Employment and Wage Responses to Trade Shocks: Evidence from Mexico during the 2008-09 U.S. Recession

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Motivation

- How do labor markets adjust in the short run when hit by sudden trade shock?
  - Employment versus wages and vertical integration
  - Import competition versus imported inputs
  - Diffusion of shock through the labor market
  - Skill upgrading of employed workforce
- Questions important for literature and policy
  - Literatures make claims about each of the above
  - Policy: unemployment insurance versus income support in social protection programs

A Natural Experiment

- "Great Trade Collapse" (Baldwin 2009), Mexico's trade with the U.S. fell 43% (real)
  - Eaton et al. (2009): ~ 70% of global decline in global trade/GDP due to fall in demand for manufactured goods
  - Shock unlikely to be due to Mexican industry trends (…)
- Shock for Mexico: a "natural experiment" to assess the effect of trade on labor markets in a developing economy characterized by "vertical integration"
  - Formal employment in trade-intensive northern states fell more than 9% between September 2008 & March 2009
  - Change in the log real wage of "stayers" between quarters was 0.030 and 0.018 in Q1 & Q2 2008 and -0.001 and -0.012 in Q3 & Q4

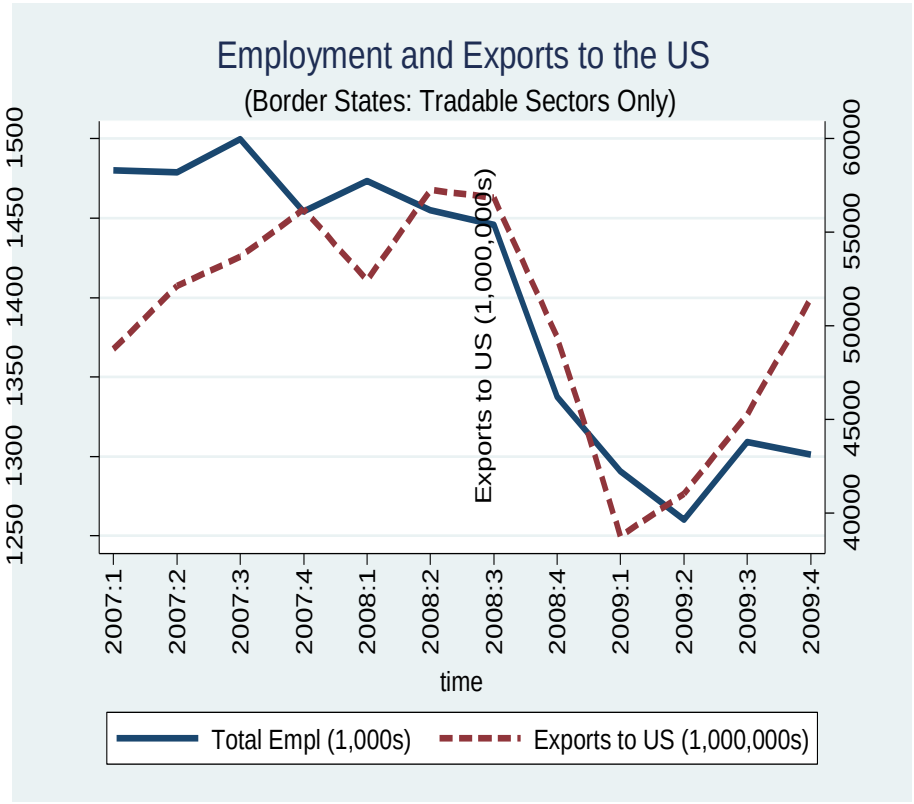
Outline

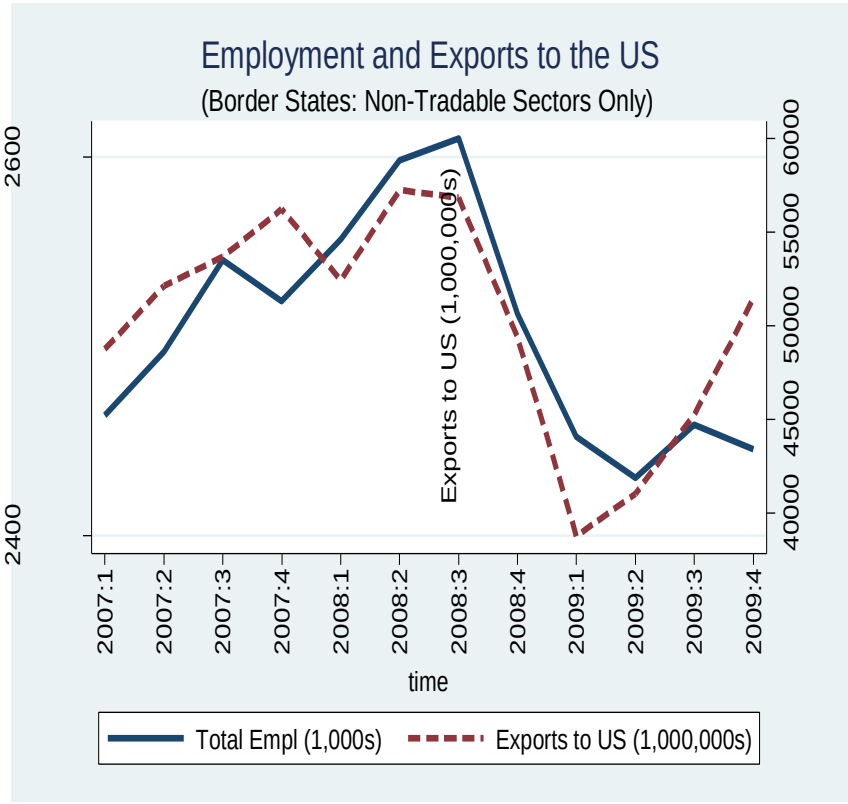
- Data
- Illustrative Figures
- Empirical models
  - Employment
  - Wages of stayers
  - Relative wages of stayers (composition of labor)
- Results
- Endogeneity of trade shock during crisis: treatment effects as deviations from industry trends
- Conclusions

Data

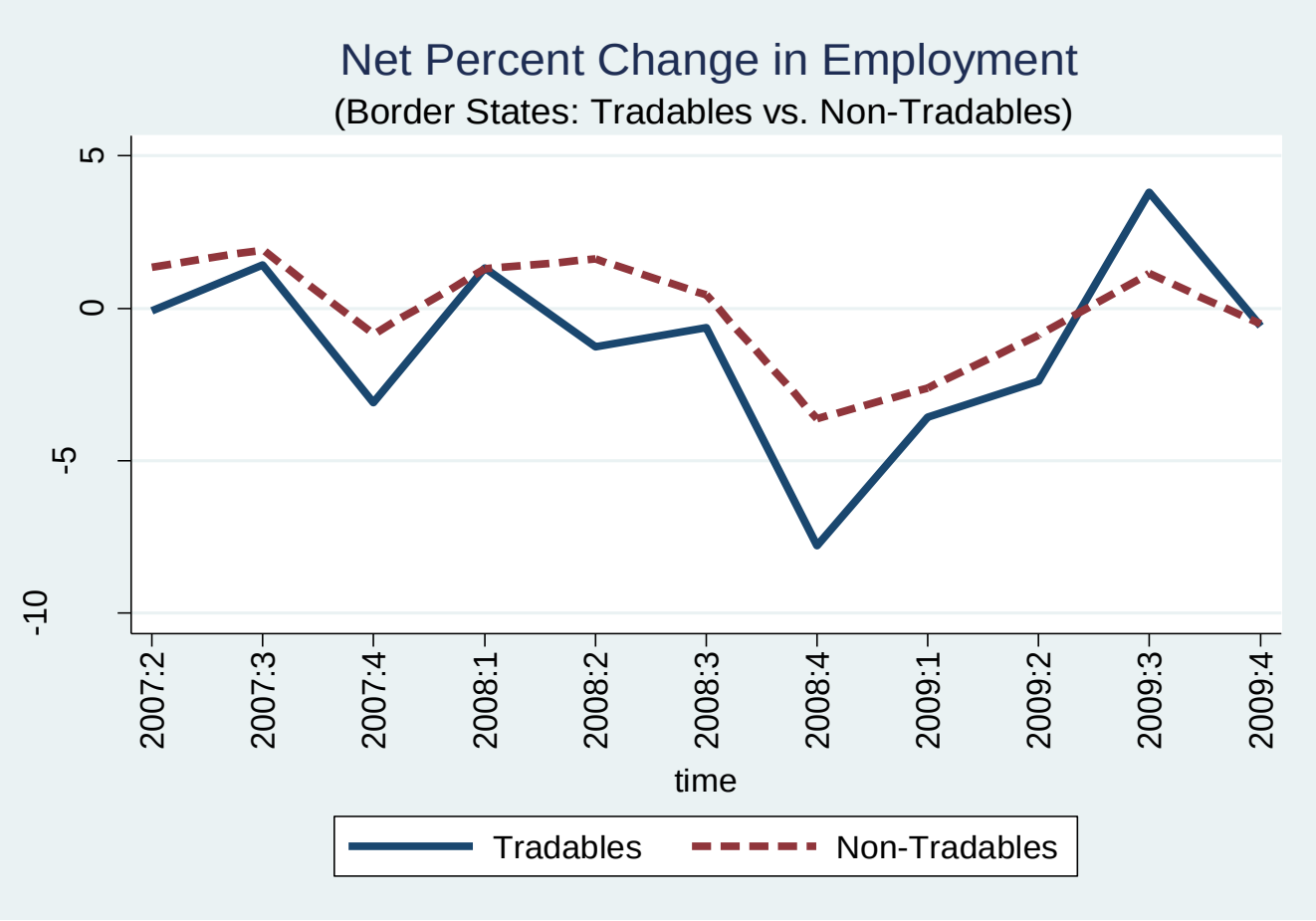
- Mexican social security records
  - Follow formal workers across firms & industries
  - Information on wages and industries
- Trade with U.S.
  - Customs transactions from U.S. ITC
- Quarterly data
  - Employment & wages at end of period
  - U.S.-Mexico bilateral trade averages within quarters
- Matched data covering 3.6-4.2 million workers in border states
  - Employment & trade classifications resulting in 105 tradable industries and 1 non-tradable

