it was broken up, but the legacy of *Iskra* has continued to dominate the Slovenian manufacturing scene.

Iskra obviously had the advantage of 'growing up' in a kind of market economy. But so had many other firms from the old Yugoslavia, of whose legacy we now hear nothing. And Yugoslavia was not the only CEEC to adopt a market socialist system. Hungary, too, abandoned central planning and introduced a 'New Economic Mechanism' in 1968. That change undoubtedly strengthened Hungary's capacity to export manufactured goods. Yet, by the early 2000s, a direct comparison of supply networks in Hungary and Slovenia produced a stark result – Slovenia had first-tier suppliers, and Hungary had none (Dyker *et al.*, 2003).

No doubt the market socialist environment of the old Yugoslavia was a necessary condition for the emergence of an Iskra – but only in the sense that it made it *possible* for that company to develop as a unique repository of technological and design capability, able to compete on international markets, and indeed a major source of hard currency for the government of the old Yugoslavia. And while the knowledge embedded in the Iskra organisation represented a critically important legacy of Yugoslav market socialism, it was a legacy based on firm-specific, tacit knowledge. Customers and suppliers of Iskra might pick up some of that tacit knowledge, but the major channels of dissemination of Iskra know-how stopped at the boundaries of the Iskra complex. The break-up of Iskra as a formal business conglomerate in the early 1990s did not break up Iskra as a knowledge complex. But for the same reason it did not automatically open up new channels of dissemination of technology and design from Iskra to the rest of the national and regional economies.

What was it about the East European socialist heritage that was so inimical to the development of top-class supply industries? It was certainly not lack of scientific capability. All of the Soviet-bloc countries had well-developed S&T systems, usually operating largely under the aegis of national Academies of Science, and employing in total several million researchers and ancillary workers. In the late 1980s, the CEECs and the main industrial republics of the Soviet Union were all spending at least 1% of GDP on R&D, in one case as much as 4%. The average figure was about 2.5% (Gokhberg, 1999, p. 157). However, the structure of those S&T systems was poorly oriented to the needs of an efficient industrial supply system. Very little research was carried on in universities, which meant that universities did not have the kind of graduate programmes that feed top-class young specialists to industry in the developed market economies. Research institutes were grossly over-manned, and not all the research personnel were capable of producing good scientific research. Basic research was favoured over applied:

> *Apart from research carried out for military purposes, theoretical investigation was much more favourably treated than experimental and applied research, which often struggled with obsolete equipment, lack of maintenance, lack of the neces-*

> *sary, expensive, hi-tech – and even shortage of cheap, low-tech components and reagents.* (Kozlowski & Ircha, 1999, p. 115)

At the level of individual subjects, too, there was a strong bias in favour of 'classical' science, and against the organisational and life sciences.

> *Pre-1970 priorities (physics, nuclear energy, chemical engineering) [were] justified on the basis of a 'science push' and 'linear model of innovation' concept that was in turn perceived as leading to industrial development and linked to the technologies of heavy-industrial mass production and the military-industrial complex.* (Kozlowski & Ircha, 1999, p. 113)

The preponderance of the classical sciences was, therefore, firmly rooted in the preferences of communist régimes. However, scientists themselves found those sciences congenial enough in the restrictive political circumstances of Soviet-style communism.

> *Communist régimes used Marxism as a legitimising dogma. The doctrines of Marx, Engels, Lenin and Stalin were born at a time when physics predominated within science. Physics was treated by communist régimes as a signpost indicating the way that mankind should broaden its dominion over nature in accordance with the 'laws' of historical materialism. Chemistry, mathematics, and above all physics, have, nevertheless, exact, operational criteria of competence, and require exceptionally high levels of mathematical knowledge. Under the communist régime these factors enabled researchers to create integrated disciplinary communities that were (relatively) resistant to political and ideological control.* (Kozlowski & Ircha, 1999, p. 115)

There were structures in the old communist systems which focused on applied research, and on design, and which should, in principle, have been able to develop the scientific discoveries of physics, mathematics, and chemistry in ways useful for the development of complex industrial configurations. However, these structures were in the main subordinate to sectoral industrial ministries and (socialist) enterprises. Those organisations were forced by the imperatives of central planning to place first priority on the fulfilment of short-term quantitative output targets, so that research into new processes and products often had to take second place. Design, as an integrative function encompassing everything from conceptual research to marketing, was little understood.

These problems remained recalcitrant through the early years of transition. Thus in Estonia, always a front-runner in transition, engineering factories were still making their own drill bits in 1994 (Dyker & Radosevic, 1994, p. 4). Within science, the share of basic research (within an admittedly sharply contracting total) actually increased in the early and middle 1990s, while the disciplinary preponderance of mathematics, physics and chemistry remained pronounced as ever (Gokhberg, 1999; and Kozlowski & Ircha, 1999). Despite sharp cutbacks in budgetary support, most research institutes continue to be over-manned. State policies to encourage research institutes to link up with industry in the commercialisation of research results produced only patchy results (Balázs, 1996; Jasinski, 1997). In practice, research institute spin-offs often reduced to little more than academic moonlighting for short-term financial gain. Against this background, it is not difficult to see:

- why East European companies find it so difficult to take on the role of first-tier supplier, with all that that implies in terms of quality control, reliability, design capability and ability to cooperate creatively with other companies that are half partners, half rivals;
- why East European companies find it relatively easy to take on the role of second-tier or third-tier supplier, where the products concerned are fairly homogeneous, commodity-type (therefore easily adapted to quantitative production planning), where the price of inefficiency leading to low productivity is paid by the workers (in the form of low wages) rather than the company (in terms of lost contracts), and where the design component tends to zero.

