Wheels of Fortune?
A Guide to the Global Auto Industry for Equity Investors

Lift the hood of a Ford Fiesta, and you will find that under the plastic covers, the basic mechanics of the car’s internal combustion engine have changed little since the company rolled out its Model T in 1908. Yet the contemporary Ford passenger car also includes many innovations, from high-tech braking systems to parking sensors to rain-sensitive wipers, and a futuristic design that looks more like a spacecraft than a horseless carriage.

Similarly, the global auto industry today represents a combination of the old and the new. This paper seeks to explain the interaction between these forces, first by analyzing the political protectionism, manufacturing overcapacity and intense competition that have been industry features for decades. These trends will then be placed in the context of 21st-century challenges, such as potential new competitors, emerging-market growth and the development of alternative drivetrains.

We show how understanding these trends is crucial for investors seeking opportunities in an industry where earnings are highly cyclical and returns decline over time (Display below). Key research questions include the likely impact (continued)

SUMMARY
Political interference, fierce competition and rapid technological change all present significant challenges for investing in the auto industry. But we believe that research into the dynamics of the auto industry can provide a broad contextual framework for understanding the forces shaping auto markets and manufacturers, which can be combined with a disciplined investing process to yield rewarding equity opportunities.
of strategic industry trends on the earnings of automakers and parts companies, as well as shorter-term factors such as the outlook for vehicle demand. How many cars people buy is a major driver of earnings and stock prices, and when car sales fall precipitately, as they did in 2009 (Display 1), investors need to develop a view of the likely scale and timing of a recovery.

At Bernstein, experience has taught us that economic disruption often presents opportunities, and understanding the interaction between the old and new forces in the global auto industry can yield insight into exploiting these as well as avoiding traps.

Political Favoritism: Blessing or Curse?
Any assessment of the auto industry’s investment profile must begin far from the markets—with politics. In many countries, the auto business has long been a favorite of politicians, for good reasons. Carmakers employ many people in well-paid jobs and produce visible, even charismatic, products. The industry has historically enjoyed a gratifying aura of progress and high technology, although this has faded in recent years as cars have become a more mature consumer good.

In developing economies such as China, the auto industry enjoys the status of a “strategic” industry, attracting a preferential supply of capital and the benefit of protectionist policies. This, however, can often be a double-edged sword. Political influence has often had a negative impact on the auto industry by prompting overinvestment and preventing job cuts, thereby hampering crucial restructuring.

Uncompetitive carmakers have not been allowed to fail in most countries. In the US, Chrysler was bailed out by the federal government in 1979. Three decades later, the government stepped in again to help Chrysler and GM through the bankruptcy process in 2009.

In Europe, the situation is even more political: In the UK, automakers such as Rover have been allowed to fail; but in Continental Europe, weaker automakers have generally been acquired by their domestic competitors to form a small group of national champions. Examples include Audi in 1964, Citroën in 1976 and Alfa Romeo in 1986.

It’s little surprise that no European automakers have come close to bankruptcy during the current economic slowdown, even as vehicle sales in the developed markets of Europe and North America tumbled, prompting a profitability slump (Display 2). South Korean manufacturers, however, remained profitable due to a resilient home market and their exposure to emerging Asia.

Many companies have benefited from government support, directly in the shape of loans and indirectly as a result of
scrappage schemes intended to boost demand, which helped prevent European sales from falling as far as in the US during the recent crisis. Potential support by the German government for GM’s European subsidiary Opel continues the industry tradition of political interference.

The political dimension, combined with the influence of labor unions in most automakers, also makes it more difficult for auto companies in developed markets to compete on cost with newer entrants. Indeed, in the US, the unionized workforces of the domestic Detroit-based industry acquired preferential pay and benefits over time, resulting in much higher hourly labor costs than workers receive in US-based auto plants of Japanese manufacturers (Display 3).

Continued competitive pressure and the bankruptcy of GM have reduced these wage costs to the level of the older Japanese transplants, but both Detroit and Toyota have legacy workforces that are not cost-competitive against the newest South Korean-owned US plants. The pattern in Europe is similar: unionized labor forces at incumbent automakers are typically not competitive with newer plants, and while the overall cost base has benefited from additional capacity in lower-cost areas such as eastern Europe and Turkey, the progress in reducing capacity in legacy plants has been slow to nonexistent.

### Overcapacity and Inefficiency

Political interference often leads automakers to build too much capacity and shun restructuring. Politicians are loath to see heavy job losses, auto plants tend to be located in areas where they are one of the few major employers in town, and there’s always a multiplier effect on local employment. Closing an auto plant sometimes has a devastating impact on an entire region. For example, in 2009, plant shutdowns in GM’s former heartland north of Detroit inflicted one of the highest unemployment rates recorded in any US metropolitan area during the recession.

But politics is not the only reason for these inefficiencies. Overcapacity is also linked to the historical dominance of the manufacturing function within the corporate hierarchy. And then, there is the eternal and mostly misplaced optimism of marketing folk concerning sales of a new model. For whatever reasons, capacity utilization remains persistently low, especially in developed markets (Display 4).

In any industry, overcapacity usually depresses profitability, since it shifts the balance of pricing in favor of the consumer. Moreover, there is a particularly powerful temptation to sell another car at a discounted price to generate some contribution toward the heavy burden of fixed costs required to manufacture the vehicles. In recent years, consumers have gained even more

---

As of December 31, 2009
* $1.5 per euro
† Big 3 = Chrysler, Ford and GM
Source: Barclays Capital

---
Internet Overturns Information Asymmetry for Car Buyers

For many people, a car is more than a means of transport; it’s an expression of identity and lifestyle. But the process of buying a car is almost universally loathed: most consumers have tales to tell of predatory salespeople, shoddy after-sales service and a pervasive feeling of being ripped off. Today, the automotive retailing landscape is changing rapidly, as the Internet makes it easier for customers to shop and compare products, as in so many other retail businesses.

