

EFFECTS OF THE 2008–09 CRISIS ON THE AUTOMOTIVE INDUSTRY IN DEVELOPING COUNTRIES: A GLOBAL VALUE CHAIN PERSPECTIVE

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This chapter examines the impact of the 2008–09 economic crisis on global value chains (GVCs) in the automotive industry. The goal is to provide an overview of GVCs in this important industry, examine government responses to the recent economic crisis, and discuss where the industry is headed, particularly in light of the increasing importance of both production and consumption in large developing countries such as China and India.

The first section highlights three important ways in which the organization of automotive industry GVCs differs from those in other industries. First, export of finished vehicles to large mature markets is effectively limited by political constraints. Second, product architecture is of integral nature, leading to thick “relational” linkages between lead firms and first-tier suppliers. In essence, the dense interaction of system elements within the vehicle is mirrored by dense interactions between automakers and key suppliers. For this and other reasons, the role of suppliers in the industry has become more important than in the past. Third, because of these features, the organization of production in the industry has remained more regional than global.

The chapter's second section summarizes government responses to the 2008–09 economic crisis, focusing on mature markets, especially North America and Europe. These interventions underscore the influence politics has on the industry, and vice versa. Government interventions will continue to affect the industry as market growth, and hence production, shifts to less developed countries (LDCs) and local firms begin to compete more directly with multinational firms in developing-country and world markets.

Section three analyzes the position and role of developing countries in automotive industry GVCs by comparing the development paths of China, Mexico, and India. While these three countries have relied to varying degrees on foreign direct investment to jump-start their industries, we see a gradual deepening of GVC integration in all three. However, outcomes and prospects for the future are variable. Two features of the Chinese industry—the leveraging of a well-developed supply base, both locally in Shanghai and abroad, and a domestic market large enough to justify the development of vehicles tailored to local tastes—position that country best for future development.

The fourth section summarizes our insights and provides policy recommendations for the automotive industry in developing countries.

Global Value Chains in the Automotive Industry

In previous publications¹ we have argued that the automotive industry is neither fully global, with interlinked, specialized clusters, as is the case in the electronics industry, for example; nor fully local, tied to the narrow geography of nation states or specific localities, as is the case for some cultural or service industries. Instead, the degree of global integration differs at various stages of the value chain. Global integration has advanced least at the design stage, as firms have sought to leverage engineering effort across products sold in multiple end markets. Because centrally designed vehicles are manufactured in multiple regions, however, lead-firm-supplier relationships typically span multiple production regions. Increasingly, lead firms demand that their largest suppliers have a global presence and system design capabilities as a precondition to being considered as a source for a complex part or subsystem (Sturgeon and Florida 2004). As suppliers have taken on a larger role in design, they have established their own design centers close to those of their major customers to facilitate collaboration. On the production side, the dominant trend is regional integration, a pattern that has been intensifying since the mid-1980s for both political and technical reasons. In North America, South America, Europe, southern Africa, and Asia, regional parts production tends to feed final regional assembly plants that produce largely for regional markets. Political pressure for local production has driven automakers to

set up final assembly plants in many of the major established market areas, such as the United States and Europe, as well as in the largest emerging market countries, such as Brazil, China, and India.

Within regions, there has been a gradual investment shift toward locations with lower operating costs: the southern United States and Mexico in North America, Spain and Eastern Europe in Europe, and Southeast Asia and China in Asia. Ironically, perhaps, it is primarily local lead firms that take advantage of such regional cost-cutting investments (for example, the investments of Ford, General Motors [GM], and Chrysler in Mexico, and Volkswagen and Peugeot in Eastern Europe). This is because the political pressure that drives the establishment of foreign assembly plants in large markets is only relieved when jobs are created locally; for example, Japanese and Korean (Republic of Korea) automaker investments in North America and Europe have been concentrated in the United States, Canada, and Western Europe, and not in Mexico or Eastern Europe. As a result, automotive parts are more heavily traded between regions than are finished vehicles. Within a country, automotive production is typically clustered in one or a few industrial regions. In some cases, these clusters specialize in specific aspects of the business, such as vehicle design, final assembly, or the manufacture of parts that share a common characteristic, such as electronic content or labor intensity. Because of large sunk investments in capital equipment and skills, regional automotive clusters tend to be very long-lived.

To sum up the complex economic geography of the automotive industry, global integration has proceeded farthest at the level of buyer-supplier relationships, especially between automakers and their largest suppliers. Production tends to be organized regionally or nationally, with bulky, heavy, and model-specific parts production concentrated close to final assembly plants to ensure timely delivery (for example, engines, transmission, and seats and other interior parts), and lighter, more generic parts produced at a distance to take advantage of scale economies (for example, tires and batteries) and low labor costs (for example, wire harnesses). Vehicle development is concentrated in a few design centers such as Tokyo, Detroit, and Stuttgart. As a result, local, national, and regional value chains in the automotive industry are “nested” within the global organizational structures and business relationships of the largest firms.

The Growing Role of Large Suppliers

One of the main drivers of global integration has been the consolidation and globalization of the supply base. In the past, multinational firms either exported parts to offshore affiliates or relied on local suppliers in each location, but today *global suppliers* have emerged in a range of industries, including motor vehicles

(Sturgeon and Lester 2004). From the mid-1980s through the 1990s, suppliers took on a much larger role in the automotive industry, often making radical leaps in competence and spatial coverage through the acquisition of firms with complementary assets and geographies. As automakers set up final assembly plants in new locations and tried to leverage common platforms over multiple products and multiple markets, they pressured their existing suppliers to move abroad with them. Increasingly, the ability to produce in all major production regions has become a precondition to being considered for a project. However, what is emerging in the automotive industry is more complex than a seamless and unified global supply base, given the competing pressures of centralized sourcing (for cost reduction and scale) and regional production (for just-in-time and local content). The need for full co-location of parts with final assembly varies by type of component, or even in stages of production for a single complex component or subsystem. Suppliers with a global presence can try to concentrate their volume production of specific components in one or two locations and ship them to their own plants close to their customers' final assembly plants, so that modules and subsystems can be built up and sent to final assembly plants as needed.

What should be clear from this discussion is that the economic geography of the automotive industry cannot be reduced to a set of national industries or a simple network of specialized clusters. Business relationships now span the globe at several levels of the value chain. Automakers and first-tier suppliers have certainly forged such relationships, and as the fewer, larger suppliers that have survived have come to serve a wider range of customers, these relationships have become very diverse. With further consolidation induced by the crisis, the staying power of smaller, lower tier, local suppliers is called into greater question, however well supported they are by local institutions and interfirm networks, especially since many upstream materials suppliers, such as the automotive paint supplier PPG, are also huge companies with global operations.

Continuing Importance of Regional Production

Since the late 1980s, trade and foreign direct investment have accelerated dramatically in many industries. A combination of real and potential market growth with a huge surplus of low-cost, adequately skilled labor in the largest countries in the developing world—such as China, India, and Brazil—has attracted waves of investment, both to supply burgeoning local markets and for export back to developed economies. It is common with GVCs of this type that innovation and design functions remain in industrialized countries, while production functions migrate to developing countries, enabled and encouraged by the liberalization of trade and investment rules under an ascendant World Trade Organization (WTO). Yet

regional production in some industries has remained very durable, especially in the automotive industry. The WTO notwithstanding, political pressure motivates lead firms to locate production close to end markets. This in turn creates pressure for supplier co-location within regional-scale production systems for operational reasons, such as just-in-time production, design collaboration, and the support of globally produced vehicle platforms. Because lead firms in the automotive industry are few in number and very powerful, they have been able to force their key suppliers to embrace the strategies of regional co-location and global expansion, what Humphrey and Memdovic (2003) call “follow sourcing.”

While consumer tastes and purchasing power, driving conditions, and the nature of personal transportation can vary widely by country, local idiosyncrasies in markets and distribution systems are common in many industries. However, it is possible to feed fragmented and variegated distribution systems from centralized production platforms, as long as product variations are relatively superficial. The continued strength of regional production in the automotive industry is one of its most striking features (Lung, Van Tulder, and Carillo 2004)², standing in stark contrast to other important high-volume, consumer-oriented manufacturing industries, especially apparel and electronics, which have developed global-scale patterns of integration that concentrate production for world markets in a few low-cost locations.

Why is political pressure for local production felt so acutely in the automotive industry? The high cost and visibility of automotive products, especially passenger vehicles, among the general population can create the risk of a political backlash if imported vehicles become too large a share of total vehicles sold. This situation is heightened when local lead firms are threatened by imports. The case of Japanese exports to the United States in the 1960s and 1970s did much to set the regional pattern of automotive industry GVCs. In that period, Japanese (and to a lesser extent, European) automakers began to gain substantial market share in the United States through exports. Motor vehicle production in Japan soared from a negligible 300,000 units in 1960 to nearly 11 million units in 1982, growing on the strength of Japan’s largely protected domestic market of about 5 million units, plus exports (Dassbach 1989). Excluding intra-European trade, Japan came to dominate global finished vehicle exports by a wide margin, with the bulk of exports going to the United States (Dicken 2007).

