Trade Liberalization and Household Consumption of Durable Goods in Mexico

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Abstract

This paper studies the effect of trade liberalization on the household consumption of durable goods in Mexico. We estimate the impact of a change in the tariff rate on the average age and quantity owned of a panel of household durable goods. We find that the Mexican trade liberalization policy has had the effect of decreasing the average age of household durable goods owned by 10.85 years and has induced an average of one in ten households who own a durable good to purchase an additional unit of that good. These findings suggest that further reductions in tariff rates might induce households to more frequently update their old durable goods and to purchase additional units of durable goods that they already own.

1. Introduction

Globalization has dramatically increased the volume of trade occurring in the world. While a robust literature surrounds the relationship between trade and economic growth, the question of how increased trade openness affects the patterns of durable good consumption is less studied.

The specific research question we address is how has trade liberalization affected the household consumption of durable goods in Mexico. Mexico is a prime candidate for study for this paper for two reasons.

First, the Mexican government conducts a detailed survey of households that provides an excellent source of microdata for studying durable goods consumption.

Second, beginning in 2004 but especially in 2009 as a response to the global financial crisis, Mexico launched a unilateral trade liberalization program which slashed tariff rates for its non NAFTA trade partners on huge swathes of manufactured goods. This provides the significant change in tariff rates that this paper seeks to analyze.

While many other studies on Mexican trade have focused on broad macroeconomic indicators such as GDP and unemployment, we instead analyze household durable good consumption. The consumption of durable goods such as refrigerators and dishwashers can provide a significant improvement in household production that is not necessarily reflected by changes in income and is significantly understudied in the literature.

The rest of the paper is organized as follows. In section 2 we describe the sources of the Mexican microdata and tariff data used by the paper and outline the limitations imposed by our purchase history approach. In section 3.1 we describe the primary outcomes of interest and define the controls used. In sections 3.2-3.5 we perform a series of regressions with durable good age and tariff rate. In section 3.6 we perform a series of regressions with durable good quantity and tariff rate. In section 4 we outline the main findings of the paper and highlight future extensions to the work done here.

2. Data

2.1. Microdata on Mexican Household Consumption

Microdata on Mexican household consumption comes from the National Survey on Household Income and Expenditure (ENIGH) dataset provided by the Instituto Nacional de Estadistica y Geografia (INEGI). The ENIGH dataset consists of a set a household surveys conducted every two years going back to 1984 in which households are asked to provide detailed information about their socioeconomic and demographic characteristics and to describe their monthly income and household expenditures. Of particular interest for this project is the hogares subset of the dataset, which provides data on the consumption of

household durable goods such as televisions, microwaves, refrigerators, washers, and stoves.

Specifically, households are asked three questions about each of the durable goods surveyed.

1. Do you own any of the good?
2. How many of the good do you own?
3. When did you last purchase this good?

The ENIGH dataset consists of cross sectional observations, not panel data, so different households are surveyed each year, making year over year comparisons of individual households impossible. Instead, from this data as well as sociodemographic information, we construct a dataset that includes the purchase history for each household describing the quantity and age of the durable goods owned as well as household income, size, and number of children present.

Mean Number and Age of Household Goods

ITEM	MEAN NUMBER	MEAN AGE
bicycle	0.24	5.52
blender	0.86	5.59
car	0.44	4.58
computer	0.32	3.54
dvd	0.43	4.14
fan	0.92	3.71
iron	0.79	5.03
microwave	0.42	5.56
motorcycle	0.08	3.18
printer	0.12	3.31
radio	0.8	6.4
refrigerator	0.85	7.23
sewing machine	0.16	14.79
stove	0.88	8.11
toaster	0.14	5.99
truck	0.13	6.44
tv	1.47	4.3
vacuum	0.07	5.46
vcr	0.06	9.75
videogame	0.11	3.02
washer	0.67	6.05

Table 1: This table provides the mean number and age of goods owned by the households surveyed across the entire dataset.

The constructed dataset provides a rich depiction of the factors of household production in far more detail than is reflected by income or other more aggregate measures of welfare.

There are, however, several limitations to the purchase history approach. The characteristics of the household such as income and size are measured at the time of the survey, whereas the purchase of goods may have occurred several years earlier. The regressions in this paper control for household characteristics at the time of the ENIGH survey, but it is possible that these characteristics may have shifted between the time the household purchased a good and the time of the survey.

Additionally, the purchase history approach relies on asking households when they last purchased goods, a question which was only added to the ENIGH survey in 2010, thus restricting our dataset to information from surveys in 2010, 2012, 2014, and 2016.

Despite these limitations, the purchase history approach provides ample data for some potentially interesting analyses.

2.2. Tariff Data

Tariff rate data for Mexican imports is sourced from the World Bank Integrated Database (IDB).

Traded goods are classified by Harmonized System (HS) code, which consists of six digits that each provide information about the types of goods being traded. For example, goods with HS codes beginning in 84 are classified as "machinery and mechanical equipment," whereas goods beginning in 8418 describe "refrigerators, freezers and other refrigerating or freezing equipment," and so on, with each additional digit further specifying the goods in question.

The IDB provides data on the tariff rate and volume of Mexican imports by HS code. HS codes for each of the durable goods used in the ENIGH survey were manually assigned. Six digits of specification were used when they unambiguously identified the exact category of goods being analyzed, for example 851690 covers ironing machines and 851672 describes household toasters. For other cases, such as cars, where multiple six digit HS codes were applicable, tariff rates were assigned by using a trade volume weighted average of all applicable categories. For example, 870321 describes cars with engine sizes less than 1000cc, 870322 describes cars with engine sizes between 1000cc and 1500c, and so on. In this case, the average was taken of all 8703XX tariff codes weighted by their respective trade volume.

The tariff rate described by the IDB HS code database is the tariff rate that applies to nations with Most Favored Nation (MFN) status with Mexico. MFN status denotes most countries Mexico trades with, with the notable exception being nations with whom Mexico has specific trade agreements with.

For example, since the United States and Mexico are both parties of the North American Free Trade Agreement (NAFTA), imports coming from the United States to Mexico would be subject to rates typically much lower than those described by the IDB. In comparison, China and Japan have no special trade agreements with Mexico, so they fall under MFN status and goods imported from China and Japan into Mexico are subject to the exact MFN rates described in the IDB dataset.