On the Diffusion of the Shock: Tighter Co-movement of Employment in NON-Tradables with Exports?

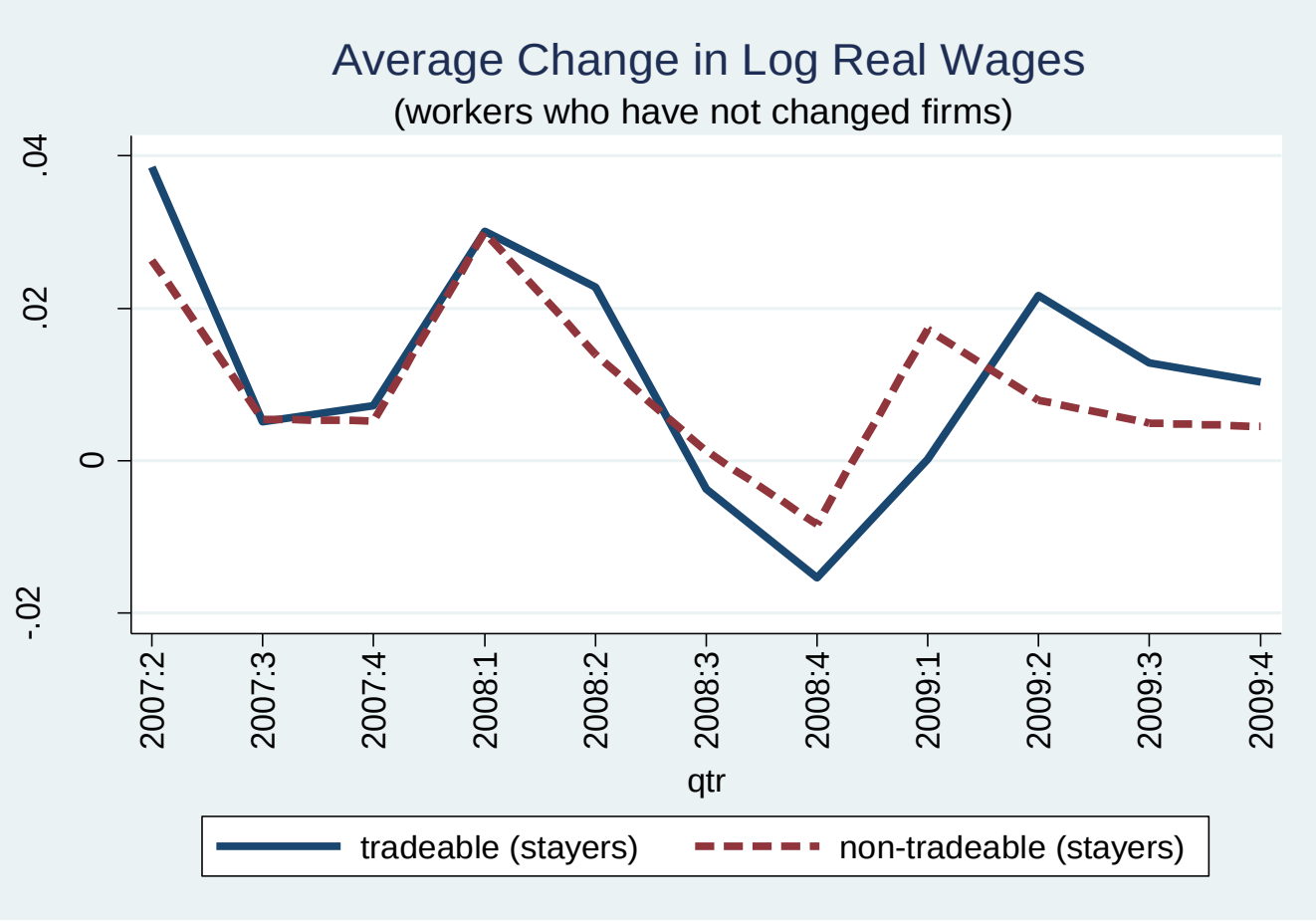




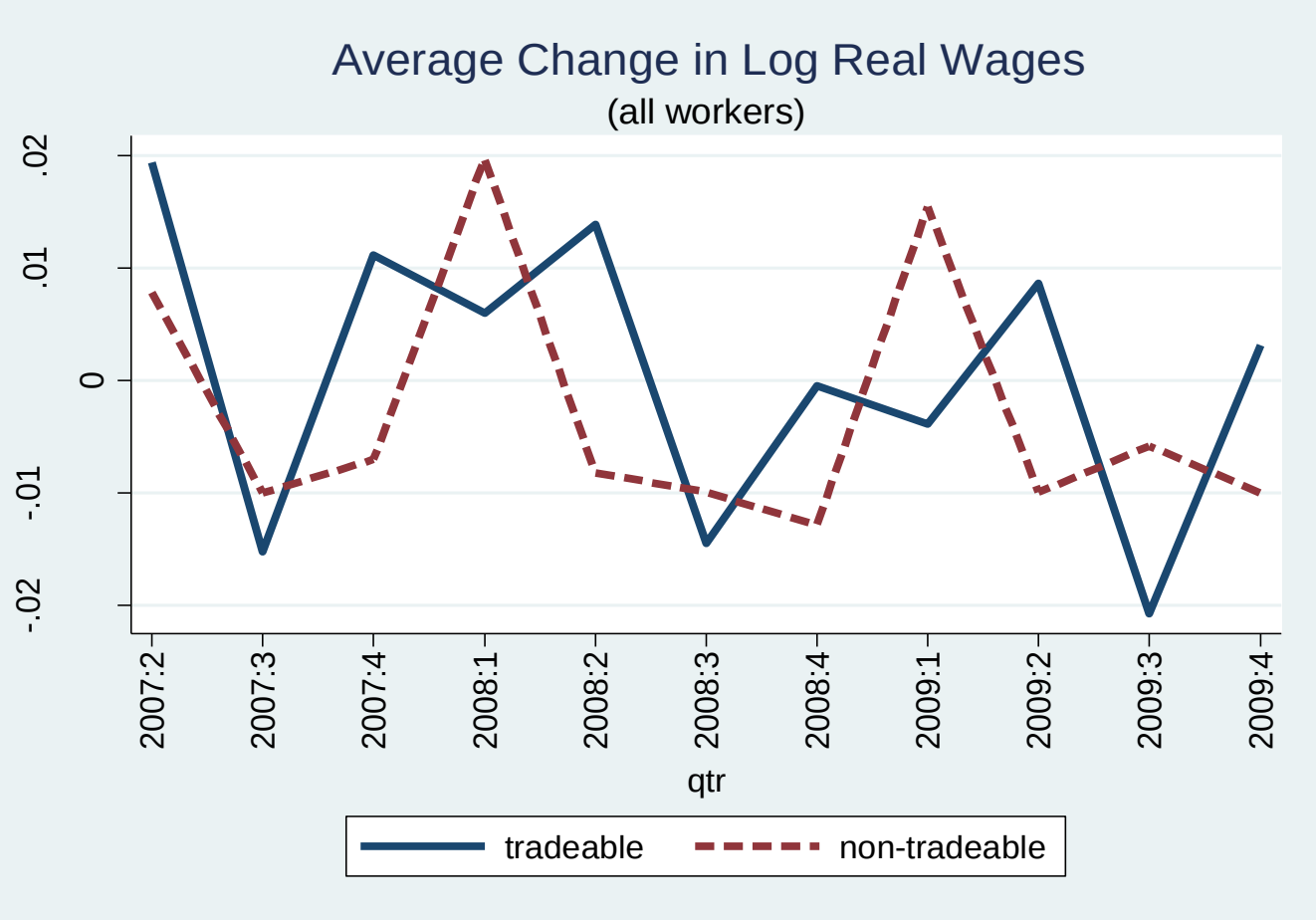
But Magnitude Much Larger in Tradables



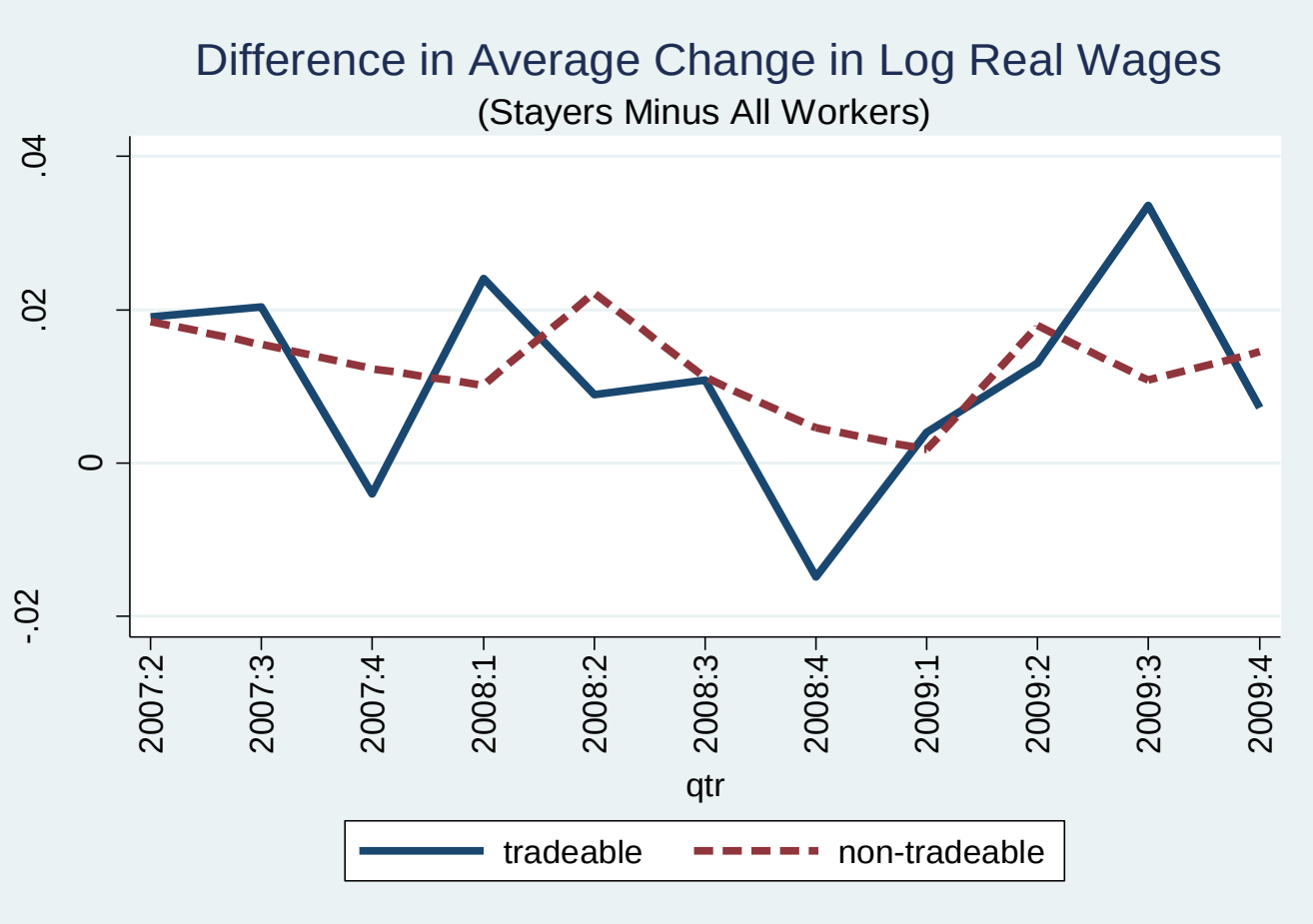
Real Wage Changes for Stayers (controls for worker-firm effects)



Change in Log Wages for Everyone (includes composition effects)



A Picture on Compositional Changes: Relative Wages of "Stayers" v. All



Within Industries Employment and Wages

- Approach: Exports and imports; time-to-build; related industries; crisis
- Time to build specification of employment model

$$\Delta E_{i,t} = \beta_m \cdot \Delta m_{i,t} + \beta_x \cdot \Delta x_{i,t} + \beta_{m2} \cdot \Delta m_{i,t+1} + \beta_{x2} \cdot \Delta x_{i,t+1} + \gamma_t + \Delta \varepsilon_{i,t}$$

- Average wage changes of stayers

$$\overline{\Delta W}_{i,t} = \beta_m \cdot \Delta m_{i,t} + \beta_x \cdot \Delta x_{i,t} + \beta_{m2} \cdot \Delta m_{i,t+1} + \beta_{x2} \cdot \Delta x_{i,t+1} + \gamma_t + \Delta \varepsilon_{i,t}$$

Index of "Related" Industries Trade Shocks

$$I_{i,t}^{m} \equiv \frac{\sum l_{j \neq i} \cdot m_{j,t}}{L_i}$$

$I_{i,t}^{m}$: number of workers (in all of Mexico) employed in industry *i* at time *t*, but that were also employed in any other industry *j* during 2008-09.

