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Title: "AJAE appendix for *Dairy Tariff-Quota Liberalization: Contrasting Bilateral and Most Favored Nation Reform Options*"

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Bilateral TRQ Filling Ratios

The U.S. has *nine* different specialty cheese quotas (called TRQIDs) totaling over 136,000 metric tons (mt) (see www.amad.org, appendix table 2): Cheese Substitutes (TRQID11); Blue Veined (TRQID12); Cheddar (TRQID13); American (TRQID14); Edam/Gouda (TRQID15); Italian (TRQID16); Swiss (no eye) (TRQID17); Other cheese substitutes (TRQID18); and Swiss (with eye) (TRQID19). Within each TRQID, the quota allocated varies by country and variety across product lines at the *HS8-digit* level. However, each TRQID covers only a subset of HS8-digit cheese lines that do not map directly to the model's HS6-digit tariff lines (i.e. HS 040690).

We also had to confront the issue of bilateral quota allocations. The AMAD notifications report the quota level allocated to specific partners for each TRQID. However, not all countries export to the U.S. in all TRQID categories (appendix table 2). Furthermore, for some TRQIDs (but not all) Finland, Sweden and Austria received separate quota allocations from the EU15 as a group. To minimize the amount of information lost in aggregating TRQs to the model's HS6 digit commodity level and 14 country aggregation (appendix table 1), we calculated a filling ratio for each of the nine specialty cheese quotas at the most detailed level available (HS8-digit):

$$(1) \quad {}^{ID}FR_{r,k} = \frac{{}^{ID}Quant_{r,US,k}}{{}^{ID}Quota_{r,k}}$$

where, ID indexes a particular TRQID ($ID = 11 \dots 19$), r indexes the source region, k indexes the HS8-digit specialty cheese line, FR denotes the filling ratio, equal to the quantity exported from r to the U.S. ($Quant$) divided by the $Quota$ allocated to r in commodity (k). At this point we have filling ratios at the HS8 digit level that vary by r and TRQID (ID).

Next we aggregated the filling ratios under each TRQID to the sub-sector model regions (14 countries) using a trade-value weighted aggregation as:

$$(2) \quad {}^{ID}FR1_m = \sum_m \left(\frac{{}^{ID}V_{r \in m, US, k \in g}}{\sum_m {}^{ID}V_{m, US, k \in g}} {}^{ID}FR_{r,k} \right)$$

where, m indexes one of the 14 model countries in a particular TRQID (ID). The numerator in (2), ${}^{ID}V_{r \in m, US, k \in ID}$, is the value of trade from r (as an element of m) to the U.S. in commodity k (as an element of TRQID (ID)) and the denominator is the total value of trade from m to the US in a particular TRQID. This yields a value share from which to weight the filling ratios ($FR_{r,k}$) derived in (1).

The share weighted filling ratios (${}^{ID}FR_m$) in (2) vary by (ID) and exporter (m). As a final step we aggregated ${}^{ID}FR1_m$ across TRQIDs using the value of trade in the total value of trade across all TRQIDs as weights to arrive at the model aggregated filling ratios which vary only by exporter (m):

$$(3) \quad FR2_m = \sum_m \left(\frac{V_{m, US, g}}{\sum_g V_{m, US, g}} FR1_{m,g} \right)$$

The resulting filling ratios are reported in appendix table 2. The EU15 is the only country to trade in all nine TRQIDs. TRQID 11 (Cheese Substitutes) is the largest traded category with the EU15 and NZL getting the largest quota allocation in this category. The second-to-last column in appendix table 2 reports the PE/GE model filling ratios. Interestingly, six countries were out-of-quota in 2001 with Australia (AUS) exporting more than twice its quota allocation. Clearly these seven countries have a lot at stake when it comes to liberalizing US specialty cheese TRQs.

Multilateral (MFN) TRQs

To complicate matters, the MFN quota, which is available for any country, is at the forefront of the agricultural trade negotiations. The MFN quota accounts for less than five percent of total bilateral TRQs in most cases (appendix table 2). We allocate the MFN quota as an auction where the quota goes to the highest bidder and assume that exporters can shift specialty cheese costlessly from the bilateral out-of-quota market to the MFN market. This is an important point because substantial improvements in market access may not occur immediately if exporters simply redirect bilateral (out-of-quota) exports to the MFN regime in order to take advantage of the additional quota available.

Which exporter will pick up the MFN quota is a critical issue in the set up of this scenario. We incorporate detailed unit values of specialty cheese supplied by different exporters to re-establish the units of comparison. The EU15 supplies the highest valued specialty cheese (table 2) so we normalize all unit values on the (0,1) interval ($EU15 = 1.0$).