Fortunately for this paper, the durable goods studied in the ENIGH database consist primarily of electronics and household appliances which Mexico overwhelmingly imports from MFN nations such as China and Japan with two notable exceptions - cars and trucks. Mexican consumption of cars and trucks is almost entirely sourced from domestically produced vehicles, and as such is not typically subject to any tariff rates at all.

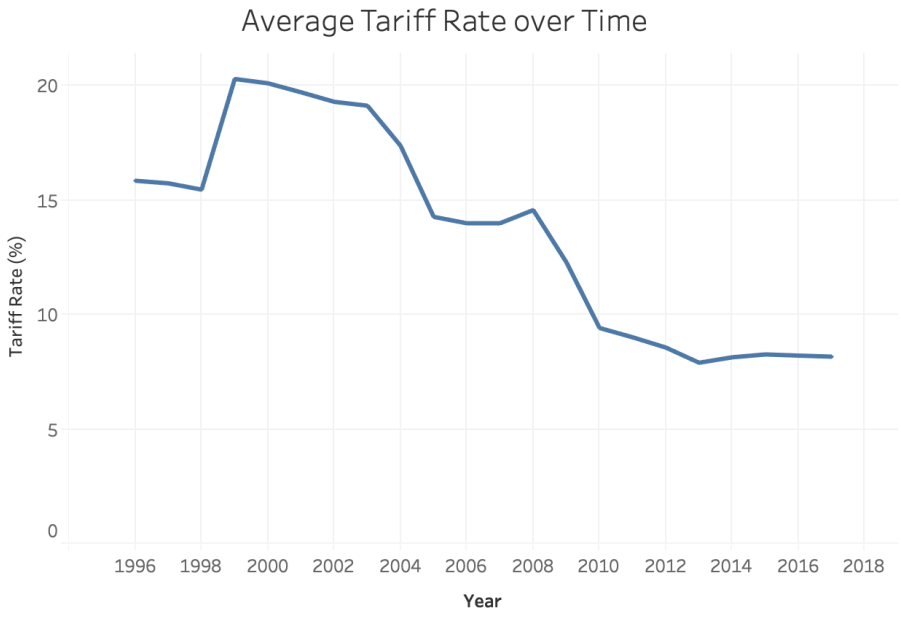


Figure 1: The above graph plots the simple average of the tariff rates of all goods studied between 1996-2017.

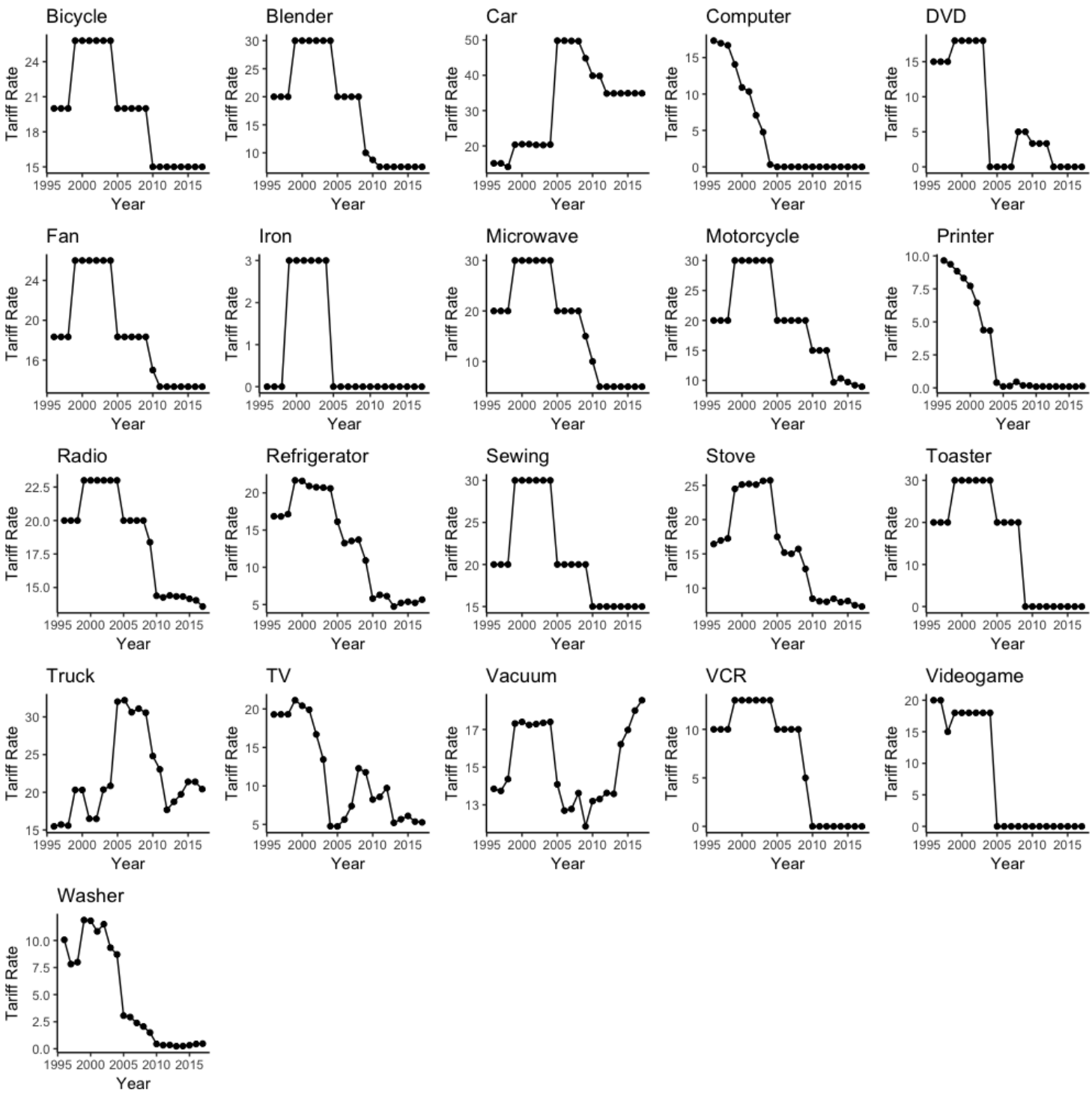


Figure 2: The above graphs plot the individual tariff rates for all goods studied between 1996-2017.

The graphs in Figure 1 and Figure 2 show a similar pattern of shifts in the tariff rate for each appliance. The tariff rate is highest between 2000-2004 and then falls in 2004 and again in 2009 and plateaus at this new low for most of the goods studied, with only a few exceptions. This demonstrates a significant amount of variation in the tariff rate, making this dataset an excellent candidate for analysis of the effects of trade liberalization.