As Japanese automakers’ exports to the United States increased, the concomitant gain in market share came at the direct expense of the American “Big 3” automakers (General Motors, Ford, and Chrysler), sparking a political backlash that resulted in the setting of “voluntary” limits to market-share expansion via exports. A stark reality increased the political tension further: American automakers had been, and continue to be, unable to penetrate Japan’s domestic market in

any meaningful way. In response Japanese automakers agreed to a set of “voluntary export restraints” that capped exports to the United States. As a way to continue their market share gains, Japanese automakers embarked on a wave of plant construction in the United States. By 1995, Japanese automakers were locally manufacturing two-thirds of the passenger vehicles they sold in the United States (Sturgeon and Florida 2004).³

As Japanese “transplant” production in North America ramped up after 1986, Japanese exports began a long decline. In 2009, transplants in North America had the capacity to assemble more than 6 million units, more than one-third of projected U.S. demand in 2011, and employed approximately 90,000 workers, just under one-third of North American assembly employment in 2005 (Sturgeon, Van Biesebroeck, and Gereffi 2007). Because of the high cost, large scale, and long life of assembly plant investments, there has been a cyclical pattern of rising finished vehicle imports to the United States as market share shifted in favor of non-U.S.-based firms, followed by new assembly plant investments that effectively ratchet imports back down. In this way, plants in Japan are kept in full operation as new market share in the United States is absorbed by new capacity in North America. This pattern can be expected to continue if market share continues to shift away from the Big 3, but new plants will only be added if and when Japanese and other non-US automakers are confident that their market share gains in North America will be long-standing.

This pattern reveals the political sensitivity to high levels of imports, especially of finished vehicles, in places where local lead firms are present, as they are the United States and Europe. In our view, the willingness of governments to prop up or otherwise protect local automotive firms is comparable to that of industries such as agriculture, energy, steel, utilities, military equipment, and commercial aircraft. As a result, lead firms in these industries have adjusted their sourcing and production strategies to include a greater measure of local and regional production than can be seen in other industries. Political sensitivity also explains why Japanese, German, and Korean (“Korean” refers to Republic of Korea throughout) automakers in North America have not concentrated their production in Mexico, despite lower operating costs and a free trade agreement with the United States (Sturgeon, Van Biesebroeck, and Gereffi 2007).⁴ Japanese automakers also shifted European production to Eastern Europe later and less aggressively than American and European lead firms, and have even moved to China later than their European and American competitors.⁵

Effects of the Economic Crisis on the Auto Industry

The global financial crisis of 2008–09 severely deepened an ongoing global economic recession that had been under way since early in 2008. The impact of the

crisis on the automotive industry has been more severe than for any other industry except housing and finance, which prompted large-scale government intervention around the world. This section provides background on the impact of the crisis, highlights the possible objectives of various government interventions, and discusses the different stages or degrees of intervention undertaken. (For a more detailed discussion of these issues, see Sturgeon and Van Biesebroeck 2009).

The severity of the impact on the auto industry has several causes. First, the industry was in a dire state to begin with. The value chains led by the American Big 3 automakers were in particularly bad shape, with declining market share, global overcapacity, and rampant supplier bankruptcy. For companies already on life-support, the freezing of credit markets meant cancelled orders, unpaid supplier invoices, and “temporarily” shuttered plants. Huge debt loads, high fixed-capital costs, high labor costs, and immense pension and health care commitments to retirees added to the immediacy of the damage. Second, the high cost and growing longevity of motor vehicles prompted buyers to postpone purchases that they might otherwise have made. Consumers, especially in the world’s largest national passenger vehicle market, the United States, found it difficult to obtain loans for purchase and, driven by fear of job loss, moved aggressively to increase their rate of saving. Vehicle sales plunged, and as a result, beginning in the fall of 2008, the industry fell into the most severe crisis experienced since the Great Depression.

Because of the co-location of assembly and parts plants in national and regional production systems, the effects of the crisis have largely been contained within each country or production region. For example, the largest sales decline was experienced in the United States. While this had a dramatic effect on parts imports, which declined at an average annual rate of 20.2 percent over the 2008–09 period (U.S. International Trade Commission), the more severe impact of the crisis in the United States was on assembly and parts plants within North America, some of which not only ceased importing parts, but temporarily or even permanently closed.

In this environment, the U.S. Congress, supported by a new administration unwilling to preside over the liquidation of the country’s largest and most heavily unionized manufacturing industry, offered several waves of bailouts, but only after a series of humiliating congressional hearings where Big 3 CEOs made the case for government assistance and were aggressively cross-examined about management culpability. In the aftermath, General Motors’ CEO resigned and the company was forced to file for Chapter 11 bankruptcy. Chrysler also filed for bankruptcy and narrowly avoided a break-up through partial liquidation and sale of its more lucrative assets to the Italian automaker Fiat, which provided technology and management support in an effort to restructure the company to make it

viable again. While it is widely believed that Ford has not yet asked for or received government assistance, the company did accept a \$5.7 billion “retooling loan” in June 2009 from the U.S. Department of Energy to develop more fuel-efficient cars and trucks.

In Europe, too, bailouts were provided, but in different ways. Credit support and loan guarantees were given directly to troubled firms. The scrapping, or environmentally motivated subsidies provided to consumers, helped firms indirectly by boosting industry sales. The different ways governments intervened are discussed in greater detail below.

Government Intervention in Developed Countries

During the 2008–09 economic crisis, many sectors saw reduced sales and firms teetering on the edge of, or falling into, bankruptcy, but only in the banking sector did the Western governments intervene on a larger scale than in the automotive industry. The systemic importance of the banking sector explains the motivations for interventions there. The reasons for the bailout of the automotive industry require a longer list of explanations as follows:

1. **Intervention was believed to be feasible and manageable.** The automotive industry is extremely concentrated at the top. Lead firms are very large and few in number and the value chain is structured in a clear, hierarchical way. As a result, government officials believed they could effectively assist the industry by propping up lead firms, which in turn generate business for thousands of the upstream suppliers.
2. **Political sensitivity is acute.** Large bankruptcies can create political reactions in any industry or country, but large, regionally concentrated employment in the automotive sector, the iconic status of passenger vehicles, and strong labor unions made it all the more difficult for politicians to let large firms in this sector fail, especially at a time when the aggregate labor market was very weak.
3. **Multiplier effects boost the rationale for automotive industry bailouts.** The notion of multiplier effects was frequently evoked as a justification for bailing out automakers. While it is misleading to present these as indirect job creation, bailouts can minimize the increase in cyclical unemployment over the short term.⁶
4. **Stimulating vehicle demand was seen as an effective way to stimulate aggregate demand.** Customers can alter the timing of vehicle purchases more easily than most other purchases. Purchasing a new vehicle is often a discretionary decision, usually made when the household still has a working vehicle. While this causes sales declines to be larger at the start of recessions (triggering calls

- for intervention), it also makes demand-stimulus interventions quite effective, because consumers can move purchases forward.
5. **Stimulating vehicle demand has environmental side-benefits.** The high fuel prices of the summer of 2008, along with rising concern over carbon emissions, awakened politicians, once again, to the importance of reducing the consumption of fossil fuels. Policy measures have included CO₂ taxes, higher fuel efficiency standards, and R&D for technology development.
 6. **Bailing out automakers helped solve the nation's credit problems.** In most countries, the bulk of vehicle sales are financed (90 percent in the United States). Tightening credit conditions for customers made it much harder to obtain vehicle financing than in normal circumstances. The operations of GM and Chrysler are deeply intertwined with their finance companies, often depending on them for profits. The difficulty for these firms to obtain credit themselves made it impossible for them to provide consumer financing and hampered their usual role in financing working capital (that is, vehicle inventories) in dealership networks.

Because the policy objectives, justifications, and motivations for interventions and bailouts have been so numerous and the actions taken so swift and complex, it is hard to evaluate them. No single criterion—the rescue of an individual firm, the slowing of unemployment, the repair of credit markets, the reduction of carbon emissions, or stimulation of aggregate demand—can be used as a measure of success. Clearly, policies that seek to achieve multiple objectives are laudable, but the debate has been muddied because different objectives and outcomes have been emphasized by different policymakers and with different constituencies. With so many possible goals and measures to choose from, it is easy to claim success or failure based on political expediency.

The Ladder of Government Intervention

While the examples above are drawn from the United States, virtually every Western government with a sizeable domestic automotive industry intervened in that industry in some way or another during the 2008–09 economic crisis. These policy measures are laid out here according to a “ladder of intervention,” from less drastic and controversial to more so. As problems with individual companies worsened, governments have found themselves climbing this ladder quite rapidly.

1. **Credit warranties** are the least controversial form of intervention. Most countries have initiated schemes to guarantee or extend credit, and these are typically not limited to the automotive industry. A popular approach to support

- the automotive industry is to earmark loans for R&D or vehicle development to boost fuel efficiency or to secure the loan with company land or buildings.
2. **Recapitalizing financing units** is similar to credit warranties and interventions in the banking sector, with an important difference that there is often very little or no equity participation by governments. The fall in both new and used vehicle demand forced large losses at financing units active in the leasing market. Compared with banks or other financial institutions, there are few retained earnings in automaker's credit arms to strengthen the company's equity position, because earnings are passed on to keep manufacturing units afloat.
 3. **Purchase subsidies paid directly to consumers** benefit automakers and suppliers, stimulate the broader economy, and are easily monitored. In most countries, rules were put in place to yield environmental benefits as well. The macroeconomic effect of these programs has been large, but they are proving to be a drag on sales recovery.
 4. **Government provision of working capital** to specific companies is unlikely to come without policy makers gaining some influence over decision-making, although governments have been at pains to stress that they were not interfering with the day-to-day operations of firms and that they plan to sell their stakes at the first opportunity.
 5. **Takeover liabilities** are similar to the provision of working capital without the expectation that the loans will ever be repaid. In this case, governments become even more extensively involved in the management of the firm. While these cash infusions are technically structured as loans, there is often no real expectation of repayment.
 6. **Quasi-nationalization of the industry** took place as part of the accelerated bankruptcy procedure of Chrysler and GM, wherein the U.S. (and Canadian) government took large equity stakes in the restructured companies in exchange for debtor-in-possession financing. At this point, government intervention in strategic decision making became more explicit: appointing new top management, demanding larger wage cuts, restructuring of the product portfolio, and insisting on additional plant closures. The stated objective is to sell government ownership shares as soon as possible, but before this can happen it will have to be clear that the companies are financially stable.

