The Impact of NAFTA on the Sugar Markets in Mexico and the United States

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Dissertation: Analysis of the United States' Sugar Industry

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Outline

- U.S. sugar industry & policies
- Papers from my dissertation
- Welfare Implications of NAFTA on Sugar Markets in the U.S. and Mexico
  - Develop a partial equilibrium trade model between the U.S., Mexico and ROW
  - Determine the ex post impact of NAFTA on U.S. and Mexican welfare by using the concept of economic surplus

U.S. Sugar Industry

Small in terms of acres, etc.

Major agricultural crops produced in the United States in 2011 (excluding root crops, citrus, vegetable, etc).		
Crop	**Harvested Area (million acres)**	**Cash Receipts from Sales ($ billion)**
Corn (grain)	84	63.9
Soybeans	73.8	37.6
Hay	55.7	6.7
Wheat	45.7	14.6
Cotton	9.5	8.3
Sorghum (grain)	3.9	1.3
Rice	2.6	2.9

Source: USDA NASS, 2013

Sugarbeets for sugar:

- Acres: 1.3 million acres;
- Cash receipts: $1.5 billion

Sugarcane for sugar:

- Acres: 850,000
- Cash receipts: $849 million

U.S. Sugar Industry

- Generates $20 billion of economic activity annually (ASA, 2014)
- Creates over 142,000 jobs in 22 different states
- U.S. sugar policy regulates the U.S. sugar market

U.S. Sugar Policy

- 2014 Farm Bill extended 2008 Farm Bill sugar policy

- U.S. sugar policy three main components:
  1. Domestic marketing allotment or overall allotment quantity (OAQ)
  2. Tariff-Rate Quotas (TRQ)
  3. Loan rate

OAQ

- Regulates U.S. marketing of sugar.

- Divided between sugarbeets and sugarcane:
  - Sugarbeets: 54.35%
  - Sugarcane: 45.65%

- U.S. sugar producers can *produce* as much sugar as they want, but OAQ limits how much they *market*.

TRQ

- Issued to 40 countries
- Import sugar tariff free into the U.S.
- Set at an annual minimum of 1.33 MMTRV
  - WTO & free trade agreement requirements
- On April 1 the USDA can increase the TRQ
- Under NAFTA Mexico is no longer bound by the TRQ as of 2008

Goal of U.S. Sugar Policy

- "The Sec. of Agriculture's goal is to maintain the domestic price of sugar above the government loan-rate price when determining the TRQ and OAQ"
  - Raw sugarcane: 18.75 cents/lb
  - Refined sugarbeets: 128.5% raw sugarcane loan rate

- The USDA sugar forecast determines the TRQ

Dissertation Goal

- **Analyze the primary issues concerning the U.S. sugar industry**
- 2014 sugar industry experts stated that the most pressing issues facing the U.S. sugar industry:
  1. Imports of sugar from Mexico
  2. Future trade agreements
  3. Mandatory genetically modified (GM) labeling initiatives
  4. Sugar substitutes

