The effects of liberalizing the yellow maize market in Guatemala.

A partial equilibrium multi-market approach

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Outline

- 1. Introduction
- 2. The multimarket model
- 3. Data and calibration
- 4. Results
- 5. Conclusions

1. Introduction. Background

- Guatemalan economy: relies on agricultural production.
- CAFTA agreement: changes in trade policy not substantial.
- Sensitive products: main crops and related products.

1. Introduction. Objective

- Objective:

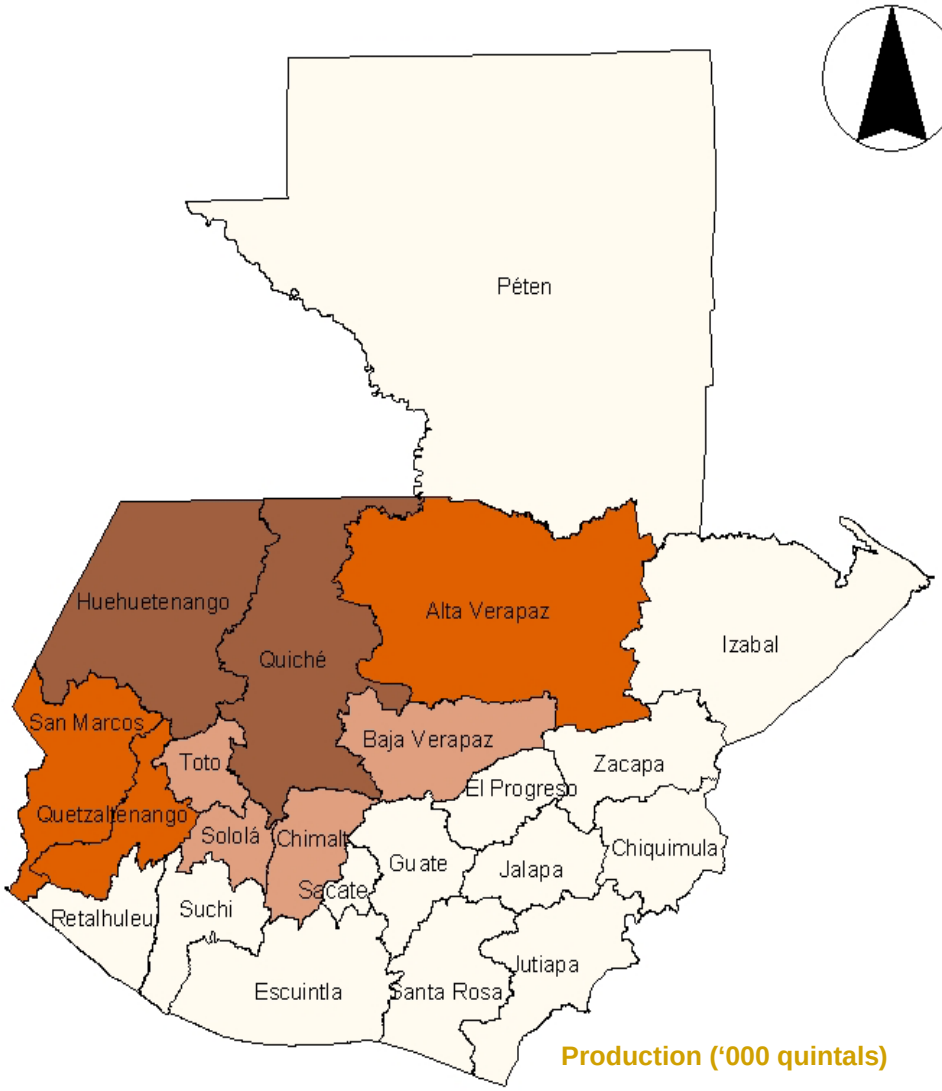
  To analyze direct and indirect effects of a trade liberalization of the yellow maize market.