3. Findings

3.1. Variables of Interest

The two primary outcomes of interest for this paper are good age, which describes the average age of the good owned by households, and good number, which describes the average quantity of the good owned by households.

Shifts in good age reflect a shift in the intensive margin of the goods studied, since it is reasonable to assume that newer products reflect higher quality than older ones. Similarly, shifts in good number reflect a shift in the extensive margin of the goods studied, since we assume that increased consumption of a good is generally beneficial for the household.

The primary regressor being studied is the tariff rate on each individual good, measured as the percent duty taxed by Mexico when the good is imported from abroad during the year when the good was purchased.

The controls included are income, household size, number of children, and household municipality. Income is measured as the log of average monthly real income in 2005 pesos at the time of the ENIGH survey. Household size describes the number of occupants of a household at the time of the ENIGH survey. Number of children describes the number of children present in the household at the time of the ENIGH survey. Mexico is divided into 31 states. These states are further divided into 2,448 federally defined municipalities. Household Municipality describes the municipality in Mexico that the household resided in at the time of the ENIGH survey.

3.2. Linear Age Regressions

The full linear regression specification for age is

$$\begin{aligned} \text{Age}_{ij} = \beta_0 + \beta_1 \text{Tariff}_{ij} + \beta_2 \text{Income}_i + \beta_3 \text{HouseholdSize}_i \\ + \beta_4 \text{Children}_i + \beta_5 \text{Municipality}_i + \epsilon_{ij} \end{aligned} \tag{1}$$

where Age_{ij} denotes the age of good j in household i, Tariff_{ij} denotes the tariff rate for good j in household i, Income_i denotes the log of real income for household i, HouseholdSize_i denotes the household size for household i, Children_i denotes the number of children present in household i, and Municipality_i denotes the municipality household i resides in.

We begin by examining the regression table for televisions in detail before proceeding to the full table of results.

tv Age Regression Table

	(1)	(2)	(3)	(4)
VARIABLES	TARIFF	+INCOME	+DEMO	+CITY
tv Tariff	0.466***	0.457***	0.456***	0.440***
	(0.00240)	(0.00245)	(0.00245)	(0.00263)
Log Real Income		-0.319***	-0.329***	-0.300***
		(0.0127)	(0.0136)	(0.0150)
Household Size			0.0241**	0.00594
			(0.00982)	(0.0101)
Number of Children			-0.0635***	-0.0445***
			(0.0134)	(0.0136)
Constant	-0.616***	4.356***	4.512***	4.068***
	(0.0248)	(0.203)	(0.209)	(0.245)
Observations	50,287	50,234	50,234	50,234
R-squared	0.437	0.444	0.445	0.467
CITY FE				YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: The above table reports the results for television age regressed on tariff rate with controls for the log of real income, household size, number of children, and municipality fixed effects.

The tv Age regression table reports the results for several regression specifications, each with an additional added term or terms.

Regression specification (1) shows the result of television age regressed on the television tariff rate, and reports a coefficient of 0.466. This means that a one percent increase in the television tariff rate is associated with an increase in the average age of televisions owned by households by 0.466 years. This result is statistically significant at the 1% level, and has an R^2 value of 0.437 which suggests that the tariff rate plays a large role in explaining the variation in the age of household televisions.

Regression specification (2) shows the result of television age regressed on the television tariff rate and the log of real income. The coefficient for tariff rate stays stable across the inclusion of income, and the result remains significant at the 1% level. The coefficient for income is negative, which means that as income increases the average age of appliances owned decreases, which makes sense as wealthier households with more disposable income are better able to update their durable goods.

Regression specification (3) shows the result of television age regressed on the television tariff rate, the log of real income, and two sociodemographic characteristics - household size and number of children present. The coefficient for tariff rate stays stable across the inclusion of income and socioeconomic controls, and the result remains significant at the 1% level. The coefficient for household size is significant at the 5% level and is positive, suggesting that as household size increases the average age of durable goods increases.

This seems plausible since larger households will consume more in rent, food, utilities, and other costs which smaller households might be able to use to more frequently upgrade their durable goods.

The coefficient for number is children is significant at the 1% level and is negative, suggesting that as the number of children in a household increases the average age of household durable goods decreases. This suggests that households with more children might prioritize spending on upgrading durable goods such as a newer, safer car over spending in other categories.

Finally, regression specification (4) shows the result of television age regressed on the television tariff rate, the log of real income, sociodemographic characteristics, and municipality fixed effects. The coefficient for tariff rate stays stable across the inclusion of income, socioeconomic characteristics, and municipality fixed effects, and the result still remains significant at the 1% level. This result supports the hypothesis that decreases in the tariff rate increase the frequency at which households update their television purchases.

Now we present the results for the all 21 durable goods.

Age Regression Table

VARIABLES	(1) TARIFF	(2) +INCOME	(3) +DEMO	(4) +CITY
bicycle Tariff	0.856***	0.867***	0.866***	0.903***
	(0.00531)	(0.00534)	(0.00532)	(0.00542)
blender Tariff	0.394***	0.397***	0.397***	0.415***
	(0.00114)	(0.00114)	(0.00114)	(0.00113)
car Tariff	-0.121***	-0.121***	-0.121***	-0.120***
	(0.00306)	(0.00303)	(0.00302)	(0.00302)
computer Tariff	0.869***	0.869***	0.866***	0.864***
	(0.00699)	(0.00700)	(0.00701)	(0.00702)
dvd Tariff	0.399***	0.400***	0.400***	0.403***
	(0.00339)	(0.00339)	(0.00339)	(0.00336)
fan Tariff	0.735***	0.738***	0.736***	0.762***
	(0.00316)	(0.00318)	(0.00316)	(0.00317)
iron Tariff	2.551***	2.533***	2.531***	2.556***
	(0.0107)	(0.0108)	(0.0108)	(0.0105)
microwave Tariff	0.329***	0.331***	0.332***	0.351***
	(0.00132)	(0.00132)	(0.00132)	(0.00134)
motorcycle Tariff	0.463***	0.465***	0.466***	0.503***
	(0.00558)	(0.00558)	(0.00559)	(0.00587)
printer Tariff	1.347***	1.347***	1.338***	1.334***
	(0.0152)	(0.0153)	(0.0153)	(0.0150)
radio Tariff	0.944***	0.952***	0.953***	1.014***
	(0.00292)	(0.00292)	(0.00292)	(0.00299)
refrigerator Tariff	0.590***	0.594***	0.594***	0.623***
	(0.00146)	(0.00146)	(0.00146)	(0.00144)
sewing Tariff	0.592***	0.594***	0.589***	0.605***
	(0.00448)	(0.00448)	(0.00452)	(0.00496)
stove Tariff	0.542***	0.545***	0.546***	0.564***
	(0.00140)	(0.00140)	(0.00140)	(0.00139)
toaster Tariff	0.260***	0.261***	0.261***	0.270***
	(0.00194)	(0.00194)	(0.00193)	(0.00199)
truck Tariff	-0.0437***	-0.0445***	-0.0447***	-0.0290***
	(0.00767)	(0.00764)	(0.00760)	(0.00797)
tv Tariff	0.466***	0.457***	0.456***	0.440***
	(0.00240)	(0.00245)	(0.00245)	(0.00263)
vacuum Tariff	0.140***	0.138***	0.140***	0.160***
	(0.0272)	(0.0272)	(0.0270)	(0.0282)
vcr Tariff	0.646***	0.645***	0.648***	0.672***
	(0.00605)	(0.00602)	(0.00603)	(0.00733)
videogame Tariff	0.451***	0.452***	0.451***	0.455***
	(0.00783)	(0.00783)	(0.00780)	(0.00797)
washer Tariff	0.908***	0.911***	0.909***	0.928***
	(0.00301)	(0.00301)	(0.00299)	(0.00289)

