

Analysis of the Microcar Market in the United States and India:

Impact of Macroeconomic Forces and Cultural Values

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Abstract:

The boom of the microcar market in India has lead to domestic and international firms taking advantage of this growth. Many places including India are experiencing this trend, but due to differences in cultures, preferences and values, the United States is not.

Companies that want to venture into the microcar market in both countries will need to read the market for the desire and feasibility for these small cars, generally based on designs contra to what has been used by the masses. With thorough, in-depth market research of both American and Indian car magazines, online forum posts and market research databases, this thesis explains the successes and failures of microcars in the two markets over the past two decades and draws conclusions of the future of the design.

Results indicate that the microcar boom in India is just beginning; many companies have seen great success within the past 10 years accompanied with India's overall economic growth. The American market is slowly accepting the idea of smaller cars over previous preferences for larger vehicles, but more time is needed before a microcar can come to the U.S. and be successful on a large scale. As the international demand for oil increases, accompanied with uncertain future supply and global competition for other raw materials that comprise automobiles rise, the necessity of microcars for basic transportation will increase in both India and the U.S. Also, new technologies in safety will drive the demand through assuring customers, specifically in the U.S. market, that microcars are overall a better alternative to other internal-combustion transports.

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I understand that my thesis will become part of the collection of Oregon State University. My signature below authorizes release of my thesis to any reader upon request. I also affirm that the work represented in this thesis is my own work.

Stephen Michael Hodges, Author

Acknowledgements

I would like to thank my parents Randy and Patti for always believing in me and giving me more support and love than I could ever ask for.

“Love is patient and kind. Love knows neither envy nor jealousy. Love is not forward and self-assertive, nor boastful and conceited.”

1 Corinthians 13:4

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I. Background

Comparison

This thesis explores why microcars traditionally have not been popular in the United States but are wildly successful in India. Business ventures wanting to break into the microcar market can use this thesis as an examination of what Indian car preferences can ensure a successful entrance into the market and can also explore the possibility of a renewed microcar market in the United States. Microcars are popular in many other markets around the world, but this thesis limits the scope of study to the United States and India due to recent active market trends in both markets.

What is a Microcar?

The traditional definition of a microcar is a vehicle with “less than 700cc motor and no more than two doors” (32). This type of car is used all around the world in many different fashions, but has not come into the US market in traditional form. With one notable exception as the Smart Car FourTwo, global microcars have not been introduced into the United States for about a decade. Past models of America-style microcars sold very well (Geo Metro, etc.) but were phased out with no replacement. In retrospect, the microcar market in many countries around the world is thriving, specifically in the market in India where sales are driven notably by the Tata Nano. The traditional definition has shifted in recent years with adaptations for the growing markets around the world to include cars with motors up to 1 liter (1.5 liter in the United States and some car models with 4 doors (32). Essentially, a microcar is designed to be small not only to save money in the manufacturing process, but to pass this savings on to customers who want a very basic form of personal transportation.

Indian Examples of Microcars

Seeing the success of microcars (mostly the huge demand for the domestically-produced Maruti 800 and the Tata Nano,) many companies outside of India have prototypes or concepts to sell a microcar in India and other countries in South East Asian in the near future. This is a non-exhaustive list of microcars sold within India:

- **Tata Nano (\$2500):** The Nano is a pet project of Ratan Tata, chairman of India-based Tata Motors, who imagined a low-cost vehicle that could safely transport a family in India who otherwise could not afford a car. The Nano is about 10 feet long and five feet wide. The 2-cylinder petrol engine delivers 33 horsepower and a top speed of just over 60 mph. The basic model has no radio, air-conditioning or air bags, but it does have seat belts and a catalytic converter to reduce air pollution, and it gets 50 miles to the gallon. It meets all current safety and emissions requirements in India and will be ready for market later this year (23).
- **Suzuki/Maruti 800 (\$4994):** Prior to the Nano announcement, the Maruti 800 was the lowest-priced vehicle in India. During the 1980s and 1990s, it was the country's top-selling car. Known as a "city car," it produces 37 horsepower and runs on 12-inch wheels. Four people can fit inside comfortably, including the driver. The top speed is 78 mph, and the frugal car can get 47 miles to the gallon on clear, flat roads (21).
- **GM all-electric Spark (~\$6500):** This model is coming to the US as a gasoline powered car, but will be targeted to Mumbai city drivers due to the relative wealth of the area and abundance of electricity. In size, it has a

bigger chassis and larger dimensions than traditional microcars in India and will also come with a higher cost than most Indians are accustomed to in the microcar segment (7).

- **Ford Figo (~\$7700):** Ford, seeing the success of the Tata Nano, has created its own microcar based on the same chassis as the American-bound Fiesta and is similar in size to the Nano. At about twice the price of the Tata, Ford is targeting buyers who want a slightly more upscale microcar with enough power for highway speeds but with the maneuverability of a normal city car and with available luxury options such as keyless entry or Bluetooth connectivity (12).
- Other manufacturers with smaller productions of microcars: Fiat Palio, Chery A1, Hyundai I10 and Nissan/Renault/Bajaj joint venture (41).

Indian Car Market Explained

As most of these cars have less than 50hp and have top speeds in the 60's or 70's, most American buyers would brush these aside because of the lack of desired power or because of their small stature. None of these cars are available in the United States not only because of the uncertainty of mass-sales (a necessary part for microcars to succeed because of small margins) but also because most of these cars do not meet US regulations on safety and emissions. The most expensive cars on this list are the American cars ranging between \$7,000 and \$8,000; a luxury price for the majority of Indians. The average price of microcars in India is between \$5,000 and \$5,500 and this price has been decreasing in the recent years as companies see continued opportunity for the emerging middle class car market (41).

