

Used Vehicle Imports Impact on New Vehicle Sales: The Mexican Case

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Abstrac

This paper analyzes the potential impact of used vehicle trade liberalization on Mexico's new vehicle market with the full implementation of the NAFTA agreement. Although the legal environment has been unfavorable toward the importation of used vehicles into Mexico, used vehicles primarily from the U.S. have entered the market as gray or illegal goods. In recent years Mexico may have already become a dumping ground for U.S. used vehicles. Beginning in 2009, Mexico is set to progressively open the market for used vehicle imports according to NAFTA regulations, fully liberalizing it by 2019. To quantify the potential impact of legal used vehicle imports, this paper develops a new analytical model. Given the lack of historical data, the methodology combines econometric estimation with a comparative analysis using the Polish used vehicle case as foundation. Through various scenarios, our research suggests that the medium-to-long term impact on new vehicle sales could be severe. The auto industry could reach a low 0.6 million units by the time the market is fully liberalized. And even under the most optimistic scenario, the industry only reaches 1.3 million units by 2019, not much higher than the 1.15 million units in 2007. While some academic literature indicates that there are social and economic benefits of free trade in used vehicles, at least in the case of a lower income market opening itself up to a much larger and higher income mature market, the net impact seems to be negative. Industry generated revenue losses for both automakers and the Mexican government could reach as high as \$100 billion in the 2009-2019 period.

Key words: trade, used vehicle imports, Mexico.

JEL Classification: F, F4.

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Introduction

Over the last fifteen years, Mexico has embarked upon a process of trade liberalization signing trade agreements with the U.S., Canada, Brazil, Argentina, Colombia, Chile, Japan and the European Union (EU), to mention a few. As it pertains to the automobile sector, the agreements have allowed new vehicles to be freely traded among these markets. For used automobiles, this liberalization in general has not taken place. However, beginning in January of 2009 in accordance with the North American Free Trade Agreement (NAFTA), the market for used vehicles progressively will become open, achieving full liberalization by 2019.

Historically, the legal environment has been most unfavorable toward the importation of used vehicles into the Mexican economy. Nonetheless, used vehicles primarily from the U.S. have entered the market, as gray, parallel or illegal goods.¹ According to Durhan and Sheffet (1998) three necessary conditions must exist for gray markets to develop, all of which are met in the Mexican case. First, product(s) must be available in other markets, i.e., internationally. Second, trade barriers such as legal restrictions, transportation costs, etc. must be low enough to allow parallel importers to move the product(s) from one market to another.² Third, price differentials among markets must be large enough to provide the motivation for gray marketing.

Gray imports have benefited from the long history that Mexican politicians have in “regularizing” (granting amnesty to) smuggled used vehicles prior to elections. In 1999, the Mexican government had a conflict with the Peasant Democratic Union over regularizing gray vehicles (*Financial Times*, 1999). While the administration of President Vicente Fox and the Mexican motor industry opposed such regularization, they were defeated by the opposition legislature which passed a bill allowing such regularization on March 13, 2000. The government decree allowed amnesty for pickups of more than ten years of age, i.e., models 1990 and above.

Similarly, on August 22, 2005, amnesty was granted to all used vehicles aged ten to fifteen years which weighed less than 4.6 tons. The 2005 decree was pushed ahead of the 2009 NAFTA regulations with the only exception being that used vehicles needed to pay a fifteen percent tariff. The 2005 decree was revised in 2007 to allow starting in April of 2008, only used vehicles aged ten years for the remainder of 2008, i.e., only 1998 models.³

¹ Used vehicles coming from the United States into Mexico illegally are also known as “chocolates”, because the buyer never knows what he/she is getting until they try them.

² The border between Mexico and the U.S. extends for approximately three thousand kilometers.

³ According to NAFTA, starting on January 1, 2009, vehicles aged ten to fifteen years will be legally allowed into Mexico free of tariffs. However, it remains to be seen whether the government will intend to limit the importation of used vehicles to 10 years of age only, i.e., only 1999 models.

In Mexico, import licenses allow the importation of used vehicles for those who are set to fulfill a business contract within the country, to U.S. citizens and to U.S. permanent residents. These types of used vehicles are granted a temporary license, though many are not returned to the U.S. once the license expires. Additionally, those living within the border and free trade zones of Baja California, some parts of Sonora, the State of Baja California Sur, and the border city of Cananea in Sonora are able to own imported used vehicles that are four to fifteen years older than the current model year. Once used vehicles are allowed into Mexico, they are not permitted by law to be sold outside these regions, though in reality many do not adhere to the rules.