Table 3: The above table reports only the coefficients for the tariff rate of a particular good across the four linear age regression specifications used in this paper.

The complete regression table includes the beta coefficient for the tariff rate of a particular durable good for each of the linear age regression specifications. Looking across the rows of the table shows that the coefficient for tariff rate is statistically significant at the 1% level and remains stable upon the inclusion of income and sociodemographic controls and municipality fixed effects for each durable good. Going down the column of the richest regression specification (4) reveals positive, statistically significant tariff rate coefficients with magnitudes between 0.4 and 1.0 with three notable exceptions.

Cars and trucks both report negative coefficients. This seems plausible since Mexico is overwhelmingly a net exporter of cars and trucks and imports only a tiny fraction of vehicles for domestic consumption.

In addition, the coefficient for vacuum is smaller than for many of the other goods, but this can be explained by the trend in the vacuum tariff rate - vacuums are the only durable good whose tariff rate rose significantly between 2009 and 2017.

3.3. Age Regressions with an Interaction Term

Now we extend the richest linear age regression specification by including an interaction term between the tariff rate and income.

The age regression specification with an interaction between the tariff rate and income is

$$\begin{aligned}\text{Age}_{ij} = \beta_0 + \beta_1 \text{Tariff}_{ij} + \beta_2 \text{Income}_i + \beta_3 \text{Tariff}_{ij} * \text{Income}_i + \beta_4 \text{HouseholdSize}_i \\ + \beta_5 \text{Children}_i + \beta_6 \text{Municipality}_i + \epsilon_{ij}\end{aligned} \tag{2}$$

where Age_{ij} denotes the age of good j in household i, Tariff_{ij} denotes the tariff rate for good j in household i, Income_i denotes the log of real income for household i, $\text{Tariff}_{ij} * \text{Income}_i$ denotes the interaction between the tariff rate for good j in household i and the log of real income for household i, HouseholdSize_i denotes the household size for household i, Children_i denotes the number of children present in household i, and Municipality_i denotes the municipality household i resides in.

washer Age Regression Table

VARIABLES	(1) TARIFF	(2) +INCOME	(3) +DEMO	(4) +CITY	(5) +TARIFF*INCOME	(6) +TARIFF^2
washer Tariff	0.908***	0.911***	0.909***	0.928***	0.487***	2.018***
	(0.00301)	(0.00301)	(0.00299)	(0.00289)	(0.0510)	(0.0114)
Log Real Income		0.216***	0.267***	0.225***	0.141***	0.283***
		(0.0111)	(0.0116)	(0.0120)	(0.0129)	(0.0113)
washer Tariff * Income					0.0285***	
					(0.00329)	
Household Size			-0.101***	-0.0713***	-0.0717***	-0.0877***
			(0.00858)	(0.00847)	(0.00847)	(0.00798)
Number of Children			-0.0618***	-0.0863***	-0.0869***	-0.0651***
			(0.0116)	(0.0113)	(0.0113)	(0.0106)
washer Tariff Squared						-0.0963***
						(0.000960)
Constant	2.891***	-0.465***	-0.784***	0.395**	1.705***	-1.432***
	(0.00998)	(0.173)	(0.175)	(0.196)	(0.208)	(0.184)
Observations	79,943	79,897	79,897	79,897	79,897	79,897
R-squared	0.623	0.625	0.628	0.662	0.663	0.706
CITY FE				YES	YES	YES

Table 4: The above table presents the results of dishwasher age regressed on dishwasher tariff rate across several linear and nonlinear specifications.

Regression specification (5) shows the effect of the inclusion of an interaction term between tariff rate and income on dishwasher age. The coefficient for washer Tariff * Income is positive at 0.0285 and statistically significant at the 1% level. This suggests that there is a nonlinear relationship between changes in the dishwasher tariff rate and changes in the average age of dishwashers owned.

A positive coefficient for the interaction term suggests that for a given change in the tariff rate, higher income households will on average have an increased impact on the age of their dishwashers due to the tariff rate. This seems plausible since wealthier households have more disposable income that they can spend on updating their durable goods whereas poorer households might be allocating more of their spending towards necessities and might make do with older

appliances.

