The Role of Transfer Payments in Mitigating Shocks: Evidence from the Impact of Hurricanes

Tatyana Deryugina

University of Illinois

May 11, 2012

Extreme weather events will be increasingly costly, but catastrophe is not unavoidable

- Upward trend in damages from natural disasters (Board on Natural Disasters, 1999).
- Climate change will increase the frequency and intensity of extreme weather events, change their spatial distribution (Meehl et al., 2007; Schneider et al., 2007).
- Country characteristics and institutional quality affect disaster-related deaths (Kahn, 2005; Skidmore and Toya, 2005).
- Few papers on the medium and long-run effects of extreme weather events (e.g. Strobl, 2009; Strobl and Walsh, 2008).

How resilient are local economies in the US?

- Do hurricanes have detectable county-level effects? If so, are they persistent?
- Annual county-level data (1970-2006), differences-in-differences approach.
- Population, employment rate, earnings, and various transfers to individuals in the 10 years before and after the hurricane.
- Use year-by-year estimates to illuminate non-monotonic effects.

Non-disaster government transfers appear to play a large role in recovery

- Temporary decline in the construction sector.
- No evident changes in employment or earnings.
- PDV of transfers to individuals over the eleven years after the hurricane:
  - Non-disaster related transfers from government: \$500 - \$700 per capita.
  - Disaster-related transfers from government: \$356 per capita.
  - Transfers from businesses (insurance): \$20-\$40 per capita.

Policy implications are complicated

- Fiscal costs of disasters are 2-3 times larger $\Longrightarrow$ the returns to mitigation are larger.
- Conditional on hurricane, transfers may be welfare improving.
- Presence of transfer payments may be creating longer-run moral hazard.
- Disaster risk should potentially be incorporated into UI premiums.

Sample construction and controls

- Restrict sample to states most often affected: Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Texas, Virginia.
- Create control group using propensity score matching based on historic hurricane record.
- Control for hurricanes outside the 10-year estimation window, year, county, and coastal-indicator-by-year fixed effects.
- Standard errors clustered spatially.

Mean shift and trend break test for the construction sector

	Construction employment (log)		Construction establishments (log)		Construction per worker wage (log)		Per capita single family housing construction (log)	
Post hurricane	-0.0567	-0.0760	0.0237	0.0074	0.0773	0.0682	-0.0807	-0.0802
	(0.0458)	(0.0447)*	(0.0255)	(0.0250)	(0.0232)***	(0.0247)***	(0.0408)**	(0.0406)**
Post hurricane time trend		-0.0195		-0.0163		-0.0091		0.0005
		(0.0055)***		(0.0037)***		(0.0040)**		(0.0066)
Overall time trend	-0.0034	0.0077	-0.0059	0.0034	-0.0034	0.0018	0.0092	0.0089
	(0.0035)	(0.0054)	(0.0022)***	(0.0034)	(0.0020)	(0.0035)	(0.0035)***	(0.0044)**
Mean of dep. var.	6.90		4.33		10.16		-5.40	
Observations	4,978	4,978	7,524	7,524	4,940	4,940	8,436	8,436
R-squared	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99

Mean shift and trend break test for the construction sector

	Construction employment (log)		Construction establishments (log)		Construction per worker wage (log)		Per capita single family housing construction (log)	
Post hurricane	-0.0567	-0.0760	0.0237	0.0074	0.0773	0.0682	-0.0807	-0.0802
	(0.0458)	(0.0447)*	(0.0255)	(0.0250)	(0.0232)***	(0.0247)***	(0.0408)**	(0.0406)**
Post hurricane time trend		-0.0195		-0.0163		-0.0091		0.0005
		(0.0055)***		(0.0037)***		(0.0040)**		(0.0066)
Overall time trend	-0.0034	0.0077	-0.0059	0.0034	-0.0034	0.0018	0.0092	0.0089
	(0.0035)	(0.0054)	(0.0022)***	(0.0034)	(0.0020)	(0.0035)	(0.0035)***	(0.0044)**
Mean of dep. var.	6.90		4.33		10.16		-5.40	
Observations	4,978	4,978	7,524	7,524	4,940	4,940	8,436	8,436
R-squared	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99

