

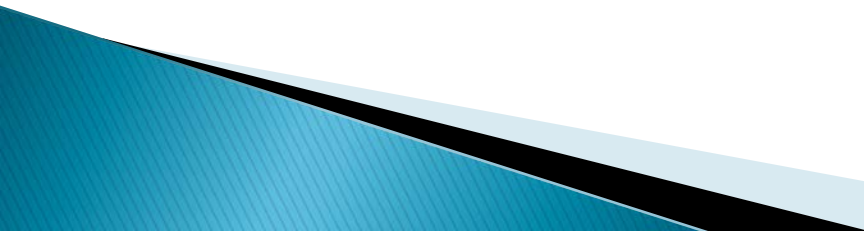
Wage Convergence in Mexico

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Introduction: Motivation

- ▶ This paper examines the dynamics of wages in post-NAFTA Mexico.
 - ▶ NAFTA brought not only an increase in trade, but also on capital and labor mobility.
 - ▶ **What are the effects of K and L mobility on real wages?**
 - ▶ Does increasing economic integration between Mexico and the U.S. implies faster convergence at the regional level?
 - ▶ Mexico's integration with the U.S. economy through capital flows (FDI and portfolio) and labor (legal and illegal migration) makes it a very interesting case study.
 - ▶ Greater integration with the U.S. has affected not just output growth but also the supply of labor across regions, changing the regional distribution of Mexican wages.
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Introduction: Previous Major Work

- ▶ Using data from 1987 to 1997, Robertson (AER, 2000) finds support for U.S. wage shocks having stronger effects on the border than on Mexico's interior:
 - Following a wage shock, wages in Mexican border cities converge to U.S. wages more quickly than wages in the interior of Mexico.
 - Within the Mexican border region, cities with more foreign capital and migration flows experience larger wage shocks and more rapid wage convergence to U.S. wages than other Mexican border cities do.
- ▶ He leaves the following conjecture:
- ▶ “Of forces that could integrate labor markets – goods flows, capital movements, and migration – migration may be the dominant mechanism.” Robertson (AER, 2000, p. 743).

Introduction: Other Works

- ▶ Empirical work on Mexico's regional income has found mixed results:
 - Chiquiar (JDE, 2005) finds that the divergent pattern started in the mid-1980s did not reverse with NAFTA, while Rodriguez-Oreggia (ARS, 2005) finds evidence in favor of absolute β -convergence for the period 1985–2000.
- ▶ On wages in Mexico:
 - between 1990 and 2000, Chiquiar (JIE, 2008) reports that regions more exposed to globalization appear to have exhibited wage increases.
 - Cabral et al. (JDS, 2010) found positive FDI effects on wages.
- ▶ Greater economic integration should in theory help reduce the income gap: Milanovic (REStat, 2006) for the interwar period (1920–1938).
- ▶ DiCecio and Gascon (ARS, 2010) combines income convergence with U.S. state migration.
- ▶ Barro et al. (AER, 1995) consider types of capital (such as human capital) that cannot be financed by borrowing on world markets, which makes open economies converge only slightly faster than closed economies.
- ▶ In the small open economy with capital intensity below the steady-state in Rappaport (JEDC, 2005), outmigration directly contributes to faster income convergence but also creates a disincentive for gross capital investment. For low income levels, the latter effect dominates and labor mobility actually slows down the speed of income convergence.

Introduction: Our past work

- ▶ On real wages for north/south regions:
 - Mollick, André V., and Cabral, René, Assessing Returns to Education and Labor Shocks in Mexican Regions after NAFTA, *Contemporary Economic Policy*, 2014, forthcoming.
- ▶ On real output:
 - Cabral, René, and Mollick, André V., Mexico's Regional Output Convergence after NAFTA: A Dynamic Panel Data Analysis, *Annals of Regional Science*, 2012, 48 (3): 877–895.
- ▶ On real wages (without years of education):
 - Cabral, René, Mollick, André V., and Faria, João R., Capital and Labor Mobility and their Impacts on Mexico's Regional Labor Markets, *Journal of Development Studies*, 2010, 46 (9): 1523–1542.

Introduction: Our Approach

- ▶ We revisit wages across states along several dimensions.
- ▶ First, the post-NAFTA period is interesting:
 - after 1995, no negative shocks occurred in Mexico as in 1982, 1987, and 1994.
- ▶ Second, we compare the economic importance of flows of people and capital.
- ▶ Third, we employ dynamic panels to estimate wage equations:
 - Reverse causality from wages to fundamentals and shocks.

