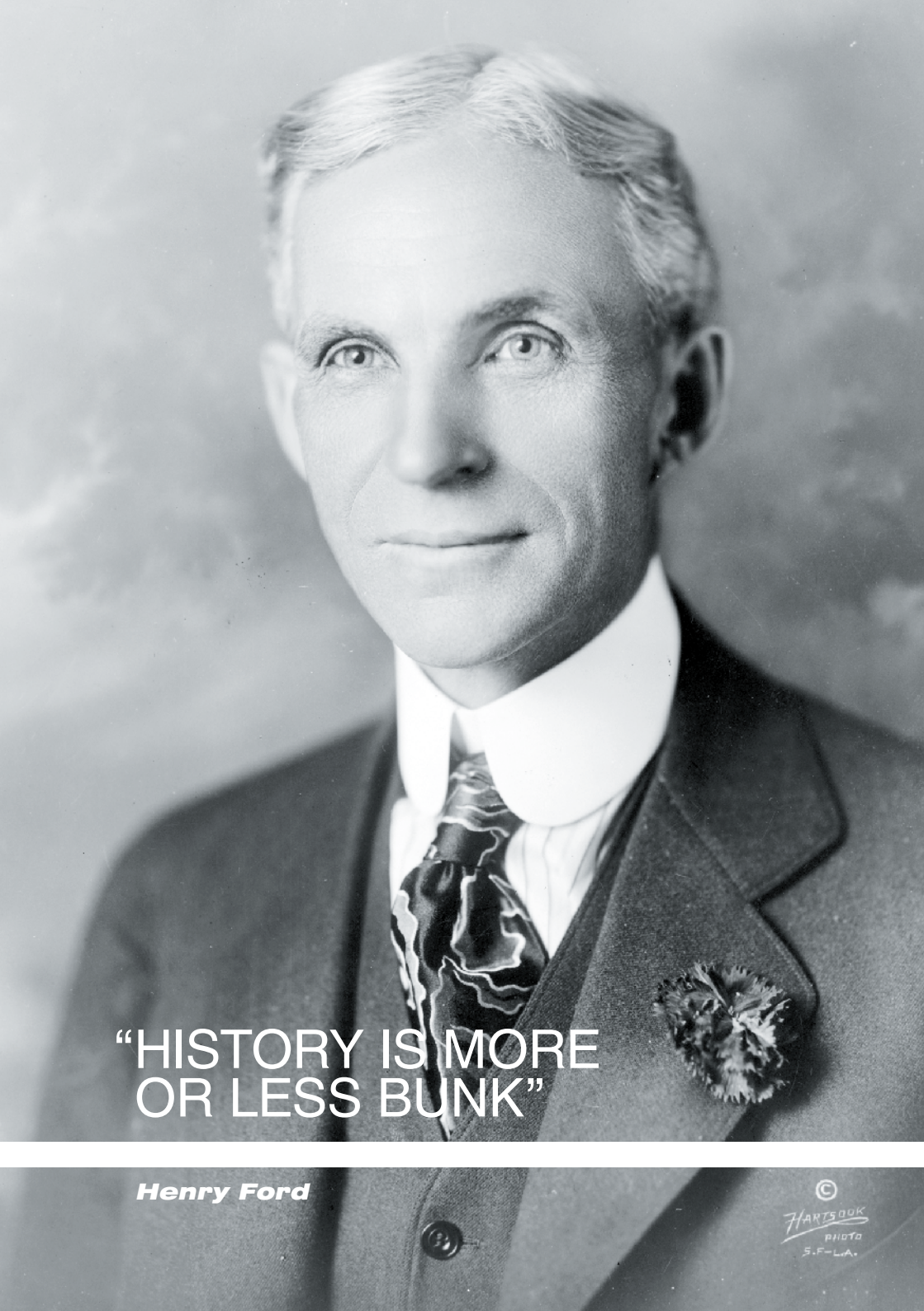
SKOLKOVO
Moscow School of Management

The World's Top Auto Markets in 2030:

Emerging Markets Transforming the Global Automotive Industry

SIEMS Issue Report
SKOLKOVO Institute for Emerging Market Studies


“HISTORY IS MORE
OR LESS BUNK”
Henry Ford
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Content

Introduction

The past few years have not been kind to the global auto industry. The Great Recession and persistently tight credit conditions wiped out the profitability of most of the world's big automakers and forced an unprecedented level of state interventions to stave off bankruptcy. Vehicles sales levels in many mature markets, such as the United States, are not expected to exceed their pre-recession levels until the middle of this decade.

These tribulations, however, have partially masked a historical shift that has been underway in the industry for a number of years. The motorization of the emerging markets is quickly breathing new life into the industry. While China has clearly led the way over the past decade, other markets, like India and Brazil are coming on strong. This paper finds that future growth in vehicle sales throughout the emerging markets is so promising that the secular decline in global sales growth that the industry has been experiencing since the mid-1970s is on the cusp of being soundly reversed.

Using the most recent data on demographic and economic trends, we project motor vehicle registrations and sales for the largest and fastest growing motor vehicle markets in the world by 2030.

We find that:

- There will be a new Big Three by 2030. China, the U.S. and India! These three are projected to account for approximately 60% of global vehicle sales by then.
- The number of motor vehicles on the road is expected to increase by one billion between 2010 and 2030. The motorization of today's emerging markets will account for almost 75% of that growth.

DATA AND METHODOLOGY

The objective of this paper is to estimate the world's largest and fastest growing markets for motor vehicles over the next two decades. Using the latest demographic and economic data we estimate the growth in motor vehicle registrations and sales for passenger cars and light passenger trucks[1] (for this study, we exclude medium and heavy trucks, and commercial vehicles of any kind) from 2010-2030.[2]

Using data available for the world's top 43 motor vehicle markets[3] over 2004-2008, we determined the statistical relationship between ownership propensity (defined as vehicle ownership per 1,000 people or OWN) and Gross National Income per capita (pGNI) or:

(1) $Ln(OWN_{it}) = a + b*ln(pGNI_{it}) + e_{it}$

Where:

- ***Ln(OWN)*** and ***ln(pGNI)*** are the natural logs of vehicle ownership per 1,000 and per capita ***GNI*** in country ***i*** and in year ***t***. GNI is measured in Purchasing Power Parity (PPP) U.S. dollars.
- ***a*** is the y intercept or constant.
- ***b*** is an estimate of the income elasticity of demand with respect to ownership propensity.
- ***e*** is an error term.

Population projections from the Economic Intelligence Unit (EIU) through 2030 were then used to scale up OWN estimates into total vehicle registrations for each country in every year.[4] Annual sales were then estimated for each country by taking the annualized change in vehicle registrations and adding the estimated number of vehicles scrapped in that same year. See Appendix III for a more detailed description of this methodology.[5]

1/ Motor vehicles registrations, a stock measurement, give us a proxy of the number of vehicles currently on the road in each country. Sales, a flow measurement, will show us how quickly the vehicle market is growing in each country.

2/ By "car" or "automobiles" we are referring to passenger cars, which are defined as motor vehicles with at least four wheels, used for the transport of passengers, and comprising no more than eight seats. Automobiles make up approximately 87% of the total motor vehicle annual production in the world. The remaining 13%, not included in our statistics, is made up by light commercial vehicles and heavy trucks (motor vehicles with at least four wheels, used for the carriage of goods), buses, coaches and minibuses (more than eight seats in addition to the driver's seat).

3/ These 43 countries have accounted for approximately 99 percent of global motor vehicle sales in recent years.