American Examples of Microcars

Though the microcar market in the United States has not been as active as it has been in India, there have been some good examples of microcars in this country that have sold well. These successes are due to cult-like followings or trend popularity instead of sustainability forces. The new push today in the American market is to save money due to rising fuel costs.

- **Geo/Chevy Metro:** Similar to the model of the American Smart Car, the Geo Metro entered the market as a “supermini” microcar with a slight sports appeal. The car was a rebadged version of the Suzuki Swift by General Motors economy car importer: Geo. It was produced from 1989 to 2001 and came in many different body styles including hatchbacks, sedans and convertibles. Most Metros would achieve 55mpg; an unmatched figure for most of the cars sales run. It was only in 1995 when basic safety features (such as airbags or ABS) were offered, along with a 4 cylinder engine. The Geo badge was dropped in 1998 in favor of the Chevy label and public sales of the Metro ended in year 2000 as the Chevy Aveo was preparing to enter the market as its replacement. This car was also sold as the Suzuki Swift (for more sports appeal) and the Subaru Justy (for more rugged appeal) (13).
- **Smart ForTwo:** After 10 years of sales success around the world, Smart’s parent company Daimler reported that Penske Auto Group would distribute Smart Fortwos in North America. The car was modified from its European version to include more powerful engines, added side impact

protections and ceiling revisions. In its safety efforts, the Smart Fortwo has the best safety record in its class. American Smart's averages 36mpg, significantly less than some diesel European versions that achieve 70+mpg averages in part due to their added weight without increased performance. Sales have been strong through the recession, though many who signed up for Smarts "wait list" were not able to purchase their car. Smart had hoped for higher sales; it is a fad for people to buy rather than a mass solution for cheap efficient transportation (18).

- **Ford Fiesta:** First coming to the United States between 1976 and 1981, the Fiesta has been a huge success internationally for Ford, but not in North America. The larger compact Escort was introduced in the early 1980's to compete in the economy market for Ford, but when the Metro began to ramp up sales, the Fiesta made another appearance in 1990-1995. During this time, the car had similar fuel economy and horsepower figures to the Metro and included similar safety features added over the years. The car internationally had become such a major player for Ford that struggling US sales ended in 1995. The car in the US had been viewed as a very basic form of transportation while around the globe, specifically in Europe, it was a compact sports car with a huge range of options. The newest Mark VI Fiesta (and the biggest Fiesta ever built) is available in North America and South America (11).
- **Toyota Yaris:** With one of the largest engines offered in this category, the Yaris S hatchback (2 or 4 door) is the only trim to qualify as a microcar

because of its size. Originally sold as the Echo, it was relabeled the Yaris in 2007. The Japanese model is directly sold around the world, but more power, all-weather options and power features are changed for the American model. Originally, the Yaris did not have any safety features above standard front airbags. Only in 2009 did the market demand standard ABS and side airbags. Even without these features, the NHTSA rated the Yaris a “Good” safety rating. It achieves 36.5mpg averages across all of its models, including its subcompact variants (37).

- Note: The Mini Cooper, though at 145.6 inches, does not qualify as a microcar because of its intended market: they are intended to be sports compacts instead of a microcar transport. Their engines produce too much horsepower and are too large to be considered a microcar. As an example: the highest horsepower engine of the other examples is 10hp less than the entry-level Mini hardtop (24).
- Though there are no other examples of mass produced cars in the US that adhere to the >150 inch length definition of a microcar, other manufactures have small cars in the City Car class that are competitors. Examples: Honda Yit, Kia Rio, Hyundai Accent, and the Nissan Versa (22).

Analysis

Due to US regulation and preferences, American microcars on average are much bigger and more powerful than Indian counterparts. Americans have more to spend on added luxury and comfort features, adding weight and increasing the price. The average price of the base models of these vehicles is \$12,000 due to increased material use and standard features. Horsepower in these cars nearly doubles most other microcars around the world and their performance is enough to satisfy the needs of American buyers (enough power to sustain higher speeds, and 0-60 times in the 12 second range) (4). It is harder to find microcars in the US market because of the “bigger is better” attitude. The past successes of the Geo Metro and the Smart Fortwo have done well in the market because of their trendy/cult-like following rather than functionality for the masses (17).

II. Market Opportunities and Forces in India

Competition

The liberalization of India’s economy in the 1990’s opened the door to Foreign Direct Investment growth, and the ability of millions to pull themselves from poverty (1).

During this time, the traditional micro car companies such as Maruti and companies producing scooters and three-wheelers gained huge revenues in a growing market. One of the first companies to see this success and begin to plan on ways to capitalize on it is Tata. As the Maruti 800 had been favored by Indians since 1984, it had become the best selling car in India until competition from other firms ramped up in the 2000’s. During this time, 2.5 million 800’s were sold; showing the size of the market (9). When Tata saw the opportunity to make a competitor for the 800 in the light of the Maruti not meeting