I. The Data

- ▶ Our dataset expands from 1996 to 2006 (output) and from 1997 to 2006 (wages) across all Mexico's 32 states.
- ▶ The data are compiled from various Mexican government agencies:
- ▶ real GDP per capita (1993 Mexican pesos) is from **INEGI**;
- ▶ GDP per capita is a measure of labor productivity: Y/L ;
- ▶ state population figures, international migration rates and domestic migration rates are all from **CONAPO**;
- ▶ FDI data are from the **Ministry of Economy**;
- ▶ real exchange rate is from Mexican Central Bank (**Banxico**):
 - the competitiveness of the Mexican peso against a broad basket of currencies
 - an increase means a real depreciation of the peso
- ▶ real wages are for employees enrolled in Mexico's social security system (**IMSS**); and
- ▶ average years of schooling are obtained from the **Ministry of Education**.

I. The Data

- ▶ Output per capita is the largest in Distrito Federal (DF).
- ▶ Real wages are also the highest for DF. Some border states (Nuevo León and Baja California) have real wages higher than the national average.
- ▶ The (domestic or international) migration rates are calculated as the difference between outflows and inflows of people over total population: **a positive number means a net outflow of people from the state.**
- ▶ The ratio of FDI stock to GDP is the highest in DF (9%), followed by Baja California and Nuevo Leon (5%), two Northern states.
 - Oaxaca and Chiapas display the lowest FDI/GDP ratios.
- ▶ In Mollick and Cabral (*CEP*, 2014), we follow Chiquiar (JIE, 2008) and merge border states with other Northern states.
 - 13 states in the Border–North panel (6 in the Border and 7 in the North)
 - 19 states in the South–Center panel.
- ▶ Border panel has too few observations with 6 border states:
 - Indirectly, we can see the impact of border states looking at the panel of 26 non–border states; or
 - use of dummy variable.



Descriptive Statistics

Table 1. Descriptive Statistics: Annual Data, 1997-2006.

State	IMSS Wage	Years of Schooling	GDP per capita	FDI to GDP Ratio	Population Growth Rate	International Migration Rate	Domestic Migration Rate
Average	33.93	7.63	14,382	0.02	1.34	0.59	-0.18
Border	36.532	8.47	20,129	0.03	1.79	0.36	-0.37
Non-Border	33.327	7.43	13,056	0.01	1.24	0.65	-0.13
Border-North	33.166	8.03	16,185	0.02	1.43	0.66	-0.30
South-Center	34.449	7.35	13,148	0.01	1.28	0.55	-0.10

Table 2. Correlograms

	IMSS Wage	Years of Schooling	GDP per capita	FDI to GDP Ratio	Population Growth Rate	International Migration Rate	Domestic Migration Rate
26 Non-Border States							
IMSS Wage	1						
Years of Schooling	0.734	1					
GDP per capita	0.716	0.789	1				
FDI to GDP Ratio	0.606	0.605	0.667	1			
Population Growth Rate	0.081	0.269	0.329	0.200	1		
International Migration Rate	-0.382	-0.447	-0.525	-0.350	-0.835	1	
Domestic Migration Rate	-0.057	-0.267	-0.199	-0.117	-0.734	0.343	1
6 Border States							
IMSS Wage	1						
Years of Schooling	0.765	1					
GDP per capita	0.662	0.665	1				
FDI to GDP Ratio	0.382	0.047	0.367	1			
Population Growth Rate	0.152	-0.159	-0.140	0.529	1		
International Migration Rate	-0.620	-0.520	-0.226	-0.267	-0.566	1	
Domestic Migration Rate	-0.032	0.343	0.273	-0.522	-0.882	0.203	1

II. The Empirical Models

- ▶ We test initially for **absolute convergence**: wages as a function of state specific effects and lagged wages:

- ▶
$$W_{it} = \mu_i + \gamma W_{it-1} + v_{it} \quad (1),$$

- ▶ where: μ_i are state fixed effects and v_{it} is an idiosyncratic error term. Following Islam (1995) the implied rate of convergence, λ , is calculated as the negative of the log for the lagged wages coefficient, γ .
- ▶ Absolute convergence exists if $0 < \lambda < 1$; $\lambda > 1$ would suggest divergence.
- ▶ Limitations of (1):
- ▶ Other variables should be examined.
- ▶ We employ two basic models for wages:
 - **Years of education**
 - **Real output per capita (labor productivity)**
- ▶ As shift factors we have:
 - **FDI to capture foreign capital inflows**, shocks to labor demand, and
 - **state migration flows OR population growth**, shocks to labor supply.
- ▶ We control for the competitiveness of the Mexican peso (the **real exchange rate**).
 - Large currency fluctuations may have exposed Mexico to international markets more than trade reforms: Verhoogen (QJE, 2008)
 - Robertson (NAJEF, 2003) finds that real exchange rates correlate with real wages in Mexico.