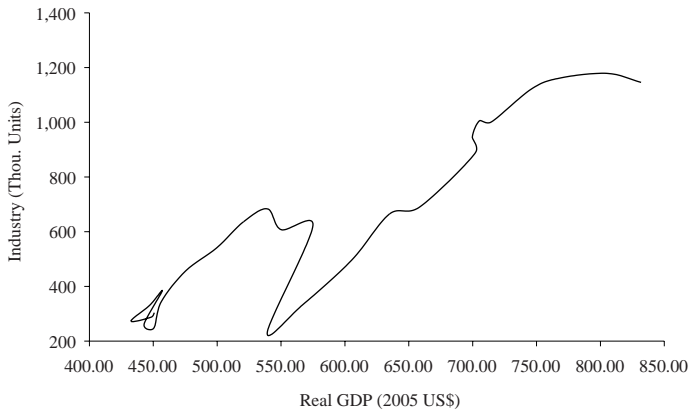
Strong evidence shows that Mexico already has become a dumping ground for American used vehicles, with detrimental effect on healthy development of the vehicles market. Post the “tequila crisis” new vehicle sales in Mexico grew robustly from 0.2 million units in 1995 to over 1 million units in 2002. Since then, industry growth has stayed mostly flat. It underperformed despite improved macroeconomic and political fundamentals, low fuel costs (due to government fuel subsidies), favorable credit conditions, stable vehicle prices due to strong currency and market openness to new competitive entries. New vehicle sales have been flat in recent years despite healthy income growth (Figure 1).

Mexico’s recent experience is a disappointment compared to other emerging markets. For instance, new vehicle sales in Brazil, Russia, India and China have doubled since 2003. In each of these markets, new vehicle sales are highly responsive to GDP growth. In other words, the percentage change in new vehicle sales is larger than that in GDP. The GDP-to-new vehicle sales elasticity between 2003 and 2007 for Brazil, Russia, India and China averaged 2.37, 2.44, 2.07, and 1.91 respectively. For the Mexican case, the elasticity turned out to be inelastic, i.e., 0.6.⁴

According to the Automotive Motor Industry Association (AMIA), more legal used vehicles were imported than new cars sold in Mexico in 2007. Mexico’s Secretariat of Economy believes that 1.2 million used vehicles legally entered the market in 2007, more than the 1.15 million new vehicle units sold. These figures do not account for the number of gray vehicles that are currently being driven on Mexican roads without proper tags, registrations, insurance and required emission inspections. Some experts estimate this could be in the range of two to four million vehicles (*Los Angeles Times*, 2005).

⁴ Mexico’s GDP-to-new vehicle sales elasticity averaged a sound 4.62 between 1980 and 2002.

Figure 1
Mexico: Total New Vehicle Sales vs. Real GDP



Source: Haver Analytics, Authors' calculation.

The impact of used vehicle penetration is also noticeable on segments mix and manufacturing foot print. Mexico has a young population with the age group twenty five to thirty four accounting for thirty six percent of the population. Additionally, sixty five percent of Mexicans have an annual household income of less than 28,000 US dollars. Consequently, the most popular vehicles are traditionally low cost small vehicles. In the past few years, however, the share of mini and small vehicles as a percentage of the total industry has dropped from thirty seven percent in 2003 to twenty two percent in 2007. A strong substitution effect is evident, especially for first time buyers, between buying a new small vehicle or buying a bigger, used import vehicle in the same price range.

The main purpose of this study is to analyze what could happen to the Mexican new vehicle market when the borders open to used imports and to shed some light on the indirect impact on the Mexican economy. Compared with the size of the Mexican market, the supply of used vehicles in the U.S. seems limitless. Auto Dealers Exchange Services of America (ADESA, 2006) estimate that the U.S. is home to approximately 100 million vehicles at least ten years old or older, of which twelve million are ten years old only. Ten-year-old vehicles will be allowed to enter Mexico in 2009-2010. Additionally, approximately ninety million vehicles in the U.S. aged two to eight years of age will be allowed to enter Mexico in coming years. With that in mind, our goal is to quantify the potential impact that used vehicle imports coming from the U.S. could have on Mexico's new vehicle sales.

In section 1 we discuss the benefits and costs of used durable goods imports, especially as it relates to used vehicles trade. In section 2, we present the Polish case study to illustrate new-used vehicle market dynamics when the used vehicle trade was liberalized. Section 3 develops a demand and supply model for the Mexican market. Section 4 presents our empirical findings and develops various scenarios. Then, the last section summarizes our results and provides with conclusions.