L_i: total workers in industry *i*

$m_{j,t}$: log of imports in industry *j* in time *t* (of course we use the analogous concept for exports)

Intuitively, indices equal to the weighted average of "related" imports and exports in each time period

Related Industries and Trade Shocks

$$\Delta E_{i,t} = \beta_m \cdot \Delta m_{i,t} + \beta_x \cdot \Delta x_{i,t} + \beta_{m2} \cdot \Delta m_{i,t+1} + \beta_{x2} \cdot \Delta x_{i,t+1} + \beta_{Im} \cdot \Delta I^m_{i,t} + \beta_{Ix} \cdot \Delta I^x_{i,t} + \beta_{Im2} \cdot \Delta I^m_{i,t+1} + \beta_{Ix2} \cdot \Delta I^x_{i,t+1} + \gamma_t + \Delta\varepsilon_{i,t}$$

$$\overline{\Delta W_{i,t}} = \beta_m \cdot \Delta m_{i,t} + \beta_x \cdot \Delta x_{i,t} + \beta_{m2} \cdot \Delta m_{i,t+1} + \beta_{x2} \cdot \Delta x_{i,t+1} + \beta_{Im} \cdot \Delta I^m_{i,t} + \beta_{Ix} \cdot \Delta I^x_{i,t} + \beta_{Im2} \cdot \Delta I^m_{i,t+1} + \beta_{Ix2} \cdot \Delta I^x_{i,t+1} + \gamma_t + \Delta\varepsilon_{i,t}$$

If workers move between horizontally-related industries, positive shocks to related industries associated with declines in employment and increases in wages in a given industry

If workers move between vertically-related industries (i.e., characterized by input-output relationships), expected coefficients in the employment equation could be opposite, i.e., positive shocks for the supply chain.

Summary of "Within" Industry Effects

- Employment versus wages and vertical integration
  - Time-to-build specification
  - Employment elasticity w.r.t. to one-period ahead exports: 0.03
  - Stayers' wage elasticity w.r.t. to exports: 0.01
- Import competition versus imported inputs
  - Employment elasticity w.r.t. to imports ~ 0.02
  - Stayers' wage elasticity w.r.t. to imports: ~ 0.006 (n.s.)
- Diffusion of shock through the labor market
  - Empl significantly correlated with "related" imports and exports
  - Wages are not
- Skill upgrading: Relative wage of "stayers"
  - W.r.t. imports: 0.008; W.r.t. exports: 0.024
  - W.r.t. one-period ahead exports: 0.015
  - W.r.t. "related" imports: 0.065; W.r.t. "related" exports: 0.110

Results: Within-industry Employment

Imports from the U.S.	0.020*	0.014	0.014	0.017*
	(0.011)	(0.009)	(0.009)	(0.009)
Exports to the U.S.	0.021	0.034**	0.030*	
	(0.015)	(0.016)	(0.017)	
One-period ahead: Imports from the U.S.		-0.020*	-0.020*	
		(0.011)	(0.011)	
One-period ahead: Exports to the U.S.		0.039***	0.035**	0.032**
		(0.015)	(0.014)	(0.014)
Related imports from the U.S.			0.138**	0.126*
			(0.070)	(0.070)
Related exports to the U.S.			0.151	0.177*
			(0.119)	(0.103)
One-period ahead: Rel. imports			-0.144	
			(0.109)	
One-period ahead: Rel. exports			0.180	
			(0.153)	

Wages of Stayers

Imports from the U.S.	0.008*	0.006	0.006
	(0.004)	(0.004)	(0.004)
Exports to the U.S.	0.010**	0.011***	0.007*
	(0.004)	(0.004)	(0.004)
One-period ahead: Imports		-0.002	-0.003
		(0.004)	(0.003)
One-period ahead: Exports		0.003	0.004
		(0.003)	(0.004)
Related imports			0.001
			(0.030)
Related exports			0.140
			(0.091)
One-period ahead: Rel. imports			0.049*
			(0.027)
One-period ahead: Rel. exports			-0.002
			(0.036)
Observations	1,133	1,028	1,025
R-squared	0.553	0.554	0.571

Relative Wages of Stayers

Imports from the U.S.	0.008**	0.006*	0.006*
	(0.004)	(0.003)	(0.003)
Exports to the U.S.	0.021***	0.028***	0.024***
	(0.007)	(0.007)	(0.007)
One-period ahead: Imports from the U.S.		0.000	0.000
		(0.004)	(0.004)
One-period ahead: Exports to the U.S.		0.016***	0.015***
		(0.004)	(0.004)
Related imports from the U.S.			0.065**
			(0.033)
Related exports to the U.S.			0.110***
			(0.040)
One-period ahead: Related imports from the U.S.			-0.037
			(0.041)
One-period ahead: Related exports to the U.S.			0.041
			(0.059)