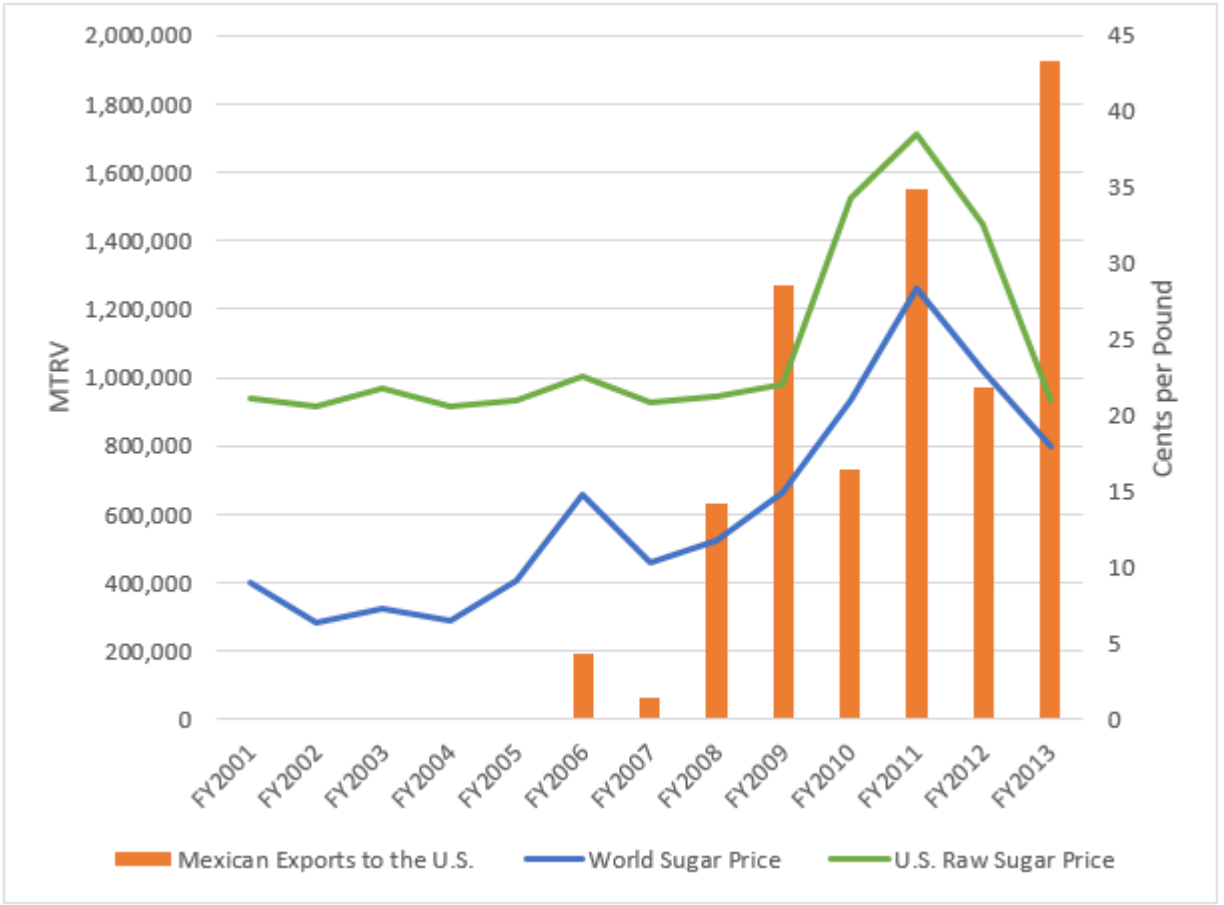
- Today I will discuss one of the seven papers from my dissertation