1. Benefits and Costs of Used Imports

A rich literature on the impact of trade liberalization for used durable goods in developing markets is available. Sen (1962), Smith (1974 and 1976), Pack (1978), Bond (1983) and Navaretti, Soloaga and Takacs (2000) argue that developing economies are better off from increased trade in used durable goods. As for the specific case of used vehicles, Grubel (1980) is among the first who examined the issue. He stresses the slowly-depreciating nature of vehicles in developing countries in explaining the potential gains from trade.

Recently, Pelletiere and Reinert (2002 and 2004) analyzed the used automobile exports of the United States, highlighting various positive factors. For the importing countries, cheap used vehicle imports offer low income households the possibility of vehicle ownership and a high level of personal mobility, increasing social welfare benefits. In addition, lengthening the life time of durable goods, i.e., postponing scrapping, contributed to industrial ecological objectives (Van Wee, Moll and Dirks, 2000).

On the other hand, open used vehicle trade is not without drawbacks. The rationale for restricting used vehicle trade in developing countries often falls into two categories: 1) problems with valuation and protection against fraud and corruption and 2) safety and environmental concerns.⁵ The illegal importation of used vehicles falls outside formal economic activities, which in turn are not taxed, negatively affecting government revenue inflows. Additionally, informality removes the incentive for businesses to improve their customer service and productivity. Thus, growth potential is reduced; fewer jobs are created, driving more people into the informal sector, further limiting growth in a self-reinforcing cycle.⁶

⁵ See *The Economist* (2002) for the associated air pollution effects in Latin America. Additionally, Janischweski, Henzler, and Kahlenborn (2003) highlight the detrimental impact that used vehicle imports has on the environment.

⁶ One additional problem with used vehicle trade is asymmetric imperfect information. The economic literature refers to lemon markets, as it pertains to the automobile sector, as those in which consumers' collective experience is with "bad" used automobiles. The literature is divided as to whether lemon markets actually exist in used

Historically, used vehicle markets have been supplementary to new car markets in satisfying transportation needs for different customers. Blomquist and Haessel (1978), O'Herlihy (1965) and Tischler (1982, 1983) included size, age distribution and prices of used vehicles as independent variables to forecast new vehicle sales. Rosales, Peraza and Rodríguez (2008) estimate new vehicle sales by employing GDP, interest rates, inflation, foreign exchange rates, and other lagged variables as alternative exogenous variables. While different modeling techniques could be used forecast new vehicle sales, our study takes a different approach, bearing in mind that no model has been built in such a way.

Our methodology compares other market' experiences, i.e., Poland, to quantify the potential impact that used vehicle imports could have on new automobile sales. It allows for replicability where our forecast can be tested to obtain similar results. Also, our methodology could be applied to other markets where used vehicle imports play an imperative role in the domestic auto sector. In the next section we will review the Polish case, and highlight the impact that new vehicle sales had when the used vehicle trade was partially (in 2002) and then fully liberalized (in 2004).

2. Poland Case

Recent experience in Poland's used vehicle market offers an excellent case study for Mexico's future. Both are mid-income countries opening up to a much larger and richer neighbor –EU (particularly Germany) in Poland's case and North America (particularly the U.S.) in Mexico's case. Poland's automotive industry has historically experienced several structural changes. The domestic vehicle industry has evolved from locally produced old Soviet-Era models, to opening the market for Western vehicle production in the mid 90s, to joining the EU in May 2004. For the sake of our analysis, we will focus on the most recent factors that have driven new vehicle sales in the Polish market. In particular, we concentrate on the impact that liberalizing the used vehicle market had on new vehicle sales.

After growing robustly, new vehicle sales in Poland saw a declining trend after 2000. Among the factors that put downward pressure on the industry were an increase in excise taxes and interest rates, the decrease of custom duty rates on imported automobiles and the slowing global growth post 9/11. Additionally, in January 2002, Poland started a transition period in preparation for EU accession.

vehicles. Pratt and Hoffer (1984) analyzed the pick-up market and concluded that the market for used pick-up trucks was a lemon market. Others such as Bond (1984) reevaluated Pratt and Hoffer (1984) and found that was not the case.

The government lifted barriers against import of used vehicles aged ten years and older. By 2003, the economic momentum gained strength, but new vehicle sales stayed mostly flat.

