



The World's Industrial Transformation

A Chatham House Report

Donald Hepburn, Andrew Black, Matteo Ferrazzi, Andrea Goldstein,
David Hurst, Steven McGuire and Michael Owen



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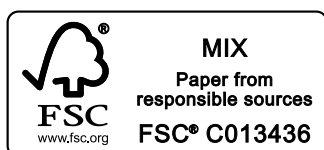
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Executive Summary

The last 25 years have seen a dramatic transformation of the world's manufacturing landscape. Globalization has hugely increased the world's available labour supply while a flood of foreign direct investment by multinationals has unlocked new sources of advantage.

The star performer has been China. It is now the world's largest manufacturer, overtaking the United States in 2011. Most dramatically, in the automotive sector it produced more vehicles in that year than the United States and Japan combined.

Prospects for the world's manufacturing landscape are more uncertain. In developed countries the financial crisis and recession have highlighted structural problems which will take a long time to overcome, and a long period of tepid growth is likely in the West. This will involve rebalancing in favour of industry as financial and public-sector services shrink.

Fortunately, developing countries such as China and India should continue to grow at a healthy rate, partly owing to the emergence of a huge middle class that will need consumer goods and vast infrastructure investments. Both will boost domestic industry.

Putting these two economic outlooks together, the long-term fall in the share of manufacturing in the world

economy is likely to be halted. Much faster growth in the developing world, where manufacturing has a bigger share than in the developed world, will reinforce this trend.

Companies will continue to seek out the best locations. Wages in some developing countries are growing much faster than in the West. This is the case in China's coastal provinces, prompting companies to move to inland China and to other lower-cost locations such as Vietnam and Bangladesh. This trend will also lead to the 're-shoring' of some production to developed countries. Further factors that could encourage this trend are higher real exchange rates in developing countries and higher transport costs if oil prices rise.

Many multinationals have an interest in preserving free trade, given their dependence on global supply chains. Despite this, there may be greater political pressures to promote domestic production and bring jobs home during future recessions and at certain points in countries' upcoming electoral cycles. Although this report takes the view that these protectionist pressures are unlikely to lead to a significant or sustained reversal of globalization, governments will need to be ever more proactive in arguing for the benefits of continuing globalization (see policy recommendations for further detail).

The Chatham House project

The focus of this report is to assess which industries might change the global manufacturing landscape and drive future growth. The report brings together the findings of four sectoral case studies: aircraft, automotive, pharmaceutical and retailing.

The following tabulation shows whether they will grow faster than GDP.

Table 1: Will the case study industries drive growth?

Industry	Developed world	Developing world	Total world
Aircraft	Yes	Yes	Yes
Automotive	No	Yes	Yes
Pharmaceutical	Yes	Yes	Yes
Retailing	No	Yes (No in long term)	No

The aircraft industry should grow quickly, driven by strong growth in demand for air travel. Production will continue to be dominated by the United States and Europe, at least until 2020, with smaller contributions from Brazil (Embraer) and Canada (Bombardier). But China is rapidly building its own aircraft industry. It will challenge the Boeing/Airbus duopoly by 2020 and will be an important player by 2030, based on its huge domestic demand for aircraft.

The world market for cars will continue to shift in favour of developing countries. The developed world is saturated, and growth there will come from technical advances in fuel use and in safety. By contrast, car ownership in the developing world will soar, and production will increasingly be concentrated in these markets.

Pharmaceuticals demand will be buoyant, though there will be some brake on supply in countries where healthcare is public and government budgets remain under pressure. The other factor that will have a big impact on this industry is technology. Recent basic scientific breakthroughs in genomics should produce an increasing flow of new drugs over the next 10 years. These developments may lead to cheaper drugs but the impact is not likely to be felt much before 2020.

Retailing is very well developed in the West and is not expected to drive growth there. It faces a continuing revolution as e-commerce separates product selection from purchase and expands its share at the expense of physical shops and established retailing companies. Internet purchasing also facilitates closer relations between producers and consumers, who may ignore retailers altogether. Developing countries, on the other hand, are at different stages of retail development. The emergence of their middle class will require a big expansion in modern retailing, some of which will be related to an increase in auto-related infrastructure spending, as shopping becomes motorized. In the longer run, however, modern supermarkets and efficient supply chains will mean that retail's share of the economy in these countries falls towards Western levels.

Other industries not covered by this report may also drive growth and merit further study. These include durable consumer goods in developing countries, all

aspects of health spending including medical machinery, consumer and business electronics, and machinery to support the growth of infrastructure and environmental investment.

Policy recommendations

- The manufacturing transformation described in this report has brought enormous net benefits to millions of people both in the developed world (through lower prices) and in the developing world (through more jobs). Policy recommendations stemming from the four case studies aim to ensure that the benefits of this transformation continue:
- From the aircraft and auto studies comes a clear recommendation that governments should support free trade and resist protectionist pressures. Global agreements such as the stalled Doha round now seem to be beyond the reach of the international community but fresh attempts to promote international trade and investment, including regional initiatives such as the Trans-Pacific Partnership and the Transatlantic Trade and Investment Partnership, should be strongly supported.
- Governments should be more wholehearted in their protection of intellectual property (IP). This was specifically identified as important in the aircraft and pharmaceutical industries but would also apply in the auto industry. As innovation goes global, countries that traditionally imported ideas are increasingly developing their own and will come to appreciate the advantages of better IP protection.
- Governments around the world will have different views on the effectiveness of industrial policy, but there was agreement across the aircraft, automotive and pharmaceutical case studies that government efforts and subsidies should be directed towards raising education standards, particularly in science and technology, and supporting basic research. This should provide a level playing field for companies within an industry to compete on equal terms. Investment in education and training, research and

development, and innovation has a high payoff in helping both existing industries and the development of new industries. Countries that succeed in building a highly educated workforce will in turn benefit by attracting investment in high value-added activities.

- Industry policies that distort the market should be avoided. Examples include trying to attract investment in the aircraft industry into areas such as testing and component manufacturing which are best carried out close to major manufacturing hubs in Europe, America and Asia; offset agreements that lead to the construction of inefficient local capacity; the preservation of persistent over-capacity in the auto industry; and government pressure on pharmaceutical companies to supply subsidized drugs to developing countries.
- Governments need to re-examine the balance of advantages and disadvantages of deregulation. Market failures in the financial sector and economic models that proved disastrously wrong have shaken people's faith in laissez-faire capitalism. Financial markets

turned out not to be efficient and the current (and complex) moves to replace 'light touch' regulation with more effective regulation to protect economies from another financial meltdown should be pushed through to a speedy and internationally agreed conclusion.

- History reminds us that globalization can go into reverse, with disastrous consequences for growth, so governments also need to work much harder to demonstrate the benefits of globalization and to mitigate the costs. This will require compensating the losers – for instance, through much more education and re-training for those who lose their jobs to the workforce in emerging countries. There is also a need to address the significant increase in inequality: those who have benefited from globalization – whether individuals or companies – should be seen to bear their 'fair' share of the tax burden. Unless this problem is tackled, support for globalization is likely to be undermined by a political backlash in many countries.

1. Introduction

Donald Hepburn

There have been huge changes in the world's manufacturing landscape over the past 150 years. In the nineteenth century the lead in manufacturing passed from China to the United Kingdom and then to the United States. The last 25 years, and particularly the last decade, have seen an equally dramatic transformation as large swathes of industry have moved to emerging countries to take advantage of benign economic and political conditions. New industries based on breakthroughs in biosciences, information technology and environmental sciences are also changing the balance of manufacturing, while a close scrutiny of the sources of competitive advantage has prompted many companies to outsource parts of the value chain, including service functions such as accounting or human resources, which were previously carried out within the firm and recorded as manufacturing.

This transformation has been driven by a combination of political, economic, demographic and environmental trends during what may, with hindsight, prove to have been a golden age for the global economy. The ongoing economic crisis, which started with the collapse of Lehmann Brothers in 2008 and has morphed into a sovereign debt crisis and a eurozone crisis, challenges the sustainability of the recent combination of political and economic policies around the world.

This report starts by describing briefly how the manufacturing landscape has changed and explaining the causes. It then makes some underlying assumptions for the world to 2020 to provide a background against which to judge the past and future contribution of four sectoral case studies – aircraft, automotive, pharmaceutical and retailing.¹

The report concludes by drawing together findings from the case studies to see if their industries will drive growth in future. It then looks at broader questions about the way in which the manufacturing landscape may change in the next 10 to 20 years, what will cause these changes, what more specific assumptions have to be made, and the risks and uncertainties that will affect the outcome.² While the limited number of case studies precludes a definitive answer to these questions, the report is intended to provide a framework of analysis for further work in this area.

Recent trends

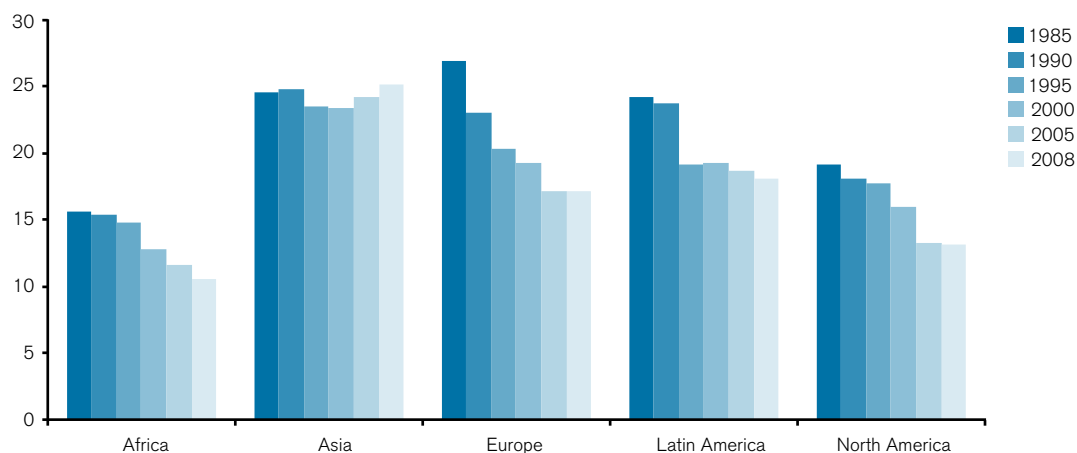
Manufacturing's share of world output has been shrinking for many years (see Figure 1.1) as services have taken an ever-increasing share, particularly in the developed world. Among emerging countries, manufacturing's share of output has also fallen in Africa and Latin America. In Asia, manufacturing's share is constant but this hides a fall in Japan, an increase in China and little change in South Korea and India. In all regions, services have gained share and contributed more to growth, with agriculture being the big loser worldwide.

Figure 1.1 also shows that manufacturing's share levelled off between 2005 and 2008 in Europe and North America, and even rose slightly in Asia. Europe and North America suffered a further sharp fall in 2009 as their economies went into recession but the share of manufacturing recovered in 2010. Since 2008 there has been much talk of the need, in at least some developed countries,

¹ Retailing is not classified as an industry in the International Standard Industrial Classification but is included because it is the channel through which most consumer goods pass and because it raises many interesting issues about the similarities and dissimilarities between the developed and developing world.

² For more detail on the project and the case studies, see the Chatham House series of Briefing Papers on the World's Industrial Transformation, <http://www.chathamhouse.org/research/economics/current-projects/worlds-industrial-transformation-series>.

Figure 1.1: Manufacturing's share of GDP



Source: Structural Changes in the World Economy, UNIDO (2010).

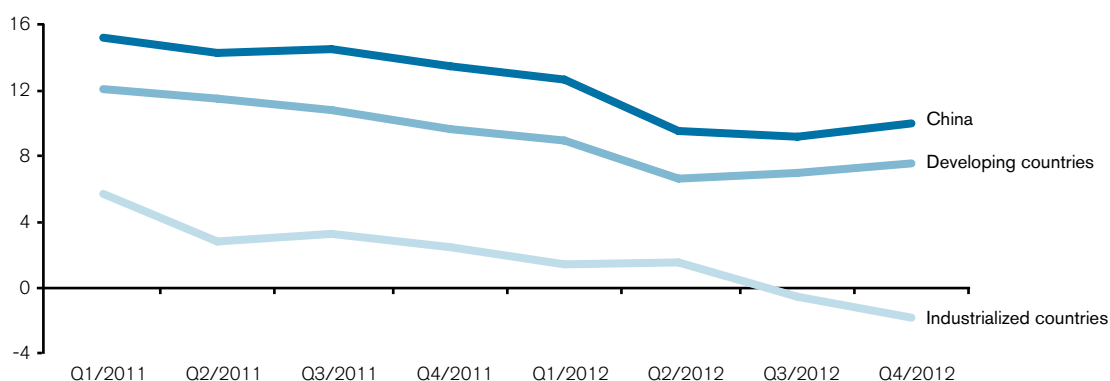
to rebalance economies away from financial and public services and back towards manufacturing. There has already been some slimming of the workforce in banks and the public sector but it is too early to say whether a new trend has emerged.

There have been two big shifts in manufacturing. The first, most dramatic change regards the location of manufacturing. The second is a change in the structure of manufacturing from traditional industries such as food, textiles, apparel and footwear towards more sophisticated industries such as consumer durables (e.g. cars, televisions,

white goods) and newer industries based on technological breakthroughs (e.g. IT, medical equipment and environmental investment technologies).

The shift in location relates to the changing balance between developed and developing countries. Almost one-third of manufacturing value added is now in developing countries, up from under 20% about 15 years ago, and Figure 1.2 shows that this shift continues. UNIDO statistics show that manufacturing has continued to grow rapidly in developing countries while it actually declined in the industrialized world in the second half of 2012.³

Figure 1.2: Growth in manufacturing value added (annual % change at constant 2000 US\$)



Source: World Manufacturing Production, UNIDO (2011 and 2012).

³ UNIDO (2011 and 2012).

China is the star performer. In 2000 it was the largest manufacturer in three industries (tobacco, textiles and leather goods) but within 10 years it has also become number one in apparel, rubber and plastics, non-metallic products, basic metals, electrical machinery and cars, and is challenging for leadership in a number of others. In 2011 it overtook the United States as the world's largest manufacturing country.⁴

The other big change is the structural shift from basic to more advanced industries. In the developed world, apparel, footwear and textiles have declined as production has moved to developing countries. Growth in the developing world has been much higher across all industries but it too has seen structural change. The more traditional industries such as food, textiles and footwear have grown but other industries such as base metals (e.g. steel), other transport (railway rolling stock, ships, aircraft), televisions, machinery (both office and factory), furniture and medical equipment have grown much faster. This reflects both increasing domestic demand for such goods as incomes rise and export demand.

Another important trend in manufacturing over this period has been the growing importance of multinational companies, especially through their investment in developing countries. Their investment provides not just the capital but also the technology and business practices necessary to succeed. Multinationals are increasingly

based in developing countries, with China leading the way, particularly in the financial, energy and raw-material sectors but also increasingly in manufacturing. There is also a trend towards unbundling of the value chain. Many companies have outsourced parts of the chain (including back-office functions) to other companies, particularly in the developing world as trade barriers and transport costs have fallen.

What are the drivers of change?

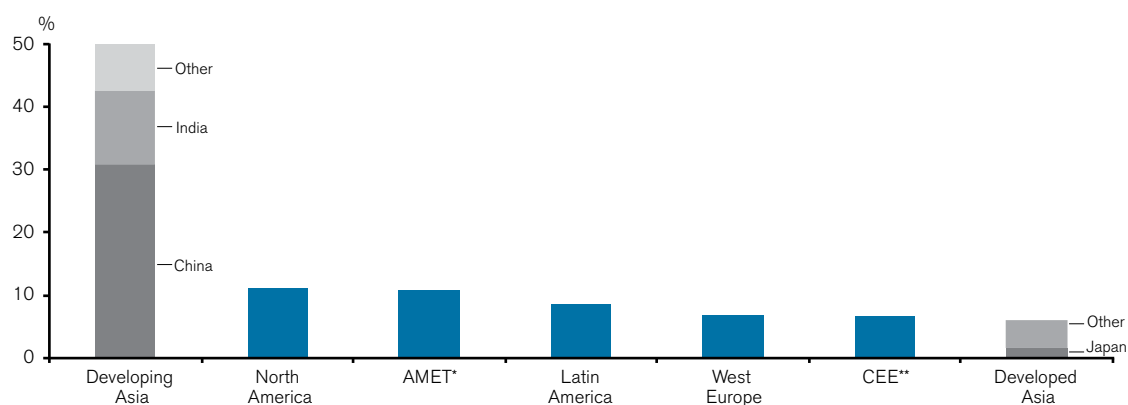
Demand-side drivers

Domestic consumer spending is often the main determinant of industry growth – industries grow in response to local demand for their output. Such demand reflects:

- Changes in population and income;
- Income elasticities;
- Changing tastes.

The latest UN population forecasts show that less developed countries already account for 82% of the world's population and will make up 95% of the anticipated 760 million increase up to 2020.⁵ Asia already accounts for 60% of the world's population and is expected to account for over 50% of the increase to 2020.

Figure 1.3: Share of increase in purchasing power, 2011–20



*AMET: Africa, Middle East and Turkey.

**CEE: Central/Eastern Europe.

Source: Author's forecasts and TLE Strategy Ltd.

4 *Financial Times*, 13 March 2011.

5 UN Population Division (2010).

The world's population is also ageing, albeit from different starting points. This will have a significant impact on consumption because older people have different needs and pensioners' incomes will be under pressure in countries with high levels of public debt. Other demographic drivers include falling household size and urbanization.

Total and per capita income growth will continue to be much higher in developing countries than in the developed world. Figure 1.3 shows that developing countries will account for over three-quarters of the world's increase in purchasing power, with China and India alone accounting for 43% and Japan less than 2%. The dominance of the developing world is less if measured at market exchange rates but will still make up 65% of the increase, with China and India alone adding nearly 33%.

Income elasticities vary from industry to industry and by level of development. At low levels of income, demand for basic necessities is elastic but as incomes rise consumer durables and services enter the frame. As shown earlier, the structure of the industrial sector changes to mirror this, with slower growth in food, textiles and apparel but faster growth in durables.

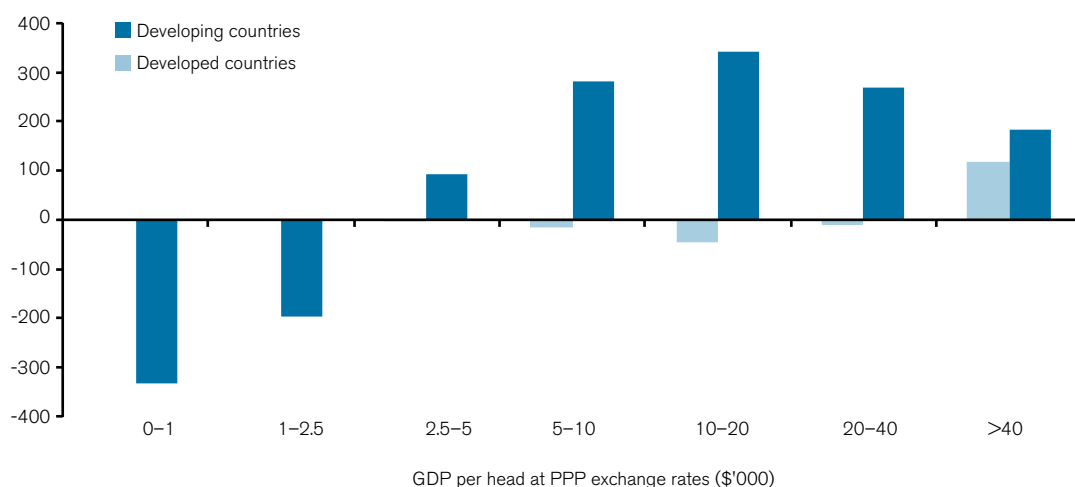
The way in which incomes are distributed is also an important driver of consumption. The world is likely to experience a surge in the number of people entering the middle class. Figure 1.4 shows the increase in the number of people in different income groups over the next 10

years, assuming growth of about 2% in the developed world and 6% in developing countries. As incomes rise there will be a further dramatic fall in the number of very poor people and an equally dramatic increase in middle-income groups in developing countries. The really big increase will be in the two income groups \$5,000–10,000 and \$10,000–20,000; there are expected to be 650 million more people in these groups by 2020, two-thirds of them in China and India. This will lead to rapid growth in spending across a wide range of goods and services. Industries to benefit will include cars and aircraft (as mass tourism spreads to the Asian middle classes).

In the developed world, consumer spending will remain depressed, at least in the immediate future, as it struggles to shake off the ongoing economic crisis, but within this rather poor overall outlook some sectors will continue to grow faster than average. Health spending is one. The impact of ageing is likely to reinforce the apparently limitless demand for better healthcare despite the increasing cost of many therapies.

