

Who Benefited from Trade Liberalization in Mexico? Measuring the Effects on Household Welfare

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Overview:

Basic Questions:

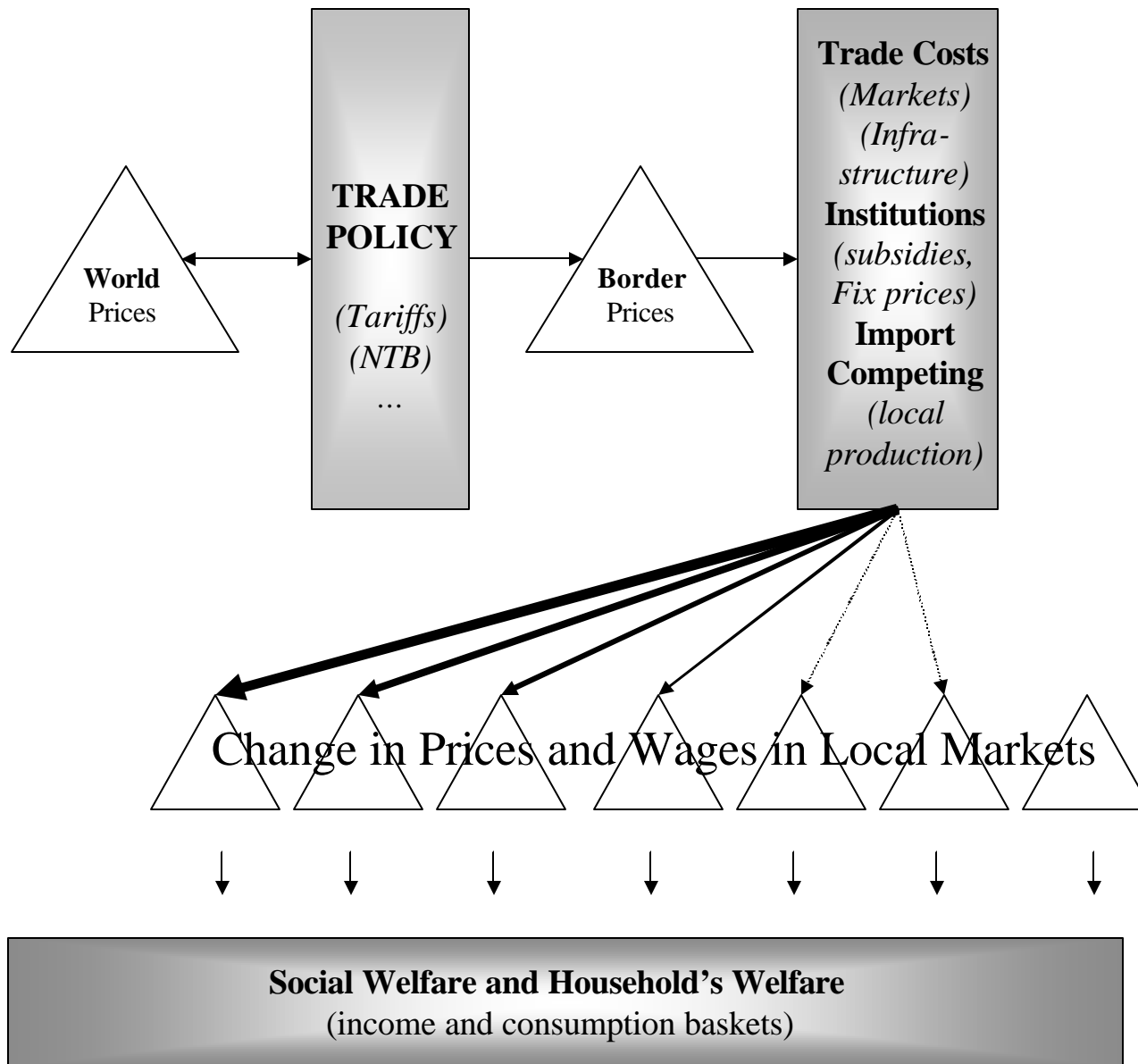
- What has been the effect of Mexican trade liberalization on households welfare? (no simulation, but estimation)
- Are those effect uniformly distributed or some population group suffers disproportionately or/and gains marginally?

What do we need to analyze to answer this question?

- Through which channels has trade liberalization affected households?
- How have Prices and Wages changed?
- Are those changes equal for all households?
- How have those changes affected household's welfare?