Interaction and Square Terms in Age Regressions

ITEM	INTERACTION	SQUARE
bicycle	0.0687***	-0.0145***
	(0.00643)	(0.00210)
blender	0.0151***	-0.00312***
	(0.00122)	(0.000235)
car	0.0479***	0.0307***
	(0.00364)	(0.000132)
computer	0.0646***	-0.0331***
	(0.00898)	(0.00185)
dvd	0.0356***	0.0309***
	(0.00406)	(0.000440)
fan	0.0300***	-0.00278***
	(0.00317)	(0.000862)
iron	0.252***	omit
	(0.0113)	omit
microwave	0.00990***	0.00356***
	(0.00151)	(0.000198)
motorcycle	0.0127**	0.00371***
	(0.00635)	(0.000790)
printer	0.0712***	-0.103***
	(0.0211)	(0.00900)
radio	0.00492	0.0563***
	(0.00309)	(0.00152)
refrigerator	0.00983***	0.000128
	(0.00159)	(0.000316)
sewing	0.0270***	-0.0700***
	(0.00517)	(0.00171)
stove	0.0186***	-0.0260***
	(0.00153)	(0.000340)
toaster	0.00746***	0.00496***
	(0.00217)	(0.000370)
truck	0.0607***	0.0994***
	(0.00850)	(0.00170)
tv	-0.00602**	0.0703***
	(0.00283)	(0.000434)
vacuum	-0.0909***	0.0653***
	(0.0335)	(0.0186)
vcr	0.0191**	0.0261***
	(0.00761)	(0.00318)
videogame	0.0345***	0.00104
	(0.0102)	(0.0277)
washer	0.0285***	-0.0963***
	(0.00329)	(0.000960)

Table 5: The above table lists the beta coefficient for tariff rate interacted with income and tariff rate squared for each durable goods studied in this paper using regression specifications (5) and (6) described in the previous table.

Note that the result for ironing machine is omitted in Table 5 for the square tariff regression since ironing machine only had 2 tariff rates across the time period studied, resulting in a regression that was collinear with specification (4) from the linear regression table.

Looking at the table of the coefficients of the interaction terms for all durable goods suggests that the previous analysis holds true across all of the goods studied with only two exceptions. The interaction terms are positive and all are statistically significant at the 5% level, with most goods significant at the 1% level.

Vacuums and televisions are the only two goods with negative coefficients that deviate from the trend. As before, vacuums were the only durable good to see a significant increase in their tariff rate over the period of the studied. As for televisions, the negative coefficient of the interaction term suggests that given a fixed change in the tariff rate, as income increases the effect of the tariff change on the average age of televisions owned decreases. This could suggest that televisions are considered an important enough good by wealthier households such that they are less sensitive to shifts in price induced by changes in the tariff rate and instead prioritize television spending over other forms of spending.

3.4. Age Regression with Squared Tariff Rate

Finally, we extend the richest linear age regression specification by a squared tariff rate term. The age regression specification with a nonlinear tariff rate term is

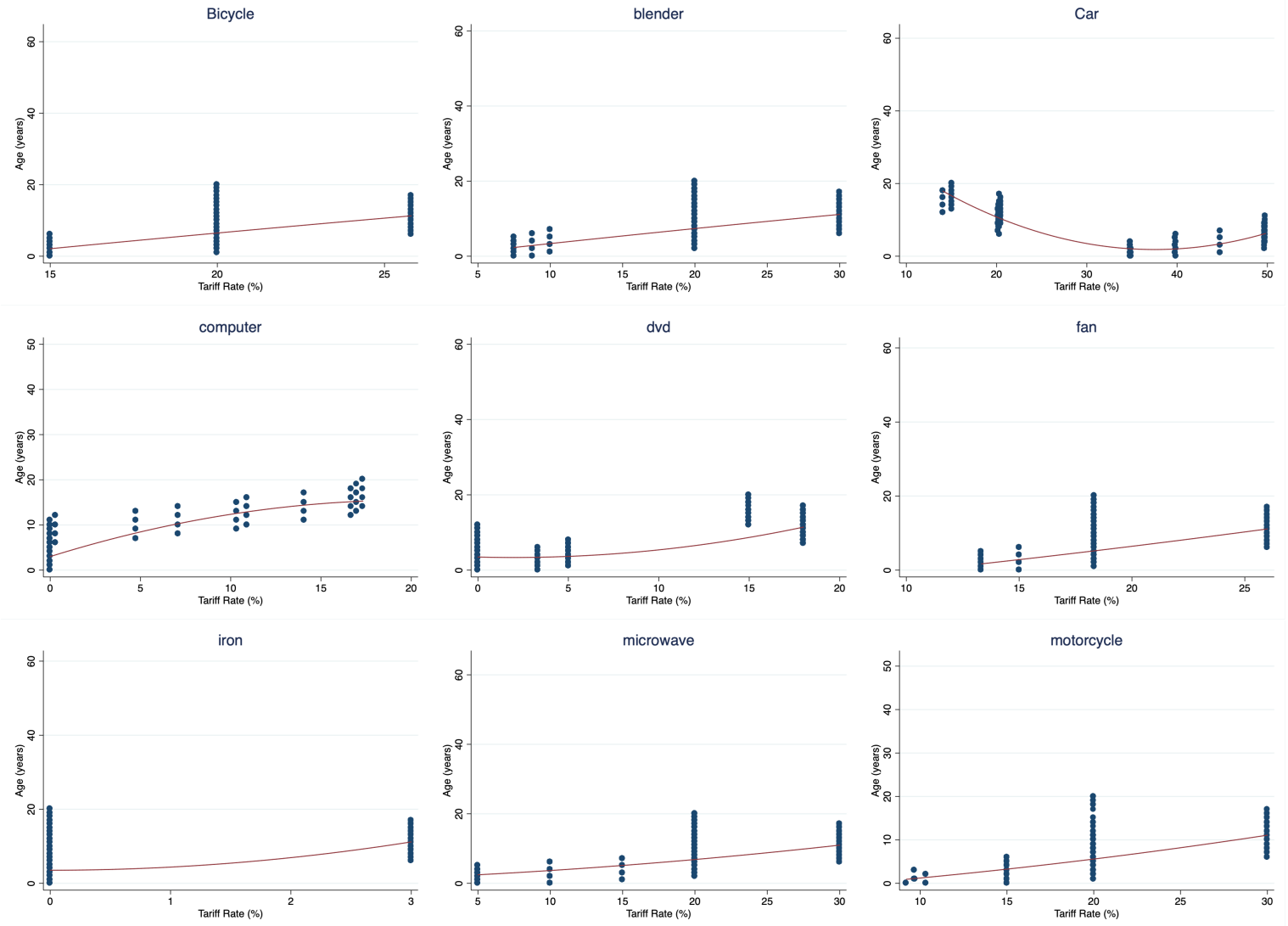
$$\begin{aligned} \text{Age}_{ij} = \beta_0 + \beta_1 \text{Tariff}_{ij} + \beta_2 \text{Tariff}_{ij}^2 + \beta_3 \text{Income}_i + \beta_4 \text{HouseholdSize}_i \\ + \beta_5 \text{Children}_i + \beta_6 \text{Municipality}_i + \epsilon_{ij} \end{aligned} \tag{3}$$

where Age_{ij} denotes the age of good j in household i, Tariff_{ij} denotes the tariff rate for good j in household i, Tariff_{ij}^2 denotes the square of the tariff rate for good j in household i, Income_i denotes the log of real income for household i, HouseholdSize_i denotes the household size for household i, Children_i denotes the number of children present in household i, and Municipality_i denotes the municipality household i resides in.