- 4 agricultural products considered
  - Yellow maize
  - White maize
  - Beans
  - Poultry meat

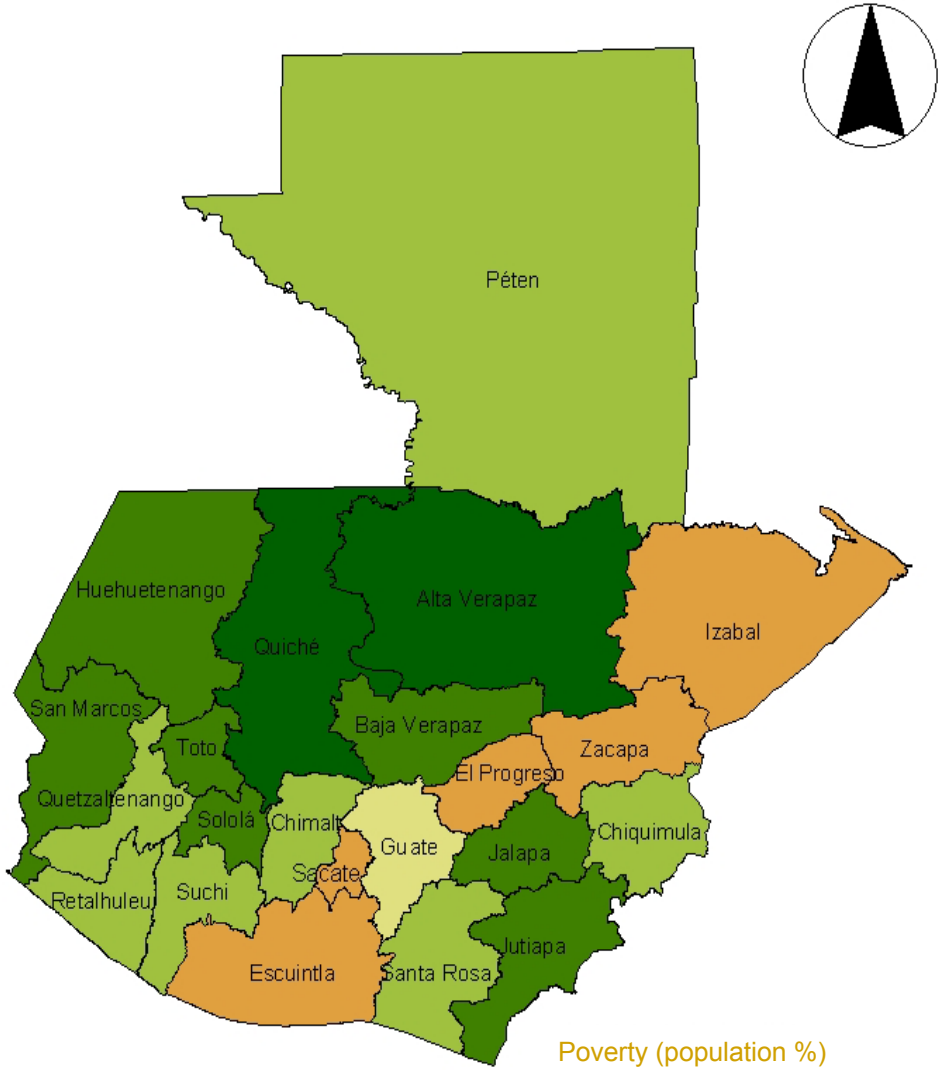
1. Introduction. Importance of products

REGION	PRODUCT	EXTREME POOR	POOR	NON POOR	EXTREME POOR	POOR	NON POOR
		Average Consumption	Average Consumption	Average Consumption	Average Production	Average Production	Average Production
METROPOLITANA	Maize	33.24	5.31	1.16	.00	1.37	.05
	Bean	1.73	3.36	1.21	.00	.82	.07
	Poultry	5.05	4.04	3.20	.63	.16	1.10
NORTE	Maize	26.95	16.55	4.84	2.60	4.68	1.65
	Bean	6.34	5.22	2.92	.46	1.36	1.10
	Poultry	3.33	3.56	3.15	1.29	.54	.48
SURORIENTE	Maize	32.61	17.11	5.00	9.23	3.43	3.55
	Bean	16.17	8.02	3.13	2.15	1.99	1.28
	Poultry	2.63	3.65	3.34	.84	.51	.89
PETEN	Maize	45.19	21.28	5.62	33.02	31.52	9.75
	Bean	17.85	9.20	2.82	14.72	13.53	4.92
	Poultry	1.89	4.01	3.16	1.53	.50	.16

Yellow Maize Production. Guatemala – 2003



Poverty Map. Guatemala – 2002



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2.The multimarket model. Description

- Considers direct and indirect links between sectors of the economy (substitutes and complementary).
- Considers more than one market (≠ partial eq.) but not all the indirect effects (≠ CGE).
- Useful to asses the *ex ante* effects of a policy on quantities and prices of a group of related products and factors (specially in agriculture).
- Transmission of the policy to households through their production and consumption patterns.
- Investment and government sector are frequently not considered.