Prior to Poland's EU accession in 2004, the 1994-2003 average ratio of used vehicle imports to new vehicle sales was 0.3. In other words, there were 300 used vehicle imports for every thousand of new vehicles sold. In 2004, when the used vehicle import market was fully liberalized, the ratio reached 2.3. The flood of used vehicles from Western Europe, primarily from Germany, became a major source of substitution in relation to new cars. Consequently, new vehicle sales dropped by 6.5%, reaching 367 thousand units in 2004. By 2005, the industry reached a ten year low of 282 thousand units, down 23% versus the previous year and the used import-to-new vehicle sales ratio reached a historic high of 3.1.

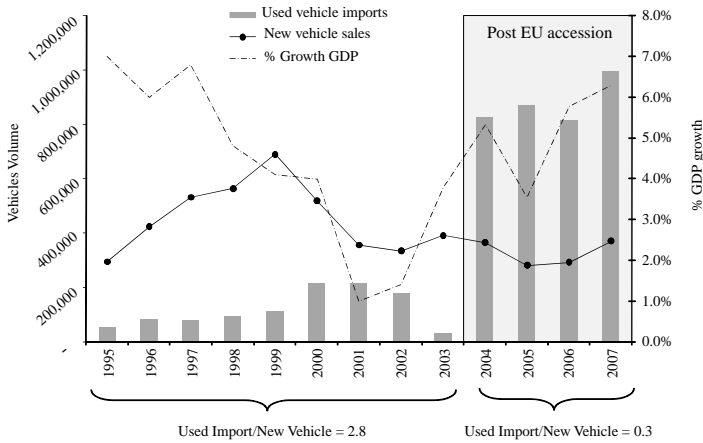
In 2006 and 2007, the ratio of used imports to new vehicle sales stabilized at around 2.8. However, despite GDP growth averaging a solid 6% year-over-year (yoy), the industry was not able to recover to the 1999 levels when growth was around 4% yoy and vehicle sales reached approximately 700 thousand units. (See Figure 2) According to the Polish Automotive Industry Association (PZPM), the lack of regulations to promote newer and more environmental friendly models should keep used vehicle imports high for a long time (*Polish News Bulletin*, 2008). BMI research believes the influx of used cars is the most important factor behind the collapse of the Polish vehicle market following the EU accession in May 2004 (*BMI Industry Insights*, 2007).

Now the question is: Will Mexico's domestic new vehicle market travel down the path? And what would be the degree to which new vehicle sales suffer from the opening of the border due to NAFTA regulations? In the next two sections, we will introduce our mathematical model, conduct forecast and scenario analysis, and present our findings.

3. The Model for Mexico

As highlighted in the previous sections, one of the most pressing topics that could affect new vehicle sales in Mexico is the progressive liberalization of the used vehicle market. Starting in January 2009, used vehicles aged ten years or older will be legally allowed in the market free of duties. Then, every two years, the age limit will drop by two years such that by 2011 eight year old vehicle imports originating from Canada or the U.S. will be legally allowed into the Mexican market. By 2019, all used vehicles, regardless of their age, will be legally allowed according to NAFTA regulations.

Figure 2
Poland-Vehicle Sales, Used Imports & GDP Growth



Source: Haver Analytics, Authors' calculation.

Despite the lack of data availability, and uncertainties as to whether the government will adhere to the current stipulations of NAFTA, we have developed a methodology to tackle the issue. The motivation to build our model is threefold. First, we aim at quantifying the potential impact that used vehicle imports could have on new vehicle sales, considering that no analytical model has been built in such a way. Second, our study allows for replicability where forecasts can be tested by others to obtain similar findings. Third, we developed a comparative analysis using the Polish case as foundation so that other researchers could apply our model to other markets.

The first step of our model is to estimate Mexico's vehicle parc ($\Delta P(t)_{MEX}$)—total number of vehicles on the road. The annual data series can be obtained by employing vehicle parc at time t ($P(t)_{MEX}$), the vehicle parc during the previous period ($P(t - 1)_{MEX}$) and the scrappage rate (SR_{MEX}).⁷ The mathematical relationship is presented in equation 4.1.

$$\Delta P(t)_{MEX} = P(t)_{MEX} - P(t-1)_{MEX} + (SR_{MEX} * P(t-1)_{MEX}) \tag{4.1}$$

⁷ Scrappage is defined as the number of vehicles removed from circulation in any given year. This value is reported as percentage of the number of vehicles in use.