Welfare Implications of NAFTA on Sugar Markets in the U.S. and Mexico

Motivation

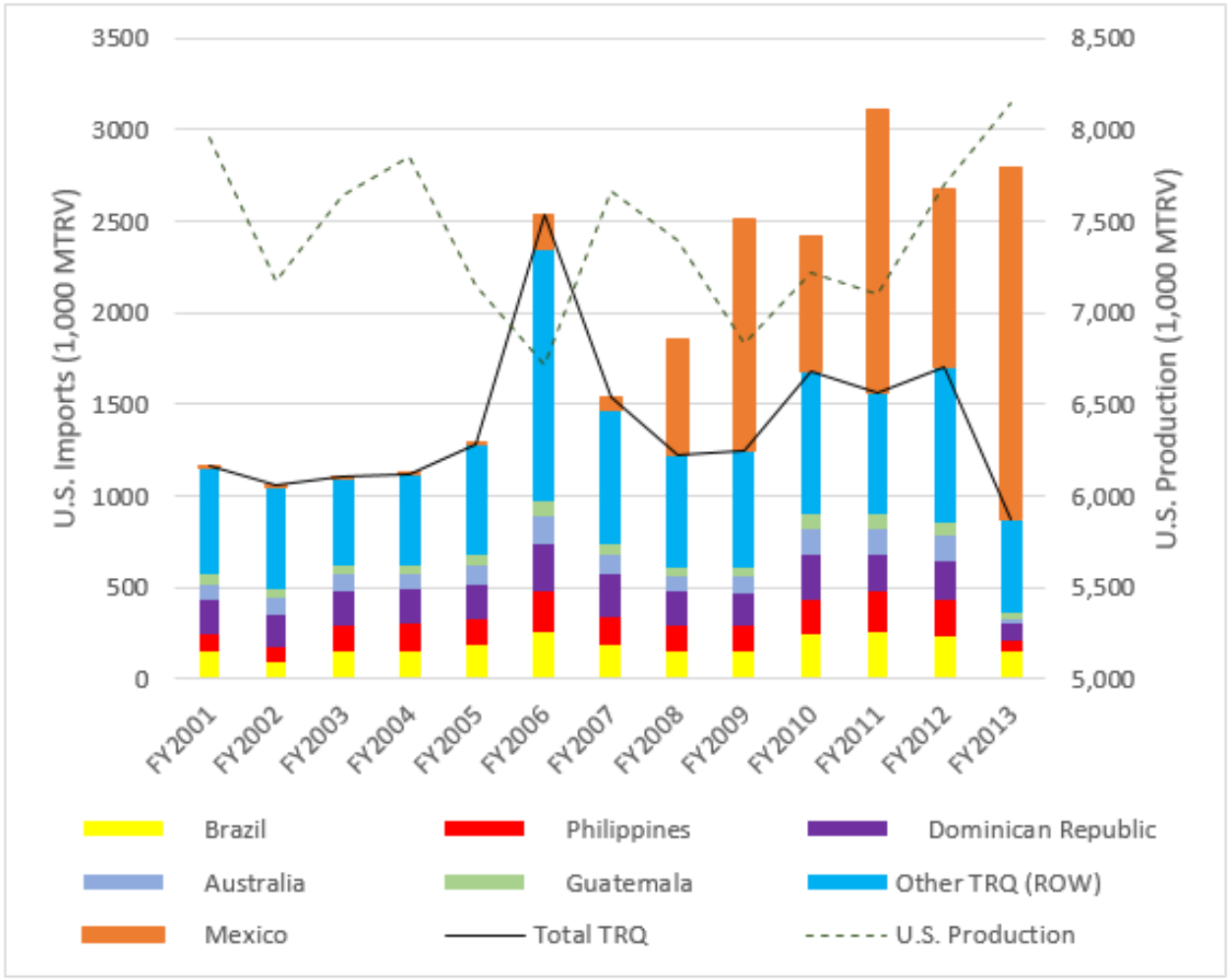
January 1, 2008: NAFTA became fully effective

- Sugar trade between U.S. and Mexico unrestricted: Mexico no longer under TRQ.
- U.S. sugar industry: “Unrestricted sugar from Mexico depressed U.S. sugar prices”



Motivation

- Top exporters of sugar into the U.S. (TRQ countries and Mexico) and U.S. domestic production



Objective

- Use concept of economic surplus to determine the ex post impact of NAFTA on U.S. and Mexican welfare.

- Develop a partial equilibrium (PE) sugar trade model between Mexico, the U.S. and the TRQ countries (ROW).