Accelerated Growth of the Industry in Developing Countries

This section analyzes the historic shift—accelerated by the 2008–09 economic crisis—of the automotive industry to large developing countries. The industry's rapid growth in these countries has permitted governments to limit the scope of their interventions during the crisis. Nevertheless, the crisis in the industry in

industrialized countries has had important consequences for the industry in developing as well.

Despite the recent and dramatic effects of the economic crisis on the automotive industry, it is important to begin with a longer-term perspective. Recent events will serve to hasten long-term trends, most notably, (1) the shift of automotive production to developing countries, where sales growth is strongest, (2) consolidation in the global supply base and among automakers, and (3) the internationalization of automakers from developing countries (for example, the Chinese state-owned automaker Geely’s current bid to take over Ford’s Swedish car unit, Volvo).⁷ Automakers will be discussed first, followed by suppliers.

Table 6.1 lists the countries where more than 1 million vehicles were produced in 2007 (except France and Iran, where data were unavailable), ranked by annual production growth rates over the 2007–08 period, which were negative for most countries. The table shows that the crisis-induced contraction of production has

Table 6.1 Passenger Vehicle Production Levels and Growth in Countries Producing 1 Million or More Units in 2008

Country	Units (thousands)		Annual growth 2002–07 (percent)	Units (thousands) 2008	Annual growth 2007–08 (percent)
	2002	2007			
Spain	2,855	2,891	0.25	1,940	-32.90
Canada	2,629	2,602	-0.21	2,068	-20.52
United Kingdom	1,821	1,770	-0.57	1,450	-18.08
United States	12,280	10,611	-2.88	8,746	-17.58
Italy	1,427	1,284	-2.09	1,085	-15.47
Germany	5,145	6,200	3.80	5,500	-11.29
Republic of Korea	3,148	4,085	5.35	3,830	-6.24
Mexico	1,805	2,254	4.54	2,154	-4.44
India	892	2,046	18.06	2,022	-1.20
Japan	10,258	11,596	2.48	11,564	-0.28
Turkey	340	1,097	26.40	1,147	4.57
China	3,251	8,890	22.29	9,340	5.06
Russian Federation	1,220	1,654	6.28	1,776	7.40
Brazil	1,793	2,960	10.55	3,210	8.45
Thailand	540	1,178	16.88	1,400	18.85

Source: Data for 2002 and 2007 and for North American countries and Japan are taken from *Automotive News*. Other information comes from various Internet sources, mostly from newspaper reports and national industry associations.

Note: Two countries are missing: France (3.01 million vehicles in 2007) and Iran (1.18 million in 2007); 2008 production volumes were not available for these countries.

been most pronounced in countries that have experienced the slowest rate of production growth over the preceding five years. The table also shows China, where the rebound in sales has been particularly strong, surpassing the United States for the first time in 2008 as the number 2 auto producing country in the world. Looking at these trends and considering the pending plant closures in North America and Europe, we are led to the conclusion that some portion of the current production decline in mature markets will be permanent and that China is likely to occupy the top spot soon and keep it for the foreseeable future.

That said, the overall structure of the post-crisis industry is still taking shape, as many firms have yet to liquidate, fully complete their bankruptcy restructurings, or be certain of avoiding bankruptcy. Only after the announced plant closures and capacity reductions have been carried out will alterations in global market share and the relative weight of the industry in different regions become apparent. However, the likely four market-share leaders in size order, Toyota, Volkswagen, Ford, and Hyundai, will signal a remarkable break from the industry's recent past. Furthermore, the ascendance of Chinese companies and India's Tata into the top 20 could have far-reaching effects on the global automotive market.

It is important to note that the industry's growth in the developing world has been limited to a specific subset of countries. Political pressure to build vehicles where they are sold and effective caps on large-scale finished vehicle exports, discussed earlier, combined with very high minimum economies of scale for truly "integrated" production means that market size dictates the potential for the industry's growth. The impact of market size is manifested in four ways. First, even when existing vehicle designs are used as a basis, it is only profitable for lead firms to tailor final products to fit consumer tastes in very large markets (Brandt and Van Biesebroeck 2008). This took place in Brazil, China, and India, but not in other developing countries. In these countries, lead firms have established local design, engineering, and regional headquarters facilities. Once automakers set up these local technical centers, they tend to pressure "global suppliers" to establish local engineering capabilities as well (Humphrey and Memedovic 2003; Sturgeon and Lester 2004). When this occurs, global suppliers can begin to source inputs locally, providing opportunities and support for local second-tier suppliers to develop. Over time, it is possible for local firms to start serving automakers directly, and international opportunities can grow from there. Thus virtuous cycle of development can only develop if the local domestic market is large enough to attract significant investment in the first instance.

A second dynamic has unfolded in a few mid-sized developing countries that are large and rich enough to support the assembly of vehicles without modification. Examples include South Africa, Thailand, and Turkey. These countries have become final assembly hubs for their wider regions. Because there are strong

agglomeration economies in the automotive industry, the presence of final assembly plants can provide opportunities for local suppliers producing, especially, bulky, heavy, or fragile parts such as seats. Proximity to plants assembling existing vehicle designs can create export opportunities as well, even when supply contracts are based on existing blue-prints, because identical vehicles are being produced elsewhere in the world. However, global suppliers are commonly present in these locations as well, limiting the opportunities for local firms.

A third dynamic has occurred in developing countries that are proximate enough to large markets in developed countries to supply parts on a just-in-time basis and within regional trade blocs, such as Mexico in NAFTA and Hungary, the Czech Republic in the EU, and Thailand in ASEAN and in East Asia more generally. If they are geographically close to large existing markets, they can become hubs, especially, for the production of labor-intensive parts. Wire harness and automotive electronics assembly on Mexico's border with the United States is a long standing example, and several Central and Eastern European countries have taken on a similar role for the industry in Western Europe. As some final assembly has developed in Mexico and Eastern Europe, these plants have been able to serve them, and plants for the production of more capital-intensive parts have been established as well. However, because of the proximity to developed economies, these activities tend to be carried out by global suppliers and few opportunities have arisen for local firms.

A fourth, nascent dynamic is for a local lead firm to leverage the new, relatively open local and global supply base to rapidly become more competitive locally and, perhaps, in world markets. Consider the case of Chery Automobile, a small state-controlled Chinese company based in Wuhu, some 200 kilometers west of Shanghai, that within a remarkably short time, has been able to develop and market a line of Chery-badged vehicles. While perhaps not world class, the Chery vehicles are nevertheless suitable for both the local market and for export to other developing countries. The first Chery prototype was built in December 1999, and volume production began in March 2001. By the end of 2007, plant capacity had grown to 600,000 units, and Chery was already China's largest vehicle exporter.

A few details are necessary to understand to grasp how remarkable is Chery's rise. Vehicle design and development are notoriously difficult tasks, typically the purview of companies that have been in the business for decades. New vehicle designs commonly require more than 30,000 engineering hours, and take three to five years to complete, as well as several billion dollars of upfront investment (Sturgeon, Van Biesebroeck, and Gereffi 2008). Firms that do enter the business usually come from a field such as aircraft, where related design and engineering experience has been accumulated over a similarly long period (Mitsubishi, Subaru, BMW, and SAAB are examples).

Chery has been able to launch its own line of branded vehicles in a very short time by tapping the expertise of first-tier global suppliers with operations both in China and in the West to obtain a full range of inputs, from parts to processes to design expertise. For styling and engineering, Chery works with Italdesign, Pininfarina, and Torino in Italy. Additional engineering and development work is outsourced to Lotus Engineering and MIRA in the UK and to Porsche Engineering in Germany and Austria. Chery works with AVL in Austria on gasoline and diesel engines, and with Ricardo in the UK on hybrid power trains. Heuliez in France supplies a retractable hardtop for the Chery A3 coupe cabriolet, a car designed by Pininfarina. For critical parts and subsystems, Chery sources from global suppliers such as Bosch, ZF, Johnson Controls, Luk, Valeo, TRW, and Siemens VDO (*Automotive News* 2007). These sourcing arrangements, which have only recently become readily available for fledgling companies like Chery to piece together, show that Chery is nothing like a typical car company, especially because it is far removed from the most recent entrants to the mass market for cars, the vertically integrated and horizontally diversified national champions from Korea, Hyundai, Kia, and Daewoo. Companies that jump to the head of GVCs in this way, however, may still fail to develop deep design and system integration expertise that allows them to compete at the vanguard of fast-moving markets. More than any other motivation, it is access to the deep competencies in vehicle design and engineering that has driven local lead firms from China and India to acquire or attempt to acquire distressed auto companies in the West during the 2008–09 crisis and its aftermath.