15.3. Industrial supply networks in Kazakhstan

Most of what was said above about CEE is also applicable to Kazakhstan, as part of the former Soviet Union. However, an extra dimension is added to the problem in this case in that Kazakhstan was, indeed, only a region (however big) of a country, rather than a country. It was, furthermore, a region of a country in which central planning was practised in a much more rigid form than was common in even the more conservative CEEs in the pre-transition period. As a result, there were few main production lines located in Kazakhstan in the Soviet period. Rather, Kazakhstan's manufacturing capability was largely limited to medium-sided plants making components or semi-processed inputs for union-wide complexes managed by industrial ministries in Moscow. The picture was particularly sharply delineated in middle-tech, engineering-based sectors.

Such supply networks as did exist in Kazakhstan were fundamentally disrupted by the break-up of the Soviet Union. And new, nationally-based networks have not yet developed to take their place. The most striking example of this is the agricultural machinery sub-sector. Previously part of an all-union complex, the agricultural machinery companies of Northern Kazakhstan have signally failed to reorient their networking patterns to the new national dimensions - despite the existence of a strong local buyer base in the form of the wheat-producing industry of Northern Kazakhstan. Another example is steel. Kazakhstan steel firms are not important suppliers to Kazakhstan engineering firms, and Kazakhstan engineering firms are not important customers for Kazakhstan steel firms.

The scope for networking is further limited by the transaction patterns that have emerged under transition. Many Kazakhstan firms operate strictly on the basis of pre-paid orders (*po zakazam*). Given the financial constraints they face, this is understandable. Nevertheless, it does sharply limit their scope for building up on-going relations with clients, which can lead to knowledge-building – as well as to profitable business. Industrial associations exist, but they do not seem to operate as effective vehicles of 'horizontal' networking, at least in the engineering industry. The typical company in this sector of the Kazakhstan economy is effectively isolated to an extent rarely encountered in other countries.

Emerging trends in the foreign trade of Kazakhstan have tended to reinforce rather than alleviate these tendencies. In particular, the pattern of exporting has largely excluded significant learning effects. Notably in the engineering-based sectors, exporting has very much followed the domestic pattern – it has been in response to specific orders, probably partly or wholly pre-paid. In 2001, Kazakhstan exported machine-tools to a value of $212,700 to Iran. In no other recent year have exports of machine-tools to that country exceeded $100,000, and over the first six months of 2003 they were negligible. In 2001, Kazakhstan exported $150,000 worth of trailers to Kuwait. For every other recent year, the corresponding figure is zero. The pattern is absolutely identical for the United Arab Emirates. It is obvious that the Kazakhstan firms involved can learn very little from one-off deals like these. There is somewhat more continuity on the import side, but here, too, there is a tendency for patterns to be erratic. Thus, Kazakhstan imported $705,800 worth of tractors from Italy in 2000 and $946,000 in 2001, but virtually none in 2002 and 2003. Imports of heavy earth-moving equipment from Slovakia came to $1.908 m in 2000, but have been negligible since. These patterns may make some sense in terms of obtaining value for money, but, again, they tend to limit the scope for significant learning effects.

FDI in Kazakhstan is mediated by 5,300 foreign-owned companies and joint ventures.[2] It generates $8.5 bn of turnover each year and employs some 315,000 people, around 4.3% of the active population of the country. Annual inflow of FDI into Kazakhstan industry has been around $3 bn in recent years, coming to $2.95 bn in 2002. These figures compare favourably with corresponding figures for CEE. The annual trade surplus from FDI is some $1.5 bn. While FDI in Kazakhstan is heavily oriented to exporting, it also serves the home market, with domestic sales from companies hosting foreign investment standing at over $6 bn annually (*Kratkii*..., 2003, p. 136). FDI in Kazakhstan is heavily concentrated

[2] Figure for 2002. This represented a 33% increase on 2001. See *Kratkii…* (2003), p. 135.

in the oil and gas sectors, with 71% of inflow into industry in 2002 going to those sectors, and some 35% of turnover from FDI originating from Atyrau *oblast'*, the main oil-producing area. In global terms, these are not the sectors with the highest potential for generating learning effects, because they do not tend to spawn highly ramified supply networks, and because they sell globally. But they do need a supply base, and many of their supplies, especially in relation to drilling, have to be to the highest specifications. At present, the bulk of these supplies are imported.[3]

