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CAR INDUSTRY IN MEXICO

THE SAFETY ISSUES OF THE NISSAN MEXICANA TSURU (SENTRA II)

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APRIL 2016

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INTRODUCTION

This document describes the results of an analysis regarding the vehicle industry in Mexico and is particularly focussed on the Nissan Tsuru. This study aims to identify the historical annual production of Nissan vehicles and, in particular, the Tsuru in Mexico. This will provide a general overview to understand the Tsuru's impact on the Mexican car industry and market as one of the top sellers. In addition, this study also aims to assess the safety issues related to this vehicle in order to identify the number of people killed in Mexico in accidents that involved a Tsuru, and the number of deadly accidents where a Tsuru was involved.

Relevant sources of information have been analysed and correlated in order to identify the required outputs. All analysis, graphs and tables presented in this document have used data from the following sources:

- The National Institute of Statistics and Geography (INEGI¹)
- The Mexican Association for the Automobile Industry (AMIA²)
- The Mexican National Commission for Insurance and Bonds (CNSF³);
- The 3rd CONAPRA report for road safety accidents in Mexico⁴; and
- A technical monograph from the car industry published by the Mexican Ministry of Economy⁵

This document provides a brief overview of the importance of the car industry in the Mexican economy. It describes the establishment of Nissan Mexicana, its production and top seller cars including the Tsuru (Sentra II).

It also includes a thorough analysis of the safety issues concerning the Tsuru. Given the official national statistics and calculating probabilities, this report also estimates the minimum number of deaths and crashes observed in an accident involving a Tsuru.

¹ INEGI – Instituto Nacional de Estadística y Geografía. <http://www.inegi.org.mx>

² AMIA – Asociación Mexicana de la Industria Automotriz. <http://www.amia.com.mx>

³ CNSF – Comisión Nacional de Seguros y Fianzas. <http://www.cnsf.gob.mx>

⁴ CONAPRA – Comisión Nacional para la prevención de accidentes
www.conapra.salud.gob.mx/Interior/.../3erInforme_Ver_ImpresionWeb.pdf

⁵ <http://www.economia.gob.mx/comunidad-negocios/industria-y-comercio/informacion-sectorial>

BACKGROUND

The Mexican Car Industry

The vehicle industry in Mexico dates back to 1925. The first vehicle manufacturing company established in Mexico was Ford Company in 1925. In 1935 General Motors started operations and, in 1938, Automex, which later became Chrysler, opened. All the vehicle manufacturing plants were established in Mexico to meet the domestic demand. In 1962, the Government issued a Decree to strengthen the domestic market. This Decree eliminated vehicle imports, imposed a minimum of auto-parts made in Mexico (60%) and set prices in the market to raise productivity. In 1977, a new Decree was issued to foster the automobile market as an export sector. The new Decree cut the minimum of auto-parts made in Mexico and established that 30% of the production of vehicles had to be exported.

In 1990, the Former President, Carlos Salinas, issued a new Decree to authorize the imports of brand new vehicles. In 1994 the North-American Trade Agreement (NAFTA) came into effect. NAFTA reduced the import fees from 20% to 10% and eliminated them in 2004 and also reduced the margin of auto-parts made in Mexico to 29% in 1998 and eliminated the margin altogether in 2004. In 2004, the Former President, Vicente Fox, issued a new Decree to raise productivity and reduce costs in the automobile industry. The Decree promoted the foreign investment inflow and authorized the entry of new automobile manufacturers.

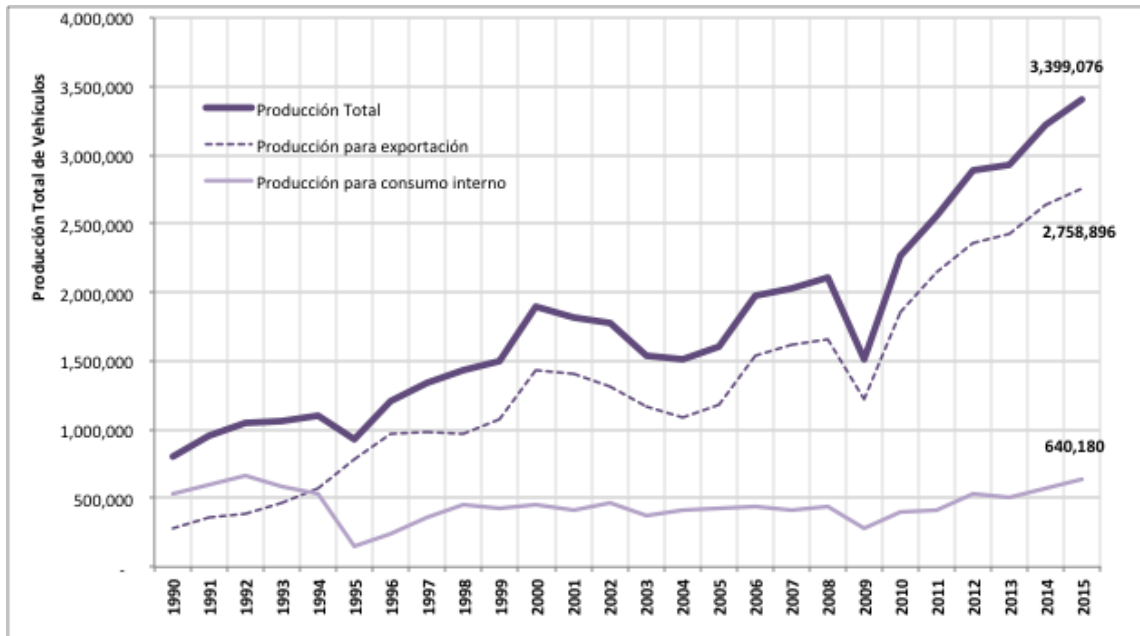
By 2013 the car industry in the country had reached a historic figure in terms of volume production, increasing from 1, 055 million units in 1993 to approximately 3 million in 2013. In 2009 the industry experienced a decrease in production of (-21%) in relation to 2008, this was associated to the global financial crisis.

However the sector experienced a strong improvement in production in the following years with an annual increase of 53%, 22%, 12% and 10% for 2010, 2011, 2012 and 2013 respectively. The success of the following years after the recession may be associated with the commercial policies the Mexican government implemented that encouraged vehicle trade where more than 82% of the total vehicle production in the country is for units that get exported.