Previous Literature

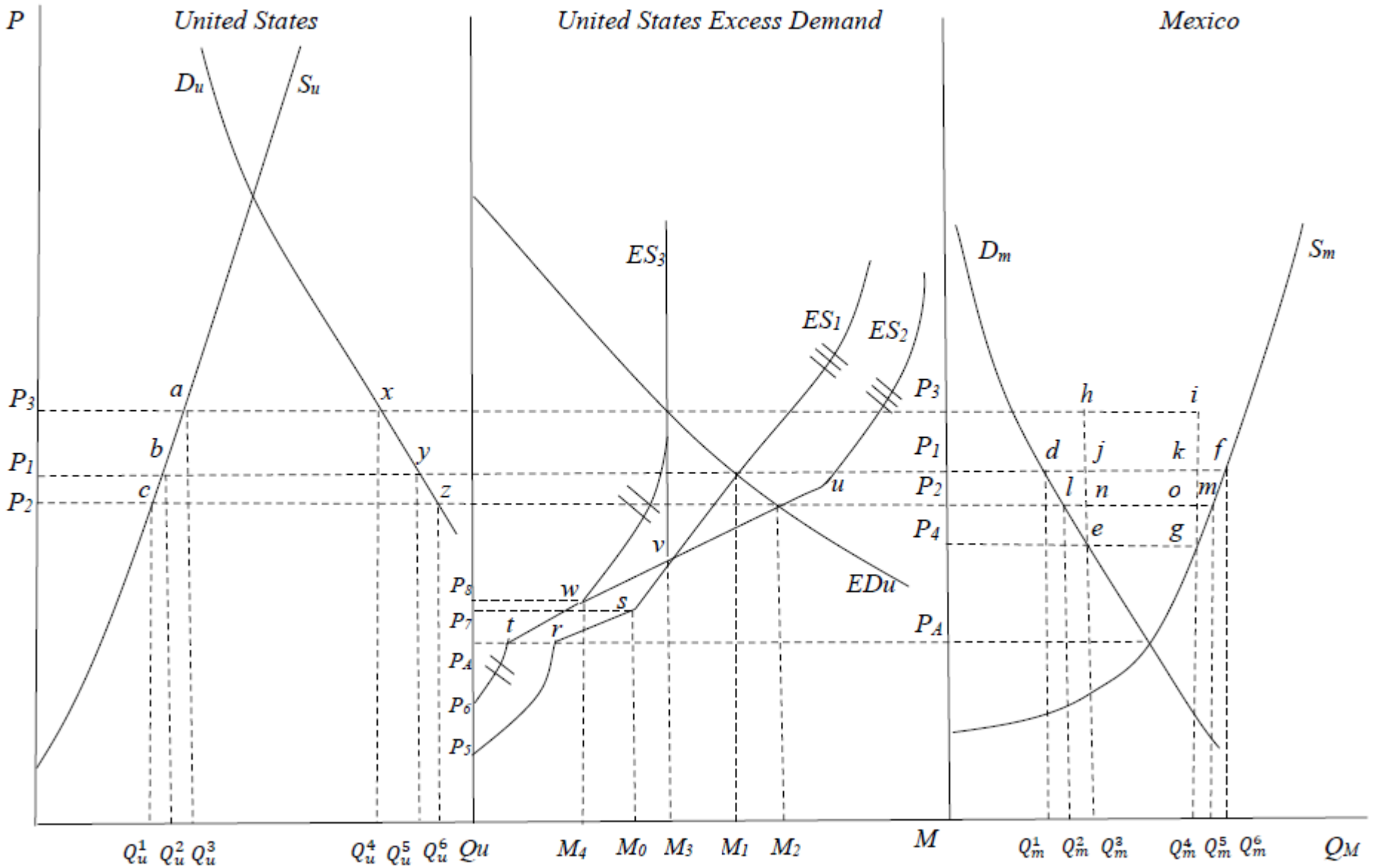
Issue Examined	Previous Literature
Cost of U.S Sugar Policy	Behgin et al. (2003); Beghin & Elobeid (2014)
Impact of U.S. Sugar Policy Changes	Petrolia and Kennedy (2003); Schmitz et al. (2002)
	Gwo-Jiun, Schmitz & Knutson (1987)
	Babcock & Schmitz (1987)
Predicted Cost of NAFTA	Knutson et al. (2010); Kennedy & Schmitz (2009)
	Abler et al. (2007); Sano et al. (2004)
USDA Sugar Forecast	Lewis and Manfredo (2012)

- No known research has examined *realized* changes in U.S. and Mexican welfare due to NAFTA.