What has been left unsaid so far, but should be clear from this discussion, is that small developing countries far from large existing markets have been and will likely continue to be unable to develop a domestic automotive industry. For most countries with small, easily saturated markets, it has been extremely difficult for local firms to develop a significant role in the industry.⁸ Because of this, the geographic shift of the industry from developed countries (DC) to emerging markets has been the most dramatic in large developing countries such as Brazil, China, and India.

The investment patterns and strategies at the automaker level just discussed have direct analogs in the parts-making sector, not least because the strategies of buyer and suppliers tend to be tightly interwoven, as discussed earlier. In 1999 only four firms from developing countries (one each from Malaysia and China and two Indian firms) appeared on a list of automakers producing more than 100,000 vehicles annually (*Automotive News* 2007). By 2007, right before the global crisis, 12 additional developing country lead firms joined the list, one from Iran and 11 from China. As a result, developing-country lead firms' total share of world vehicle production increased from 1.9 to 7.5 percent from 1999 to 2007, an increase almost entirely attributable to Chinese firms.

Similarly, the list of the largest suppliers to the North American industry (top 150) and to the global industry (top 100) published annually by *Automotive News* reveals the limited importance of developing firms among First-tier suppliers. First, the number of developing country suppliers on the global 100 list remained the same between 1999 and 2007. Only one Mexican firm moved significantly upward in the ranking. Of the top 150 suppliers to the North American industry, one of the two Mexican firms on the list in 1999 failed to make it in 2007. As Korean lead firms saw their production grow by 25 percent, almost identical to worldwide production growth, Korean suppliers also started to play an important role. Two Korean firms are now on the top 100 list worldwide and one Korean on the top North American list, prior to any Korean assembly plant opening on the North American continent.

In contrast to many other industries, developing country firms have not been able to establish a presence in the global automotive industry by moving from simple, labor-intensive components to capital- and technology-intensive components. Instead, local assembly is often the first step, and the development of a the parts sector comes later. Sutton (2007) illustrates the difficulties faced by second-tier suppliers in China and India in meeting the quality standards set by foreign carmakers. Brandt and Van Biesebroeck (2008) show that China only started to run a trade surplus in parts in 2005. This is the usual pattern: as a local automotive industry develops, the country initially runs a trade deficit in parts because it does not have the local capabilities to produce advanced components or the quality standards to sell in advanced markets. Significant parts exports only emerge when final assembly capability is quite mature. In the context of GVCs, these exports might be dominated by global rather than local suppliers. This hypothesis is supported by Table 6.2, which shows the top 10 developing country exporters of automotive and motorcycle parts. Most of the countries listed have had substantial final assembly capacity for many decades, and host significant investment by global automotive suppliers.

Canadian Auto Industry Before and During the Economic Crisis

The growing importance of developing countries as final goods markets and production platforms has prompted important changes in the way suppliers in the mature markets operate. Before describing the different development patterns in developing countries, we discuss the recent experience of Canadian suppliers. A recent survey by the Canadian Auto Parts Manufacturers (Asia Pacific Foundation of Canada 2005) demonstrates that the growing importance of markets in East Asia creates both opportunities and threats for home-based firms. Canadian suppliers are under pressure both to compete harder for domestic business and to establish manufacturing facilities overseas.

Table 6.2 Top-10 Developing Economy Exporters of Intermediate Parts for Passenger Vehicles and Motorcycles

Economy	1988	2006	CAGR 1988–2006 (percent)
Mexico	790	27,930	21.9
China ^a	109	26,361	35.6
Brazil	417	7,855	17.7
Thailand	53	6,349	30.5
Taiwan, China	274	5,064	17.6
Turkey	57	3,365	25.4
Indonesia	17	2,904	32.9
Philippines	18	2,564	31.7
India	189	2,190	14.6
Argentina	25	1,579	26.0

Source: UN Comtrade, using modified Broad Economic Category (BEC) classification (see Sturgeon and Memedovic, forthcoming).

Note: The exporters are ranked by 2006 exports, with annual growth 1988–2006. CAGR = compound annual growth rate.

a. Includes Hong Kong, China.

Table 6.3 groups the answers to five survey questions that probe the firms about their own production activities, sourcing, investments, and customer demands. These responses illustrate the changing geographical activities of Canadian supplier firms before the crisis. Comparing the geographical distribution of three activities—production, sourcing, and investment—a clear trend away from Canada toward Asia is apparent. While almost 70 percent of the firms' production takes place in Canada, only 51 percent of inputs are currently sourced domestically and only 49 percent of greenfield investment occurs in Canada. In contrast, Asia is the production location for only 0.3 percent of current output, but the source of 4.7 percent of inputs. Most importantly for the future, 28 percent of all greenfield investment by Canadian automotive parts suppliers are being made in Asia, ahead of even the United States.

An important impetus for Canadian suppliers to invest overseas is the explicit requests from current customers: 64 percent of suppliers report that they have received a request in the last three years to aid the overseas expansion of their customers by setting up overseas operations of their own. Some suppliers also indicated that they believe serving Japanese-owned firms in other countries will increase their chances of gaining new business to supply Japanese assembly in Canada.

The responses of Canadian suppliers to the 2008–09 crises can be gauged from a small survey of second tier suppliers by Facey (2009), summarized in Table 6.4. In this survey, cost-cutting is the item that appears time and again. While firms

Table 6.3 Changing Geographical Exposition for Canadian Suppliers
percentage of survey responses

Survey questions	Canada	United States	Europe	Latin America	Asia
Fraction of your firm's production taking place in facilities located in . . .	69.4	17.1	11.86	1.4	0.3
Fraction of supply needs that were sourced from . . .	51.1	33.3	9.0	1.9	4.7
Fraction of greenfield investments (past 5 years) made in . . .	49	18	4	1	28
In the last three years, has one or more of your major customers ever threatened to switch to overseas suppliers?					71 Yes
In the last three years, has one or more of your major customers asked your firm to initiate or expand activities in new geographical markets in order to facilitate its own expansion agenda?					64 Yes
Countries mentioned most frequently: United States (33), Korea (33), China (33), Mexico (22)					

Source: Asia Pacific Foundation of Canada 2005.

Table 6.4 Impact of the Crisis on Quality Initiatives of Second-Tier Canadian Suppliers, 2009
percentage of responses

Survey questions	Possible answers	Fraction answering "yes"	
Is the area of . . . in your company affected by the recession?	Quality control	6	
	Top answer: human resources	25	
	Answered "all of the above"	37	
Over the past 6 months, which of the following events have you noticed in your company?	Cut in quality program	13	
	Top answers (cost reduction, layoffs, reduced working hours, waste reduction)	100	
Rate your company's involvement in the following programs before and during the recession (Fraction answering "active" or "very"):	Before	During	
	Cost reduction activities	50	100
	Customer satisfaction	100	100
	Supplier development	37	24
	Continuous improvement	69	37
	New product development	13	6
	Process/product innovation	63	25

Source: Facey (2009).

report layoffs and other cost-cutting measures, they have clearly resisted cutting quality programs, even in difficult economic times. The top section shows that there were cuts in quality programs, but only as part of broader cost-cutting efforts. The bottom section ranks the programs that have seen changes in the firm's "active involvement." The areas are ranked from the largest increase at the top to the largest decrease at the bottom. Only 50 percent of firms indicated an active involvement in cost reduction activities before the crisis, while all firms did so during the crisis. Active involvement in process or product innovation declined from 63 percent of firms before the crisis to 25 percent during the crisis. Not surprisingly, cost reduction has moved to the top of the list. More interestingly, it also seems that suppliers have chosen to scale down activities related to innovation, product development, and continuous improvement before de-emphasizing customer satisfaction or supplier development initiatives. This is somewhat surprising since the bottom two areas on the list are likely to have a more immediate effect on product quality.⁹

***Lead Firm Strategies Toward Developing Country Expansion:
A Case Study in China***

The impact of the 2008–09 economic crisis on developing countries can be seen through a comparison of two distinctive strategies that foreign lead firms in the automotive industry have followed in China. Because all the firms discussed here are huge multinational corporations (MNCs), with established brands and extensive international operations, their strategies share many elements. However, firms have sought to participate in the rapidly growing Chinese market in different ways.¹⁰ Some firms have actively tailored their existing vehicle portfolios to local tastes, while others have focused on selling existing vehicles in upper market segments. The former strategy, while riskier because of the larger investment and supply-base support required, has led to greater success because it has allowed MNC lead firms to sell more vehicles and compete more directly with local carmakers.

This discussion draws on information the authors collected as part of a global automotive supplier benchmarking study of the International Motor Vehicle Program (IMVP), comparing practices, capabilities, and performance of automobile suppliers around the world. The assessment focuses on the production of seats, exhaust systems, and brakes, at plants in China, Republic of Korea, Japan, Europe, and North America. Thus far, data have been collected at plants in China and Japan, as well as at a few European plants. A report on the interim findings of this project can be found in Brandt and Van Biesebroeck (2008).

