

# Managed Trade: The U.S.-Mexico Sugar Suspension Agreements

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July 20, 2018

## Abstract

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Under the 1994 North American Free Trade Agreement Mexican producers were granted free access to the U.S. sugar market while all other suppliers, including U.S. refiners, were subject to supply quotas. Following a surge in imports of Mexican sugar, the American Sugar Coalition initiated anti-dumping and countervailing duty (ADCVD) proceedings against Mexico in early 2014. In December 2014, the ADCVD cases were halted as a result of two Suspension Agreements negotiated between the U.S. and Mexico. This paper contributes to a very small number of empirical studies that have estimated the impact of suspension agreements. We measure the impacts of ADCVD and the Suspension Agreements on U.S. raw and refined prices, the raw-to-refined margin, and the quantity and composition of sugar imports from Mexico. Results suggest U.S. raw sugar prices increased by 3¢ per lb. (14%) under ADCVD proceedings, approximately equivalent to an *ad valorem* tariff between 40 and 50% while the Suspension Agreements increased U.S. raw sugar prices by an additional 2¢ (70% tariff equivalent). Impacts on U.S. refined sugar prices increased by similar amounts under ADCVD proceedings and the Suspension Agreements (4.5¢ per lb.). Ultimately, both ADCVD proceedings and Suspension Agreements significantly reduced sugar imports from Mexico. U.S. sugar refiner welfare hinges critically on the quantity and composition of sugar imports. As such, refiner revenue, following the ADCVD and Suspension Agreements, is estimated to have declined by 16%, relative to a free-trade environment.

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## Key Words

anti-dumping, countervailing duty, sugar, trade remedy law, trade suspension agreement, NAFTA

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*“The sugar industry has been at the center of the most contentious trade issues between Mexico and the United States since NAFTA was first negotiated in the early 1990s.”* The New York Times (June 4, 2017)

## 1 Introduction

Sugar from Mexico has entered the U.S. duty-and-quota-free since January 2008 under the North American Free Trade Agreement (NAFTA). Mexico’s free access to the U.S. sugar market destabilized U.S. domestic sugar policy, and was a driving force behind the call to renegotiate NAFTA (Malkin, 6 June 2017). Since 2008, Mexico has been the largest exporter of sugar to the U.S., and beginning in late 2011, Mexican sugar exports to the U.S. nearly doubled and remained high for the next three years.

In response to the import surge of Mexican sugar, the American Sugar coalition initiated antidumping and countervailing duty (ADCVD) proceedings against Mexico in March 2014. In May 2014, the U.S. International Trade Commission (USITC) made a preliminary determination that subject imports resulted in economic injury to U.S. sugar farmers and refiners, and in August 2014, the Department of Commerce (DOC) announced preliminary duties ranging from 39.54% to 47.26% (USITC, 2014). Investigations were halted in December 2014 as a result of two Suspension Agreements signed by the U.S. and Mexican governments, which stipulated price and quantity restrictions on Mexican sugar exports to the U.S.

Since the seminal work on dumping by Viner (1923), legal and economic scholars have sought to understand the incentives created under trade remedy law (TRL) and the associated effects on trade. U.S. ADCVD laws provide a formal mechanism, known as the suspension process, through which domestic and foreign producers can resolve ADCVD disputes by reaching an agreement that “eliminates the risk of injury” to domestic producers.<sup>1</sup>

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<sup>1</sup> §§704(c) and 734(c) of the Tariff Act of 1930 govern the imposition of Suspension Agreements in resolution of ADCVD disputes. Similar mechanisms exist in other countries. However, their use in the European Union has decreased substantially in recent years (Steinbach, 2014).

If suspension negotiations are successful, the terms of suspension—which usually include voluntary export restraints (VERs) or price restrictions—take the place of ADCVD tariffs on subject imports.

ADCVD duties have disparate effects on prices and the composition of trade compared to Suspension Agreements. This difference can lead to a divergence of interests between upstream and downstream producer groups with respect to the preferred regulatory environment (Feinberg and Kaplan, 1993). A common *ad valorem* duty levied across all product categories will reduce overall trade levels, with little cross-product trade diversion. In contrast, Suspension Agreements tend to divert trade toward finished products (Falvey, 1979).

The simple filing an ADCVD investigation can affect markets (Mahdavi and Bhagwati, 1994; Prusa, 2001; Staiger and Wolak, 1994), and ADCVD duties can result in substantial trade reductions for named products and source countries (Prusa, 2001). These impacts may be even larger for agricultural products (Carter and Gunning-Trant, 2006, 2010).

Though there is some discussion to the contrary (Messerlin, 1989), there is substantial economic theory suggesting that Suspension Agreements can benefit parties to the action, relative to levied duties. Domestic and foreign litigants can collude to fix prices and/or the quantity of imports (Moore, 2005; Prusa, 1992). The parties also save legal fees from continued litigation (Farr and DeFrancisco, 2006). From a political economy perspective, even the government can benefit if the electoral returns from industry profits are large relative to the losses from higher consumer prices (Rosendorff, 1996).

Empirical studies on the effects of Suspension Agreements are few. Staiger and Wolak (1994) show that—like ADCVD duties—Suspension Agreements result in substantial trade restrictions. Existing case studies focus almost exclusively on the Suspension Agreements negotiated in resolution of the U.S.-Mexico “Tomato Wars.” Baylis and Perloff (2010) studied the trade diversionary effects of the 1996 U.S.-Mexico Tomato Suspension Agreement. They found that over three-fourths of the Mexican fresh tomatoes restricted from entering the U.S. under the Agreement were ultimately imported via cross-country and cross-product trade

diversion.

The 1996 U.S.-Mexico Tomato Suspension Agreement was re-negotiated in 2013. The new Suspension Agreement substantially reduced the import of fresh tomatoes from Mexico to the U.S. and eliminated much of the cross-country and cross-product diversion of tomatoes and tomato products entering the U.S. (Ghazalian, 2015). U.S., Canadian, and Mexican producers of several varieties of fresh tomatoes benefited from the revised terms of the Agreement (Kosse and Devadoss, 2016).

The primary condition for successful suspension negotiations is that each domestic producer be made at least as well off under the Suspension Agreement as it would have been by proceeding with ADCVD investigations (Prusa, 1992). However, heterogeneous preferences within the domestic industry make this condition difficult to achieve in the presence of trade diversion. In the sugar market, sugar farmers prefer heavy restrictions on the import of sugar and sugar-containing products, whereas domestic refiners may prefer raw sugar inputs to enter duty-and-quota-free.

In this paper, we use the U.S.-Mexico sugar dispute as a case study to *explicitly* compare the benefits of ADCVD duties versus the Suspension Agreements to different groups within the domestic petitioners. We develop an empirical model to compare U.S. sugar prices and returns to U.S. cane refiners under *Sugar from Mexico* ADCVD investigations and the U.S.-Mexico Sugar Suspension Agreements. We contrast our findings with a counterfactual scenario in which sugar imports from Mexico are unrestricted. Although there have been a small number of papers on the effects of Suspension Agreements, this paper is the first in this line of research to assess the implications of multiple alternative empirical regimes on distinct producer groups at different points along the domestic supply chain.

