



Staple to Cash Crop Production in Mexico after NAFTA: Effect of PROCAMPO

***Joanne R. Henderson, Kathy Baylis
and Jason Barton***

**CATPRN Workshop
Toronto, May 15, 2010**

Have decoupled income payments, PROCAMPO facilitated the switch from staples to cash crop production?

- *Concern about staple producers and conversion costs*
- *Much work on affect of decoupled payments in US and EU.*
- *Little done in developing countries where credit constraints may matter.*



What we do

- Examine crop choice since NAFTA
 - Poverty: Cord and Wodon (2001); Sadoulet and de Janvry (2001); Yunez-Naude and Taylor (2006)
- County-level data
 - Greater number of observations (1,400 counties)
 - Can observe regional distribution
- More recent years (2001 and 2003)
 - Previous studies used data from 1997/98



Hypotheses

- NAFTA will lead producers to transition to cash crop production.
- The shift to decoupled income payments, PROCAMPO, allows producers to switch crops.
- Areas closest to the United States border will see a greater movement to cash crop production after NAFTA.



PROCAMPO

- Per hectare payment
 - Paid on nine staple crops planted during the 1993/1994 agricultural year
 - 950 pesos per hectare in 2003 (\$90USD)
- In 2003, 2.8 million farmers received 13 billion pesos for 13.7 million hectares of land
- “Anticipated” and “Capitalized” PROCAMPO
- Future of PROCAMPO



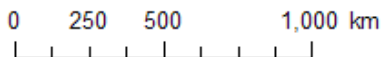
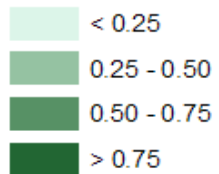
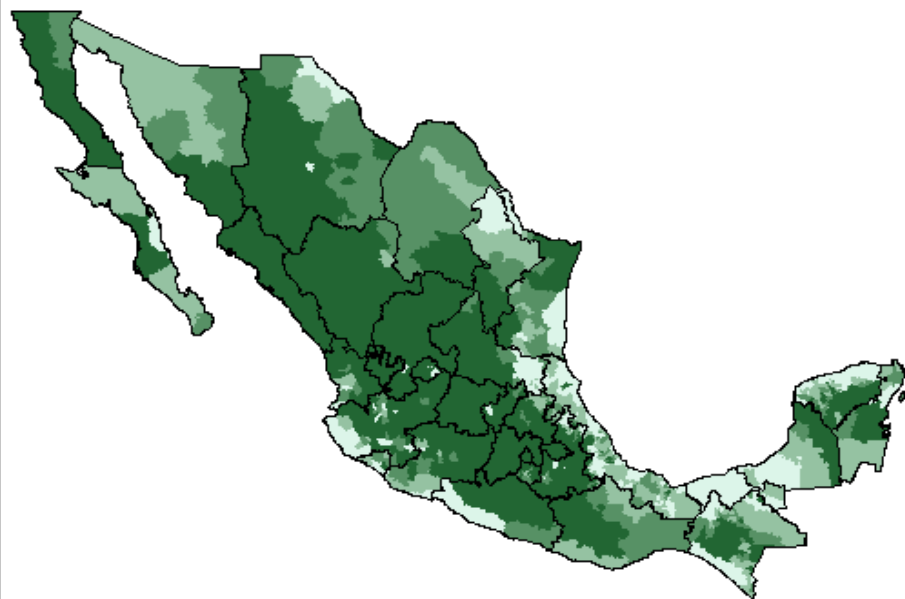
Data

National Institute of Statistics, Geography and Information (INGEGI)