Although the identities of the firms interviewed are confidential, observed differences fell largely along national lines, with clear differences between Asian and

Western automakers. The first strategy, “cautious localization,” is favored by the Japanese and Korean producers interviewed. Vehicles are produced in China in large volumes, but designed entirely overseas. Most first-tier suppliers are joint ventures (JVs) between a local Chinese firm and a foreign partner responsible for manufacture and often the design of the part back in the home country. Some modules are supplied by wholly owned foreign subsidiaries (WOSs), which are allowed in China for parts but not for final assembly. Since the use of second- or even third-tier suppliers is typically blocked by headquarters for quality reasons, the majority of suppliers to cautious localizers tend to be either JVs or WOSs.

This sort of centrally coordinated GVC facilitates high product quality but raises costs because parts cannot be altered or easily outsourced to take advantage of lower cost, lower quality manufacturing. In the end, vehicles tend cost too much to appeal to a large number of buyers, and it is more difficult to introduce products specifically aimed at the local market. While average income levels in the Chinese economy are rising rapidly, relatively wealthy customers have led the market, leaving the lower priced segments as the fastest growing market segments. Japanese and Korean lead firms have sought to avoid competition with domestic lead firms selling low-quality/low-cost products, but the high costs associated with the cautious localization strategy have also *forced* them to pursue the upper segment of the market, which is becoming less important over time as vehicle ownership levels in China increase. One potential benefit of this strategy, however, is that it may enable lead firms, over time, to tap into lower cost JV and WOS sources for parts and components for export to higher cost production locations. Since vehicles produced in China are identical to those being assembled elsewhere, they may be creating a competitive export platform for the future.

It should be noted that designing vehicles at home for production overseas is the same approach described earlier that Japanese automakers took to penetrate markets in the United States and Europe, so the cautious localization strategy is compatible with the larger global strategies of these firms. The difference is that consumer preferences in China, as well as in other developing countries, is vastly different from the market in Japan, while the markets in the United States and Europe are similar enough to sell vehicles with only minor alterations, such as converting right-hand drive vehicles to left-hand drive. As a result, with a few exceptions, the vehicles produced by Japanese automakers in Japan, Europe, and the United States have proven too expensive to sell in large volumes in developing countries.

The second strategy pursued by automotive lead firm multinational enterprises (MNE) in China can be called “aggressive localization.” A select number of European and American JVs have taken an approach in which both lead firms and first-tier suppliers set up design and engineering centers in China. Parts, modules,

and eventually complete vehicles are redesigned to better suit the tastes and purchasing power of local consumers. An important advantage of this approach is that modules can be redesigned to be compatible with the manufacturing capabilities of the domestic firms and meet local regulatory, that is, safety and environmental, requirements. In this way, larger fixed costs are incurred in terms of design and engineering, but variable costs fall because lower cost domestic suppliers and production processes can be used. As a result, vehicles can be produced in China at lower cost and compete directly with less expensive domestic offerings. The challenge is to find components of the vehicle for which this sort of localization is feasible and cost-effective, while at the same time insuring that quality and fit are not so compromised that the company's brand image is damaged.¹¹

It is notable that only a few automotive lead firm MNCs have chosen the second approach thus far, but this model could prove very disruptive for manufacturing in more developed countries if prices fall and quality improves to the point where large-scale parts exports are possible. Moreover, intense competition in the domestic Chinese market and falling prices may be accelerating the process of local capability-building. One major international lead firm described a five-year plan to lower its production costs in China by 40 percent by 2010.

An observable area of difference in the two strategies is in the composition of suppliers. The authors interviewed several final assembly plants, asking for the identity of first-tier suppliers for a wide range of major parts and systems (60–75 suppliers per firm). Table 6.5 reports the fraction of domestic, JV, and WOS first-tier suppliers, as well imports for two domestic, three Asian, two North American, and two European automakers operating in China. The results show that domestic Chinese lead firms are clearly localizing most aggressively and did not report any imports of major modules or systems. These firms were also much more likely to source from 100 percent domestically owned firms than from either joint ventures or foreign subsidiaries: 61 percent of the suppliers identified were domestic firms and the rest were JVs.

For the three Asian lead firms, on the other hand, only 5.5 percent of suppliers were domestic Chinese-owned firms, on average. In two of the three cases, the share was well below 5 percent. Imports also make up a non-negligible share of components, accounting for almost 22 percent on average and even one-third of parts in one case. In contrast, for the American and European lead firms interviewed, the share of parts sourced from domestic firms was noticeably higher and imports were lower. For one U.S. lead firm, in particular, sourcing is almost as domestically focused as for Chinese lead firms.

While the two approaches to expansion in China have been apparent for some time, the effect of the crisis, by and large, has meant an acceleration of the observed pre-crisis differences, at least in the short term. For some firms, the

Table 6.5 Sourcing by Original Equipment Manufacturers in China from Three Possible Sources
percentage of first-tier suppliers

Lead firm	Domestic firms	Joint ventures and wholly-owned foreign subsidiaries	Overseas (imported)
European	14.0	86.0	0
European	23.8	68.3	7.9
United States	14.3	57.1	24.5
United States	39.6	58.5	3.8
Average Western	15.4	69.7	14.5
Asian	2.2	64.4	33.3
Asian	4.8	85.5	9.7
Asian	9.4	67.9	22.6
Average Asian	5.5	72.6	21.9
Chinese	58.2	41.8	0
Chinese	63.4	36.6	0
Average Chinese	60.8	39.2	0
Average (all)	25.5	62.9	11.3

Source: Brandt and Van Biesebroeck 2008.

aggressive localization strategy has been driven by scarcity of resources—either financial or in terms of management capacity. The greater toll of the crisis on American lead firms, in particular, has further encouraged a very aggressive expansion strategy in China; sales there accounted for the same number of vehicles as the U.S. market sold in the first 9 months of 2009. Starved of funds for vehicle development, Western lead firms have relied on more global suppliers to tailor vehicles to local tastes. The need for cost savings has intensified the quest to utilize lower cost second and third-tier suppliers in China as well.

On the other hand, the crisis has made firms pursuing a cautious localization strategy, in particular the Japanese, even more cautious. A common strategy for firms in a recession is to return to core markets and perceived comparative advantages. During a recession, there is even less incentive to deviate from strategies—centered on efficient production and high quality—that have served Japanese lead firms well in the past.

More generally, the aggressive localization strategy can be viewed as a more short-term, less patient strategy. The objective is to expand Chinese sales quickly without waiting for the Chinese middle class to grow even richer or technological capabilities in the local supply to rise even further, such that the same vehicles popular in developed countries can be sold in China as well. It is also a higher risk strategy, as there is a non-negligible risk that the premium brand advantage will

be eroded if low-quality local parts find their way too quickly into Chinese-made vehicles. Again, such a strategy appeals most to firms hit hardest by the crisis.

Development of the Industry Before and During the Crisis in Mexico

Mexico's automotive industry is deeply integrated in the North American production system. It relies almost entirely on foreign lead firms and suppliers for vehicle designs and investment. The country's annual car sales are too small, given its population size and level of economic development, to warrant many models made specifically for the local market. Relatively low wages make Mexico an attractive export platform for the NAFTA market. In the four years from 2004 to 2007, Mexican production expanded by 35.5 percent, while U.S. production fell 9.5 percent and Canadian production declined by 4.5 percent. Almost all of this expansion was due to exports to the United States. Table 6.6 shows very high export ratios—specifically to other NAFTA countries—for all assemblers in Mexico, though less so for Volkswagen and Nissan, which use their plants in Mexico to serve the local market and for export to other countries in Latin America.

Mexico has become an important export platform for automotive parts within North America as well. In 1990, Mexico ranked third as an exporter of automotive parts to the United States (\$5.2 billion), well behind Japan (\$10.2 billion) and Canada (\$8.4 billion). By 2005, Mexico occupied the top position, with exports to the United States totaling \$18.5 billion. For some labor-intensive parts, wiring harnesses perhaps being the best example, Mexico has a NAFTA market share of more than 90 percent. Note that most of these producers are global suppliers operating gigantic facilities in Mexico both for export and shipment to domestic assembly plants.

Production of auto parts, especially electronics and other labor-intensive parts, began in the border region of Mexico well before NAFTA, with investments and sourcing driven by American firms seeking to cut costs under the “Maquiladora” program, which allowed firms to pay tariffs only on value added in Mexico. But after NAFTA these trade preferences were extended to the whole country and investments surged to the interior. Except for investments to support Nissan's final assembly plant in Aguascalientes, the only high-volume Japanese-owned assembly plant in Mexico, Japanese parts suppliers have announced only a few sizeable investments in Mexico, such as Ahresty's \$66M foundry in Zacatecas and Bridgestone's \$81M lampblack plant in Tamaulipas.