Outside the oil and gas industries and allied sectors, where Chevron, British Gas, Agip and Mobil are the biggest foreign investors, FDI has been at a comparatively low level. There are one or two significant islands of FDI in manufacturing. Lucky Goldstar (LG) of Korea is responsible for giving Kazakhstan revealed comparative advantage in the manufacture of TVs and PCs. However, this operation is purely assembly, with all components being brought in from Korea. The coefficient of value added in Kazakhstan is only about 5%. Siemens manufactures computers, computer parts and general electrical supplies in Kazakhstan, but has been reluctant, up to now, to embark on large-scale investments. The Karaganda Steel Works is owned by the international steel firm ISPAT, and trades under the name ISPAT-KAZMET. But the works is largely oriented to the export market for rolled steel, and supplies little to domestic steel-users. Reorientation of the plant to the supply of special steels to the domestic market (mainly to engineering companies) would require major restructuring, and would likely involve a critical loss of economies of scale.[4] ISPAT-KAZMET also tends to obtain its own supplies from abroad. Samsung has a 27% share the Kazakhmys copper and silver mining concern, based in Dzheskazgan. These projects have been of considerable importance in themselves. The development of Kazakhmys, in particular, has demonstrated how the introduction of leading-edge soft technology can revolutionise a traditional, primary-producing sector. But none of the plants involved have a big networking effect on the Kazakhstan economy as a whole, none have done much to raise the game of other Kazakhstan companies (See *Innovative Industrial...*, 2003, p.18). We should note the LG does have strategic plans to raise the domestic proportion of value added in its Kazakhstan operations, and that it is being supported by the Kazakhstan Investment Committee in this, in the form of specific forms of tax relief in relation to the production of washing machines and vacuum cleaners. Overall, however, the conclusion must be that, while the impact of FDI

[3] At present Kazakhstan imports annually some $2 bn worth of equipment, this accounting for some 30% of total imports. It can be assumed that the bulk of these imports go to the oil and gas industries.

[4] Note that ISPAT does have plans to build a plant near Aktau, on the Caspian Sea, to manufacture large-diameter pipes for the oil and gas industry. See Tazhutov, 2003.

in Kazakhstan outside the host firm itself has not been non-negligible, it has been much less than experience in other transition countries suggests is possible. Indeed, foreign-owned companies in Kazakhstan seem to share the same characteristic of *isolation*, which we picked out as a key feature of domestic firms.

15.4. Industrial supply networks in China

The economic history of China is clearly very different from that of CEE and Kazakhstan. For all the tremendous success in the development of an export-oriented manufacturing sector in the coastal region of the country over the past twenty years or so, China as a whole remains a predominantly agrarian country with a level of GDP per head of not much more than $1,000. More important, when China first started out on the 'New Course', involving the marketisation of a significant section of the Chinese economy, the level of general industrialisation in the country was still extremely low. In distinction to CEE, therefore, China did not inherit a distorted pattern of industrialisation (and a correspondingly distorted pattern of human capital accumulation) from the pre-reform era. Nor did it inherit a deeply ingrained culture of central planning, with a brief period of Soviet-style planning 1958-61 quickly followed by the chaos of the Cultural Revolution, and then the adoption of the New Course. In that respect, the history of China is much more like that of Yugoslavia/Slovenia than that of the Soviet Union or, say, Poland or the Czech Republic.

In one respect, however, the Chinese pattern has been very similar to that of the Soviet Union and the former Soviet-bloc countries of Eastern Europe. The 1950s saw the establishment in China of a Soviet-style S&T system, with all its characteristic weaknesses, notably neglect of applied research and design, and of university research and graduate programmes (Suttmeier & Cong Cao, 1999). The launching of the New Course signalled a major change in direction in the scientific sphere, too, and the 'Decision on the Reform of the S&T Management System' of 1985 sharply reduced budgetary grants to research institutes and sought to encourage the development of 'Academy-industry links', thus anticipating the trend in CEE in the 1990s. In China, as later in CEE, the marketisation process had unintended consequences, with many institutes forming 'new technology enterprises' (NTEs), to operate as profit-oriented, high-tech companies. But the Chinese government decided to accommodate and even facilitate this development, with the launching of the Torch programme in 1988, which saw the creation of some hundreds of high-tech zones in China, providing premises and infrastructure for some 65,000 NTEs by 1998. In one case, a company that started off as an NTE – the Legend Group, China's biggest computer firm –

has actually ended up by taking over its parent institute – the CAS Institute of Computing Technology (Suttmeier & Cong Cao, 1999).

The process of restructuring the Chinese S&T system has clearly gone a lot further than parallel processes in CEE. But we should not exaggerate the impact of this process. With China spending on S&T less than 1% of GDP, the potential effect of Chinese science on the economy is sharply limited. In any case, however, that potential is far from attained. The quality of Chinese scientific output continues to be uneven, research institutes are still overmanned, and linkages between science and industry continue to be generally weak (Suttmeier & Cong Cao, 1999). The Chinese S&T system has certainly not stood in the way of the development of the Chinese industrial supply system. However, it is clearly not a major factor in the explanation for the phenomena we are researching. To go further in that quest, we have to look at the history of Chinese engineering-based manufacturing itself.

China started making lorries (using Soviet models, in terms of both process and product) in the early 1950s. Car production (initially very limited production of limousines for high officials) started in 1958. But political instability hampered the development of the new industry, and in 1961 only five cars were produced in the whole country. The 1960s saw the expansion of lorry production, but car production continued to be oriented strictly to the official market, and just 196 cars were produced in China in 1970. The principle of regional self-sufficiency which was politically prevalent at the time, however, ensured the creation of a very large number of (mostly small) automotive factories – as many as 1,950 by 1976 (Tsuji & Quan Wu, 2004, p. 232), while the principle of self-reliance meant that many of these companies were working largely with the (restricted) experience and know-how of the domestic industry. Thus, when the New Course was proclaimed in 1978, China had already accumulated a significant, if limited, amount of physical and human capital in the motor vehicle industry. It was only, however, with the influx of foreign capital and technology into the industry from 1983 that the Chinese automotive industry began to move towards world standards. If we want to understand the *indigenous* forces that drive Chinese machine building towards the production possibility frontier (in qualitative as well as quantitative terms), we have to look at sectors where the foreign investment element is not present.