4/ Both population projections and GDP growth forecasts for each country (2010-2030) were provided by the Economic Intelligence Unit (EIU). Appendix I gives a more detailed description of these data sources.

5/ We choose to only model demand here. Since we are ignoring the business cycle and are only concerned about secular or long-term growth, we assume that any supply shortages are eventually eliminated over the long-run.

RESULTS

OWN and pGNI data points are provided on the scatter graph below for all 43 countries over 2004-2008 (Appendix IV lists all 43 countries). Notice the exceptional "tightness of fit" for the observations. As per capita income rises, so does ownership propensity, in a strongly predictable fashion. In fact, differences in pGNI explain 90 percent of the variation in OWN. We found the statistical relationship strong regardless of using a times series or cross sectional regression.

- 90 percent of the variation in vehicle ownership between nations is explained by differences in per capita incomes.

FIGURE 1
Rising income implies rising auto ownership
Vehicle Ownership Propensity and Per Capital National Income
(43 countries)

(in GDP Per Capita, PPP)
lnown - - - - - - - - - - - - - - - - -
Fitted values • • • • • • • • • • •
ln(own) = -5.076893 + 1.068019*ln(GDP Per Capital, PPP). R -Square=0.8981
Source: SIEMS' calculations with World Bank and Wards data

The interpretation of these results could not be clearer. *Poor people don't buy cars! And as people grow richer they buy more cars!* The emergence of a middle class is thus essential for the development of a motor vehicle market. Moreover, it is the *level of per capita income*, not the *size of a nation's economy* that creates the spending power to buy cars and light trucks.

The demand for motor vehicles does not grow smoothly with changes in per capita incomes, but goes through periods of acceleration and deceleration. Growth in ownership propensity is weak at both low and high levels of income but strongly accelerates at levels of income in between.

The *"sweet spot"* for growth in motor vehicle ownership occurs at around $5,000 - $12,000 per capita in Purchasing Power Parity (PPP) terms (a level that corresponds to roughly U.S. $2,500-$8,000 per capita at current exchange rates for most of the developing nations)[6]. As per capita income reaches $3,000, vehicle ownership begins accelerating and continues rising until peaking at approximately $8,000-$9,000. As per capita income surpasses this high water mark, growth in ownership propensity gradually declines, approaching zero for per capita incomes in excess of $30,000 (that is, increases in per capita income at that level does not increase average vehicle ownership).

FIGURE 2
Emerging Markets Entering that "Sweet Spot"
Income Elasticity of Demand
(with respect to vehicle ownership propensity)

(GNI Per Capita, PPP)
Source: SIEMS' calculations

Regression estimates for motor vehicle registrations, annual vehicles sales, along with population and per capita GNI projections are provided in Appendix IV.

6/ PPP was considered a better indicator of affordability given that automakers are increasingly producing and pricing their vehicles for the local market. Nevertheless, the explanatory power of income at current exchange rates was also highly statistically significant.

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THE MOTOR VEHICLE MARKET TODAY

The Developed Nations

While China is widely given credit for surpassing the United States as the largest market for passenger vehicles in 2009, Chinese auto sales were probably roughly equal to that of the United States that year.[7] The parity the Chinese reached last year is still remarkable considering that their sales levels were running one-third that of the United States as recently as five years ago. It is important to note, however, that U.S. sales were running in the vicinity of 16-17 million units for some time before the unprecedented collapse and are expected to gradually reach that level again by at least the middle of this decade. This implies the U.S. is likely to "regain" its status as the largest car market within a few years unless Chinese domestic sales continue to surprise with exceptional strength.

Top Ten Markets in 2009 (Annual Vehicle Sales)		
1	U.S.	10,401,682
2	China	10,331,300
3	Japan	4,574,699
4	Germany	3,994,832
5	Brazil	3,069,568
6	France	2,642,656
7	Italy	2,339,253
8	U.K.	2,183,473
9	India	2,066,707
10	Russia [8]	1,465,917
Source: Wards		

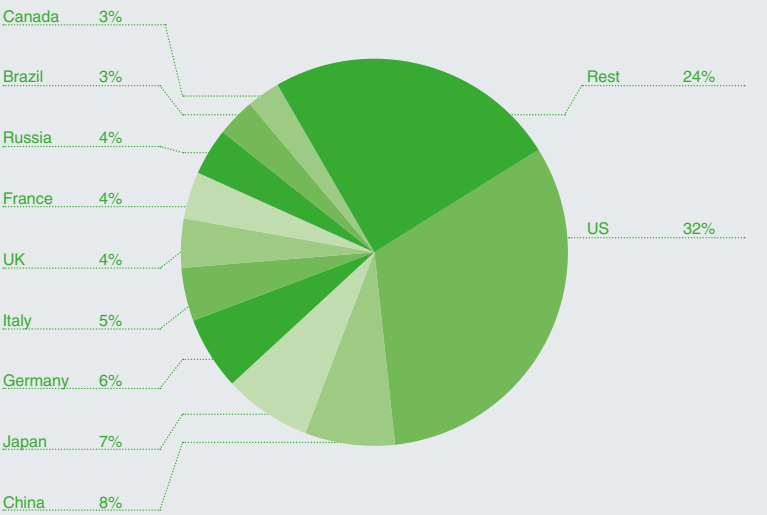
7/ China's categorization of passenger cars does not correspond to the U.S. classification system, and Chinese rural residents often use commercial vehicles for personal travel. Excluding the sale of various trucks, we find that China's total passenger car sales were only 10.3 million in 2009. China's widely quoted figure of 13.3 million was for total auto sales. The breakdown in these figures was provided by CAAM, the Chinese Association of Automobile Manufacturers.

8/ Russia and Canada had almost identical auto sales in 2009 but Russia is given 10th place given its auto market collapsed 50% in 2009 but is expected to gradually recover to that level again by mid-decade.

That said, the rich developed economies' dominance of the industry has been quickly eroding in recent years. In 2005, they accounted for 80% of both global sales and total motor vehicle registrations (cars and light trucks). By 2009 these figures had dropped to 60% and 73%, respectively. Again, much of this recent collapse can be attributed to the historical collapse in U.S. sales. In 2009 the developed economies comprised six of the top ten largest markets for passenger vehicles with the U.S. and China dominating the pack.

There are some gaps in ownership propensity among the developed nations that is not explained entirely by differences in per capita income. For example, while Japan has a per capita income equal to that of Germany, its level of vehicle ownership is significantly lower (449 versus 572). The mass motorization seen on the scale in the United States and much of Western Europe is less likely in nations with exceptionally high population densities. The United States continues to have by far the highest level of ownership propensity, with about 815 per 1,000 in 2009.[9]

FIGURE 3
Percent Share of Top 10 Markets-Vehicles Registered (2010)



Source: Wards

9/ Income distribution and urban population were also modeled as explanatory variables but were not found to be statistically significant. See Appendix II for a more detailed description of these variables.

For the developed nations, annualized growth in vehicle ownership propensity has stagnated in the low single digits for two decades. This is because once a household owns 1–2 cars, increases in per capita income are unlikely to encourage additional purchases. With population growth equally slow in most of the developed countries, growth in total sales has also been weak.

With one-third of the world's registered vehicles (one-quarter billion in 2010), the United States is larger than the next five largest markets combined. While the United States is clearly a mature market, the number of vehicles being scrapped each year off such a large base guarantees that the U.S. share of annual world sales will remain high for some time. Japan's global share of registered vehicles, currently 7%, is falling rapidly (it was approximately 10% just five years ago). Western Europe, also a mature market for motor vehicles, accounts for approximately 25% of global vehicle registrations while North America accounts for 31% (2010 estimates).