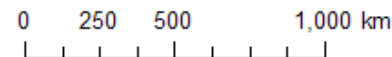
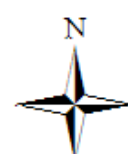
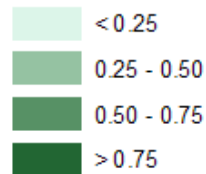
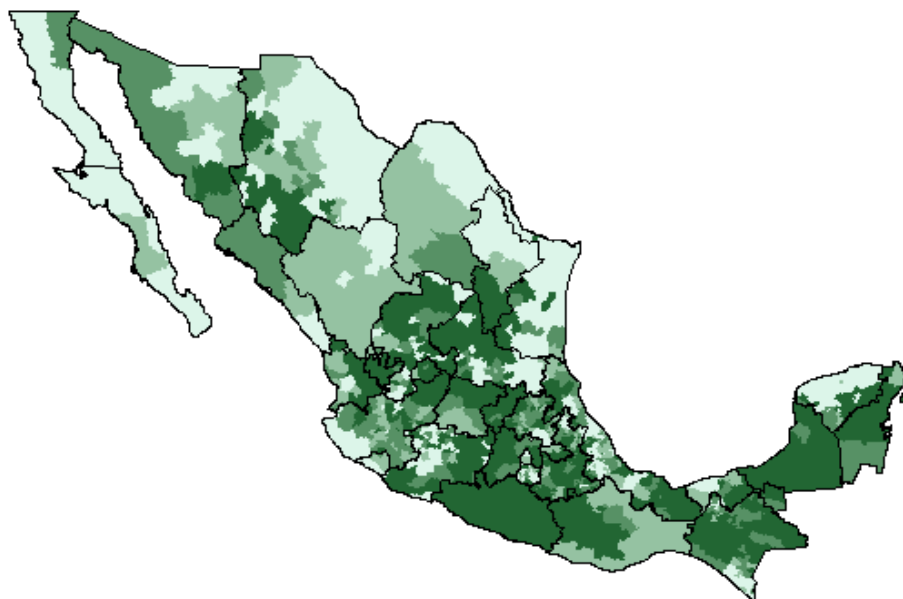
- Infrastructure and economic data
 - Economic censuses of 1989, 1999, and 2004
 - General population censuses of 1990, 2000, and 2005
- Agricultural data
 - 1991 agricultural census
 - Annual agricultural yearbooks 2000/2001 and 2002/2003
- Government payment data
 - PROCAMPO, other government payments, credit data, the annual agricultural yearbooks for 2000/2001 and 2002/2003
 - PROGRESA/ Oportunidades 2002 and 2003



**Percent of Crop Land Planted in Staples
1991**

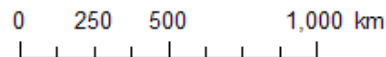
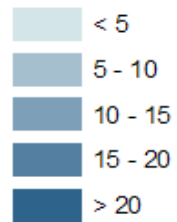
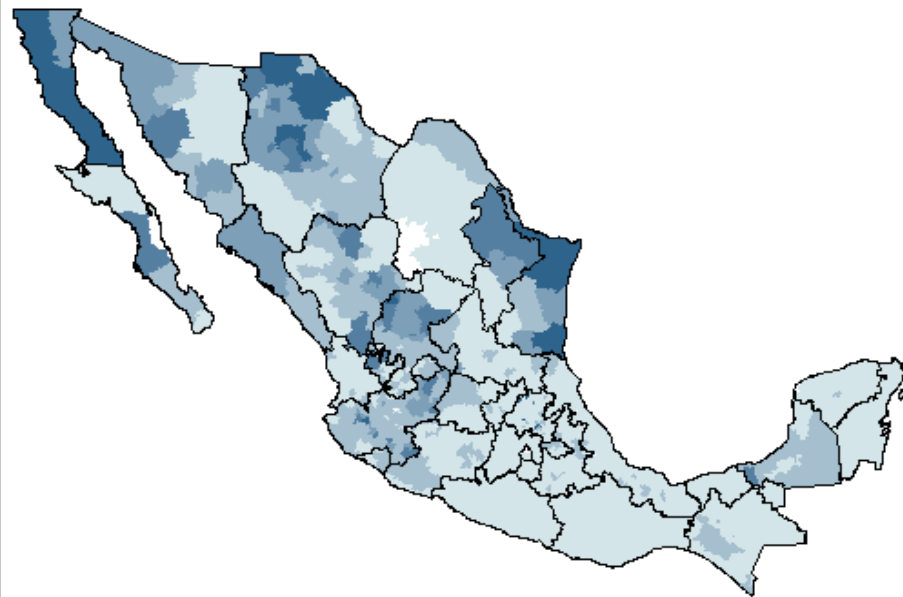