The Demise of the Small Dealer

Almost all carmakers sell their wares through an independent network of franchised dealers: a single-branded outlet that sells and finances new and used vehicles, as well as servicing them and selling spare parts. Before the advent of intense cross-border competition, this was a highly profitable business, especially decades ago, when cars were chronically unreliable and dealers earned money from repairing them under warranty. Yet dealer profitability has been under pressure for decades, and their numbers are falling steadily, with increasingly heavy investment in real estate and facilities squeezing out smaller mom-and-pop stores.

Some brands, such as Mercedes, even have a policy of bringing dealers in-house: Mercedes argues that its company-owned outlets outperform its franchises, and it sees no reason not to move toward a wholly company-owned network. Certainly the trend toward larger, out-of-town facilities favors investors with deep pockets: for this reason there has been a corresponding trend toward larger companies owning a variety of automotive retail franchises, such as Inchcape, a UK-based publicly traded company.

But what’s really squeezing profitability for dealers? Our research suggests that the main factor is the erosion of the information asymmetry, in which the retailer knows more about the product, its features, quality and price than the consumer. This asymmetry has long been a subject of academic inquiry, most famously in George Akerlof’s 1970 paper about used cars, “The Market for Lemons.”

More recent research has focused on the Internet, which helps consumers level the playing field by researching their prospective purchase online. All auto manufacturers have extensive websites, many with a so-called configurator allowing consumers to build a “dream car” in a virtual environment. Along with other resources, such as reliability surveys by consumer groups, buyers are better prepared than ever for a showdown with a shark-like salesman.

In addition, web-based new-car buying services such as Autonation.com in the US and New-car-discount.com in the UK allow more consumers to enjoy discounts that manufacturers typically offer to fleet buyers. These services aggregate consumer orders to boost their buying power, which translates into lower prices—and lower margins for dealers.

We expect the trend toward improved information to spread to all parts of automotive retailing, including vehicle servicing. Some auto retailers already know that they can no longer profit from the information asymmetry and are competing instead on service quality. Perhaps, it is just a matter of time before car buyers get a retail experience to match their love of the product.
coming on stream in 2011. In short, we believe that overcapacity in the US marketplace is likely to prove as chronic in the next decade as it has been historically.

**Consumers Benefit from Intense Competition**
The increasing presence of international carmakers in both the US and Europe is the latest sign of intense competition in the auto industry. Although many automakers have strong positions with loyal consumers in their home markets, there’s usually at least one scrappy competitor challenging the status quo in most segments. This role has most often been played by Japanese automakers, who chalked up major market-share successes in both the US and Europe during the 1980s and 1990s, and more recently by the South Korean Hyundai/Kia group.

To some extent, the global ambitions of both Japanese and South Korean competitors have benefited from a protected home market—foreign auto brands have a market share of just 5% in Japan and less than 30% in South Korea. European and US car buyers also prefer domestic brands, although these markets are not as skewed toward domestic manufacturers and the competitive playing field is more level. For example, the market share of non-European manufacturers in Europe exceeds 35%.

All this competition is great for consumers. Car prices have fallen in real terms, becoming cheaper relative to other consumer goods (Display 5). The number of models on sale has also increased dramatically over the past 20 years as automakers have sought to improve profitability by segmenting the market into smaller niches, catering to ever more refined consumer tastes. Consumers have more choice than ever, at lower prices than ever. Moreover, in many markets, automakers offer buyers financing, often at preferential rates aimed at increasing sales. Although the auto-finance business has been dented by the credit crisis, it’s as old as the industry itself and we expect it to bounce back.

What’s good for consumers doesn’t make life easier for investors. The combination of intense competition, a large fixed-cost base (auto plants are big and capital intensive, as is the process of researching and developing new vehicles) and cyclical swings in demand for vehicles depresses profitability. Across the industry, return on sales is a paltry 2% on average through a cycle (Display 6). Even at their most profitable, most automakers add no economic value, meaning that the return on capital is lower than their cost of capital.

**The Emergence of New Competitors?**
Despite intense competition among automakers, and in marked contrast to many other industries, the group of global competitors has changed only slowly over time. The last wave of

---

**Display 5**
**Cars and Trucks Are Getting Cheaper**

![Graph showing Real Vehicle Prices](image)


**Display 6**
**Profitability Is a Persistent Weakness**

![Graph showing Automakers Return on Sales by Competitor Group](image)

*Through December 31, 2009
*Including financing, where applicable
†US losses capped at 10%
Source: Company reports and Bernstein*
Manufacturers or Banks? The Auto Industry and Consumer Finance

For most people, buying a vehicle is the second-largest purchase they will make after buying a home. Few prospective purchasers have enough to pay cash up-front; as a consequence, the auto industry has long tried to clinch the sale by providing financing.

During the days of financial austerity preceding World War II, Germany’s Volkswagen (VW) distributed savings boxes to encourage consumers to put money aside to buy the vehicle that eventually became the Beetle (Bug). Today all automakers offer a range of financial-services products, ranging from classic consumer loans to various types of leases. It’s a highly profitable business, providing a useful boost to the meager returns from making vehicles, but there are risks involved.