The Developing Nations

The developing nations have just recently become a force within the global motor vehicle industry. As recently as 2004 they only accounted for 18% of global vehicles sales but by 2008[10] their share of sales had increased to one-third of all vehicles sold.

But was this recent rise for the developing nations primarily a China phenomenon? While China's performance has been simply unprecedented in recent years (vehicle sales have risen from 2.3 million in 2004 to 10.3 million in 2009 while its global share of registered vehicles leaped from 1.2% to 8% over the same period) it was hardly the only force in the emerging auto market. Barely ranked in the top 15 just five years ago, India's sales now exceed two million units, placing them directly behind European powers Italy and the UK. Despite a relatively soft economy in 2008 and 2009, Brazil saw its motor vehicles sales double over the past five years. At 3 million, it is now the world's fifth largest auto market. Despite its massive 2009 tumble, Russia is worth mentioning here. Like Brazil, sales doubled during the second half of the last decade to 3 million units in 2008 before its economic collapse. All in all, however, China has accounted for roughly 60% of the market share increase for emerging markets economies in recent years.

10/ Latest year available with complete country data.

With estimated vehicles per 1,000 of 12 and 44 in 2010 for India and China, respectively[11], motorization in these twin giants is still in its infancy.

Not Surprisingly, China has been in its economic sweet spot for growth in motor vehicle sales since the middle of last decade, when sales have been rising much more swiftly than overall growth in per capita income. Because it is a relatively new car market (there were practically no commercial sales of any consequence until the mid-1990s), China's stock of registered vehicles is still only one-quarter that of the United States.

Brazil was in its sweet spot during all of the past decade which explains its resilient auto sales (as was Russia for part of the decade) but India's per capita income, valued at $2,800 (PPP) in 2009, remains impatiently below that threshold for now.

11/ We received our 2008 registration figures for China and India directly from official sources (China Statistical Yearbook 2008 and the Society of Indian Automotive Manufacturers) then adjustments for sales and scrappage levels in 2009 to derive 2010 registration figures as a starting point for forecasting.

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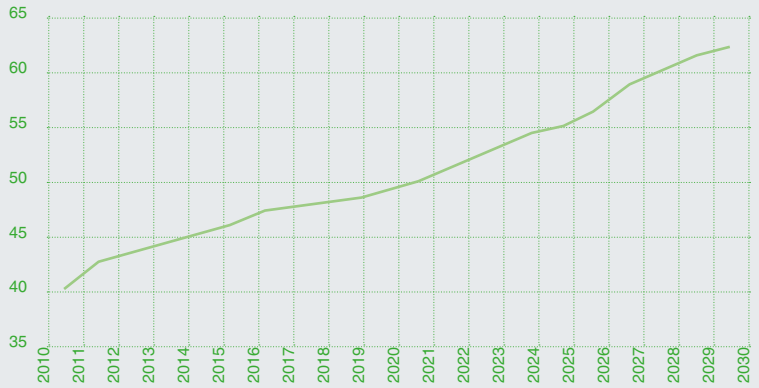
THE MOTOR VEHICLE MARKET IN 2030[12]

The car industry in twenty years will be very different from the one today. Today's emerging market economies will be the driving force for all the changes between now and then.

- There will be a new Big Three by 2030. China, the U.S. and India! These three nations will dominate the auto market by then, projecting to own over one-half of vehicle registrations and approximately 60% of global vehicle sales.
- Between 2010 and 2030, the fleet on vehicles on the road is expected to rise by almost 1 billion. Today's developing nations will account for almost 75 percent of that growth. (i.e., only a quarter will come from today's developed nations).

FIGURE 4
Market Share of Developing Nations (Sales: 2010–2030)



Source: SIEMS' calculations

12/ See Appendix V for 2020 projections for vehicle registrations and sales.

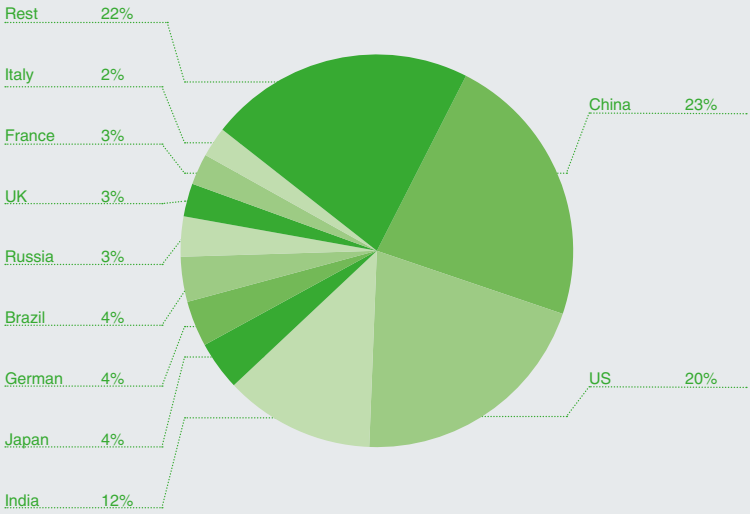
- Global vehicle sales are projected to more than double from approximately 63 million in 2009 to 140 million by 2030.

The emerging market motorization of China and India (more detailed information on individual countries are provided in the next section) will dominate this transition, as their combined shares of motor vehicle registrations are expected to rise from 10% in 2010 to 35% by 2030.

- The BRIC economies are projected to account for four of the top six markets in vehicle sales by 2030.

For the highly saturated markets of the developed economies, vehicles sales will continue to be driven by the replacement demand of their current stock of vehicles rather than by new demand. While today's developed economies still comprise six of the top ten rankings in vehicle registrations by 2030, their shares will all have shrunk. Japan is the only rich market of significant size that is expected to see an outright decline in annual sales (driving this is an expected 10% decline in its population). Modestly growing per capita incomes and stagnate population growth in Germany, France, Italy and the U.K. will give these economies only fractionally larger vehicle markets twenty years from now.

FIGURE 5
Percent Share of Top 10 Markets: Vehicles Registered (2030)



Source: SIEMS' calculations

While the U.S. accounts for by far the largest decline in the world's share of registered vehicles (32% to 20%), its domestic sales is expected to grow from the current trend line of 16–17 million units (which is what it averaged before the recent recession) to 23.5 million by 2030. This modest growth will be the result of three factors in favor of the United States over this period. First, population is projected to increase by over 50 million and per capita income to grow from $43,000 to approximately $60,000. As a result, vehicle ownership propensity is expected to continue rising from 807 to 975 (almost one vehicle per person).[13]

- The United States, which has been the largest market for motor vehicles sales since the birth of the industry over a century ago, is projected to lose that top ranking (permanently) to China in 2020.