Changing tastes can also be important in boosting certain industries. Rising incomes and exposure to foreign ideas through international branding and travel can alter spending patterns. Global brands can also create demand where it did not exist before. Examples include the rapid growth of coffee and chocolate consumption in China and the spread of fashion brands throughout emerging markets.

Figure 1.4: Change in population by income group, 2011–20 (millions)



Source: TLE Strategy Ltd.

Finally, there is a demand for publicly supplied goods and services, expressed through the ballot box. The most relevant here is the demand for medical care, including for the elderly. This will drive growth in demand for pharmaceuticals and medical services, though heavily indebted countries will struggle in the short term to meet this demand.

Supply-side drivers

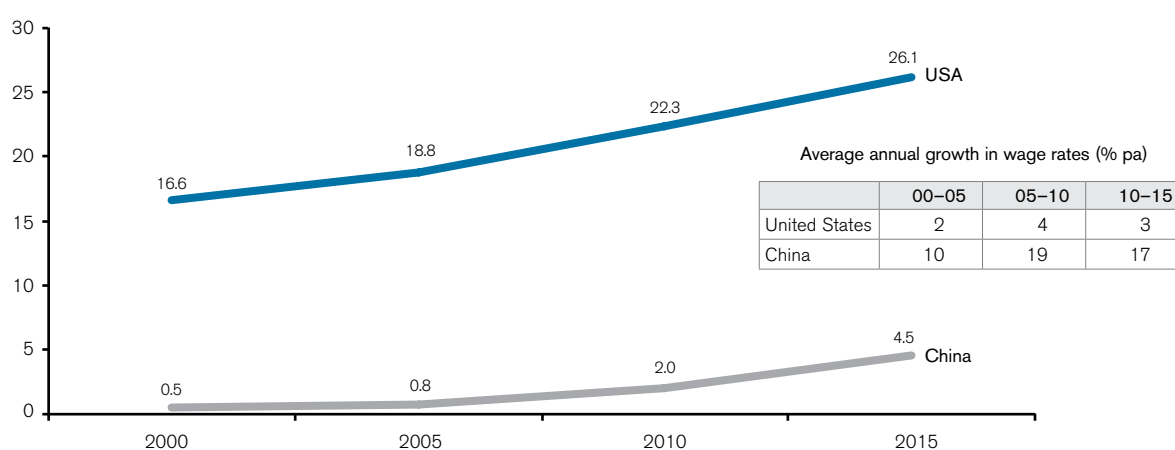
The most important supply-side driver is the availability of labour. The latest UN forecasts show that all of the increase in the number of people in the age group 15–59 (roughly the working-age population) will be in less developed countries, with the number in the developed world actually falling.⁶ Of the extra 450 million people in this age bracket, nearly 120 million will be in India, while there will be no change in China. These forecasts illustrate very clearly how the demographic dividend will have passed from China to India by 2020.

This demographic shift in China is already starting to change the face of Chinese industry, pushing up wages in coastal provinces. A recent report by Boston Consulting Group (BCG) drew attention to the rapid rise in wages in China and the fact that they have risen faster than

productivity.⁷ Figure 1.5 shows how pay and benefits for the average Chinese worker rose by 19% a year, but only by 4% in the United States, between 2005 and 2010. BCG expects the catch-up to continue. It reflects the growing scarcity of labour, at least on the coast, and also the Chinese government's policy of adjusting its growth model from one based on exports to being based on domestic consumption. The government's intention, expressed in the latest Five-Year Plan, is also to encourage manufacturing to move up the value chain by the promotion of more sophisticated industries. More labour-intensive industries are already moving inland in China and to countries which still have plenty of available labour, such as India, Bangladesh, Vietnam and Indonesia.

Another supply-side driver is the availability of investment capital. Capital is currently constrained in the developed world as banks rebuild their balance sheets after the financial crisis. In the longer term, private investment should recover but public-sector investment will remain under pressure for some time. In contrast, emerging countries have savings to fund domestic investment. A good example is the boost to investment in China to offset lower exports during the economic crisis.

Figure 1.5: Relative factory wages, China and United States (\$/hr)



Source: Made in America, Again (BCG 2011).

⁶ Ibid.

⁷ Boston Consulting Group (2011).

The pace of innovation and technical progress in both products and manufacturing processes will also affect the shape of industry. Innovations in advanced technologies such as computing, biotechnology, genomics, nanotechnology, new materials, fuel cells and new manufacturing processes such as 3-D printing are transforming old industries and creating new ones. Another huge opportunity is in health where these technologies, or combinations of them, are starting to appear on the market in the shape of targeted therapies for serious diseases. Initially, they will drive industry change in developed economies but research is also taking place in developing countries and the effects will be felt there as well.

Innovation can also create entirely new industries, built on needs we never knew we had. The Sony Walkman is the classic example (although, in an interesting demonstration of the speed of change, production of the Walkman has recently ceased). Other examples include social networks delivered over the internet.

Other drivers

Governments can also have a big influence on the industrial landscape through a wide range of policies including exchange-rate management, export promotion, investment subsidies, domestic content and technology transfer requirements, protection of infant industries, support for national champions, and protection of strategic industries from hostile takeovers.⁸

The use of these powers is common, has varied over time and between countries, but is now becoming more widespread. In the recent economic crisis, governments leaped into action when the integrity of the financial system was threatened. Banks were bailed out and/or nationalized, and automobile companies were rescued in the United States. In earlier decades Japan and South Korea promoted chosen industries using government-supported industrial groups (*keiretsus* and *chaebols*). China has also used this type of policy to develop certain industries. The Five-Year Plan 2011–15 has identified seven strategic industries – energy conservation and environmental protection,

next-generation IT, biotechnology, high-end equipment (aircraft, high-speed rail), new energy (nuclear, wind, solar), new materials and new energy vehicles – in which the government intends China to succeed on a global scale. The aim is to increase their share of GDP from 5% now to 15% by 2020.

The research question

The first question this project sought to answer is ‘Which industries will change the industrial landscape in future, leading growth in the next decade?’ This raises fundamental questions about the causes of economic development, which are particularly relevant as the developed world struggles to find growth to pull itself out of the worst economic situation since the 1930s. Unless the developed world can re-discover growth, the risk is a decade of stagnation as governments pursue austerity to cut budget deficits and banks deleverage.

The four sectoral case studies here – aircraft, automotive, pharmaceutical and retailing – look at trends in the past 25 years, what has driven growth and the outlook for the next 10 or more years.⁹ Each sector has its own particular characteristics, so they cannot all be fitted into a single template. In some industries the main driver may be consumer demand. In others, technological breakthroughs or government policy may be the most important factor.

The case studies consider the drivers mentioned above and address some of the questions lying behind the research question, including:

- What will be the main drivers?
- How fast will the industry grow?
- Where will this growth take place?
- Will the shift to developing countries continue?
- Does the recent economic crisis change the outlook for the industry?

The final chapter assesses these findings and comes to a view on whether the four industries will drive growth in future in developed and developing countries. It then

⁸ Whether such policies are good for the economy is another question.

⁹ There are, of course, many other industries, particularly in high-tech sectors, which could also be studied in any follow-up research.

considers wider questions about the way in which the world's manufacturing landscape will develop over the next 10 years. Forecasts have been made on the basis of an economic scenario which sees growth resuming, not perhaps at recent high rates but at least at a moderate 2% in the developed world and 6% in developing countries. This is consistent with a year or two of low or no growth in developed countries followed by faster recovery in 2014–20. However, another scenario is possible. Ongoing economic problems in Europe and the United States suggest that the risks of another financial crisis and further recession are quite high. While there is scope in some developing countries to turn to domestic demand to provide growth, a collapse in demand from the West would have some impact on their economies.

The outlook would also depend on how countries react when faced with a further rise in unemployment. As a starting point for the case studies, it was assumed that globalization, in the form of free trade and movement of capital and labour, would continue or at least not go into reverse to any significant extent. This was partly based on the fact that many supply chains rely on global sourcing and it would not be in the interests of companies in the

developed world to encourage trade barriers. But protests are rising in Europe over the impact of spending cuts and job losses, and there are further cuts to come, while in the United States unemployment is still nearly 8% and another slowdown would push it up again. Faced with these political pressures, globalization might go into reverse as it did in the 1930s, with a big impact on the location of production.

Other wider issues include the development of wage rates around the world and the impact this might have on the return of some manufacturing to developed countries ('re-shoring'). So far the evidence of re-shoring has been sketchy and the latest data (in Figure 2) show that manufacturing is still growing much faster in the developing world. But as wages in some developing countries continue to catch up with those in developed countries there may be more relocation of production to even lower-cost countries (e.g. from China to Bangladesh) together with more re-shoring to the developed world.

Finally, it is interesting to speculate on which other sectors might drive growth. The growth of new industries based on technological developments has already been mentioned and these could be candidates for further study. Services could also resume their role in driving growth.

2. The Aircraft Industry

Steven McGuire

Overview of the industry

Arguably no other technology-rich sector has been so dominated by Europe and the United States as aerospace. While Japan and, recently, other Asian countries such as China have developed significant innovative capacity in areas such as electronics and renewable energy technologies, aerospace has largely remained the domain of the same set of European and American companies that dominated the landscape five decades ago. Only in recent years has this dominance been eroded – with Canada and Brazil carving out important positions in the regional jet market. Over the years, several countries, including South Africa and Indonesia, attempted to gain market share – but to little effect. In the past five years a renewed effort has been made to break the ‘Euro-American’ dominance of the sector; Japan, China, India and Russia have all announced significant new efforts aimed at developing an indigenous civil airliner. China has announced a series of production arrangements with major manufacturers in the United States and Europe, using the immense promise of its internal air-travel market as a bargaining chip.

Why has this regional dominance proved so durable, and is it now being eroded? On the face of it the Euro-American dominance does seem to be slipping. Market

‘pull’ forces suggest that production will follow demand as the incumbents conclude they need to place production facilities in Asia to maintain their competitive position. Offset arrangements – where production is outsourced in return for orders – have long been a feature of the industry and will in future be the minimum expectation of Asian governments.

On the other hand, any erosion of the competitive position of the United States or Europe would have serious consequences. In the United States, aerospace is one of the very few manufacturing sectors that generate trade surpluses: in 2011, the US balance of trade in aerospace exceeded £55 billion.¹⁰ The European industry generated a surplus of €34 billion on export sales that accounted for a third of the EU’s manufacturing exports.¹¹ In Europe and the United States, employment in the aerospace sector has remained relatively stable for a decade after a significant reduction during the 1990s as the post-Cold War era saw big cuts in defence spending and a wave of consolidation. At a time when unemployment of skilled workers is politically sensitive, renewed shrinkage of the industry will be resisted.

The aerospace industry presents a particular puzzle: it is at once very globalized and centralized. Few other industries are as reliant on a complex and spatially dispersed supply chain, yet few other sectors have as concentrated a structure at the apex of the industry. Systems integration seems to present incumbent firms with a particularly strong source of competitive advantage. It is also the case that long life-cycles and the complex international regulatory regime for aircraft favour firms with easy access to huge financing (for both product development and sales), the necessary technical expertise, a close relationship with governments and an ability to manage after-sales support. Even the Boeing 787 programme, which was envisaged as a revolutionary departure from the traditional, pyramidal structure of extensive subcontracting of design and manufacturing, had to be re-centralized under Boeing control, demonstrating the need for strong programme management.

¹⁰ Aerospace Industries Association, http://www.aia-aerospace.org/economics/aerospace_statistics/.

¹¹ Aerospace and Defence Industries Association of Europe (2010).

Demand-side drivers: market growth

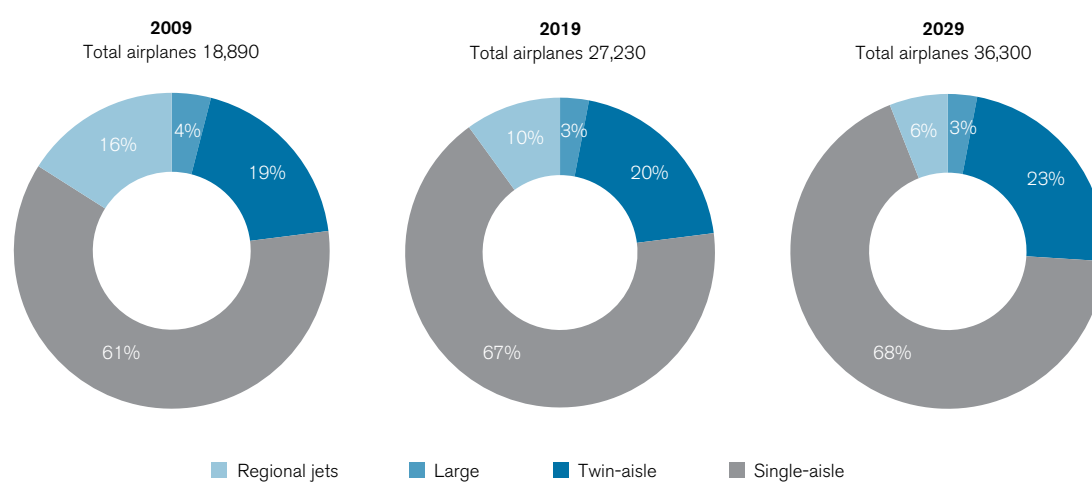
All major forecasts agree that air passenger growth will continue to rise faster than GDP growth for the next 10–15 years (Figure 2.1). Aircraft manufacturers also expect that Asia will remain the fastest-growing regional market, and a number have concluded that placing production facilities there is necessary to maintain a competitive position. As Asia emerges as the new, dominant region in the global economy it seems likely that production will follow customers. China in particular stands out as an emerging giant, with an expected demand for new aircraft that is simply extraordinary. China will need to triple the size of its existing civil aircraft fleet by adding almost 3,800 large (that is, over 100-seat) airliners.¹²

Boeing calculates that 60–80% of the increase in global demand for air travel is directly related to economic growth and the consequent need for business and cargo air services.¹³ Tourism-related travel has been increasing at an average annual rate of 4% (long-term growth in air

travel has been averaging approximately 4.4% for over a decade).¹⁴ In Asia a newly affluent middle class has joined Western consumers as keen travellers, and tourism in Asia grew by 5.5% in 2010.¹⁵ Moreover, much of this growth is in premium traffic, where leisure travellers pay for business-class seats, with yields growing by 40% since 2007.¹⁶ Three-quarters of Asian outbound tourists visit other countries in Asia, thus fuelling demand for medium-sized jets suitable for intra-regional travel.¹⁷

This expectation of the dominance of smaller aircraft is evidently shared by emerging-market players in Russia, Japan and China, all of which are developing products in the 100–130-seat category. There they will face direct competition from new generations of the Airbus A320 and Boeing's 737 range. These smaller aircraft are the mainstay of the production lines of both major manufacturers. Moreover, both Canada's Bombardier and Brazil's Embraer also have aircraft of this capacity.¹⁸ Although the market is potentially large, existing and emerging manufacturers are concentrating on the same competitive space.

Figure 2.1: Predicted demand for airliners



Source: Boeing Market Forecast 2010–2029.

¹² UK Trade and Investment (2010).

¹³ Boeing, *Global Market Forecast* (2010), p. 8.

¹⁴ *Ibid.*, p. 4.

¹⁵ World Tourism Organization (2011).

¹⁶ Airbus Industrie (2010).

¹⁷ IPK International 2010.

¹⁸ Polek (2011).

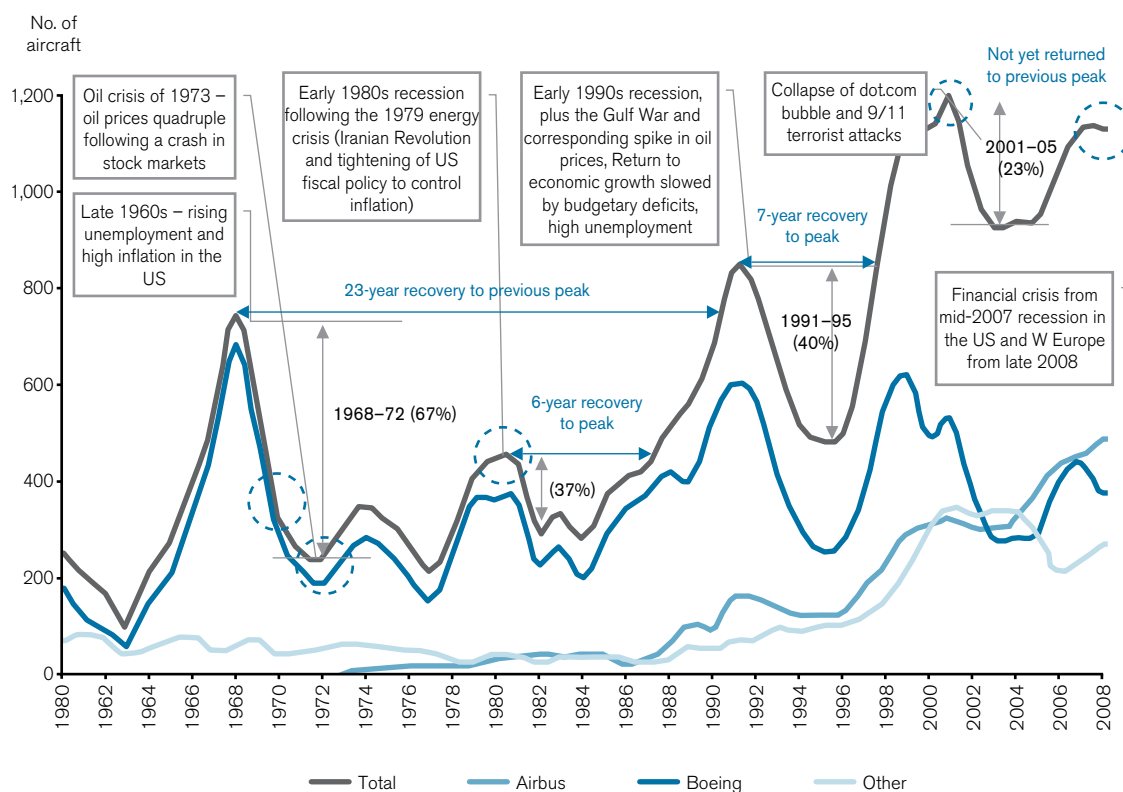
To capture part of this market, several Western firms have entered into extensive subcontracting arrangements with Chinese partners. Airbus now has an A320 assembly line in China, and Bombardier and Embraer both make extensive use of Chinese manufacturing partners as a means of gaining aircraft orders. Nonetheless, as Sören Eriksson notes, many Western firms regard relations with Chinese companies as a risky but necessary step, and concerns about technology transfer and loss of competitive advantage remain.¹⁹

Supply side: technology, industrial structure and barriers to entry in aerospace

Products and services can be placed on a continuum relating to their technological characteristics. At one

end are complex products and services (CoPS) – highly intricate, customized and costly – while commodified products sit at the other end. CoPS entail the creation of a highly specialized set of arrangements among suppliers, customers and political authority. The complexity of the system demands high levels of coordination and co-creation among suppliers, contractors and customers, while the bespoke nature of the CoPS implies a specific relationship to political power, whether regulators or legislators.²⁰ The implication of the argument is that CoPS can confer on firms an incumbency advantage through the erection of significant barriers to entry. A challenger firm needs to surmount not just technological barriers, but obstacles that arise from regulatory compliance, marketing and customer support and outright political influence in the purchasing decisions of buyers.

Figure 2.2: Volatility in demand for airliners



Source: UK Trade and Investment, *UK International Aerospace Strategy 2010*.

19 Eriksson (2010).
20 Hobday (1998).

Aircraft manufacturing features a relatively standardized product, so there is some disagreement about whether aircraft are CoPS, though major studies of high-technology sectors have tended to categorize them as complex systems.²¹ But the sector is CoPS-like in most other respects: the product is immensely complicated, with major subsystems being technologically complex in themselves; and some aerospace subsystems, notably engines and avionics packages, are themselves regarded as CoPS.²² The implication of a complex system for industrial structure is that it underpins the dominant position of system integrators. Only these ‘top-of-the-tree’ firms possess both the technical and financial strength and the regulatory expertise to bring these systems to market. This is known as the cascade effect: the durability of the competitive position of leading systems integrators through dominance of the top tier of subsystem suppliers.²³ Challenger firms simply lack the necessary resources to organize, integrate and produce a CoPS.