Mexican Car Industry - Annual Production

The following graph shows the total vehicle production for the last two decades. It is worth noticing the strong link that this industry has in the NAFTA region (see figures for 1994). The automotive industry is without doubt NAFTA's most representative success story.

Figure 1 – Total vehicle production in Mexico by type of production



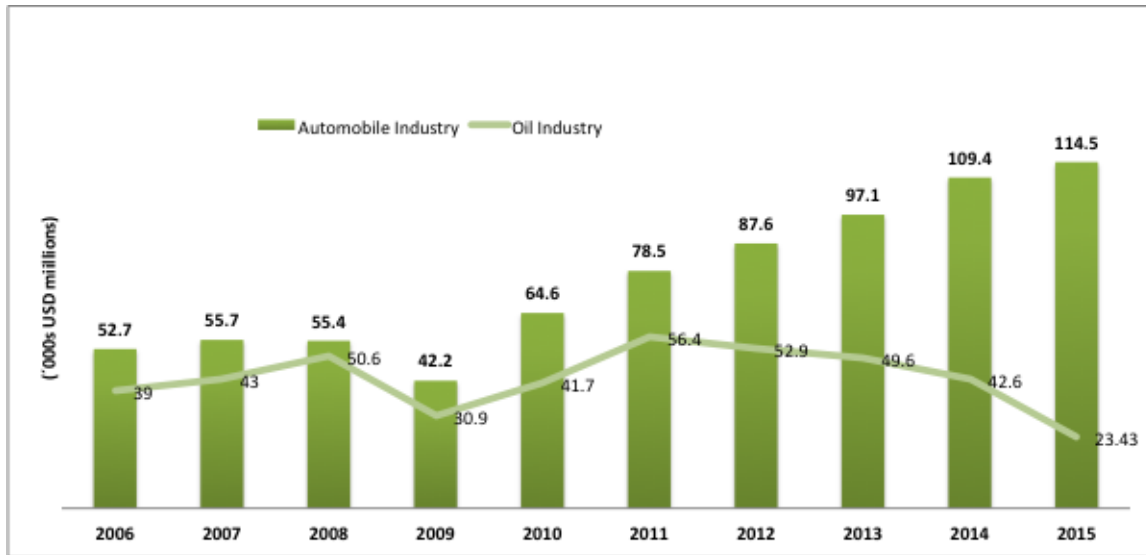
Source: Graph elaborated with data from the Mexican Association for the Automobile Industry (AMIA)

The car industry in Mexico is the most important and dynamic sector in the country. In 2015 the car industry represented 20.3% of the total national exports that reached US 380,201 million⁶, compared to 19% in 2012. In the last 20 years (since 2013) the car industry has increased its contribution to the Mexican economy by 8.5 times, compared with only 1.59 for oil industry in the same period. The car industry in México has been a strategic driver for the Mexican economy. Exports from this industry are the greatest contributor to foreign currency in the country, above the oil industry. In 2015, car industry exports represented 25.5% of total exports and 30.9%⁷ of the manufacturing sector.

⁶ INEGI Trade Balance December 2013

⁷ Monography in Car Industry. February 2014. Mexican Ministry of Economy

Figure 2 . Exports Car vs. Oil Industry 2006 - 2015



Source: Ministry of Economy with data from the Mexican Central Bank.

The Mexican Ministry of Economy reported that in 2013 it ranked 4th as a world light vehicle exporter, only below South Korea and above Spain. According to data from the International Organization of Motor Vehicle Manufacturers (OICA), in 2015, Mexico ranked as the 6th largest vehicle producer in the world, and in 2015.

Table 1 – Main World Light Vehicle Exporters

| Rank | Country | million units | | % change |
|------|----------------|---------------|------|----------|
| | | 2010 | 2015 | |
| 1 | China | 18.26 | 24.5 | 34.2% |
| 2 | USA | 7.74 | 12.1 | 56.3% |
| 3 | Japan | 9.62 | 9.27 | -3.6% |
| 4 | Germany | 5.9 | 6.03 | 2.2% |
| 5 | South Korea | 4.27 | 4.55 | 6.6% |
| 6 | Mexico | 2.34 | 3.56 | 52.1% |
| 7 | Spain | 2.38 | 2.73 | 14.7% |
| 8 | Brazil | 3.38 | 2.42 | -28.4% |
| 9 | Canada | 2.06 | 2.28 | 10.7% |
| 10 | France | 2.22 | 1.97 | -11.3% |
| 11 | United Kingdom | 1.39 | 1.68 | 20.9% |
| 12 | Check Republic | 1.07 | 1.3 | 21.5% |

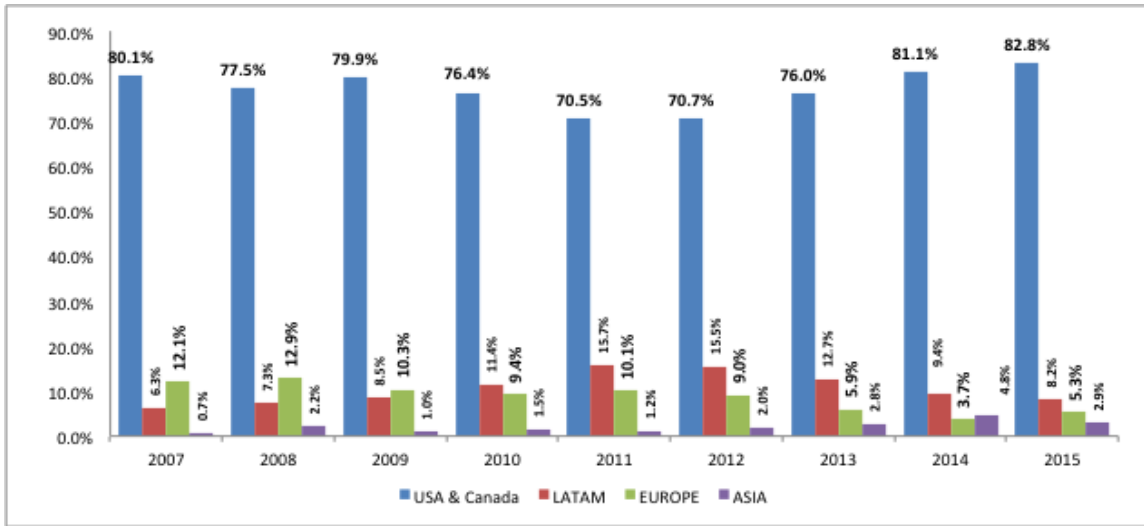
Source: OICA

Exports Mexican Car Industry

The following graph shows that most of the vehicle units produced in Mexico are exported to the US and Canada. This represents a share of 82.8% from the total production in 2015. An average rate of exports to US and Canada has remained constant and over 70% for the last nine years.