Exogenous Trade Shocks?: "Continuous" Treatment Effects

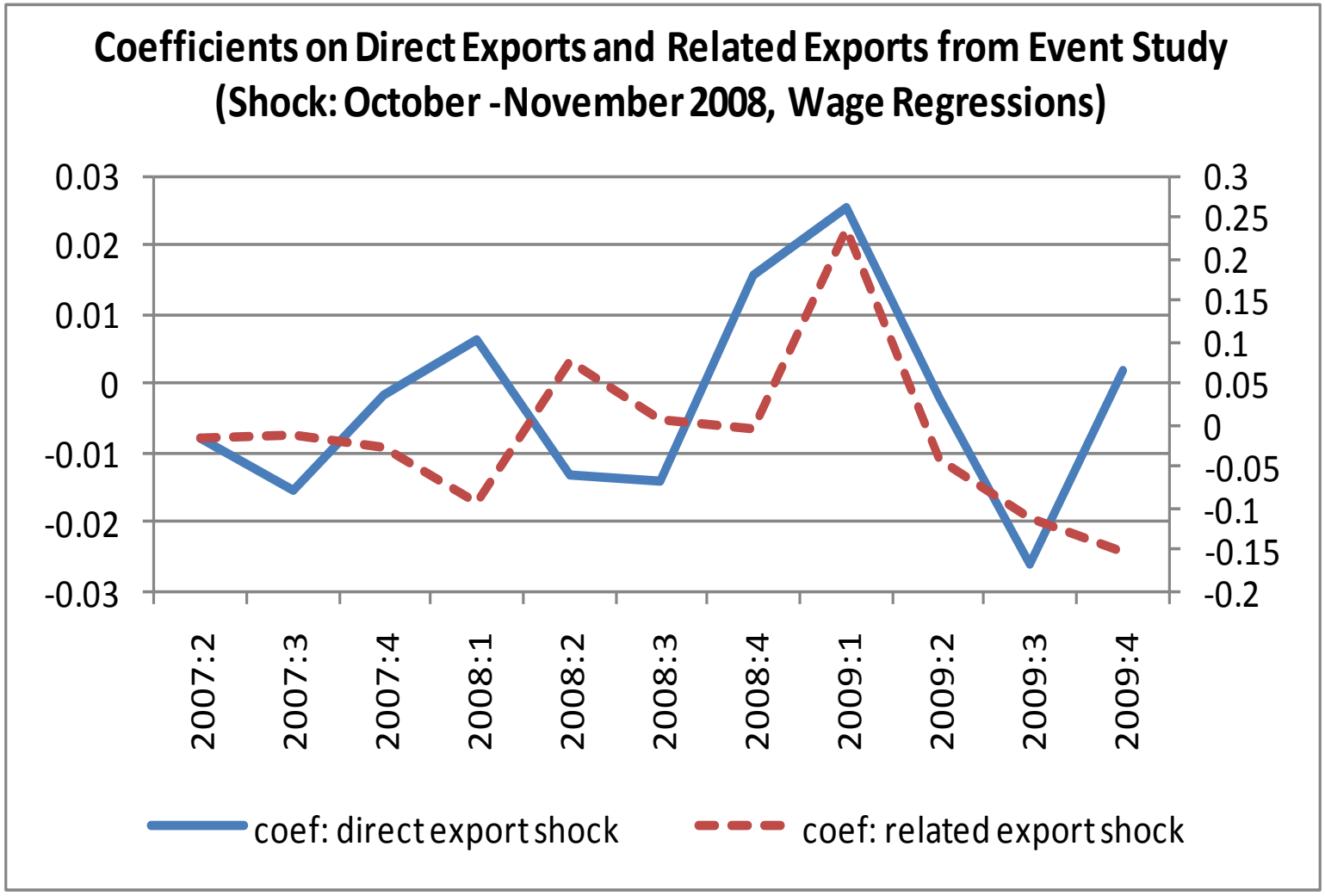
$$\Delta E_{i,t}, \overline{\Delta W}_{i,t}, diff_{i,t} = \beta_{x,t} \cdot \gamma_t \cdot \Delta x_{i,t \in crisis} + \beta_{Ix,t} \cdot \gamma_t \cdot \Delta I^{x}_{i,t \in crisis} + \Delta \varepsilon_{i,t}$$

If the trade collapse induced inter-industry dispersion in employment and wages that deviated from common trends, then:

$$\beta_{x,t} > 0 \text{ or } \beta_{Ix,t} > 0 \text{ during } t \in crisis$$

$$\beta_{x,t} < 0 \text{ or } \beta_{Ix,t} < 0 \text{ during recovery}$$

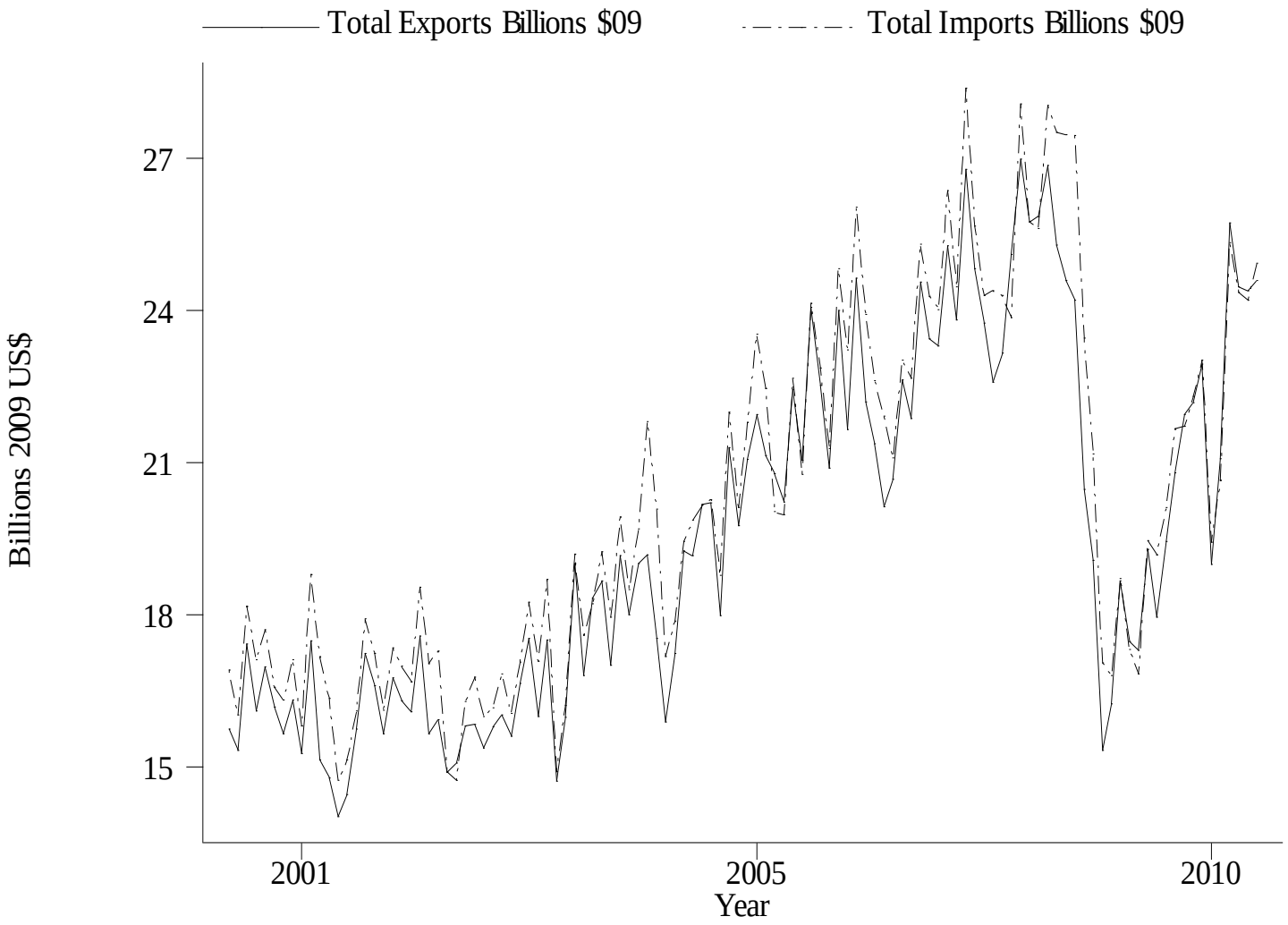
Continuous Treatment Results: Wages of Stayers



Conclusions

- Trade collapse was exogenous to trends in labor market trends in Northern Mexico
- Adjustment mostly through quantities
  - Trade variation in quantities > unit values (prices)
  - Magnitude of effects larger on employment than wages of stayers
  - Compositional effects reflected in relative wages of stayers
- Vertical trade
  - Positive partial correlation of imports with employment
- Time-to-build specification does well
  - Leads of exports and lags of imports affect wages and employment
- Related industries: through input-output relationships
  - Increases in exports and inputs in “related” industries positively affect wages and employment

Total Mexican Exports and Imports Billions 2009 U.S. Dollars



Compositional Accounting Algebra

The differential wage change variable:

$$diff_{i,t} = \frac{\sum_{w \in stayers}^{N_{stayers}} ln(w_{w,i,t}) - ln(w_{w,i,t-1})}{N_{i,stayers}} - \left(\frac{\sum_{w}^{N_t} ln(w_{w,i,t})}{N_{i,t}} - \frac{\sum_{w}^{N_{t-1}} ln(w_{w,i,t})}{N_{i,t-1}} \right)$$

Wage setting process: Wages = f(worker fixed effects + time-varying industry effects):

$$ln(w_{w,s,t}) = \alpha_w + \gamma_{i,t} + \varepsilon_{w,f,t}$$

$(\gamma_{i,t} - \gamma_{i,t-1})$ minus $(\gamma_{i,t} - \gamma_{i,t-1}) + (\bar{\alpha}_{i,t} - \bar{\alpha}_{i,t-1})$

Reduces to changes in average worker FE:

$$diff_{i,t} = (\bar{\alpha}_{i,t-1} - \bar{\alpha}_{i,})$$