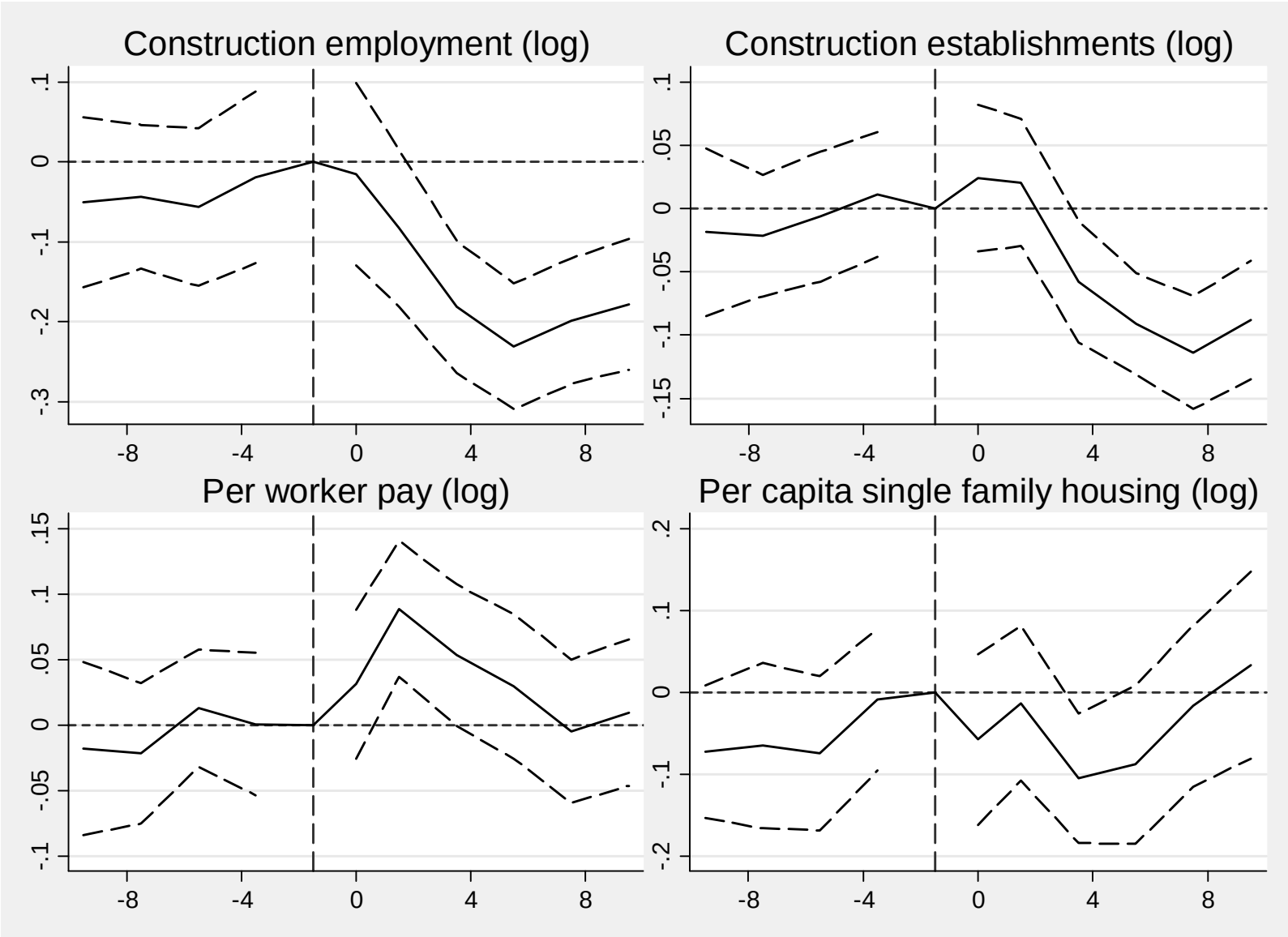
Mean shift and trend break test for the construction sector