For the same year, Figure 3 shows that exports to Latin America reached 8.2% and Europe and Asia with a share of 5.3% and 2.9% respectively.

Figure 3 – Market share of the vehicle production in Mexico by region



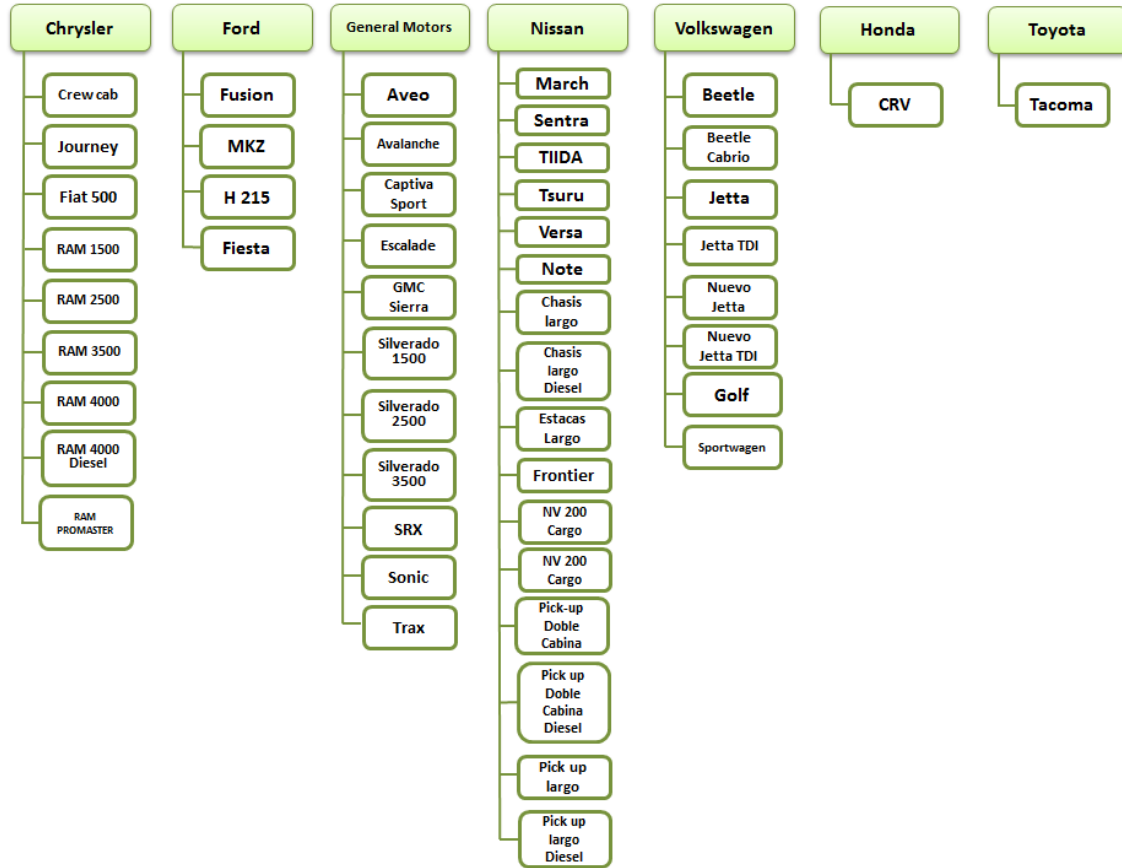
Source: Graph elaborated with data from the Mexican Association for the Automobile Industry (AMIA)

Domestic Market Share by brand (light vehicles) - Mexican Car Industry

There are 19 production car plants in the country across 11 states. Currently, Mexico produces more than 50 car models of light trucks and vehicles as shown in the following chart.

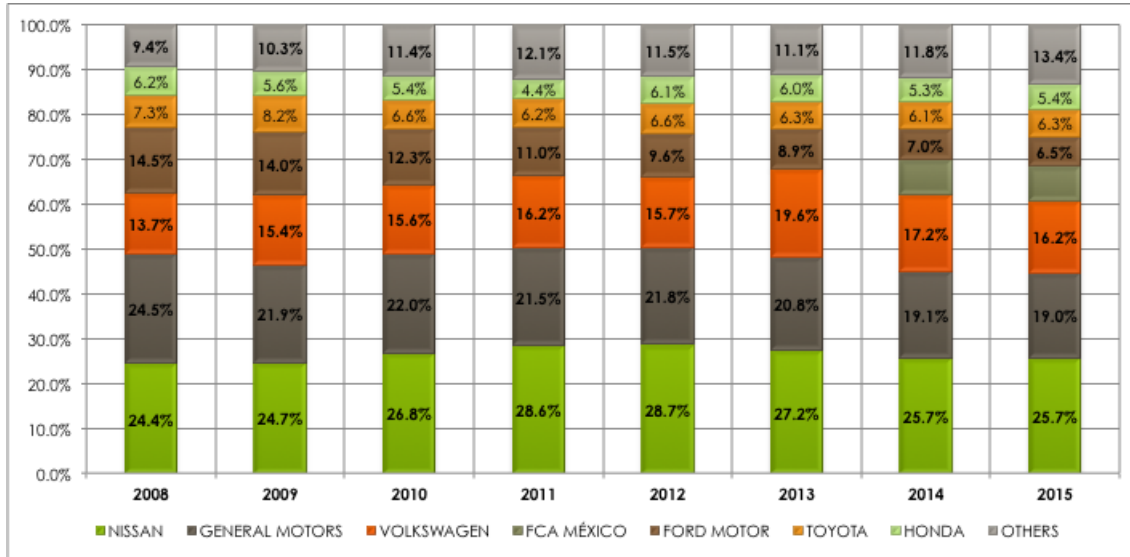
Nissan is the brand with the highest number of car models in the production line. This is the result of Nissan’s successful strategy to provide affordable, low cost and convenient vehicles.

Figure 4 – Car models for the most significant brands established in the country



The following graph shows the market share of the main brands producing light vehicles that are sold in the country for the period 2008 to 2015. Among the most significant brands, Nissan has reached a considerable market share of more than 25% for more than a decade, followed by General Motors and Volkswagen.