Regression specification (6) of Table 4 shows the effect of the inclusion of a squared tariff term.

The result is negative and statistically significant at the 1% level, further suggesting that there is a nonlinear relationship between dishwasher age and the dishwasher tariff rate.

Quadratic Fit of Tariff Rates on Durable Good Age



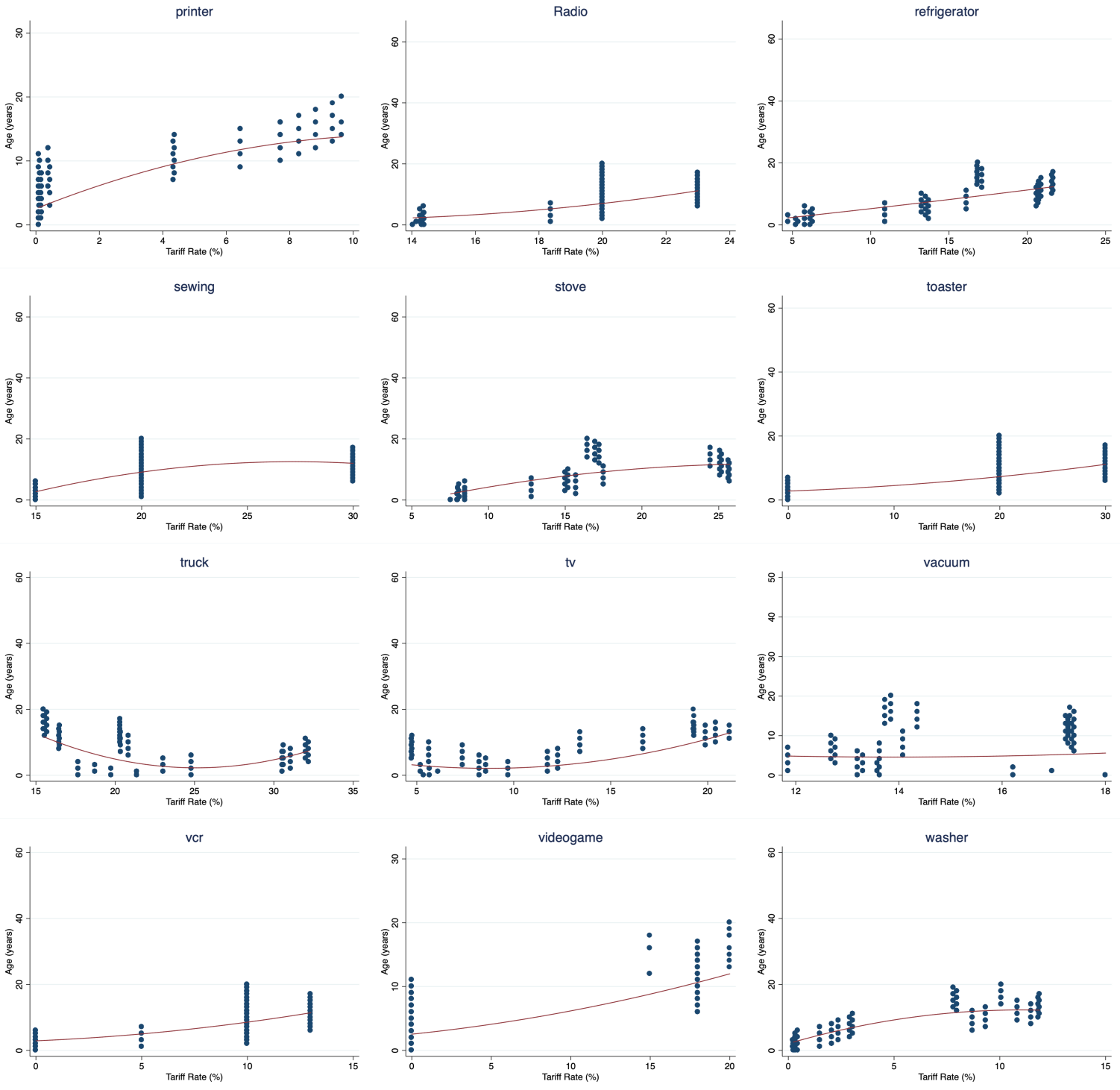


Figure 3: The above series of plots shows the quadratic tariff rate fit on good age for each of the durable goods studied.

Looking at the coefficients for the tariff squared term presented in Table 5 shows that the tariff squared term is statistically significant at the 1% level for almost all of the durable goods. The sign of the tariff squared term is both positive and negative depending on the appliance.

Looking at the plots of the quadratic fits suggests that for some of the goods, such as microwaves and fans, the fit of the quadratic curve is fairly flat in the domain of the tariff rate values relevant for this paper. Other goods, such as printers and computers, show a much more pronounced nonlinear fit.

3.5. Age Regression Summary

The above findings provide strong evidence for an economically important and statistically significant relationship between changes in the tariff rate and the average age of household durable goods.