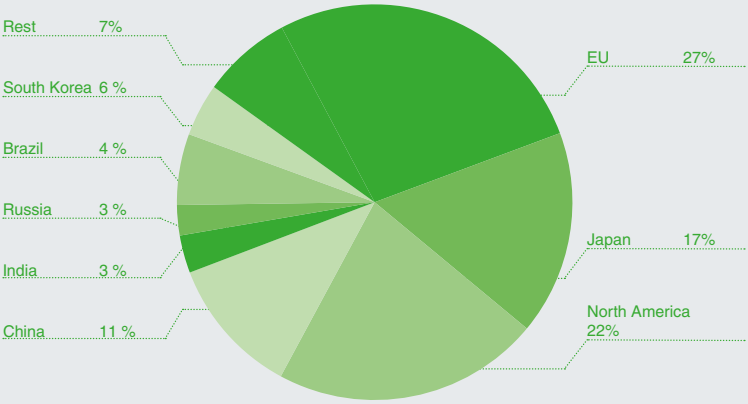
Top Ten Markets in 2030 (Annual Vehicle Sales)		
1	China	39,161,189
2	US	23,452,310
3	India	22,852,752
4	Brazil	6,473,470
5	Japan	4,163,286
6	Russia	3,856,427
7	Germany	3,499,904
8	UK	3,181,032
9	France	2,744,346
10	Mexico	2,480,799
Source: SIEMS' calculations		

13/ Naturally, any downward revision to long-term U.S. economic growth forecasts would result in slower income growth and fewer vehicle sales. Our model assumes average U.S. economic growth of 2.6% from 2010-2030, compared to 3.0% rate the U.S. averaged over the past 14 years (1994-2008).

GLOBAL AUTO PRODUCTION: A SNAPSHOT

Shares of global vehicle production currently mirror, more or less, shares of global consumption. The notable exceptions are the United States and Japan. The U.S., since the mid-1970s, has imported a large share of its domestic consumption of motor vehicles while Japan has been an export powerhouse, leading the world in vehicle production for much of the past several decades. Look for the emerging markets of Brazil, China and India to continue acquiring larger shares of global production as automakers find it increasingly economical to produce their vehicles in the world's fastest growing markets.

FIGURE 6
World Passenger Car Production (% Share) 2008



Source: OICA

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THE END OF THE RAINBOW IS IN ASIA AND BRAZIL

The Asian automotive market[14] is now larger than Western Europe's and is poised to supplant North America as the largest regional market for passenger vehicles no later than the middle of this decade.[15] It is also very likely to be the chief engine for long-term global motor vehicle demand growth. Most governments in the Asia-Pacific region have curbed or abolished restrictions on vehicle imports, reduced excise taxes on autos and simplified certification and liberalized auto financing, hence, there are few or no regulatory hurdles to continued growth.

We examine the four largest emerging market economies' (in terms of GDP) auto markets below in more detail:

CHINA

First in this Car Race

By our projections, China will become the largest auto market in terms of registered vehicles by 2028, surpassing the United States which has easily possessed the largest stock of autos over the past century. This is remarkable growth considering that America's stock of registered vehicles is currently four times larger.[16]

- By 2030, China is expected to have almost 400 million vehicles on the road.
- China's share of the worldwide motor vehicle registrations is expected to rise from 8 percent in 2010 to 23 percent by 2030.

14/ All of Asia, including Japan.
15/ Again, these figures and projections ignore the most recent recession and focuses on trend sales growth. Asia was the largest regional market for sales during the severe 2008-09 global recession.
16/ It was seven times larger in 2004.

This enormous growth of vehicles on the road will naturally be driven by strong sales. China's annual vehicle sales are expected to reach almost 21 million by 2020 and then a projected 39 million by 2030. This amounts to annual sales growth of approximately 6.4% over 2020-2030, a marked slowdown from the blistering 36% pace it averaged during the past decade.[17]

- In 2020, China is projected to become the world largest market for motor vehicle sales, surpassing the United States. By 2030, China's annual sales are expected to reach 39 million, or 28% of global sales.

China's appetite for vehicles is primarily driven by its growth in per capita income, not by population. While China's population is expected to rise by only 100 million between 2010 and 2030 (a 7% increase), its per capita income is estimated to triple from $6,735 in 2010 to $18,877 by 2030 (measured in PPP), increasing ownership per 1,000 from a projected 44 in 2010 to 275 in 2030, roughly equal to South Korea's ownership level today.

With income elasticity of demand remaining elevated (see section I) between income levels of $5,000 and $12,000 before falling off, China's motor vehicle demand should remain in that "sweet spot" for only three-to-five more years before growth really begins to taper off. So while growth in auto sales is clearly set to slow in the coming years, the fact remains that the Middle Kingdom is already a huge market for motor vehicles and solid single-digit sales growth should be easily achievable given the sheer number of Chinese entering the middle-class over the next decade.[18]

Unlike other developing nations China has allocated enormous resources to expand its highway infrastructure to help accommodate this unprecedented growth in motorization. China's quantity of paved highway has increased from 1.4 million kilometers in 2000 to 3.6 million in 2007, making it second only to the United States.[19]

17/ China's GDP growth is assumed to average 7% during 2010–2020 then drop off sharply to 4.3% from 2020-2030.

18/ China's ongoing urbanization will have countervailing effects on vehicle ownership propensity. On the one hand, the higher incomes of urban dwellers will unambiguously increase ownership. On the other hand, access to mass transit will tend to offset ownership rates.

19/ According to China Statistical Yearbook 2008.

INDIA
Moving Into the Fast Lane

With vehicle ownership of approximately 12 per 1,000 citizens[20], India has one of the lowest ownership propensities of any country in the world. But if China is the hare then India is the tortoise in this automotive story. Having started liberalizing its motor vehicle market (and its economic reforms) 15 years later than China, India's car market is expected to come on strong over the next two decades. Our forecasts show that growth in India's motor vehicle market will be powered by both rapid increases in population and per capita income. India's population is projected to grow by a sizeable 340 million (29 percent) between now and 2030, giving it a population greater than that of China's.

Although starting from a much lower base, India's 2010 estimated per capita income of $3,000 (PPP) is expected to rise over two and one-half times to approximately $8,000 by 2030.[21] While India's vehicle ownership is only expected to reach 140 per 1,000 by 2030 (approximately equal to current day Mexico), its population of 1.5 billion will transform India into the third largest motor vehicle market by 2030 (by both registrations and sales) and give it a full head of steam heading into the middle of the century as its per capita income remains in the sweet spot for sales for an extended period.[22]

- India's share of the motor vehicles on the road worldwide is expected to rise from 2.5 in 2010 to 12 percent by 2030.
- By 2030, India will have 215 million vehicles on its roads, (almost as many as the U.S. did in 2000).

In terms of annual sales, India is projected to surpass Japan by 2015, placing it third in total sales. By 2030, India will be selling approximately as many passenger vehicles as the United States with 23 million units!

- India will be the fastest growing auto market of any sizeable developing nation over the next two decades, averaging 12% growth in annual sales.[23]

Skeptical that India's lousy infrastructure could support those many vehicles? See Appendix VI for a short discussion on the progress India is making

20/ Author's estimates for 2010 based off Society of Indian Automotive Manufacturers 2008 estimates.
21/ According to the National Council for Applied Economic Research, in 2005, the middle-class share of the population in India was only 5%. By 2015, it forecasts this will rise to 20% and then 40% by 2025.
22/ Like China, India is assumed to average economic growth of 7% (in PPP) from 2010-2020. It decelerates less quickly than China's during 2020-2030, however, averaging 5.8%.
23/ Interestingly, reducing both India's and China's average economic growth projections by a full percentage point over 2010-2030 did not materially reduce forecasted sales levels for both countries.

BRAZIL
The Engine of South America

Overshadowed by India and China, Brazil's auto market has performed well in recent years. In 2009 domestic sales were over 3 million vehicles, making Brazil the fifth largest auto market in the world. Credit this to Brazil's growing middle class in recent years. At just one-third of the population in 1993, its share rose to 44% in 2002 and then to 52 percent in 2008. Relatively quickly and quietly, Brazil has become a middle-class nation.