II. The Empirical Models

- ▶ The models employed to test conditional convergence are:

- ▶
$$\mathbf{w}_{it} = \mu_i + \gamma_1 \mathbf{w}_{it-1} + \gamma_2 \text{EDU}_{it} + \sum \beta_j \mathbf{x}_{it}^j + \mathbf{v}_{it} \quad (2a),$$

- ▶
$$\mathbf{w}_{it} = \mu_i + \gamma_1 \mathbf{w}_{it-1} + \gamma_2 (\mathbf{Y}/\mathbf{L})_{it} + \sum \beta_j \mathbf{x}_{it}^j + \mathbf{v}_{it} \quad (2b),$$

- ▶ where: j goes from 1 to k ; \mathbf{x}_{it} is the group of k shift or control variables;
- ▶ endogenous explanatory variables are instrumented with suitable lags of their own: we use 2 and 3 lags;
- ▶ Blundell and Bond (1998) propose a model in which lagged differences are employed in addition to the lags of the endogenous variables, producing more robust estimations when the autoregressive processes becomes persistent.
- ▶ SGMM estimators are said to be consistent if there is no second order autocorrelation in the residuals by the AB (2) test and if the instruments employed are valid by Hansen's J-test.
- ▶ For 32 states and 10 years of data, we have 320 total observations
 - 26 states form a panel of non-border states: 260 total observations;
 - and 6 states form a panel of border states: only 60 total observations

Table 3. Dynamic Panel Data Models (SGMM) for IMSS wages**Panel A. With education and FDI/migration rates**

Variables	2 lags	3 lags	2 lags	3 lags	
	All states	All states	No border states	No border states	
	(1)	(2)	(3)	(4)	
Lagged real wages	0.771*** (0.052)	0.739*** (0.065)	0.840*** (0.054)	0.834*** (0.059)	
Log of years of schooling	0.330*** (0.104)	0.403*** (0.140)	0.194* (0.103)	0.211* (0.117)	lower
FDI to GDP ratio	-0.335 (0.429)	-0.639 (0.541)	0.095 (0.244)	-0.121 (0.273)	
International migration rate	0.021* (0.012)	0.015 (0.017)	0.023** (0.011)	0.021 (0.017)	
Domestic migration rate	-0.006 (0.015)	0.012 (0.015)	-0.014 (0.018)	-0.007 (0.023)	
Real exchange rate	-0.003*** (0.0002)	-0.003*** (0.0002)	-0.003*** (0.0002)	-0.003*** (0.000)	
Implicit λ	0.260	0.302	0.174	0.182	lower
No. of observations/cross-section	288/32	288/32	234/26	234/26	
No. of instruments	33	29	33	29	
AB(2)	-0.41	-0.44	-1.19	-1.14	
p-value	[0.684]	[0.662]	[0.233]	[0.253]	
Hansen	31.86	31.44*	25.34	25.26	
p-value	[0.198]	[0.088]	[0.500]	[0.285]	

III. Results: Schooling

- ▶ Very significant education effects that are higher for all states (0.330 or 0.403):
 - It drops to 0.194 or 0.211 without border states.
- ▶ No effect of FDI on wages, contrary to Cabral et al. (JDS, 2010), in which FDI (a positive shock to labor demand) moves wages up.
- ▶ The migration coefficients are only statistically significant for international migration (0.021):
It moves up to 0.023 without border states.

Table 3. Dynamic Panel Data Models (SGMM) for IMSS wages**Panel B. With labor productivity and FDI/migration rates**

Variables	2 lags	3 lags	2 lags	3 lags	
	All states	All states	No border states	No border states	
	(1)	(2)	(3)	(4)	
Lagged real wages	0.911*** (0.016)	0.891*** (0.018)	0.920*** (0.016)	0.905*** (0.020)	
Log of labor productivity	0.038*** (0.014)	0.055*** (0.018)	0.025 (0.016)	0.044** (0.021)	lower
FDI to GDP ratio	0.147 (0.139)	-0.139 (0.198)	0.259 (0.161)	-0.133 (0.220)	
International migration rate	0.023*** (0.007)	0.022*** (0.007)	0.024*** (0.007)	0.022*** (0.007)	
Domestic migration rate	-0.009 (0.008)	-0.002 (0.013)	-0.019 (0.014)	-0.005 (0.017)	
Real exchange rate	-0.003*** (0.0001)	-0.003*** (0.0002)	-0.003*** (0.0002)	-0.003*** (0.0002)	
Implicit λ	0.093	0.115	0.083	0.100	lower
No. of observations/cross-section	288/32	288/32	234/26	234/26	
No. of instruments	33	29	33	29	
AB(2)	-0.51	-0.42	-1.31	-1.15	
p-value	[0.612]	[0.676]	[0.189]	[0.249]	
Hansen	31.75	31.48*	25.55	25.73	
p-value	[0.201]	[0.087]	[0.488]	[0.264]	