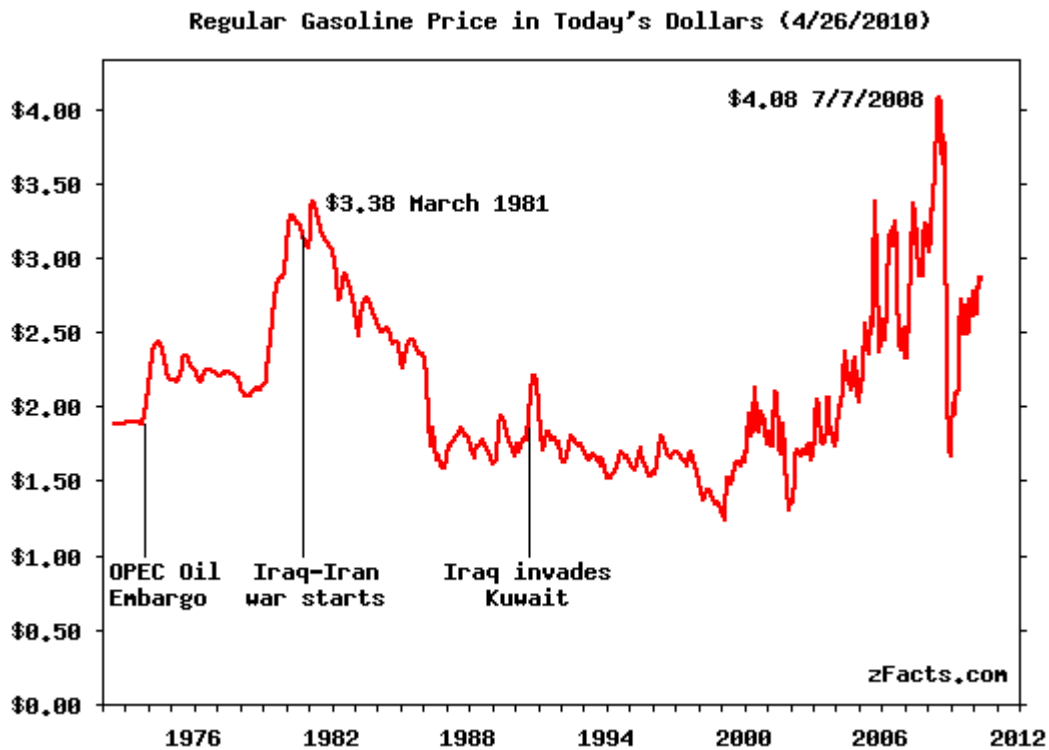
BS IV emission standards for the next generation, along with declining sales in the face of competition, they created the Nano. This car has been seen as the benchmark of other microcars since its introduction as it meets European IV standards for emissions and safety; something that most cars in India cannot say they achieve (33).

As car prices were decreasing in price, other companies listed in the examples section have been developing microcars to gain market share contra the Nano, but there have not been any production examples. Other companies such as Chevy have only had prototype vehicles shown at Car Shows and Expos. The Chevy Spark does have a gasoline version of their Indian electric concept car, but have not produced it due to their efforts shifting to producing a Nano competitor in the less than \$5000 price range (7). Another potential competitor against the Nano is from Bajaj, a gigantic producer of motorcycles and scooters in India, who partnered with Renault/Nissan in May 2008 to produce a prototype to compete with Tata (3). Reports say that the car will be on the market starting in 2012 at a price near \$3000, and soon thereafter several companies will follow in the same suite. Between now and 2012, the Nano has the opportunity to be sold uncontested and gain loyalty around India.

Demand for Oil

The price of oil globally is planned to increase over the next decade due to an incredible increase in competition. Much of this competition comes from China and India. Statistics show that demand for oil imports by China and India will almost quadruple by 2030 and could create a supply “crunch” as soon as 2015 if oil producers do not step up production (39). This translates into higher oil prices for everyone, but resonates most with poorer

car buyers who consider fuel price much more than buyers in developed countries when purchasing a car. Prices for fuel in the United States are very low compared to most countries in the world; not excluding India. The graph below shows the price of oil since 1972, adjusting for inflation.