Whenever possible, Mexico's government statistics are employed as the official source for historical parc data. In addition, the historical series (1980-2007) for Mexico's vehicle parc published by the National Statistics and Geography Institute (INEGI) are used. Then, to estimate the future parc, i.e., 2008-2019, it is necessary to estimate SR_{MEX} and $P(t)_{MEX}$. In concurrence with Schifter, Diaz, Mugica and Lopez (2004), the scrappage rate for the Mexican market is approximated to be 3%. The values of vehicle parc $P(t)_{MEX}$ are estimated in equation 4.2a. The equation is given in both general and estimated forms, with t statistics in parentheses, coefficient of determination R^2 , the F statistic, and the Durbin-Watson statistic.

To correct for serial correlation in error terms, we incorporate an ARIMA (autoregressive integrated moving average) component to the equation. The first component consists of AR, or autoregressive terms. Each AR term corresponds to the use of a lagged value of the residual in the forecasting equation. The second part consists of MA, or moving average terms. A moving average forecasting model uses lagged values of the forecast error to improve the current forecast. The nature of the correlation between current values of residuals and their past values provides general guidance in selecting an ARIMA specification. If partial autocorrelations were small enough after one lag, then a first-order AR model would be appropriate. Alternatively, if partial autocorrelations decline geometrically, a first-order MA process is appropriate. Only a few AR and MA terms are used to fit the properties of the residuals.

The next step in the model is estimation of vehicle demand based on economic growth. In equation (4.2a), we estimate $P(t)_{MEX}$ by employing Mexico's real GDP (Y_{MEX}) as the explanatory variable.⁸ Mexico's GDP is used to explain the variation in the purchasing power of the household, which in turn stimulates vehicle ownership. Using annual data from 1980 to 2007, the estimate of α_2 is positive and significant at the 2% level in equation (4.2b).

$$P(t)_{MEX} = \alpha_1 + \alpha_2 Y_{MEX} \quad (4.2a)$$

$$P(t)_{MEX} = -12241103 + 42032.77Y_{MEX} + 0.95MA(1) + 0.50AR(2) \quad (4.2b)$$

$$(15.91)$$

$$R^2=0.98; F=466.48; DW=2.07$$

With all of the previously unknown variables presented in equation 4.1 now estimated, Mexico's annual gross increases of vehicle parc ($\Delta P(t)_{MEX}$) can be

⁸ Mexico's real GDP is obtained from INEGI, given in 1993 billion US Dollars.

found. Alternatively, the additional vehicle parc estimated in 4.1 can be expressed as the sum of new vehicle sales (NV_{MEX}) and used vehicle imports (UI_{MEX}), as represented in equation 4.3.

$$\Delta P_{MEX} = NV_{MEX} + UI_{MEX} \quad (4.3)$$

Our goal is to solve for NV_{MEX} , with the understanding that new domestic sales and used imports are to a certain degree substitutes. To capture the degree of substitution, we introduce equation 4.4, which presents the ratio of used vehicle imports to new vehicle sales, something we call “used penetration ratio,” or UPR .

$$UPR_{MEX} = UI_{MEX} / NV_{MEX} \quad (4.4)$$

Then, we can have equation 4.5 by substituting equation 4.4 into equation 4.3. Subsequently, we link the Polish case to the Mexican scenario to quantify the potential impact that used vehicle imports could have on new vehicle sales. To do so, we employ equation 4.6 and 4.7.

$$\Delta P_{MEX} = NV_{MEX} (1 + UPR_{MEX}) \quad (4.5)$$

Although the situations in Poland and Mexico have many similarities, key differences between the two exist. Most importantly, in Poland, full liberalization occurred at once in 2004. In Mexico’s case, the market will progressively open and full liberalization will not take place until 2019. Consequently, if we want to compare Poland’s case to Mexico’s current environment, we need recognize those differences. Therefore, we introduce a discount factor that accounts for import age restrictions, i.e., DF_{MEX} . Equation 4.6 highlights that by the time Mexico fully liberalizes its market in 2019, Mexico’s and Poland’s used penetration ratio will be the same, i.e., $UPR_{MEX} = UPR_{POL}$.

$$UPR_{MEX} = UPR_{POL} * DF_{MEX} \quad (4.6)$$

The discount factor for age restrictions is defined in equation 4.7. It takes into account the age restriction of used vehicle imports according to NAFTA ($IAGE_{MEX}$) and the life expectancy of new vehicles ($LIFE_{MEX}$).⁹ Employing the