The main structural benefit is that earnings from financing vehicles are less cyclical than earnings from selling vehicles, since the income stream is spread over the contract period—typically, about three years. Just as selling spare parts provides an important and relatively stable earnings stream for auto companies, earnings from financing can act as a shock absorber in recessions, when car sales plummet.

The downsides of finance are subtler. The first concerns the leasing model, widespread especially in the US, where the customer has the right to return the vehicle at the end of the contract at a prearranged price. The risk that the used car may be worth less than the agreed-upon price, or “residual value,” is known as “residual value risk.”

Carmakers often increase this risk because an optimistic assumption on residual value makes the leasing contract cheaper, as the amount to be financed depends on the difference between the purchase price and the residual value. Often, auto companies overestimate the residual value in a leasing contract to clinch a deal today, while ignoring the potential bad news tomorrow. When a used vehicle is worth less at the end of the lease than originally assumed, the loss on its sale can wipe out any profit on the leasing deal. Residual value write-offs are a major menace to finance earnings, particularly in recessions. However, the element of moral hazard has been reduced in the cases of GM, Chrysler and Fiat, since these manufacturers have sold controlling stakes in their finance units to third parties.

Getting to Grips with Gearing

Auto financing also affects company indebtedness (gearing). The finance operations of carmakers are essentially banks and have much higher borrowing levels than their industrial parents. Since auto loans are relatively low risk and easily packaged, automakers are among the biggest borrowers in the securitized-debt market.

However, when consolidated for the group, finance-company debt makes carmakers look much more highly leveraged than most industrial companies. Understanding the structure of an auto-company balance sheet therefore requires a separate analysis of the finance company (Display). These risks escalate during recessions: indeed, when debt markets froze in the recent financial crisis, many investors mistakenly feared that auto companies would be unable to refinance their debt. Assessing the leverage of automakers is a tricky task that investors must be aware of when evaluating potential opportunities.

Display

<table>
<thead>
<tr>
<th>Finance Unit</th>
<th>% of Total (2008)</th>
<th>Debt</th>
<th>Earnings</th>
<th>Effect of Finance Arm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toyota</td>
<td>96</td>
<td>4</td>
<td></td>
<td>Least dependent on financing</td>
</tr>
<tr>
<td>BMW</td>
<td>92</td>
<td>(23)</td>
<td></td>
<td>Loss due to bad debts</td>
</tr>
<tr>
<td>VW</td>
<td>91</td>
<td>14</td>
<td></td>
<td>Low due to strong auto profitability</td>
</tr>
<tr>
<td>Honda</td>
<td>85</td>
<td>43</td>
<td></td>
<td>Absorbs shock of depressed earnings</td>
</tr>
<tr>
<td>Ford</td>
<td>83</td>
<td>21</td>
<td></td>
<td>Finance loss = 21% of total loss</td>
</tr>
<tr>
<td>Nissan</td>
<td>80</td>
<td>&gt;100</td>
<td></td>
<td>Partial offset of auto loss</td>
</tr>
<tr>
<td>Peugeot</td>
<td>78</td>
<td>&gt;100</td>
<td></td>
<td>Partial offset of auto loss</td>
</tr>
<tr>
<td>Daimler</td>
<td>66</td>
<td>25</td>
<td></td>
<td>Absorbs shock of depressed earnings</td>
</tr>
<tr>
<td>Renault</td>
<td>56</td>
<td>&gt;100</td>
<td></td>
<td>Offsets auto loss</td>
</tr>
</tbody>
</table>

Source: Company reports and Bernstein
national consolidation took place in the 1970s and 1980s, and leaving aside such charismatic but economically insignificant players as Jaguar and Porsche, Chrysler is the only major carmaker to have changed in ownership over the past 20 years. And while the elite group of global carmakers has changed somewhat over the years, most notably with the emergence of Toyota as global leader, the only significant new entrant over the past 20 years has been South Korea’s Hyundai/Kia (Display 7).

Perhaps this explains why the auto industry has a reputation for conservatism and slowness to adapt to consumer and technological trends, attracting its fair share of visionaries over the years seeking to reinvent the auto business.

**Barriers to Entry Are Formidable**

We would argue that the relative stability of competitive dynamics is a product of political interference discussed earlier, as well as the formidable economic barriers to entry in the industry. The most significant barriers, in our view, are in distribution and research and development and, to a lesser extent, in some aspects of manufacturing.

Most automakers distribute their products through a dedicated network of dealers selling new and used vehicles, and offering servicing, spare parts and financing. Building such a network from scratch is a daunting undertaking. It took Japanese and South Korean manufacturers about 20 years to achieve a significant presence in Europe and the US (for example, Hyundai started in the US in 1986).

Similarly, the investment in research and development (R&D) is substantial. Most automakers spend about 6% of turnover on R&D, and building engineering expertise is a similarly long game. Finally, while some parts of auto manufacturing are relatively simple assembly of parts received from suppliers, both construction of the steel body shell and the manufacture of engines and transmissions are highly capital-intensive, requiring any aspirant entrant to have very deep pockets.

**Global Advantages**

We believe that these barriers to entry make the near-term emergence of new global competitors unlikely, even from China and India. Although automakers in these countries have some big cost advantages due to the availability of cheap assembly labor, they still need to build distribution and engineering capabilities from scratch. Of course, China’s lax attitude toward intellectual property rights has allowed its domestic manufacturers to plagiarize vehicle designs for domestic sale, but any attempt to export a vehicle containing significant intellectual property from a major global manufacturer is likely to attract a blizzard of lawsuits. So far, attempts by indigenous Chinese manufacturers to sell their existing designs in developed markets have fallen foul of safety and emissions legislation, and despite attractive prices, the vehicles involved are simply not competitive with existing offerings in these markets.