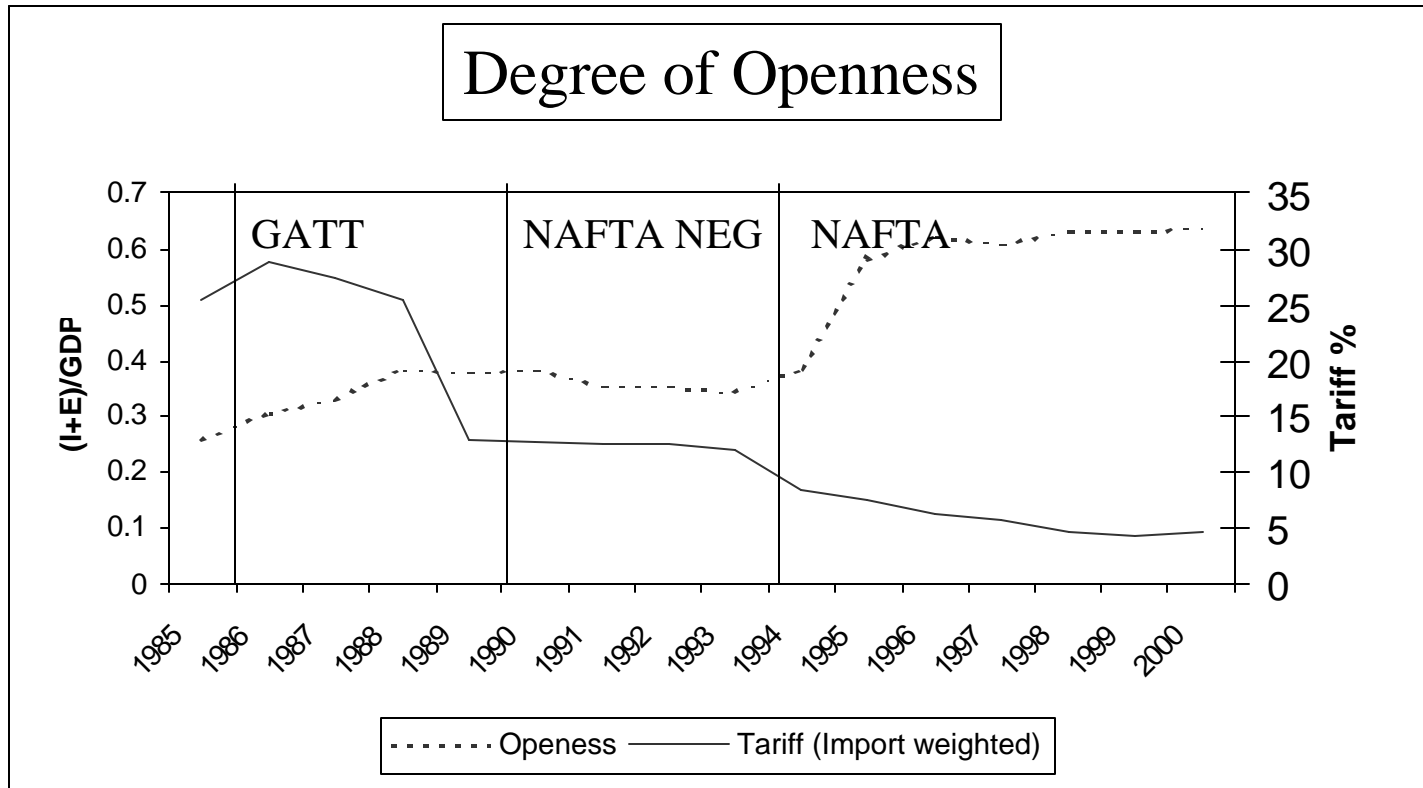
What this paper adds to the recent literature?

- Comprehensive analysis (consumption, income, wages)
- Looks at the effects at the regional level.



From World Prices to HH Welfare

Mexico's Trade Liberalization



Theoretical Framework

How to estimate welfare change due to trade liberalization:

- a) Isolate the effect of trade liberalization on local prices in domestic markets.
- b) Estimate the changes in wages due to the changes in prices
- c) Feed the changes in prices and wages into the household welfare function to obtain changes in real income.

Data

Data from households surveys:

- Prices
- Wages
- Households and individual characteristics

Data from National statistics:

- Tariffs
- Trade
- Regional CPI

Data dimension:

- 6 household surveys from 1989 to 2000
- 12 products (4 manufacturing and 8 agricultural)
- 2 wages (skilled and unskilled)
- 32 Geographic entities (States)

Change in Household Welfare (%)

Farm Household Model:

$$\frac{du_h}{y_h} = \sum_{\mathbf{1}^u} \mathbf{q}_{h(s,u)}^x dw_{h(s,u)} + \sum_{\mathbf{1}^g} \mathbf{q}_{hg}^x dp_{gh} - \sum_{\mathbf{1}^g} \mathbf{q}_{hg}^c dp_{gh} - \sum_{\mathbf{1}^g} \mathbf{h}_{hg} \mathbf{q}_{hg}^c dp_{gh}$$

labor
agric. income
consumption
income effect

$$- \frac{1}{2} \left(\sum_{\mathbf{1}^g} \mathbf{e}_{hg} \mathbf{q}_{hg}^c dp_{hg}^2 + \sum_{\mathbf{1}^g} \sum_{k \neq g} 2 \mathbf{e}_{hgk} \mathbf{q}_{hg}^c dp_{gh} dp_{kh} \right)$$

price effect
cross price effect

In order to calculate this equation, one needs:

Elasticities (changes in the consumption): $\mathbf{h}_{hg}, \mathbf{e}_{hg}, \mathbf{e}_{hgk}$

Change in prices and wages: $dp_{hg}, dw_{h(s,u)}$

Price-Wage Elasticities

Linking prices to wages:

Earnings Equation: $W_{ijt} = W_{ijt} (P_{gjt}, H_{jt}, Z_{it})$

Varying Coefficient Model:

$$\ln w_{ijt} = \sum_{g,r,s} \mathbf{q}^r \mathbf{q}^s \ln p_{ij}^{g,r} \mathbf{b}_{ij}^{g,r,s} + Z_{it} \mathbf{g}_{it} + H_{jt} \mathbf{d}_{jt} + \mathbf{e}_{ijt}$$

Wages are a function of prices (P) of goods (g), individual characteristics (Z) and Household characteristics (H)

Price Transmission

Pass-through literature: Goldberg and Knetter, 1997

$$\ln P_{rgt} = \mathbf{b}_0 + \mathbf{b}_1 \ln X_{gt} + \mathbf{b}_2 \ln Z_{gtr} + \mathbf{b}_3 d_r \\ + \mathbf{g} \ln(1 + \mathbf{t}_{tg}) + \mathbf{g}_1 \ln\{(1 + \mathbf{t}_{tg})d_r\} + \mathbf{e}_{rgt}$$

X = international price

Z = price of import competing goods

d = trade costs (distance from US border)

\mathbf{t} = tariff

\mathbf{g} = Pass-through coefficient (1= full)

Interaction term pass-through * trade costs (regional)
gives the effect of the change in tariff at the regional
level.

Results: Price transmission

Manufacturing (4): Homogeneous results. Pass through in the states closer to the US border is high (from 50% to full). Trade costs reduce the pass through of about 10% every 1000 km from the border.

Agriculture (8): More heterogeneous results. Pass-through for Cereals (32% - 17%), Fruit, Oils and Fats and Vegetables (in some cases southern regions have higher pass-through)

Reasons for lower pass through in agriculture:

- Lower imports,
- Higher domestic supply,
- Consumer preferences,
- Higher transport costs per value
- Agriculture liberalization has been small.

Price-Wage Results

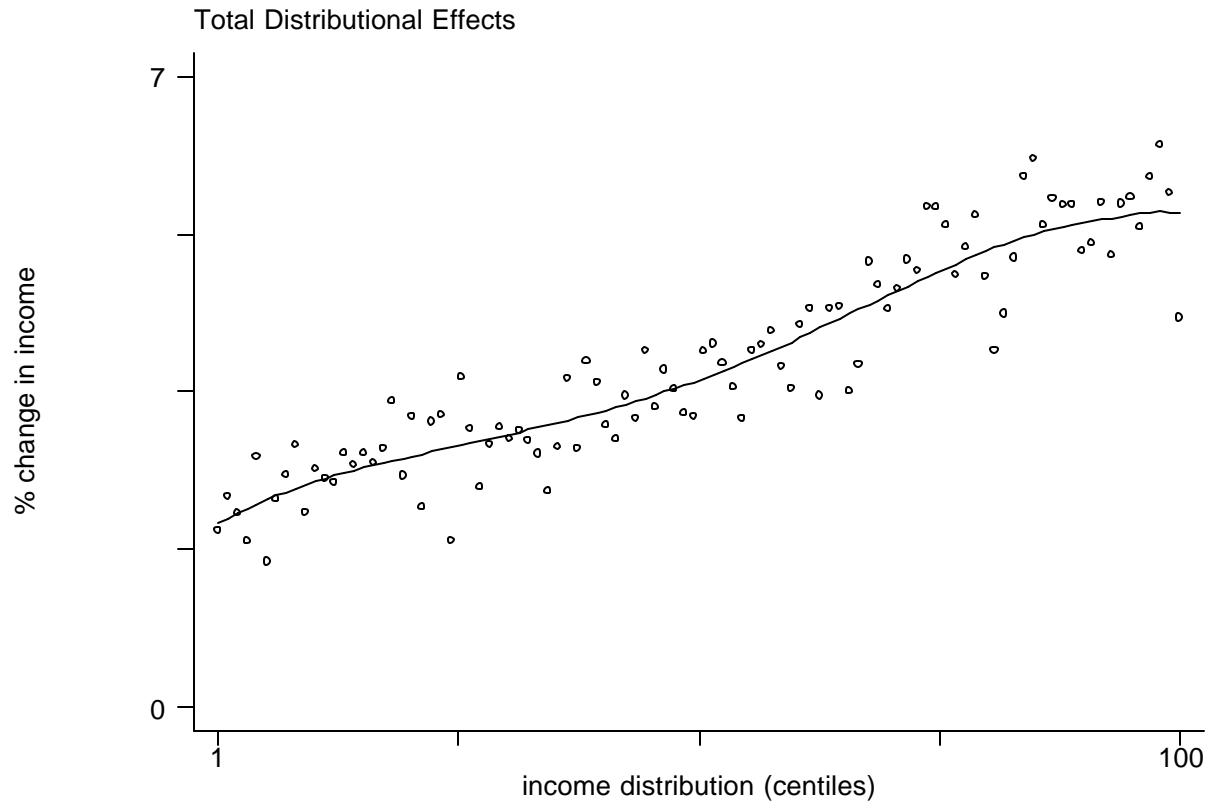
Elasticity:

- In industrialized regions (US border and Mexico City) wages are mostly affected by the prices of manufacturing products (textiles elasticity: 0.4 unskilled and 0.5 skilled).
- In agricultural regions (North and South) agricultural prices influence wages substantially. (elasticity 0.7 and 1.2)

Wages:

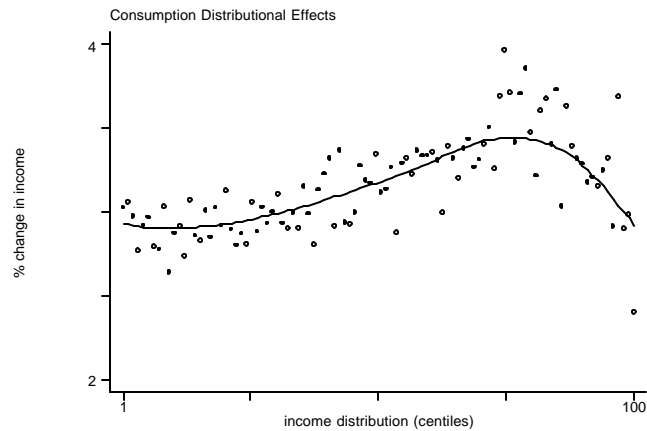
- In Northern regions and those closer to the US trade liberalization has increased wages (both skilled and partially unskilled)
- Negative effect of unskilled wages in southern regions.

Results: Welfare changes (%)