Such a sector is the humble bicycle industry. The Chinese bicycle industry was already producing nearly ten million units per year in 1978 (Zhang *et al.*, 2004, p. 179). Driven by demand from a huge domestic market, untrammelled by political prejudices, the sector was already a mass-production industry in the time of Mao, and it tripled its output to nearly 30 m units per year between 1978 and 2000. While the domestic market remained the main focus of the sector,

several million Chinese bicycles were being exported each year by the turn of the century.
The bicycle industry inherited from the earlier period and developed under the New Course was primarily state-owned. However, by the early 1990s, the big, state-owned bicycle companies were beginning to run into serious financial difficulties. At this point, private companies emerged as a new, dynamic force in the industry, to take it forward to the fresh triumphs of the early 21st century. By 2000, private companies in Tianjin alone[5] were producing 13 m bicycles per year.

These private bicycle producers are predominantly small family firms – in 2000 there were no fewer than 283 in Tianjin alone. Significantly, they developed initially as component suppliers to the big, state-owned bicycle manufacturers. It is perhaps for that reason that:

> *These small enterprises that are independent and [at the same time] interrelated have formed an industrial chain that is difficult to imitate and copy. This kind of industrial chain based on division of labour and cooperation can produce new productive forces, overcome the shortcomings of the weakness of individual enterprise[s] and improve overall scale strength*. (Zhang *et al.*, 2004, p. 172)

The pattern of hierarchy within the industrial chains varies considerably. Sometimes the chain is made up simply of a large number of small and medium-sized firms, each concentrating on a single function within the chain. More reminiscent of the car industry is the pattern of

large core enterprises ↔ leading enterprises ↔ network of SMEs

(Zhang *et al.*, 2004, p. 183). This corresponds exactly to the standard hierarchy of

lead firm ↔ first-tier supplier ↔ second / third-tier supplier,

with leading enterprises

> *play[ing] the role of horizontal support in production, vertical tie[s] in selling and innovation and guidance in R&D for key technologies* (Zhang *et al.*, 2004, p. 179).

How exactly does the whole become greater than the sum of the parts in the operation of China's bicycle clusters?

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[5] In 2000 Tianjin produced 44.1% of total Chinese bicycle output. See Zhang *et al.* (2004, p. 179). NB Tianjin is also a major centre of the Chinese automotive industry.

> *Let us analyze direct economic factors. In Tianjin's bicycle enterprise clusters, specialized division of labor has improved production efficiency and relative concentration of geographical location has made enterprises able to obtain materials from local sources. It has reduced purchase cost, storage cost, circulating funds and the cost for changing processing links. Meanwhile, the close location and the network founded on the common basis of social culture have lowered trade expenses for enterprises and at the same time, saved time and expenses which enterprises have to spend in searching for production factors and market information. Moreover, this kind of interrelated organization structure forms [external] scale economies so as to meet the diversified and [particular] demands of the market. The industrial environment within clusters makes enterprises in clusters more adaptable to market environment and its changes. With this kind of industrial environment, enterprises in clusters can make use of the feedback mechanism between diversification of products and market [share] to form market power.*
>
> *The enterprises within clusters know relative market information about advanced technology, advanced accessories and equipment supply much earlier than those outside the clusters. Within clusters, information, knowledge and best practice can rapidly spread in the region and thus, the creative ability of enterprises and institutes has been improved and [a] regional innovation system has been formed. The interrelated organization structure within clusters makes various knots believe in each other and continuously accumulate knowledge through interaction and study.* (Zhang *et al.*, 2004, pp. 181-2)

The key factors of China's bicycle industry success, then, are external economies of scale, economies of information, trust, and collective learning. The overarching feature of the success story is that that it is a story of spontaneous and cumulative development. In biological terms, the Chinese bicycle industry just 'grew'.

15.5. Key sectoral case studies from each of the regions studied

15.5.1. The automotive industry in Central-East Europe (CEE)

The pattern of development of the vehicle industry and related industries under communism varied widely from one Central-East European country to another. Hungary and Slovenia had little vehicle production as such, apart from Hungary's Ikarus bus producer, but had significant capacities in general engineering. Czechoslovakia had the famous Škoda plant, one of the leading automobile producers of the pre-WW2 world, plus a network of supplier enterprises located in both the Czech and Slovak parts of the state. Unsurprisingly, Škoda was not able to maintain its technological dynamism under Soviet-style central planning, and by the 1980s, the Czech car producer had become a byword for low quality and obsolescence. But Škoda always managed to hang on to a low-end niché in Western markets, and the Škoda production network still represented an important legacy of human (if not fixed) capital for the new, democratic and capitalist Czechoslovakia (subsequently the Czech Republic and Slovakia) after 1989. Socialist Poland boasted two main car producers – FSM (Fabryka Samochodów Malolitrażowych) and FSO (Fabryka Samochodów Osobowych). The former produced Fiat models under a licensing agreement with the Italian firm.

Within a few years of the start of transition in CEE, the region's automotive industry had been largely taken over by the leading multinationals in the sector. Fiat bought FSM, while General Motors and Daewoo took over different parts of FSO, and Ford built a small assembly plant at Płońsk, near Warsaw. Volkswagen famously took over Škoda, and Renault extended their existing assembly plant in Slovenia. In Hungary, Suzuki and GM set up subsidiaries, respectively Magyar Suzuki and Opel Hungary, while Audi, part of the VW group, built an engine plant. As a Japanese-owned company, Magyar Suzuki were subject to a 50% Hungarian local-content requirement and a 60% EU local-content requirement, to the extent that they wanted to sell their output in the EU.