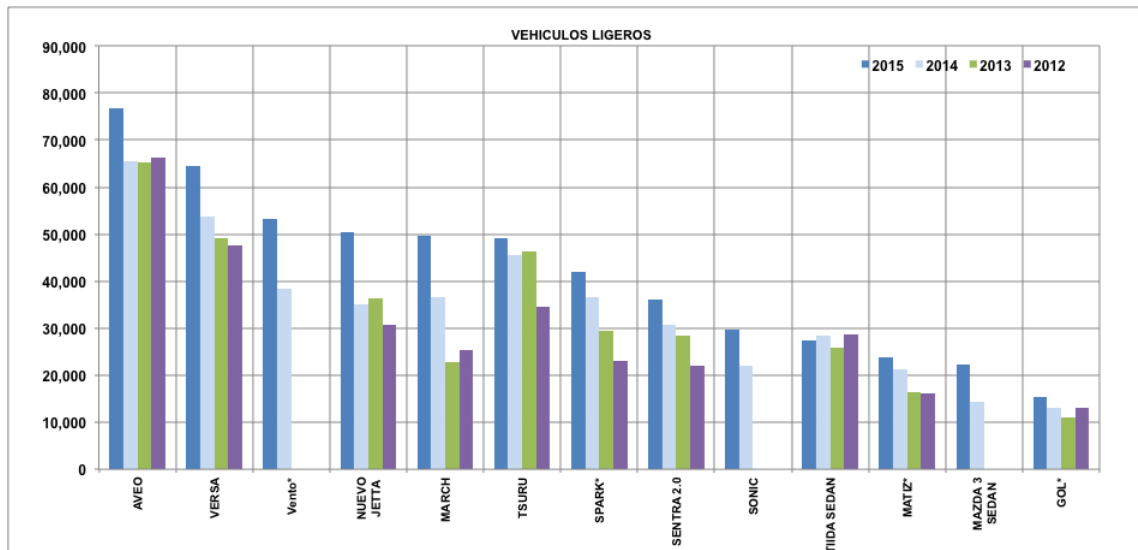
Figure 5 – Market share participation by brand for light vehicles sold in the country



Source: Graph elaborated with data from the Mexican Association for the Automobile Industry (AMIA)

For the last three years, the top three selling cars in Mexico included the Aveo, Versa and Tsuru. This indicates that Nissan’s vehicles are still very in much favour in the Mexican market. The Tsuru in particular remains popular among new buyers looking for convenient and low cost cars.

Figure 6 – Best Sellers Cars in Mexico 2013 - 2015



Source: Graph elaborated with data from the Mexican Association for the Automobile Industry (AMIA)

“NISSAN MEXICANA” - CAR INDUSTRY

Nissan in Mexico

Nissan Mexicana was established in Mexico in 1961. It owns two plants: the Cuernavaca vehicle production plant (with the production of the **Tsuru**, Versa/Tiida and Pickup) and the Aguascalientes plant (with the production of the Platina, Versa/Tiida, Sentra, Renault Clio) as shown in Figure 8 in Annex I.

In addition it owns three development centres. In 1966 Nissan Mexicana commenced vehicle production at the Cuernavaca plant, as Nissan's first overseas plant. By 1971 it commenced export to Latin America and the USA in 1995. The company acquired the number one market share in Mexico by 1987, the success promoted the engine production at the Aguascalientes plant in 1983 and a full vehicle production by 1992. In 2007 it initiated exports to Europe.

According to the Mexican Association for the Automobile Industry Statistics, Nissan Mexicana had more than 40% of the market share in October 2013 for the production of light vehicles (ranked the first in the country). One of Nissan's characteristics in Mexico is its high sales efficiency and one of its most successful cars was the Sentra introduced in Mexico in 1984.

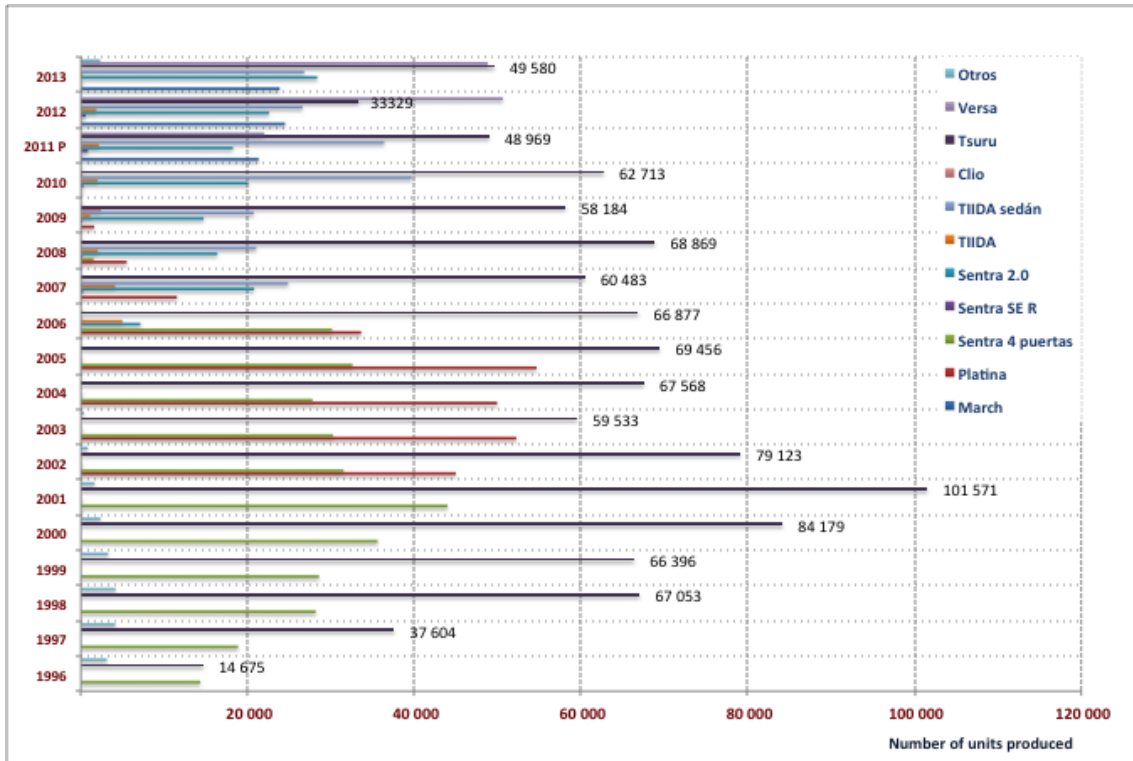
In Mexico the Sentra (B11 model) was called the Datsun/Nissan Tsuru, the first three generations of the Sentra were known as the Tsuru (Japanese for crane) introduced in 1984. The 1994 model is still sold under that name, having gone through three model changes, alongside the current Sentra.