**Percent of Crop Land Planted in Staples
2003**

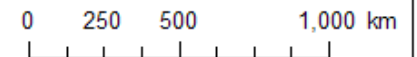
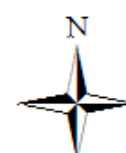
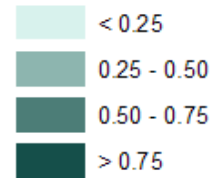
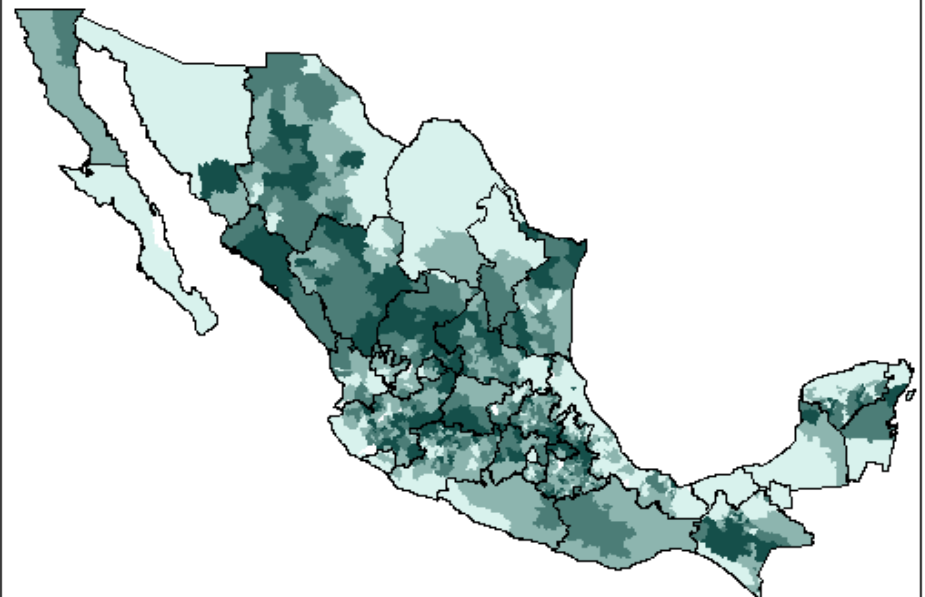


Staple Crops Include:
Barley, Beans, Corn, Cotton,
Rice, Sorghum, Soy,
Sunflower and Wheat

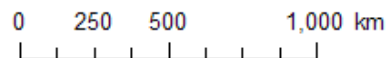
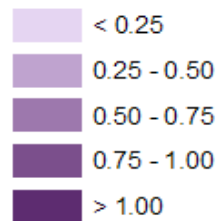
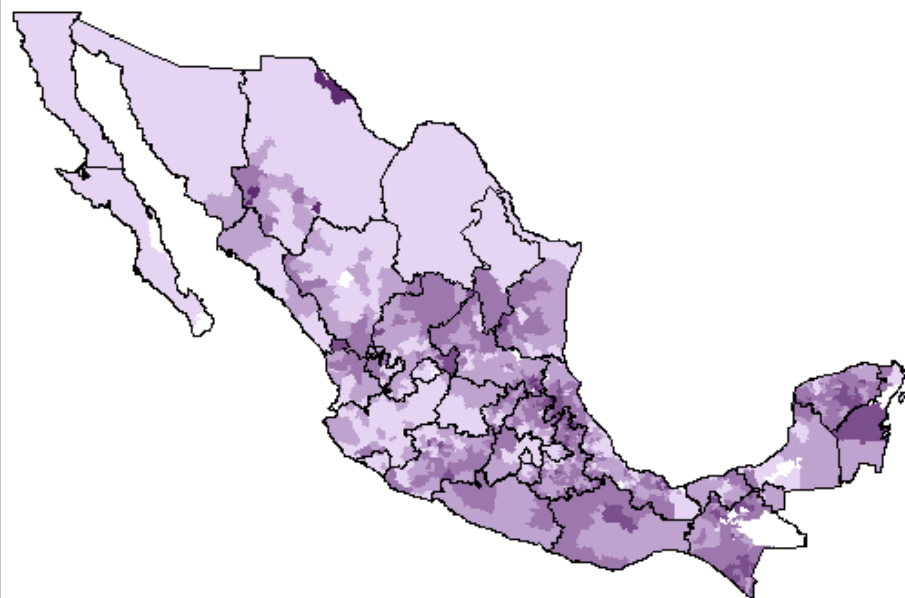
**PROCAMPO Payments per Producer
(thousands of pesos)
2003**