	Construction employment (log)		Construction establishments (log)		Construction per worker wage (log)		Per capita single family housing construction (log)	
Post hurricane	-0.0567	-0.0760	0.0237	0.0074	0.0773	0.0682	-0.0807	-0.0802
	(0.0458)	(0.0447)*	(0.0255)	(0.0250)	(0.0232)***	(0.0247)***	(0.0408)**	(0.0406)**
Post hurricane time trend		-0.0195		-0.0163		-0.0091		0.0005
		(0.0055)***		(0.0037)***		(0.0040)**		(0.0066)
Overall time trend	-0.0034	0.0077	-0.0059	0.0034	-0.0034	0.0018	0.0092	0.0089
	(0.0035)	(0.0054)	(0.0022)***	(0.0034)	(0.0020)	(0.0035)	(0.0035)***	(0.0044)**
Mean of dep. var.	6.90		4.33		10.16		-5.40	
Observations	4,978	4,978	7,524	7,524	4,940	4,940	8,436	8,436
R-squared	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99

Mean shift and trend break test for the construction sector

	Construction employment (log)		Construction establishments (log)		Construction per worker wage (log)		Per capita single family housing construction (log)	
Post hurricane	-0.0567	-0.0760	0.0237	0.0074	0.0773	0.0682	-0.0807	-0.0802
	(0.0458)	(0.0447)*	(0.0255)	(0.0250)	(0.0232)***	(0.0247)***	(0.0408)**	(0.0406)**
Post hurricane time trend		-0.0195		-0.0163		-0.0091		0.0005
		(0.0055)***		(0.0037)***		(0.0040)**		(0.0066)
Overall time trend	-0.0034	0.0077	-0.0059	0.0034	-0.0034	0.0018	0.0092	0.0089
	(0.0035)	(0.0054)	(0.0022)***	(0.0034)	(0.0020)	(0.0035)	(0.0035)***	(0.0044)**
Mean of dep. var.	6.90		4.33		10.16		-5.40	
Observations	4,978	4,978	7,524	7,524	4,940	4,940	8,436	8,436
R-squared	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99

Construction sector over the medium term



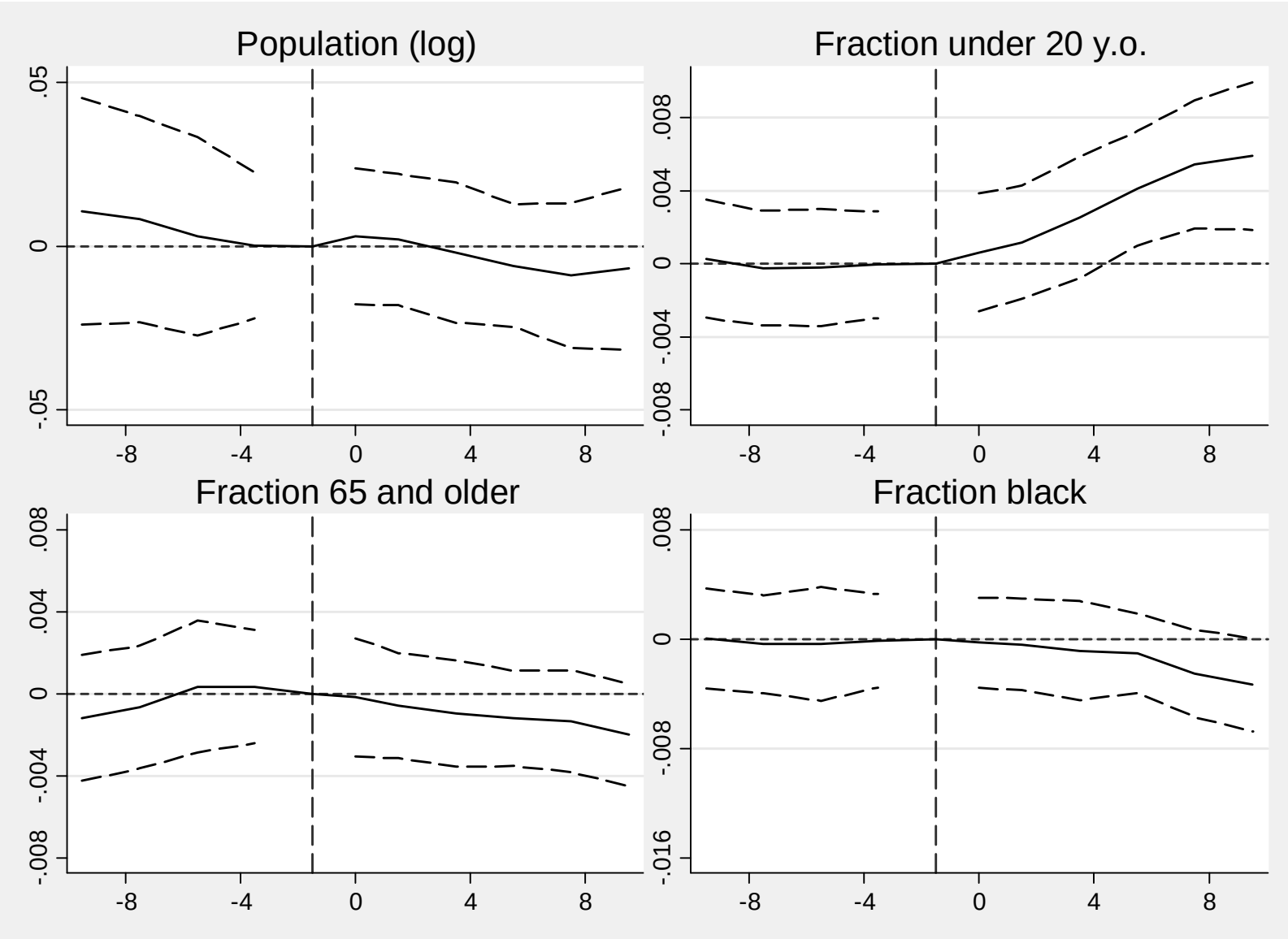
Trend break and mean shift test for population and demographics