III. Results: Productivity

- ▶ Significant productivity effects that are higher for all states (0.038 or 0.055):
 - It drops to 0.025 or 0.044 without border states.
- ▶ No effect of FDI on wages as before.
- ▶ The migration coefficients are always statistically significant for international migration (0.023 or 0.022):
 - They become 0.024 or 0.022 without border states.

III. Empirical Results: Convergence

- ▶ For the education model, the implied λ 's (speed of adjustment to the steady-state) tend to be higher with all states:
 - Convergence drops when border states are excluded.
- ▶ For the labor productivity model, we have similar same results.
- ▶ For the education model, rate of wage convergence varies from 26% – 30%/year.
 - Drops to 17% or 18% excluding border states.
- ▶ For the labor productivity model, rate of wage convergence varies from 9% – 11%/year.
 - Drops to 8% or 10% excluding border states.

Table 4. Dynamic Panel Data Models (SGMM) for IMSS wages**Panel A. With education and FDI/population growth rates**

Variables	2 lags	3 lags	2 lags	3 lags	
	All states	All states	No border states	No border states	
	(1)	(2)	(3)	(4)	
Lagged real wages	0.644*** (0.111)	0.556*** (0.076)	0.678*** (0.137)	0.651*** (0.126)	
Log of years of schooling	0.485*** (0.185)	0.621*** (0.185)	0.494*** (0.230)	0.484* (0.270)	mixed
FDI to GDP ratio	-0.103 (0.337)	-0.349 (0.800)	-0.179 (0.319)	-0.341 (0.522)	
Population growth rate	-0.025 (0.018)	-0.039** (0.019)	-0.014 (0.018)	-0.029 (0.021)	
Real exchange rate	-0.003*** (0.0002)	-0.003*** (0.0005)	-0.003*** (0.0003)	-0.003*** (0.0004)	
Implicit λ	0.440	0.587	0.389	0.429	lower
No. of observations/cross-section	288/32	288/32	234/26	234/26	
No. of instruments	33	29	33	29	
AB(2)	0.18	0.46	-0.72	-0.45	
p-value	[0.854]	[0.642]	[0.469]	[0.651]	
Hansen	31.89	31.69	25.48	25.38	
p-value	[0.236]	[0.107]	[0.547]	[0.331]	

Table 4. Dynamic Panel Data Models (SGMM) for IMSS wages**Panel B. With labor productivity and FDI/population growth rates**

Variables	2 lags		3 lags		
	All states	All states	No border states	No border states	
	(1)	(2)	(3)	(4)	
Lagged real wages	0.873*** (0.020)	0.850*** (0.020)	0.897*** (0.021)	0.873*** (0.024)	
Log of labor productivity	0.042* (0.023)	0.059*** (0.017)	0.058** (0.025)	0.054** (0.027)	mixed
FDI to GDP ratio	0.245 (0.217)	-0.021 (0.196)	0.034 (0.185)	-0.222 (0.234)	
Population growth rate	-0.016*** (0.005)	-0.020*** (0.007)	-0.011* (0.006)	-0.018** (0.007)	
Real exchange rate	-0.003*** (0.0001)	-0.003*** (0.0002)	-0.003*** (0.0002)	-0.003*** (0.0002)	
Implicit λ	0.136	0.163	0.109	0.136	lower
No. of observations/cross-section	288/32	288/32	234/26	234/26	
No. of instruments	33	29	33	29	
AB(2)	-0.35	-0.13	-1.02	-0.93	
p-value	[0.727]	[0.897]	[0.310]	[0.351]	
Hansen	31.84	31.75	25.45	25.84	
p-value	[0.238]	[0.105]	[0.549]	[0.308]	

IV. Concluding Remarks

- ▶ Examining the Mexican post-NAFTA experience, the results herein suggest states closer to the U.S.–Mexican border converge more rapidly towards the steady state.
- ▶ FDI flows have no impact on regional wages.
- ▶ With respect to the conjecture in Robertson (*AER*, 2000), migration forces seem to be the main force behind the adjustment:
 - Although values are small, they have statistically significant effects.
- ▶ Extending the data in time?