Table 15.1. Leading investments of automotive multinationals in CEE, 1989-2001

Firm	Subsidiary / Partner	Approximate value of investment (m US$)	Year of initial investment
Daewoo	FSO (Żerań), Poland	1,200	1995
Daewoo	Automobile Craiova, Romania	900	1994
Fiat	FSM, Poland	1,800	1992
General Motors	Gliwice, Poland	265	1995
General Motors	Opel Hungary	460	1991
Isuzu	Tychy, Poland	364	1997
Renault	Novo Mesto, Slovenia	54	1993
Renault	Dacia, Romania	100	1999
Suzuki	Magyar Suzuki	406	1990
Volkswagen	Škoda	2,000	1991
Volkswagen	Audi Hungária	923	1994
Volkswagen	BAZ, Slovakia	750	1991

Source: Pavlínek (2001), p. 16.

The experience of FDI in the car industry in CEE has been generally positive. After initial losses, most of the plants concerned were making profits by the late 1990s (see table 15.2). In the cases of Fiat's Polish plants, VW/ Škoda and Magyar Suzuki, these profits were coming largely from exports to the EU (Jones, 1999, p. 319). By the mid-1990s, VW/ Škoda was purchasing 80% of its supplies from firms located in the Czech Republic or Slovakia (Martin, 1998, p. 21). The corresponding figure for Magyar Suzuki was 54% (Ellingstad, 1997, p. 12). But these aggregate figures hide a striking unevenness in the pattern of development of the auto supply industry in CEE. While VW/ Škoda obtains most of its supplies from local firms, foreign firms continue to predominate among first-tier suppliers. Where first-tier suppliers are locally-based firms, they are nearly always wholly or partially foreign-owned (Dyker, 1999, pp. 14 & 19). The pattern is exactly the same in Hungary (Havas, 1999), while in Poland foreign firms have tended to follow an explicit policy of bringing their established first-tier suppliers with them (Havas, 1997, pp. 217-8).

Table 15.2. Profits of multinational automotive subsidiaries in CEE (m of national currency units)

	1993	1994	1995	1996	1997	1998
Škoda	-4,300	-2,400	-1,600	200	1,200	2,200
Magyar Suzuki	-6,840	-2,046	-351	887	1,651	16
Audi Hungaria	-	-1,056	2,811	4,386	15,900	44,343
Opel Hungary	736	6,095	14,584	20,691	32,246	33,305

Source: Havas (1999), Tables 1, 2, 6 & 7.

How are we to explain this poverty of first-tier suppliers among countries with long traditions of industrialisation and levels of GDP per head in the range of $5,000-15,000? Corporate strategy is certainly one factor. Opel Hungary have kept aggregate local content to a negligible level, leaving little room for Hungarian second- and third-tier suppliers, never mind first-tier suppliers (Havas, 1997, p. 230). Audi Hungaria followed the same strategy (Pavlínek, 2001, p. 28) as did GM Poland initially, later switching to a policy of encouraging local suppliers after the completion of its Gliwice factory (Havas, 1997, p. 216; Pavlínek, 2001, p. 25). VW may have been inclined to favour German- and/or Austrian-owned supplier companies for reasons of ‘cultural closeness’. But specialists from the region itself are in no doubt that the main reason for the lack of first-tier suppliers lies in the absence of critical technological and organisational capabilities. Thus, Havas (1999, p. 37) judges that in the CEE automotive industry

> ‘it is not feasible to “raise” – or keep alive – “national” first-tier suppliers’.

15.5.2. The automotive industry in China

As we saw earlier, Chinese automotive development during the 1950s, 1960s and 1970s was largely limited to lorry production. The line of development started to change after the death of Mao Tse-Dun, with the proclamation of the New Course in 1978. But by 1985 China was still only producing 5,200 cars per year. In the same year, China imported 106,000 cars, plus 111,000 lorries (Harwit, 2001, pp. 655-6). Against that background, the Chinese government decided to adopt a strategy of encouraging foreign car firms to set up joint ventures (initially with a 50% limit on the foreign shareholding) in China. The first such agreement was with American Motors Corporation (AMC, subsequently taken over by Chrysler Corporation, which was itself subsequently taken over by Daimler-Benz) in 1983, to set up production of the Jeep in Beijing. In 1984, VW signed a 25-year agreement to develop passenger-car production in Shanghai. They subsequently signed a similar agreement to set up and run a factory in Changchun. Peugeot also signed an agreement in 1984 to make cars in Guangzhou.