2.The multimarket model. Structure

- Non tradable goods:
  - White maize, Beans
- Tradable goods:
  - Yellow maize, Poultry meat.

- W. maize and beans are complementary in production.
- Y. maize is exclusively used as an input in poultry meat production.

2. The multimarket model. Equations

- Log linearization of the system.

$$\log(S_i) = \alpha_i^s + \sum_j \xi_i^j \log(p_j); i, j = w, y, b, p$$ Supply

$$\log(D_y) = \alpha_y + \xi_y^p \log(p_p) + \xi_y^{yc} \log(p_y^c)$$

$$\log(D_i) = \alpha_i + \sum_j \eta_i^j \log(p_j^c) + \eta_i^y \log(Y)$$ Demand

$$\log(Y) = \sum_i \frac{p_i S_i}{Y} \log(p_i) - \frac{p_y^c D_y}{Y} \log(p_y^c)$$ Income

2. The multimarket model. Equations

$$S_i\left(p_i, p_y^c\right) + M_i = D_i\left(p_i^c, Y\right) \quad ;i = w,b,p$$ Equilibrium

$$S_y\left(p_i, p_y^c\right) + M_y = D_y\left(p_w, p_p, p_p^c, p_y^c\right)$$

$$p_i^c = p_i\left(1 + mrg_i\right)$$ Prices

$$p_i^c = p_i^W \cdot e \cdot \left(1 + tr_i\right) \cdot \left(1 + tmg_i\right)$$ Prices tradables

3. Data and Calibration

- Data correspond to the year 2000.
- Quantities consumed, produced and traded from MAGA.
- Prices from IMF statistics.
- **Encovi** survey for household data. Country representative. Urban and rural.
- Elasticities from previous studies.

3.Data and calibration.

Policy simulated

- Elimination of trade barriers for yellow maize. (*48% reduction in p_y)*
- Equilibrium solution before and after the policy → changes in prices and quantities
- Sensibility analysis:
  - Scenarios of half and double elasticities.
  - Scenario of substitution in consumption of w. maize and y. maize.

4. Multimarket results. (% change)

Scenario	BASE	I	II	III	IV	V
Sb	0.99	0.75	1.10	0.59	1.31	-6.42
Sw	3.74	2.11	6.14	3.09	3.15	-6.88
Sy	-19.91	-10.90	-34.57	-17.37	-17.61	-21.59
Sp	2.42	2.42	4.83	2.42	2.42	2.42
Dy	4.83	2.42	9.66	4.83	4.83	91.12
Db	0.99	0.75	1.10	0.59	1.31	-6.42
Dw	3.74	2.11	6.14	3.09	3.15	-6.88
Pb	-4.72	-3.32	-5.26	-5.11	-1.40	-15.95
Pw	-4.83	-2.60	-8.13	-8.04	-8.21	-56.52
Mp	-77.53	-52.36	-132.48	-65.01	-59.89	-594.91
My	13.49	7.08	25.14	12.60	12.69	130.56
Dp	-5.32	-2.89	-8.46	-4.11	-3.61	-55.39
Nominal y	0.34	0.41	0.25	0.25	0.27	-1.11
CPI	-0.20	-0.11	-0.31	-0.30	-0.28	-2.71
Real y	0.54	0.52	0.56	0.55	0.55	1.61

The multimarket model. Equations

- Welfare effects. Second-order measure.

$$\left(\frac{dW}{Y}\right)_h = \sum_i \phi_{hi}\left(d\log p_i\right) + \frac{1}{2}\left[\sum_i \phi_{hi}\,\xi_i\left(d\log p_i\right)^2 + \sum_i \sum_{j\neq i} \phi_{hi}\,\xi_i^j\left(d\log p_i\right)\left(d\log p_j\right)\right] -$$

$$-\sum_i \theta_{hi}\left(d\log p_i\right) - \frac{1}{2}\left[\sum_i \theta_{hi}\,\eta_i\left(d\log p_i\right)^2 + \sum_i \sum_{j\neq i} \theta_{hi}\,\eta_i^j\left(d\log p_i\right)\left(d\log p_j\right)\right]$$