We find that ADCVD proceedings and the Suspension Agreements increased U.S. prices for raw and refined sugar, relative to free trade with Mexico. U.S. raw sugar prices increased by 3¢ (14%) under ADCVD proceedings relative to a counterfactual free-trade scenario, approximately equivalent to an *ad valorem* tariff in the range of 40–50%. The Suspension

Agreements increased U.S. raw sugar prices by an additional 2¢, roughly equivalent to a 70% tariff. Impacts on U.S. refined sugar prices were similar under ADCVD proceedings and the Suspension Agreements ( $\approx 4.5\text{¢}$  per lb.). ADCVD proceedings and Suspension Agreements significantly reduced sugar imports from Mexico. Consistent with (Falvey, 1979), the Agreements also induced a major shift in the composition of trade away from raw sugar and towards semi-refined (estandar) sugar. Some U.S. cane sugar refiners were made worse off from the Suspension Agreements, both relative to ADCVD proceedings and free trade. Liquid sugar producers (known as “sweetener stations” or “melt houses”), on the other hand, who were not part of the ADCVD petitioners, likely benefited from the Agreements.

## 2 Background

In the U.S., sugar is derived from both sugar beets and sugarcane. Refined sugar originating from one source is physically and chemically identical to the other. An important characteristic of sugar is the degree of refining purity, known as polarity, which is based on the product’s molasses content, color, and dextran content. A polarity measure of 100 degrees signifies pure, refined sugar. Lower measurements correspond to less refined sugar. The USDA, Food and Drug Administration (FDA), and the Customs and Border Patrol (CBP) label any sugar of polarity less than 99.5 as raw sugar and any sugar of polarity of 99.5 degrees or greater as refined. Sugar of polarity equal to or greater than 99.5 is approved by the FDA for human consumption, whereas sugar of less than 99.5 polarity is not.

Sugarcane is primarily grown in Florida, Louisiana, and Texas. Raw sugar is extracted from sugarcane through a milling process. The raw sugar is then sent to refineries to be transformed into refined sugar. Sugarbeets are planted annually and are grown in 11 states. Most production occurs in the Great Plains and Far West. In contrast to sugarcane, sugar beets do not go through the raw sugar stage. Instead, they are refined from beet to final product in a continuous process at a single manufacturing facility. The majority of beet

processors in the U.S. are cooperative organizations owned by sugarbeet farmers.

In addition to standard cane refiners and beet processing operations, there are also several “sweetener stations” or “melt houses” in the U.S., which convert food-grade or near-food-grade sugar into liquid (USITC, 2014). These liquid sugar processors are typically low-investment operations that do not perform a significant amount of refining and whose activities primarily involve melting sugar and adding water. Liquid sugar is sold for industrial use and accounts for approximately 17% of all sugar consumption in the U.S. (USITC, 2014).

The U.S. government employs several policy instruments, collectively known as the U.S. sugar program, to restrict the amount of sugar supplied to the U.S. market in an effort to support sugar prices (Jurenas, 2012). Growers receive annual marketing allotments (i.e., production quotas) and are eligible for short-term, non-recourse financing through the Commodity Credit Corporation (CCC) (USDA, 2016). Forfeited sugar is sold for non-human consumption or disposed of through re-export program credit swaps. Foreign access to the U.S. market is heavily regulated. With the exception of Mexico, all imports are subject to tariff-rate quotas (TRQs) (Jurenas, 2012).<sup>2</sup>

Mexican sugar is derived entirely from sugarcane and is primarily marketed into the U.S. in two forms: semi-refined (of polarity between 99.4 and 99.9 degrees, also known as “estandar”) and refined sugar. Lower-polarity semi-refined sugar is sold to U.S. cane refineries to be converted into refined sugar. Higher-polarity semi-refined sugar is typically sold directly for human consumption or sent to “melt houses” to be transformed into liquid sugar.

Beginning in late 2011, Mexican sugar exports to the U.S. nearly doubled from slightly less than 1 million metric tonnes raw value (MTRV) to approximately 2 million MTRV and remained high for the next three years. On March 28, 2014, the American Sugar Coalition and its members filed ADCVD petitions against sugar from Mexico.<sup>3</sup> The USITC deemed

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<sup>2</sup>For a discussion of TRQ administration, see Skully (2001).

<sup>3</sup>The precise scope of investigations included all products imported under US tariff codes 1701.12.1000, 1701.12.5000, 1701.13.1000, 1701.13.5000, 1701.14.1000, 1701.14.5000, 1701.91.1000, 1701.91.3000, 1701.99.1025, 1701.99.5025, and 1701.99.5050.

the domestic “like product” to include raw and refined cane and refined beet sugar, but did not extend to high-fructose corn syrup. The USITC also deemed that one liquid sugar producer had sufficient capital investments to be considered part of the domestic industry; all other melt houses were excluded. A timeline of the sugar litigation and suspension process is presented in Table 1.

Table 1: U.S.-Mexico Sugar Suspension & Litigation Timeline

<b>Date</b>	<b>Event</b>
Mar-14	American Sugar Coalition file ADCVD petitions against sugar from Mexico.
May-14	USITC makes preliminary determination that subject imports results in economic injury.
Aug-14	DOC determines subject imports received subsidies and announce preliminary duties.
Dec-14	ADCVD duty investigations suspended as a result of Agreements between the Mexican & U.S. governments.
Jan-15	Imperial Sugar Company & AmCane Sugar, both sugar cane refiners who also process raw sugar imported from Mexico, contest the Suspension Agreements & request continuation of the Investigation.
Mar-15	USITC finds that Suspension Agreements completely remove injurious effects of subject imports (unanimous vote).
Apr-15	DOC rule that Imperial & AmCane has standing to request continuation of ADCVD investigation.
Sep-15	DOC issues final affirmative determination.
Nov-15	USITC issues final affirmative determination. Agreements remain in force.
Dec-16	The American Sugar Coalition requests administrative review of the CVD Agreement.
Feb-17	USITC begins administrative review of Agreements.
Jun-17	U.S. & Mexican governments reach deal to revise Suspension Agreements.

On May 9, 2014, the USITC made a preliminary determination that the subject imports resulted in economic injury to the U.S. sugar industry. On August 26, 2014, the DOC further determined that the subject imports received subsidies and announced preliminary duties on sugar imports from Mexico ranging from 39.54% to 47.26% (USITC, 2014).

On December 19, 2014, ADCVD investigations were suspended as a result of two Agreements between the Mexican and U.S. governments.<sup>4</sup> The Suspension Agreements stipulated minimum FOB reference prices of 26¢ per lb. for sugar of polarity above 99.5, and 22.25¢ per lb. for all other sugar. The Agreements also limited the amount of Mexican sugar exported

<sup>4</sup>The terms of the Suspension Agreements are detailed in USITC (2015).

to the U.S. in a given fiscal year. Further, a maximum of 53% of exports from Mexico to the U.S., in any given fiscal year (October 1 through September 30), could be refined sugar (99.5 polarity or higher), with the remainder being raw (below 99.5 polarity).