Table 2 – Nissan Mexico vehicle production by year and by type

| Nissan en Mexico - vehicles produced in the country | | | | | |
|---|---------------|------------|----------|------------------------------------|-------------------------|
| Name | Body | Introduced | Removed | Plant production origin | Available in the market |
| Tsuru B11 | Notchback | 1984 | 1986 | Mex Cuernavaca, Morelos | No |
| Tsuru B11 | Coupé | 1984 | 1986 | Mex Cuernavaca, Morelos | No |
| Tsuru B12 | Notchback | 1986 | 1990 | Mex Cuernavaca, Morelos | No |
| Tsuru B12 | Station wagon | 1986 | 1990 | Mex Cuernavaca, Morelos | No |
| Tsuru B13 | Notchback | 1993 | On-going | Mex Cuernavaca, Morelos | Yes |
| Tsubame B13 | Station wagon | 1993 | 2004 | Mex Cuernavaca, Morelos | Yes |
| Sentra B14 | Notchback | 1995 | 1999 | Mex Aguascalientes, Aguascalientes | No |
| Sentra B15 | Notchback | 2000 | 2006 | Mex Aguascalientes, Aguascalientes | No |
| Sentra B16 | Notchback | 2007 | On-going | Mex Aguascalientes, Aguascalientes | Yes |
| Tiida | Hatchback | 2006 | On-going | Mex Aguascalientes, Aguascalientes | Yes |
| Tiida | Notchback | 2006 | On-going | Mex Aguascalientes, Aguascalientes | Yes |
| Platina | Notchback | 2002 | 2010 | Mex Aguascalientes, Aguascalientes | No |

The following graph shows Nissan Mexico production by type of vehicle. The chart demonstrates that the Tsuru is the most popular vehicle for Nissan Mexico. Its production reached the highest volume in 2001 and it remains one of the top sellers for Nissan in 2013, and it is also among the top sellers in the Mexican internal market alongside the Versa.

Figure 7 – Nissan Mexico production by type of vehicle



Source: Graph elaborated with data from the Mexican Association for the Automobile Industry (AMIA)

The Tsuru (Sentra)

The Datsun 160J was the first Nissan vehicle introduced in Mexico. In **1984** the first Nissan Sentra (B11/1982-1986) was launched as a replacement of the Datsun 160J under the name "Tsuru". The Tsuru was quickly accepted by the Mexican market as a comfortable and affordable choice of car, however it did not replace the VW Sedan as the top-selling car in Mexico. A second-generation Tsuru was launched in **1989** (B12/1986-1990), with a more square-shaped and larger design. Neither generation managed to replace the Tsuru to become the best-selling car in Mexico.

The third generation Tsuru (the Sentra III, B13/1992-ongoing) was introduced in **1992**. This Tsuru featured a more rounded 1990s type design scheme. Soon the third generation Tsuru came to be known as powerful and comfortable, yet affordable. With the Chevrolet Corsa in 1994, however, the Tsuru had a new rival. It didn't take long for it to overtake the Chevy, and soon the Sedan. It reached the top in 1998 and it didn't missed until 2005, with the VW Pointer. The Nissan Platina was thought to be its successor, but the incredible volume of Tsuru sales kept the Platina further down in the rankings. The Renault-based Platina remains to date in the top 10.

The Mexican-built Sentra B13 is still sold in Mexico as well as parts of Asia, Africa, the Middle East, Central America and South America. Tsuru vehicles destined for the Mexican market were modified by Nissan de Mexico specifically for the Mexican market and for the most part are identical to the 1991 model except for a new Renault clutch/transmission, updated Mexican made electronic systems and minor cosmetic and ergonomic upgrades. The Tsuru was the most popular car in Mexico from 1997 until 2011 when it was surpassed by the Mexican made Volkswagen Jetta. The Tsuru includes a catalytic converter, which is compulsory in Mexico and South America. Its affordable price, relatively good fuel economy, easy to fix and find spare parts make it popular among local taxi drivers and low income families in Mexico, South America, Central America, and the Caribbean.

The Tsuru remains the most popular choice for city taxi cab drivers in Mexico (Airport and hotel taxis usually consist of higher end vehicles) and are a replacement for the VW Beetle. Much like its predecessor, Tsurus have been sighted in the Southwest United States since Mexican nationals can operate them in the USA as long as they have the valid registration documents (they are illegal for sale and/or export into the USA **since they do not meet the DOT's safety requirements e.g. airbags and electronic stability control**).

Tsuru's safety issues

Regarding the safety of the B13 model (Tsuru), this study analyses and correlates information from the most relevant sources of data in relation to road accidents and crash fatalities where a Tsuru has been involved.

The Tsuru as the vehicle with the worst “index fatality score” in Mexico

Official National Statistics (INEGI & CENAPRA) data only provide information of total fatal accidents but this data is not segregated by type/brand of vehicle (this database provides the number of accidents and fatalities by road in a specific region). Therefore, this report also consulted information provided by insurance companies, which are collected and published by the Mexican National Commission for Insurance and Bonds (CNSF).

Note: it is important to highlight that CNSF only provides information from insured vehicles (not all vehicles in the country) and so merging with INEGI information was necessary.

In order to identify the “**fatality score**” of a certain brand/type of vehicle, both databases were merged. Only data from the period of 2007 to 2012 allowed to match both sources of information. The results can be translated as:

The probability or the “index fatality score” for a certain type of vehicle involved in an accident.

The “index fatality score” provides information about the safety of a car. Meaning that in a given year, the Tsuru experienced the highest index of accidents (Table – 3)

An “index” measure allows the comparison across all vehicles. So the rank/score is not determined by the number of vehicles but by the ratio of “X-brand fatal accidents” per 1,000 to “x-brand” total accidents experienced at a national level

It is worth highlighting that if two cars have the same number of fatal accidents, it is not possible to conclude that the safety protection in both cars is similar. However, the number of fatal accidents and deaths per 1,000 accidents provide statistical information about how the safety protection prevents a fatal accident in a specific car.