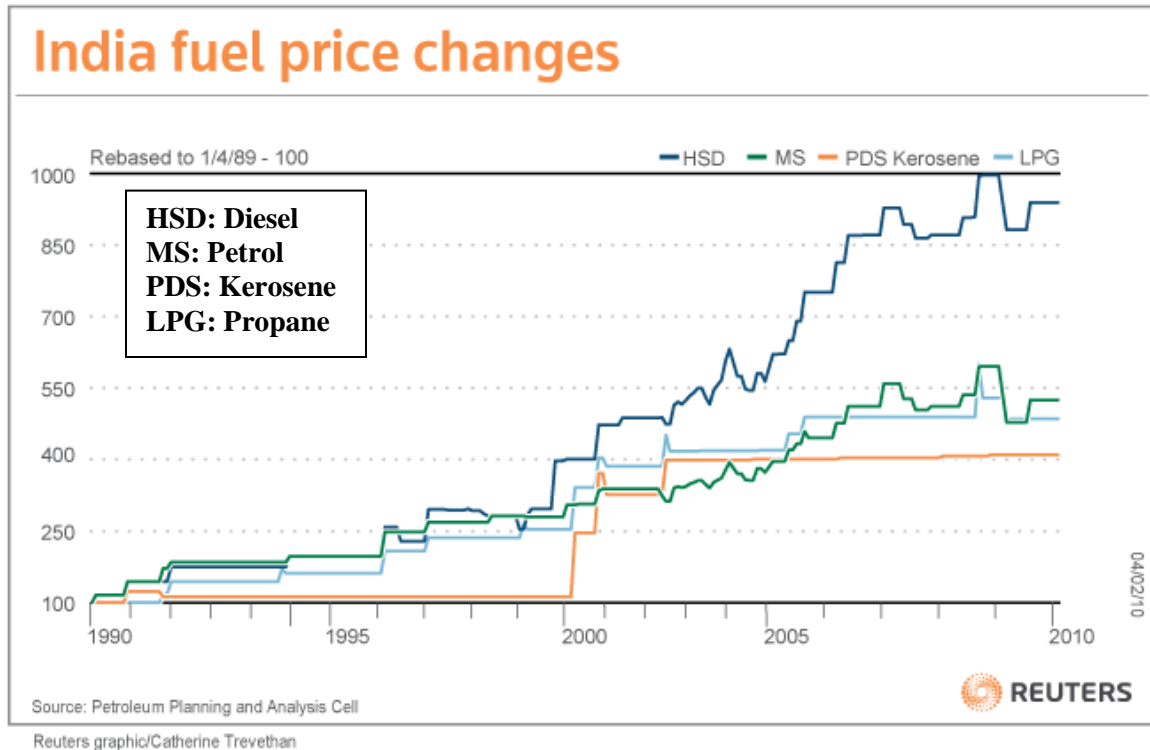


Graph 1: USA Fuel Prices Since 1972

Oil prices in the USA have had their high points, specifically during the early 1970's, the early 2000's and most recently. But overall, the price is far lower than gas prices in the International market, with an average price of \$2.50 per gallon of petrol since 1976.

During the times when gas prices were the highest, there were efforts in the United States to make more efficient cars, but most of the time these labors did not lead to much lasting change. The highest average gas mileage for cars and trucks in the United States was in year 1982 (4). Since this time, average gas mileage has decreased due to increased

average size of vehicles (such as the SUV boom,) other weight-adding measures like safety equipment, but mostly the lack of drive to make more fuel efficient cars is the low gas prices. In India, where gas prices have averaged \$3.20 a gallon over the past two decades, the developing economic environment makes higher fuel costs a larger issue and thus drives the microcar market.



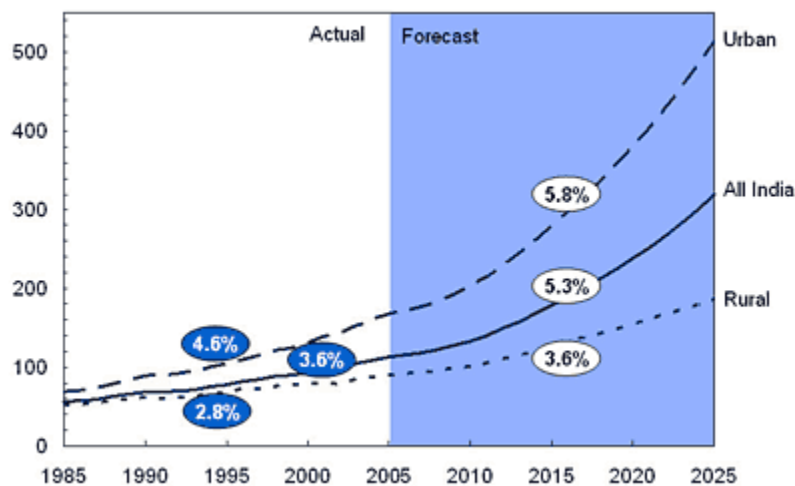
Graph 2: India Fuel Prices since 1990

Increasing global demand will translate into higher prices for all; making microcars demanded further in the Indian market and could potentially create a bigger force for a microcar market in the United States.

Shift in Indian Demographics

Even with higher fuel prices, more Indians will be able to afford a car and fuel as their overall GDP per capita income increases. According to the World Bank, the 2008 per

capita income stood at \$1019; up from \$452 reported at the turn of the millennium. This is an impressive jump as there are over a billion people in India. Through these strong positive indicators, 400 million Indians still are classified by the UN as “very poor,” and though urbanites are seeing the most from the growing economies, 1/3 of urban folks live in shantytowns (8). The graph below demonstrates GDP per capita growth since major economic liberalization, and includes a prediction for continued growth rates in the country.



Source: PBS NOW

Graph 3: Historical and Forecasted GDP per Capita in India

Though rural areas are predicted to grow more slowly, the microcar is going to still succeed due to three factors. First, the poor are more likely than middle class to pay for common goods (such as fuel) due to availability and other situational factors. Second, the poor have a higher likelihood of spending their disposable income on more luxurious items (like cars) instead of other obligations such as their home. And finally, this emerging economy will eventually modernize as unprecedented growth and modernization in the urban setting will find its way to the rural areas in time. All of the GDP per capita factors combined make a very real demand and market for microcars.

More people will have the resources to purchase cars in the near future, and the concept of a microcar make the ability to purchase a car realistic through their inexpensive price, fuel and maintenance. There were 1.53 million cars sold in India 2009, up from 1.22 million the previous year. Analysts say expected growth 10-14% this year (15).

III. Market Opportunities and Forces in the United States

Changing US Car Preferences – Smart ForTwo Case

According to CBS news, in the United States, “When it comes to better gas mileage, size matters;” this report is in response to the Smart ForTwo entering the US market in 2008 (40). When fuel prices were at \$4.00 a gallon in some areas, only the Smart car imported into to the US was trying to revive the microcar pasts created in the early 1990’s (Honda CRX, Geo Metro, etc.) and fill the need for improved fuel efficiency. Smart USA, a subsidiary created by the Penske group created when Daimler AG did not want to import and associate Smart under the Mercedes label as they believed it would tarnish their brand and there was not a need (19). But according to Penske, they believe that the microcar market is ready for the Smart ForTwo. The American version averages 40mpg; a vast improvement over other small car options in the US and is much higher than the the current fuel efficiency standards though this is far less than European versions (some achieving 71mpg) (30). While aimed at being a commoner’s car, it has only seen success as a trendy car to buy rather than a wide-scale car for the masses as it is in other places in the world. One of the major issues that Smart is running into is convincing American drivers to drive something smaller than they are accustomed to. Americans, in general, enjoy large roomy cars and space. This is evident as cars over the past few decades have become larger and heavier vis-à-vis worse fuel economy as well. For example, a Honda

Civic in 1986 would average 55mpg while today's model averages 35mpg and is almost three feet longer and weighs nearly half a ton more (40).