After the Suspension Agreements were reached, two cane sugar refiners—Imperial Sugar Company (owned by Louis Dreyfus) and AmCane Sugar—appealed arguing that the Suspension Agreements did not eliminate the injurious effects of the subject imports and requested continuation of the investigations. On March 19, 2015, the USITC found by unanimous vote that the Suspension Agreements completely removed the injurious effects. Imperial and AmCane argued that the agreement would restrict imports of raw sugar from Mexico and thereby hurt U.S. refiners of imported Mexican sugar (see Table 1). The USITC ruled that the terms “eliminates completely the injurious effects of subject imports” did not mean every member of the domestic industry must be made better off from the Agreements, rather that the Agreements benefited the domestic industry as a whole (USITC, 2015).

Nevertheless, Imperial and AmCane requested the investigations continue. In September and November 2015, the DOC and USITC issued final affirmative determinations that the Agreements remained in effect. The DOC monitors and enforces the Suspension Agreements, which are subject to administrative review and termination procedures.

In December 2016, the American Sugar Coalition alongside Imperial and AmCane requested administrative review of the CVD Agreement. The USITC review process began in February 2017 with the threat that—if the Suspension Agreements were not successfully renegotiated—the DOC would begin administering duties as of June 2017. The U.S. and Mexican governments agreed to revised terms of the Agreements on June 5, 2017. Under the revised Agreements, volumetric and price restrictions remain the same, but the share of imports allowed over 99.5 polarity has been reduced from 53% to 30% (ITA, June 30, 2017). U.S. cane refiners remain opposed to the revised terms of the Agreements (Malkin, 6 June 2017).

### 3 Empirical Analysis

We develop an empirical model to compare the returns to U.S. cane and beet farmers and cane sugar refiners under ADCVD investigations and the Suspension Agreements. We analyze the impacts of each regime on U.S. raw and refined prices, the raw-to-refined margin, and the quantity and composition of sugar imports from Mexico. Using these results, we compare outcomes under ADCVD proceedings and the Agreements to a counter-factual “free trade” scenario in which sugar from Mexico continues to enter the U.S. duty-and-quota-free.

#### 3.1 U.S. Raw and Refined Sugar Prices

To analyze the impact of the investigations and the Agreements on U.S. raw and refined sugar prices, we compare the historical relationship between domestic and world sugar prices under three empirical regimes: (1) free trade (observed prior to initiation of ADCVD proceedings), (2) ADCVD investigations (observed from April 2014–Dec 2014), and (3) Suspension (observed from Jan 2015–Dec 2016). Our data includes monthly observations of U.S. and world prices for raw and refined sugar from January 2011 to December 2016. The U.S. domestic raw sugar price is the Intercontinental Exchange (ICE) Sugar No. 16 nearby futures contract.<sup>5</sup> The world raw price is the nearby price for the ICE No. 11 contract.<sup>6</sup> The world refined price is the nearby price for the No. 5 London Daily futures contract for refined sugar free-on-board in Europe. There is no futures market for refined sugar in the U.S., thus, we use the average monthly spot price for refined cane sugar as published by *Milling*

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<sup>5</sup>“Nearby” refers to the contract with the closest settlement date. The ICE No. 16 contract specifies that 112,000 pounds of raw cane sugar be physically delivered to one of five U.S. refinery ports: New York, Baltimore, Galveston, New Orleans, or Savannah. Delivery months are January, March, May, July, September, and November.

<sup>6</sup>The No. 11 contract specifies delivery of 112,000 pounds of raw cane sugar in delivery months March, May, July, and October. Delivery on the No. 11 contract occurs at a port in the country of origin free-on-board the receiver’s vessel. Delivery can originate in about 30 different countries, including Australia, Brazil, Costa Rica, South Africa, etc.

Table 2: Augmented Dickey-Fuller Tests for Stationarity

Price Series	Test-Statistic	P-Value	Conclusion
World Raw	-2.100	0.24	<i>Fail to Reject</i>
World Refined	-1.947	0.31	<i>Fail to Reject</i>
U.S. Raw	-1.665	0.45	<i>Fail to Reject</i>
U.S. Refined (Cane)	-1.768	0.40	<i>Fail to Reject</i>

*ℳ Baking Magazine*.<sup>7</sup> These price series are shown in Figure 1 alongside prices for refined and semi-refined (estandar) sugar in Mexico for reference.<sup>8</sup> The start date is purposely chosen to correspond with the surge in Mexican sugar imports that gave rise to the ADCVD proceedings.

As a preliminary matter, we briefly consider the time-series properties of our data. If U.S. and world prices are trending independently from one another, we run the risk of identifying spurious, rather than genuine, correlation between prices. Table 2 reports the results of Augmented Dickey-Fuller (ADF) tests for stationarity for each series (Said and Dickey, 1984). The second column reports the ADF test statistic, and the third column reports the corresponding MacKinnon approximate p-value. As shown in Table 2, we fail to reject the null hypothesis of non-stationarity for all prices series. We address potential concerns about spurious correlation in the discussion of estimation results below.

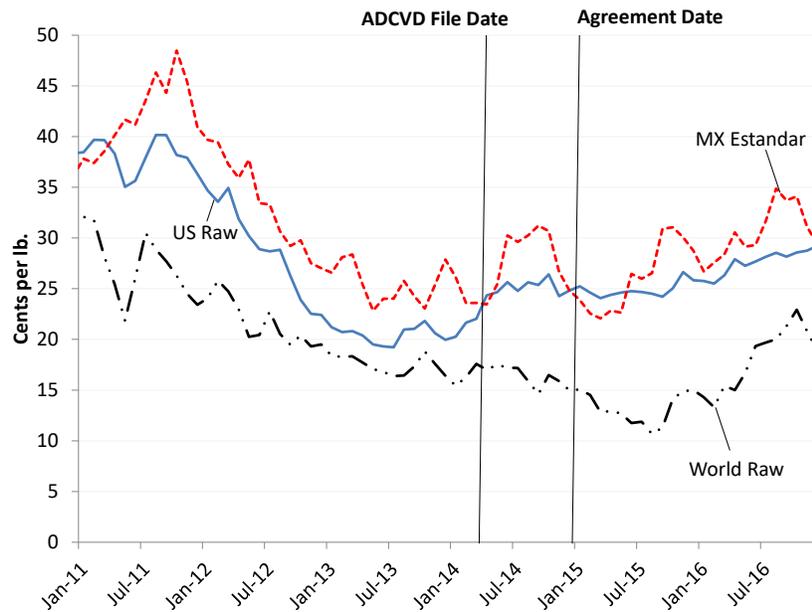
As another preliminary matter, it is also useful to ask whether there is evidence that the ADCVD case and Agreements had an impact on domestic prices. To answer this question, we use common procedures to test for the presence of a structural break in historical U.S.-world price relationships in April 2014 (ADCVD) and December 2014 (Agreements). We estimate the following equation over the period of analysis:

$$p_t = \alpha + \beta w_t + \epsilon_t \tag{1}$$

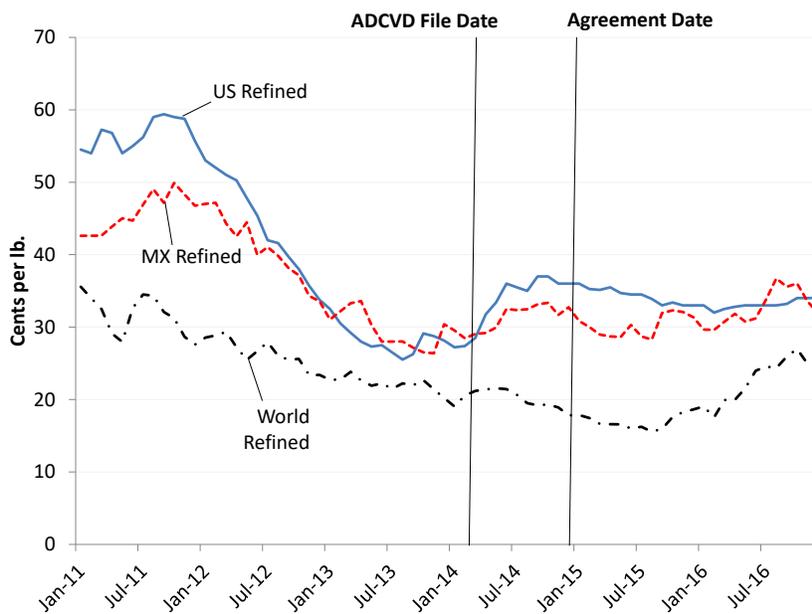
<sup>7</sup>In recent months the U.S. price for refined beet sugar has diverged somewhat from the price for refined cane sugar due, at least in part, to recent state and federal regulations concerning the labeling of genetically modified organisms in food products. Because this price divergence is unrelated to the implementation of the sugar Suspension Agreements, we elect to use the U.S. refined cane price.

<sup>8</sup>The price series for semi-refined and refined sugar in Mexico were obtained from Servicio Nacional de Informacion de Mercados SNIIM-Economica.

Figure 1: Historical Prices for Raw and Refined Cane Sugar



(a) Raw Prices



(b) Refined Prices

Source: The U.S. raw price series is the monthly nearby ICE No. 16 price obtained from Table 4 of the USDA ERS Sugar and Sweeteners Yearbook. World raw and refined price series are obtained from Tables 03a and 03b from the USDA ERS Sugar and Sweeteners Yearbook. The world raw price series is the monthly nearby ICE No. 11 price. The refined price is the average nearby price for Contract No. 407 (aka no.5), London Daily Price, f.o.b. Europe. The price series for semi-refined (estandar) and refined sugar in Mexico are obtained from Servicio Nacional de Informacion de Mercados SNIM-Economica. The U.S. refined sugar price is the simple monthly average of the lower end of the range for refined cane sugar as published by Milling & Baking Magazine.

where  $p_t$  is the dependent price (U.S. raw or refined) observed at time  $t$  and  $w_t$  is the corresponding world price. Table 3 reports the results of tests for a known and an unknown structural break in the historical U.S.-world raw price relationship and the U.S.-world refined price relationship (Andrews, 1993; Chow, 1960). Column (1) and (2) show the results for a known break at April 2014. Columns (3) and (4) show results for a known break at December 2014. In both specifications, we strongly reject the null hypothesis of no structural break for both the raw and refined series.

Table 3: Structural Break Analysis

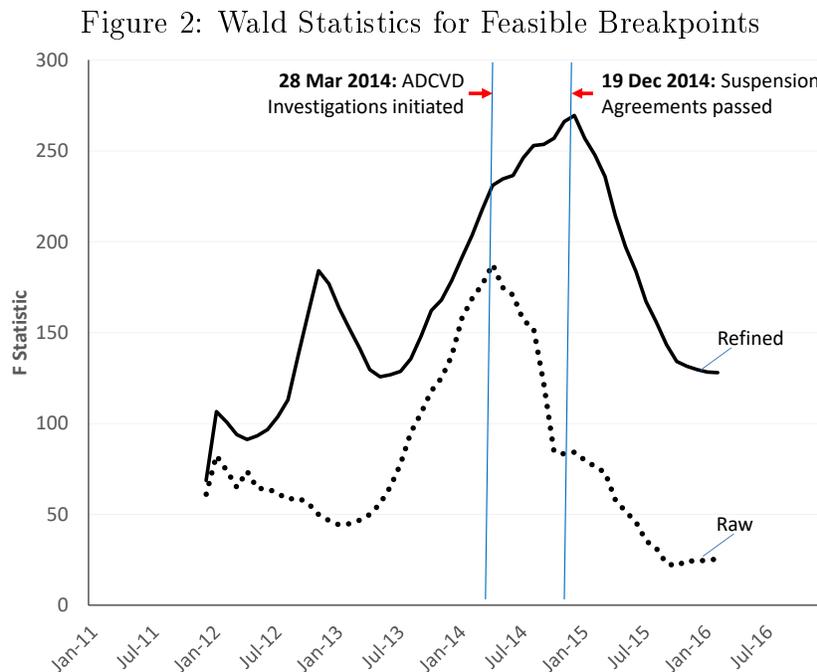
	Known Break				Unknown Break		
	Apr-14		Dec-14		Break	$\chi^2$	p-value
	$\chi^2$	p-value	$\chi^2$	p-value			
U.S. & World Raw Prices	187.55	0.00	79.85	0.00	Apr-14	187.55	0.00
U.S. & World Ref. Prices	231.02	0.00	319.45	0.00	Dec-14	269.46	0.00

Unknown break tests using the Supremum Wald statistic are shown in Columns (5) through (7) of Table 3. Findings also strongly support the presence of a structural break. The unknown break test for the raw price series identifies the break at April 2014, consistent with literature that finds ADCVD filings impact the market (Mahdavi and Bhagwati, 1994; Prusa, 2001; Staiger and Wolak, 1994). The refined price series identifies the break at December 2014. Figure 2 presents the Wald statistic for each candidate break date. As shown in the Figure, break results are fairly stark for both the raw (at April 2014) and refined series (at December 2014), indicating the findings from the break tests are robust.

We formally estimate the effects of ADCVD proceedings and the Agreements on the U.S.-world raw price relationship and the U.S.-world refined price relationship using a regime-switching model. For each U.S. price series we estimate the following equation:

$$p_t = \alpha + \delta^I I_t + \delta^S S_t + \beta^f f_t w_{t-1} + \beta^I I_t w_{t-1} + \beta^S S_t w_{t-1} + \epsilon_t \quad (2)$$

where  $p$  (the U.S. price) and  $w$  (the world price) are defined as in equation (3) above. Vari-



ables  $f_t$ ,  $I_t$ , and  $S_t$  are indicator variables for the pre-ADCVD free trade regime, the ADCVD investigation regime, and the Agreement regime, respectively. Each of these indicator variables is equal to unity if at time  $t$  the corresponding regulatory regime is in effect and equal to zero otherwise.<sup>9</sup> The constant  $\alpha$  is a parameter that measures the average wedge between the dependent price variable in the U.S. and the corresponding world price over the time horizon. The inclusion of the additional parameters  $\delta^I$  and  $\delta^S$  allow this domestic-to-world price wedge to vary in the ADCVD and Agreement regimes. Coefficients  $\beta^f$  and  $\beta^I$  and  $\beta^S$  measure the responsiveness of domestic prices to shocks to the world market under the three regimes. The final variable,  $\epsilon$ , is a residual, which we have assumed is uncorrelated with the other explanatory variables at time  $t$ . Table 4 shows the estimation results.