This integration into the larger North American economy boosted production disproportionately in the good years, but it also exposed Mexico to the U.S.-originated crises and the collapse in demand, centered on of the American lead firms who have made substantial investments there, Ford and GM. The greater

Table 6.6 Production, Sales, and Exports by Automakers with Assembly Plants in Mexico 2004–07

Automaker	Domestic production			Imports (no. of units)	Exports (no. of units)	Exports to United States and Canada (no. of units)	Total domestic sales (U.S. dollars)
	Domestic production (no. of units)	Domestic production sold in Mexico (no. of units)	Share of production (percent)				
GM	1,884,730	385,665	585,989	1,499,065	1,483,965	971,654	
Nissan	1,550,563	726,829	184,209	823,734	669,167	911,038	
Chrysler	1,282,670	20,785	475,948	1,261,885	1,185,608	496,733	
Volkswagen	1,282,314	261,979	329,356	1,020,335	568,750	591,335	
Ford	909,480	165,007	527,052	744,473	730,110	692,059	
Honda	89,753	29,734	133,309	60,019	52,713	163,043	
Toyota	65,458	0	185,490	65,458	42,360	185,490	
Total	7,064,968	1,589,999	2,421,353	5,474,969	4,732,673	4,011,352	
	Share of						
	Share of domestic sales produced locally (percent)	Share of local production exported (percent)	Share of exports to United States and Canada (percent)	Exports CAGR 04-07 (percent)	Production CAGR 04-07 (percent)	Domestic sales CAGR 04-07 (percent)	
GM	40	80	99	1	-1	-3	
Nissan	80	53	81	34	16	-2	
Chrysler	4	98	94	-7	-6	4	
Volkswagen	44	80	56	27	22	-7	
Ford	24	82	98	54	41	-5	
Honda	18	67	88	3	-3	18	
Toyota ^a	0 ^a	100 ^a	100 ^a	N/A ^a	N/A ^a	40	
Total	40	77	86	14	10	-1	

Source: Asociación Mexicana de la Industria Automotriz (AMIA).

Note: CAGR = compound annual growth rate.

a. Toyota began production in Mexico in 2006; production data are for 2006 and 2007 only. Figures for domestic sales are for 2004–2007.

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importance of smaller vehicles in Mexico's assembly plants, and drive by American automakers to concentrate closures in higher cost plants in the United States and Canada, has softened the blow to some extent. While North American production declined by 16.4 percent between 2007 and 2008, Mexican production increased slightly, by 3.9 percent. As a result, production of finished vehicles in Mexico surpassed Canadian production for the first time in 2008.

Clearly, the fate of an industry in a small, regionally embedded country like Mexico is tied to factors that lie largely outside the control of the state or of local firms. Ironically, the flagging prospects of the Big 3 automakers have created more risks for Mexico and Canada than for the United States.¹² These companies, even though based in the United States, have been more important in driving investment and industrial upgrading in Mexico than have Asian firms. Japanese and Korean automakers, with the exception of Nissan, have concentrated their North American investments within the United States (and to a lesser extent, Canada) for political reasons, while the Big 3, when they have made new North American investments at all, have sought to cut costs in North America by building and planning new capacity in Mexico. Now, with the crisis, we believe that the future of this most recent investment wave must be called into question by the severe crisis that has currently overtaken the Big 3.

Development of the Industry Before and During the Crisis in China and India

China's strategy mirrored Mexico's initially, with the important difference that government policy insisted on joint ventures and other explicit policies to facilitate or even force technological transfer and greater involvement of local firms. While the long-term success of these programs is still unclear, they may have helped local assemblers compete with foreign firms producing in China. In the early years, the industry depended very strongly on investment by Western MNCs (lead firms and suppliers) and relied almost entirely on the advanced design and engineering expertise of these companies. Chinese firms were only responsible for the very simplest steps in the production process, and the parallel management structures (and the Chinese and Western plant manager, engineering manager, and so on) often required little from the Chinese side of the company. JVs only in name, the Chinese contribution to new investments often amounted to little more than the provision of real estate. However, over the course of 20 years, the JVs in assembly and component production have transferred many crucial production, engineering, marketing, and management skills to individuals and independent Chinese firms, a few of which are now operating successfully at each stage of the automotive value chain. Acquisition of final elements of technological knowledge, including vehicle design and system integration, will be hastened by the 2008–09

financial crisis, which has made some of these assets (for example, in companies such as SAAB, Volvo, Hummer) available for acquisition at “fire sale” prices.

In contrast, India has, even from the start, relied more than any other developing country on homegrown lead firms to propel its industry. A disadvantage of this approach is that the absorption of global best practices has been proceeding more slowly (Sutton 2007). Nevertheless, the development of the Indian automotive industry has accelerated very quickly in the past several years. This improvement in the breadth and depth of local capabilities has been aided, most notably, by foreign acquisitions.

Because per capita income growth is slower in India than in China, market potential was not perceived to be large enough to convince foreign lead firms to take the investment risks they did in China, even when investment restrictions were lifted. As a result, while growth in the Indian industry started earlier than it did in China, it has proceeded at a slower pace. Nevertheless, every aspect of vehicle development and production, including design and engineering, has been present in local firms from the beginning, and this has allowed the industry in India to make rapid progress.

To gauge the difference in initial development between China and India, it is instructive to compare the market shares of the leading automakers in both countries in 2001 (see table 6.7). In India, no leading multinational automakers were among the top four. Suzuki, a small Japanese firm with a controlling investment stake held by GM, was the number one producer in India. The company ranked 15th in the world when it began production in India, accounting for about 10 percent of GM’s sales. Suzuki’s Indian JV has operated with a great deal of independence and substantial input from the local partner, Maruti. Hyundai, India’s number two producer, was only the eighth largest producer worldwide at the time it began production in the country. The next two firms, Tata and

Table 6.7 Market Share of Leading Car Producers in India and China in 2001

Maruti Udyog Ltd (JV with Suzuki)	62.2	SAIC-VW Joint Venture (JV)	32.7
Hyundai Motor India Ltd	16.5	FAW-VW JV	18.9
		Dongfeng-Citroën JV	10.2
Tata Engineering and Locomotive Co. Ltd	11.5	SAIC-GM JV	8.2
Hindustan Motors Ltd.	3.4	Guangzhou-Honda JV	7.2
		Tianjin Xiali-Daihatsu JV	7.2
Top 4:	93.6	Top 6:	84.4
Number of vehicles	529,947	Number of vehicles	597,074

Source: Sutton 2004.

Hindustan Motors, are independently owned Indian firms. In China, by contrast, all of the six largest producers were foreign JVs. Ford was the only one of the top seven firms worldwide not producing in the country.¹³

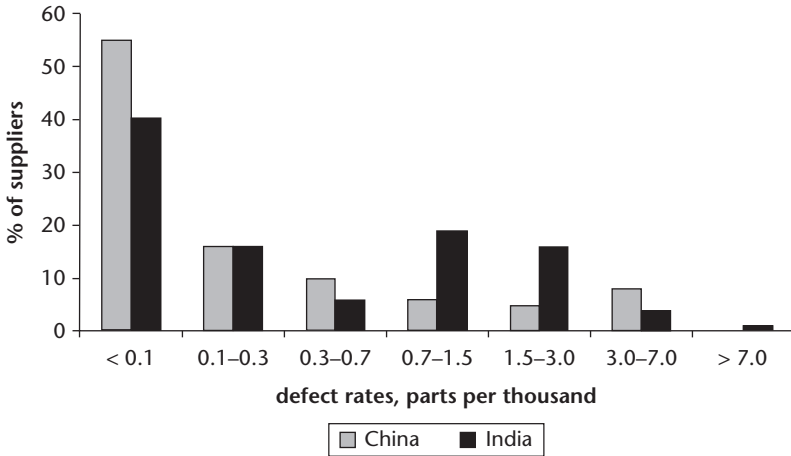
The market share differences between China and Mexico in table 6.7 are mirrored by differences in the sourcing strategies of local assemblers. As the table shows, sourcing by Chinese lead firms is almost fully local. Chinese lead firms are piggybacking on the global supply chain that has emerged around the JV car assemblers, on one hand, and are providing some local first-tier suppliers with important “learning” opportunities on the other. As seen in case of China’s Chery, discussed earlier, local lead firms contract out much of their design work (and even some of the engineering and testing) to vehicle engineering companies. The “integral” design architecture of motor vehicles highlights the fact that these firms will have to master design and development capabilities to be independently successful.

Nevertheless, Chinese firms such as Chery and Geely are providing domestic suppliers, as well as JV suppliers, important opportunities to upgrade their capabilities and to become more deeply involved in the design, prototype development, testing, and mass production of important part and vehicle subsystems. Managers at several major JV suppliers interviewed as part of our field research expressed similar sentiments about the emerging “learning” opportunities provided by local lead firms, and described how they hoped to build on them. The process of capability-building can be difficult and time consuming, and weaknesses in areas such as system integration on the part of domestic lead firms present a set of issues for suppliers that are distinct from those faced when they serve lead firms with deeper competencies. However, the first-tier suppliers interviewed for the study were nearly universally impressed with the speed of learning at firms like Chery. The rapid proliferation of models sold by these firms is testimony to the opportunities being provided.

In addition, competition with the most advanced domestic firms—Chery, Geely and SAIC (Shanghai Automotive Industry Corporation)—is proving to be a major stimulus for some foreign lead firms to pursue an aggressive localization strategy in China. Only by sourcing locally almost as much as Chinese lead firms have foreign automakers been able to compete for the middle of the market—a segment that is growing especially strongly (Brandt and Thun 2010).

These differences are reflected in the quality of the domestic supply-base. The statistics in Figure 6.1 illustrate the higher defect rates (in parts-per-thousand) for Indian versus Chinese suppliers. Because foreign automakers invested more aggressively in China to build up a local supply chain than in India, it is not surprising that Indian suppliers were lagging behind Chinese suppliers in both productivity and quality, both at the time of our initial field research (2004) and in a follow-up study by Sutton (2007). Furthermore, an update of the Chinese data in

Figure 6.1 Supplier Defect Rates for New-Generation Lead Firms



Source: Brandt and Van Biesebroeck (2008).

Brandt and Van Biesebroeck (2008) shows remarkable improvement that is unlikely to be matched by the Indian industry, which has been developing more slowly.