Table 3 – Fatal accidents per every 1,000 accidents by year and by brand for the top three highest index of accident rate

| Year | Highest fatality score | Type of Vehicle | Brand | Number of “x-brand” fatal accidents per 1,000 “x-brand” accidents | Number of “x-brand” drivers deaths per 1,000 “x-brand” accidents |
|------|------------------------|----------------------------------|--------------------------------|---|--|
| 2007 | 1st | Tsuru | NISSAN | 29.57 | 21.27 |
| | 2nd | Chevy | General Motors | 15.40 | 4.97 |
| | 3rd | Tsuru | NISSAN | 14.94 | 5.34 |
| 2008 | 1st | Tsuru | NISSAN | 26.096 | 13.17 |
| | 2nd | Sentra | NISSAN | 13.469 | 3.54 |
| | 3rd | Jetta Mod 99_11 (1) Chevy (2) | Volkswagen / General Motors | 12.35 (1) | 2.71 (2) |
| 2009 | 1st | Tsuru | NISSAN | 28.004 | 12.39 |
| | 2nd | Sentra | NISSAN | 16.050 | 3.93 |
| | 3rd | Jetta Mod 1999 2011 | Volkswagen | 13.64 | 2.95 |
| 2010 | 1st | Tsuru | NISSAN | 20.212 | 8.07 |
| | 2nd | Sentra | NISSAN | 11.926 | 2.68 |
| | 3rd | Jetta Mod 1999 2011 | Volkswagen | 10.82 | 2.24 |
| 2011 | 1st | Tsuru | NISSAN | 27.706 | 12.10 |
| | 2nd | Jetta Mod 1999 2011 | Volkswagen | 15.80 | 3.73 |
| | 3rd | Sentra | NISSAN | 14.53 | 3.11 |
| 2012 | 1st | Tsuru | NISSAN | 18.231 | 7.23 |
| | 2nd | Sentra | NISSAN | 10.58 | 2.37 |
| 2012 | 1st | Tsuru | NISSAN | 18.231 | 7.23 |
| | 2nd | Sentra | NISSAN | 10.58 | 2.37 |
| | 3rd | Jetta Mod 1999 2011 | Volkswagen | 10.75 | 2.35 |
| 2013 | 1st | Vectra | General Motors | 24.16 | 10.56 |
| | 2nd | Tsuru | NISSAN | 20.02 | 8.75 |
| | 3rd | Micra | NISSAN | 16.37 | 7.15 |

Source: results obtained with data from the National Commission for Insurance (CNSF) and INEGI

Note: for the years of 2007 to 2010 the highest rank was for “others” (a variety of cars aggregated in “others”), but these are not properly classified by the CNSF and comparison with single type of cars is not possible. Therefore, are not included in this rank.

Note: 2013 information used a different universe of vehicle due to a new database, so a ranking should not be compared

From the above it can be said that:

- In 2013 – for every 1,000 Tsuru accidents occurred, the number of fatal Tsuru accidents was 24.16
- In 2012 - for every 1,000 Tsuru accidents occurred, the number of fatal Tsuru accidents was 18.23.
- In 2012 – for every 1,000 Tsuru accidents occurred, the number of (driver) deaths was 7.23
- In 2008 – for every 1,000 Jetta accidents occurred, the number of fatal Jetta accidents was 13.64.
- In 2008 – for every 1,000 Chevy accidents occurred, the number of (driver) deaths was 2.71

For most of all the years analysed, the **Tsuru** experienced the highest **index fatality score** for the number of fatal accidents where it was involved. From the brands that result in the highest index for number of driver deaths, it can be concluded that: “the Tsuru is the vehicle within the top three highest index of fatal accidents among all brands⁸”.

Comparing the ranking score of the Tsuru with other brands, the following table shows that:

- In **2012** - for every 1,000 Tsuru accidents that occurred, the number of fatal Tsuru accidents was 18.23.
- In **2012** - for every 1,000 Peugeot accidents that occurred, the number of fatal Peugeot accidents was 0.82

Table 4 – Comparison - Number of “X-brand” fatal accidents and deaths per 1,000 “X-brand” accidents by year

| Year | Number of fatal “X-brand” accidents per 1,000 Total Tsuru accidents | Number of deaths (driver) per 1,000 Total accidents | Number of deaths (passengers) per 1,000 total accidents |
|--------------------------------|---|---|---|
| 2007 (Tsuru/NISAAN) | 29.5708 | 21.2731 | 13.9661 |
| 2007 (Solara/Toyota) | .014 | .00001 | 0.00 |
| 2012 (Tsuru/NISAAN) | 18.2309 | 7.2323 | 4.8241 |
| 2012 (PEUGEOT) | .082 | 0.00 | 0.00 |

Source: Data obtained with information from the Mexican National Commission for Insurance and Bonds (CNSF) in addition to INEGI data.

From all above it can be concluded that:

- From 2007 to 2013 the Tsuru was one of the most unsafe vehicle when it is involved in an accident.
- The Tsuru is the vehicle with the worst index fatality score.

⁸ This analysis includes all brands reported by the insurance companies

The scale of a Tsuru involved in fatal accidents and number of deaths

In order to identify the number of deceased people in accidents that involved a Tsuru and the number of deadly accidents where a Tsuru was involved, it was necessary to identify the probability of a **Tsuru** being involved in a **fatal accident** compared to the number of fatal accidents occurring at a National Level.

The calculation of this probability is described in greater detail in Annex II, but generally speaking we used data to identify the **probabilities**:

- i. To have an accident at a national level;
- ii. To have an accident where a Tsuru was involved; and
- iii. To experience a fatal accident in a Tsuru given the fact that a Tsuru was involved.

Analysis of the probabilities shown in the following table are described in detailed in annex II.

Table 5 - Probability of having a Fatal accident in a Tsuru given the fact that there was an accident at a national level

| Year | Probability (i) fatal accident at a national level | Probability (ii) Having a Tsuru involved in an accident | Probability (iii) Having a fatal accident in a Tsuru given there was a Tsuru accident | Probability for a Tsuru to get involved in an fatal accident given there was a fatal accident at a National Level |
|------|--|---|---|---|
| 2007 | 1.609% | 3.224% | 2.957% | 5.92% |
| 2008 | 1.704% | 3.224% | 2.610% | 4.94% |
| 2009 | 1.833% | 3.273% | 2.800% | 5.00% |
| 2010 | 1.799% | 2.242% | 2.021% | 2.52% |
| 2011 | 1.922% | 2.524% | 2.771% | 3.64% |
| 2012 | 1.802% | 2.593% | 1.823% | 2.62% |

Estimated number of deceased people in Mexico in accidents that involved a Tsuru,

Once the probability of experiencing a fatal accident in a Tsuru is known and the number of fatal accidents at a national level is established, it will be possible to ascertain the number of killed people in an accident that involved a Tsuru. These figures represent the minimum number of deaths, it is understood that figures may be much higher depending on national deaths reported by officials sources.