As shown in Table 4, based on monthly data, the imposition of the Agreements coincides with a large and statistically significant increase in the U.S.-world margin for both raw and refined prices. Coefficient  $\hat{\delta}^S$  is 0.55 in the raw equation and 0.62 in the refined equation. These estimates suggest that the Suspension Agreements increased the average domestic-

<sup>9</sup>Regime dates are as follows: Jan 2011–Mar 2014 for the pre-ADCVD free trade regime, April 2014–Dec 2014 for the ADCVD investigation regime, and Jan 2015–Dec 2016 for the Agreement regime.

Table 4: Three-Regime Regression Model

VARIABLES	(1)	(2)
	Log U.S. Raw Price	Log U.S. Refined Price
Agreement	0.545** (0.260)	0.622* (0.320)
ADCVD	0.249 (0.199)	0.228 (0.236)
“Free Trade”*Ln World Raw Price (L1)	0.875*** (0.077)	
ADCVD*Ln World Raw Price (L1)	0.829*** (0.093)	
Agreement*Ln World Raw Price (L1)	0.766*** (0.102)	
“Free Trade”*Ln World Ref. Price (L1)		1.085*** (0.128)
ADCVD *Ln World Ref. Price (L1)		1.057*** (0.142)
Agreement*Ln World Ref Price (L1)		0.925*** (0.151)
Constant	0.631** (0.240)	0.142 (0.421)
Observations	72	72
R-squared	0.700	0.602

(L1) indicates there is a one-period lag on the explanatory variable.

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

to-world price wedge by over 55% for raw sugar and 62% for refined sugar. Both estimates are statistically significant at conventional levels. Point estimates also suggest ADCVD investigations increased the U.S.-world margin, though by a smaller magnitude than the Agreements. Coefficient  $\hat{\delta}^I$  is 0.25 in the raw equation and 0.23 in the refined equation; both estimates are statistically insignificant.

More restrictive regulatory regimes also appear to have reduced the responsiveness of U.S. prices to shocks to the world market. In the raw equation, the world price coefficient is 0.88 in the pre-ADCVD “free trade” regime. The estimated coefficient falls to 0.83 in the

ADCVD regime and to 0.77 in the Agreement regime. Similarly, in the refined equation, the coefficient falls from 1.09 in the pre-ADCVD “free trade” regime, falling to 1.06 and to 0.93 in the ADCVD and Agreement regimes. Across both equations and for all regimes, the lagged world price coefficient is statistically significant at the 1% level.

Table 5: Post-Estimation Wald Tests

Specification	Regime Comparison					
	Free Trade; ADCVD		Free Trade; Agreement		ADCVD; Agreement	
	F-Statistic	p-value	F-Statistic	p-value	F-Statistic	p-value
(1) U.S. Raw	5.2	0.0080	16.73	0.0000	6.97	0.0018
(2) U.S. Refined	3.59	0.0332	3.67	0.0309	1.44	0.2433

F statistic with 2 numerator and 66 denominator degrees of freedom.

Table 5 formally tests the hypothesis that the U.S.-world price relationship changed following the initiation of ADCVD proceedings and the imposition of the Suspension Agreements. Column (1) of the Table reports the F-statistic for a Wald test of the joint restrictions  $\hat{\delta}^I = 0$  and  $\hat{\beta}^I = \hat{\beta}^f$ . Stated alternatively, these restrictions imply commencement of ADCVD investigations had no effect on the U.S.-world price relationship. We reject this hypothesis for both the U.S. raw and U.S. refined specifications. Similarly, Column (3) tests the hypothesis that price relationships under the Agreements were the same as those under the free trade regime (joint restriction  $\hat{\delta}^S = 0$ ;  $\hat{\beta}^S = \hat{\beta}^f$ ). Again, we reject the hypothesis for both specifications. Finally, Column (5) tests the hypothesis that the U.S.-world price relationship is unchanged from the ADCVD investigation regime to the Agreement regime ( $\hat{\delta}^I = \hat{\delta}^S$ ;  $\hat{\beta}^I = \hat{\beta}^S$ ). We reject this hypothesis at the 1% level for the U.S. raw specification but fail to reject for the U.S. refined price.

We contrast predicted U.S. raw and refined sugar prices generated by estimating equation (2) with a counterfactual price series in which the ADCVD investigation was never filed and the Agreements were never implemented. These counterfactual prices ( $\tilde{p}_t$ ) are constructed

from the pre-ADCVD “free trade” coefficients estimated in equation (2) as follows:

$$\tilde{p}_t^f = \hat{\alpha} + \beta^f w_{t-1}$$

$$\tilde{p}_t^I = \hat{\alpha} + \hat{\delta}^I + \beta^I w_{t-1}$$

Figure 3 shows the U.S. raw prices predicted under each regime over the estimation horizon. Actual and counterfactual price estimates generated using the pre-ADCVD “free trade” regime coefficients are depicted as the solid black line of Figure 3. The dashed green line depicts prices generated using the ADCVD regime estimates, and the solid red line depicts prices for the Agreement regime.

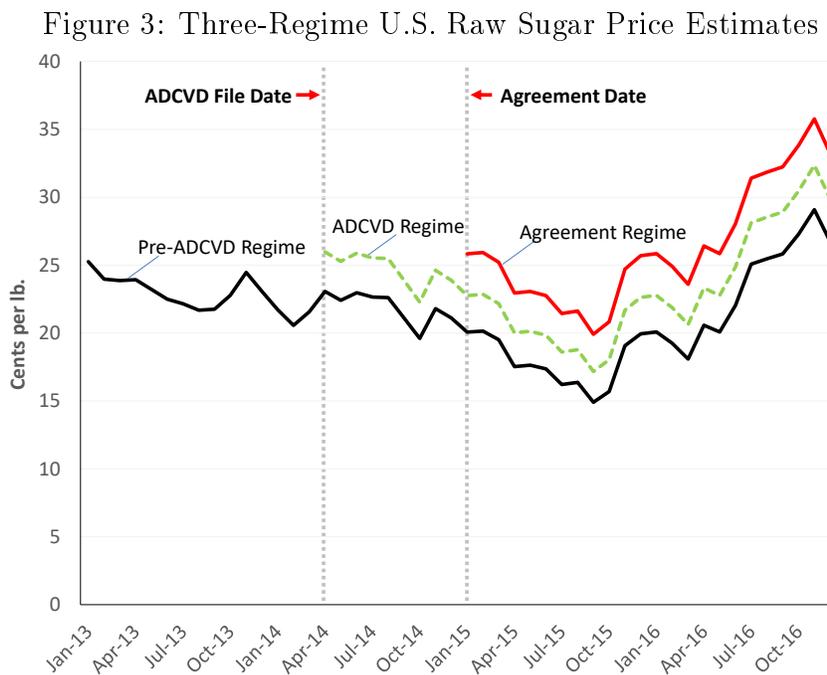


Table 6 compares predicted ADCVD and Agreement price series with counterfactual “free trade” prices. From April to December 2014, ADCVD proceedings increased U.S. raw sugar prices by 2.83¢ per lb. (from 21.93¢ to 24.76¢) relative to what they would have been had investigations not been filed, i.e., under the counterfactual “free trade” regime. In contrast, the Suspension Agreement increased U.S. raw sugar prices by an average of

5.80¢ per lb. (from 20.58¢ to 26.37¢). Turning to U.S. refined prices in Table 6, ADCVD proceedings increased prices by 4.65¢ per lb. (from 30.32¢ to 34.97¢) relative to “free trade” regime counterfactual estimates. Agreement regime prices increased by 4.50¢ (from 29.11¢ to 33.61¢).