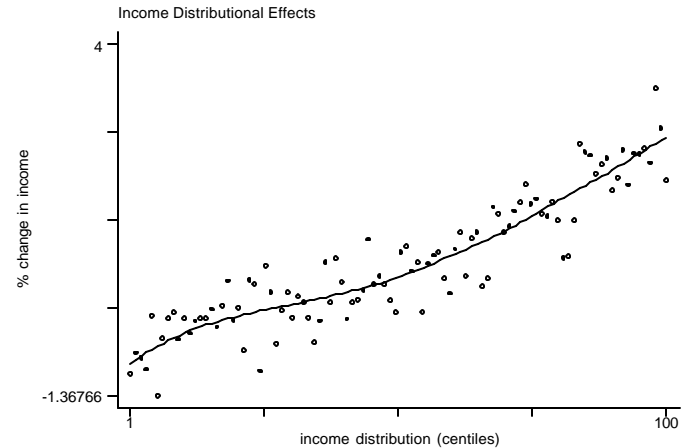


Results: Decomposition

Consumption



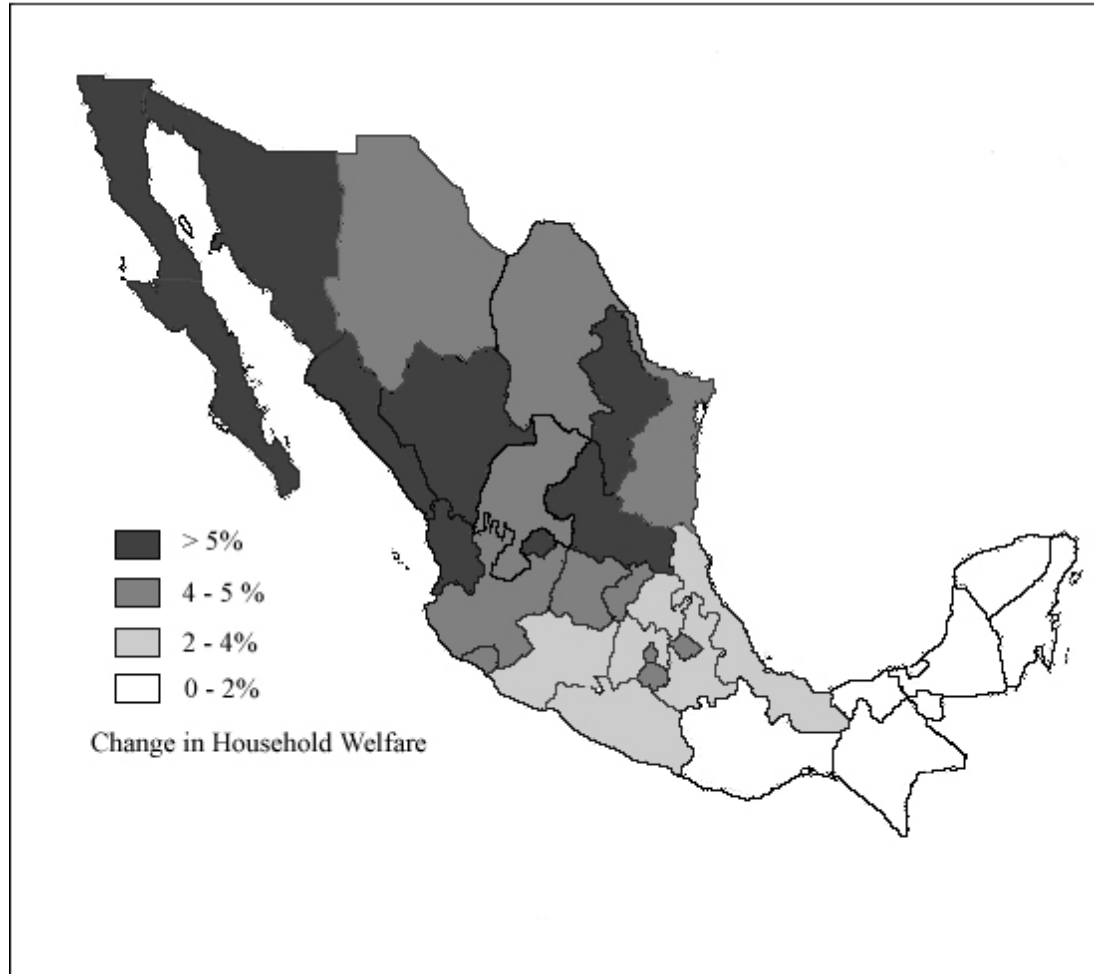
Income



Consumption basket is less expensive

Income has declined for poorer households (lower AG income, lower unsk wages)

Changes in Household welfare (by state)



Summary – effects of tariff liberalization

Prices: Tariff liberalization has produced its effects mainly through movement in the prices of manufacturing products. Prices of agriculture products have not been affected as much as manufacturing. (lower pass-through, still protected, consumer preferences, larger domestic supply, higher trade costs).

Consumption: Lower prices = Cheaper consumption basket.

Income: Lower agricultural income. Tariff liberalization has had little effect on unskilled wages (actually unskilled wages have declined in the agricultural regions). On the other hand, tariff liberalization has caused an increase in skilled wages.

Inequality: Skill Wage gap has increased. Widening gap in regional wages. Inequality has increased.

Poverty: Tariff liberalization alone has produced a decline in poverty of about 3 percentage points.

Mexico



Manufacturing

Year	Average Tariff	Food Products	Household Equipment	Other Manufact.	Textiles and Apparel
1989	12.89	15.1	14.1	10.5	19.7
1992	12.50	14.6	13.1	12.1	19.8
1994	8.56	11.6	4.9	8.3	18.0
1996	6.12	9.0	3.2	6.5	14.0
1998	4.49	5.7	1.7	4.1	10.0
2000	4.58	3.9	0.9	2.5	6.0