In addition, existing global competitors have themselves started to manufacture in low-cost regions. For example, Suzuki’s small cars are now manufactured in India, and the new generation of Nissan’s Micra will be manufactured in India, China and Thailand. So, even though emerging markets in Asia are posing a big competitive threat to many industries in developed markets, the auto industry is a different story. Carmakers from

---

Display 7

**The Usual Suspects: Auto Superpowers Are Hard to Dislodge**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Toyota</td>
<td>10%</td>
<td>3</td>
<td>11%</td>
<td>4</td>
<td>13%</td>
<td>1</td>
</tr>
<tr>
<td>GM</td>
<td>14</td>
<td>1</td>
<td>15</td>
<td>1</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Renault/Nissan</td>
<td>—</td>
<td>—</td>
<td>10</td>
<td>5</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Volkswagen</td>
<td>6</td>
<td>4</td>
<td>9</td>
<td>6</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Hyundai/Kia</td>
<td>3</td>
<td>—</td>
<td>4</td>
<td>—</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Ford</td>
<td>14</td>
<td>2</td>
<td>14</td>
<td>2</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>DaimlerChrysler</td>
<td>—</td>
<td>—</td>
<td>11</td>
<td>3</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Nissan*</td>
<td>6</td>
<td>5</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Fiat</td>
<td>5</td>
<td>6</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

*As of December 31, 2009

*Included in Renault/Nissan for 2001 and 2011E

Source: Company reports and Bernstein

---

1More “D” than “R.” In the automotive world, most of the manufacturer’s effort is devoted to development and detail engineering of vehicles, while much of the genuine research and innovation is, in fact, done by suppliers.
Ingenuity, Integration and the Pursuit of Profitable Manufacturing

At the dawn of the automotive age, the very first vehicle manufacturers were small-scale craftsmen. They quickly became extinct as the auto industry developed into a pioneer of industrial mass production, establishing large-scale manufacturing as a major driver of industry economics.

Henry Ford revolutionized the industry with the Model T, showing how the cost and retail price of a vehicle could drop by more than half through increased production volume and streamlined methods. High levels of vertical integration were also a feature of the auto business in the years before World War II, and Ford’s vast Rouge complex in Detroit turned iron ore into vehicles and was a widely admired model. With similar scale and integration, plus a complex multidivisional structure, General Motors became the archetype of the modern industrial company and the subject for one of the first classic management books: Peter Drucker’s 1945 study Concept of the Corporation.

After World War II, European automakers followed their US rivals and developed large-scale, highly integrated models. Only in Japan was this model challenged: Lacking financial and technical resources, Japanese manufacturers—especially Toyota—pioneered an alternative approach. They outsourced much of the car to a network of supplier partners that delivered components just in time, with minimal inventory. This “lean manufacturing” model, combined with a relentless focus on quality and continuous improvement, resulted in more reliable vehicles at lower cost. It was an unbeatable concept, and all global manufacturers have been forced to try to adopt it in order to compete.

Today, auto companies are much less integrated than in the past. Gross margins of 30% or lower mean that at least 70% of the cost of a vehicle is purchased material and components. Parts suppliers have become essential, tightly integrated partners and are appealing for investors as well. Although some types of components, such as interior trim moldings with wafer-thin margins, suppliers who combine

Display
Size Still Matters, but Smaller Manufacturers Can Have Big Success

Global Automakers by Production Volume (2011E)

![Graph showing global automakers by production volume](image)

As of December 31, 2009
Source: JD Power
efficiency with strong technical skills in particular product niches can offer very attractive returns.

Indeed, parts companies have been at the forefront of technical progress, with innovations such as fuel injection, electronic engine controls and airbags. They are structurally better positioned to enjoy returns from new technology than a single carmaker, since a parts supplier with an exciting new invention can potentially sell it to all industry players.

What about scale? The failure of industry giant General Motors in 2009 proves that size alone does not guarantee success. Moreover, recalls of Toyota models in early 2010 highlight the logistical and communications challenges facing large companies as they deal with global quality issues. Our research also indicates that manufacturing scale is becoming less compelling as technical innovations and outsourcing reduce the dependence of huge auto facilities on massive machines such as house-size steel presses and robotized welding lines as large as football fields.

Yet size still matters. The largest automotive firms all make millions of units annually (Display), and it’s no coincidence that the smaller players—Jaguar, Porsche, Volvo, and even Chrysler and Mazda—have all been acquired by larger names or are involved with them through partnerships.

In our view, research and development is probably the biggest driver of scale in today’s auto industry. Consumer demand for an ever-wider range of new vehicles and daunting government regulations on safety and emissions are costly and unaffordable if development expense is spread over a small production volume. Fiat CEO Sergio Marchionne maintains that a carmaker competing in all segments needs a minimum volume of 5.5 million units to survive. But the continued success of companies such as Daimler and BMW indicates that it’s entirely possible to prosper at a more modest scale of between one and two million units a year. ■

Emerging markets in Asia will face an uphill struggle if incumbents are already capitalizing on at least part of their cost advantage, and they lack global distribution as well as globally competitive products. Of course, it is still possible that a strong globally competitive Chinese or Indian carmaker will eventually emerge, but it will be a long haul against considerable odds.