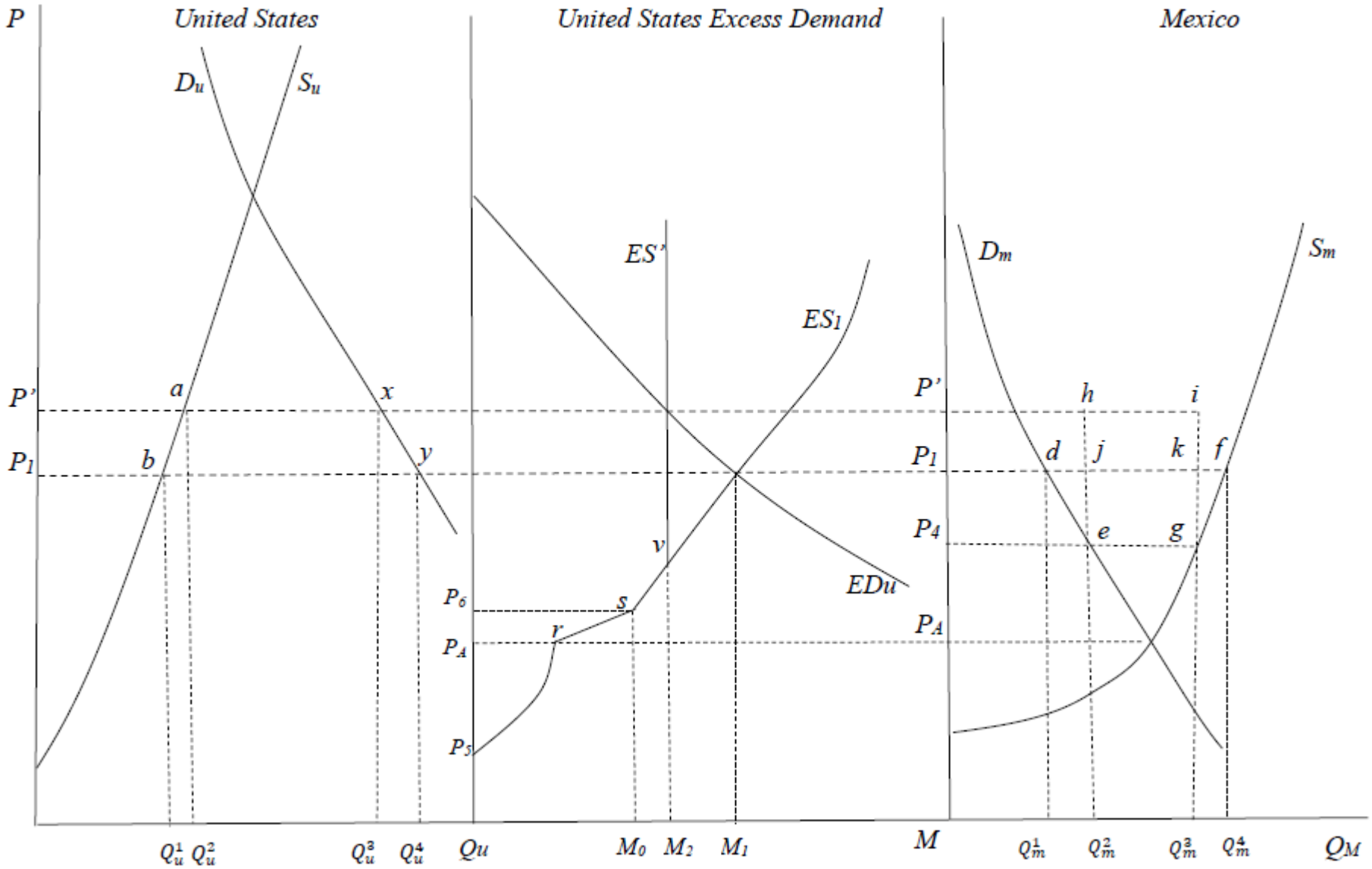
Impact of NAFTA: FY 2008 through FY 2013