According to an American car magazine, the reason cars today are so much larger and heavier than the past is safety standards and the perception of being safe.

One of the main car performance testers and editors of Car and Driver magazine says that safety equipment standard in most cars today including front, side and curtain airbags, antilock brakes, and intrusion resistant structural design add on average 700 lbs to the car weight thus inhibiting fuel economy. In retrospect, the newest administration and congress in Washington are forcing automakers to achieve fleet averages of 35mpg.

Now Congress is looking to force automakers to increase mileage standards. A proposed new law would mandate that manufacturers achieve an average of 35 miles per gallon across their entire fleet of cars and trucks (5).

Fuel Consumption in the United States

Efforts by Washington to curb fuel consumption are primarily driven by the need to reduce dependence on foreign oil. Car companies have not made cars that deliver better fuel economy in this country because the market has not demanded it. One way to bring the need for better fuel economy is through a larger gas tax at the federal level (14). This will increase the consumer price and encourage Americans to use less fuel and potentially push the need greater for a microcar market in the US.

The driving culture in the United States is also an aspect that can be examined to help decrease fuel consumption and adhere to new fuel standards. In general, the American

attitude of “bigger is better” and driving more than most citizens of other countries keeps fuel demand high (4).

Renewed Attempts to Create a Microcar Market

Several companies, both domestic and foreign, have seen the rising gas prices in the US and are beginning to develop American versions of microcars that fit with trends and preference in the United States. Ford and GM showed off their international chassis-based microcars (same chassis as their Indian microcars) in 2008 when the Smart ForTwo was gaining popularity (10).

According to an automotive consulting company CSM Worldwide, even with ever increasing gas prices in the US, any car smaller than the current lineup of subcompacts in the United States will not sell well (Examples Honda Fit, Nissan Versa and Toyota Yaris.) This group calls microcars a vehicle with a length less than 150 inches. Their analysis states that American buyers generally will sacrifice a few miles per gallon to buy slightly larger, slightly more expensive cars. Their forecast is that microcars will not make much of an impact in the U.S. market: selling only 100,000 microcars through 2013 (29). Though this is a prediction of slow sales, large online and viral marketing interest through social media sites and forums predicts stronger sales. As an example, smartusa.com receives millions of visitors each quarter meaning there is a strong demand for the Smart brand (30).

An American attempt to revive the Geo Metro microcar is from GM. There are doubts that their microcar (similar to the Indian microcar prototype) at their executive level

because of their poor sales of the Chevy Aveo. Their concept, produced at their South Korea factory, incorporated the facts that microcars sell well in much of the world but kept in mind US preferences including creating the illusion of greater height and width to make the car appear bold and strong. The car is only 141 inches long and would be the shortest car sold in the United States; 11.7 inches smaller than their Aveo hatchback (29). According to several articles, the GM microcar was going to be marketed in the US beginning in 2010, but that was predicted before their bailout. Forums still indicate that the concept will be sold in the US within a few years (29). One major aspect that will determine the success of the GM microcar, as well as other American microcars, is the willingness of dealers to sell the cars. With GM dealers barely surviving the recession, most will want to sell larger, more profitable cars to their customers. With the small margins on microcars, some dealers may not want to sell them especially after the slow sales of the Aveo.

Subcompact Vs. Microcar

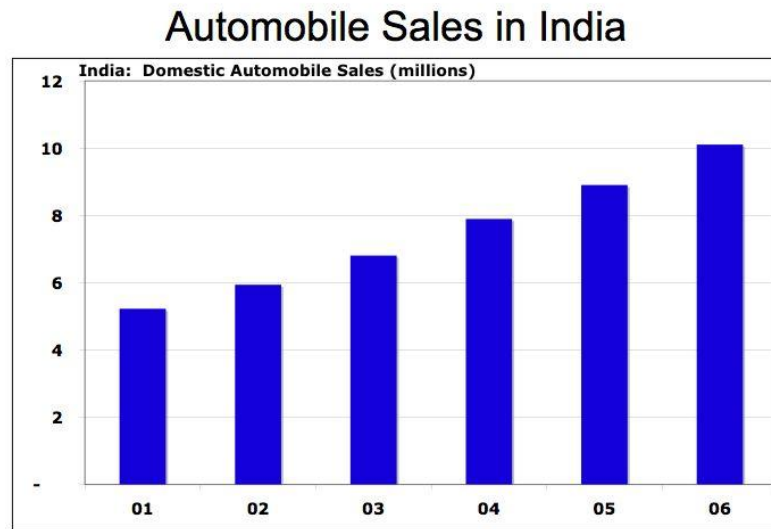
Even though CMS consulting (noted above) predicts microcars to not sell well, they expect subcompacts to increase in sales over the next few years. Subcompacts are the class larger than microcars but smaller than midsize sedans. These cars will sell well because they fit better with the American lifestyle, while being a substantially bigger vehicle and achieving good fuel economy. They are also safer vehicles and are perceived to be safer than microcars; a very valuable aspect to Americans.