	Fraction black residents		Fraction 65 and older		Fraction 20 and younger		Population (log)	
Post hurricane	0.0004	0.0000	-0.0007	-0.0010	0.0000	0.0006	0.0057	0.0073
	(0.0017)	(0.0017)	(0.0013)	(0.0013)	(0.0015)	(0.0015)	(0.0109)	(0.0115)
Post hurricane time trend		-0.0005		-0.0003		0.0006		0.0015
		(0.0002)**		(0.0002)*		(0.0002)**		(0.0020)
Overall time trend	-0.0003	0.0000	0.0000	0.0002	0.0003	0.0000	-0.0011	-0.0019
	(0.0001)**	(0.0002)	(0.0001)	(0.0002)	(0.0001)**	(0.0002)	(0.0011)	(0.0018)
Mean of dep. var.	0.28		0.12		0.31		10.56	
Observations	8,892	8,892	8,931	8,931	8,931	8,931	8,931	8,931
R-squared	0.99	0.99	0.99	0.99	1.00	1.00	1.00	1.00

Trend break and mean shift test for population and demographics

	Fraction black residents		Fraction 65 and older		Fraction 20 and younger		Population (log)	
Post hurricane	0.0004	0.0000	-0.0007	-0.0010	0.0000	0.0006	0.0057	0.0073
	(0.0017)	(0.0017)	(0.0013)	(0.0013)	(0.0015)	(0.0015)	(0.0109)	(0.0115)
Post hurricane time trend		-0.0005		-0.0003		0.0006		0.0015
		(0.0002)**		(0.0002)*		(0.0002)**		(0.0020)
Overall time trend	-0.0003	0.0000	0.0000	0.0002	0.0003	0.0000	-0.0011	-0.0019
	(0.0001)**	(0.0002)	(0.0001)	(0.0002)	(0.0001)**	(0.0002)	(0.0011)	(0.0018)
Mean of dep. var.	0.28		0.12		0.31		10.56	
Observations	8,892	8,892	8,931	8,931	8,931	8,931	8,931	8,931
R-squared	0.99	0.99	0.99	0.99	1.00	1.00	1.00	1.00