Table 15.3. The main Chinese automotive companies

Name	Country of origin	Annual production (units)	Location
Shanghai Volkswagen Automotive Company Ltd	Germany	278,890	Shanghai, Jilin
FAW-Volkswagen Automotive Company Ltd	Germany	191,695	Changchun
Shanghai GM Automobile Industry Co. Ltd	US	111,623	Shanghai
Tianjin Xiali Automobile Company Ltd	Japan	89,921	Tianjin
Dongfeng Peugeot Automotive Company Ltd	France	84,378	Hubei, Wuhan, Sichuan
Changan Suzuki Automobile Co. Ltd	Japan	67,846	Chongqing, Guandong
Guanzhou Honda Automobile Co. Ltd	Japan	59,024	Guanzhou
Jieli Group Corporation	China, Germany	47,370	Guanzhou, Jilin
China FAW Group Corporation	China	30,165	Changchun, Jiangsu
Yue Jin Motor Group Corporation	Italy	23,026	Nianjin

Source: *Chinese Automotive Industry Yearbook 2003.*

This deal was not a success, and Peugeot abandoned it in 1997, though they subsequently entered another joint venture. In combination with a number of medium-sized Japanese joint ventures (see table 15.3), it is these international operations that have dominated the emerging Chinese car industry, with only one wholly Chinese enterprise among the major vehicle producers of the country. Prior to China's accession to the WTO, all these joint ventures were subject to a 40% local content rule.[6]

Table 15.4. China's leading exporters of complex auto parts in 2001

Type of company by ownership	Name of company	Exports, m US$	Product types
Domestically owned	China FAW Group Corporation	44.3	Various
Multinational	Kunshan Liufeng Machinery Industry Co. Ltd	61.2	Aluminium alloy wheel hubs
Multinational	Siemens VDO Automotive Huizhou Co. Ltd	44.6	Car radios
Domestic, plus foreign j.v. partners	Wanxiang Qianchao Co. Ltd	43.0	Universal joint, bearings, drive shaft, constant velocity joint, rubber seal elements, ball bearings
Multinational	Shanghai Yanfeng Johnson Controls Seats Co. Ltd	43.0	Covers and parts for seats
Domestically owned	Guangzhou City Huanan Rubber Tyre Co. Ltd	41.4	Covers for radial tyres
Domestically owned	Zhejiang Wanfeng Autocar Group	29.8	Aluminium wheels
Domestically owned	Shandong Longji Group Co. Ltd	19.6	Brake drums and discs
Domestically owned	Xiang Torch Investment Co.Ltd	19.0	Brake discs, lights, mirrors, sparking plugs
Domestically owned	Fujian Yuanguang Combined Wire Co. Ltd	18.7	Wiring harness

Source: Sutton, 2004, p. 14.

There are 2,201 auto parts makers in China (*China*…, 2003). Of these, 352 have links with foreign companies. The first tier of the supply hierarchy, making exhausts, turbochargers, seats etc., is dominated by these 352 firms, with the rest largely making simple components. But of the top ten Chinese exporters of complex components, seven are Chinese-owned (see table 15.4). The pattern of development of the Chinese auto parts industry is typified by the development of the industry in Shanghai, where VW, in cooperation with the Chinese car indus-

[6] This was not an absolute requirement, but sub-40% local content entailed a penal duty on imported parts.

try at local and national levels, developed an explicit programme for the development of local suppliers, systematically transferring technology to potential first-tier suppliers (Tsuji & Quan, 2004, pp. 243-4; Harwit, 2001, p. 666).

The Chinese government is currently aiming to increase exports of car parts sharply in the period up to 2010, partly, perhaps, because they see less danger of a protectionist backlash from the developed countries in relation to parts than in relation to finished cars. No doubts have been raised as to whether China disposes of the basic technical capabilities required for this task (*China*…, 2004). But there are some doubts about whether the Chinese infrastructure could handle such an expansion. And there are more serious doubts as to whether China's second- and third-tier suppliers are capable of giving their first-tier suppliers the necessary support in relation to the demands of the export market.

15.5.3. The engineering-based industries in Kazakhstan

In 2002, there were 1,046 'machine-building' firms in Kazakhstan (45.3% fewer than in 1998), including 919 small, 93 medium-sized and 34 large. Of the total number of firms in 2002, eight were government-owned and 21 foreign-owned. All the rest were privately owned (some with a minority, non-controlling state shareholding). Employment has tended to fall in the engineering-based industries, totalling 74,900 in 2002 compared to 90,300 in 1998. After dropping sharply in the early and mid-1990s, the aggregate output of these industries recovered strongly in the period 1998-2001, before falling by 2% in 2002. The share of the engineering-based industries, taken together, in total industrial production fell from 3.4% in 2001 to 2.9% in 2002.

As tables 15.5-8 indicate, the overall financial position of the engineering-based sectors is not too bad. Since 1999, the average rate of profit in the electrical, electronic, and automotive sectors has gone up from around zero or less to 8-9%. But nearly a third of firms in these sectors make losses, and most of the companies involved are at best marginally competitive.

Table 15.5. Key financial indicators for the machinery and equipment industry in Kazakhstan

	1998	**1999**	**2000**	**2001**	**2002**
Total profit (m tenge)	-5275	-1073	-326	472	-477
Rate of profit	-27.7		-1.6	1.9	-2
Proportion of companies making losses					44
Fixed investment (m tenge)		265	82	66	
Share in total increment to industrial value added (%)		1.7	0.6	11.7	

Source: National statistics.

Table 15.6. Key financial indicators for the electrical and electronic goods industry in Kazakhstan

	1998	1999	2000	2001	2002
Total profit (m tenge)	0	-431	292	359	721,64
Rate of profit		-4.9	1.8	1.7	7.4
Proportion of companies making losses					34.5
Fixed investment (m tenge)		42	45	348	
Share in total increment to industrial value added (%)		0.3	0.5	1.3	

Source: National statistics.

And in the machinery and equipment sector, profitability is currently around zero (a big improvement since 1998), and nearly half of the firms in the sector make losses. One of the key factors lying behind this pattern is lack of investment.