The aerospace sector has other characteristics that militate against market entry. First, the aircraft industry is prone to violent swings in demand (see Figure 2.2). It is also very capital-intensive, with long payback periods that dampen investor enthusiasm for the sector. The pattern that has developed in many states in recent years has been to create a *de facto* national champion aerospace systems integrator, then use that firm as a focus for broader efforts in the market. Arguably, Embraer of Brazil set the pattern for emerging economies. The company benefited from extensive government support in the form of protectionist tariffs, government procurement policies and access to research and development (R&D) support.²⁴ In the absence of strong government support, market entry in aerospace is exceptionally difficult.²⁵

Another important barrier is the extensive regulatory regime for aerospace products. In other sectors, latecomers seeking to enter the market can do so by offering cheaper

and simpler products, and so avoid direct competition with incumbent producers. This practice was used successfully in consumer electronics by Japanese firms and, more recently by South Korean car producers.²⁶ This is not an option in aerospace. US Federal Aviation Administration (FAA) and European airworthiness certification authorities require certification of any aircraft, wherever manufactured, to conform to standards. The requirement to conform to international standards at the outset renders any low-end entry impossible. Indonesia found this out to its cost when its licensed production arrangement of Bell 412 helicopters foundered on regulatory compliance issues raised by the FAA and Indonesian regulators themselves.²⁷

Can the latecomers break the dominance of the incumbents?

Faced with such high supply-side barriers, latecomer strategies in aerospace may take several forms. The latecomer strategies employed by Russia and China are in many respects similar to those employed by Brazil. Both states have abandoned extensive internal competition among several aircraft companies in favour of a single (or very few) national champions. This concentrates technical and scientific skills. Moreover, like Brazil, both Russia and China make use of co-production and licenced production arrangements. Whether these states can attain the final stage and develop radical innovations for the sector remains to be seen. One key difference is that overt protection of the type used by Brazil is now extremely difficult under World Trade Organization rules.

The Japanese aerospace industry presents an example of a different strategy. Japanese firms lead the world in the development and application of composites, including load-bearing components for aircraft. Such composites are stronger than steel or aluminium as well as being lighter

²¹ Eriksson (2000).

²² Hobday (1998), p. 690.

²³ Nolan et al. (2008).

²⁴ Teitel (2006).

²⁵ McKinsey and Company (April 2008).

²⁶ Vertesy and Szirmai (2010), p. 7.

²⁷ Eriksson (2003). See also Goldstein (2003).

and hence fuel-saving. This gave leading firms such as Mitsubishi a key role in the development of the Boeing 787, and has also allowed Mitsubishi to explore the launch of its own regional jet.

Russia

The Russian aerospace industry virtually collapsed in the wake of the Soviet Union's demise. Although very advanced in terms of theoretical understanding of a range of aerospace technologies, Soviet manufacturing capabilities never allowed Russia to develop the necessary process technologies. The decline of the civil aerospace sector was particularly marked. In 2005, the output of the entire Russian civil sector was 10 aircraft.²⁸ In 2006 President Vladimir Putin announced the creation of the United Aircraft Building Corporation (UAC), which amalgamated the major Russian design bureaus under a single corporate structure. After an initial flotation and the issuance of new shares in 2010, the Russian federal government controlled 82% of the corporation.²⁹

Russia's principal civil aircraft offering is the Sukhoi Superjet 100, designed for the 75–100-seat market, as are virtually all other new entrants' products. Though drawing heavily on Sukhoi's own rich design resources, the jet makes extensive use of Western suppliers for major subsystems, including the French firm SNECMA for the engine.³⁰ Moreover, Alenia Aeronautica was engaged as a strategic partner in 2007 to oversee foreign sales and support for the aircraft.³¹

China

China is unique among emerging competitor nations in having a significant domestic market for aircraft, which in theory should allow it to adopt more autarkic development policies for the sector, safe in the knowledge that national-champion firms could sell to a large, captive domestic

market. In fact, Chinese policies for the sector have to a large extent mirrored those seen in other manufacturing industries such as automobiles, with Beijing using access to the huge domestic market as a lever to encourage foreign firms to invest in joint production arrangements with domestic manufacturers.

Aviation Industries of China (AVIC) was formed in 2008 by a state-sponsored merger of two large state-owned enterprises. AVIC is also a large (30%) shareholder in the Commercial Aviation Company of China (COMAC), which was also created in 2008 with the specific aim of developing a medium-range 100–150-seat civil airliner.³² The Chinese cite Airbus' complex corporate structure as inspiration for AVIC's complicated arrangement of specialist subsidiaries: 'Airbus has already proved that one of the best frameworks for building large aircraft is one made up of business segments and centres of excellence.'³³

China has opted to make extensive use of foreign firms in the development of civil aircraft. The new C919 medium-range jet will use Honeywell's avionics systems, GE technologies in a range of subsystems³⁴ and Western-designed engines from CFM International.³⁵ COMAC also announced a potentially wide-ranging collaborative agreement with Bombardier in March 2011, which would see the firms cooperating on marketing and product development.³⁶ Aside from allowing Chinese technicians and engineers an opportunity to learn from Western companies, the use of existing suppliers and major subsystems is almost certainly designed to facilitate the long and complex airworthiness certification processes in Europe and the United States.

While China's openness to FDI and other forms of collaboration with Europe and North American firms has generally been welcomed, there remain some concerns that the inevitable technology transfer between foreign and Chinese partners will, over time, present problems for incumbent firms.

28 International Trade Administration (2010).

29 United Aircraft Corporation (2010).

30 McHale (2010).

31 Sukhoi Aircraft Company.

32 UK Trade and Investment (2010).

33 AVIC President Hu Xiaofeng, quoted in Perrett (2010).

34 Honeywell (2010).

35 Perrett (2010).

36 Bombardier (2011).

Potential constraints on growth

As more and more consumers pile onto planes to travel for business or pleasure, increasing competition for the resources necessary for the aircraft to take off is intensifying. The underlying price trend for oil has been climbing since 2007, and the aircraft industry is a key consumer of oil in the form of kerosene fuel for the engines. Every aircraft is packed with electronics, fixtures and fittings made from a range of products ranging from lanthanum to titanium to cotton – all commodities whose price has rocketed in the past three years. As the number of significant and developed economies increases, so too will competition. Over the longer term, the growth and expansion of technological capabilities suggest that globalization will increase the opportunities to generate solutions to these issues, but the short-term impact is negative.

The aircraft industry has made important incremental improvements in the economic and environmental impact of its products. Nevertheless, it can be argued that it still works to the same ‘template’ of metal construction, wings and turbine engines that existed in the 1950s. Unlike computing, it has not undergone a dramatic, ‘game-changing’ innovation.³⁷ It has been suggested that radical innovations that overthrow incumbent firms typically come from ‘left field’ and represent a decisive shift in products or services. However, some empirical work in technology-rich fields suggests otherwise. It has been argued that most radical innovations are built on existing knowledge to a greater extent than was previously realized.³⁸ Similarly, other work suggests that new product development in aerospace is facilitated by the rich technical resources available to dominant Western firms. It is unclear whether newcomer firms possess this kind of extensive and rich network. Incumbent firms expend large amounts of money on R&D: Boeing spent \$4.1 billion in 2010,³⁹ while EADS, Airbus’ parent company, spent €2.9 billion in the same year, exclusive of government research contracts.⁴⁰

Conclusion

Barring major social upheaval and economic collapse, Asia is poised to become the dominant market for the civil airliner industry in the coming decades. Much of this growth will be driven by China, which is expected to need a further 3,800 large aircraft to meet growing demand.

This will exert a significant ‘pull’ effect in terms of manufacturing location, and more Western firms will partner with Chinese firms. In addition to its already large and rapidly growing domestic market, China also has the advantage of an exceptionally large pool of labour and a government policy clearly focused on building an aircraft industry. It is using elements of a national champion strategy while at the same time engaging in collaborative ventures with Western companies.

It seems very likely that Japan and Russia will also seek to take advantage of the expansion of global air travel to launch a range of aircraft designed principally to meet demand for medium-sized airliners in Asian markets. They will join offerings by incumbents Airbus, Boeing, Bombardier and Embraer.

However, new challengers face obstacles that either do not exist or are not as significant in other sectors. Few industries demand the range of corporate competencies expected of an aircraft manufacturer. The need to conform to international regulatory standards gives existing integrators and major subsystem suppliers an important lever in commercial negotiations. They also possess access to innovation networks in the form of research institutions and other technologically advanced sectors that – at least for now – cannot be replicated by emerging economies.

In addition, all aircraft producers rely on other sectors for key technologies and share major subsystems such as engines and avionics. Technological interdependence is actually increasing, making it more difficult for states to pursue autarkic technology policies, and few emerging states show signs of having significant capabilities across the whole range of supporting sectors. This probably

³⁷ McGuire (1999).

³⁸ Schoenmakers and Duysters (2010).

³⁹ Boeing (2010a), p. 3.

⁴⁰ EADS (2010).

explains why some companies or countries have chosen a key competitive niche in the aerospace market as a major supplier, rather than as a systems integrator. The Japanese success in supplying components is one example.

These trends suggest that incumbent producers will continue to enjoy significant competitive advantages. While Asia and other players such as Russia will take a greater share of production in the aircraft industry,

the sector does not seem poised for a major 'break' in technological trajectories that would open up opportunities for new entrants to offer dramatically different products. The rules of the game in aerospace remain those written by Europe and the United States in the wake of the Second World War, and both Airbus and Boeing have significant resources available to meet the current wave of competition.

3. The Automotive Industry

Matteo Ferrazzi and Andrea Goldstein

Introduction

The automotive industry played a crucial economic, technological, political and social role in the twentieth century. The International Organization of Motor Vehicle Manufacturers (OICA) estimates that about nine million people – more than 5% of the world's total manufacturing employment – are directly involved in making vehicles and parts. If auto manufacturing were a country, it would have one of the world's 10 largest economies. The multiplier is also huge. The European Automobile Manufacturers' Association (ACEA) estimates that each direct auto job supports almost another five indirect jobs in the community – a total of more than 12 million jobs in Europe alone.

The industry is also important because some of the most revolutionary developments in the twentieth century – mass production, the multidivisional form of business organization, and just-in-time – originated in car companies, respectively Ford, GM and Toyota.

Which countries and regions will dominate the industry in future? What can firms do to position themselves in the changing climate and take advantage of the next generation of opportunities and technologies? How will the global economic crisis affect the competitiveness of economies and companies? This chapter analyses the changes in the industry and suggests some pointers towards answers to these questions.

Changing auto-manufacturing geographies

New hierarchies in world production

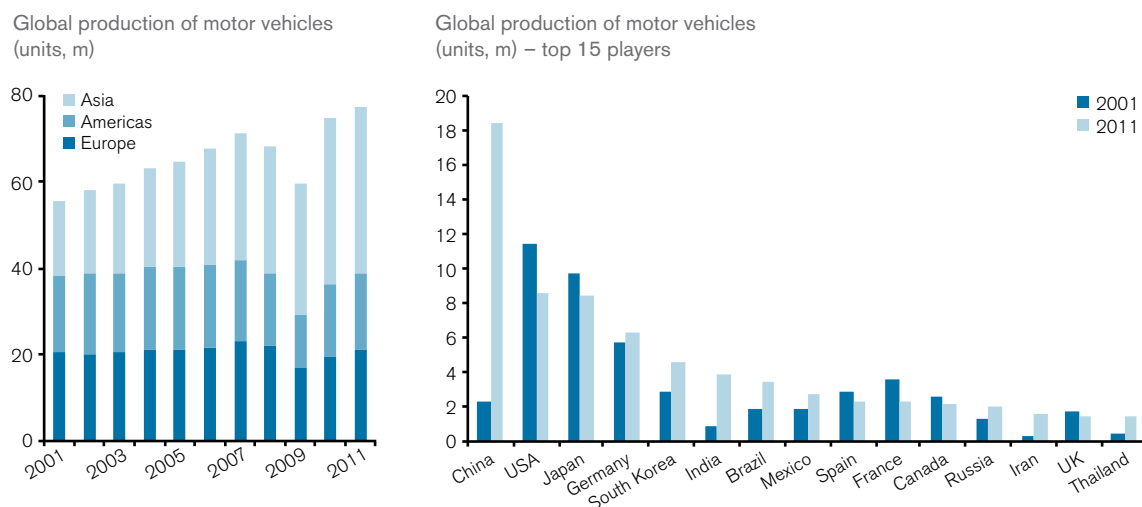
The automotive industry is global, with 40 car-producing countries worldwide, although far fewer are capable of developing models. Emerging economies are quickly becoming major producers. It is not easy to distinguish between demand and supply shifts as capacity may move to emerging economies because production there is cheaper and/or because demand growth is brisker.

The world's production of motor vehicles (including passenger cars, light vehicles, trucks and buses) reached record levels just before the global economic crisis of 2008–09, hovering around 70 million units per year in 2006–08, according to OICA data. In 2009, production dropped to 62 million units, roughly the same as 2003–04. By 2012 production had risen to a new high of 84 million.

While world production grew at around 3% annually in the past decade, performance differed significantly among the main centres and the geography of the automotive industry has changed dramatically.

- The United States and Japan, which accounted for 38% of world production in 2001, saw their combined share fall to 21% in 2011.
- In 2009 China surpassed Japan for the first time as the world's largest producer. One year later, it produced twice as many vehicles as Japan.
- In 2009, production in emerging markets overtook that in the 'Triad' of North America, Japan and Western Europe. In the decade 2001–11, the share of emerging markets in global production rose from 27% to 57%. Of the 31 million increase in the number of vehicles produced in emerging markets, 16 million are attributable to China alone.
- BRIC countries (Brazil, Russia, India and China) increased their share from 11% in 2001 to 34% by 2011.
- Latin American and Central/East European countries have more than doubled their shares of production in their respective continents during the last decade.

Figure 3.1: Production of motor vehicles, 2001–11



Source: Author's elaboration on OICA data; author's projections.

As Figure 3.1 shows, the major losers since 2001 have been developed countries such as the United States (–2.8 million units), Japan (–1.4m), France (–1.3m) and Italy (–0.8m). German makers now produce more cars abroad than at home (in 1995 only one-third were produced outside Germany⁴¹).

Taking into account the saturation of developed markets and the expected rapid growth of demand in emerging markets, worldwide new car sales growth is not expected to exceed 2.5–3.5% a year. On this assumption, car production will grow by a third to exceed 100 million in 2020. If demand and supply trends continue to follow the patterns of the last decade, Europe and the Americas will produce around 20 million vehicles each, while the main contribution to growth will come from Asia, spurred by the fast growth of the regional market.

Understanding the main trends in automotive production also requires an analysis of company-level production. Despite the emergence of new producers (mainly Chinese), the sector remains highly concentrated. The top five companies – each producing in at least eight countries –

account for almost 50% of global production, the top 10 for around than 65–70%, and the top 15 producers for almost 80% (See Table 3.1).

From the company-level data provided by OICA, it emerges that Asian producers were the main ‘winners’ of the last decade. Japanese firms increased their share through organizational innovation, proper product positioning and outstanding intuition about emerging trends e.g. hybrid-engine cars. South Korea’s Hyundai went from being a minor regional producer to the world’s fourth-largest. While all European car manufacturers faced broadly similar problems (stagnant sales, harsh competition, inflexible labour markets), some found relative solace in their control over local markets. German brands continue to command a large domestic market share, and this is also true to some extent for PSA and Renault in France, and Fiat in Italy. America’s ‘Big Three’ (GM, Ford and Chrysler) were the real ‘losers’.

While traditional players are, on average, increasingly international, those from China, India and Russia are almost entirely producing in their home market.⁴² The

41 Deutsche Bank (2011).

42 Emerging-market original equipment manufacturers (OEMs), apart from numerous Chinese producers, include two from India, two from Russia and one from Malaysia. Argentina, Brazil and Mexico made unsuccessful attempts to set up domestic manufacturers after the Second World War. Nevertheless, some parts suppliers from Brazil and Mexico have become multinationals themselves, with plants in Central/Eastern Europe and China.

Table 3.1: Production of top 15 world automotive players

Company	Country	Production (units, m)			Difference 1998–2010	World share (%)			Difference (%) 1998–2010
		1998	2006	2010		1998	2006	2010	
Toyota	Japan	5.2	8.0	8.6	3.4	9.8	12.1	11.0	1.2
GM	US	7.6	8.9	8.5	0.9	14.3	13.4	10.9	-3.4
Volkswagen	Germany	4.8	5.7	7.3	2.5	9.1	8.6	9.4	0.3
Hyundai	Korea	0.9	2.5	5.8	4.9	1.7	3.7	7.4	5.7
Ford	US	6.6	6.3	5.0	-1.6	12.4	9.4	6.4	-6.0
Nissan	Japan	2.6	3.2	4.0	1.4	4.9	4.8	5.1	0.2
PSA	France	2.2	3.4	3.6	1.4	4.2	5.1	4.6	0.4
Honda	Japan	2.3	3.7	3.6	1.3	4.4	5.5	4.7	0.3
Suzuki	Japan	1.3	2.3	2.9	1.6	2.4	3.5	3.7	1.3
Renault	France	2.3	2.5	2.7	0.4	4.3	3.7	3.5	-0.8
Fiat	Italy	2.7	2.3	2.4	-0.3	5.1	3.5	3.1	-2.0
Daimler*	Germany	4.5	2.0	1.9	-2.6	8.5	3.1	2.5	-6.0
BMW	Germany	1.2	1.4	1.5	0.3	2.3	2.1	1.9	-0.4
Mazda	Japan	1.0	1.4	1.3	0.3	1.8	2.1	1.7	-0.1
Chana	China	n/a	0.5	1.1	n/a	n/a	0.8	1.4	n/a
World		53.0	66.5	77.7	24.7	100	100	100	-

Source: Authors' elaboration on OICA data.

*Daimler-Chrysler in 1998.

impressive increase in Chinese production during the last decade is an effect not only of investment by the top original equipment manufacturers (OEMs) – PSA, Volkswagen,⁴³ Ford, Honda, Mazda, Mitsubishi and Toyota, totalling 3.4 million vehicles yearly – but also of the growing contribution of local players. In 2006 only four local Chinese producers could produce 100,000–150,000 vehicles each. In 2009, there were 17 Chinese vehicle producers, of which 11 produced more than 150,000 cars per year. However, only one, Chana, surpassed the one million level and is ranked among the top 15 global producers. The current structure of the Chinese automotive industry reflects an early stage of development and further consolidation – driven by the state – is expected.⁴⁴ The cost advantage will remain significant, since even the expected growth in labour costs will be accompanied by higher productivity.

The Chinese car market doubled from 2003 to 2008 and is now the world's largest. Foreign car manufacturers account for around 70% of new car sales, but this share is expected to fall below 50% in the next decade. However, Chinese vehicles are still not up to the world-class standards required to compete in more mature markets. A few are exported, mostly to other developing countries and targeted at price-conscious customers. In order to better position Chinese cars, the government has promoted the use of more fuel-efficient and less polluting vehicles. A pilot programme launched in 2010 in five cities (Shanghai, Shenzhen, Hangzhou, Hefei and Changchun) subsidizes the purchase price of electric and plug-in hybrid cars and the construction of charging stations and battery recovery networks. Nationwide, there is a small subsidy to reduce the price of fuel-efficient cars with engines under 1.6 litres.

⁴³ For Volkswagen cars alone (excluding Audi and light commercial vehicles), China became the world's largest production base in 2009.

⁴⁴ Russo et al. (2010).

Trade in automotive products has also boomed, rising almost eightfold between 1980 and 2006, according to UN data. In terms of net trade balance, the contrast between the three poles of the 'Triad' is clear. In 2008 Japan and the EU recorded very sizeable surpluses, of \$155 billion and \$109 billion respectively, while the United States had an \$88 billion deficit. Between 2000 and 2008, the participation of the 10 largest emerging economies (including South Korea and the United Arab Emirates) in global automotive trade rose from 10.7% to 16.6%. Interestingly, over this same period the EU managed to augment its extra-regional exports from 12.3% to 15.2% of total trade, while the combined weight of Japan, the United States and Canada fell from 37.4% to 27.1%.

Demand trends: new consumers on the doorstep

There are around 430 million vehicles in circulation in the 'Triad', with a further 90 million in BRIC countries. Vehicle density varies widely. There are around 50 per 100 people in the developed world but only two cars for every 100 inhabitants in China and India, according to data from ACEA.

The main factor explaining differences in car ownership is the level of income. Car ownership takes off when GDP per capita reaches \$5,000 (see Figure 3.2). Many emerging markets are in the 'take-off' phase and a rapid increase in car density can be expected in the next decade. Above \$30,000, the car market approaches saturation. In the last two decades, sales of new cars were more or less stable in Europe or even declining in the United States and Japan. Income inequality also explains trends in car sales: when inequality is high, the demand for luxury and premium brands rises fast.

Demographic factors – especially size of population, ageing and urbanization – are also important influences. On the one hand, growing population and rural-to-urban migration will sustain the demand for vehicles, although this will mainly affect emerging markets. On the other hand, a large and increasing part of the population will restrict its daily travel to short or medium

distances, very often within urban areas. The aim of improving traffic flows in urban areas and reducing emissions could, in the longer term, impose a ceiling on the number of cars in circulation. This effect will initially be limited to large Western cities, where alternative modes of transportation are more developed (public transport, car-sharing, bikes, etc.), and only later reach emerging economies.