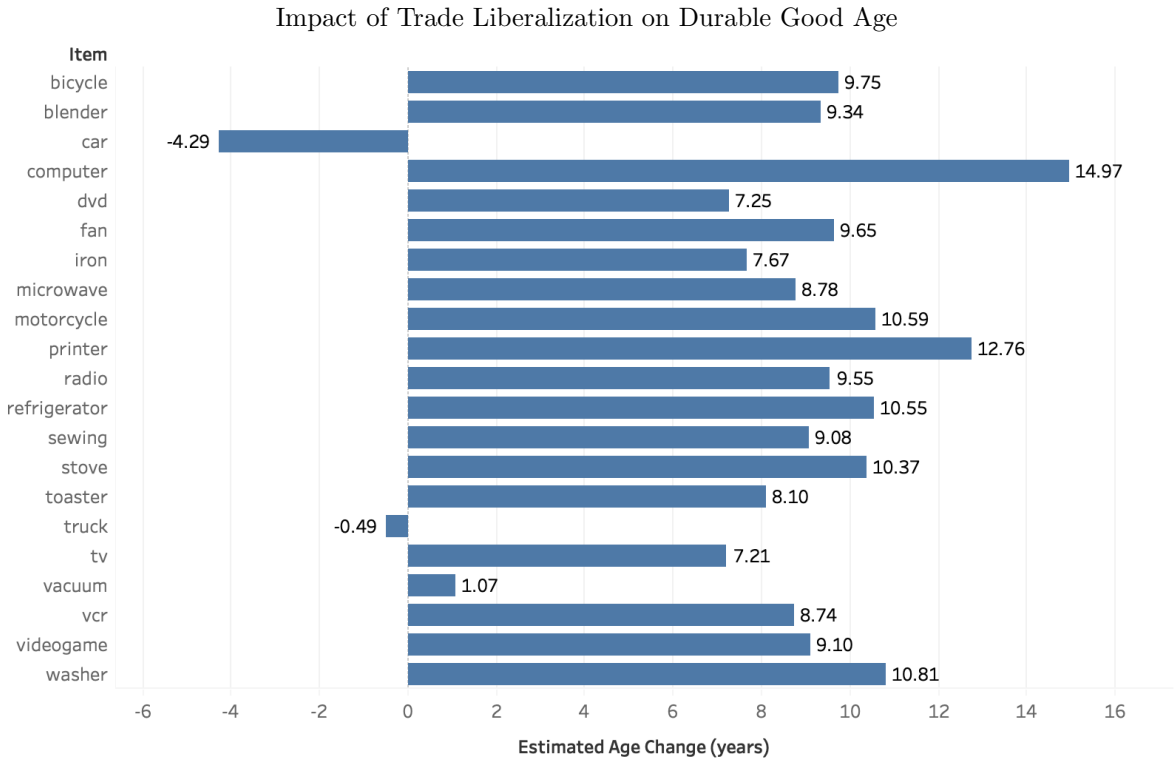


Figure 4: The above plot shows the estimated decrease in the average age of all durable goods studied attributable to the total change in tariff rates between 1996 and 2016.

The above graph is constructed by taking the largest change in the tariff rate between 1996-2016 and multiplying by the estimated beta coefficient of the linear regression model of durable good age and tariff rate controlling for income, sociodemographic characteristics, and municipality fixed effects.

The results show a substantial decrease of between 7 and 11 years in the average age of the durable goods studied with the exceptions of cars, trucks, and vacuums as noted previously.

The largest change in the tariff rate between 1996-2016 averaged across all the goods studied is -16.66%. The average beta coefficient for tariff rate across all goods studied is 0.65. Multiplying these values together gives a result of

10.85 years.

This suggests that the Mexican trade liberalization policy has had the effect of decreasing the average age of household durable goods owned by 10.85 years.

3.6. Number Regressions

Now we proceed to analyzing the impact of changes in tariff rates on the average number of durable goods owned by Mexican households.

A significant limitation of the purchase history approach used to construct the dataset for this paper is that the same households are not tracked over time. As such, while it would be interesting to measure how trade liberalization affects the decision of households to purchase a refrigerator or stove or other appliance for the first time, with the constructed purchase history we are only able to observe the most recent purchase of the good being analyzed. We have no way of distinguishing between households who do not own a certain durable good regardless of the price versus households who want a certain durable good but are deciding not to purchase it because the price is too high. This makes it impossible to do regressions on households who do not own any durable goods.

Instead, what we can do is estimate the impact of trade liberalization on households that already own a durable good. Since they already own a durable good, we have evidence that they are in the market for that good, and can use changes in the tariff rate to determine if lower tariffs result in increased consumption of these durable goods.

The full linear regression specification for number is

$$\begin{aligned} \text{Number}_{ij} = \beta_0 + \beta_1 \text{Tariff}_{ij} + \beta_2 \text{Income}_i + \beta_3 \text{HouseholdSize}_i \\ + \beta_4 \text{Children}_i + \beta_5 \text{Municipality}_i + \epsilon_{ij} \end{aligned} \tag{4}$$

where Number_{ij} denotes the quantity of good j owned by household i, Tariff_{ij} denotes the tariff rate for good j in household i, Income_i denotes the log of real income for household i, HouseholdSize_i denotes the household size for household i, Children_i denotes the number of children present in household i, and Municipality_i denotes the municipality household i resides in.

Number Regression Assuming Ownership Table

VARIABLES	(1) TARIFF	(2) +INCOME	(3) +DEMO	(4) +CITY
bicycle Tariff	-0.0148***	-0.0118***	-0.0133***	-0.0177***
	(0.00128)	(0.00127)	(0.00127)	(0.00131)
blender Tariff	-0.000667***	-0.000444*	-0.000473**	-0.000701***
	(0.000237)	(0.000235)	(0.000231)	(0.000236)
car Tariff	0.000843***	0.00102***	0.00105***	0.00101***
	(0.000310)	(0.000305)	(0.000305)	(0.000307)
computer Tariff	-0.0191***	-0.0163***	-0.0172***	-0.0175***
	(0.000817)	(0.000870)	(0.000880)	(0.000858)
dvd Tariff	-0.00218***	-0.00113***	-0.00124***	-0.00178***
	(0.000365)	(0.000364)	(0.000365)	(0.000379)
fan Tariff	-0.0201***	-0.0109***	-0.0125***	-0.00405***
	(0.00108)	(0.00106)	(0.00106)	(0.00107)
iron Tariff	-0.00612***	-0.00393***	-0.00422***	-0.00545***
	(0.000853)	(0.000848)	(0.000849)	(0.000864)
microwave Tariff	-0.000128	-8.00e-05	-9.45e-05	-0.000182*
	(0.000101)	(0.000101)	(0.000101)	(0.000105)
motorcycle Tariff	-0.00190*	-0.00127	-0.00159	-0.00341***
	(0.00101)	(0.00101)	(0.00102)	(0.00111)
printer Tariff	-0.00664***	-0.00558***	-0.00585***	-0.00597***
	(0.000911)	(0.000899)	(0.000917)	(0.00109)
radio Tariff	-0.00854***	-0.00541***	-0.00594***	-0.00991***
	(0.000631)	(0.000620)	(0.000619)	(0.000665)
refrigerator Tariff	-0.00103***	-0.000893***	-0.000978***	-0.00103***
	(9.31e-05)	(9.35e-05)	(9.42e-05)	(0.000102)
sewing Tariff	-0.00410***	-0.00392***	-0.00400***	-0.00415***
	(0.000649)	(0.000645)	(0.000647)	(0.000729)
stove Tariff	-0.000159	-0.000136	-0.000187	-0.000160
	(0.000249)	(0.000248)	(0.000234)	(0.000296)
toaster Tariff	-0.000278***	-0.000258***	-0.000260***	-0.000266***
	(7.68e-05)	(7.64e-05)	(7.59e-05)	(7.64e-05)
truck Tariff	-0.00174***	-0.00165***	-0.00167***	-0.00119*
	(0.000626)	(0.000622)	(0.000624)	(0.000654)
tv Tariff	-0.0536***	-0.0397***	-0.0399***	-0.0320***
	(0.000743)	(0.000701)	(0.000700)	(0.000713)
vacuum Tariff	0.00113	0.00107	0.00109	0.00124
	(0.00145)	(0.00144)	(0.00144)	(0.00160)
vcr Tariff	-0.00176***	-0.00181***	-0.00177***	-0.00219***
	(0.000661)	(0.000657)	(0.000654)	(0.000782)
videogame Tariff	-0.00524***	-0.00403***	-0.00386***	-0.00382***
	(0.00113)	(0.00111)	(0.00111)	(0.00125)
washer Tariff	-0.00113***	-0.000984***	-0.00103***	-0.00113***
	(0.000137)	(0.000136)	(0.000137)	(0.000146)