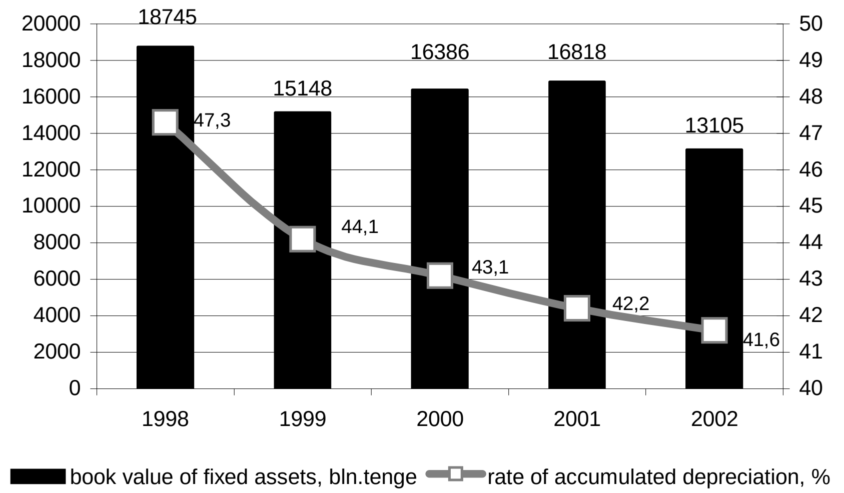
Table 15.7. Key financial indicators for the transportation equipment industry in Kazakhstan

	1998	1999	2000	2001	2002
Total profit (m tenge)	13	156	644	1985	2061,2
Rate of profit		2.7	4.8	8.8	9.9
Proportion of companies making losses					23.9
Fixed investment (m tenge)		138	6	23	
Share in total increment to industrial value added (%)		1	0.9	7.5	

Source: National statistics.

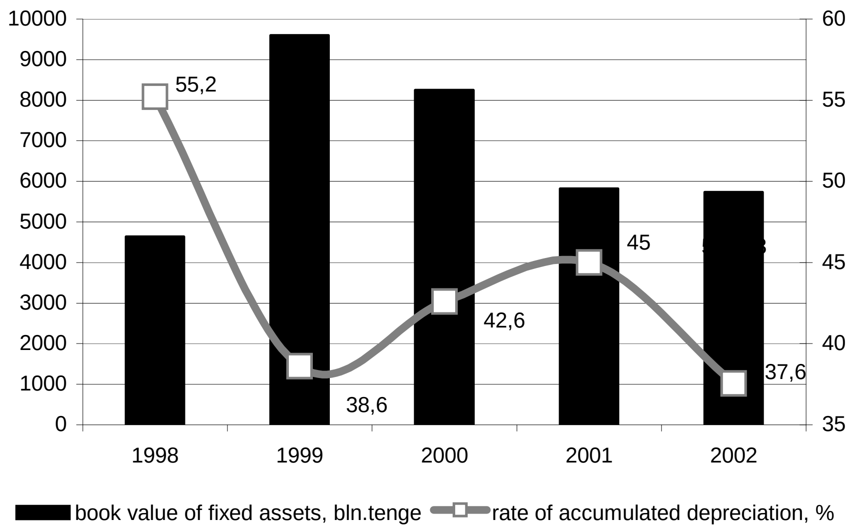
As figure 15.1 shows, the capital stock of the 'manufacture of machinery and equipment' sub-sector was 30% lower in 2002 than it had been in 1998. Over the same period, the fully written-off proportion of the total capital stock fell significantly, but still stood at more than 40% in 2002. In the automotive industry, the pattern is a little different. Substantial increases in both domestic and foreign investment in the period 1999-2000 have meant that the total capital stock of the sub-sector was some 24% higher in 2002 than it had been in 1998, while the proportion of fully written-off equipment within the capital stock fell from 55.2% in 1998 to 37.6% in 2002 (figure 15.2).

Figure 15.1. Fixed assets by kind of activity "Manufacture of machinery and equipment"



Source: National statistics.

Figure 15.2. Fixed assets by kind of activity "Manufacture of motor vehicles, trailers and semi-trailers, other transport equipment"



Source: National statistics.

However, the trend in the total capital stock of the sub-sector has been clearly downwards since 1999, and it is evident that the sub-sector needs another major investment boost, if the positive elements in capital stock trends are to be maintained and strengthened.

The study carried out by the Centre for Science Research and Statistics (CSRS) of innovation activity in Kazakhstan industry presents a striking picture of the pattern of innovation in the engineering-based sectors in the country (*Analiticheskaya Spravka,* 2002). On the basis of a questionnaire completed by twenty-one engineering firms, CSRS found that engineering accounted for 65% of the total number of improvements in process technology in 2002 (155 out of 238); and the number of improvements in process technology in engineering grew by 28.1% between 2001 and 2002. Of a total number of new technological processes introduced in 2002 of 278, 167 (60%) came from engineering. And in that year firms from the engineering and electronics industries claimed that 35.6% and 21.2% respectively of total output was of innovatory products. Yet while engineering output increased by 8% 2001-2002, sales fell by 5%. These figures suggest a pattern of essentially improvisatory innovation. In the face of increasing competition from foreign producers, and in a situation where sales are carried on essentially on the basis of pre-paid orders, firms make small, superficial innovations, to address the special needs of particular customers, or simply to produce the appearance of innovation. These superficial innovations at the product level have no direct link with process innovation. This is a pattern, which is common, and well-documented, in the transition countries of Central-East Europe. Inzelt (1999) has dubbed it 'skin-deep' innovation. Strikingly, total expenditure on R&D in engineering in Kazakhstan in 2002 was just 600,000 tenge ($4,000).