IV. Conclusions

Gas Prices:

One of the greatest reasons that cars in India are smaller and use less gasoline than those in America is because of the price of gas and the population who can afford that price. Research shows that gas prices have always been slightly higher than they are in the United States where gas prices are currently averaging \$3.20 a gallon where as in India they average \$4.00 per gallon of petrol. In India's economic environment and with their average income in the low \$1000's, there is a specific group of cars that are available for purchase for most Indians; microcars. As the average price for these cars are in the \$5000's, these cars are much more affordable to most people than regular cars; including those who live in poverty. Cars this low in price must be smaller because they use much less materials than cars seen in the United States and use less fuel as well. As more Indians buy cars and the demand for oil goes up with the increase of the Indian middle class, this explosion of microcars will drive up the price for oil and thus keep the demand for microcars high versus regular sized cars in India. Increases in gas prices may seem high in the American market, but considering the 37% of Indians in poverty, this change in price can mean the difference of affording a car or a smaller form of transport such as a three-wheeler or moped (8).

Growing Indian Market:



Source: Society of Indian Automobile Manufacturers

Graph 4: Increasing Automobile Sales in India

With a growing economy, even through the global recession, the need for personal transportation has greatly increased since economic liberalization in the past few decades. The need for personal transportation has translated into India becoming the second largest two-wheeler market in the world, the fourth largest commercial vehicle market in the world and the 11th largest passenger car market in the world. In 2016, predictions indicate that India will be the 7th largest car market in the world showing the vast opportunities for domestic and foreign firms (2). As more people come out of “extreme poverty” and move into “poverty,” there will be more people who can buy microcars in India. Cars like the Nano are designed to be purchased by the commoner in India, with an average income just over \$1000 per year or by groups in rural populations looking for cheap transportation. Many firms have seen the Nano’s popularity in response to the growing market and wish to produce a similar vehicle.

Demographics:

With the growing economy, Indians have enjoyed an increase in per capita GDP. This allows for the purchase of more consumer items such as an automobile. Per capita GDP has increased 55% in the past decade allowing for microcar sales to thrive (25). One of the major differences in the automotive market, specifically for microcars is the larger use of cash-in-hand to purchase a vehicle instead of the use of credit. As only 1 billion people have access to credit around the world, most being in developed countries, the lack of access to credit to the vast majority of Indians prevents the sales of more expensive cars in many cases due to cost (27). In the United States, the majority of cars are purchased through the credit market allowing larger more expensive cars to be purchased. In India, cars are purchased closer to income levels and within their means ergo the microcar price range.

Public Transportation

In part due to the lack of road infrastructure and quality of roads in some areas, the use of public transportation is much higher in India than it is in the United States. For example, the train system in India is one of the most used in the world in both the rural and urban settings (44). There are both formal and informal systems of public transportation including: auto rickshaws, taxis, and palanquins translating into less of a need for a car that can carry many people. In the urban setting, the informal sector plus busses negates the need for a large car. In the rural setting, getting from village to village is possible with supplies in third class coaches. In the United States, our roads are far more developed and expansive. As most places in the US can be driven to by car on developed roads, there are more people that have cars in general. Groups of people are more likely to get to drive

together somewhere rather than in India, where people will take public transportation and meet. Overall, even though the quality of public transportation in India is not as good as it is in the United States, due to average incomes and the lack of personal transportation through the decades of Indian development, people are accustomed to using public transportation. As more people buy personal transportation, it can be concluded that average passenger loads will be very low as public transportation will still be readily available and used.

Mileage vs. Safety Trade-off

A simple physics equation shows that the less a car weighs, the more likely damage will occur to the car and its occupants. For example, if a car weighs 1000 kg while a car hitting it at 30kph weighs closer to 2000kg, the first car is at a great disadvantage according to $F=m(dv/dt)$ (where F is force of accident) physics. Thus, many American feel obliged to purchase a larger and heavier car to counteract this. General Motors was famous for stating that they sell cars “by the foot and by the pound” in the 1950’s and 1960’s, starting a dangerous trend of overweight cars. These cars may weigh more, but the trade-off is worse fuel economy. There is a direct inverse relationship between safety and mileage because of the weight that safety equipment and design adds to a car. Over the years, regulators have continued to add safety requirements for cars sold in the United States and without using different types of materials; cars continue getting heavier and thereby less fuel efficient. India has their own safety standards that parallel the last generation European standards, and the Tata Nano claims they meet them. Most mircocars in India have no safety features though Tata has a European Nano that meets

current Euro IV standards (35). Until microcars are as safe as the example set by Smart, there will not be multiple major microcar players in the United States.

Setup of Roads

The setup of both rural and urban settings in the United States and India is very different. In India, most urban settings are much more compact and do not have modular planning as seen in American cities. In the rural settings, people live together in villages in small spaces rather than spread out as people live in rural America (6). Because of the large distances between people and towns in the United States, there is a need for larger vehicles to carry people and materials. The US has many more rural; backcountry roads and highways that make the need for a larger vehicle necessary, as well as the power to maintain highway speeds. The average Indian will take the train or a bus if they need to travel far distances rather than taking their car. This means that most of their personal driving needs will be short distances or in cities where small cars are needed. The small stature of these cars also makes traffic and parking much easier. Parking and traffic in most areas of the United States are very small problems in comparison with Indian cities. Americans are able to drive their trucks into cities, park, and sit through traffic with no problem; this is not a reality in India. As most city plans in Indian were thoroughly developed before the advent of the automobile, roads are generally smaller and denser than they are in the United States where many cities were planned around the idea of personal transportation (6). This has a significant influence on the car buyers in both countries and also has major influence on car design.