In our view, the barriers to entry in the auto business also mitigate against the emergence of a new competitor with genuinely disruptive technology, by tilting the playing field in favor of incumbents and increasing the probability that anyone with any good ideas will simply be bought out by a big established player. The emergence of electric carmaker Tesla Motors, the most likely recent candidate for the role of disruptive competitor, is a case in point: Daimler of Germany recently bought a 10% stake, as it is interested in the company’s battery-pack technology. And Tesla has discovered that even potentially disruptive technology still requires proven skills in vehicle design and manufacture—its first vehicle is, in fact, a modification of a Lotus design.

**Growth in Emerging Markets**

While the competitive dynamics of the auto industry remain rather static, big changes are being driven by consumers. Growth in emerging markets from Asia to Latin America is creating entire new classes of potential customers who would never previously have been able to afford a car.

There’s a well-established correlation between wealth and auto consumption. Once consumers have a roof over their heads, a refrigerator and a television, the next big-ticket item they want is usually a car. This trend is illustrated by plotting economic growth against car sales, which shows that car sales in an economy usually take off once a GDP per capita of about $5,000 is reached (Display 8, next page). Rates of automotive growth also depend crucially on the availability of infrastructure—there’s not much use having a car if there are no roads—but even given the challenges faced by emerging economies in this regard, growth in these regions cannot be ignored by auto manufacturers.

---

2 *The Economist* (May 7, 2009)

3 This is similar to competitive dynamics in the global pharmaceutical industry, where smaller start-ups with good ideas are often bought by incumbents whose research is relatively unproductive but who have skills in getting new drugs through regulatory hurdles as well as established distribution networks.
In fact, over the past 10 years, growth in the emerging markets has accounted for substantially all the increase in global vehicle sales, with the developed markets of US, Europe and Japan declining (Display 9).

So should investors get excited about the prospects for emerging-market growth in autos? The volume opportunity is there, but our research suggests that, true to its historical form, the auto industry has already thrown too much capital at it.

**China: A Tough Market to Crack**

China is perhaps the largest near-term opportunity, but the competitive landscape is complicated by the fact that the Chinese government requires foreign competitors to enter joint ventures with local partners as a price of market access. Notwithstanding this requirement, all the major global competitors are present in the market, and some have been so for a long time—Volkswagen’s involvement in China dates to 1978. All are keen to have a slice of the pie, and we expect continued energetic competition for market share.

Brutal price competition in China is being driven by the usual global suspects as well as domestic carmakers. Many of these have connections to local joint-venture partners, and many have vehicle designs closely copied from global players.

And, of course, there is a political dimension. The Beijing government has decreed the auto industry to be “strategic,” and many of the local auto firms are allied with regional governments pushing their own development agendas. Local players have proved to be aggressive competitors, often more concerned with building market share than with profitability.

Margins are also getting squeezed in China and other emerging markets by consumers. When people buy cars for the first time, they tend to prefer smaller models, which are more than adequate for a driver upgrading from a motor scooter or bicycle. However, small cars are much less profitable than larger models, as we note below. Indian manufacturer Tata Motors’ Nano car is a case in point: an impressive low-cost concept that’s already selling like hot cakes, but at a starting price of just over $2,000, it’s likely to require very high sales volumes in order to break even.4

Though China dominates the headlines, the factors driving industry returns in other emerging markets are very similar. In our view, the persistent pattern of intense competition and low

---

4 The Nano is not, in fact, as cheap as its starting price would suggest: the bulk of sales volume is expected to be in models costing about $4,000 or more. It’s important to remember that it can’t be sold in developed markets in its current form, since it would not comply with safety and emissions regulations. In addition, it’s not clear how attractive the Nano would be to consumers, since it would be much worse than existing cars in terms of comfort and performance.
profitability that is familiar from the auto industry in developed markets is likely to be repeated in newer ones.

Alternative Powertrains Take On Gasoline

Alongside the emergence of new consumer groups, the global auto industry is facing pressure for change in the technology that it uses to move its vehicles. The dawn of the motor car in the early 20th century saw much interesting experimentation with methods of propulsion, including steam and electric cars, but none of these concepts ever took off. For a century, the internal combustion engine, whether spark or compression ignition (i.e., gasoline or diesel), has dominated the auto industry.

Today this dominance is under threat. The twin specters of more expensive oil and global warming have prompted auto companies to experiment with alternatives, but there are few serious contenders on the horizon. Hybrid concepts, with a combination of electricity and internal combustion, are the most familiar on the streets, while progress is being made on “simple” battery electric power. Most futuristic of all is the fuel cell, which reacts hydrogen and oxygen to produce electric power.

Each of these approaches has strengths and weaknesses when compared with the dominant gasoline or diesel internal combustion engine (Display 10). Hybrids offer better fuel economy than conventional gasoline and have proved a consumer hit for Toyota, quality woes notwithstanding. Indeed, the success of its Prius vehicle prompted previously skeptical competitors to catch up by developing their own hybrid concepts.