Future demand will be influenced by the ongoing shift in income towards emerging countries, especially in Asia. The next two decades will probably see an automotive market with two main faces, as described below.

- **Growing demand in emerging markets.** Sales of imported used cars will grow first, followed by a boom in new car sales, initially in the small/medium and ultra-low-cost segments. The Tata strategy of producing the Nano, the world's cheapest car, will be followed by others. Multinational OEMs will also produce affordable 'world cars'. Drivers in emerging markets will be richer than a generation ago but still quite young.
- **Increasing sophistication in more mature markets.** Growth will be driven by technological innovations. Although 'conventional' combustion engines will continue to play a major role in the medium term, other solutions (such as biofuels, electricity, natural gas and hydrogen) will become increasingly interesting for consumers, particularly if oil prices remain high. To ensure the mass adoption of such innovative solutions, new fuel systems may require public support, in the form of financial incentives during early phases of development, and investment in the relevant infrastructure. European and Japanese producers, traditional leaders in non-conventional engines, may be challenged by Chinese producers. Incentives may also be needed to overcome crises and sudden demand drops, as happened in 2008–09, when 'cash-for-clunkers' programmes were introduced.⁴⁵

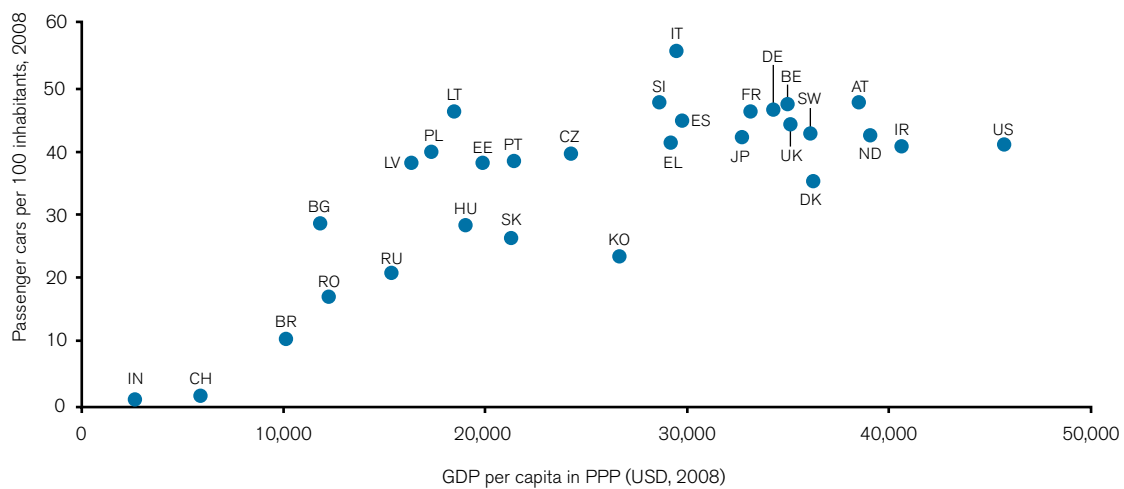
⁴⁵ Haugh, Mourougane and Chatal (2010).

Technological innovations will also be introduced to enhance safety. Impressive advances have already been recorded and both active safety systems (braking, lighting, different driver assistance, etc.), passive ones (airbags, protection bars, etc.) and driving-assisted vehicles (cruise control, lane-keeping functions) will

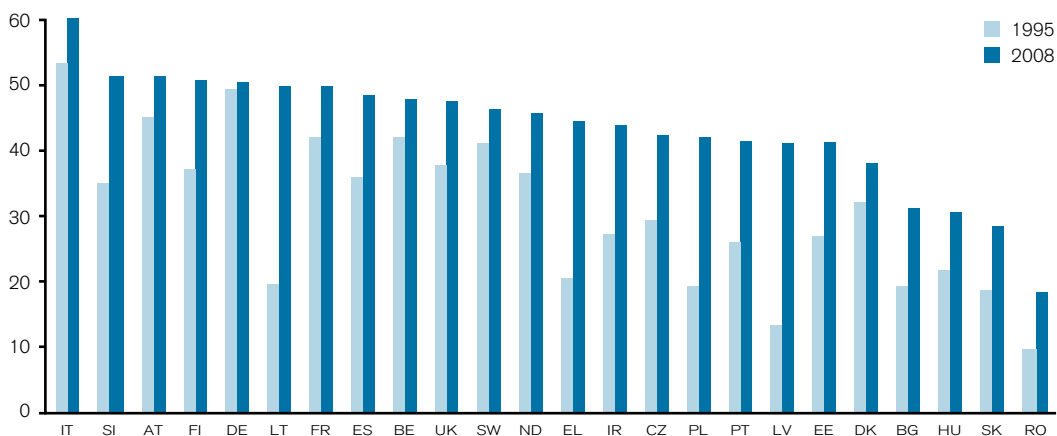
become more widespread. Vehicle-to-vehicle and vehicle-to-infrastructure communication, including connection with ICT infrastructures, is the next frontier. Needless to say, environmental and safety improvements will not spread evenly around the world, given their cost.

Figure 3.2: Car density and the vehicle park

Per capita income and vehicle park density, 2008



Passenger cars per 100 inhabitants in Europe, 1995 and 2008



AT	Austria	DE	Germany	FR	France	KO	Korea	RO	Romania
BE	Belgium	DK	Denmark	HU	Hungary	LT	Lithuania	RU	Russia
BG	Bulgaria	EE	Estonia	IN	India	LV	Latvia	SI	Slovenia
BR	Brazil	EL	Greece	IR	Ireland	ND	Netherlands	SK	Slovak Rep.
CH	China	ES	Spain	IT	Italy	PL	Poland	SW	Sweden
CZ	Czech Rep.	FI	Finland	JP	Japan	PT	Portugal	UK	United Kingdom
								US	United States

Sources: ACEA, Eurostat, IMF.

Corporate strategies after the global economic crisis

These factors are affecting the business strategies of the main OEMs. The global economic crisis has magnified pre-existing challenges, accelerated the rebalancing of economic activity between industrial and emerging economies and forced car manufacturers to take emergency measures to rescue their businesses.⁴⁶ In particular, the crisis hit OEMs with massive overcapacity, estimated at between 20% and 35% – lower in Europe and higher in the United States. Over the past two decades manufacturers maximized volumes to boost capacity utilization. This usually entailed considerable price discounts and low margins on all but the most luxurious brands. Declining profitability for many players was one of the consequences.⁴⁷ Overcapacity, a feature of the industry for decades, will remain one of the principal challenges for the future. If the rate of growth of car demand during the next decade remains the same as in the previous 10 years, world vehicle production will not reach the current level of installed production capacity of 110 million, and still less the likely level of capacity as companies in emerging markets continue to invest.

Companies have been undertaking various steps to mitigate falling profitability:

- **Consolidation.** In the 1990s and early 2000s, mergers and acquisitions were prevalent, leading to the dominance of large automotive groups such as GM or Volkswagen. Later, strategic alliances (such as Renault-Nissan) and joint ventures aimed at single projects (e.g. common platforms, engines) became more popular.
- **Relocation of facilities** to low-cost areas, driven by lower production costs (mainly labour⁴⁸) and related to local demand. The impact of labour costs is higher for small and medium-sized cars, so low-cost areas are mainly attractive for these segments. In some

cases, relocation occurred within the same country: in China, from the coast (where labour costs are increasing fast) to inland areas: in Brazil, from the São Paulo-Rio de Janeiro-Belo Horizonte triangle to the northeast, where global OEMs such as Ford and Fiat are investing significantly. The development of new large factories in emerging markets has also contributed to global overcapacity.

- **Increasing globalization** of all major producers, irrespective of their product range, in terms of production and sales. All the main producers serve all five continents.
- Striving for **operational excellence**, with all OEMs introducing lean manufacturing and total quality management. This has shifted the value-added and production burden towards their Tier I and II suppliers, which have become increasingly relevant players in the automotive arena.

The economic crisis accelerated some of these trends. Restructuring efforts intensified and production has been further relocated. The most notable case has been the United States, where the government endorsed the reorganization plans of GM and Chrysler and provided financial support at below-market rates. In addition Fiat acquired a 20% equity stake in Chrysler, later raised to 51%, in exchange for proprietary technology.

Conclusion

The automotive industry remains one of the cornerstones of global manufacturing, not only in terms of turnover, employment and trade, but also for its crucial role in introducing new technologies and organizational methods. It will continue to support development, especially in industrializing countries.

⁴⁶ Ibid.

⁴⁷ It is interesting to note that car manufacturers, despite operating in a capital-intensive industry, display very high ownership concentration levels. For six European makers (BMW, Fiat, Daimler, PSA, Renault and Volkswagen), the largest shareholder (a family in four cases, a public-sector entity in two) owns on average 27.6% of shares. It is surprisingly difficult to find comparable data for US and Asian firms.

⁴⁸ On the supply side, labour costs remain one of the main drivers, favouring emerging economies. Capital availability, the quality of infrastructure, transport costs, labour productivity and government support are additional factors. Numerous emerging countries – some Central/East European countries are the best examples – made tremendous efforts to improve the business environment and reduce taxation levels to attract the needed foreign direct investment.

The location of production has changed dramatically in recent years. In 2009, for the first time, more cars were produced in emerging markets than in the United States, Europe and Japan combined, and China overtook Japan as the largest producer. BRIC countries now produce one car out of three.⁴⁹ In considering the impressive increase in Chinese production during the last decade, it is clear that this was due to foreign investments by the top OEMs, as much as to the growing contribution of local players. The consolidation of the Chinese industry with government backing (including by policies that support the leapfrogging of OEMs in the area of electric engine technology) will be one of the main themes in future.

Further concentration among players will reduce the number of global players. In the words of Fiat CEO Sergio Marchionne,

only six OEMs, among mass auto producers, could survive in the future. One will be from the United States, one from Germany, one French-Japanese with a possible presence in the US, one in Japan, one in China, plus possible room for a further producer in Europe.⁵⁰

This forecast will probably prove correct – although the overlooking of Hyundai is rather surprising considering how rapidly the South Korean firm has attained global reach and improved the quality of its cars – but there is a huge degree of uncertainty regarding the possible future role of producers in China and India, where more than one could emerge as global players.

On the demand side, the shift in wealth towards Asia and emerging countries in Eastern Europe and Latin America will drive car ownership. In more mature markets, however, sales of new cars could remain stable or even decline, as happened during the last decade in the EU, the United States and Japan. Taking into account the expected growth of car sales in emerging markets and the relative saturation of the more developed markets, sales are expected to grow by around 2.5–3.5% a year until 2020 – a boost from 78 million in 2010 to over 100

million in 2020 – provided there are no major shocks to the global economy.

In Western markets innovation will be among the main drivers of growth. Customers will be increasingly sensitive to global warming and safety concerns, and their needs will increase competition in an already tough market environment. R&D outlays will remain a key source of competitive strength, creating an incentive for producers to share some of the costs and enter into alliances and other forms of collaboration, both with other OEMs and with suppliers.

Global overcapacity, a feature of the automotive industry for decades, will persist. Financial markets may exert growing pressure to increase the return on capital invested in the car industry, especially if controlling shareholders, who currently have very sizeable equity holdings, decide to dilute their stakes. The threat of plant closures in industrial countries will complicate the political economy of the global car industry, conceivably resulting in calls for protectionist measures against China and other emerging economies along the lines of the voluntary export restraints accepted by the Japanese in the 1980s. At any rate, Western governments are likely to remain relatively active – through subsidies, scrap incentives and direct interventions. Although interventionism will be less visible than during the 2008–09 crisis (when the US government, for instance, had to bail out two of the ‘Big Three’), various incentives to support auto sales in saturated markets – mostly related to ‘greening’ the car park – will be widespread.

The industry will continue to be global. The recent economic crisis has not led to a complete overhaul of the automotive industry landscape, but simply accelerated the rebalancing of global economic activity between industrial and emerging economies and forced car manufacturers to take emergency measures to rescue their businesses. New players (especially from China and India) are not only increasing their share of fast-growing emerging markets, but will also gradually become capable of challenging incumbents in Western markets.

49 For an analysis on Russia, see Kuboniwa (2009).

50 *Automotive News Europe*, December 2009.

4. The Pharmaceutical Industry

Michael Owen

Introduction

The global research-based pharmaceutical industry saw a big expansion in the later decades of the twentieth century, driven by a pharmacological revolution in drug discovery, public demand for better healthcare, and the willingness of affluent countries to invest in health systems. However, in recent years, both supply and demand factors have put this model under strain.

This chapter examines the sources of these strains and identifies the developments in science, the economics of

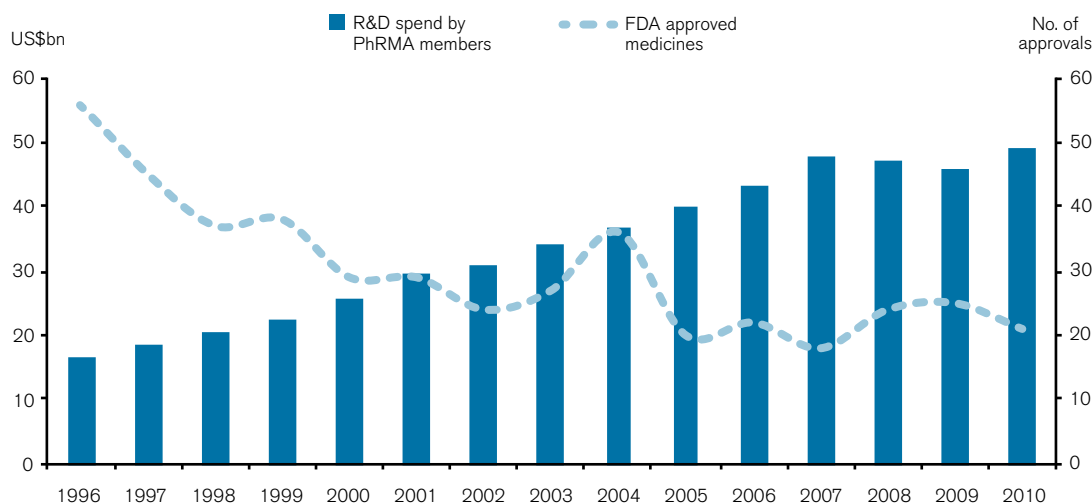
healthcare and regional economic power that are likely to determine the future of the global industry. In view of the uncertainties surrounding the timing and impact of these forces, a scenario approach is used to highlight potential outcomes. The term 'Big Pharma' is used here as shorthand for large companies based in the developed countries. By comparison, 'Emerging Pharma' refers to pharmaceutical companies based in emerging markets, primarily Asia and Latin America.

The signs of strain

Price pressures

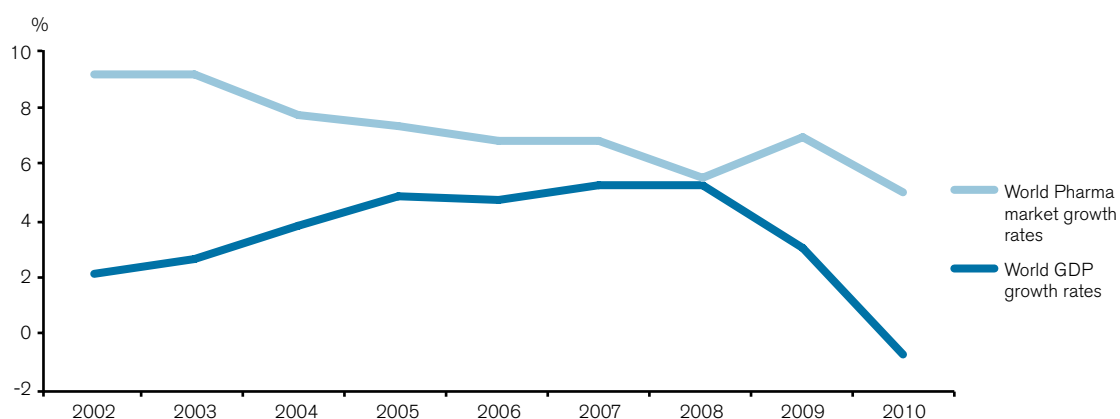
The 'blockbuster' drugs that ensured the financial success of many pharmaceutical firms were equally 'cost-buster' drugs for many healthcare systems and payers, who questioned their increasing costs. Pharmaceutical companies contended that medicines provided good 'value' when compared with the costs of alternative treatment, although payers still tended to focus on cost rather than value. The price pressures on drugs were accompanied by growing generic competition. Generic prescribing and dispensing now rapidly erode the post-patent sales of originator brands.

Figure 4.1: The decline of R&D productivity



Source: Industry data.

Figure 4.2: Pharmaceuticals growth vs GDP growth



Sources: FDA and PhRMA data.

Research productivity

Research-based companies, needing to launch new revenue-producing drugs, faced increasing difficulties not only because of the challenges of making new research breakthroughs but also as a result of heightened regulatory criteria, especially in drug safety. This is reflected in the statistics on the numbers of drugs approved by the US Food and Drugs Administration (FDA) (see Figure 4.1).

Industry implications

The combination of demand- and supply-side pressures meant that the industry was faced with a squeeze on margins, and pressures for consolidation, which led to a spate of significant mergers and acquisitions (M&A) activity by the leading firms.

These developments have led many to conclude that the traditional model of the pharmaceutical industry is no longer valid, and that there will be a major transformation to a substantially different mode of operation and existence. To address this issue requires examination of the forces affecting the industry.

Future drivers of the pharmaceutical industry

Demand

The intrinsic demand for health and pharmaceutical expenditures continues to rise. First, increased

longevity has led to an increase in more chronic conditions associated with ageing. Demand for healthcare has also risen owing to the increasing numbers of elderly people in the population. Data show that people aged over 80 in developed countries account for between twice and ten times the healthcare expenditure of those aged 50–64. Secondly, there are rising expectations of what should be available from healthcare systems. Third, new areas for intervention have been identified, for conditions that were not acknowledged in the past.

World and regional market growth

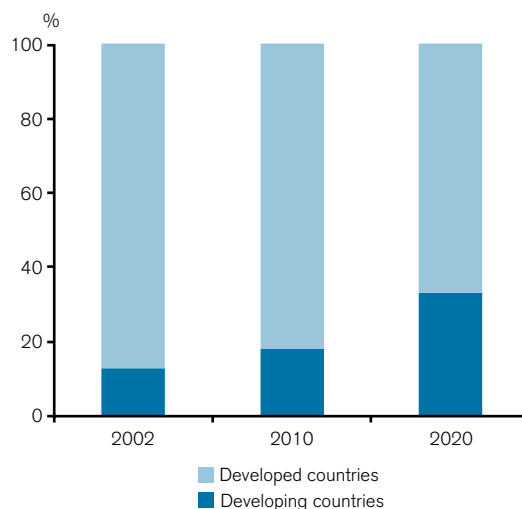
This report assumes the most likely outlook to be rather moderate world economic growth up to 2020. At a macro level, pharmaceutical market growth has consistently exceeded GNP growth by a significant factor (see Figure 4.2). There can be little doubt that innovation has been the major driver of growth in the pharmaceutical market. Waves of drug discoveries have created new opportunities for treatment interventions, creating new therapeutic fields; these have been accompanied by pronounced moves in up-trading to the newer therapies in established treatment areas. In the major world markets, healthcare payers have acquiesced, with varying degrees of reluctance, in funding these innovations.

Table 4.1: Global pharmaceutical market rankings

2001		2011	
1	United States	1	United States
2	Japan	2	Japan
3	France	3	China
4	Germany	4	Germany
5	Italy	5	France
6	UK	6	Italy
7	Canada	7	Brazil
8	Spain	8	Canada
9	China	9	Spain
10	Brazil	10	United Kingdom
11	Mexico	11	Russia
12	Australia	12	India
13	South Korea	13	South Korea
14	India	14	Australia

Source: Industry data.

Figure 4.3: Evolving global shares of developed vs developing regions



Source: Author's estimates based on industry data.

Over the past nine years, the global pharmaceutical market has grown at an annual rate of 7%. Growth rates in the mature markets of North America and Europe have been lower, and in Japan considerably lower at 4%. The markets that have grown strongly in recent years have been in the Asia-Pacific region and Latin America, where economic development has resulted in stronger middle-class demand for healthcare. China has now become the third largest pharmaceutical market, after the United States and Japan (see Table 4.1).

Over the next 10 years, the balance of potential outcomes suggests that annual world market growth of around 6% is a reasonable expectation, with the strongest growth in the Asia-Pacific region, especially China and India, where strong double-digit growth is anticipated. As a result of the sharp differentiation in growth rates between the developed and developing regions, the developing world's share of the global market is expected to increase significantly (see Figure 4.3).