- Among the developing economies, Brazil is currently ranked second in sales after China.

Brazil's fundamentals for vehicles sales growth going forward look solid. The population is expected to grow by 41 million by 2030 (21% increase) and per capita income is projected to rise by approximately 60% ($10,000 to $16,000).[24] This is expected to increase Brazil's ownership propensity from around 126 today to 271 per 1,000 by 2030 (China's estimated level by then) putting around 65 million vehicles on the road throughout Brazil (equal to Germany's in 2030). Brazil, too, will need to improve its transportation infrastructure if it is to reasonably accommodate this increased vehicular traffic.

Brazil's annual vehicles sales are expected to reach 4.4 and 6.5 million by 2020 and 2030, respectively. By 2030 it will be the fourth largest market for sales, selling 50% more vehicles than Japan.

- Already a large market, motor vehicles sales will more than double in Brazil between now and 2030.

24/ This comes out to 3.8% economic growth from 2010-2020 and 3.4% from 2020-2030, levels that Brazil has reached in recent years given its improved macroeconomic performance. When measured at PPP over time, growth could potentially be higher in Brazil. If this occurs, Brazil's sales projections would be clearly understated.

RUSSIA

Higher vehicle ownership will keep the market growing

The first decade of the 21st century put Russia on the automotive map for the first time in history. After sales soared to three million units in 2008 the vehicle market collapsed by half in 2009.

Looking forward, Russia's auto market will experience two countervailing forces that will keep the market neither growing briskly nor collapsing. First, Russia's population is expected to fall from 140 to 126 million by 2030. Offsetting this is an expected doubling in Russia's per capita income (PPP) from approximately $14,000 in 2010 to $28,000 by 2030. This rise in purchasing power is expected to increase Russian vehicle ownership from 216 today to 454 per 1,000 by 2030. Interestingly, Russia is expected to experience the largest absolute increase in ownership propensity of any major country.

The number of vehicles on the road will double from roughly 30 to 60 million and annual sales are expected to climb to approximately 3.9 million units by 2030. *Unfortunately, that only amounts to annual sales growth of 1.3% when calculated from the 3 million unit level achieved before the recent collapse*. Its share of registered vehicles on the road will fall too, from 4% to 3%. Nevertheless, this meager growth will be enough to make Russia the sixth largest car market in the world by 2030.

- At almost 4 million vehicles sold per year, Russia will possess the world's 6th largest motor vehicle market by 2030.

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SMALLER MARKETS STILL WORTH WATCHING

The following four countries warrant some discussion for their vehicle sales growth potential:

INDONESIA

Like India, Indonesia has lousy transportation infrastructure but its economy has been showing greater potential in recent years and so have auto sales. With surprisingly low ownership propensity (20 per 1,000) and population growth of almost 50 million by 2030, Indonesia will be entering its sweet spot for sales sometime later this decade. We conservatively project annual sales at 2.4 million (ranking it 12th and just a notch behind both Italy and Mexico) in 2030 but the actual number has the potential to be much higher. Bottom line? This could be one of the faster growing emerging auto markets going forward.

MEXICO

A lackluster economy has always kept the auto market from flourishing in this land of 112 million denizens. But with vehicle ownership projected to rise from 144 to 242 per 1,000 and population to rise by 25 million, Mexico should be delivering annual auto sales of 2.5 million units by then, making it the tenth largest auto market in the world by 2030.

EGYPT

There are only 35 vehicles for every 1,000 Egyptians right now but Egypt has two things going for it. First, its population will grow from 85 to 111 million. Second, during much of the next twenty years, its per capita income will dwell in the sweet spot of high octane sales growth. We project sales of 1.8 million by 2030 but economic reforms and slightly faster economic growth could produce annual sales closer to 3 million units.

TURKEY

Per capita incomes approaching $20,000 will push vehicle ownership per 1,000 from approximately 100 to 250 per 1,000 between now and 2030. With a population projected at 85 million by 2030 (it is 73 million today), annual vehicle sales should cruise in at a respectable 1.7 million units.

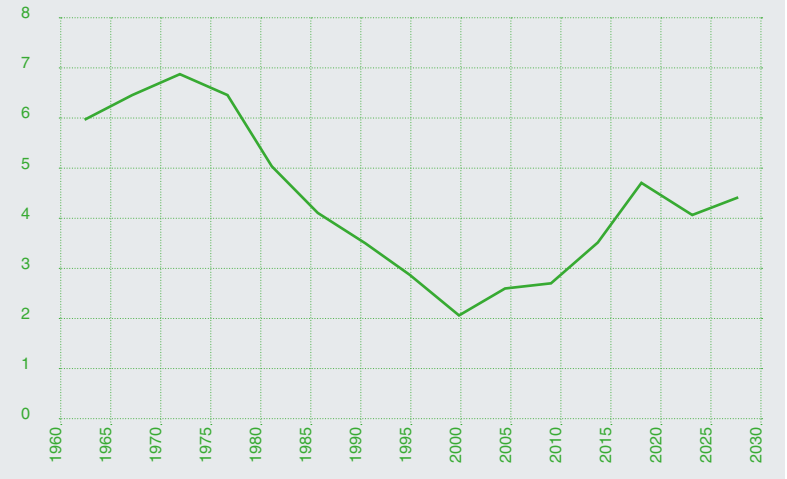
BETTER DAYS AHEAD

The post World War II economic boom, fueled by the rapid growth in today's developed nations, elevated the auto industry for three decades. Since the mid-1970s, however, growth in world demand began to quickly slow as the developed nations' auto markets began maturing. Starting shortly after the beginning of this century, however, this long decline in sales growth started to reverse itself, powered by the beginnings of the motorization of the emerging markets.

For the past half century, sales in the global auto industry have been completely dominated by the triad – the U.S., Western European and Japan. This dominance has been fading quickly in just the past few years – driven by the most rapid expansion in the middle class in world history – with almost all of it occurring in the developing world. Incredibly, the emerging economies are now home to approximately one-half of the global middle class and this share is expected to rise to 85 percent by as early as 2030.

With vehicle ownership levels a fraction of what they are in the developed world and with an enormous number of people entering that "sweet spot" for car buying over the next two decades, the emerging markets are expected to account for one-half of the industry's sales by 2020 and then more than 60% of sales by 2030.

FIGURE 7
Back on the upswing! Growth in global sales (1960–2030) (10 year moving average)



Source: Ward's, SIEMS' calculations

While it is impossible to predict which automakers will flourish in this new automotive world, there is probably one thing that can be said for certain. The fastest-growing segment in the car industry over the next two decades will be the small or compact car. It is the only size that will be affordable to the burgeoning middle classes throughout these countries.

With many of the emerging markets either approaching their sweet spot or already possessing a large car market (China), the global industry will be entering a period of protracted sales strength, not unlike the one it experienced in the first quarter century following the Second World War. As a consequence, we project:

- The motorization of the emerging markets is expected to increase the growth rate in annual auto sales from the 2.7% experienced over the past decade to an average of 4.6% over the next twenty years.

For the first time since its birth a century ago, the industry will reverse its secular decline in sales. Over the next 20 years, the industry will sell approximately as many motor vehicles as it sold during its entire history.

Fasten your seatbelts! This will all make for an interesting ride.