Table 6: The above table reports only the coefficients for the tariff rate of a particular good across the four linear number regression specifications used in this paper.

As with the age regressions, we see that the coefficient for tariff rate is stable across the four linear regression specifications shown in the table and that the results are statistically significant at the 1% level for all goods with the exception of cars, trucks, and vacuums as previously noted.

The coefficient of bicycle tariff under regression specification (4) of -0.0177 can be interpreted as stating that a one percent increase in the bicycle tariff rate is associated with a decrease in the average number of bicycles owned by 0.0177.

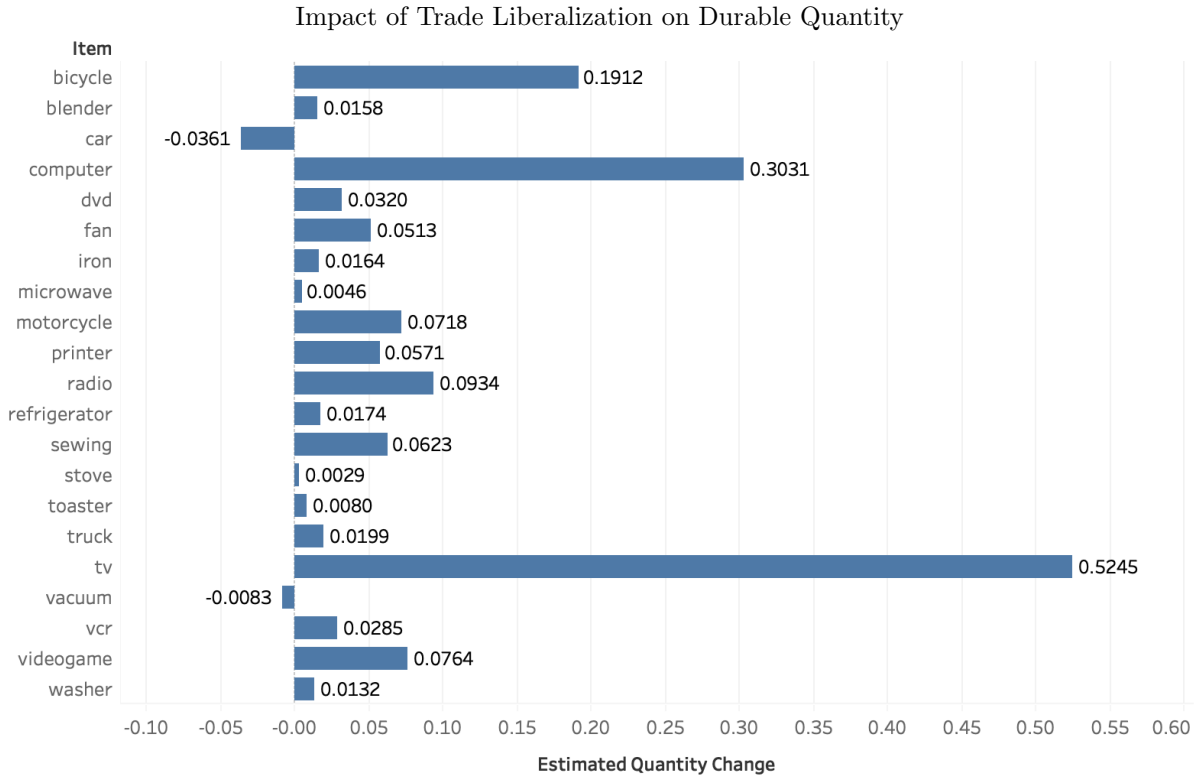


Figure 5: The above plot shows the estimated increase in the average quantity of all durable goods studied attributable to the total change in tariff rates between 1996 and 2016 for households that already owned at least one of the durable goods.

The above plot shows the estimated effect of the trade liberalization policy

on the quantity of each durable good owned for households that already owned at least one of the durable goods.

The results show a consistent increase in the average quantity owned of the durable goods between 0.05 and 0.10, with several higher outliers, and the the negative outliers of cars and vacuums as described previously. To synthesize these results, since the largest change in the tariff rate between 1996-2016 averaged across all the goods studied is -16.66% and since the average beta coefficient for tariff rate across all goods studied is -0.00586, multiplying these values together gives a result of 0.1.

This suggests that the Mexican trade liberalization policy had the effect of increasing the average number of household durable goods owned by households who already owned one of the durable goods by 0.1. In other words, we can say that the trade liberalization policy induced an average of one in ten households who owned a durable good to purchase an additional unit of that durable good.

4. Conclusion

The regression findings have demonstrated that Mexican trade liberalization has had economically large and statistically significant effects on the average quantity and age of household durable goods. These findings suggest that further reductions in tariff rates might induce households to more frequently update their durable goods and to purchase additional units of durable goods that they already own. Moreover, these findings also highlight the importance of further study on the consumption of household durable goods as an important supplement to income and other aggregate indicators for measuring the impact of policy changes on household welfare.

Extensions to this work might include using some of the many different socioeconomic characteristics in the ENIGH dataset to construct synthetic cohorts in the data as done by Attanasio and Szekely. [1] This would cause the dataset to more closely reflect panel data, and would allow much more detailed study into the decision of households to transition from consuming zero of a good

to consuming that good, an aspect of consumption that the purchase history approach of this paper was not able to investigate thoroughly.

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