Regional disease patterns

Traditionally, chronic diseases predominated in developed economies; less developed economies experienced more acute conditions. However, as the emerging economies have developed and their populations have aged, they

have begun to adopt the disease characteristics of the more advanced nations, with a growing proportion of chronic diseases such as diabetes and hypertension.

In many parts of the developing world, infectious disease is still rife and climate change is likely to alter disease patterns among countries. Resistance to anti-infectives remains a key challenge and the risk of pandemics is still an underlying threat in the world.

Sources of funds

(i) **Demand and funding:** Intrinsic demand for improved healthcare is likely to be as strong as ever. The issue is the extent to which funds will be made available to finance this 'demand'. In developed markets, healthcare – and pharmaceutical – funding has become ever more institutionalized, even in the historically 'free market' US environment, where the overwhelming bulk of pharmaceutical sales are made through a contracted system, which gives market power to institutional purchasers.

(ii) **Supply:** The proposition that the traditional pharmaceutical industry model no longer works is predicated not only on demand-side resistance, but also on an apparently failing record in research and development. For the industry as a whole, there are a number of reasons why

the continuing rise in R&D expenditure is not matched by the output of new medicines, primarily resulting from the increased costs and timescales of research, development and marketing approval.

New horizons

Despite this, the prospects for the pharmaceutical industry are being transformed as a result of the completion of the human genome-mapping project, which has led to greatly improved understanding of the genetic basis of disease and the potential to design therapeutic interventions to tackle the root causes. An individual's DNA can now be read for as little as \$1,000.⁵¹ These therapies could be fundamentally more effective than previous treatments, particularly in identifying which patients will respond to which therapies.

This has raised the issue of the cost of drug discovery and marketing, given the need to develop a range of targeted therapies, rather than a single therapy for a population. Against this, the costs of development could be significantly lower than with a standard new entity since the proof of concept could be much more easily validated. There are not yet sufficient empirical examples that could verify whether the new economic model can work. However, it is not difficult to understand the long-term logic of this therapeutic revolution in drug development and delivery.

Global issues for the pharmaceutical industry

While the pharmaceutical industry has always been very international in its perspective and location, the developed world has traditionally comprised between 80% and 90% of the global market by value.

However, rising affluence in emerging markets – especially in the Asia-Pacific region – has substantially

changed the dynamics of the global market, as shown earlier. While many global companies have sought to take advantage of the opportunities in the emerging markets, they are still mainly focused on traditional developed-country markets.⁵²

Historically, there were good reasons for this. The major companies saw themselves as the repositories of pharmaceutical science and development expertise. In order to manage these functions they developed highly centralized structures at their corporate centres to direct the various components of the value chain from basic research through to product development, clinical trials, manufacturing, and finally sales and marketing.

The slowdown in the developed markets – as well as the need to look to new lower-cost locations – has shifted the emphasis towards the emerging areas, as a source of both revenue growth and research. The quality of science and technology in countries such as India and China has given new impetus to the diversification of R&D investments. Moreover, the potential new R&D model need not require the traditional huge scale of investment. New skills in such fields as bioinformatics lower the entry barriers for new firms in emerging markets.

The industry globally is still dominated by US and European firms.⁵³ Other countries have not made it into the upper echelons. The major global firms have been able to entrench their position through their dominance of the sales and marketing networks. This latter aspect may become less important as more targeted therapies lessen the effectiveness of mass-marketing sales-force muscle. The question is what it will take for an emerging-country firm to achieve global success. If future industry success factors are now being changed by the scientific cost function, then a wider range of capabilities will be required, with more alliances, collaborations and global networks, and new entrants may well enter the market.

In the light of the many uncertainties facing the global pharmaceutical industry, forecasting a single path ahead is difficult, so broad scenarios have been used to illustrate the range of possible outcomes.

⁵¹ *Financial Times* (2012).

⁵² IMS Health (2010).

⁵³ OECD (2011), Table 5, p. 13.

Scenarios for the pharmaceutical industry

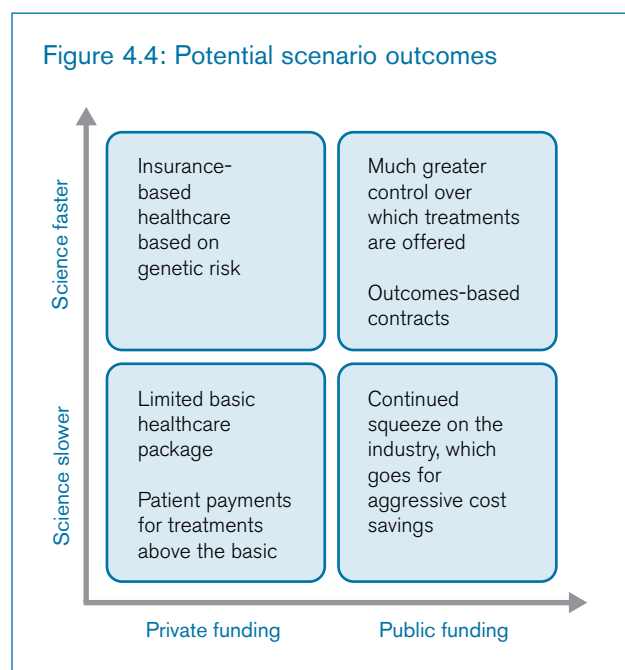
In looking at potential scenarios for the pharmaceutical industry, the main uncertainties involve the interaction between science and economics:

- the speed and extent of the therapeutic application of new science, and
- the pressure on funding, which could take the industry into new relationships with payers and the public.

The potential for science to transform therapeutic disease interventions is of a revolutionary nature. However, the pace at which this revolution will proceed is uncertain for a number of reasons, including numerous technical hurdles, timescales and social and ethical aspects of genetics.

The other dimension of uncertainty is economics. If the resistance of Western third-party payers to the growth of expenditures continues, this could encourage the growth of private funding, which is more the norm in emerging markets.

The grid in Figure 4.4 shows a possible combination of 'scenarios' based on the interaction of these scientific and economic uncertainties.



Science slower and public funding

Slow scientific progress and unchanged 'public' funding mechanisms lead to a continuation of current trends. The industry would experience sluggish growth, with new products based on extensions of existing technology. Many firms would face pressure to merge, as an increasing percentage of their sales became subject to generic competition. The industry would try to keep going through aggressive cost savings, including a more cautious approach to research. Big Pharma would feel insufficiently rewarded for innovation and so restrict activities to lower-risk research projects, and might diversify more into generics and over-the-counter (OTC) drugs to generate additional sales.

Emerging Pharma companies will benefit from the moves by Big Pharma to outsource many functions, such as clinical development and manufacturing, to lower-cost locations, especially in Asia. Emerging Pharma will continue to have a cost advantage in generics and would target a larger global share of this market, in alliance both with Big Pharma and with independent operations. However, there is also a risk of more head-on competition between Big and Emerging Pharma, as each targets the generic market to try to bolster revenue growth.

Science slower and private funding

Scientific progress is slow, but the funding agencies shift costs towards the private sector, by defining a more limited basic healthcare package, including medicines, available to all; but individuals would be able to pay privately for a higher standard of treatment. This would create an overt 'two-tier' system of healthcare, with political repercussions in some countries.

Big Pharma would see scope for the development of innovative products and care packages aimed at a thriving private insurance market. A sharper distinction would develop between those firms remaining in the forefront of innovation and those that had chosen to retrench. Firms with a broader portfolio of products would be able to offer more attractive deals to insurers, who would be more commercially orientated than public bodies driven by concerns about bureaucratic cost containment.

As in the previous scenario, both Emerging Pharma and Big Pharma would benefit from low-cost locations. With a more subdued innovation environment, many emerging companies would see low-cost generics as a big opportunity. In this scenario, there could be less competitive rivalry between Big and Emerging Pharma in the area of generics, since there would be a larger number of funding organizations. This could provide more scope for direct deals with insurers, as well as through Big Pharma alliances.

Science faster and public funding

In this outlook, the therapeutic promise of the genetic revolution finally comes to fruition. Targeted treatments offer highly effective therapies for a greater number of disease areas than hitherto, reassuring third-party payers that treatment funding was well directed. However, there would be greater demand on funding because of new therapeutic opportunities, putting even more pressure on less innovative companies that would be likely to exit or be taken over.

Big Pharma would negotiate contracts with payers based on *actual* treatment outcomes. Research would have a new impetus – more selective and less serendipitous – but Big Pharma would also be more conscious of the need to ensure an end market for products through close liaison with payers, possibly akin to a defence-type procurement system, in which payers determine the products they want and are prepared to pay for. Public funders will still regard the therapeutic breakthroughs as a cost threat rather than a benefit opportunity. Hence Big Pharma would see the potential to link up with patient groups, to act as a joint lobbying force on public funders.

Emerging Pharma would see opportunities to tap into the new technologies where they could offer cost advantages, such as in information processing and application. For Emerging Pharma, there would probably be a sharper distinction between firms at the forefront of the new technologies and the rest. They would also be efficient sub-contractors/partners to Big Pharma in meeting the needs of the public funding agencies.

Science faster and private funding

In this final scenario, the realization of the genetic revolution takes place in a setting where there is no universal health-care provision, but a thriving private insurance sector. As a result of the wealth of genetic data now available, insurance companies have a comprehensive knowledge of the risk factors applying to different population sub-groups and are able to use normal insurance principles of risk-spreading across the customer base. Individuals take responsibility for managing their risk profiles through lifestyle and behaviour, and the system becomes more akin to that of motor insurance, where premiums are based on underlying risk factors but can be adjusted by cooperatively managed health programmes. Public authorities are also able to subsidize certain disadvantaged groups that would otherwise suffer discrimination from the pure insurance principle.

This scenario is likely to provide the best growth prospects for the industry. Big Pharma would be closely involved in the development and supply of medicinal therapies for specific population genotypes. It also faces big challenges from at least two main areas. First, would the lower costs of development through greater certainty of outcome offset the smaller patient numbers for differentiated therapy?⁵⁴ This needs to be verified in practice. Secondly, the scientific developments might well blur the distinctions between different types of healthcare, such as prevention, genetic screening, genetic counselling, lifestyle management, diagnostics and therapeutic options. This dimension might be a big differentiator within the industry. A very different range of skills and key success factors would be required.

For Emerging Pharma, this scenario probably provides the most fluid and receptive environment for new entrants – both as alliance partners and as independent enterprises – since more open technology will put a premium on innovators and dynamic fast followers. These are abilities that will play strongly to the strengths of many Asian companies. The agility of Emerging Pharma in embracing these more high-tech challenges could shift the centre of gravity of the pharmaceutical world towards Asia, and not just in sales terms.

This scenario raises the question of whether an emerging company could challenge the dominance of the big US

54 One possible model is described in PricewaterhouseCoopers (2008), pp. 15–17.

and European companies in the next 10 years. The short answer is 'probably not', since the traditional barriers to entry are still likely to prevail, although they may well become less decisive the faster the pace of scientific advance. Streamlined development processes facilitated by genomics, together with more specialized products requiring less mass-marketing muscle could open up the field for smaller, niche companies offering new technologies and competences in the pharmaceutical sector.

Conclusion

Over the next decade the industry will continue to grow faster than the world economy, particularly in developing countries. The balance of sales will shift in favour of those countries, particularly in Asia, where rising incomes and a growing middle class will drive rapid growth in demand for pharmaceuticals.

Until now, large developed-country pharmaceutical companies have dominated the industry worldwide owing to their superior research capabilities, sales and marketing networks, and understanding of regulatory systems. Pharmaceutical companies in emerging markets, lacking leading-edge research capabilities, have focused more on generics.

The status quo is, however, under threat. The Big Pharma business model is increasingly threatened by downward pressures on prices by healthcare providers, and the rising cost of finding new drugs and bringing them to market. This is likely to lead to some further consolidation of the industry.

Another factor driving change in the industry is the shifting balance of diseases. Chronic health problems associated with ageing and a 'Western' lifestyle, such as diabetes and dementia, are becoming ever more prevalent in the West but are also spreading to emerging countries.

Looking ahead, there are two big uncertainties. The first relates to technology. A decade after the sequencing of the human genome, the benefits in terms of targeted therapies are starting to appear and the pharmaceutical industry could also be revolutionized by new drugs derived from genetic breakthroughs. However, the *rate* at which new treatments arrive is very uncertain.

The other major uncertainty is the ability of the public sector to continue to fund the provision of drugs, given the pressure on government budgets in many developed countries. The need to reduce budget deficits in the face of growing demands from ageing populations will create significant problems in those countries where healthcare provision is mainly a responsibility of the public sector.

The potential impact on the industry of these scientific and economic uncertainties and their interaction, explored in the scenarios set out above, will be pivotal in shaping the global industry, bringing a sea change in the industry's operating model and its relationships with its key constituents – payers, healthcare professionals and patients. The scenarios have focused on the developed-country healthcare systems, which traditionally constituted most pharmaceutical sales by value. If the private sector becomes more of a feature in these markets, a more overt 'two-tier' system of access to medicines could develop, in relation to the affordability of innovative drugs.

The scenarios also raise the issue of different levels of access to medicines between the developed and developing world, whose health priorities are likely to remain rather different for the next two decades. The differences will become less marked as companies try to alleviate some of the disparities through donations, concessionary pricing and out-licensing. However, if access to medicines on a broad scale in emerging markets is not possible via the normal commercial model, since the supply prices of Western-made drugs are unaffordable, then a different mechanism might be needed, such as a charity or NGO model.

Another issue raised by the scenarios is the shifting balance of economic power from West to East and its likely impact on the pharmaceutical industry. Economics and technology will interact with this change in the balance of geographic influence in a way that could see fundamental realignments in the structure and centre of gravity of the global industry. In some scenarios, emerging companies could increase their share of the world market.

While the drivers and uncertainties can be mapped, assumptions made and projections scoped out, the timing and dynamics of the precise future path for the global pharmaceutical industry remain open questions. The forces of innovation and globalization are likely to take the industry to new horizons over the coming decades.

5. The Retail Industry

David Hurst and Andrew Black

Introduction

The retail industry is undergoing wrenching changes as the developed world adapts to tougher economic circumstances and the developing world experiences a transformation of the sector in response to rising incomes and urbanization.

Retailing is a very diverse business. The basic distinction is between the ‘modern trade’, involving shops, big car parks and extensive IT systems for delivery and budget control, and the ‘traditional trade’ characterized by more informal open markets and bazaars. Retailers can also be classified as destination venues, which include high streets and shopping malls,⁵⁵ and ‘convenience’ venues, which offer consumers easier access to a more restricted range of frequently higher-priced goods. Retailing is shifting towards more modern destination venues

in the emerging markets, while a trend towards more convenience venues in the developed world may be occurring. A further distinction can be made between grocery/food shopping, hardline categories such as electrical appliances and softline categories such as clothing and furnishings.

This chapter argues that, as income and age patterns in society change, variations in the pattern of retailing are to be expected. As societies develop, retailing’s share of the economy is expected to shrink.

Factors driving retailing trends

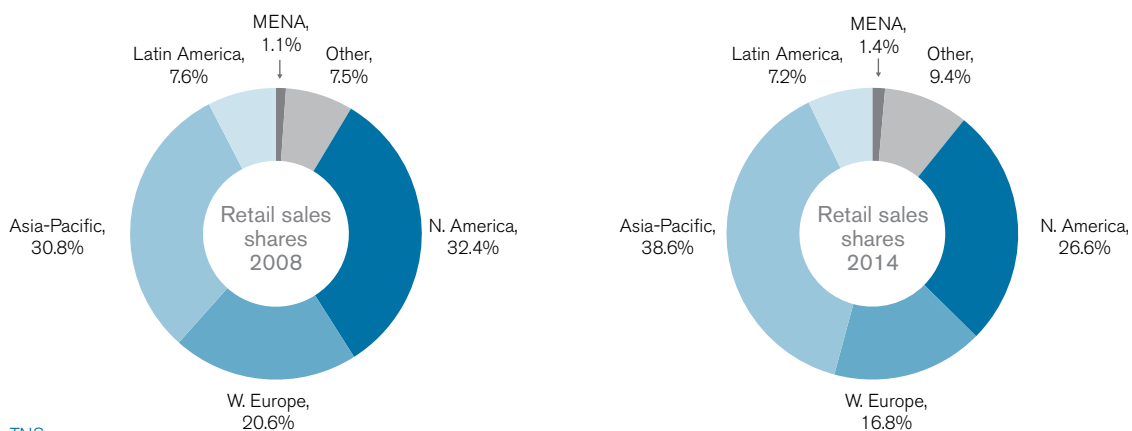
The main factors driving change in retailing are:

- income and spending power;
- demographics – age cohorts, household size and urbanization;
- raw material, energy and transport costs;
- planning and land use; and
- the internet and mobile communications.

Income and spending power

The last two decades have seen an extraordinary improvement in the living standards of billions of people in emerging countries, led by China. As GDP rises in the Asia-Pacific and South American regions, there will be a shift in the distribution of retailing activity (see Figure 5.1).

Figure 5.1: Geographical changes in consumer spending



Source: TNS.

55 As well as smaller specialist shops and street markets.

Table 5.1: Consumer income groups, consumption types and retail formats: indicative view

Income range GDP per head at PPP rates (\$)	Characteristic consumption and transport type	Predominant retailing type
<i>Traditional trade</i>		
0–1,000	<i>Subsistence:</i> Not regularly participating in the organized economy	Informal trade, open markets and street hawkers, with some barter
1,000–2,500	<i>Basic goods:</i> e.g. hard soap, loose-leaf tea, bicycles	Open markets, transition to 'traditional' stores
2,500–5,000	<i>Economy products:</i> e.g. basic margarine, toilet soap, pickup trucks	Counter service in small general and specialist stores
<i>Modern trade</i>		
5,000–10,000	<i>Branded 'commodity' products:</i> e.g. fabric washing powders, motorbikes	Developing self-service, emergence of supermarkets
10,000–20,000	<i>Added value products:</i> e.g. fabric conditioners, low-fat margarines, family motoring	Hypermarkets, extensive multiple stores
20,000–40,000	<i>'Luxury' products:</i> e.g. dishwashers, expensive ice cream, new cars	Shopping malls, shared shopping space, growth of hard discount as mass retailers go for quality, 'branded' private labels
40,000+	<i>'Prestige' and 'designer' products:</i> e.g. fine wines, designer labels, sports cars, SUVs	Retail fragmentation, with specialist shops, international luxury retail outlets, shift back to convenience

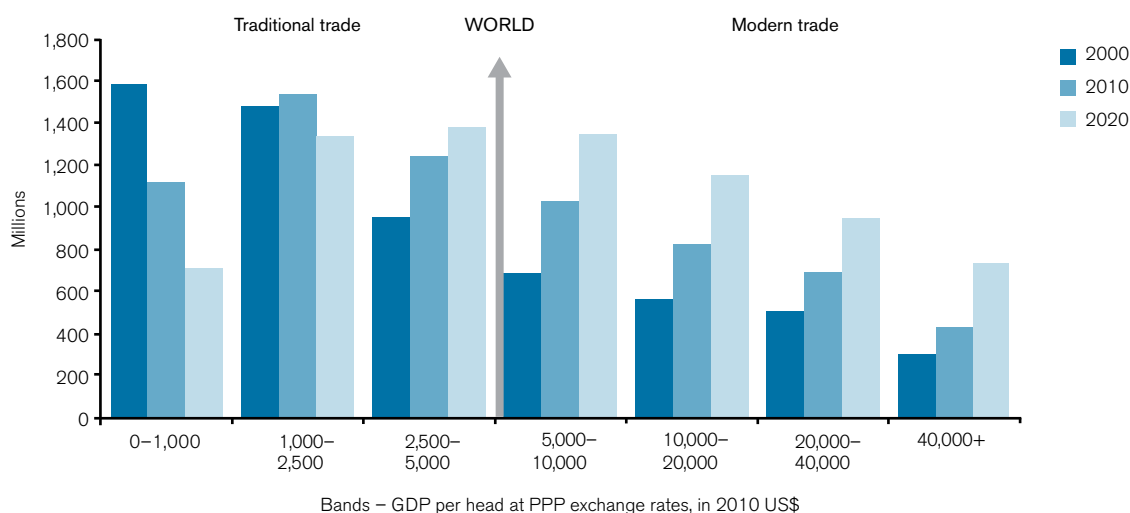
Source: TLE Strategy Ltd.

The combined share of North America and Europe in global retailing in 2008 was 53% but by 2014 is expected to fall to 43%, only slightly bigger than that of the Asia-Pacific region. This is already influencing investment decisions by local and international retailers.