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Appendix IIIVI

EIU METHODOLOGY FOR LONG-TERM FORECASTS

The Economist Intelligence Unit (EIU) has traditionally produced five-year forecasts. However, many companies make strategic business decisions over timeframes in excess of five years. Therefore, the Economist Intelligence Unit has developed a methodology for producing long-term economic forecasts, which has been applied to the 60 largest economies. Our long-term projections will provide information to facilitate such decisions made over these longer timeframes. Long-term forecasts and scenarios are also key to understanding some of the big economic issues that will shape global business in the coming decades.

The methodology is distinct from that used to generate our five-year forecasts, which is based on a "demand side" forecasting framework which assumes that supply adjusts to meet demand either directly by changes in output, or by the drawing down (or building up) of inventories. Such a framework is appropriate for constructing short- and medium-term projections where output can deviate substantially (but temporarily) from its long-run sustainable level. But a demand side framework is not appropriate for forecasting over the long term. Instead, we utilize a supply side framework, in which output is determined by the availability of labor and capital equipment, and the growth in productivity.

The key output of our long-term model is a forecast of real GDP growth per capita, which can be combined with population growth forecasts to give a forecast for each country for real GDP growth. From this building block, we are then able to make projections for a series of market sizing variables important for long term business planning. These include GDP in US dollar terms and at PPP conversion rates, consumer spending, and exports and imports.

The Economist Intelligence Unit is well placed to produce long-term projections and scenarios-we have considerable experience in tracking and forecasting a series of economic and institutional factors which our analysis suggests are closely related to long-term growth prospects. These factors include the availability of an educated workforce, the openness of the economy to trade, the quality of institutions (including the legal framework and the quality of the bureaucracy), fiscal policy, the degree of government regulation, move-

ments in the population of working age relative to the overall population, and the development of information and communication technology infrastructure. In addition, the income gap between each country and the global technological leader (the US) is important as this illustrates the potential for economic catch-up by importing ideas and techniques. Forecasts of GDP growth per capita can then be combined with demographic projections (taken mainly from the US Census Bureau) to give forecasts for overall GDP growth. This is explained in more detail below.

Growth projections

The main building blocks for the long-term forecasts of key market and macroeconomic variables are long-run real GDP growth projections. We have estimated growth regressions (based on cross-section, panel data for 86 countries for the 1970-2000 period) that link real growth in GDP per head to a large set of growth determinants. The sample is split into three decades: 1971-80, 1981-90 and 1991-2000. This gives a maximum of 258 observations (86 countries for each decade); given missing values for some countries and variables, the actual number of observations is 246. The estimation of the pooled, cross-section, panel data is conducted on the basis of a statistical technique called Seemingly Unrelated Regressions to allow for different error variances in each decade and for correlation of these errors over time.

The regressions, which have high explanatory power for growth, allow us to forecast the long-term growth of real GDP per head for sub-periods up to 2030, on the basis of demographic projections and assumptions about the evolution of policy variables and other drivers of long-term growth.

Definitions of variables

The dependent variable is GDPG: Average annual growth in real GDP per head, in the 1970s, 1980s and 1990s, measured at national constant prices.

The independent variables include:

LnGDPPL: The natural logarithm of GDP (adjusted for purchasing power parity—PPP) per worker (that is, per population aged 15-65) in constant 1980 US dollars at the start of each decade. Expressed as an index, US=1.

LnSCHOOL: The natural logarithm of the mean years of schooling of the population aged over 15 at the start of each decade. Missing values for some countries are filled in by estimating mean years of schooling on the basis of an equation relating mean years of schooling (where available) to gross primary school enrolment ten years previously, and to secondary and tertiary enrolment ratios five years previously.

LnLIFEEXP: The natural logarithm of life expectancy at birth at the start of each decade. This variable also enters the equation in squared form, reflecting diminishing returns to growth of increases in life expectancy at high levels.

OPEN: Updated Sachs-Warner index of openness—the fraction of years during each decade in which a country is rated as an open economy according to the following four criteria: (1) average tariff rates below 40%; (2) average quota and licensing coverage of imports of less than 40%; (3) a black-market exchange-rate premium that averaged less than 20%; and (4) no extreme controls (taxes, quotas, state monopolies) on exports.

INST: Index of institutional quality (on a scale of 1-10) that is an average of five sub-indices of measures of the rule of law, quality of the bureaucracy, corruption, the risk of expropriation and the risk of government repudiation of contracts. Forecast values are based on corresponding indicators from our business environment rankings.

LABPOP: The difference between the growth rate of the working-age population (aged 15-65) and the growth rate of the total population in each decade in the 1970-2000 period.

TOT: The average annual rate of change of the terms of trade in a given decade.

GOVSAV: The average government savings ratio in each decade (current government revenue minus current government expenditure) expressed as a share of GDP.

TRADESH: The average share of trade (exports and imports of goods and services) in GDP, lagged by one decade to deal with the endogeneity of growth and trade.

GOVREG: An index on a scale of 1-10 of regulation of product, credit and labor markets. For forecast periods, the composite index is based on seven indicators from three categories of our business environment rankings model – from Policy towards private enterprise (ease of setting up new businesses, freedom to compete, price controls); from Financing (openness of the banking system, financial market distortions) and from Labor markets (restrictiveness of labor laws, wage regulation).

LnICT: The natural logarithm of an index, on a scale of 1-10, of the development of information and communications infrastructure. ICT development is found to influence growth significantly only from the 1990s, with little or no impact in previous decades. For 1990 the index is measured simply on the basis of fixed telephone lines per 1,000 population. From 2000 a more sophisticated measure is constructed, reflecting the very rapid development of ICT. The composite ICT index is based on ten indicators. Six indicators are quantitative and rely on our forecasts of fixed-line telephone penetration (lines per 100 population); mobile telephone penetration (subscribers per 100 popu-

lation); the stock of personal computers (PCs per 100 population); Internet users (per 100 population); the number of Internet servers (per million population); and broadband penetration (per 1,000 population). In addition, there are four qualitative indicators from our "e-readiness" model. These include the quality of Internet connections, the development of e-business, the development of online commerce and the exposure of the population to the Internet ("Internet literacy"). Each of the ten indicators is transformed into an index scaled 1-10. The composite ICT infrastructure/use index, on a 1-10 scale, is an average of the ten component indices.

Control variables include ***PRIMARY***: Share of the exports of primary products in GDP at the start of a decade; ***TROPIC***: Percentage of the land area within a country that has a tropical climate; ***COLONY***: History of independent statehood – a dummy variable taking the value of 1 if a country was a colony before 1945; and, in some specifications, regional dummy variables.

The forecasts of GDP growth, of capital stock growth (based on estimated investment shares and assumed depreciation rates) and of growth in labor supply (based on projections of working-age population and assumptions on labor force participation) yield labor productivity growth and total factor productivity growth forecasts. The latter utilize the growth accounting identity, $GY = b \times GK + c \times GL + A$, where ***GY*** is growth of real GDP, ***GK*** growth of the capital stock and ***GL*** growth of human capital (the labor force adjusted for changes in skills). "***A***" stands for growth in total factor productivity; "***b***" and "***c***" are the shares of capital and labor in income.

Trade values are forecast on the basis of simple import (function of GDP and relative prices) and export functions. Forecast market exchange rates (that is, the differential between PPP and market exchange rates) depend on the differential in labor productivity growth between a country and the US.

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OTHER EXPLANATORY VARIABLES

Both are these variables were not found to be statistically significant with respect to vehicle ownership propensity.

Income distribution

The proxy for income distribution was the 'Gini coefficient.' Nations with relatively high income inequality (i.e., the share of national income is skewed toward the top) are expected to experience lower vehicle ownership than nations with similar per capita incomes but lower income inequality.