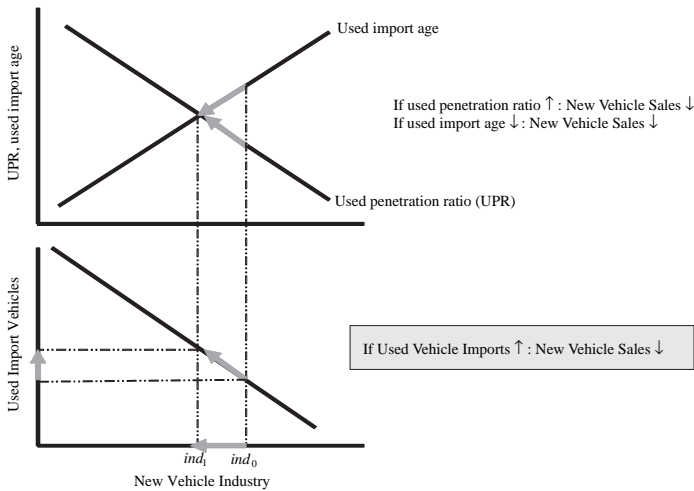
⁹ The age restriction of used vehicle imports is set to be 10 in 2009-10; 8 in 2011-12; 6 in 2013-14; 4 in 2015-16; 2 in 2017-18; and 0 in 2019. Following Schifter, Diaz, Mugica and Lopez (2004), we estimate the life expectancy of a new vehicle in Mexico to be 20 years.

above equations, we solve the model and the solution is presented below in equation 4.8. Graphically, the methodological approach is shown in Figure 3.

$$DF_{MEX} = 1 - \left(\frac{IAGE_{MEX}}{LIFE_{MEX}} \right) \tag{4.7}$$

$$NV_{MEX} = \left[\frac{\Delta P_{MEX}}{1 + \left(UPR_{POL} * \left(1 - \frac{IAGE_{MEX}}{LIFE_{MEX}} \right) \right)} \right] \tag{4.8}$$

Figure 3
Mexico: Methodological Approach



4. Scenario analysis

We are now ready to present a few future market scenarios, which we group into “Type A” and “Type B” scenarios. We quantify the potential impact of used vehicle imports on new vehicle sales by employing our model presented in section 3. For the scenarios “Type A” we solve new vehicle sales for 2019 and back track industry volumes to 2008. We do so to comply with the fact that the used vehicle market in Poland fully liberalized in 2004 and in Mexico, the same development is expected to occur in 2019. For the “Type B” scenarios, our assumptions vary yearly according to NAFTA stipulations.

4.1 Scenarios “Type A”

The goal of these scenarios is to quantify the long term impact the opening of NAFTA could have on new vehicle sales. We adhere to NAFTA regulations as our baseline scenario and assume Mexico’s market equilibrium mimics the Polish one. Thus, by 2019, Mexico’s UPR is close to 2.8, which is more than double of the ratio experienced in Mexico over the past few years, i.e., 1.2. Once we solve new vehicle sales in 2019 based on a GDP growth forecast, we obtain the 2008-2018 industry volumes following equation 5.1. Given the levels of uncertainty, we have developed alternative scenarios to capture the downside and upside risk. We do so by altering the expected values of the used penetration ratio.

$$NV(t)_{MEX} = NV(t-1)_{MEX} * \left(\frac{NV(2019)_{MEX}}{NV(2007)_{MEX}} \right)^{12} \quad (5.1)$$

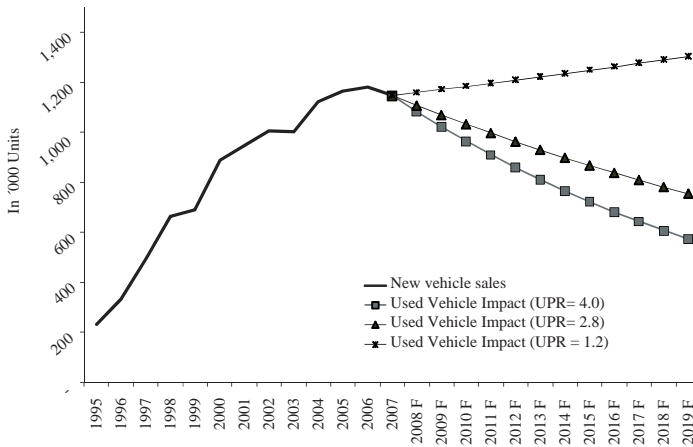
The upside scenario assumes that the attractiveness of used imports stay unchanged despite the change of their legal status. The argument is that used vehicles have penetrated the Mexican market for a very long-time, and that its impact on new vehicle sales has already taken place. Consequently, we assume the ratio of used vehicles-to-new vehicle sales stay at 1.2. This is perhaps the most optimistic scenario for new vehicle sales in Mexico, unless the NAFTA agreement is not implemented. At the other extreme, if the attractiveness of used imports jumps at the first stage of trade liberalization, then used imports are likely to surge and the impact on new vehicle sales could turn out to be much stronger than the Polish case. In that scenario, we assume the UPR is 4.