Display 10
Automotive Powertrain Technologies Compared

<table>
<thead>
<tr>
<th>The Incumbent</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Combustion</td>
<td>Range (very high fuel energy density)</td>
<td>Carbon emissions</td>
</tr>
<tr>
<td>(Gasoline)</td>
<td>Cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Existing fuel infrastructure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attracts more R&amp;D spending than alternatives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Significant development potential remains</td>
<td></td>
</tr>
</tbody>
</table>

| The Alternatives       | As gasoline plus:                               | As gasoline plus:            |
| Internal Combustion    | Better fuel economy                             | NOx emissions (more emissions hardware) | |
| (Diesel)               | Lower carbon emissions                          | Higher manufacturing cost    | |

| Hybrid                  | Better fuel consumption in urban driving        | No potential to eliminate carbon emissions |
| (Gasoline/Electric or   | Lower carbon emissions                          | Full-cycle fuel economy no better than diesel |
| Diesel/Electric)        | Development potential (still a relatively new technology) | Cost (effectively two parallel powertrains) |
|                        |                                                  | Complexity, bulk, weight       |

| Hydrogen Fuel Cell      | Potentially carbon-neutral*                      | Very high cost                |
|                        | Development potential (still a relatively new technology) | Fuel production and compression consume significant energy |
|                        |                                                  | Requires new fuel infrastructure |

| Battery Electric        | Potentially carbon-neutral*                      | Range, charging time          |
|                        | Development potential (still a relatively new technology) | Cost, weight and longevity of battery |
|                        |                                                  | Requires new charging infrastructure |

* Depending on how the hydrogen or electricity is produced
Source: Bernstein
By the way, so-called plug-in hybrids are essentially electric vehicles with a small gasoline engine as a safety blanket: since their performance in gasoline-only mode leaves a lot to be desired, and the weight of the back-up engine reduces the range in electric mode, we suspect that they’re likely to remain a small niche.

**Hybrids, Hydrogen or Hype?**

Despite the increasing popularity of hybrids, we doubt that this technology represents the future of the auto industry, for several reasons. First, the fuel-economy benefit of hybrid vehicles is no better than a comparable diesel vehicle. Second, hybrids do not offer a plausible path to the holy grail of new vehicle technology—zero or near-zero carbon emissions. Third, they suffer from the inherent weight and complexity of what are, in essence, two parallel powertrains.

Experience helps overcome some of these challenges, and the application of Toyota's legendary production engineering is capable of reducing costs further. Nevertheless, our analysis indicates that a hybrid is still significantly more expensive than a conventional powertrain, which reduces its profitability and allure for manufacturers, and explains why most companies have been reluctant to follow Toyota's lead. In our view, hybrids are likely to be most successful in markets that have not historically promoted diesel, and they are a transitional technology that will pave the way to the eventual adoption of battery electric vehicles.

Fuel cells face even bigger challenges than hybrids. The auto industry has spent more than a decade trying to adapt the space-age fuel-cell technology for cars, with few results to match the promises of the early innovators. There are two unresolved problems: First, although the prototypes work just fine, the fuel cells remain extremely expensive to manufacture. Second, it remains unclear just where to get hydrogen for a widespread hydrogen economy. Although hydrogen is a very common element, most of it is engaged in stable relationships with other elements, forming molecules such as water. The most obvious way of creating pure hydrogen, by electrolyzing water, requires large amounts of electrical power.

Even if hydrogen can be sourced, the costs of building a hydrogen infrastructure are enormous, the gas must be heavily compressed (using more energy) to make it practical as a fuel, and its flammability gives rise to safety concerns. Automakers such as Honda, with its impressive FCX concept, continue to work on the technology, but we think that the high associated costs will thwart the widespread adoption of fuel-cell technology in vehicles.

In our view, the most exciting technology for potentially zero-emission personal transport is the electric car. Most of an electric vehicle is straightforward to engineer, as both the vehicle itself and electric propulsion are very mature technologies. The key to success is the power source: the battery. Improvements in battery technology—notably, lithium ion cells, best known today for their application in portable consumer devices such as phones and MP3 players—are gradually leading to electric vehicles that are practical for everyday use.

**Building a Better Battery**

The limitations of conventional batteries help explain why the use of gasoline to power vehicles was a practical development and not a historical accident. Gasoline simply packs much more “bang” than any other fuel, when comparing the energy density of various fuels and batteries (Display 11).

Display 11

**Chocolate or Batteries? The Energy Density Conundrum**

![Energy Density Chart](source: Bosch and Bernstein)
Energy density is the amount of energy contained in a given weight and volume. Batteries, even state-of-the-art lithium ion ones, are much less convincing than gasoline—with lower energy density than a chocolate bar, the range of a battery-powered vehicle is extremely limited.

This is the key challenge for battery electric vehicles, yet the latest version of the Tesla electric roadster, a car that is on the market today, though very expensive at $100,000+, claims a range of 244 miles. In practice, the actual range depends on driving style, speed and ambient temperature, as well as the number of hills on a given route. Lower-priced vehicle concepts expect to have a range of about 100 miles, which appears marketable given that the average daily distance driven, even in the relatively sparsely populated US, is less than 50 miles.

The other issue with battery electric is the recharge time. Unlike an internal combustion vehicle, whose fuel tank can be rapidly refilled, battery electric has recharge times of between three and eight hours. The faster end of this range requires special technology, while most electric vehicles can be fully recharged overnight, using a normal domestic power connection.

One solution to this problem is to make the battery pack replaceable, and at least one company is now seeking to build a business on this idea. In our view, it is more likely that consumers will learn to live with this aspect of electric car performance—for example, by adopting an overnight charging routine, especially since the electricity for charging an electric car will cost pennies, a surprisingly cheap advantage for adopting a "green" technology.

Given the limitations of electric vehicles, we expect them to be used primarily as urban transport or for short-distance daily commuting. In the first instance, they may become a household’s second or third vehicle, supplementing a more conventional car with a longer range. Nonetheless, as the technology improves—in particular, regarding the cost and energy density of batteries—we expect strong growth as electric cars get ever closer to the functional benchmarks set by today’s conventional vehicles. The Tesla sports car proves that electric cars can also be fun to drive, with rapid acceleration and sporty characteristics, and automakers are certain to design different versions to appeal to different consumer groups.