Urbanization rate

The urbanization rate is the percent of the population living in urban areas. Mass motorization on the scale of the United States or Europe is less likely in nations with exceptionally high population densities. For example, while Japan has a per capita income equal to that of Germany, its level of vehicle ownership is significantly lower. Nations with high urban populations typically have well developed public transportation systems.

Appendix VI

MOTOR VEHICLE SALES PROJECTION METHODOLOGY

Annual sales in the current year (t) for each of the 43 sample nations were calculated using this formula:

Sales (t) = (Vehicle Registration (t) – Vehicle Registration (t – 1)) + Number of Vehicles Scrapped (t)

For the developed nations, the scrappage cycle is very stable, showing little variation between nations or over time. For example, the 2008 scrappage rate ranged from 2.1% in the U.S to 6.9% in Japan. The average for the 27 developed nations over 2005–2008 was 4.2%. This figure is used to project the number of vehicles scrapped in the developed nations from 2010–2030.

Estimating the scrappage rate for the developing nations was much more problematic given the volatility of the series over time and between nations. For the 16 developing nations, the average scrappage rates (2004–2008) were calculated using the following formulas:

Scrappege rate (t) =
Number of Scrapped Vehicles (t) ÷ Vehicle Registration (t)

Number of Scrapped Vehicles (t) =
Sales (t) – (Vehicle Registration (t) – Vehicle Registration (t – 1))

The average scrappage rate for the developing nations was calculated as 1.6% but then converges gradually towards developed nations' average scrappage rate (i.e., 4.2%) over time based upon the growth in each developing nations' vehicle registrations per 1000, with the formula as:

Scrappege rate (i, t) =
1.6% + Vehicle Registration (i, t) ÷ 480 x 2.6%

For country (i) in time (t)
Where 480 is the average vehicles per 1000 in the developed nations.

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OUR ECONOMIC PROJECTIONS

Ownership Propensity (per 1,000)

COUNTRY	2010	2015	2020	2025	2030
Brazil	126	157	186	221	271
Canada	635	649	680	707	726
China	44	76	124	187	275
Egypt	60	75	94	119	155
France	486	520	562	610	667
Germany	572	633	699	756	806
India	12	24	42	72	127
Indonesia	22	34	50	71	104
Italy	595	632	670	718	781
Japan	449	481	509	553	619
Mexico	144	166	188	212	242
Russia	216	275	331	388	454
UK	511	534	560	602	671
US	807	843	884	930	975

Source: SIEMS' Projections

Total Registrations (In Millions)

COUNTRY	2010	2015	2020	2025	2030
Brazil	24.89	32.82	40.69	50.56	64.37
Canada	21.59	23.12	25.31	27.42	29.23
China	58.37	103.73	174.18	267.05	394.51
Egypt	5.04	6.98	9.29	12.53	17.21
France	30.55	33.49	36.72	40.34	44.51
Germany	47.49	52.65	57.81	62.06	65.51
India	20.51	39.46	70.33	122.72	215.04
Indonesia	5.27	8.69	13.26	19.91	30
Italy	34.59	36.44	38.08	40.21	43.16
Japan	56.97	59.99	61.93	65.1	70.25
Mexico	16.21	19.6	23.32	27.53	32.68
Russia	30.52	38.12	44.5	50.59	57.39
UK	31.8	34.37	37.28	41.34	47.34
US	249.85	272.72	297.44	325.5	354.63

Source: SIEMS' Projections

Country	pop 2010	pop 2020	pop 2030	ppp 2010	ppp 2020	ppp 2030	per capita 2010	per capita 2020	per capita 2030
Argentina	40.52	44.24	47.44	547.91	759.30	1028.90	13,522	17,163	21,688
Australia	21.51	24.04	26.10	788.07	1049.48	1367.67	36,637	43,655	52,401
Austria	8.42	8.67	8.85	293.62	366.00	450.34	34,872	42,214	50,885
Belgium	10.63	10.68	10.64	350.79	423.33	499.99	33,000	39,638	46,991
Brazil	196.83	219.08	237.74	1918.55	2774.44	3884.48	9,747	12,664	16,339
Canada	34.01	37.24	40.25	1199.96	1552.33	1979.36	35,283	41,685	49,177
China	1339.24	1406.75	1436.57	9019.84	17810.88	27117.75	6,735	12,661	18,877
Czech	10.20	10.01	9.61	232.76	298.05	364.62	22,819	29,775	37,941
Denmark	5.53	5.66	5.76	182.36	227.27	278.81	32,977	40,154	48,404
Egypt	84.66	99.10	111.16	450.74	807.15	1447.91	5,324	8,145	13,025
Finland	5.35	5.50	5.54	164.80	207.24	272.06	30,803	37,680	49,107
France	62.92	65.34	66.76	1947.17	2318.24	2780.17	30,947	35,480	41,644
Germany	82.95	82.68	81.28	2584.23	3106.07	3488.18	31,154	37,567	42,916
Greece	10.99	10.97	10.81	300.61	363.75	444.55	27,353	33,159	41,124
Hungary	9.88	9.62	9.27	167.49	232.51	314.54	16,952	24,170	33,931
India	1184.09	1362.05	1532.65	3547.15	6948.28	12207.73	2,996	5,101	7,965
Indonesia	242.97	267.53	288.68	925.24	1598.88	2572.33	3,808	5,976	8,911
Ireland	4.17	4.55	4.87	156.71	213.79	312.41	37,581	46,987	64,150
Israel	7.56	8.80	9.98	192.96	271.85	388.01	25,524	30,892	38,879
Italy	58.09	56.85	55.24	1609.16	1758.38	1973.26	27,701	30,930	35,722
Japan	126.80	121.63	113.52	3830.81	4131.06	4628.43	30,211	33,964	40,772
Korea	49.51	50.19	49.91	1307.44	1897.62	2571.58	26,408	37,809	51,524
Malaysia	28.85	33.31	38.24	358.35	566.53	845.41	12,421	17,008	22,108
Mexico	112.47	124.28	135.04	1370.03	1937.86	2672.40	12,181	15,593	19,790
Netherlands	16.54	16.90	17.26	603.86	741.70	898.04	36,509	43,887	52,030
New Zealand	4.37	4.76	5.05	109.64	155.15	211.47	25,089	32,595	41,874
Norway	4.86	5.06	5.16	236.79	303.44	366.42	48,722	59,967	71,012
Philippines	99.90	118.58	136.25	304.70	528.25	927.05	3,050	4,455	6,804
Poland	38.10	37.64	36.20	638.06	864.09	1151.63	16,747	22,957	31,813
Portugal	10.68	10.82	10.71	212.17	250.23	306.01	19,866	23,126	28,572
Romania	21.44	21.03	20.23	232.28	334.04	457.29	10,834	15,884	22,604
Russia	140.98	134.60	126.33	1979.42	2809.02	3550.40	14,040	20,869	28,104
Slovak	5.48	5.43	5.31	105.17	144.96	195.50	19,208	26,711	36,811
South Africa	49.11	48.53	48.85	473.32	658.45	1034.83	9,638	13,568	21,184
Spain	45.92	48.61	50.78	1238.96	1498.41	2003.38	26,981	30,825	39,452
Sweden	9.32	9.53	9.59	306.42	393.44	510.26	32,878	41,284	53,207
Switzerland	7.83	8.02	8.05	289.45	343.88	404.14	36,967	42,878	50,203
Taiwan	22.90	23.44	23.55	749.01	1082.38	1395.40	32,708	46,177	59,253
Thailand	67.50	71.17	71.72	502.78	783.48	1194.44	7,449	11,009	16,654
Turkey	73.32	79.68	84.19	820.97	1185.90	1709.56	11,197	14,883	20,306
UK	62.22	66.52	70.58	1967.59	2293.54	2878.99	31,623	34,479	40,790
US	309.55	336.64	363.83	13299.06	16965.24	22074.66	42,963	50,396	60,673