Table 6 – Estimated deceased people in accidents that involved a Tsuru

| Year | Number of deaths national level (CONAPRA) | Probability to have an accident in a Tsuru given the accident is fatal. | Number of deaths on Tsuru accidents |
|----------------|---|---|-------------------------------------|
| 2007 | 15,349 | 5.92% | 909 |
| 2008 | 17,062 | 4.94% | 842 |
| 2009 | 17,820 | 5.00% | 891 |
| 2010 | 16,559 | 2.52% | 417 |
| 2011 | 16,615 | 3.64% | 605 |
| 2012 | 16,681 ^(a) | 2.62% | 438 |
| Total | | | 4102 |
| Average | | | 684 |

Source: results obtained with data from CONAPRA, CNSF, INEGI and IMT

Note (a): Lacking data for the number of deaths at a national level in 2012. It was assumed this year as the average of 2007 to 2011

Estimated number of Deadly accidents where a Tsuru was involved

Similarly, the minimum number of deadly accidents involving a Tsuru was calculated as:

Table 7 – Estimated deadly accidents where a Tsuru was involved

| Year | Number of fatal accidents (CONAPRA)/INEGI) ¹ | Probability to have an accident in a Tsuru given the accident is fatal. | Number of fatal accidents where a Tsuru is involved |
|----------------|---|---|---|
| 2007 | 8,155 | 5.92% | 483 |
| 2008 | 8,467 | 4.94% | 418 |
| 2009 | 8,395 | 5.00% | 420 |
| 2010 | 8,187 | 2.52% | 206 |
| 2011 | 7,919 | 3.64% | 288 |
| 2012 | 7,472 | 2.62% | 196 |
| Total | | | 2011 |
| Average | | | 335 |

Note (1): National data for urban roads and highways. Sources: INEGI/CONAPRA

From the data above it can be concluded that:

- Between 2007 and 2012 **there were 4102 deceased** people after being in an accident involving a Tsuru
- Between 2007 and 2012 there were **2011 fatal crashes that involved Tsurus** (the killed people might or might not have been passengers of the Tsurus)

CONCLUSIONS

- The car industry in Mexico represents one of the most successful industries in the country;
- The car industry in Mexico has increased from a total production of more than 1 million in 1993 to more than 3 million in 2015;
- In 2013 car industry exports represented 25.5% of total exports in the country;
- In 2015, Mexico ranked as the 6st largest vehicle producer in the world;
- In 2013, Mexico ranks 4th as a world light vehicle exporter, only below South Korea and above Spain;
- In 2015, most of the vehicle production in Mexico was for exports from which 82.8% is for USA and Canada, 8.2% for LATAM and 5.3% for Europe.;
- Among the most relevant brands selling light vehicles in the country, Nissan has dominated the Mexican market with more than 24%% of the total domestic market between 2008 and 2015;
- The top three car sellers in México for the month in between 2013 and 2015 were: Aveo, Versa and Tsuru;
- The Sentra II or Tsuru B13 is still the top seller car for Nissan Mexicana;
- Regarding the safety issues of the Tsuru collected data, statistics and probabilities show that:

From 2007 to 2012 the Tsuru was the most unsafe vehicle when it gets involved in an accident.

The Tsuru is the vehicle with the worst index fatality score.

- **The number of deceased people in accidents that involved a Tsuru and the number of deadly accidents were a Tsuru was involved:**
 - Between 2007 and 2012 **there were 4102 deceased** people after being in an accident involving a Tsuru; an average of **684 per year**.
 - Between 2007 and 2012 there were **2011 fatal crashes that involved Tsurus** (the killed people might or might not be passengers of the Tsurus); an average of **335 annually**.

ANNEX I

Figure 8 - Light Vehicle Production Plants by brand



ANNEX II

Calculating the probability of having an accident at a national level (i)

In order to identify the probability of having an accident at a national level, it was necessary to identify the total number of fatal accidents at a national level in the first instance.

Total number of fatal accidents occurred at a national level in a given year where data collected from INEGI for urban and suburban areas were added to data from CONAPRA for Federal Highways (with the assumption that for every fatal accident there were 2 road deaths). This assumption provides a conservative position given the fact that INEGI doesn't report fatal accidents in Federal Highways (or rural areas). This assumption also considers that fatal accidents in Federal Highway are more likely to have at least one death in comparison with urban accidents due to the speed and kind of impact these accidents usually experience. Therefore Total fatal accidents at a national level are the sum of (1) + (3) as shown in the following table.

Table 8 – Calculation of total number of fatal accidents occurred in the country 2007 - 2012

| Year | Number of accidents in urban and suburban areas (1) | Number of deaths in Federal Highways (2) | Number of fatal accidents in Federal Highways (3) | Total fatal accidents at a national level (4) |
|------|---|--|---|---|
| 2007 | 5456 | 5398 | 2699 | 8155 |
| 2008 | 5777 | 5379 | 2690 | 8467 |
| 2009 | 5960 | 4870 | 2435 | 8395 |
| 2010 | 5671 | 5032 | 2516 | 8187 |
| 2011 | 5716 | 4406 | 2203 | 7919 |
| 2012 | 4737 | 5469 | 2735 | 7472 |

(1) Source: INEGI

(2) Source: CONAPRA

(3) Source: Assuming that for every one fatal accident, two road deaths occurred

Therefore, the probability of having a fatal accident at a national level is obtained by dividing the number of fatal accidents by the total number of accidents at a national level.