The other feature of the pattern of innovation in the engineering-based industries brought out by the CSRS study is *autarky*. Out of the modest number of new technologies introduced, none came from abroad. Expenditure on intellectual capital (patents, licenses etc.) is negligible. In this respect, the data on innovation conspicuously confirms the general picture of the engineering-based industries in Kazakhstan - as a collection of firms with few links between themselves, and virtually none with the wider world of engineering.

There is little scope in Kazakhstan for the development of mass-market-oriented middle-tech sectors like cars and bicycles. Where there is enormous scope for the domestic engineering-based sectors to develop within the framework of international supply networks is in relation to the Caspian oil and gas industry, with its large measure of foreign ownership. At present, however, that scope is poorly exploited. As we saw earlier, the Caspian hydrocarbons sector sources most of its inputs from abroad. Kazakh firms do sell to the oil and gas firms active in the Caspian region, but generally sell only components. There are virtually no Kazakh firms that could be classified as specialist suppliers (in supply-hierarchy terms first-tier suppliers) to the Caspian hydrocarbon industry. Perhaps more disturbing, the management of the majority of the engineering enterprises in Kazakhstan show few signs of aspiration towards such a status, in many case preferring to seek reestablishment of tradition links with enterprises from other post-Soviet countries (mainly Russia).

15.6. Conclusions

The Chinese bicycle story is a classic illustration of the proposition that networking clusters can develop spontaneously, and can maintain sustained technological dynamism spontaneously in an environment that can be described as, at best, benign neglect. The Kazakhstan story is an equally striking illustration of the proposition that networking clusters cannot develop in situations where neither government nor company managers have a clear vision of the potential for the development of such clusters. Geographical and sectoral isolation can, it seems, be as stable an equilibrium as the more dynamic equilibria we see in China.

But not all the news from China is good news. The best Chinese car-parts makers may be internationally established first-tier suppliers, but the component supply base is weak. It must be said, however, that the Chinese experience with the car industry replicates that of the rest of the world. To the extent that there is unevenness in levels of achievement between different tiers of automotive supply chains in the developed industrial countries, it is the second- and third-tier suppliers that are the laggards (Sutton, 2004, p.18). In the emerging economies, the tendency is for that gap to be very large. Thus, Sutton (2004), in his comparison of the automotive industries of China and India, found exactly the same pattern in the latter country as in the former.

These general considerations are reinforced if we look at the details of the strategic development of the Chinese car parts industry. VW clearly went into China on the basis of an explicit agreement with the Chinese authorities to develop local sourcing. Japanese firms have also done a good deal to develop Chinese supply networks, though it is unclear, whether they give a significant proportion of their complex component business to Chinese-owned firms (Tsuji & Quan, 2004, pp. 247-8). What can be said with confidence is that by far the greater part of the Chinese car industry is controlled by foreign companies with a commitment to the Japanese model of supply networking. But while reference to corporate strategy, and indeed to government and municipal policy, may explain why potential Chinese first-tier suppliers were offered the opportunity to establish themselves on leading-edge markets, it does not explain why the Chinese 'candidates' were able to take those opportunities with such panache. Clearly critical technological and organisational capabilities were available to the Chinese auto parts industry, many of them, no doubt, originally developed in the Chinese bicycle industry.

The Chinese bicycle story also goes a long way to explaining why CEE has found it so difficult to develop first-tier suppliers. Whether under communism and/or post-communism, and with the exception of Yugoslavia/Slovenia, Eastern Europe has never 'grown' any industrial sector. It has never developed the kind of close-knit, trust-based cluster culture of sharing information and innovation that characterises the Chinese bicycle industry. In the transition period, the multinationals have played some role in providing human capital inputs into the development of the car parts industry. However, they have done so largely within the limits of their own equity holdings, and locally-owned companies have been left largely to their own devices. Domestic R&D organisations, still mired in their own restructuring problems, have had little to offer in the way of R&D, training or technology mediation to the auto parts industry, or indeed to any other industry (Dyker, 2004). Yet it is clear that only a decisive, mould-breaking initiative can solve the problem of the weakness of first-tier suppliers in CEE. In principle that initiative could come from the private sector or the public sector. But while the multinationals are willing enough in principle to help to build up human capital in the domestic auto parts industry, their practical commitment is likely to remain limited. And CEE has as yet no great international companies of its own which could come in and fill the gap. We are left, therefore, with a challenge to public policy, a challenge which may well require the creation of wholly new types of human-capital-forming institutions – loosely modelled on patterns familiar from U.S., European and Japanese experience, but no doubt also reflecting local specificities. This process will cost a good deal of money, and in a situation where a number of the CEECs are currently struggling with large budget deficits, in an effort to bring them within the exacting limits of the Maastricht criteria for accession to the Single Currency, it may be difficult to find that money from domestic sources. EU Structural Funds are one alternative source, but at time of writing, it seemed likely that much of the money in principle available from that source would continue to be used to pacify sectoral and regional lobbies, rather than being used for strategic policy purposes. China, too, has its problems, with its bottlenecks at the level of second- and third-tier suppliers. But those problems are common in the developing world, and should in principle be soluble on the basis of policies aimed simply at facilitating the natural 'trickle-down' process. CEE needs trickle-up, and that is as much a challenge to public policy as to the laws of physics.

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