As incomes rise, different consumption and retailing patterns emerge (see Table 5.1). When combined with the trends shown in Figure 5.1, a higher proportion of

the higher income groups will be in developing markets in future. One of the most important drivers of retailing is the spread of the car to less affluent households in emerging markets. The greater this penetration, the more similar the retail industry in developing countries becomes to that in the industrialized countries. Figure 5.2 shows the number of people in each income group up to 2020.

Figure 5.2: Population by income band



Source: TLE Strategy Globegro©.

Table 5.2: Expenditure breakdown by income level, 2005 (as % of total expenditure, global averages)

GDP/head (\$PPP)	Food, beverages, tobacco	Clothing and household	Health	Transport and communications	Recreation, education and restaurants	Other (inc. financial services)
500	64	14	3	10	7	3
1,000	59	14	3	11	9	4
2,500	52	13	4	15	11	5
5,000	38	14	7	18	16	7
10,000	37	11	8	21	17	7
20,000	19	12	11	20	28	11
40,000	13	10	14	19	27	18

Sources: TLE Consumption Curves/World Bank/OECD (2005).

Until now, most people shopped in traditional trade formats. In 2020, the traditional trade will still be strong, but the world will be predominantly served by the modern trade. Higher income also leads to a reallocation of spending. While the absolute amounts continue to increase, households allocate greater proportions of their spending to non-food items (see Table 5.2).

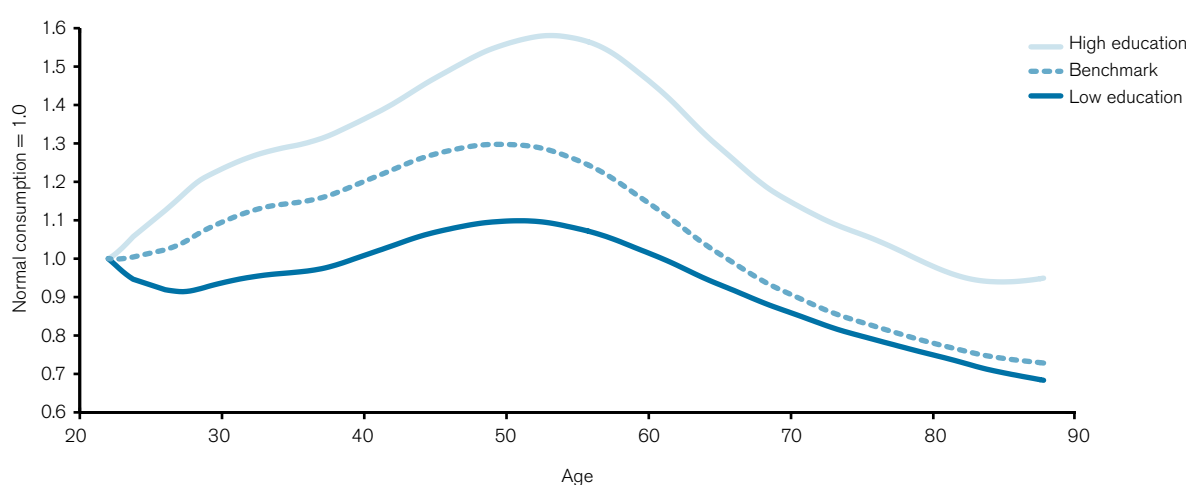
Above incomes of \$25,000 per head, the absolute amount spent per head on food and grocery starts to plateau. Grocery retailing competition becomes more intense and focuses on price. Retail 'branding' becomes an increasingly important means for product differentiation. 'Zero-sum' competition leads to further retail

concentration. Retailers' own brands also prosper, as they appropriate the margin branded manufacturers use for advertising to add to product quality or 'give' the money back to the consumer through lower prices.

Demographics – age cohorts, household size urbanization and the size of retailing

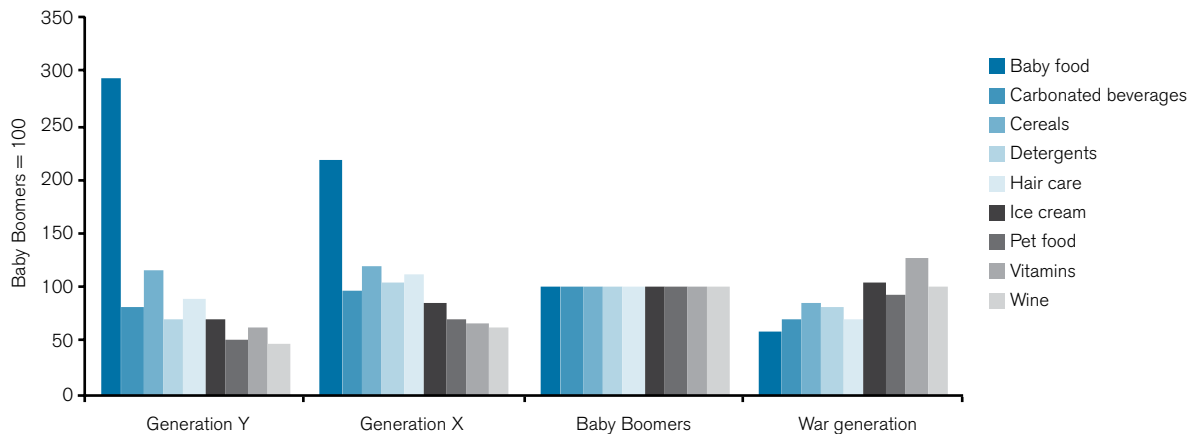
The primary consumer unit used to be the nuclear family, with women doing most of the shopping. Today, consumer profiles are more diverse, with smaller household sizes, and more single-parent, single-person and elderly households. Only 25 years ago, only 41% of the world population was urban. By 2035 the figure will be 61%.

Figure 5.3: Relative levels of consumer income by age and education



Source: Fernández-Villaverde and Krueger (2004).

Figure 5.4: Indexed consumption levels



Sources: Hale (2010), Nielsen & TLE Calculations.

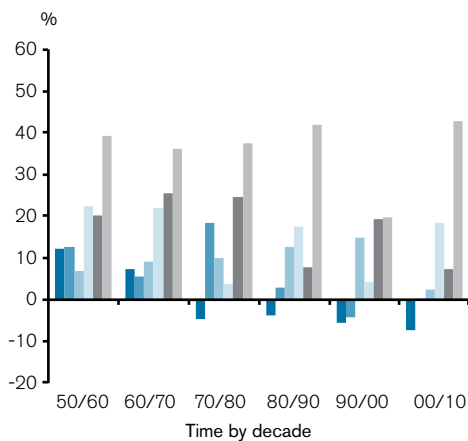
The rapid rise in the number of elderly households will have a major impact over the next 20 years. As people age, their incomes fall and they spend a smaller share of their income on transport, clothing, furnishings, electronic appliances and restaurants, but much more on healthcare. The elderly require more convenience shops, small pack sizes, ease of access, and fewer bulk shopping trips.⁵⁶

Age, education and income are closely associated, as can be seen in Figure 5.3. People with higher levels

of education have a much more pronounced rise in income up to age 50 and also a much sharper fall as they age.

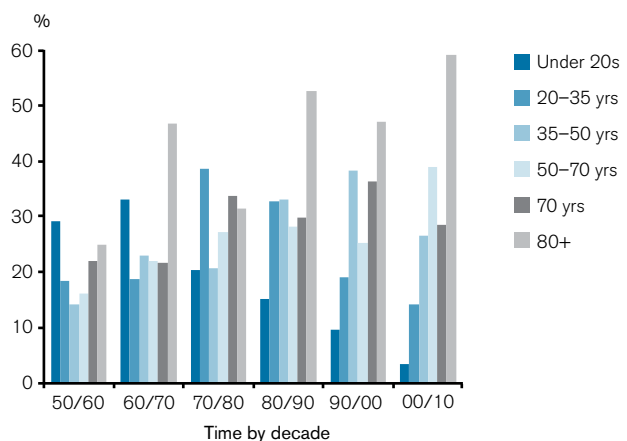
The age structures of different parts of the world have a big impact on income and consumption. Much of the developed world is ageing fast whereas the rest of the world is still facing the growth of middle-aged cohorts. Variations in generational spending patterns in Western countries are shown in Figure 5.4.

Figure 5.5: Population growth in developed markets



Source: UN Population Statistics (2009).

Figure 5.6: Population growth in emerging markets



⁵⁶ Interestingly, private motor transport can become more important for the elderly than for other age groups.

'Baby Boomers' are the biggest spenders in virtually all the categories shown. The living standards of younger generations are falling as a result of significant increases in the cost of housing, travel and education.⁵⁷ If this trend becomes more general, the consumption of many retail goods in the West may fall.

Figure 5.5 shows shifts in different age cohorts of the population in developed countries over time. In the last decade the youngest age cohort has declined and the population in much of the developed world is expected to shrink.

Contrast this with the situation in emerging markets, shown in Figure 5.6. Population growth among all age cohorts has been rapid. Two broad trends are observable in the emerging markets; first, the slackening of growth in the 'under 20s' group and, secondly, the rapid growth in the elderly population. In both developed and emerging markets the rise of the elderly consumer is one of the most important challenges facing retailing.

We should also note that in emerging markets people are leaving rural areas to find better-paying jobs in the cities. This leads to a higher concentration of young and middle-aged people in cities, while the share of the very

young and very old in rural areas rises as urban children are left with their grandparents in rural areas. These trends accelerate retail growth in urban areas and reduce it in rural areas.

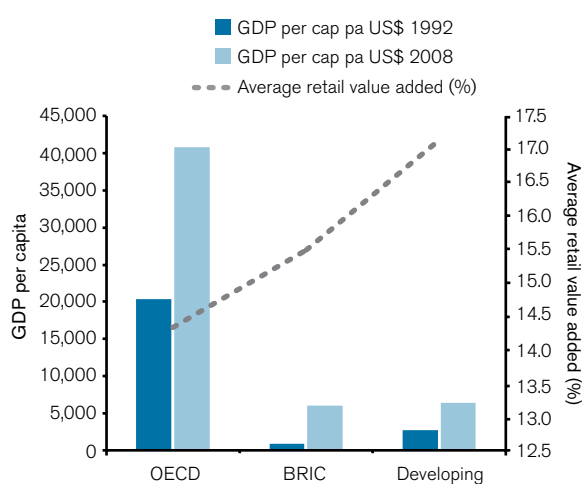
The size of retailing

The absolute size of the retail industry grows as economies grow, but its relative size, measured by its share of value added, falls. Figure 5.7 shows per capita GDP levels in 1992 and 2008 in the OECD, the BRICs⁵⁸ and the developing world. The dotted line shows value added in the retail sector as a percentage of GDP: the richer the region, the smaller the relative size of retailing. This is due to the greater scale efficiencies in centralized supply and delivery chains in higher-income areas. In the developing world there will be huge efficiency gains as incomes rise.

Raw material, transport and energy costs

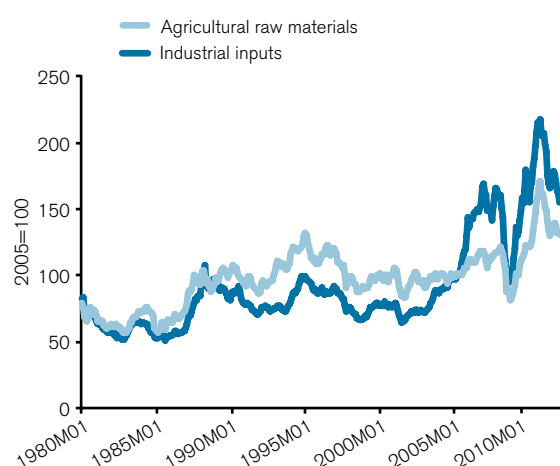
Western living standards have been supported by cheap energy, food and industrial raw materials. Figure 8 shows recent developments in global industrial and agricultural input prices.

Figure 5.7: Retail industry share of value added falls as GDP per capita rises



Sources: UN Population Statistics (2009) & UN National Accounts (2010).

Figure 5.8: Industrial inputs and agricultural inputs prices increase after 2008 financial crisis



Sources: IMF (2011), primary energy commodity prices.

57 See Paulin (2008).

58 Brazil, Russia, India and China.

The broad selection of goods in developed-world shops owes much to low energy and transport costs, which make it economic to transport goods over long distances. Higher transport prices will improve the economics of locally produced over imported goods.

Stagnating incomes in Western countries and rising food, materials and energy prices have reduced real living standards and will also slow the rise in emerging-market living standards. Developing countries will be faced with real policy dilemmas – whether to continue to subsidize key food and energy products or to expose their populations to world prices.⁵⁹

Planning and land use

The supply of retail sites is greatly influenced by the price and availability of land. In less densely populated countries, new retail developments are extensive and are located on the fringes of cities where car access is easier. This can lead to a ‘hollowing out’ of cities. It is frequently asserted that city shopping areas are becoming increasingly similar, as high local property prices and taxes drive out smaller shopkeepers. More affluent neighbourhoods frequently maintain more varied shopping environments than poorer areas.

Forms of government also affect retailing. Centrally planned economies had under-developed retail industries. A single town might have had just one supermarket acting as a goods collection/distribution point. Other countries, such as India, Italy and Japan, maintain local employment by protecting small retailers from competition from larger retail stores. Local retailers are quite capable of ‘tweaking’ local planning rules to exclude low-cost competition.⁶⁰

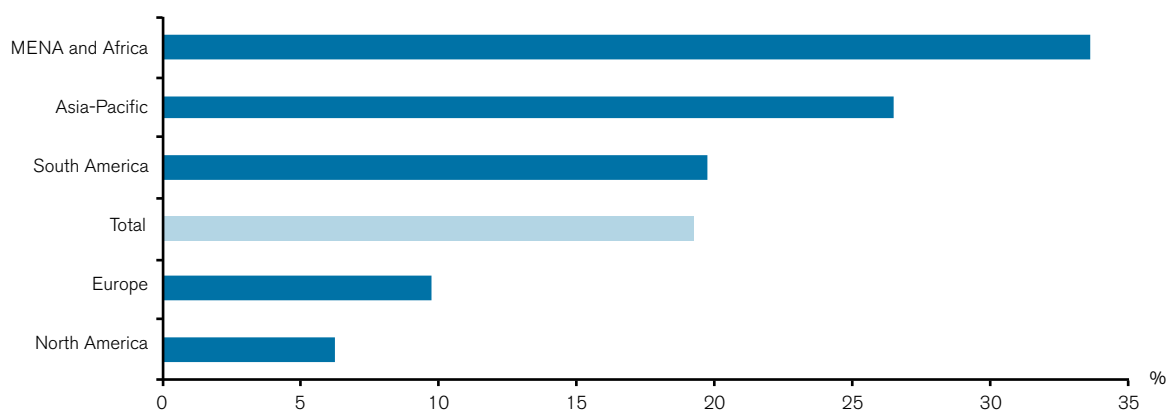
The internet and mobile communications

The internet could entirely replace some types of retailing. Suppliers can reach over the heads of retailers to establish direct links to customers. Price-comparison websites allow customers to select their products and then communicate directly with the supplier.

Figure 5.9 shows that use of the internet is increasing more rapidly in developing than in developed markets, albeit from a much lower base.

Internet shopping is not ideal as there are challenges in ensuring products are delivered to the right person at the right time at the right place. Bulky materials cannot be put into post boxes, and failed deliveries cause logistical

Figure 5.9: Regional growth in internet users



Sources: Forrester Research and Internetworldstats.com, June 2010.

59 Energy subsidies, for instance, vary widely across the world. In Iran around one-third of the government budget is spent on energy subsidies. Energy subsidies vary from 6% of GDP in Russia to 3.4% in Indonesia (2005), 1.8% in India and 0.4% in China. Globally fuel subsidies were estimated at \$557 billion in 2008. See also IEA (2010b), p. 29, and IEA (2006), p. 281.

60 In the United Kingdom, discounters such as Aldi and Lidl have found it difficult to acquire good sites since the incumbent grocers buy them up and keep them in their own large land banks.

problems, similar to the loss of airline luggage. There is also a difference between the food and grocery trade and other forms of retailing as customers still prefer to do their own food shopping.

Other retail areas, such as electrical goods, are more strongly affected by the internet. Over one-third of sales of electrical goods are transacted over the internet,⁶¹ since customers can find precisely what they want, often much more cheaply than on the high street.

Age-related differences in the use of online purchasing may be overstated. While the young may be more eager internet users, Baby Boomers and Generation X'ers buy more online. Customers are becoming increasingly 'multi-channel', initially finding out about a product through the internet, going to a shop to see an example, and then reverting to the internet for the final purchase. Customers following this kind of pattern tend to buy the most, whereas those who only visit shops tend to buy the least – a conclusion that will worry the retail trade.

Information flows will also change. A top-down 'brand' strategy – information about products and prices – comes largely from the suppliers. Social networking sites, peer group reviews and product comparison

sites make it easier for customers to reach their own decisions about products. This can also play havoc with sales territories conventionally defined by retailers and manufacturers.

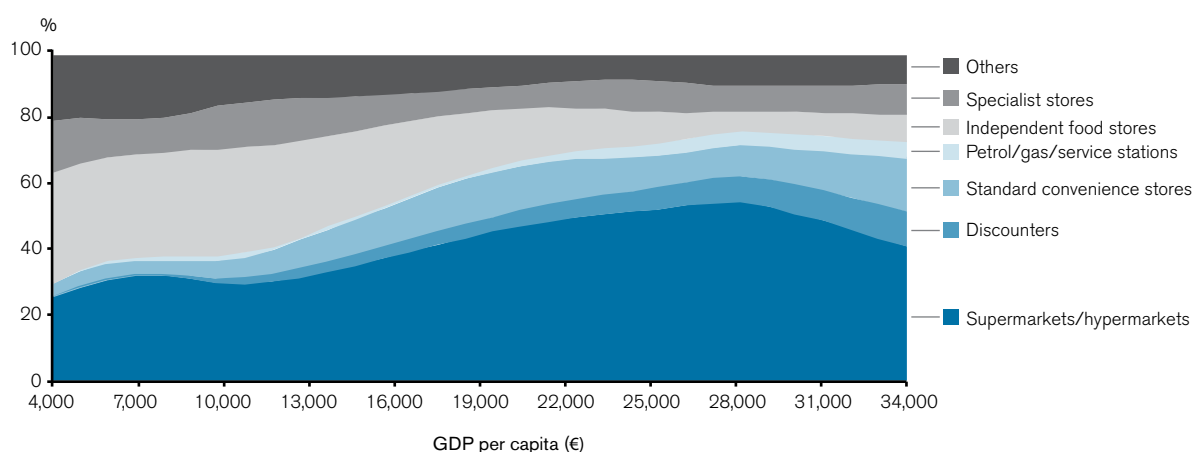
Retailing payment systems too have changed radically. What started out as a cash transaction mutated into a cheque payments system and then to credit, debit and store cards. These systems are largely owned by banks and financial institutions. PayPal, and the use of mobile phones to make inter-bank transfers, are now also becoming more widespread.⁶²

The future of retailing: the shape of things to come?

Taking grocery retailing first, Figure 5.10 shows how retail grocery formats evolve as incomes grow. With increasing affluence, hyper- and supermarkets increase their share. Further income increases lead to more fragmented retail structures.

The situation is more complicated for non-food retailing. Some retail activity, such as the audio media industry, is being annihilated by internet competition.⁶³

Figure 5.10: Relationship between retail grocery developments and income level



Sources: TLE Strategy Retail Model; Euromonitor International.

61 See Deloitte (2011) for more details.

62 Interestingly, mobile phone payment systems are used extensively in parts of Africa, leapfrogging a number of older technologies.

63 *The Economist* (2009). In Spain DVD and CD retailers have effectively withdrawn from the market.