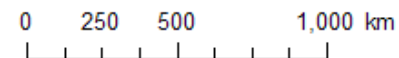
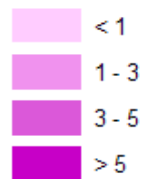
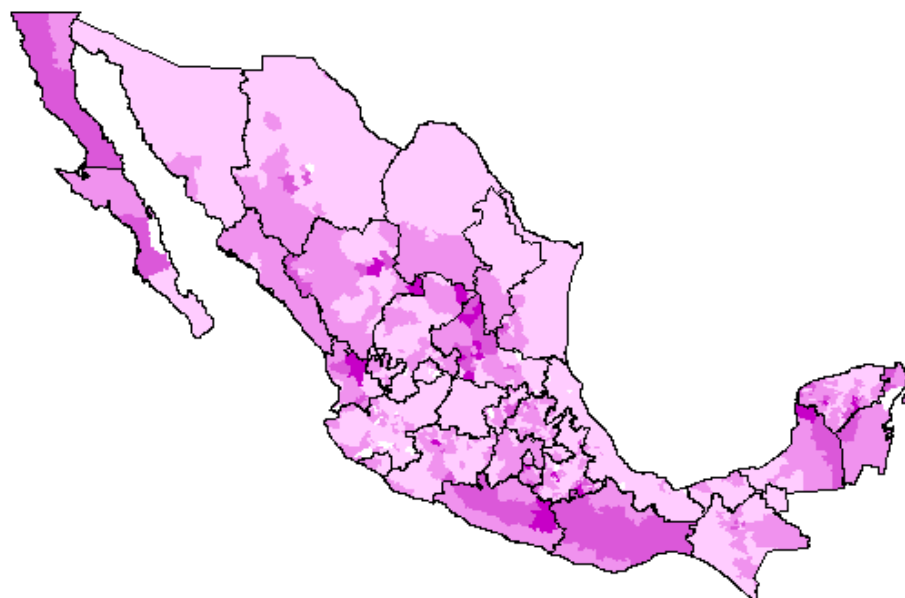
**PROCAMPO Area as a Percentage
of Total Agricultural Area
2003**



**PROGRESA Payments per Person
(thousands of pesos)
2003**



**Ejidal Land as a Percent
of Agricultural Land
1991**



County Homogeneity

- Data is at the county level
- Examine micro-level data from 1991 census
- Variation within counties and between counties

Counties with Agricultural Land Owners		
	Avg. St. Dev	Std. Dev. Of Avg.
Wage	1,095,499	2,124,893
Education	0.6909	0.7444

- Similar physical constraints
 - elevation, temperature, precipitation



Econometric Model

$$l_s / l = f(p_s, p_c, r_c, k_c, g)$$

l_s / l = change in land planted in staples

p_s, p_c = local market demand → local population, local wages

r_c = transportation cost → distance to the US border

k_c = transition cost → education, infrastructure index

g = policies → PROCAMPO, PROGRESA, other government payment

(Weighted by the total agricultural land in each county)



Percent of land in staples

	Model 1	Model 2
	Weighted Fixed Effects	Weighted Random Effects
ln(PROCAMPO payment per producer)	-0.087 (0.030)	0.017 (0.0001)
ln(other government payments per farm)	0.037 (0.011)	0.036 (0.00004)