As result, we estimate new vehicle sales in Mexico could reach from a low 0.57 million units (downside) to a high 1.30 million units (upside) in 2019. This is a very wide range. The most likely outcome, however, is that new vehicle sales will reach 0.75 million units by 2019. A graphical representation of the results is seen in Figure 4.

4.2 Scenarios “Type B”

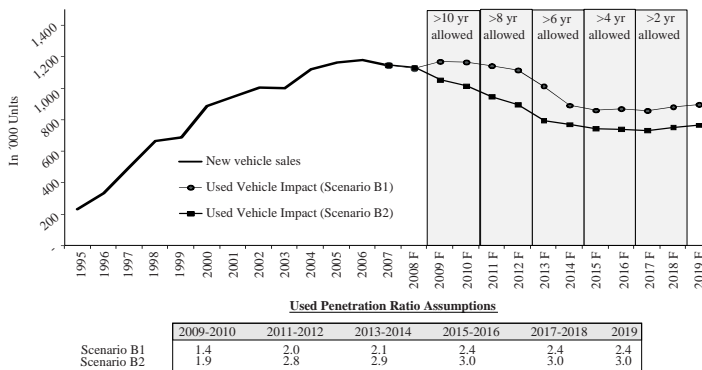
In addition to the uncertainties surrounding the market equilibrium, it is unclear whether consumers will be willing to delay their auto purchases in order to have

Figure 4
Mexico: New vehicle sales history and scenarios “type A”



access to newer vintage used imports. The purpose of the “Type B” scenarios is to quantify the year-by-year impact that the opening of NAFTA could have on Mexico’s new vehicle sales. Employing our model presented in section 3, we created Scenario B1 and B2. While both scenarios underline the negative impact that the opening of the border has on new vehicle sales, the degree of impact varies across them. The graphical representation of our results and assumptions are presented in Figure 4B.

Figure 4B
Mexico: New Vehicle Sales History and Scenarios “Type B”



Scenario B1 assumes that consumers' purchasing behavior for new vehicles is mostly unaffected in the first few years following the opening of the border. As the age restriction drops to legally allow used imports aged six years in the market, consumer's buying behavior starts to noticeably change. Consequently, new buyers begin to strongly shift to imported used vehicles around 2013. By 2016 the new vehicle sales stabilize. Our model results indicate that the industry could stay at around one million units in the first five years following the opening of NAFTA. However, once the market for used imports is fully liberalized, the industry could reach close to 0.90 million units.

With a slightly different perspective, Scenario B2 assumes that trade liberalization of imported used vehicles has a direct impact beginning in 2009. By 2015 the industry stabilizes, however, at a lower level than the one presented in Scenario B1. By 2019, the industry is expected to reach 0.77 million units.

Conclusion and Implications

We have developed an analytical model and presented a range of scenarios for the Mexican vehicle market over the next decade. It should be recognized that the legal environment towards the importation of used vehicles has been historically unfavorable. Nonetheless, through government amnesties, gray activities, etc., used imports have penetrated the Mexican market. According to the Secretariat of Economy, in 2006-2007, 2.8 million used vehicles were legally allowed in the market, more than the 2.3 million new vehicle sales originating in the same period. Our analysis shows that with the legal environment soon turning favorable towards the importation of used vehicles, new vehicle sales are likely to continue to stay flat or decline going forward. Our findings are summarized in Table 1.

We have tried to capture the market uncertainties by developing alternative scenarios. Our research suggests that the medium-to-long term impact on new vehicle sales post the opening of the border could be severe. The industry could reach a low 0.6 million units by the time the market is fully liberalized, i.e., 2019. Even under the most optimistic scenario, the industry could reach 1.3 million units by 2019.¹⁰ In the later scenario, the year over year industry growth averages a mediocre 1.1% in 2008-2019, which is well below Mexico's GDP potential, i.e., 3.5% to 4% according to Delgado (2007).

¹⁰ Outsider experts such as Global Insight, forecast an industry of approximately 1.2 million units by 2018.