Table 6: Impact of ADCVD Filing & Suspension Agreements on U.S. Sugar Prices

Price Series	ADCVD Regime			Agreement Regime		
	Predicted	“Free Trade” CF	$\Delta$	Predicted	“Free Trade” CF	$\Delta$
	<i>(¢ per lb.)</i>					
U.S. Raw	24.76	21.93	2.83	26.37	20.58	5.79
	(1.22)	(1.14)	(0.08)	(4.44)	(3.97)	(0.47)
U.S. Refined	34.97	30.32	4.65	33.61	29.11	4.50
	(1.99)	(1.78)	(0.22)	(5.68)	(5.82)	(0.15)

Standard Deviation in parentheses.

To assess whether U.S. cane and beet farmers prefer the ADCVD regime or the Suspension Agreements, we deduce an “equivalent” *ad valorem* tariff scenario. Domestic prices ( $\bar{p}_t$ ) are equal to the world price plus an *ad valorem* tariff, i.e.,  $\bar{p}_t = (1 + \tau)w_t$ , where the tariff ( $\tau$ ) is calculated in order to generate an impact on U.S. prices that is equivalent, on average, to the ADCVD investigations and Suspension Agreements.<sup>10</sup>

Table 7: Equivalent *ad valorem* Tariff

Price Series	Regime	
	ADCVD	Agreement
U.S. Raw	52%	69%
U.S. Refined	43%	70%

As shown in Table 6, the equivalent tariffs for the ADCVD regime were 52% for raw sugar and 43% for refined sugar. These numbers are in the range of the preliminary duties assessed by the DOC. In contrast, the equivalent tariffs for raw and refined sugar under the Agreements were 69% and 70%, considerably higher than those imposed by the DOC. Our calculation of the *ad valorem* tariff equivalent to the Suspension Agreements is striking

<sup>10</sup>Note that this approach to deriving the equivalent tariff is more straightforward than some methods which rely on more complex simulation. Because U.S. production and all non-Mexico imports are constrained, we do not need to worry about simultaneity between prices and aggregate deliveries.

because it implies not only that U.S. cane and beet farmers prefer the terms of the Suspension Agreements to duties, but also that the returns to the different producer groups, as a percentage of initial revenue, were similar.<sup>11</sup>

### 3.2 Cane Refiner Revenue

To assess the impact of the Suspension Agreements on U.S. sugar refiner revenue, we analyze both the change in the raw-to-refined price margin and the availability of raw sugar under the Agreements. The estimates from equation (2) imply a 1.82¢ per lb. increase (from 8.40¢ to 10.21¢) in the raw-to-refined margin under the ADCVD regime relative to the “free trade” counterfactual. In contrast, under the Agreement regime, the implied margin fell 1.29¢ per lb. (from 8.53¢ to 7.24¢). Thus, the impacts of ADCVD investigations and the Agreements on refiner revenue hinges critically on the quantity and composition of sugar imports from Mexico.

Table 8 reports average monthly Mexican sugar imports into the U.S. under the three regimes. Note that we have chosen to exclude the months January–February from these averages to control for seasonality; the ADCVD regime runs only from April–December 2014, whereas in our dataset the other two regimes run January to December. We present data under both U.S. and Mexican tariff classifications. The top number in each row corresponds to the average monthly imports in 1,000 MTRV for the relevant tariff category. The value in parenthesis is the share of total imports over the relevant timeframe. For the ADCVD and Agreement regimes, statistical significance of the change assessed relative to the “free trade” regime via a conventional mean comparison t-test, indicated by stars.

At the aggregate level, statistics are similar under the U.S. and Mexican classifications. First looking at total trade volume, average monthly imports totaled 132,000 MTRV prior

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<sup>11</sup>We note that a long-standing issue in the trade literature is whether there is a functional difference between, say a 40% and 70% tariff. They could both be prohibitive. In the current setting, this is not the case. As discussed in the next section, Mexican sugar producers have continued to import into the U.S. under both the ADCVD investigations and the Suspension Agreements. Because U.S. sugar prices are significantly higher than world prices, the U.S. remains an attractive export market even with a large tariff.

Table 8: Impact of ADCVD Filing &amp; Agreements on Quantity &amp; Composition of Imports

US Tariff Classification	Average Monthly Imports		
	“Free Trade” 2011–2013	ADCVD 2014	Agreement 2015–2016
	<i>1,000 MTRV</i> (Share of total imports)		
Total Imports	132.35 (1.00)	102.46 (1.00)	110.06 (1.00)
Polarity <99.5	35.69 (0.21)	27.1 (0.15)	56.04* (0.49)***
Polarity >99.5	96.67 (0.79)	75.36 (0.85)	54.06*** (0.51)***
<b>Mexican Tariff Classification</b>			
Total Imports	128.84 (1.00)	98.76 (1.00)	105.6 (1.00)
Polarity 96–99.4	16.30 (0.09)	17.06 (0.08)	13.72 (0.10)
Polarity 99.4–99.5	17.40 (0.09)	19.53 (0.15)	42.94*** (0.43)***
Polarity 99.5–99.7	16.25 (0.12)	15.71 (0.16)	3.38*** (0.04)***
Polarity 99.7–99.9	5.73 (0.04)	3.96 (0.06)	2.34 (0.02)
Polarity >99	72.91 (0.66)	42.49** (0.44)***	42.92*** (0.41)***
Observations	27	9	18

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

For each regime, quantity and composition of average monthly imports are evaluated for months April–December to control for seasonality of trade flows. U.S. import data obtained from the USITC Interactive Tariff and Trade DataWeb.

Mexican export data obtained from la Sistema de Información Arancelaria Vía Internet.

to the initiation of ADCVD proceedings. Under ADCVD investigations average imports dropped to 102,000 MRTV and rose slightly to 110,000 MRTV under the Agreements. Similarly, under the Mexican tariff classification, average exports to the U.S. totaled 132,000 MTRV under free trade, 98,000 MTRV under ADCVD investigations, and 105,000 MTRV under the Agreements. The two data sources also produce a similar breakdown between sugar above and below 99.5 polarity before and after the Agreement.