Population and demographics



Trend break and mean shift results for employment, earnings, and transfers

	Employment rate (fraction)		Per capita transfer from businesses (logs)		Per capita transfer from government (logs)		Per capita net earnings (log)	
Post hurricane	0.0037	0.0032	0.0475	0.0456	0.0209	0.0213	0.0062	0.0035
	(0.0046)	(0.0046)	(0.0285)*	(0.0237)*	(0.0099)**	(0.0102)**	(0.0125)	(0.0126)
Post hurricane time trend		-0.0005		-0.0019		0.0004		-0.0027
		(0.0007)		(0.0055)		(0.0013)		(0.0019)
Overall time trend	-0.0002	0.0000	-0.0027	-0.0016	0.0002	0.0000	0.0010	0.0026
	(0.0004)	(0.0007)	(0.0033)	(0.0009)*	(0.0008)	(0.0011)	(0.0010)	(0.0016)
Mean of dep. var.	0.58		4.37		8.09		9.61	
Observations	8,814	8,814	8,385	8,385	8,814	8,814	8,814	8,814
R-squared	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00

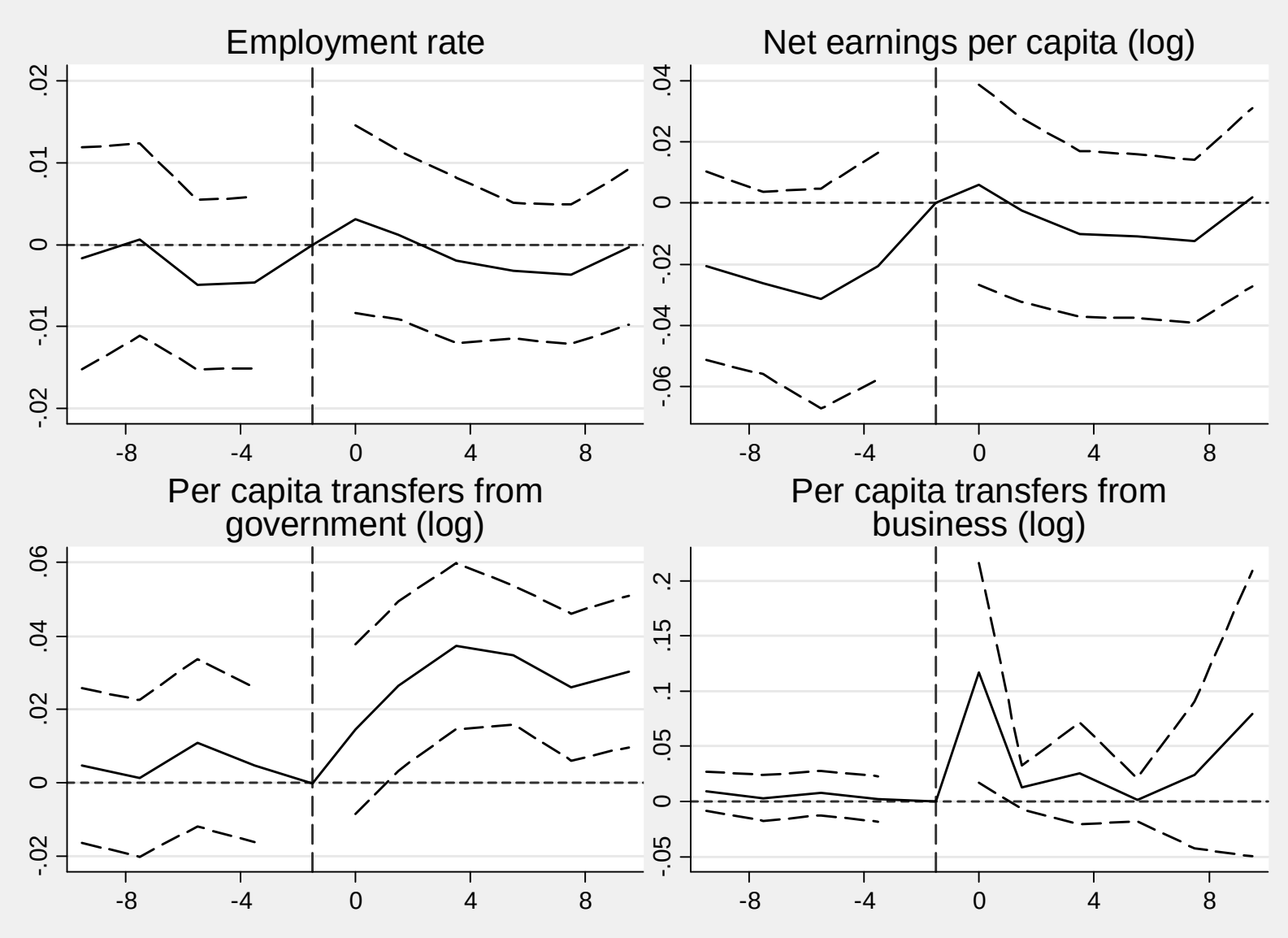
Trend break and mean shift results for employment, earnings, and transfers