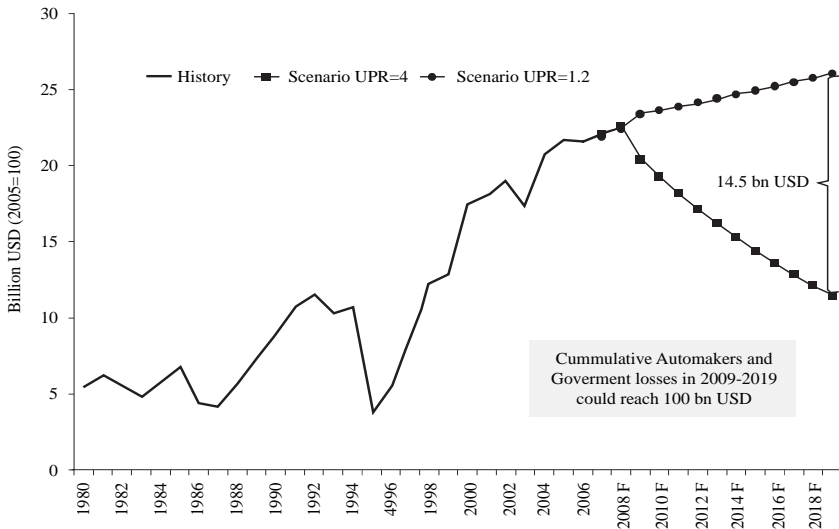
Table 1
Total New Vehicle Sales Estimated in Scenarios
(in million units)

	<i>UPR = 4</i>	<i>UPR = 2.8</i>	<i>UPR = 1.2</i>	<i>B1</i>	<i>B2</i>
2009	1.02	1.07	1.17	1.17	1.05
2010	0.96	1.03	1.18	1.16	1.01
2011	0.91	1.00	1.20	1.14	0.95
2012	0.86	0.96	1.21	1.11	0.90
2013	0.81	0.93	1.22	1.01	0.79
2014	0.76	0.90	1.23	0.89	0.77
2015	0.72	0.87	1.25	0.86	0.75
2016	0.68	0.84	1.26	0.86	0.74
2017	0.64	0.81	1.27	0.86	0.73
2018	0.61	0.78	1.29	0.88	0.75
2019	0.57	0.75	1.30	0.90	0.77

What does this mean for automaker's and government's revenue? We put side by side the most optimistic and the less optimistic scenario presented above for comparison purposes, $UPR = 1.2$ versus $UPR = 4$. In the more optimistic scenario, the automaker's annual revenue could reach close to 22.5 billion real U.S. dollars by 2019. In turn, government inflows could be approximately 3.5 billion U.S. dollars.¹¹ In the worst case scenario, automakers could earn 10 billion U.S. dollars while the government could receive close to 1.5 billion U.S. dollars. The total revenue loss that it is at risk for both the government and the automakers is close to 14.5 billion U.S. dollars in 2019 alone. In a cumulative basis, it could be more than 100 billion from 2009 to 2019. Graphically, the yearly revenue estimates are presented in Figure 5.

¹¹ To obtain revenue figures, as it pertains to the industry, we employ the results from our model, i.e. $UPR = 4$ vs. $UPR = 1.2$. For our price assumptions, we assume real prices stay constant at close to twenty thousand U.S. dollars per year. Government taxes as percentage of average vehicle price paid by the final consumer are close to 13.5%.

Figure 5
Mexico: Total Industry Revenue in Billion 2005 US dollars



The figures mentioned above certainly understate the negative impact that a lower total Mexican industry could have on the overall economy. In the U.S. for example, the economic multipliers for various types of automotive jobs range from four to twelve, with the bulk of the multipliers in the six to eight range. This means that for every 10,000 jobs lost in the automotive industry, a loss of 60,000 to 80,000 jobs in the economy could materialize.

Applying our theory, and using a conservative multiplier, i.e., 6, the overall impact on the economy could be a loss of around 87 billion U.S. dollars or 1% of GDP in 2019 alone. On a cumulative basis from 2009-2019 the overall loss to the Mexican economy could be as high as 600 billion U.S. dollars, which is equivalent to 9% of Mexico's 2007 GDP.

As mentioned earlier, there are certain social and economic benefits of free trade in used vehicles. However, at least in the case of a lower income market opening itself up to a much larger and higher income mature market, the net impact of lower new vehicle sales and easy access to used vehicle sales seems to be negative. One area for future research is the environmental impact of used vehicle penetration for Mexico.

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