Table 9 – Probability of experiencing a fatal accident at a national level (i)

| Year | Number of accidents at a national level (5) | Number of fatal accidents in urban, suburban and federal highways (Table 8) | Probability of having a fatal accident at a national level (i) |
|------|---|---|--|
| 2007 | 506,830 | 8,155 | 1.61% |
| 2008 | 496,814 | 8,467 | 1.70% |
| 2009 | 458,063 | 8,395 | 1.83% |
| 2010 | 455,106 | 8,187 | 1.80% |
| 2011 | 412,087 | 7,919 | 1.92% |
| 2012 | 414,627 | 7,472 | 1.80% |

(5) Source: CONAPRA

Calculating the probability of having a Tsuru involved in an accident (ii)

It is necessary to know the likelihood for a Tsuru to be involved in an accident. This was obtained by dividing the total number of accidents registered by the CNSF by the number of Tsuru accidents.

Table 10 – Probability for a Tsuru to be involved in an accident (ii)

| Year | Number of total accidents (CNSF) (6) | Number of accidents where a Tsuru is involved (CNSF) | Probability of having a Tsuru involved in an accident (ii) |
|------|--------------------------------------|--|--|
| 2007 | 150,641 | 4,856 | 3.22% |
| 2008 | 160,188 | 5,165 | 3.22% |
| 2009 | 170,585 | 5,584 | 3.27% |
| 2010 | 236,327 | 5,298 | 2.24% |
| 2011 | 250,951 | 6,333 | 2.52% |
| 2012 | 288,392 | 7,479 | 2.59% |

(6) Source: CNSF includes only accidents involving light vehicles

Calculating the probability to have a fatal accident in a Tsuru given the fact that there was a Tsuru accident (iii)

Available data for the period of 2007 to 2012 allowed the calculation of the probability of the Tsuru to be involved in a fatal accident given that an accident occurred. Available data from CNSF provides information about car accidents classified by car model but it does not provide information about the fatality of the accidents. However, it is possible to identify the location where the accident occurred.

Information from INEGI and CONAPRA informs about the fatality of the accident classified by municipality but they only show aggregate information about the type of vehicle such as light vehicle, heavy trucks, among others.

From the information available and to determine the probability of experiencing a fatal accident in a Tsuru given the fact that an accident occurred where a Tsuru was involved:

1. The number of fatal accidents by private light vehicles was separated from INEGI and CONAPRA information classified by municipality.
2. From CNSF data, it was possible to identify by municipality the proportion of accidents by car model.
3. The number of fatal accidents by car model given an accident occurred in a municipality is the proportion of accidents in a municipality by car model multiply by the number of fatal accidents in a municipality. For instance, if a municipality there are 100 fatal car accidents according to INEGI and CONAPRA but the data from CNSF shows that only two types of cars (A and B) had at least one accident. Let's say that car A had 120 accidents

- in this municipality and car B had 80 accidents in the same municipalities. The number of fatal car accidents by Car A is $60 = 100 * 120 / 200$ where $120/200$ represents the proportion of accidents in a municipality by Car A; the number of fatal car accidents by Car B is 40 using the same procedure.
4. The sum of the number of fatal accidents by car model over the municipalities represents the number of fatal accidents by car model at national level.
 5. To determine the proportion of accidents (Fatal and no-Fatal accidents), the same procedure was applied except that the total number of accidents was included in point 1.
 6. The probability of experiencing a fatal accident in a Tsuru conditional on an occurred Tsuru accident is the ratio between the number of fatal accidents by Tsuru at national level and the number of accidents by Tsuru national level.

This methodology allows identifying the fatal accident probability by car model conditional on an occurred accident (fatal and non-fatal accident). The following table shows the results:

Table 11 – Probability of experiencing a fatal accident in a Tsuru given the fact that a Tsuru accident occurred (iii)

| Year | Probability of experiencing a fatal accident in a Tsuru given the fact that there was a Tsuru accident (iii) |
|------|--|
| 2007 | 2.96% |
| 2008 | 2.61% |
| 2009 | 2.80% |
| 2010 | 2.02% |
| 2011 | 2.77% |
| 2012 | 1.82% |

Calculating the probability of experiencing a fatal accident in a Tsuru given the fact that there was an accident at a national level

To determine this probability, we applied the conditional probability theory. Let's denote the probability of a fatal accident at national level as $Pr(F)$, the probability of having a Tsuru involved in an accident as $Pr(AT)$, probability of having a fatal accident in a Tsuru given an occurred Tsuru accident as $Pr(FT|AT)$ where FT represents the Fatal accident of a Tsuru and AT represents an accident in a Tsuru and finally let's denote the probability for a Tsuru get involved in a fatal accident given there was an accident as $Pr(FT|A)$ where A represents an occurred accident.

By probability theory:

$$Pr(FT|AT) = \frac{Pr(FT \text{ and } AT)}{Pr(AT)} = \frac{Pr(FT \text{ and } AT) Pr(F)}{Pr(F) Pr(AT)} = \frac{Pr(FT) Pr(F)}{Pr(F) Pr(AT)} = Pr(FT|F) * \frac{Pr(F)}{Pr(AT)}$$

Where $Pr(FT \text{ and } AT)$ represents the joint Probability of experiencing a Fatal Accident in a Tsuru and experiencing an accident in a Tsuru that it is equals to $Pr(FT)$ since in order to have a fatal accident it is necessary to have an accident.

Therefore, it is possible to compute $Pr(FT|A)$ by the expression above:

$$Pr(FT|F) = Pr(FT|AT) * \frac{Pr(AT)}{Pr(F)}$$

$Pr(AT)$ is estimated as the ratio of the number of Tsuru accidents at national level to the total number of accidents according to the CNSF because it is the only available data that allows to identify the number of accidents by car model

$Pr(F)$ is estimated as the ratio of number of fatal accidents to the number of accidents at national level reported by INEGI and CONAPRA.

Table 12 – Probability of having a Fatal accident in a Tsuru given the fact that there was an accident at a national level

| Year | Probability (i) A fatal accident at a national level | Probability (ii) Having a Tsuru involved in an accident | Probability (iii) Having a fatal accident in a Tsuru given there was a Tsuru accident | Probability for a Tsuru to get involved in a fatal accident given there was a fatal accident at a National Level |
|------|---|--|--|--|
| 2007 | 1.609% | 3.224% | 2.957% | 5.92% |
| 2008 | 1.704% | 3.224% | 2.610% | 4.94% |
| 2009 | 1.833% | 3.273% | 2.800% | 5.00% |
| 2010 | 1.799% | 2.242% | 2.021% | 2.52% |
| 2011 | 1.922% | 2.524% | 2.771% | 3.64% |
| 2012 | 1.802% | 2.593% | 1.823% | 2.62% |

Source: results obtained with data from CONAPRA, CNSF, INEGI and IMT