Electric cars are not the only alternative engine in the works. With minimal technical modifications, internal combustion engines can be run on fuels other than gasoline or diesel, and alternatives such as “biodiesel” are potentially carbon-neutral and well publicized. However, these fuels all suffer from high cost (though they are subsidized in some markets), and it is unlikely to be feasible to produce them in sufficient volume to satisfy global auto demand.

The Trend Toward Smaller Cars
The quest for environmentally sustainable motoring has also prompted a backlash against one of the auto industry’s great successes of recent years: the sports utility vehicle (SUV). Originally designed as a large robust utilitarian vehicle with all-wheel drive for off-road and rural use, the SUV has subsequently morphed into a luxury vehicle for well-heeled (sub)urbanites who seldom, if ever, venture off paved roads. It’s been a success because consumers like the style, the high driving position and the image and because it’s extremely profitable. We estimate that SUVs generate margins of more than 40% for manufacturers, compared with just 10% for a comparable small car. And although automakers sell the largest numbers of SUVs in the US, the category has been growing strongly in Europe and the emerging world and spawning a number of variations—notably, smaller ones.

The profitability disparity matters for the industry, especially as consumers appear to be shifting away from larger vehicles. The SUV has always been a target for environmental campaigners, but recent oil-price swings, the declining social acceptance of

---

6 The Tesla also illustrates another key challenge facing electric vehicles: Though the car itself is a lightweight composite structure (based on the Lotus Elise), its battery pack weighs about 50 kg—as much as three hefty passengers—and accounts for nearly half the mass of the entire vehicle. More energy is needed to move the car, and the massive battery also adversely affects the vehicle’s driving characteristics.

7 This concept is being promoted by Better Place, a venture-capital-backed firm founded by Shai Agassi with Renault as a partner. While this is an admirable idea, it requires a high level of standardization across vehicle manufacturers, which is likely to prove a significant challenge in practice. The size, shape and position of the battery is a key variable in electric car design, and we suspect that carmakers will be unwilling to accept a “one size fits all” solution.

8 For good analysis of this and other important energy issues, we highly recommend Sustainable Energy without the Hot Air, by David J. C. MacKay, professor of physics at Cambridge University, available as a free download from www.withouthotair.com.
thirsty vehicles due to global warming and the recession’s effect on consumer spending are undermining the popularity of big cars (Display 12).

It’s still unclear how much of the trend is genuinely secular and how much is driven by temporary factors associated with the global economic downturn. We do know, however, that consumer tastes in vehicles are slow to change, and national preferences—Americans in pickup trucks, Germans in Mercedes, and the French in small diesel cars—are surprisingly durable. In our view, the trend toward small cars in developed markets is likely to stall as the global economy recovers, and we expect a corresponding recovery in larger and premium-priced vehicles.

We’d also caution against the view that the recent shift to smaller cars necessarily sounds a death knell for the superior margins earned historically by premium-branded manufacturers such as BMW, Mercedes, Volkswagen’s Audi and Toyota’s Lexus. All these companies have a proven ability to create and sell vehicles—large or small—on the basis of excellent design and engineering as well as perceived exclusivity. Even if the trend toward smaller cars persisted, we would expect these companies to offer an upscale option in every segment, priced at a healthy premium and with margins to match.

Display 12
Smaller Vehicles Are Gaining Popularity

<table>
<thead>
<tr>
<th>Year</th>
<th>US*</th>
<th>Europe†</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>37.9</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>65.9</td>
<td>45.0</td>
</tr>
</tbody>
</table>

*Small and midsize and small SUV as percent of total vehicle sales
†C segment (Golf size) or smaller as percent of total vehicle sales
Source: JD Power, Wards Autoinfobank

The Investment Outlook
How can an investor make sense of an industry that is simultaneously defined by trends that have held firm for decades and by a rapid change into uncharted waters? The starting point must be a thorough understanding of all aspects of the industry to develop a framework for thinking about investment opportunities. Even an investor in a long-established enterprise such as Ford must understand all the newest trends and ascertain whether they are likely to put that company’s earnings under pressure and make an investment unprofitable.

Most automotive firms, whether vehicle manufacturers or parts suppliers, are relatively mature businesses with heavy fixed costs, resulting in substantial operating leverage: in other words a relatively small change in the number of vehicles sold will have a much larger impact on earnings. Typically, the stock market tends to underestimate the likely extent of this operating leverage, both as earnings grow and as they decline. It’s therefore vitally important to understand the outlook for vehicle sales in each market: For example, our 2009 research on the US market focused on replacement demand driven by scrappage of old vehicles and on growth in the driving-age population. We concluded that these two factors alone supported an estimate of normal demand significantly higher than the prevailing bearish consensus.

Understanding trends in market share is also key, as these changes tend to be persistent, and investing in a market-share loser is seldom a happy experience. From a more tactical perspective, a new model may boost an automaker’s market share; or a new technology such as airbags may enjoy rapid global adoption and drive sales growth for a parts supplier.

Investment opportunities can also be found in companies likely to benefit from emerging trends. For example, our research on electric vehicles concluded that battery manufacturers may be poised for growth. However, there are usually high levels of uncertainty associated with such trends. In the case of batteries, it’s still not clear which technology will become widespread. Although some variation of lithium chemistry will probably prevail, the jury is still out on which technologies and companies will succeed or what future sales volumes will look like.
Indeed, history shows that the technical innovators often don’t generate the best returns for shareholders. As investors, we must therefore develop a considered perspective on all these factors and, most importantly, find an insight that is not already discounted in today’s stock price. In that sense, all active investing is contrarian—we must be convinced that we know something more than the information reflected in market prices.