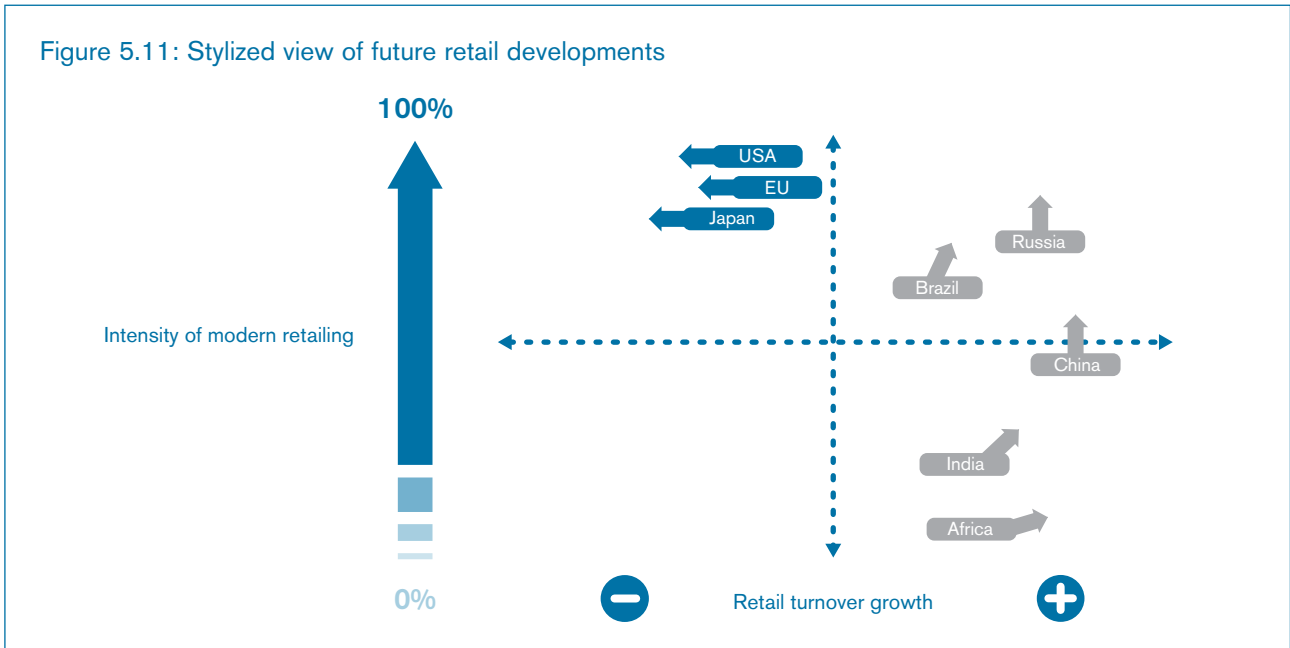


Figure 5.11 summarizes future retail developments. The x-axis divides countries and regions according to whether retail turnover is rising or falling. The y-axis measures the estimated level of intensity of modern retail techniques.

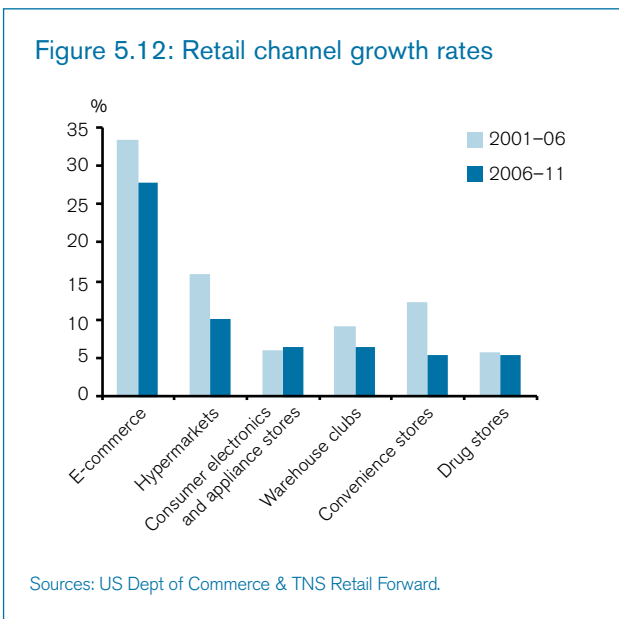
Emerging markets, represented by grey arrows, start with different levels of modern retail intensity. They are experiencing fast growth, and are expected to move from the bottom-right to the top-right quadrant, becoming

more like developed economies. The slope of the arrows roughly indicates the degree of difficulty in obtaining the necessary investment to improve the retail infrastructure.

The developed world, represented by blue arrows, is experiencing low or negative retail growth, and hence the arrows all move from the top-right to the top-left quadrant. In some countries, the intensity of modern retailing may also decline – possibly as a result of increased internet trade, which would result in fewer shops.

Retailing is a relatively volatile industry. Figure 5.12 shows recent trends in the US retail sector. As consumer tastes change, so some segments of retailing prosper, while others do not.⁶⁴

E-commerce is gaining market share at the expense of more conventional retail channels. Almost all formats experienced lower growth between 2006 and 2011.



Globalization of retail operations

Success in global markets has remained elusive, although a small number of US and European retailers have tried to achieve it. Frequently, foreign expansion is through acquisition, which does not always result in a single 'one size

64 Milliners, smiths, haberdashers, saddlers have all long since disappeared, to be replaced by other forms of retailing.

fits all' global approach.⁶⁵ Foreign expansion is risky and expensive, and domestic competitive conditions are not generally transferrable to new markets. While Carrefour, Metro, Tesco and Walmart have expanded abroad, many have suffered commercially as a result.

Our research indicates that many companies that engage in attempts at globalization have lower profitability than those that do not.⁶⁶

There may be big changes in the direction of retail investment over the next 15 years. High property prices, taxes and restrictive zoning rules act as entry barriers for new, particularly foreign, retailers. Franchising and leasing space within an existing shop may help to reduce risks.

Three trends are likely to occur in the globalization of the retail sector:

- Retailers in emerging markets will quickly adopt Western retailing technology and methods. This technology may be licensed, leased or become part of a franchising arrangement.
- Western retailers, particularly those faced with static domestic markets, will try to expand into new territories in emerging markets. While some may succeed, many will not.
- Some emerging-market retailers will also look to expand into developed markets where sales and profit values are higher than in their domestic markets.

Conclusion

As emerging markets continue to grow, and industrialized markets continue to stagnate, there will be a shift in the pattern of retailing. By 2025, the share of retailing turnover

and investment in emerging markets will be higher than in industrialized countries.

Until now, most of the world's population has been shopping in traditional trade retail formats. In 10 years' time the world will be predominantly served by modern trade – with much of the spend at the luxury end.

There will be changes in the amount of space allocated to different types of retailing. In particular, a smaller proportion of space will be available for food and grocery goods, and more for health, leisure, restaurants and financial services.

The internet will become more important, and 'multi-channel' shopping will become the norm for many kinds of retail activity. Internet competition will be so severe in some product areas that certain types of retailing will disappear from the High Street.

Within emerging markets, urban retailing will grow faster than average. The situation for rural retailers looks less rosy.

Luxury retailer brands will continue to operate globally, with an increasing number of entrants based in emerging markets. In contrast, globalization of grocery retail brands is expected to extend only slowly, although retailing technologies developed in the West will become ubiquitous. Foreign expansion for grocery operators has proved risky, and national retailers will seek to reduce risk by using franchise agreements, or by acquiring local retailers whose brands may not be easily integrated into a less tangible global brand.

Finally, the next big trend in retailing will be set by the rapid ageing of the population in both the developing and the developed world. This will tend to further depress demand for many key staples in the West, while leading to increased demand for more age-specific products and age-friendly retail channels.

⁶⁵ There is little obvious identification between Asda in the United Kingdom with its parent company Walmart in the United States.

⁶⁶ Results of analysis of Planet Retail data by TLE.

6. Conclusions and Recommendations

Donald Hepburn

The aim of this project was to map the big changes in the world's manufacturing landscape over the past 25 years, to understand what has driven them and then to look ahead to 2020 and beyond to speculate about the future shape of industry. The specific research question we set out to tackle was: 'Which industries will change the industrial landscape in future, leading growth in the next decade?'

As work progressed the ambitious nature of this project and the difficulty of reaching firm and robust conclusions became increasingly evident. The main reason is that an apparently simple question actually raises much more fundamental questions about the causes of economic development. As Chapter 1 suggests, the rise and fall of industries around the world reflect a complex combination of economic, political, social and environmental factors. The profound industrial changes over the past 25 years reflect responses to the particular circumstances affecting the world over that period, particularly globalization, economic growth and a mainly benign political background. During this time there has been a golden age, with good (though not sustainable) growth in most of the developed world and spectacular growth in the developing world, particularly China.

This chapter starts with an assessment of the research question through the four sectoral case studies before considering other industries that might also be important to growth. It then re-examines the assumptions underlying the analysis and the risks before summarizing the conclusions and making some policy recommendations.

Will the case-study industries drive growth?

Table 6.1 shows whether the four industries which were the focus of the case studies will drive growth in future, i.e. whether their value added will grow faster than GDP.

Although the study initially had a time horizon of 2020, it is useful to look beyond this to see where these industries may be heading.

Table 6.1: Will the case-study industries drive growth?

Industry	Developed world	Developing world	Total world
Aircraft	Yes	Yes	Yes
Automotives	No	Yes	Yes
Pharmaceuticals	Yes	Yes	Yes
Retailing	No	Yes (No in the longer term)	No

For **aircraft**, growth in demand for air travel, driven by rising incomes and low-price airlines following deregulation, is the key driver. Provided that the cost of fuel does not escalate rapidly, rising incomes in many developing countries are expected to push up the demand for both business and leisure travel. Demand in developed countries is likely to lag behind as income growth will be much slower, but even here demand seems to be relatively buoyant. Production will continue to be dominated by the United States and Europe, with smaller contributions from Brazil (Embraer) and Canada (Bombardier), but China's aircraft industry is expected to grow rapidly to meet its booming domestic demand for air travel; it will be based on both assembly of Airbus and the development of its own company (COMAC). Although COMAC may not have delivered many aircraft by 2020, it is expected to be well on the way to becoming an important player by 2030, though still reliant on global suppliers for many major components.

In **automotives**, the developed world has almost reached saturation, and demand will be driven mainly by replacement and innovations in safety and fuel efficiency. The developed world also has to cope with the problem of

over-capacity, which, although hard to solve in the short term for political reasons, needs to be removed in the longer term. These factors, together with the continued transfer of production to developing countries, mean that the automotive industry is unlikely to drive growth in developed countries. By contrast, demand in many developing countries is taking off because incomes have reached the critical point and falling prices have made cars much more affordable. This alone should be enough to make this industry a driver of growth in many developing countries, with any further transfer in production providing a further boost.

In **pharmaceuticals**, market growth has consistently exceeded GDP growth and will continue to do so, but with some caveats. In the developed world, ever-increasing demand will be held back, at least in those countries with public provision of healthcare, while budget deficits are reined in, though the need to reduce costs may also lead to some substitution of more effective drugs in place of hospital treatments. Assuming public debt is reduced to more normal levels in the longer run, the demand for pharmaceuticals to address the increasingly significant problems of ageing will pick up. Where healthcare is private, the need for people to increase savings and reduce consumption may affect their ability to afford drugs, though health is usually one of the last areas for economizing. In both types of healthcare regimes, the impact of technology on the cost of drugs may play a big part. Many basic scientific breakthroughs in genomics have already been made, and over the next 10 years there should be an increasing flow of new drugs. It is not yet clear whether these developments will lead to cheaper drugs; there is at least a possibility that they will, but the impact of this is likely to be felt beyond the 10-year horizon.

In developing countries, where healthcare is mainly private, demand growth will be strong, especially in the Asia-Pacific region. Emerging Pharma companies may also benefit from outsourcing by Big Pharma of some activities such as clinical development and manufacturing.

Retailing is expected to grow more slowly than GDP in the developed world owing to saturation of retail space and depressed consumer spending. Although food shopping

may hold up well as consumers stay at home rather than eating out, sluggishness in non-food retailing may outweigh these gains. Within this overall picture there will be further changes in format, with e-commerce gaining at the expense of physical shops.

The forecast for developing countries is much more complicated. In the shorter term (to 2020), there will be a boom in retailing as hundreds of millions of people join the middle class. This will be especially true of China if it reorients its economy from exports to domestic consumption. It will also apply in India, where retailing is at present overwhelmingly dominated by the traditional trade but is expected to see a transformation to modern formats. However, in the longer term as the market becomes saturated, retailing will cease to be a big growth driver and will reflect the experience of richer countries where it accounts for a much lower share of GDP. This is mainly due to the greater scale efficiencies as the traditional trade, based on small shops, is replaced by modern trade in the form of supermarkets and efficient supply chains. This does, however, bring the benefit of raising productivity and releasing labour for more productive uses.

The answer to the research question from these four case studies is somewhat mixed. Two of the industries (aircraft and pharmaceuticals) are expected to contribute positively to growth worldwide, while in the two other industries (automotives and retailing) the answer is more nuanced.

Where else might growth come from?

These four case studies make up only a small sample of industries and it is worth a short diversion to consider which other industries might drive growth in future. Table 6.2 shows that seven industries have increased their share of manufacturing value added.⁶⁷

More recent UNIDO data show that medical equipment, transport and the heavier end of manufacturing such as non-metallic products (e.g. glass, cement), metal-working and machinery of various kinds continue to gain market share.

⁶⁷ Based on a sample of 30 developed and developing countries.

Table 6.2: Increasing shares of total manufacturing value added, 1980–2006
(% of total manufacturing value added)

	1980	1990	2000	2006
Chemicals and chemical products	9.5	10.3	11.0	12.0
Rubber and plastics products	3.6	4.3	4.7	4.5
Electrical machinery and apparatus + radio, TV and communication equipment	8.3	9.8	11.6	11.2
Medical, precision and optical instruments	2.2	3.1	3.5	4.0
Motor vehicles, trailers and semi-trailers + other transport equipment	8.0	8.9	10.7	11.6

Source: UNIDO (2009).

Environmental developments will also change the industrial landscape. The increase in greenhouse gas emissions predicted in the OECD's *Environmental Outlook* to 2050,⁶⁸ much of it due to increased car use, is already prompting heavy investment in a wide range of industries to produce clean energy, reduce pollution, cut energy consumption and store carbon.

Other natural resources such as water are already under strain. Solutions that include reduction in wastage, investment in storage, desalination and treatment of waste water will boost investment in infrastructure projects and desalination schemes.

Finally, the role of technology in driving growth has been covered in various places throughout the report. It

is clear that advances in biotechnology, environmental sciences, information technology and advanced manufacturing process (such as 3-D printing) will lead to rapid growth across many industries.

It is among these industries that faster-than-average growth may be found in future, and governments may focus their support of education and training in some of these areas.

Chapter 1 discussed the relative importance of industry, services and agriculture. At the world level, there will be a 'mix' effect as faster growth in developing countries together with their higher share of industry combine to push up industry's share of world GDP. It is therefore necessary to look separately at developed and developing regions.

Table 6.3: Structure of the economies of China and India: share of GDP (%)

	1985	1990	1995	2000	2005	2010
China						
Agriculture	28.4	27.1	20.0	15.1	12.1	10.1
Industry	42.9	41.3	47.2	45.9	47.4	46.8
Services	28.7	35.5	32.9	39.0	40.5	43.1
India						
Agriculture	31.2	29.3	26.5	23.4	18.8	19.0
Industry	26.1	26.9	27.8	26.2	28.1	26.3
Services	42.7	43.8	45.7	50.5	53.0	54.7

Source: World Bank World Development Indicators.

68 OECD (2012).

In the developed world, the divergent trends in industry and services may be reversing. Industry's share of GDP has levelled off recently and could rise as governments rebalance their economies, and as developing countries face some erosion of competitiveness owing to rising wages and non-wage costs, and appreciating currencies. Services' share may also fall as banking returns to a more normal size after huge over-investment in the last 20 years and the public sector shrinks in response to government debt reduction. This de-leveraging will take many years and have a long-lasting effect on the shape of economies.

In developing countries, industry will continue to play an important role in the economy but services such as tourism, communications, insurance and other financial services will also grow rapidly in response to rising incomes. It is instructive to look at the data for China and India (see Table 6.3). During the period when the great industrial transformation was taking place, the bigger shift was actually occurring in agriculture and services.

Returning to the world level, it seems likely that the long-term decline in industry's share may have come to an end. It is also likely that agriculture's low share and the need to feed a growing population mean that agriculture's share of GDP should stabilize and could grow.

Re-examination of the assumptions and risks

The case studies were prepared against a set of economic, political and environmental assumptions. The economic forecasts, made at the end of 2010 when the world was showing a modest recovery from the 2008–09 recession, saw growth returning to the developed world and continuing at a healthy pace in developing countries. Since then, the outlook has darkened, with a double-dip recession in some countries and a possible break-up of the eurozone. However, it is necessary to look beyond current difficulties to make forecasts for 2020 and beyond. Up to 2020, the forecast can be summarized as 2% annual growth in developed countries and 6% in developing countries. This would be optimistic if the problems in the developed

world prove so severe that they push the world into a 1930s-style depression, but the momentum and much greater importance of the developing world suggest that this is unlikely. Beyond 2020 there is likely to be some convergence in growth as the bigger developing countries catch up and find it harder to out-perform the West by such a big margin.

The most serious risk from the downside scenario would be the reversal of globalization. Although many multinational companies have a vested interest in preserving free trade and consumers might have to pay higher prices for domestically produced goods, the demand for domestic jobs during a recession could trump the benefits of free trade. The danger would then be retaliatory measures and a very sharp downward spiral in world trade, as happened in the 1930s. Trade and capital flows would be constrained and there would be more 're-shoring' of production. However, supply chains have become much more complex. Intra-industry trade has grown dramatically as increased specialization has led to more decentralized production processes. While there may be more rhetoric in election years about the need to protect or create local jobs, there are countervailing pressures promoting the benefits of the new trade arrangements, and the protectionist lobby has failed so far to gain much traction.⁶⁹ Another factor to bear in mind is the growing integration of Asian trade and economic relationships. At a time when this region is becoming much more integrated, reducing economic links with this dynamic part of the world would be self-defeating.

Another unknown is exchange-rate policy. In China, the strengthening of the currency is part of a long-term plan to let the renminbi appreciate within a strictly controlled regime. The real exchange rate continues to rise as Chinese labour costs are growing much faster than those in the United States (see Figure 1.5). It is, of course, possible that these wage increases could be offset by productivity gains, although the BCG report mentioned in Chapter 1 found that this has not been the case. It is not clear how much further China will allow its currency to rise, but significant increases in wage costs are already leading to relocation of

⁶⁹ This conclusion may not apply to banking, where regulation following the crisis may lead to some retreat from global banking.

some industries from coastal China to inland provinces or to other countries with lower labour costs, and this trend is likely to continue.

Chapter 1 also referred to the role of government policy in influencing the growth and location of industries. Market failures in the financial sector in the last decade have shaken many people's faith in laissez-faire capitalism and triggered a debate about its effectiveness in delivering sustained growth. Some of the basic simplifying assumptions behind macroeconomic models were disastrously wrong. Financial markets turned out not to be efficient and 'light touch' regulation is slowly being replaced by much tougher rules. This is also encouraging the return of industrial policy, most clearly in talk about the need to rebalance economies away from over-reliance on the financial sector. Across the developed world there is a desperate search for private-sector growth to offset the deflationary effect of cutting unsustainably high budget deficits, and this could well lead to more active government measures to promote industrial growth.

The failure of the developed world to avoid recession has also reinforced the belief in state capitalism in countries such as China and Russia. They may now be much less likely to pursue market-based reforms and will continue to promote domestic (often state-owned) industries, since they regard this as a more efficient path to growth and modernization. It is too early to say whether this trend towards more interventionism will last or whether it will be successful in delivering growth. However, it will make a difference to industry location and growth.

Summary of findings

The last 25 years have seen a dramatic change in the world's industrial landscape as globalization and the transformation of major developing countries, especially China and India, have hugely increased the world's available labour supply and brought big gains in economic efficiency. International trade has soared as transport costs have fallen as a result of scale economies from larger container ships, more efficient

control of supply chains and, at least until fairly recently, moderate oil prices. International investment has also played its part, with many multinationals moving their manufacturing activities offshore to developing countries, and transferring technology and management. This led initially to low inflation in traded goods, underpinning a consumer boom in the West and appearing to herald a new golden age of steady growth. Subsequent events have shown that the golden age was in fact tarnished, having been based on an unsustainable increase in borrowing to buy residential property and to fund consumption.

The star performer during this period was China. It emerged as the world's largest manufacturer, overtaking the United States in 2011.⁷⁰ This is an astonishing rise in view of the fact that liberalization of the economy only started in 1979. Most dramatic has been the rise of China's car industry, with production of over 19 million vehicles in 2012, about 90% higher than in the United States and Japan. This growth has been based almost exclusively on meeting domestic demand: exports could, in future, further boost the size of the industry. China is also the biggest manufacturer in a number of other industries such as apparel, rubber and plastics, non-metallic products, basic metals and electrical machinery. The government's latest Five-Year Plan has identified seven strategic industries which it intends to develop to world standard – and it has the resources to make it happen, provided the country continues to enjoy growth and stability.

Brazil and India, though dwarfed by China, are also on the move. Much has been made of India's success in winning outsourced services but its industrial sector is eighth in the world, not far behind those of Brazil, Russia, Italy and United Kingdom, with growth of 8% a year in the past five years.

Looking ahead, there will be further significant changes in the world's industrial landscape. Industrial structure will continue to change as new industries based on technological innovations gain share at the expense of more traditional industries. The emergence of a huge middle class in developing countries will also drive rapid expansion of industries which meet its needs.