Agriculture

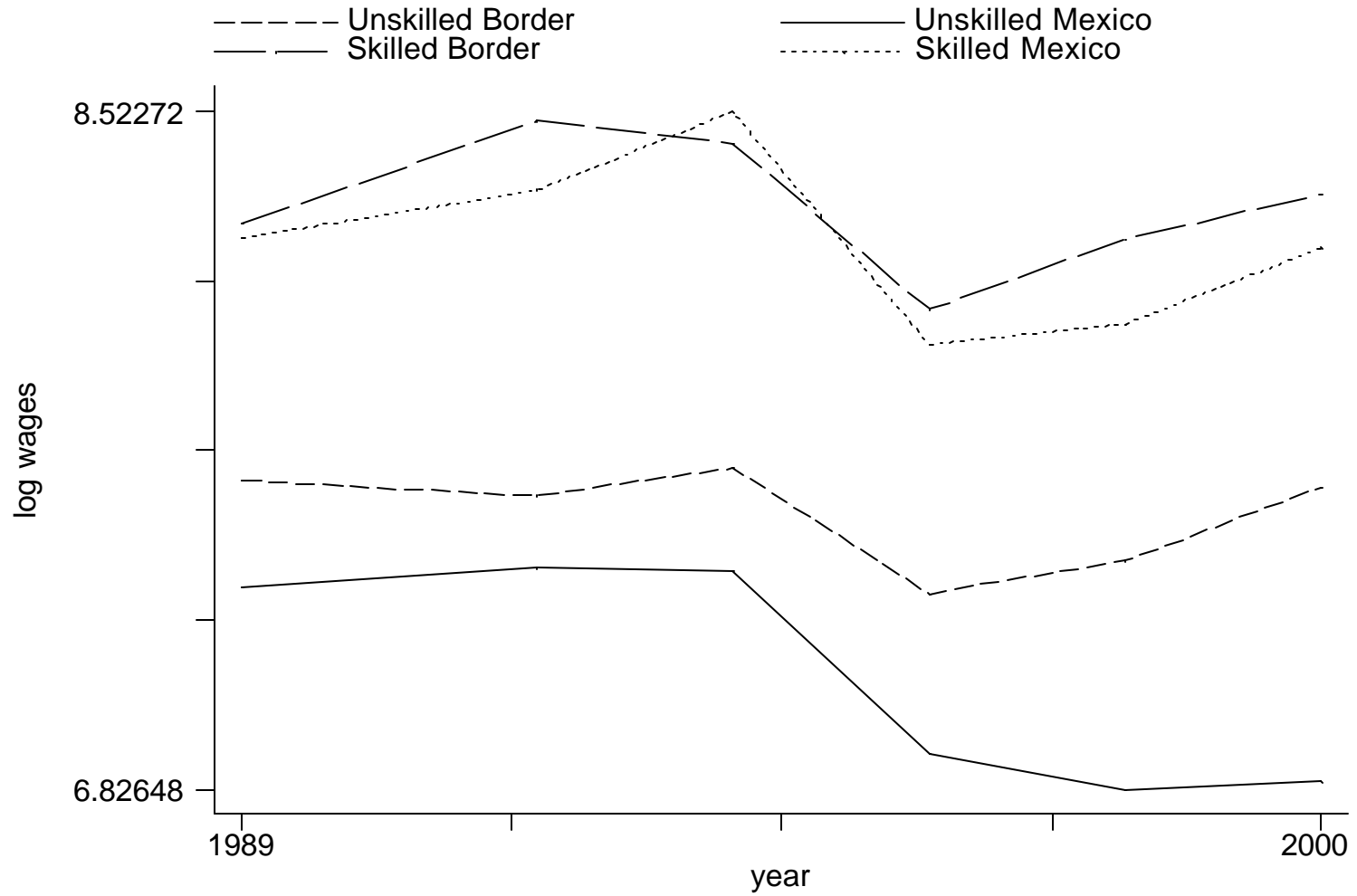
	Cereals	Dairy	Fruit	Pulses	Meat	Oils and Fats	Sugar	Vegetables
1989	9.22	10.9	19.9	10.0	10.0	11.4	12.8	7.2
1992	8.39	10.3	19.9	10.0	10.0	12.0	15.0	9.7
1994	8.31	11.1	12.9	0.1	10.0	10.4	13.1	1.7
1996	7.25	11.2	8.2	0.1	10.0	7.9	8.5	0.7
1998	5.45	10.7	4.4	0.1	9.5	5.5	7.1	0.4
2000	3.71	11.5	3.4	0.1	8.7	3.4	4.6	0.3

Manufacturing

Year	Food Products	Household Equipment	Other Manufact.	Textiles and Apparel
1989	1.00	1.00	1.00	1.00
1992	0.91	0.80	0.85	0.93
1994	0.96	0.96	0.91	1.01
1996	0.71	0.69	0.70	0.70
1998	0.69	0.65	0.69	0.71
2000	0.61	0.62	0.75	0.74

Agriculture

Year	Cereals	Dairy	Fruit	Pulses	Meat	Oils and Fats	Sugar	Vegetables
1989	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1992	0.89	0.64	0.83	1.08	0.83	0.83	1.21	1.20
1994	0.83	0.64	0.84	1.00	0.78	0.80	1.30	1.06
1996	0.95	0.59	0.67	1.17	0.63	0.94	1.26	0.76
1998	0.91	0.55	0.72	1.06	0.59	0.75	1.15	0.82
2000	0.93	0.55	0.69	0.76	0.55	0.63	1.01	0.76