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Speculation

With global crude oil prices increasing, accompanied with an uncertain future supply and global competition for other raw materials that comprise automobiles, the necessity of microcars for basic transportation will increase in both India and the US. There are huge opportunities in both markets for domestic and foreign firms, but the Indian market is already setup and demanding microcars.

Indian

Moving forward in India, microcars will need to continue to adhere to strengthening safety and environmental standards while keeping the price low. A potential firm will have to produce a car in the less than the \$3000 price range if one would want to take a large part of the car market share overall. Cars more expensive than this will not be able to compete even if they have more features. Most Indians prefer the chance to own a basic car rather than one with many features. A basic car is available to more people vis-à-vis larger target market and opportunity. The microcar revolution is just the beginning in India, and firms still have the opportunity to enter the market early.

United States

In the United States, only the market can bring a microcar revolution; most likely through higher fuel prices. Due to supply and demand or through higher fuel taxes, a higher fuel price can bring the need for more microcars to the United States. But, due to road setups in the US, the “bigger is better” attitude, and the need for more powerful and larger vehicles, microcars in the US will always be different than they are around the world. Through larger cars using lighter weight materials in their safety systems or new technologies incorporated into microcars, the safety aspect of future American vehicles

will drive the demand in the automotive market. With better microcar safety, this can assure Americans that microcars are a better alternative to other forms of personal transportation therefore increasing demand and creating opportunity for automotive firms.

Technology Improvements

Much of the technology used around the world every day in global transportation systems is 30 years old. In flight, the F16 and the 747 are essentially the same as they were when they were produced in the designed in the early 1970's. In US cars, much of the materials, safety features and engine design were products of the oil embargo era. This has led to cars continuing to meet safety and environmental standards in the United States, but not evolving to keep weight down. A study in 2001-2002 by the Rocky Mountain Institute (a nonprofit engineering/design group) used technology used in Formula 1 cars to produce a small sized SUV close to the size of a Ford Escape. This size was determined by the group as very popular in the American market. Tests showed that this hybrid SUV, with all modern environmental and safety features to meet US standards achieved 99mpg (28). This stands against the Ford Escape hybrid that achieves 40mpg averages. Technology shared saved weight and was designed to have extremely low drag. This is an outlier example, but it shows that improvement in gas mileage is possible while saving weight. Some of this technology, mostly intensely strong light weight construction materials like carbon fiber, can be used in microcars to keep weight low while being strong enough to maintain safety barriers for car occupants. This same group also has worked with semi trucks in the past and has determined that simple changes to side skirts of semis have drastically improved fuel

economy. This is another improvement that either larger cars in America can use to fit into a market of increasing gas mileage, or the larger American flavor of microcars can use to be more fuel efficient.

Another technology that has not changed in many decades is battery technology and electric cars. In the face of the oil embargo, many electric cars were produced as an alternative transportation method to gas burning vehicles. Since this time, very few changes have been made in the design and technologies in an electric car (31). A notable exception is the GM EV1 that was made in 1994, but this project was pulled as GM felt the demand was too low for a mass produced electric car. A microcar that is powered off of batteries rather than petrol or diesel has potential in both the Indian and American markets. Because the design of electric cars in the United States, as well as regulation limiting most Electric Vehicle's to 35mph, there is not a large demand for an EV microcar in the United States (31). But, in India where Tata already has a prototype EV Nano and GM is designing their "Spark" EV, there is a more real market potential for this type of microcar. The only limiting factor is the weak power grid in some Indian cities not being able to support mass amounts of EVs.

V. Final Thoughts

The market for microcars in India is greatly increasing due to their lively middle class and large population moving out of poverty. With the microcar market very small in the United States, there is great potential for a microcar market, and possibly the global recession and new environmental movements could trigger a microcar revolution similarly seen in India. Preferences for larger vehicles ("bigger is better") in the US for a

sense of security against surroundings have butted-out microcars from the domestic market. Also, the extra power desired for performance as well as for highway speeds and utilitarian purposes makes microcars a hard fit for Americans, but better used by Indian drivers. Smaller parking houses and more cramped roads, especially in cities makes the need for a microcar greater in India as well as a requirement for better fuel economy due to lower per-capita income than observed in the US. With an overall increase in the demand for oil and other raw materials, the need to produce microcars in the largest car market (The US) in the world will increase, but for the time being, there is no need to with relatively low prices for fuel and materials. The overall differences in economic standing and status, as well as cultural preference variances discussed in this thesis are the root causes of the rise of microcars in India and the lack of such a market in the United States.