⁷⁰ In term of value added, measured in dollars at market exchange rates.

However, the change will probably not be as dramatic as in the recent past. Industry will continue to seek out the most economic locations to take advantage of changing competitiveness but the big surge in offshoring may have passed its peak: the best opportunities were exploited over the past 25 years as barriers fell and the flood of cheap labour came onto the market. The financial crisis and subsequent recession, at least in the developed world, have highlighted deep structural problems. Public-sector debt levels must be reduced over a number of years just as ageing populations are leading to a reduction in the size of the workforce in Europe and Japan. This suggests that developed countries are in for a prolonged period of low growth in the optimistic scenario and a much worse outlook if the problems confronting them are mishandled.

Faced with the need to cut public-sector deficits (and jobs), the developed world is now looking very hard for new sources of private-sector growth. In the United States and United Kingdom this may take the form of rebalancing the economy away from financial- and public-sector services and in favour of industry. The emphasis is on the exploitation of new technologies to move up the value chain to knowledge-intensive industries in an attempt to reduce competition from developing countries. It is also likely that there will be more demands for support of domestic industry to create local jobs, a greater emphasis on public-sector involvement in industry strategy and more pressure to increase spending on R&D and skills development.⁷¹ If these policies are successful it could mean that industry becomes the growth driver, gaining share at the expense of services.

The developing world is also expected to see growth in its industries. Although economies here will not be immune to what is happening in the West, they have so far been fairly resilient. If China is successful in orientating its economy towards domestic consumption, it will become less reliant on exports to the developed world. The developing world will grow, on average, by much more than the developed world as the catch-up phase will last for a long time. As it does so, there will be rapid growth in demand for many consumer and investment goods, much of which will be supplied by domestic production.

Putting together these trends in developed and developing regions, the steady increase in services' share of GDP is likely to come to an end. The growing size of the developing world, where industry has a bigger share than in the developed world, will further buttress this conclusion.

It is important to draw a distinction between countries and companies. Although countries will promote local jobs and production, companies will continue to seek out the most economic and efficient locations for their production. They will respond to the changing competitiveness of countries or regions by migrating to cheaper locations in Asia, Latin America or Africa. The big surge in offshoring to take advantage of a once-in-a-lifetime removal of barriers to trade, and the flood of workers joining the world labour market when China became a member of the World Trade Organization (WTO), have passed but companies will go on looking for the best places to produce. They will also search for new ways to integrate global production. The aircraft and car industries are just two examples of the way in which supply chains are becoming more complicated and integrated to take advantage of different capabilities around the world.

Some of the industries that are likely to drive growth have been covered by the four case studies. Aircraft and pharmaceuticals are expected to continue to grow faster than GDP in both developed and developing countries. The automotive industry should be a growth driver in many developing countries but not in the developed world where demand is almost saturated. The retailing industry will grow fast to cater for the burgeoning middle classes in developing markets but will be under pressure in developed countries. Other potential growth industries include other durable goods in developing markets, all aspects of health spending including medical machinery based on advances in technology, consumer and business electronics (which will incorporate further IT advances) and sectors such as machinery which provide solutions to environmental problems, e.g. water scarcity and carbon emissions. If climate change proves to be as serious as many now believe, this will give a huge boost to a wide variety of industries which seek to respond to the problem.

⁷¹ For a discussion of this issue in the United Kingdom see Oxford Economics (2010) and Coutts and Rowthorn (2009).

Policy recommendations

This study has been very broad in scope, covering the whole of industry across all countries of the world. It also touches on fundamental questions about the causes of economic development. This poses a challenge in making policy recommendations. What might be appropriate for the United States or Europe may not be applicable to a country such as China with a different political and economic system. However, the study has sought common ground for recommendations, which are divided into implications for the industries studied and more general points.

Aircraft

- Countries and companies should continue to support free trade and avoid protectionism. The complexity of modern aircraft manufacturing means that autarkic policies are impractical and counter-productive.
- Countries wishing to develop a presence in this sector should actively support the protection of intellectual property rights and international regulation for aircraft certification.
- Countries should avoid policies which seek to attract those parts of the supply chain (e.g. testing, component manufacturing) that benefit from geographical proximity to major manufacturing hubs in America, Europe and Asia.
- Governments should support policies that enhance education and the research infrastructure as these are central to the creation of a full-scale aerospace industry. All incumbent aerospace powers have strong innovation systems that support their industry, and these should be strengthened.
- Governments need to reconcile the needs of domestic firms with the risk that subsidies violate international trade rules. Subsidies, when offered, should be targeted at early-stage research activities in a range of technologies associated with the sector, such as composite materials and electronics, and be available on a non-discriminatory basis.
- Governments should encourage deregulation of both domestic and international air travel. This will help to

lower ticket prices, encourage consumer demand and lead to a more efficient distribution of resources in the passenger and freight aircraft markets.

Automobiles

- Companies and governments should find ways to tackle overcapacity, which has been a feature of the automotive industry for decades. This will not be easy as it requires politically sensitive plant closures and will become doubly difficult if controlling shareholders, who currently have very sizeable equity holdings, decide to dilute their stakes.
- All actors should resist calls for protectionist measures against China and other emerging economies, while it is legitimate to engage in a dialogue to ensure a level playing field.
- Governments should promote supply-side innovation, which will be one of the main drivers of growth as markets approach saturation and consumers become increasingly sensitive to global warming and safety. Support for faster technological development, e.g. to speed the shift to electric and other non-carbon fuel cars, could accelerate the renewal of the car park and strengthen public support for the industry during an economic crisis. Resulting subsidies, scrap incentives and direct interventions should be used in non-discriminatory ways.
- Authorities should consider how to apply competition rules in ways that do not hinder alliances between producers and other forms of collaboration, both with other OEMs and with suppliers. This is especially relevant for R&D outlays, where there are incentives to share some of the costs.

Pharmaceuticals

Governments should:

- Establish a more realistic and consistent policy towards the pharmaceuticals industry, recognizing the costs of innovation necessary to deliver major advances in therapy. Tax and subsidy policies should be directed towards supporting R&D to encourage such innovation.

This could lower the cost of drugs at a time when there are very tight public budget constraints.

- Define a new relationship with pharmaceutical companies in countries where they play a role as the main purchasers of drugs. This could take the form of agreed profit parameters, akin to those in the defence industry.
- Support patents and the protection of intellectual property as these are vital to the invention of new drugs.
- Clarify their policy of helping developing countries through the provision of subsidized drugs and not leave it to the industry.

Retailing

Governments should:

- Aim to encourage retailing by allowing the maximum freedom for retail markets to operate, subject to those regulations and controls needed to maintain orderly trading, and to guarantee the security of the market participants, both suppliers and consumers.
- Encourage legal, social, and economic frameworks that are conducive to retailers, without seeking to interfere with the detail of buying and selling.
- Intervene as much as is required, and as little as is necessary to preserve the essential qualities of markets for the exchange of retail goods and services. They should be mindful of the way that a large number of unrelated rules and regulations can bear down on retailing and retailers, sometimes with unintended consequences.

- Encourage modern retailing formats that bring external benefits in the form of increased consumer choice as well as more efficient supply chains and accounting controls.

General

One common theme from these recommendations is that an internationally agreed set of rules is preferable to competing and contradictory sets of national rules. With this in mind, the following recommendations are also made. Governments should:

- Abide by the letter and spirit of WTO rules and should resist domestic protectionist pressures which may bring short-term political advantage but at the risk of pushing the world into a depression.
- Support the losers from globalization in order to mitigate its effects. This will require more active support and retraining for those who lose their jobs to emerging countries, government-backed investment projects and measures to raise the quality and amount of education and training. It will also require policies which demonstrate that the benefits of globalization outweigh its costs. Among these will be policies that reduce growing inequality.
- Uphold existing rules on the safeguarding of intellectual property. These may currently favour incumbents in developed countries but, with the growth of companies based in developing countries, will also come to benefit research and innovation in those countries.

References

Chapter 1: Introduction

Boston Consulting Group (2011), *Made in America, Again: Why Manufacturing Will Return to the U.S.*, http://www.bcg.com/expertise_impact/capabilities/operations/manufacturing/publicationdetails.aspx?id=tcn:12-84591&mid=tcn:12-84473.

Chatham House (2011), The World's Industrial Transformation series of Briefing Papers, <http://www.chathamhouse.org/research/economics/current-projects/worlds-industrial-transformation-series>.

Financial Times (2011), 'China noses ahead as top goods producer', Report of a study by IHS Global Insight, 13 March.

Rossi, Vanessa (2010), *A Remarkably Rosy Economic Outlook for 2020*, Chartered Insurance Institute.

TLE (2010), *Globegro Model, TLE Strategy*.

UNIDO (United Nations Industrial Development Organization) (2009), *International Yearbook of Industrial Statistics*.

UNIDO (2010), *Structural Change in the World Economy: Main Features and Trends*, Annex table 4(a).

UNIDO (2011 and 2102), *World Manufacturing Production, Statistics for Quarter 1, 2011-Q4, 2012*.

United Nations, Department of Economic and Social Affairs, Population Division (2010), *World Population Prospects: The 2010 Revision*.

Chapter 2: The Aircraft Industry

Aerospace Industry Association (2010), *Aerospace Foreign Trade*, Series 31 and 32, http://www.aia-aerospace.org/economics/aerospace_statistics/.

Aerospace and Defence Industries Association of Europe (2010), *Facts and Figures 2009*.

Aerostrategy (2009), *Globalization 2.0: The Next Stage*, September 2009.

Airbus Industrie (2010), *Global Market Forecast 2010–2029*.

Boeing Corporation (2010), *Market Forecast 2010–2029*.

Bombardier (2011), 'COMAC and Bombardier Sign Strategic Agreement on Commercial Aircraft', 24 March, <http://www.bombardier.com/en/corporate/media-centre/press-releases/details?docID=0901260d80167ce7>.

EADS (2010), *2010 Annual Report*, <http://www.eads.com/eads/int/en/investor-relations/financials-guidance/key-figures.html>.

Eriksson, Sören (2010), 'China's Aircraft Industry: Collaboration and Technology Transfer – the Case of Airbus', *International Journal of Technology Transfer and Commercialisation*, Vol. 2, No. 2.

Eriksson, Sören (2003), 'Indonesia's Aircraft Industry: Technology and Management Impediments', *International Journal of Technology Transfer and Commercialisation*, Vol. 2, No. 2. CHECK DUPLICATION/date.

Eriksson, Sören (2000), 'Technology Spill-Over from the Aircraft Industry: The Case of Volvo Aero', *Technovation*, Vol. 20.

Frenken, Koen (2000), 'A Complexity Approach to Innovation Networks: The Case of the Aircraft Industry (1909–1997)', *Research Policy*.

Goldstein, Andrea (2003), 'The Political Economy of High-Tech Industries in Developing Countries: Aerospace in Brazil, Indonesia and South Africa', *Cambridge Journal of Economics*, Vol. 26.

Hobday, Michael (1998), 'Product Complexity, Innovation and Industrial Organization', *Research Policy*, Vol. 26.

Honeywell, (2010), 'Honeywell Helps Drive Chinese Aerospace Growth with Four Major Systems for New Passenger Aircraft', 19 November, <http://www51.honeywell.com/honeywell/news-events/press-releases-details/11.19.10C919.html>.

International Trade Administration (2010), 'Russia: Consolidation of the Aerospace Industry', US Department of Commerce, trade.gov/static/aero_rpt_russian_industry_consolidation.pdf.

IPK International (2010), *ITB World Travel Trends Report*, December.

Keenan, Greg (2011), 'Airbus Takes Shine Off Bombardier's Party in Paris', *Globe and Mail*, 24 June, <http://www.theglobeandmail.com/globe-investor/airbus-takes-shine-off-bombardiers-party-in-paris/article2073901/>.

McAdam, Rodney, Tom O'Hare and Sandra Moffatt (2008), 'Collaborative Knowledge Sharing in Composite New Product Development: An Aerospace Study', *Technovation*, Vol. 28.

McGuire, Steven (1999), 'Sectoral Innovation Patterns and the Rise of New Competitors: The Case of Aerospace in Asia', *Industry and Innovation*, Vol. 6, No. 2.

- McHale, John (2010), 'Russian Aircraft Industry will Benefit from Strategic International Partnerships', *Avionics Intelligence*, 11 August.
- McKinsey and Company (2008), *The Growing Role of Emerging Markets in Aerospace*, April.
- National Science Foundation (2010), *Science and Engineering Indicators*.
- Nolan, Peter, Jin Zhang and Chunhang Liu (2008), 'The Global Business Revolution, the Cascade Effect and the Challenge for Firms from Developing Countries', *Cambridge Journal of Economics*, Vol. 32.
- Perrett, Bradley (2010), 'In For the Long Haul', *Aviation Week and Space Technology*, p. 65, 15 November.
- Polek, Gregory (2011), 'Embraer to Decide on Next Commercial Project Next Year', *Aviation News International*, 25 March, <http://www.ainonline.com/news/single-news-page/article/embraer-to-decide-on-next-commercial-project-this-year-29195/>.
- Schoenmakers, Wilfrid and Geert Duysters (2010), 'The Technological Origins of Radical Innovations', *Research Policy*, Vol. 39.
- Sukhoi Aircraft Company, <http://sukhoi.org/eng/planes/projects/rj/>, accessed 20 March 2011.
- Teitel, Simón (2006), 'On Semi-Industrialised Countries and the Acquisition of Advanced Technological Capabilities', *Economics of Innovation and New Technologies*, Vol. 15, No. 2.
- UK Department for Business, Innovation and Skills (2010), *Annual Innovation Report*.
- UK Trade and Investment (2010), *Aerospace Supply Chain in China*.
- UK Trade and Investment (2010), *UK International Aerospace Strategy 2010*.
- United Aircraft Corporation (2010), 'Shareholders of UAC Approve Additional Shares Issue', <http://www.uacrussia.ru/en/press/news/index.php?from4=2&id4=530>.
- Vertesy, Daniel and Adam Szirmai (2010), 'Interrupted Innovation: Innovation System Dynamics in Latecomer Aerospace Industries', UNU-MERIT Working Paper 2010-059.
- World Tourism Organization (2011), *World Tourism Barometer*, 2011, Vol. 9, No. 1.
- Chapter 3: The Automotive Industry**
- Deutsche Bank (2011), 'Germany's auto industry: driver and beneficiary of globalization', Research Report 10 February.
- European Automobile Manufacturers' Association (ACEA), www.acea.be.
- Haug, David, Annabelle Mourougane and Olivier Chatal (2010), 'The Automobile Industry in and Beyond the Crisis', Economics Department Working Papers No. 745, OECD.
- International Organization of Motor Vehicle Manufacturers (OICA), www.oica.net.
- Russo, Bill, Edward Tse, Tao Ke and Bill Peng (2010), *The Eight Overarching China Automotive Trends That Are Revolutionizing the Auto Industry*, booz&co.
- Kuboniwa, Masaaki (2009), *Present and Future problems of development of the Russian Auto-industry*, Russian Research Center, The Institute of Economic Research, Hitotsubashi University, Japan.
- Sturgeon, Timothy, Johannes Van Biesebroeck and Gary Gereffi (2008), *Value Chains, Networks and Clusters: reframing the Global Automotive Industry*, Massachusetts Institute of Technology Working Paper Series.
- Chapter 4: The Pharmaceutical Industry**
- European Commission (2009), 'Competition in the Pharmaceutical Sector', Final Report.
- European Federation of Pharmaceutical Industries and Associations, <http://www.efpia.eu>.
- Financial Times* (2012), 'Machine to read individual's DNA for \$1,000', 10 January.
- IMS Health (2010), 'Pharmerging Shake-up: New Imperatives in a Redefined World'.
- OECD (2011), 'Trade and Innovation: Pharmaceuticals', Trade Policy Working Paper No. 113, March.
- Pharmaceutical Research and Manufacturers of America, <http://www.phrma.org>.
- PricewaterhouseCoopers (2008), 'Pharma 2020: Virtual R&D'.
- Scrip Pharmaceutical Intelligence Services, www.scripintelligence.com.
- US Food and Drug Administration, <http://www.fda.gov>.
- Chapter 5: The Retail Industry**
- Alch, Mark L. (2000), 'The echo-boom generation: a growing force in American society', *The Futurist*, Vol. 34, No. 5, September.
- Benson-Armer, Richard, Peter Czerepak and Tim Koller (2010), 'The Commodity Crunch in Consumer Packaged Goods', *McKinsey Quarterly*, December.
- Branson, William H. (1972), *Macroeconomic Theory and Policy* (New York: Harper International).

- Deloitte (2011), 'The Multi-channel Opportunity' Consumer Survey Findings, February, http://www.deloitte.com/view/en_GB/uk/industries/consumer-business/retail/5ef899d5e544f210VgnVCM200001b56f00aRCRD.htm.
- European Commission (2009), 'Road Freight Transport Vademecum', DG for Energy and Transport, March.
- Eurostat (2009), 'European Business, Facts and Figures'.
- Findlay, Anne and Leigh Sparks (2006), 'Retail Planning and Food Retailing Competition Issues', Institute for Retail Studies, University of Stirling, Briefing Paper, 5 October.
- Forrester Research & Internetworldstats.com, June 2010 Forum for the Future, 'PepsiCo 2030 scenarios', <http://www.forumforthefuture.org/project/pepsico-global-scenarios-and-strategy-2030/overview>.
- Hale, Todd (2010), 'Mining the US Generation Gaps', Nielsen, 4 March.
- International Energy Agency (2006), *World Energy Outlook*.
- International Energy Agency (2010), 'Energy Subsidies: Getting the Prices Right', 7 June.
- IEA, OPEC, OECD, World Bank (2010), 'Analysis of the Scope of Energy Subsidies and Suggestion for the G-20 Initiative', Joint report prepared for submission to the G20 Summit Meeting Toronto (Canada), 26–27 June.
- IMAP (2010), 'Retail Industry Global Report, "No Off the Shelf Solutions"'
- IMF (2011), 'Primary Commodity Prices', IMF database. <http://www.imf.org/external/pubs/ft/weo/2012/02/weodata/weoselser.aspx?a=1&c=001&t=1>.
- KPMG & Knight Frank (2010), 'Retail Property: Investment Trends and Opportunities in China', May.
- Madden, Peter (2007), 'Scenarios for the Future of UK Retail and Sustainable Development', Forum for the Future.
- Market Wire (2004), 'Generational Buying Behaviours Examines Shopping Habits of Gen X'ers, Boomers, and Matures', December.
- Morrison, Ewan, (2010), 'Why Y Matters (Mapping the Coming Consumption Patterns of Generation Y)', <http://bellacaledonia.org.uk/2010/11/16/why-y-matters-mapping-the-coming-consumption-patterns-of-generation-y/>.
- Overman, Henry (2011), 'Big Ideas: Economic Geography', Centre for Economic Performance, Paper No. CEPCP331, March.
- Paulin, Geoffrey (2008), 'Expenditure Patterns of Young Single Adults: Two Recent Generations Compared', *Monthly Labour Review*, December.
- Paulin, Geoffrey and Brian Riordon (1998), 'Making it on their own: the baby boom meets Generation X', *Monthly Labour Review*, February.
- PwC, TNS Retail Forward (2007), 'Retailing 2015, New Frontier'.
- PwC (2008), 'Global Sourcing: Shifting Strategies'.
- Carl Steidtmann (2004), 'Synchronicity: An Emerging Vision of the Retail Future', Deloitte Research Consumer Business Brief.
- TLE Strategy: Authors' research based on outputs from proprietary models – Globegro®, ChannelGro® Model and Retail Curves Model 2007.
- UK Department of Trade and Industry, Retail Strategy Group (2004), 'The Retail Development Process and Land Assembly: Volume 1 – Report', February.
- UN Department of Economic and Social Affairs, Population Division (2009), *World Population Prospects: The 2008 Revision*, CD-ROM Edition.
- UN National Accounts online database (2010), 'Share of GDP by Activity'.

Chapter 6: Conclusions and Recommendations

- Coutts, Ken and Robert Rowthorn (2009), 'Prospects for the UK Balance of Payments', Centre for Business Research, University of Cambridge, Working Paper No. 394.
- IMF (2012), *World Economic Outlook: Update*, 24 January.
- OECD (2009), *The Bioeconomy to 2030: Designing a Policy Agenda*, <http://www.oecd.org/futures/long-termtechnologicalsocietalchallenges/thebioeconomyto2030designingapolicyagenda.htm>.
- OECD (2012), *Environmental Outlook to 2050*.
- Oxford Economics (2010), Examining Sectoral Growth in the UK.
- The Economist* (2008), 'The Battle of Smoot-Hawley', 18 December.
- UNIDO (2009), *Structural Change in the World Economy: Main Features and Trends*.
- UNIDO (2011), *World Manufacturing Production, Quarters 1–3*.



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