Step 1 – HH Welfare

Farm household model (Singh, Squire and Strauss, 1986)

$$u_h = V_h[y_h, P] = V_h[m_h + \mathbf{p}_h, P]$$

Differentiating following Taylor Series Expansion and applying Roy's identity:

$$du_h = dy_h - \sum_g c_g - \sum_g \left(\frac{\partial u_h}{\partial y_h} c_g \right) - \frac{1}{2} \left(\sum_g \frac{\partial c_g}{\partial p_g} + \sum_g \sum_k 2 \frac{\partial c_g}{\partial p_g \partial p_{k \neq g}} dp_g dp_{k \neq g} \right)$$

Step 1 - Income

Income: $y_h = \underbrace{w l_h}_{\text{labor income}} + \sum_g \underbrace{p_{hg}}_{\text{profits}}$

HH optimally chose labor and production:

$$dy_h = dw l_h + \sum_g x_{hg} dp_g$$

where:

$$d\mathbf{p}_h / dp_g = x_{hg}$$

Three Steps

Links Domestic Prices to World Prices

Links Wages to Prices

Map changes into Households welfare

Step 2 – World Prices to Dom. Prices

Pass-through (Goldberg and Knetter, 1997)

$$P_{gtr} = e_t PX_{gt}^* (1+t) TC_{gtr} = e_t (f_{gtr} CP_{gt}^*) (1+t_{gt}) TC_{gtr}$$

Expanding the Markup:

$$P_{gtr} = \left(\frac{PD_{gtr}}{CP_{gt} (1+t_{gt}) TC_{gtr}} \right)^a CP_{gt} (1+t_{gt}) TC_{gtr}$$

Taking Logs:

$$\ln P_{gtr} = a \ln PD_{gtr} + (1-a) \ln CP_{gt} + (1-a) \ln(1+t_{gt}) + (1-a) \ln TC_{gtr}$$

Control Variables		Price - Wage Elasticities						
		Region	Skill	Agricultural Products	Food Products	Households Appliances	Other Manufact.	Textiles and Apparel
Regional CPI	0.327***	Border Region	Skilled	-0.215	-0.481**	-0.286*	0.348**	0.409**
	(0.070)			(0.176)	(0.196)	(0.251)	(0.193)	(0.175)
Agricultural Worker	-0.542***	Border Region	Unskilled	-0.276	-0.629**	-0.016	0.463**	0.534**
	(0.023)			(0.256)	(0.204)	(0.291)	(0.235)	(0.228)
Permanent employment	0.290***	Northern Region	Skilled	-0.377*	0.205	-0.577***	0.198	0.343
	(0.016)			(0.271)	(0.166)	(0.238)	(0.145)	(0.149)
Household Head	0.425***	Northern Region	Unskilled	0.713***	-0.551*	-0.216	-0.265	0.174
	(0.014)			(0.269)	(0.173)	(0.284)	(0.313)	(0.299)
Age	0.009***	Central Region	Skilled	-0.301*	-0.262	-0.335**	0.362	0.317
	(0.001)			(0.255)	(0.188)	(0.244)	(0.285)	(0.244)
Education Premium	0.186***	Central Region	Unskilled	0.082	-0.062	-0.591**	-0.412	0.729**
	(0.005)			(0.298)	(0.225)	(0.314)	(0.271)	(0.191)
Local Endowment	0.001***	Mexico City	Skilled	0.157	0.316	-0.920***	-0.065	0.532**
	(0.000)			(0.344)	(0.251)	(0.426)	(0.311)	(0.283)
Gender	0.110***	Mexico City	Unskilled	0.223	-0.192	-0.431	-0.716	0.791**
	(0.013)			(0.967)	(0.210)	(0.340)	(0.223)	(0.239)
Dummy year 1989	0.203***	Southern Region	Skilled	0.032	-0.147	-0.440*	0.144	0.292
	(0.066)			(0.436)	(0.221)	(0.474)	(0.460)	(0.416)
Dummy year 1992	0.362***	Southern Region	Unskilled	1.180***	0.474	-1.552*	0.531	-0.192
	(0.056)			(0.384)	(0.249)	(0.365)	(0.451)	(0.366)
Dummy year 1994	5.383***							
	(0.731)							
Dummy year 1996	0.390***							
	(0.039)	# of Observations		44160				
Dummy year 1998	-0.178***	R-Squared		0.458				
	(0.028)							
Dummy year 2000	-0.136***							
	(0.042)							