	Employment rate (fraction)		Per capita transfer from businesses (logs)		Per capita transfer from government (logs)		Per capita net earnings (log)	
Post hurricane	0.0037	0.0032	0.0475	0.0456	0.0209	0.0213	0.0062	0.0035
	(0.0046)	(0.0046)	(0.0285)*	(0.0237)*	(0.0099)**	(0.0102)**	(0.0125)	(0.0126)
Post hurricane time trend		-0.0005		-0.0019		0.0004		-0.0027
		(0.0007)		(0.0055)		(0.0013)		(0.0019)
Overall time trend	-0.0002	0.0000	-0.0027	-0.0016	0.0002	0.0000	0.0010	0.0026
	(0.0004)	(0.0007)	(0.0033)	(0.0009)*	(0.0008)	(0.0011)	(0.0010)	(0.0016)
Mean of dep. var.	0.58		4.37		8.09		9.61	
Observations	8,814	8,814	8,385	8,385	8,814	8,814	8,814	8,814
R-squared	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00

Trend break and mean shift results for employment, earnings, and transfers

	Employment rate (fraction)		Per capita transfer from businesses (logs)		Per capita transfer from government (logs)		Per capita net earnings (log)	
Post hurricane	0.0037	0.0032	0.0475	0.0456	0.0209	0.0213	0.0062	0.0035
	(0.0046)	(0.0046)	(0.0285)*	(0.0237)*	(0.0099)**	(0.0102)**	(0.0125)	(0.0126)
Post hurricane time trend		-0.0005		-0.0019		0.0004		-0.0027
		(0.0007)		(0.0055)		(0.0013)		(0.0019)
Overall time trend	-0.0002	0.0000	-0.0027	-0.0016	0.0002	0.0000	0.0010	0.0026
	(0.0004)	(0.0007)	(0.0033)	(0.0009)*	(0.0008)	(0.0011)	(0.0010)	(0.0016)
Mean of dep. var.	0.58		4.37		8.09		9.61	
Observations	8,814	8,814	8,385	8,385	8,814	8,814	8,814	8,814
R-squared	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00

Employment, earnings, and transfers



Public medical spending and unemployment insurance largely responsible for the increase

- Change in present discounted value (PDV) of transfers from businesses: $37 per capita.
- Change in present discounted value (PDV) of federal non-disaster transfers: $654 per capita.
  - Change in PDV of public medical spending: $435 per capita.
  - Change in PDV of unemployment insurance payments: $280 per capita.

Varying the control group does not significantly alter the results

- Use only counties that experience a hurricane between 1980 and 1996.
- Increase number of nearest neighbors to 5.
- Match counties by historic hurricane record and 1970 characteristics.
- Use all counties in the hurricane region.
- Look at changes in transfers in a 50-mile radius around the hurricane-affected county.

Conclusion

- Rising damages from natural disasters and impeding climate change make the study of extreme weather events increasingly important.
- Lack of movement in other variables may be in part due to non-disaster transfer programs.
- Fiscal effects of natural disasters much larger than previously calculated $\Longrightarrow$ returns to mitigation also larger.
- More research needed on causal role of disaster and non-disaster transfers.