Government Policies



Percent of land in staples

	Before NAFTA	After NAFTA
$\ln(\text{population in thousands})$	0.265 (0.131)	0.272 (0.122)
$\ln(\text{wages per worker})$	-0.03 (0.024)	0.004 (0.030)
$\ln(\text{distance to the US border 1000km})$	0.016 (0.0003)	0.086 (0.020)

Local Market Demand
Transportation Costs



Percent of land in staples

	Coef
% of population with a high school education	-2.049 (0.318)
infrastructure index (drainage and sanitation)	-0.047 (0.031)

Transition Costs

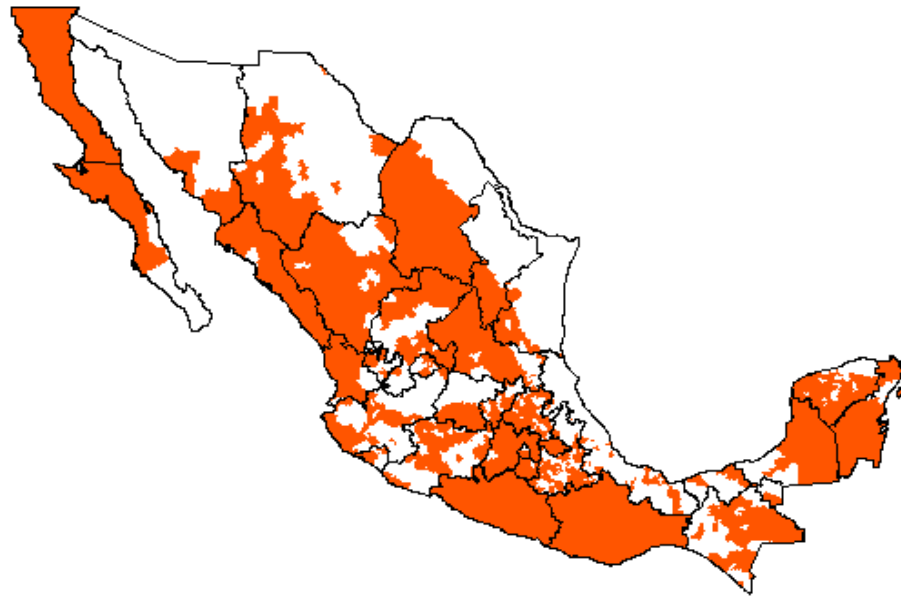


Robustness Tests

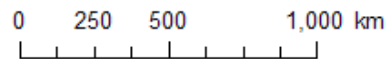
- Revenue per hectare
- Other variables
 - Literacy
 - Cities with a population over 100,000
- Homogeneity test
- Tobit regression
- *Ejidal* lands and PROGRESA areas



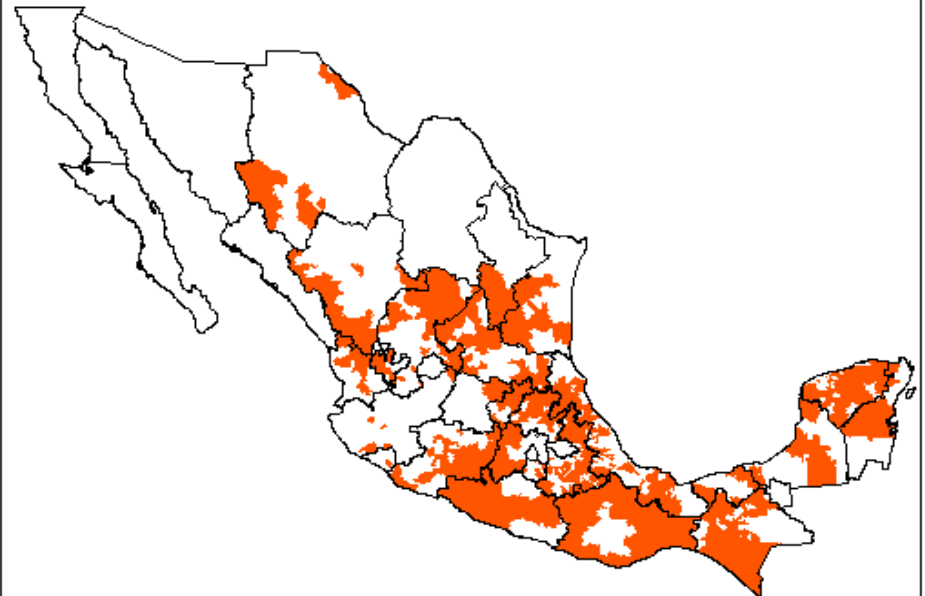
**Counties with the Highest Percentage
of Ejidal Lands**