- Actual Scenario: Mexico exports unrestricted amount of sugar
- Counterfactual Scenario: Mexico is restricted by the TRQ to pre-2008 conditions
  - Mexico is allocated 250,000 MTRV of sugar to export into the U.S.
- Two cases:
  - Case 1: TRQ filled. FYs 2008-2012
  - Case 2: TRQ not filled. FY 2013

Graph of both Case 1 and Case 2



Case 1 Only



If No NAFTA

U.S. Producer Surplus Increase:

- Case I: $P'P_1ba$

U.S. Consumer Surplus* (60% manufacturers) Decrease:

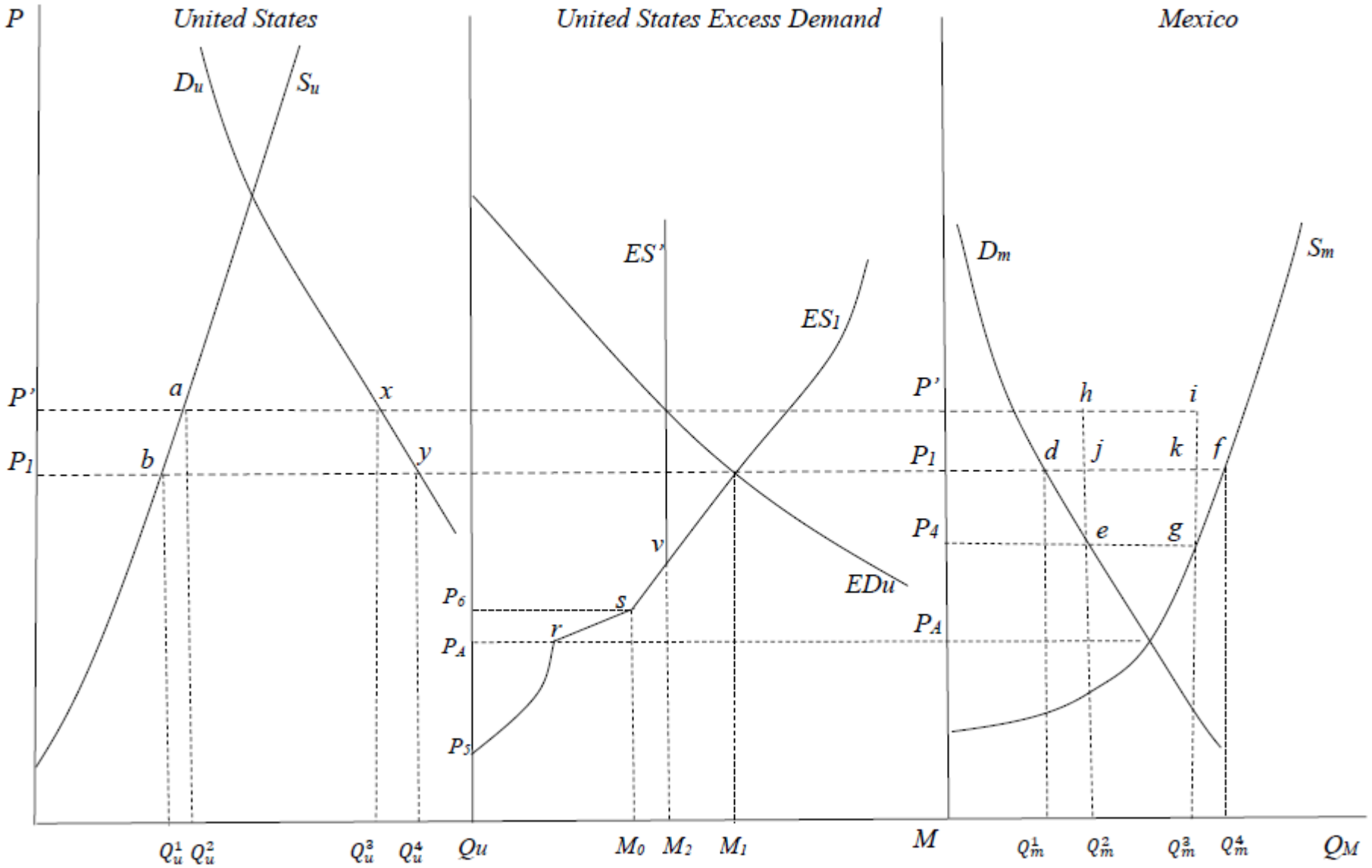
- Case I: $P'P_1yx$

Total U.S. Welfare Decrease:

- Case I: *abyx*

*U.S. sugar consumers: 60% food manufacturers; 40% restaurants, grocers, etc.

Case 1 Only



If No NAFTA

Mexican Producer Surplus change [decrease **or increase**]:

- Case I: $-P_1P_4gf+hegi= hjki-(P_1P_4ej+kgf)$

Mexican Consumer Surplus Increase:

- Case I: P_1P_4ed

Total Mexican welfare change [decrease **or increase**]:

- Case I: $hjki-(dej+kgf)$

Thus, NAFTA could decrease Mexican welfare.

Functional Forms and Welfare Measures

- Producer and consumer surplus are derived using functional forms for supply and demand curves adapted from Schmitz *et al.* (1997) and Schmitz (2002):

$$(1)\quad P_s(Q) = \alpha + \beta {Q_s}^{\gamma}$$

$$(2)\quad P_d(Q) = \delta {Q_d}^{\theta}$$

where supply and demand are constant elasticity curves, shifted upward by an intercept α, which represents the shut-down price (average variable cost).

- Under this specification, the price elasticity of demand and price elasticity of supply can be written as:=

$$(3)\quad \eta = \frac{\partial ln Q_d}{\partial ln P_d} = \frac{1}{\theta}$$

$$(4)\quad \varepsilon = \frac{\partial ln Q_s}{\partial ln P_s} = \frac{1}{k\gamma}$$

where $k = (Ps\text{-}\alpha)/Ps$ and $(0 \leq k \leq 1)$.

Functional Forms and Welfare Measures

- The parameters can be recovered given: shut-down price (α), price received by producers (P_s), price received by consumers (P_d), quantity supplied (Q_s), quantity demanded (Q_d), price elasticity of supply (ε), and price elasticity of demand (η) as follows:

$$(5)\quad \theta = \eta^{-1}$$

$$(6)\quad \gamma = (k\varepsilon)^{-1}$$

$$(7)\quad \delta = P_d Q_d{}^{-1/\eta}$$

$$(8)\quad \beta = kP_s Q_s{}^{-1/k\varepsilon}$$

- Excess demand curve for the U.S. is the horizontal difference between the U.S. supply and demand curves, S_u and D_u:

$$(9)\quad \mathrm{ED}_u = \left(\frac{P}{\delta_u}\right)^{\eta_u} - \left(\frac{P-\alpha_u}{\beta_u}\right)^{k_u\varepsilon_u}$$

- Excess supply curve facing the U.S. is the horizontal sum of the Mexican excess supply curve and the residual excess supply curve of the ROW:

$$(10)\quad \mathrm{ES} = \left(\frac{P-\alpha_m}{\beta_m}\right)^{k_m\varepsilon_m} - \left(\frac{P}{\delta_m}\right)^{\eta_m} + \left(\frac{P-\alpha_r}{\beta_r}\right)^{k_r\varepsilon_r} - \left(\frac{P}{\delta_r}\right)^{\eta_r}$$

Functional Forms and Welfare Measures

Producer Surplus

- Producer surplus at price $P^* > \alpha$, for any region is:

$$(11)\quad PS = \int_{\alpha}^{P^*} Q_s(P)dP = \int_{\alpha}^{P^*} \left(\frac{P-\alpha}{\beta}\right)^{\gamma^{-1}} dP\,.$$

- After integrating (11), substituting (6) and simplifying, producer surplus at price P^* is:

$$(12)\quad PS = \left(\frac{\beta^{-k\varepsilon}}{1+k\varepsilon}\right)(P^*-\alpha)^{1+k\varepsilon}$$