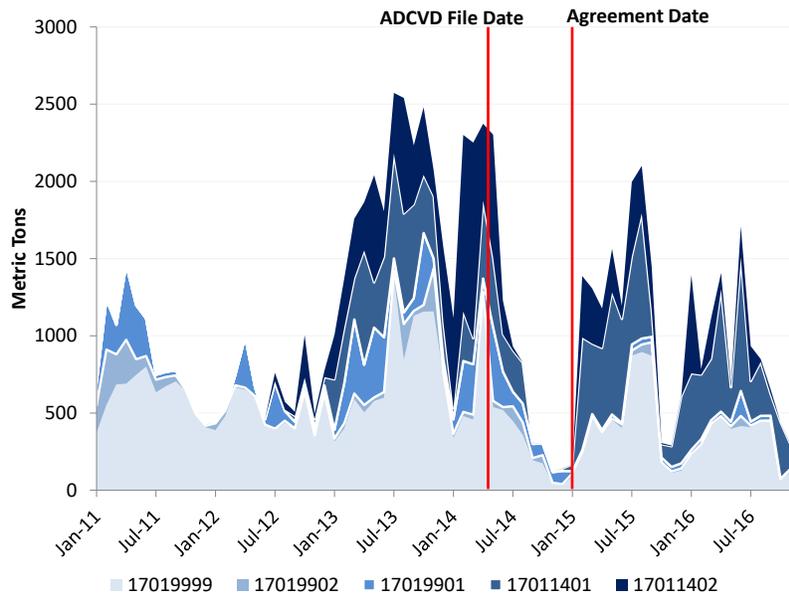
Referring to the U.S. tariff classification data, we see that the Suspension Agreements appear to be operating as intended. Total import volume decreased by over 22,000 MTRV per month on average, or 17%, from free trade levels.<sup>12</sup> Additionally, the composition of imports appears to have dramatically shifted. When Mexican sugar entered the U.S. duty-and-quota-free, approximately 75% of all imports were of polarity above 99.5. The volume of imports above 99.5 polarity fell by 44% after the imposition of the Agreements. In contrast, the volume of imports below 99.5 polarity increased by 57%. Thus, under the Agreements, import shares are approximately equal for sugar above and below 99.5 polarity. The substantial increase in sugar below 99.5 polarity suggests an increase in the availability of sugar imports for further refining, and thus, that sugar refiners may have benefited under the Agreement. This interpretation is based on U.S. tariff classifications, which are used to ensure compliance with the Agreements.

However, the more disaggregated Mexican tariff classification data tell a very different story. These data are also depicted on a monthly basis in Figure 4. As shown from Table 8 and Figure 4, the increase in sugar imports below 99.5 polarity came exclusively from an expansion in imports between 99.4 and 99.5 polarity—semi-refined sugar (estandar) that is sold to sweetener stations or “melt houses” instead of sugar refiners (Sterk, 2016). Referring to Table 8, average monthly imports of sugar between 99.4 and 99.5 polarity increased by 147% from the free trade regime to the Suspension environment.

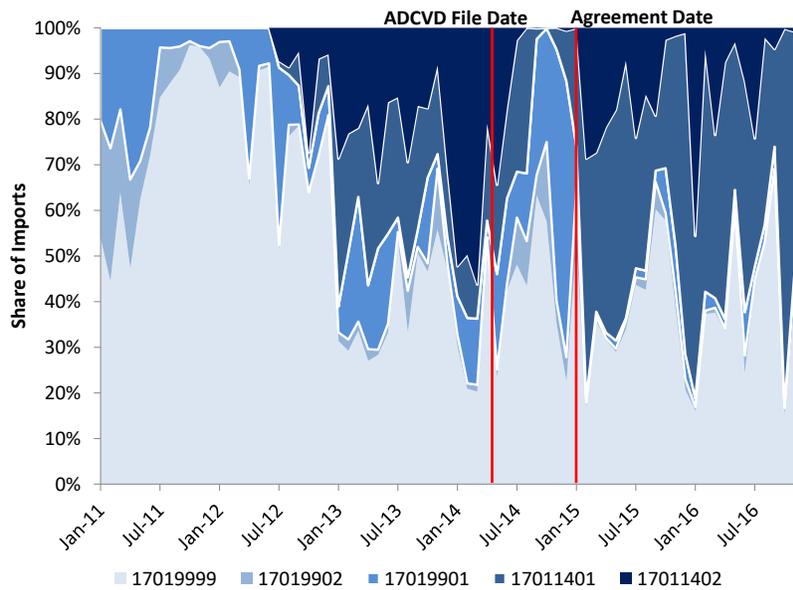
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<sup>12</sup>Note that changes in the size of the U.S. crop or U.S. demand could impact import volumes. However, as long as these fluctuations are “random” over time, they contribute only to the noise of our estimates and do not bias the results.

Figure 4: Mexican Sugar Exports to the U.S., by Tariff Classification



(a) Export Volume



(b) Composition of Total Sugar Exports

Mexican HTS Categories are as follows:

- 17011401: Sugar (dry) of polarity between 99.4 and 99.5 degrees.
- 17011402: Sugar (dry) of polarity between 96 and 99.4 degrees.
- 17011403: Sugar (dry) of polarity less than 96 degrees.
- 17019901: Sugar (dry) of polarity between 99.5 and 99.7 degrees.
- 17019902: Sugar (dry) of polarity between 99.7 and 99.9 degrees.
- 17019999: Sugar (dry) not elsewhere specified.

In contrast to semi-refined imports, sugar imported for further refining under Mexican classifications decreased under the Agreements. Table 8 shows that average monthly imports of sugar between 96 and 99.4 polarity fell from 16,300 MTRV in free trade to 13,720 MTRV under the Agreements. Thus, the Agreements reduced both the raw-to-refined price margin and left U.S. refiners with less access to inputs under the Suspension Agreements.

This dramatic shift in the composition of imports did not occur during ADCVD investigations. The initiation of ADCVD proceedings had a greater effect than the Agreements on total sugar imports. Under ADCVD investigations, total sugar imports from Mexico fell by 30,000 MTRV according to both U.S. and Mexican tariff classification. However, the composition of imports remained relatively unchanged. In fact, sugar imported for further refining (polarity 96–99.4) increased by approximately 1,000 MTRV per month.

Table 9 reports estimates of the net impact of the ADCVD investigations and the Agreements on monthly refiner revenue. As discussed, the Agreements reduced the raw-to-refined price margin relative to the pre-ADCVD “free trade” counterfactual from 8.53¢ per lb. to 7.24¢ per lb. Refiners receive this lower margin not only for sugar imports, but also for domestic raw sugar and sugar imports from countries other than Mexico. In FY 2015/16, the U.S. produced an average of 292,570 MTRV of raw sugar and imported 98,460 MTRV of raw sugar from other countries. Because U.S. production is restricted under USDA marketing allotments and all imports of non-Mexican origin are restricted under tariff rate quotas and free trade agreements, these quantities would have been the same under the counterfactual scenario.