On the other hand, capabilities at the lead firm level show an opposite pattern. Because Indian industrial policy promoted local lead firms from the start, substantial domestic capabilities in development of design, product development, and engineering have developed. When local expertise was not available, the independent lead firms, such as Tata Motors, acquired Western companies or formed international JVs.

While Indian lead firms have remained focused on the domestic market, Chinese lead firms have begun to export finished vehicles, and first to other developing countries. Geely has repeatedly postponed its plans to start exporting vehicles to North America, but it is likely to happen eventually. During its restructuring, DaimlerChrysler briefly contracted with Chery to manufacture and export compact cars to North America. SAIC (Shanghai Automotive Industry Corporation)—the joint-venture partner of General Motors and Volkswagen in Shanghai—has announced its intention to start exporting, a risky strategy since they will be competing with its joint-venture partners in their home markets. A new JV involving Honda in Guangzhou is already exporting small compact cars (the Fit/Jazz model) to Europe.

These trends are likely to continue to affect outcomes as the recent economic crisis winds down. The crisis has caused Western lead firms and global suppliers

to shed assets that would not have been otherwise available for acquisition. Indian Tata Motors was the first lead firm from a developing country to purchase divisions of Western lead firms that were struggling for survival. In July 2007, Tata acquired the venerable British luxury vehicle brands Jaguar and Land Rover from Ford. The deal included the brand names, production facilities in the United Kingdom, design and engineering facilities, and compensation to Ford for the intellectual property tied up in existing models. This acquisition of know-how, especially on the design and development side, is by far the largest prize. These capabilities could provide the company with skills and technological knowledge necessary to satisfy consumers in the West and enable Tata-designed vehicles to meet the emissions and safety standards of mature markets.

Tata's acquisition of Jaguar and Land Rover has been followed by a flurry of deals or near-deals involving Chinese companies. Most of these have been motivated by a desire to acquire foreign technology. The following deals have been noteworthy:

- **Shanghai Automotive Industry Corporation (SAIC)** entered into a joint venture partnership to produce former Rover models in China in June 2004. After losing a legal battle over the brand name, it launched its own model on the Rover platform.
- **SAIC** invested US\$500 million to acquire a controlling stake in Ssangyong, a Korean automaker in October 2004. This followed a 2002 investment to buy a 10 percent stake in Daewoo, another Korean automaker controlled by GM.
- **Nanjing Automobile** acquired the British MG Rover and shipped production equipment to China in July 2005. The company restarted production of MGs in China in 2007.
- **SAIC** purchased Nanjing Automobile in December 2007 and restarted production of MGs in the UK in 2008.
- **SAIC** began talks with bankrupt German automotive design house and contract assembler Karmann in February 2008 for a future development and contract manufacturing project. Karmann was acquired by Volkswagen in November 2009.
- **Tengzhong Heavy Industrial Machinery**, a privately-owned Chinese road equipment manufacturer, signed a memorandum of understanding with GM to purchase the Hummer unit in June 2009. The sale was subsequently abandoned.
- After Beijing Automotive's (BAIC) bid for Opel was rejected, it signed a partnership deal with the Swedish Koenigsegg Group that had been negotiating to purchase Saab from GM in September 2009. Eventually, GM sold its Saab division to Spyker from the Netherlands. The connection between BAIC and

Koenigsegg is rumored to have been one contributing factor in the redirection of the sale..

- **Geely** is the sole remaining negotiator to purchase Volvo from Ford. A tentative agreement to complete the sale in the first quarter of 2010 was announced by Ford in December 2009.

Several other announcements illustrate that developing country lead firms are claiming an increasingly important role in the global automotive industry. Again, Tata Motors is leading the way:

- **Tata** launched the Nano, a highly anticipated “one lakh” (100,000 rupies, approximately €1,800) car in January 2008. A version for Europe is anticipated in 2012.
- Berkshire Hathaway (the investment firm of Warren Buffett) invested \$230 million to acquire a 10 percent stake in BYD, a Chinese battery maker from Shenzhen with aspirations to manufacture electric vehicles, in September 2008.
- **SAIC** took majority control (50 + 1) of Shanghai GM in December 2009, and teamed up with GM to enter the Indian market via a new joint venture. SAIC has also announced plans to produce 200,000 vehicles under its own brand name by 2010, of which 50,000 are intended for export. Much of this production will take place in a wholly-owned plant (that is, without its joint venture partners GM or VW) in Yizhen, Jiangsu province.
- Volkswagen announced a €2.5 billion investment to acquire a 20 percent stake in Suzuki in December 2009. Suzuki’s dominant position in the Indian market through its JV with Maruti was cited as the prime motivation.

Conclusions and Policy Discussion

While much of our discussion has been framed in fairly general terms, it is important bear in mind the tremendous heterogeneity in how different firms or industrial groups experienced the 2008–09 economic crisis. Experiences have ranged from an all-out collapse and radical restructuring at General Motors and Chrysler, to a retrenching of core strategies until demand picks up for Toyota and Volkswagen, to pursuit of opportunistic growth opportunities either carried out either conservatively (Hyundai) or aggressively (SAIC, Geely, and Tata).

The recent crisis in the automotive sector taught the world many lessons, but left many questions unanswered as well. In particular, the question must be raised as to whether government interventions in North America and Europe positioned the companies based in these regions to compete effectively in the future.

Although the process of restructuring is still under way, several general observations can be noted, as follows.

- Economic nationalism cannot be ignored in the automotive industry. To a remarkable extent, relatively to other consumer goods industries, governments are willing to put money on the line to support national champions, even at the risk of angering their trading partners and political allies. The strength of the German government's interest in supporting GM's European Division, Opel, may be due, not only to the automaker's position as a major employer, but also to its roots as a German company prior to its acquisition by GM in 1929. Deep historical roots like these drive political sensitivities, help to justify government bailouts, and strengthen the regional pattern of GVC organization of the industry. These same dynamics are likely to play a role if finished vehicle exports from developing countries, such as China or India, increase substantially, or even if parts imports to Western economies increase suddenly after the crisis. For example, if history is any guide, companies such as Tata (India) and Geely (China) will have to establish or purchase substantial final assembly capacity in the (economic) heart of North America and Western Europe if they intend to sell large quantities of vehicles in these regions, just as Japanese and Korean firms have done in North America and GM and Volkswagen have done in China. The fact that most of the deals featuring Chinese firms purchasing well-known Western brand have fallen through underline this point. At the same time, if market share losses continue, firms based in the United States and Western Europe are likely to continue to shift production to the low-cost peripheries of Eastern and Central Europe and Mexico to reduce operating costs. It is clear that the tendency for vehicles to be built where they are sold and to be manufactured in the context of regional production systems will not quickly fade away. Indeed, the political dynamics that underlie these GVC patterns have been dramatically exposed by the nationalistic government responses to the 2008–09 economic crisis.
- Chinese interests in purchasing struggling carmakers serve as just one illustration of the rising importance of developing countries in this industry (Thun 2006). An important motivation for these firms' acquisition efforts is to acquire advanced engineering and design expertise, which they have thus far have largely outsourced to European-based automotive design firms (Whittaker et al. forthcoming).
- The (failed) bid of the Canadian global supplier Magna for the automaker Opel, on the one hand, highlights the increasing importance of suppliers and, on the other hand, the relative, regional, operational independence of the European arm of GM from its other operations. Many suppliers, especially in

North America, have been bankrupted even prior to the recession, by their weak bargaining position and the declining market shares of their core Detroit customers, but the lack of credit in the crisis made the situation for them far worse. It seems inconceivable that the group of surviving suppliers will make themselves as vulnerable again by aligning themselves to the same extent with a few clients. The solution, as before, is likely to be a wave of mergers and the rise of fewer, larger supplier. In China, currently, the balance of power is tilted more toward global first-tier suppliers than in other places.

- From a GVC perspective, the intense political attention paid to automakers has further weakened the relative position of suppliers. Even though Delphi employed approximately the same number of workers as its former parent, GM, and filed for Chapter 11 in 2005, politicians paid attention until GM itself inched towards bankruptcy in 2008. The decision by the Obama Administration to run the supplier support program through lead firms can only tie suppliers more tightly to old commercial relationships with firms that are losing market share.
- As work shifts to the supply base, value-added at the assembly stage falls, leading to a greater protectionist effect, even when import tariffs on finished vehicles are unchanged. This is particularly important in the automotive industry, where lead firms have disproportionate power in the chain. Lead firms can force their domestic supply base—which invariably faces lower levels of protection than they do—to compete vigorously with foreign firms, effectively enforcing world market prices for inputs manufactured at home.¹⁴ All benefits of protectionism of the final product then accrue to lead firms. Effectively, lead firms are able to transfer the import tariff on the final good entirely onto components, which they purchase at world prices and which make up an increasing share of the final cost of a vehicle.

On the one hand, government bailouts can be considered protectionist because they discriminate against foreign producers by assisting domestic and quasi-domestic companies only. In contrast, a policy such as the U.S. government's extremely popular "cash for clunkers" program, which subsidized the purchase of new, higher-mileage vehicles, does not discriminate based on the nationality of the automaker. As long as certain criteria are met, the policy subsidized any vehicle, domestically produced or imported. However, such policies can favor specific firms in subtle and perhaps unintended ways. Ford's popular Focus model was a strong seller with this program, but so was the already popular Toyota Prius hybrid, which is produced in Tsutsumi, Japan.