Consumer Surplus

- The formula for the change in consumer surplus from a lower price $P_1{}^*$ to a higher price $P_2{}^*$ is:

$$(13)\quad \Delta CS = \int_{P_2^*}^{P_1^*} Q_d(P)dP = \int_{P_2^*}^{P_1^*} \left(\frac{P}{\delta}\right)^{\theta^{-1}} dP$$

- After integrating (13), substituting (5) and simplifying, the change in consumer surplus is:

$$(14)\quad \Delta CS = \frac{\delta^{-\eta}}{(1+\eta)}\left(P_1^{\eta+1} - P_2^{\eta+1}\right)$$

Impact of NAFTA

U.S. Welfare (Millions of Dollars)

Impact of NAFTA on U.S. Producer and Consumer Surplus, FY 2008 through FY 2013 (Millions of Dollars)

	Producer Surplus (PS)			Consumer Surplus (CS)	Δ Total Welfare
FY	Actual	Counterfactual[1]	Δ PS	Δ CS	(ΔCS+ΔPS)
FAPRI					
2008	809	1347	-538	657	118
2009	855	2,788	-1,933	2,457	524
2010	2,562	3,582	-1,020	1,319	299
2011	3,070	6,765	-3,694	4,876	1,181
2012	2,490	4,022	-1,532	1,977	445
2013	847	3,807	-2,960	3,638	678
Average	1,772	3,719	-1,946	2,487	541

Impact of NAFTA

Mexican Welfare (Millions of Dollars)

Impact of NAFTA on Mexican Producer and Consumer Surplus, FY 2008 through FY 2013 (Millions of Dollars)

	Producer Surplus (PS)			Consumer Surplus (CS)	Δ Total Welfare
FY	Actual	Counterfactual[1]	Δ PS	Δ CS	(ΔCS+ΔPS)
FAPRI					
2008	428	88	341	-344	-3
2009	473	91	383	-376	6
2010	1,997	1,017	978	-964	13
2011	2,423	451	1,973	-1,768	204
2012	1,758	462	1,191	-1,144	47
2013	494	103	391	-381	10
Average	1,262	369	876	-830	46

Impact of NATA

- Decreased U.S. producer surplus: nearly $2 billion annually.
- Increased U.S. consumer surplus (60% manufacturers): $2.5 billion annually.

- Decreased Mexican consumer welfare: $830 million
- Increased Mexican producer welfare: $876 million
- Increased Mexican total welfare by $46 million annually.
- However, NAFTA **decreased** Mexican total welfare by $3 million in FY 2008.

Current Status of Sugar NAFTA

- The U.S. sugar industry submitted antidumping and countervailing duty petitions against Mexico on March 28, 2014 (American Sugar Alliance, 2014).

- WSJ Oct. 27—"The government said Monday it would impose additional tariffs on Mexican sugar imports as high as 47.26% after the Commerce Department preliminarily determined that Mexican sugar producers had dumped the sweetener in the U.S."

- Oct. 28 ASA press release: "U.S. and Mexican government officials yesterday initialed an accord to suspend the ongoing antidumping and countervailing duty investigations of sugar from Mexico... The DOC also announced its preliminary antidumping determination yesterday, with duty deposits of up to 47.26 percent. If a settlement is finalized, those duties will be suspended."

Current Status of Sugar NAFTA

- Nov. 18 ASA Press Release: "…. (ASA) reiterated U.S. producers' hope to finalize remaining details and conclude settlement talks, but said the industry is confident in the strength of their antidumping and countervailing duty cases if an agreement cannot be reached."

- Therefore, debate ongoing…

Future Research

- Impact of future Mexican trade restrictions (tariffs, import quotas, or TRQs) by U.S. could be investigated with this model.

- Model can be extended several ways to analyze policy issues currently under debate related to the U.S. sugar industry.

Thank you!

- Questions?

- Additional questions/information:
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