After accounting for the raw sugar available for refining from all other sources (i.e., domestic cane production and non-Mexican raw imports), average monthly refiner revenue under the Agreements falls by an estimated \$12 million per month compared to the unregulated counterfactual scenario. In other words, the Suspension Agreements have not benefited U.S. cane refiners. Rather, over their first two years of existence, the Suspension Agreements

Table 9: Average Monthly Cane Refiner Revenue, Jan 2015–Dec 2016

	ADCVD Regime		Agreement Regime	
	Predicted	“Free Trade” CF	Predicted	“Free Trade” CF
	<i>(1,000 MTRV)</i>			
U.S. Raw Production	292.57	292.57	292.57	292.57
MX Imports for further refining	17.06	16.30	13.72	16.30
Raw TRQ Imports	98.46	98.46	98.46	98.46
Total Sugar to be refined	408.09	407.33	404.75	407.33
Raw-to-Ref. Margin ( <i>¢ per lb.</i> )	10.21	8.40	7.24	8.53
Total Refiner Rev. ( <i>Million</i> )	\$91.86	\$75.43	\$64.60	\$76.60
	<b>Difference (<i>Million</i>)</b>	<b>\$ 16.43</b>		<b>-\$12.00</b>

have cost U.S. refiners approximately 16% in lost revenue.<sup>13</sup>

Columns (1) and (2) of Table 9 compare this outcome with refiner revenue under the ADCVD regime, in which total trade decreases by 23% but the composition of trade remains relatively unaffected by the policy. We also account for the fact that the raw-to-refined price margin increased by 1.81¢ per lb. as a result of investigations. In this scenario, average monthly refiner revenue increased by \$16.43 million per month—\$28.43 million greater than under the Suspension Agreements.

## 4 Model Robustness

We employ a moving block bootstrap procedure to measure the robustness of our findings (Kunsch, 1989). This method allows us to vary the starting and ending dates of our estimation period at random to assess model sensitivity and robustness across the time horizon. Observations from the Agreement regime are split into 19 overlapping blocks each six months in length. Blocks are drawn randomly with replacement and the following model is estimated for raw and refined price series:

$$p_t = \alpha + \beta w_{t-1} + \epsilon_t \quad (3)$$

<sup>13</sup>Note that these findings do not suggest that all U.S. refiners have been hurt by the Agreements. Some refiners, such as those not dependent on raw sugar from Mexico, could have benefited. Our finding is a net effect across refiners as a whole.

where variables are defined as above in equation (2). We repeat the procedure 1,000 times to generate a distribution for  $\hat{\alpha}$  and  $\hat{\beta}$ . Note that we do not employ the block bootstrap for the ADCVD regime; the short sample length of the regime (9 months) would create only 3 unique draws for the bootstrap procedure.

Table 10: Block Bootstrap Predicted Agreement Regime Prices

Variable	Obs.	Mean	Std. Err.	95% Conf. Int.
U.S. Raw	1,000	26.17	0.03	26.10 26.24
U.S. Refined	1,000	33.88	0.06	33.75 34.00
U.S. Margin	1,000	7.71	0.09	7.52 7.89

Table 10 shows the distributions generated by the block bootstrap procedure for U.S. raw and refined sugar prices. Mean estimates for each series are similar to those generated for the full sample (Table 6). The small standard errors for each series (Table 10) also suggest that the U.S.-world relationship is relatively stable across the regime time horizon. Accordingly, confidence intervals are also small for our equivalent tariff. The estimates in Table 10 imply a 95% confidence interval for equivalent tariffs (derived as described in Section 3.1) between 67%–68% for the U.S. raw price and 71%–72% for the U.S. refined price.

Table 10 also shows the implied distribution for the U.S. raw-to-refined margin generated by our block bootstrap procedure. Interestingly, the full-sample point estimate (7.24¢ per lb.) falls outside the 95% confidence interval for the block bootstrap results (7.52–7.89¢ per lb.). Thus, our bootstrap estimates suggest the impact of the Agreements on refiner revenue was smaller than our initial model suggests. Bootstrap results also suggest the impact was statistically different from zero. The 95% confidence interval for the refiner revenue impact is between -\$6.20 and -\$9.50 million, compared to the full sample estimate of -\$12.00 million (Table 9).

## 5 Conclusion

Supplier access to the U.S. sugar market is heavily regulated. The USDA prescribes marketing allotments on domestic sugar refiners, and, with the exception of Mexico, all imported sugar is subject to WTO tariff-rate quotas or other restrictions under regional trade agreements. Following a surge in Mexico sugar exports to the U.S. in FY2011/12, the American Sugar Coalition initiated AD and CVD investigations against sugar from Mexico. On December 19, 2014, these investigations were suspended as a result of two Agreements that imposed volumetric and minimum price restrictions on Mexican sugar entering the U.S.

We compare the effects of the ADCVD case with the Suspension Agreements on the welfare of U.S. beet and cane farmers and cane sugar refiners. Because domestic production is restricted by quota, profitability for domestic cane and beet producers is primarily determined by raw and refined prices. In contrast, revenue for cane refiners is a function of both the raw-to-refined margin and the availability of sugar for further refining, including from imports. Under the Agreements, the imperfect correspondence between U.S. tariff classifications and the types of sugar produced in Mexico created the potential for cross-product trade diversion among refined, semi-refined, and raw sugar. The Agreements result in an increase in the share of imports of semi-refined sugar from Mexico (i.e., *estandar*) and a drop in the share of raw and refined sugar imports from Mexico.

We develop an empirical model to compare U.S. raw and refined prices under ADCVD tariffs and the Suspension Agreements with a counter-factual scenario under which sugar from Mexico enters the U.S. duty-and-quota-free. Our model implies price impacts under ADCVD investigations approximately equivalent to the duties assessed under the DOC's preliminary findings. In contrast, the increase in U.S. prices for raw and refined sugar under the Suspension Agreements was roughly equal to those induced by a 70% *ad valorem* tariffs on sugar imports from Mexico, substantially higher than those assessed under the DOC's preliminary findings. Thus, domestic sugarcane and beet farmers were made better off by the Suspension Agreements than they would have been by ADCVD duties.

However, the Agreements have resulted in a major shortfall in U.S. imports of sugar for further refining. Imports destined for liquid sugar producers (i.e., melt houses) have increased, while sugars of lower polarity used as a refining input have decreased by 16%. The net effect is a revenue loss of \$12 million per month for cane refiners in aggregate relative to a scenario in which sugar from Mexico is unrestricted. In contrast, our estimates suggest refiner revenue increased by \$16 million under ADCVD proceedings. Therefore, some domestic refiners have been made worse off by the Suspension Agreements. Melt houses, who were not part of the ADCVD petitioners likely benefited from the Agreements.

The 2014 Suspension Agreements were renegotiated in June 2017, but some U.S. cane refiners remain unsatisfied (Malkin, 6 June 2017). Our findings shed light on the potential disconnect between the apparent benefits of Suspension Agreements to trade remedy participants in theory and the scant use of such instruments in practice. As a preliminary matter for ADCVD investigations, the USITC defines the scope of domestic products that are considered “like” the subject imports, including the array of products which are sufficiently substitutable with imports and the various stages of production that fall within the domestic product. The inclusion of multiple upstream and downstream firms within a domestic industry creates divergent intra-industry bargaining incentives and complicates suspension negotiations. Under these circumstances, trade suspension may generate undesirable or unstable equilibria.

These issues remain central to NAFTA re-negotiations. Chapter 19 of NAFTA provides a mechanism whereby private petitioners from the U.S., Canada, and Mexico may request an independent bi-national panel to review final ADCVD determinations in other NAFTA member countries (CBP, May 14, 2014). This panel process substitutes for domestic judicial review and decisions cannot be appealed to domestic courts. The Trump Administration has expressed a desire to eliminate Chapter 19 while Canada and Mexico want to retain the provision to ensure the neutrality of ADCVD proceedings (Lester, September 4, 2017).

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