Imputation of Commodity Demands

Given data on international trade flows, we then need to attribute commodity imports to v intermediate and final demand segments (d) for each region (r). Dropping region (r) subscripts, we impute demands using a least squares procedure which minimizes deviations from target import shares ($\hat{\theta}_{g,d}$) in demand segment (d):

$$\min_{M_{g,d}^*, D_{g,d}^*} \Omega = \sum_d \left[(1 + t_d^M) M_{g,d}^* - \hat{\theta}_{g,d} \left((1 + t_d^M) M_{g,d}^* + (1 + t_d^D) D_{g,d}^* \right) \right]^2$$

subject to:

$$\sum_d M_{g,d}^* = \overline{M}_g$$

$$\sum_g D_{g,d}^* = \overline{D}$$

$$\sum_g \left((1 + t_d^M) M_{g,d}^* + (1 + t_d^D) D_{g,d}^* \right) = \bar{A}_d$$

where, \bar{M}_g is aggregate imports of commodity g from the trade flow data; \bar{D} is aggregate sectoral output taken from the GTAP database; \bar{A}_d is aggregate sectoral demand from the GTAP database; and t_d^M (t_d^D) is the tax rate on imported (domestic) goods purchased in use d . We assume that target import shares ($\hat{\theta}_{g,d}$) are equivalent to the sector shares in the GTAP database. If we had external data on import demand intensity at the commodity level, this could be incorporated into the procedure.

The imputed benchmark data are $M_{g,d}^*$, which is the demand for imported commodity g in demand segment d ; and $D_{g,d}^*$, which is the demand for the domestic commodity g in demand segment d . Finally, once demand has been obtained, production is calculated by summing domestic commodity demands and exports of sub-sector good (g) in region (r).

Appendix Table 1. Country and Sector Information

Commodity Aggregation (19)		Country Aggregation (14)	
PDR	Paddy Rice	ARG	Argentina
WHT	Wheat	AUS	Australia
GRO	Other Cereals	CAN	Canada
V_F	Vegetables and Fruit	EU15	European Union
OSD	Oilseeds	JPN	Japan
C_B	Sugar Cane and Beet	LAM	Latin America and Caribbean
PFB	Plant Based Fibers	MEX	Mexico
OCR	Other Crops	MNA	Middle East and North Africa
CTL	Bovine Cattle	NZL	New Zealand
OAP	Other Animal Products	ROA	Rest of Asia
RMK	Raw Milk	ROE	Rest of Europe
WOL	Wool	SAM	South America
VOL	Vegetable Oils and Fats	SAO	South Asia and Oceania
MIL	Dairy	USA	United States
PCR	Processed Rice		
SGR	Sugar		
OFD	Other Food Products		
B_T	Beverages and Tobacco		
OTH	All Other Goods		

Appendix Table 2. TRQ Allocations and MFN Unit Values in the US Specialty Cheese Import Market, 2001

		-----TRQID-----										MFN Unit Values
Country	TRQ Variable	11	12	13	14	15	16	17	18	19	Model Aggregation	
ARG	Quota	100				143	4,808				4,782	0.6
	Trade	24				48	5,633				5,578	
	Fill	0.24				0.33	1.17				1.16	
AUS	Quota	1,133		1,617	1,000						1,249	0.7
	Trade	3,153		2,470	1,136						2,585	
	Fill	2.78		1.53	1.14						2.07	
CAN	Quota	1,141		833						70	828	0.9
	Trade	1,222		1,083						206	1085	
	Fill	1.07		1.30						2.95	1.32	
EU15 ^b	Quota	20,756	2,529	430	271	5,348	3,499	3,675	4,000	6,117	10,000	1.0
	Trade	22,800	2,692	724	159	6,326	4,625	5,625	1,977	11,000	12,100	
	Fill	1.10	1.06	1.68	0.59	1.18	1.32	1.53	0.49	1.80	1.21	
NZL	Quota	11,322		3,950	2,000						4,040	0.8
	Trade	13,600		8,226	1,985						10,700	
	Fill	1.20		2.08	0.99						1.49	
ROE ^a	Quota	1,579				167	1,323	1,850	175	5,487	4,783	0.9
	Trade	1,728				45	1,302	857	20	4,780	3,555	
	Fill	1.09				0.27	0.98	0.46	0.11	0.87	0.88	
SAM	Quota	250					511			42	471	0.4
	Trade	255					1,178			110	987	
	Fill	1.02					2.30			2.64	2.10	
MFN Quota ^c		502	N/A	240	170	26	14	80	N/A	86		
% of Bilateral Quota		1.4	N/A	3.5	5.2	0.5	0.2	1.5	N/A	0.7		

Note: Quota and Trade values are in metric tons (mt). Fill = Trade/Quota.

^a ROE countries exporting specialty cheese to the US with bilateral quota allocations are Switzerland, Czech Republic, Hungary, Norway, Poland and Romania.

^b EU15 TRQ information accounts for quota that was allocated separately to Sweden, Finland and Austria for TRQID11, TRQID15, TRQID17, TRQID18 and TRQID19 (see www.amad.org).

^c The amount of MFN quota allocated in the benchmark equilibrium of the tariff line model is zero