Imports of high-mileage cars from Republic of Korea to North America actually increased during the fourth quarter of 2008 and first quarter of 2009

(Wilson 2009). In China, government incentives for vehicles with engine sizes below 1.6 liters boosted sales of domestic firms, such as Chery and Geely, which offer smaller cars at the low end of the market (Reuters 2009). On the other hand, this spike in small car sales may also be caused by the general economic slowdown. It may be part of a broader trend toward smaller cars, as traffic congestion worsens in large cities and the Chinese automotive market matures to include more owner-driven cars (many cars in China are chauffeur-driven) and sales to individuals in cities with highly constrained parking opportunities.

However, if a central motivation of protectionist legislation is to retain domestic jobs, as opposed to companies, the strong regional structure of GVCs in the automotive industry complicates the picture. Even if the American Big 3 were to fail completely (unlikely, since the worst-case-scenario would most likely lead to a breakup and sale of large companies rather than broad-based liquidation), it is very likely that the vast majority of vehicles in the United States would continue to be produced locally, by “foreign” transplant factories owned by Asian and European automakers. American suppliers would certainly be hurt, but the largest have already diversified their customer lists to include all the world’s major automakers, and it is conceivable that smaller, domestically focused suppliers could find work with transplants, since market share would quickly swing in their direction and orders would increase.

So now, when U.S. and EU policy makers provide bailouts to save “the car industry,” they really are moving to save (in the U.S. case) the Big 3, their suppliers, and United Auto Workers’ jobs, not aggregate U.S. auto employment, which, barring huge increases in finished vehicle trade, will certainly recover to some degree when sales inevitably rebound and stabilize. There is, of course, some logic to this scenario: the GVC perspective highlights the possibility of a global division of labor, where vehicle and technology development (and R&D and engineering jobs) stay largely at home, in places such as Japan, Korea, China, and Italy. While bailouts could save U.S. design and engineering jobs, this is not an argument that has been made by policy makers.

Moreover, we have to ask if nationalistic policies will always be followed. Efforts by lead firms from China and India to acquire assets and skills in the higher value-added portions of the supply chain would have been vehemently opposed in normal times. However, in the crisis climate, the desire to save jobs, seemed, at least temporarily, to trump those concerns. In the short run, the nationalistic stance of Western governments may have made it harder for lead firms from developing countries to penetrate mature markets, but this is not the end of the story. In the crisis, firms with the comparative advantage of making smaller vehicles, such as Hyundai and Suzuki, have been hurt the least and have

gained market share. At the very least, the crisis has provided good marketing opportunities for firms producing lower quality and lower priced vehicles, such as the Dacia Logan from Romania or the Tata Nano from India, extremely low cost vehicles that have garnered much attention, at least in the news media.

Market differences limit the options available to policy makers seeking to support the automotive industry in the developing world. The extremely large development cost of country-specific or region-specific vehicles, as well as the tendency for co-location of suppliers and lead firms, puts the goal of a viable, independent, national industry beyond the reach of all except the very largest less developed countries (LDCs). As discussed in this chapter, the options are to become a regional assembly hub or to specialize in labor-intensive tasks in the context of regional production. Both options do provide growth possibilities for local suppliers and opportunities to move up in the value chain. However, both take a very long time to develop, as the selection of new suppliers is tied to new vehicle programs, which have a four- to six-year life cycle, and increasingly require co-location of engineering work in or near the world's automotive design centers.

In the long run, however, the close collaboration and co-location of lead firms with suppliers could begin to work to the advantage of LDCs.¹⁵ Global suppliers have been concentrating an increasing share of product development in the industry's traditional design centers, and when virtually all development work took place in the United States, Germany, and Japan, developing country firms were excluded. Now that some LDC markets have grown sufficiently to warrant market-specific vehicles, lead firms and suppliers are setting up local design centers. Once these reach sufficient scale, more suppliers will follow, and opportunities could open up for local firms. Once established, such industry clusters, based as they are on industry-specific labor markets and skills, tend to be very long-lived.

If the experience of the Korean industry is any guide, it is likely that the increasing production capacity in developing countries will be followed, albeit with a long lag, by the emergence of important supplier firms. This process is far from automatic, however. Our research evidence from China and India underscores the importance of satisfying and exceeding quality standards set by foreign lead firms and first-tier suppliers. The large minimum scale requirements and high technical barriers in this industry make it nearly impossible to succeed with a strategy that seeks to advance inexperienced national champions. Several countries that have tried, through the expenditure of enormous resources, to develop independent industries have lately changed course and opened up more to foreign investment. The automotive industry in Russia, Iran, and Malaysia only stand a chance if foreign lead firms are welcomed rather than discouraged.

The experience of the Mexican industry—or, similarly, that of Turkey or Thailand—highlights further that success by independent suppliers is extremely

difficult as well. The experiences of successful suppliers in developing countries suggest that three objectives must be achieved in turn. The first goal is to achieve worldwide quality standards. This is a necessary condition to start providing internationally competitive supply chains. The second goal is to improve productivity. Achieving quality standards already requires a great deal of automation. In order to be a viable automotive supplier, productivity levels must be sufficiently high and must improve at the same speed as the global average technological progress in the sector, otherwise it is impossible to match continuous price declines that are the norm in the industry. Third, firms should acquire design capabilities, which is a necessary step to greater independence and also a precondition to become lead supplier on a part when new vehicle programs are started. To achieve the first two goals, working in the value chains of foreign-owned firms accelerates the process. To achieve the third goal, it is often extremely valuable to also work for domestic lead firms because they tend to give local suppliers greater opportunities.

Notes

1. See Sturgeon, Van Biesebroeck, and Gereffi (2008) for a more elaborate discussion of the GVC perspective on this industry.
2. Of the three major vehicle-producing regions, regional integration is the most pronounced in North America. In 2004, 75.1 percent of automotive industry trade was intraregional there, in contrast to 71.2 percent in Western Europe and 23 percent in Asia (Dicken 2007, 305).
3. Around the same time, starting with Nissan in 1986 in the United Kingdom, Japanese firms constructed assembly plants in Europe to avoid import quotas in France and Italy and import tariffs in most other EU countries.
4. Volkswagen is an exception in that it has concentrated all of its North American production in Mexico, and Nissan is the sole Japanese automaker that has built up large-scale, export-oriented final assembly there.
5. The large U.S. trade deficit with China might have influenced Honda's decision to export the Honda Jazz to the European Union from China, while the almost identical Honda Fit for North America is shipped from Japan.
6. To the extent that governments are concerned with slowing the pace of layoffs during a recession, making sure automakers keep operating is indeed a sensible strategy, especially when multiplier effects are invoked. However, if we take a long-term view that includes stable unemployment rates, there is no evidence that governments are able to boost aggregate employment by propping up specific firms in specific industries. Any job that is preserved in a country's automotive industry, directly or indirectly, means one less job filled somewhere else in the economy. However, job quality may be degraded in this process of job churn, and with massive deindustrialization, regional unemployment can remain high for long periods, even as aggregate unemployment stabilizes.
7. Ford named Geely as its preferred bidder for Volvo in October 2009. After the two sides agreed on terms for intellectual property transfer, production and manufacturing commitments, and management structure in December 2009, Ford announced that the sale would be completed in the second quarter of 2010 (Bennett and Dolan 2009).
8. An exception is Taiwan, which has developed a significant export industry supplying standardized parts for use in aftermarket repair (Cunningham, Lynch, and Thun 2005).
9. In some instances, funding for continuous improvement projects was refused because downsizing had left firms too short-staffed to carry them out.

10. These differences are not limited to China: in Europe and Latin America some firms have always followed a much more engaged strategy. The chosen strategy in China for a given firm seems to carry over well to its operations in different parts of the world.

11. Some automotive lead firms are pursuing global strategies that lie somewhere between cautious and aggressive localization by trying to increase the share of parts common among global vehicle families but maintaining high degrees of product differentiation across global markets.

12. In 2005 the automotive assembly and parts sectors accounted for 1.05 percent of Canada's total private sector employment and 1.07 percent of Mexico's, but only .77 percent of the United States' (based on calculations using data from International Labour Organization, U.S. Bureau of Labor Statistics, National Institute of Statistics and Geography (Mexico), and Mexican Association of Automotive Distributors).

13. Citroën is part of PSA, the number 6 firm globally, and Daihatsu is part of Toyota, number 3 globally at the time. DaimlerChrysler (55) is not in this shortlist, but was in fact the first firm entering the Chinese market with a production joint venture in Beijing.

14. For evidence on component price convergence, see Thun 2006.

15. For China, the tremendous success of the SAIC joint ventures with GM and VW have made Shanghai a world class hub of the global auto industry. Two of the most successful private firms, Chery and Geely, are located in adjacent provinces. GM built a \$250 million technical center there, employing 2,500 employees. Other production centers exist—fully 27 of 30 provinces have their own assembly plants—but the supply base in and around Shanghai, especially, is unrivalled in China (Thun 2006). The activity in India is less concentrated, which makes it less advantageous for suppliers to establish large local operations. Tata Motors and Mahindra & Mahindra have their headquarters in Mumbai, Maruti-Suzuki near Delhi, GM India is located near Vadodara in Gujarat, Hyundai Motor India in Chennai, and Kirloskar, the joint venture partner of Toyota, is headquartered in Pune, Maharashtra.

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