Where : Pop: Population (in millions), PPP: GDP in PPP terms (in billions), at 2005 US Dollars, Per Capita: GDP per capita (unit) Source: EIU

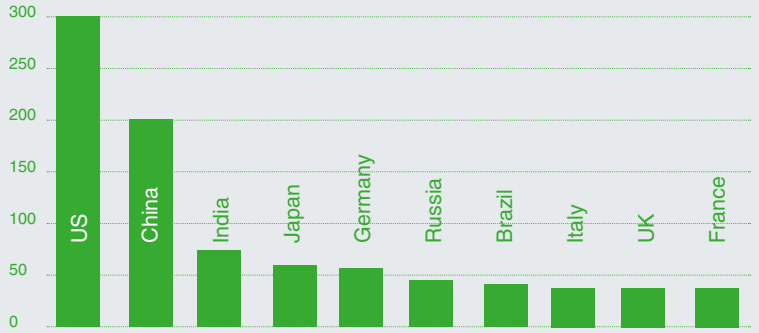
Car Sales (In Millions)					
COUNTRY	**2010**	**2015**	**2020**	**2025**	**2030**
Brazil	3.21	3.74	4.37	5.64	6.47
Canada	1.62	2.01	2.22	2.32	2.39
China	10.26	15.01	20.82	27.17	39.16
Egypt	0.52	0.67	0.91	1.28	1.79
France	1.75	2.04	2.21	2.46	2.74
Germany	2.64	3.32	3.39	3.44	3.5
India	2.89	4.64	7.46	12.96	22.85
Indonesia	0.7	0.77	1.06	1.58	2.4
Italy	1.78	1.85	1.94	2.18	2.46
Japan	4.29	4.32	4.24	4.19	4.16
Mexico	1.16	1.58	1.74	2.07	2.48
Russia	2.67	3.05	3.12	3.38	3.86
UK	2.21	2.34	2.58	2.83	3.18
US	13.65	16.5	20.81	22.37	23.45

Source: SIEMS' Projections

Appendix IIIVI

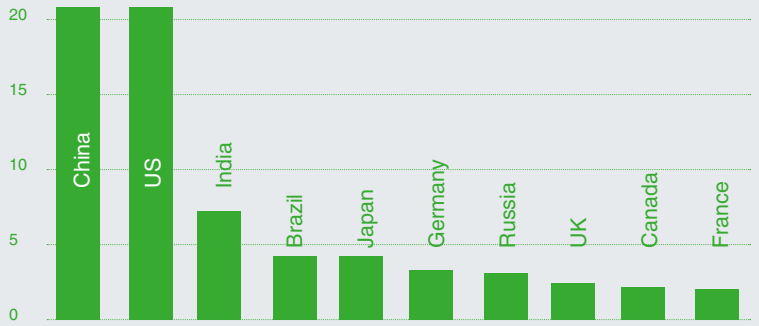
INTERMEDIATE PROJECTIONS: 2020

FIGURE 8
Total vehicles registered (Top 10 markets: 2020) in 000,000



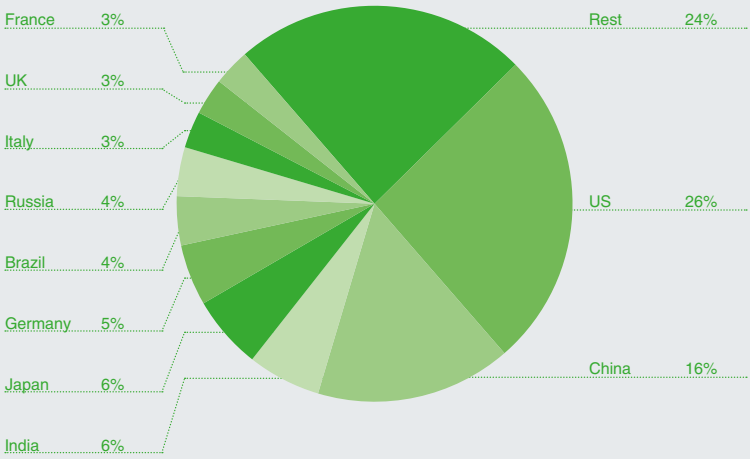
Source: SIEMS' Projections

FIGURE 9
Total vehicles sales (Top 10 markets: 2020) in 000,000



Source: SIEMS' Projections

FIGURE 10
Percent Share of Top 10 Markets-Vehicle Registered (2020)



Source: SIEMS

Appendix IIIVI

INDIA'S INFRASTRUCTURE SPENDING – HIGHWAYS & ROADS

Even for a developing country India has lousy transportation infrastructure. National and state highways are stretched beyond maximum capacities, with average trucking distance of only 200 kilometers per day (25% of the global average). So is it possible this country could add up to 200 million vehicles to its rickety roads over the next two decades? We believe it is highly likely as long as the macroeconomic picture remains reasonably sanguine.

First of all, our powerful regression results include countries with various degrees of development in their motor vehicle infrastructure. While its relatively poor infrastructure will undoubtedly inhibit India's ownership propensity, rising incomes will trump much of this.

Equally critical in this argument, India is in the process of "catch-up" on much of its infrastructure spending. Whereas in China infrastructure spending was a leading or coincident economic indicator, for India, it will be a lagging economic indicator, coming on strong, (or at least stronger) in the coming decade.

The National Highways Development Project (NHDP) was initiated in 1999 with the sole purpose of significantly improving India's highway network. Over the past 12 years India has added 32,000 Km of highways, more than double what it added from independence in 1947 through 1997. The current government has really got serious about the problem and has recently earmarked US $92 billion for road and highway construction with immediate effect until 2012. The government is also currently inviting bids for over 200 national highway projects covering over 13,000 kilometers of road. While these numbers are not Chinese like in dimension, they do promise significant improvements in India's road infrastructure in the coming decade.

The major challenges to rapidly building this infrastructure are land acquisition and the capacity to handle the projects. To build roads across several states, the government will have to manage the delicate task of buying land from multiple landowners.

Further details and the current status of all projects are available at www.nhai.org

Notes

The SKOLKOVO Institute for Emerging Market Studies (SIEMS). Headed by Professor Seung Ho “Sam” Park and based in Beijing, China, SIEMS aims to be a leading think tank on fast-growing economies, with a special emphasis on Russia, China, and India. The work of the institute is focused on providing guidance to society, corporate managers, and policy makers through rigorous but practical knowledge creation across a broad range of areas, including macro-economic and public policy, industry and technology, and corporate strategies.

SIEMS’ research is interdisciplinary, covering various fields of social science with a comparative approach across the three countries, and network-based, involving scholars from all around the world. Its researchers include full-time members from or working on the three main countries, as well as fellows from other areas currently involved in active research on fast-growing markets. The institute aims to be a hub for the creation, distribution and sharing of knowledge among scholars and managers working with fast-growing markets worldwide through regular roundtable meetings and forums. Its research output is distributed chiefly through working papers, reports, books and articles, and conferences devoted to special topics.

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