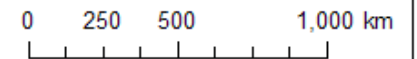
[702 Counties]



**Counties with the Highest PROGRESA
Payments per Person**



[692 Counties]



Percent of land in staples

	Ejido	Progressa	All
ln(PROCAMPO payment per producer)	-0.100 (0.033)	-0.0003 (0.055)	-0.087 (0.030)
ln(other government payments per farm)	0.057 (0.185)	0.009 (0.014)	0.037 (0.011)

Government Policies



Credit Model

$\text{credit} = f(\text{government payments, county characteristics})$

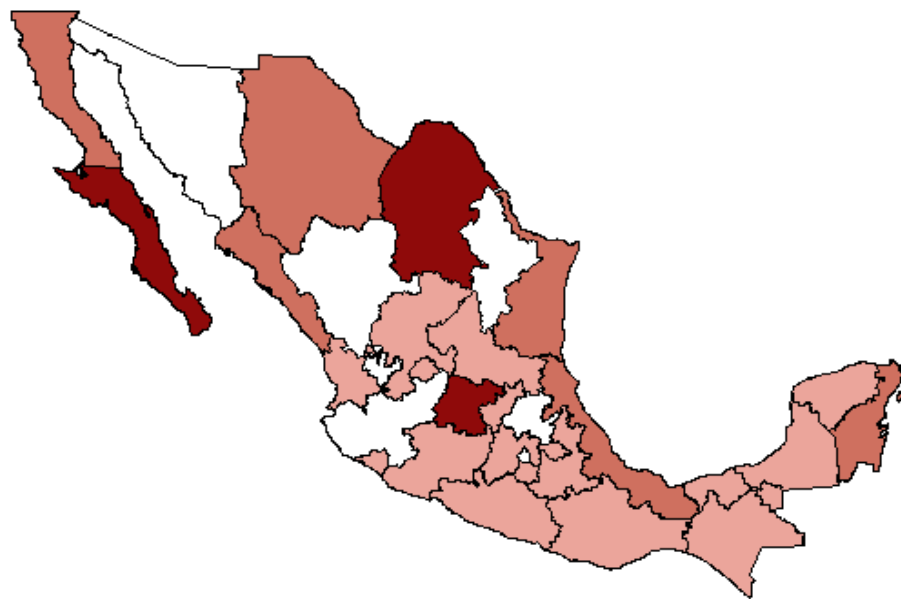
where:

government payments = PROCAMPO, PROGRESA, and other government payments

county characteristics = wages per worker, high school education, and infrastructure index



**Total Credit
(billions of pesos)
2001**



**Total Credit
(billions of pesos)
2003**



Credit Model

log(Credit Payment Total)		
	Fixed Effects	Random Effects
log(PROCAMPO payment total)	23.61**	0.531***
log(PROGRESA payment total)	-2.959	-0.883***
log(other government payments total)	-0.265	-0.163***
log(wages per worker)	-0.0246	0.607***
% of pop. with a high school education	-106.9	11.02***
infrastructure index (drainage & sanitation)	-16.63**	-3.966***

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$



Conclusions

- Some evidence that PROCAMPO has assisted producers in switching to cash crop production
- The existence of other government payments to agriculture may have slowed conversion
- Effect of PROCAMPO is larger for *ejido* producers, benefits are not constrained to larger producers
- After NAFTA, areas closer to the border have seen a greater movement to cash crop production



Implications for Canada

- Future trade agreements with developing countries can be facilitated by transition payments
- Provide payment prior to planting
- Focus on infrastructure development
- Invest in human capital