The decision to invest in an automotive company will therefore be the result of rigorous analysis of key issues specific to the opportunity at hand. Nonetheless, auto-sector opportunities are often linked to the economic cycle. A recessionary decline in vehicle sales tends to result in a general collapse in earnings and sector valuations, amid evidence of balance-sheet stress. One rule of thumb is to buy auto stocks when they look ugly and unprofitable and when there are doubts about their survival. Such investments often deliver handsome returns as autos tend to outperform during periods of economic recovery (Display 13), though the correlation is far from perfect.

This pattern has also been seen in the rally of auto-company shares since global stock markets bottomed in March 2009 (Display 14). However, there were plenty of risks, too, as highlighted by the drop in Volkswagen’s stock price after a takeover by Porsche failed to materialize. It’s striking that the best performers, such as Ford, were those facing the highest risk of bankruptcy. GM, in contrast, did the worst as bankruptcy became a reality.

For this reason, a comprehensive fundamental analysis both of the industry and the individual players is required. At Bernstein, we believe that a combination of quantitative and fundamental analysis is crucial for successful stock picking in any industry. The challenge in autos is that fundamental analysis must synthesize a century of industrial history, forward-looking technological trends and global economic and consumer patterns to create a broad contextual framework for successful investment in today’s industry.

Display 13
Auto-Sector Opportunities Are Often Tied to Economic Cycle

Auto-Sector Stock Performance vs. Economic Growth

- Median GDP Growth, OECD Countries (Left Scale)
- Global Auto-Sector Relative Returns*

Past performance is no guarantee of future results.
Through September 30, 2009
*Relative returns vs. MSCI World, smoothed on a 12-month trailing basis
Source: FactSet, OECD and Bernstein

Display 14
Separating the Wheat from the Chaff

Global Automakers Price Performance 2009

Past performance is no guarantee of future results.
Through December 31, 2009
*Volkswagen’s stock peaked at over five times its January 2008 price in a short squeeze during October 2008. Note that values above 180 are not illustrated.
Source: Bloomberg
Note to All Readers:
The information contained herein reflects, as of the date hereof, the views of AllianceBernstein L.P. (or its applicable affiliate providing this publication) (“Alliance-Bernstein”) and sources believed by AllianceBernstein to be reliable. No representation or warranty is made concerning the accuracy of any data compiled herein. In addition, there can be no guarantee that any projection, forecast or opinion in these materials will be realized. Past performance is neither indicative of, nor a guarantee of, future results. The views expressed herein may change at any time subsequent to the date of issue hereof. These materials are provided for informational purposes only, and under no circumstances may any information contained herein be construed as investment advice. AllianceBernstein does not provide tax, legal or accounting advice. The information contained herein does not take into account your particular investment objectives, financial situation, or needs, and you should, in considering this material, discuss your individual circumstances with professionals in those areas before making any decisions. Any information contained herein may not be construed as any sales or marketing materials in respect of, or an offer or solicitation for the purchase or sale of, any financial instrument, product or service sponsored or provided by AllianceBernstein L.P. or any affiliate or agent thereof. References to specific securities are presented solely in the context of industry analysis and are not to be considered recommendations by AllianceBernstein. AllianceBernstein and its affiliates may have positions in, and may effect transactions in, the markets, industry sectors and companies described herein. Bernstein Global Wealth Management is a unit of AllianceBernstein L.P.

Note to Canadian Readers:
This publication has been provided by AllianceBernstein Canada, Inc., or Sanford C. Bernstein & Co., LLC, and is for general information purposes only. It should not be construed as advice as to the investing in or the buying or selling of securities, or as an activity in furtherance of a trade in securities. Neither AllianceBernstein Institutional Investments nor AllianceBernstein L.P. provides investment advice or deals in securities in Canada.

Note to UK Readers:
This document has been provided by AllianceBernstein Limited. Authorised and regulated in the UK by the Financial Services Authority. The value of investments can fall as well as rise and you may not get back the original amount invested.

Note to Japanese Institutional Readers:
This document has been provided by AllianceBernstein Japan Ltd. AllianceBernstein Japan Ltd. is a registered investment-management company (registration number: Kanto Local Financial Bureau no. 303). The firm is also a member of Japan Securities Investment Advisers Association and the Investment Trusts Association, Japan.

Note to Australian Readers:
This document has been issued by AllianceBernstein Australia Limited (ABN 53 095 022 718 and AFSL 230698). Information in this document is intended for wholesale investors only, and is not to be construed as advice.

Note to New Zealand Readers:
This document has been issued by AllianceBernstein New Zealand Limited (AK 980088). This document is not directed at members of the public. Information in this document is intended for institutional investors only, and is not to be construed as investment advice.

Note to Singapore Readers:
This document has been issued by AllianceBernstein (Singapore) Ltd. (Company Registration No. 199703364C). The Company is a holder of a Capital Markets Services Licence issued by the Monetary Authority of Singapore to conduct regulated activity in fund management.

Note to Hong Kong Readers:
This document is issued in Hong Kong by AllianceBernstein Hong Kong Limited, a licensed entity regulated by the Hong Kong Securities and Futures Commission.

©2010 AllianceBernstein L.P., 1345 Avenue of the Americas, New York, NY 10105, 212.486.5800