Results: Pass-Through - Manufacturing

<i>Manufacturing Products</i>					
Variable		Food Products	Household Appliances	Other Manufact.	Textiles and Apparel
Constant		2.103*	-1.772	-4.296***	-4.451***
		(1.203)	(1.081)	(0.848)	(0.583)
Distance		0.035**	0.021	-0.004	0.026***
		(0.015)	(0.016)	(0.008)	(0.010)
International Price		-0.151	0.011	-0.015	0.020***
		(0.157)	(0.033)	(0.197)	(0.005)
Local supply		-0.007	-0.009	-0.022	-0.074***
		(0.013)	(0.008)	(0.016)	(0.013)
Regional Income		0.270	3.075***	3.577***	3.824***
		(0.487)	(0.494)	(0.247)	(0.267)
Tariff		1.019***	0.769***	0.671***	0.546***
		(0.104)	(0.133)	(0.065)	(0.058)
Tariff*Distance		-0.123***	-0.109**	-0.116***	-0.097***
		(0.030)	(0.044)	(0.020)	(0.014)
Observation		192	192	192	192
R squared		0.404	0.774	0.769	0.418

Results: Pass-Through - Agriculture

<i>Agricultural Products</i>								
Variable	Cereals	Dairy	Fruit	Pulses	Meat	Oils and Fats	Sugar	Vegetables
Constant	-4.761***	6.999***	-1.776*	22.709***	11.326***	5.565***	1.417***	-0.764
	(1.570)	(1.902)	(0.914)	(2.319)	(1.187)	(0.479)	(0.516)	(1.663)
Distance	-0.005	-0.046***	-0.027**	0.015	0.028***	-0.004	-0.021***	-0.012
	(0.017)	(0.017)	(0.012)	(0.010)	(0.009)	(0.006)	(0.008)	(0.012)
International Price	0.168***	2.123***	0.047	4.200***	1.733***	0.770***	-0.061*	0.026
	(0.059)	(0.346)	(0.131)	(0.461)	(0.103)	(0.052)	(0.036)	(0.257)
Local supply	0.010	-0.012	-0.013	-0.045***	-0.015	0.006	0.021***	0.042**
	(0.015)	(0.024)	(0.011)	(0.010)	(0.009)	(0.004)	(0.005)	(0.017)
Regional Income	3.695***	2.163***	1.919***	-0.084	1.039***	0.391**	0.150	1.737***
	(0.671)	(0.633)	(0.332)	(0.344)	(0.301)	(0.196)	(0.215)	(0.430)
Tariff	0.326*	0.317	0.227***	-0.979***	-3.175***	0.223***	0.266***	0.144***
	(0.179)	(1.020)	(0.074)	(0.142)	(0.580)	(0.056)	(0.064)	(0.046)
Tariff*Distance	-0.171***	0.161	0.035*	0.034	-0.027*	0.063***	0.001	0.137
	(0.045)	(0.132)	(0.019)	(0.033)	(0.016)	(0.015)	(0.016)	(0.134)
Observation	192	192	192	192	192	192	192	192
R squared	0.452	0.318	0.439	0.360	0.811	0.757	0.241	0.434

Results:

Decomposition by HH characteristics

Dependent Var: log of welfare change

age	0.0000 (0.0000)	AGUASCALIENTES	0.0113*** (0.0039)	GUANAJUATO	-0.0121*** (0.0033)	QUERETARO	-0.0117*** (0.0037)
educ	0.0016*** (0.0001)	BAJA CALIFORNIA	0.0042 (0.0034)	GUERRERO	-0.0166*** (0.0033)	QUINTANA ROO	-0.0495*** (0.0038)
gender	-0.0001 (0.0007)	BAJA CALIFORNIA SUR	0.0159*** (0.0046)	HIDALGO	-0.0116*** (0.0034)	SAN LUIS POTOSI	0.0173*** (0.0033)
hh_size	0.0005*** (0.0001)	CAMPECHE	-0.0412*** (0.0040)	JALISCO	-0.0077** (0.0032)	SINALOA	0.0153*** (0.0034)
logpcexp	0.0046*** (0.0004)	COAHUILA	-0.0075** (0.0034)	MEXICO	-0.0361*** (0.0031)	SONORA	-0.0040 (0.0034)
urban	0.0022*** (0.0006)	COLIMA	-0.0080* (0.0043)	MICHOACAN	-0.0112*** (0.0032)	TABASCO	-0.0456*** (0.0034)
		CHIAPAS	-0.0393*** (0.0031)	MORELOS	-0.0152*** (0.0035)	TAMAULIPAS	-0.0091*** (0.0033)
		CHIHUAHUA	-0.0072** (0.0033)	NAYARIT	0.0028 (0.0038)	TLAXCALA	-0.0101*** (0.0039)
Obs	8999	DISTRITO FEDERAL	-0.0133*** (0.0032)	NUEVO LEON	-0.0060* (0.0033)	VERACRUZ	-0.0127*** (0.0030)
R-Squared	0.798	DURANGO	0.0165*** (0.0036)	OAXACA	-0.0375*** (0.0031)	YUCATAN	-0.0432*** (0.0034)
				PUEBLA	-0.0115*** (0.0031)	ZACATECAS	0.0144*** (0.0037)