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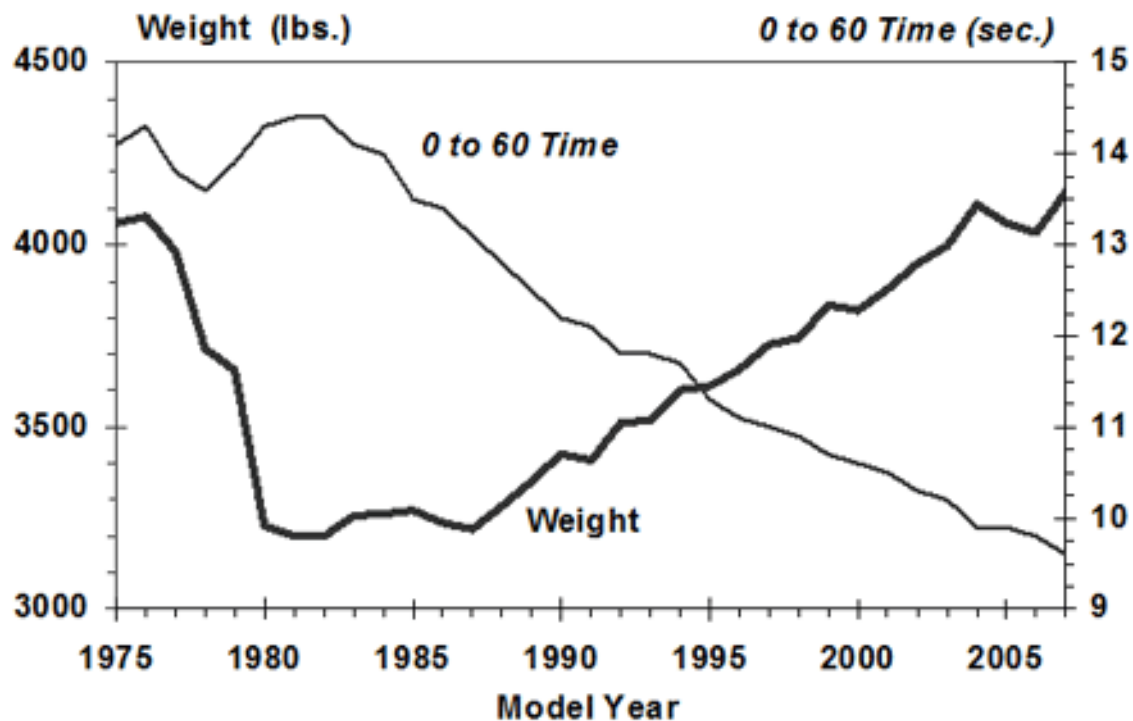
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Appendices

Appendix A

United States: Driving Preferences Preference and Safety Vs. Fuel Economy Trade-Off

Market Demands: Faster, safer, larger vehicles



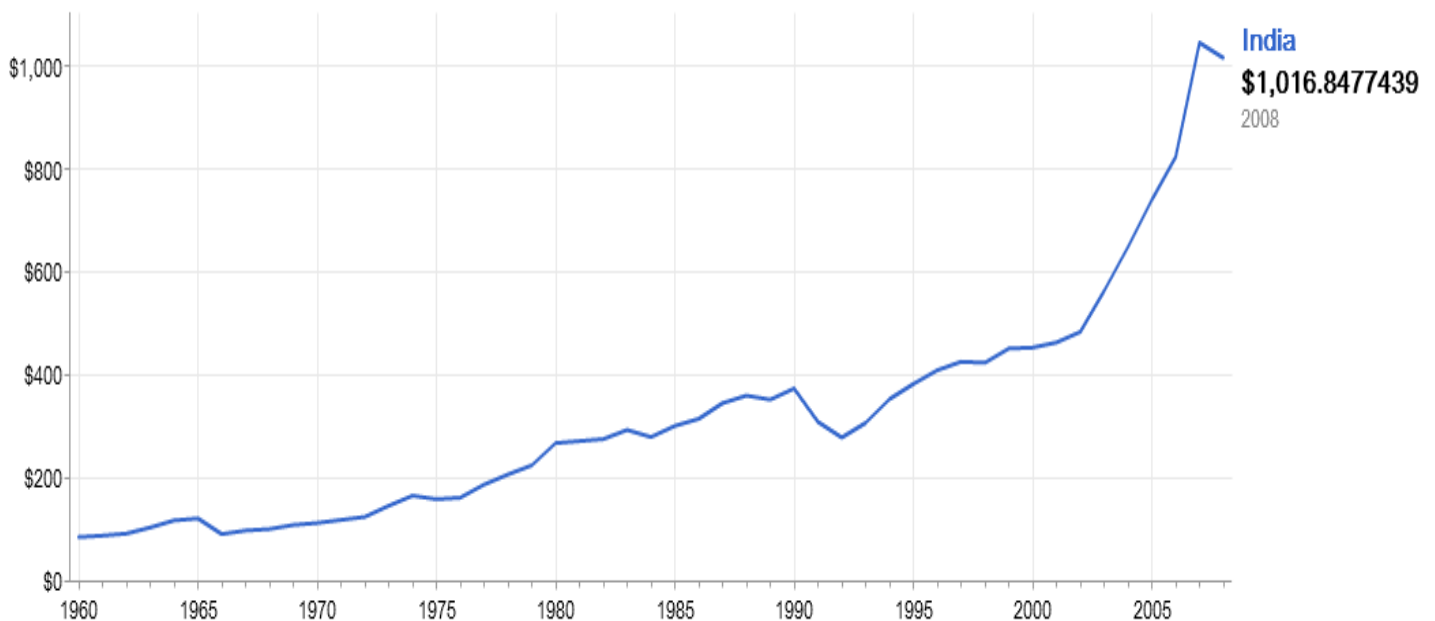
Source: EPA.gov

Important Considerations: Desire for performance, weight added by safety requirements, preference for space, historical low fuel cost

Appendix B

India: Microcar Sales Boom Opportunities for Foreign and domestic firms

Increasing Income: More disposable income to purchase luxury goods



Source: World Bank

Important Considerations: Per capita GDP still low, expensive fuel, large growing population in need of personal transport