4. Welfare results. (group average % change)

	REGION / Scenario	METROPOLI-TANA	NORTE	NOR ORIENTE	SUR ORIENTE	CENTRAL	SUROCCI-DENTE	NOROCI-DENTE	PETEN
URBAN	Base	.12	.50	.24	.49	.51	.61	.75	.25
	I	.09	.38	.18	.37	.39	.46	.57	.19
	II	.15	.65	.31	.63	.66	.79	.98	.30
	III	.15	.63	.30	.62	.64	.77	.96	.30
	IV	.11	.58	.25	.56	.58	.73	.91	.24
	V	.48	1.95	.94	1.83	1.91	2.44	2.95	.38
RURAL	Base	.76	1.66	.91	1.38	.88	1.20	1.79	-1.19
	I	.58	1.28	.69	1.05	.68	.92	1.37	-.87
	II	1.00	2.18	1.18	1.77	1.15	1.58	2.34	-1.64
	III	.98	2.14	1.16	1.75	1.13	1.55	2.29	-1.48
	IV	.94	2.07	1.10	1.59	1.06	1.51	2.17	-1.23
	V	2.90	6.17	3.34	4.71	3.11	4.56	6.97	-10.17

4. Welfare results. (group average % change)

	REGION / Scenario	METROPOLI-TANA	NORTE	NOR ORIENTE	SUR ORIENTE	CENTRAL	SUROCCI-DENTE	NOROCI-DENTE	PETEN
EXTR. POOR	Base	3.19	2.54	2.38	2.81	2.25	2.39	2.80	1.15
	I	2.46	1.95	1.82	2.14	1.72	1.84	2.14	.91
	II	4.27	3.35	3.13	3.61	2.96	3.19	3.68	1.42
	III	4.17	3.28	3.06	3.55	2.89	3.11	3.59	1.52
	IV	4.27	3.19	2.95	3.18	2.79	3.16	3.44	1.58
	V	13.29	10.05	9.47	9.84	9.04	9.83	11.03	-.93
POOR	Base	.48	1.27	1.30	1.55	1.05	1.23	1.53	-1.29
	I	.37	.98	1.00	1.18	.80	.94	1.16	-.95
	II	.62	1.66	1.71	2.01	1.37	1.61	1.99	-1.78
	III	.61	1.63	1.67	1.97	1.34	1.58	1.95	-1.61
	IV	.54	1.57	1.61	1.83	1.26	1.51	1.85	-1.39
	V	1.73	4.43	5.13	5.77	3.83	4.69	5.96	-10.72
NON POOR	Base	.16	.38	.19	.21	.35	.46	.58	-.52
	I	.12	.29	.14	.16	.26	.35	.44	-.39
	II	.20	.48	.22	.25	.44	.60	.75	-.71
	III	.19	.48	.23	.26	.44	.59	.73	-.65
	IV	.16	.43	.17	.21	.39	.54	.67	-.56
	V	.63	1.26	.41	.22	1.14	1.61	2.13	-3.82

4. Rural Households Typologies

Household typology	Percentage (of total rural population)	Consumption (goods in the model as a % of total expenditure)			Production (goods in the model as a % of total income)		% Change welfare
		Maize	Beans	Poultry	Basic grains	Poultry	
Unskilled households without land	12.90%	5.06%	2.27%	7.04%	0.00%	0.00%	2.69%
Skilled households without land	2.40%	0.60%	0.68%	4.49%	0.00%	0.00%	2.47%
Non commercial households	53.30%	4.30%	2.00%	3.54%	3.94%	5.79%	0.76%
Small commercial households	23.90%	2.64%	1.50%	3.65%	3.66%	1.32%	0.51%
Medium commercial households	5.40%	1.39%	1.16%	3.55%	7.30%	20.69%	-0.16%
Large commercial households	2.10%	0.26%	0.35%	1.47%	5.61	17.6%	-0.30%

5. Summary-Conclusions

- CAFTA presents opportunities and perils to the agricultural sector.
- Liberalization of y. maize market appears to have distributional effects towards the poor.
- A region strongly related to the products considered show some welfare losses.
- With different types of rural households: losses for large commercial farms.
- Importance of complementary policies.

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