Sri Lankan Households a Decade after the Indian Ocean Tsunami

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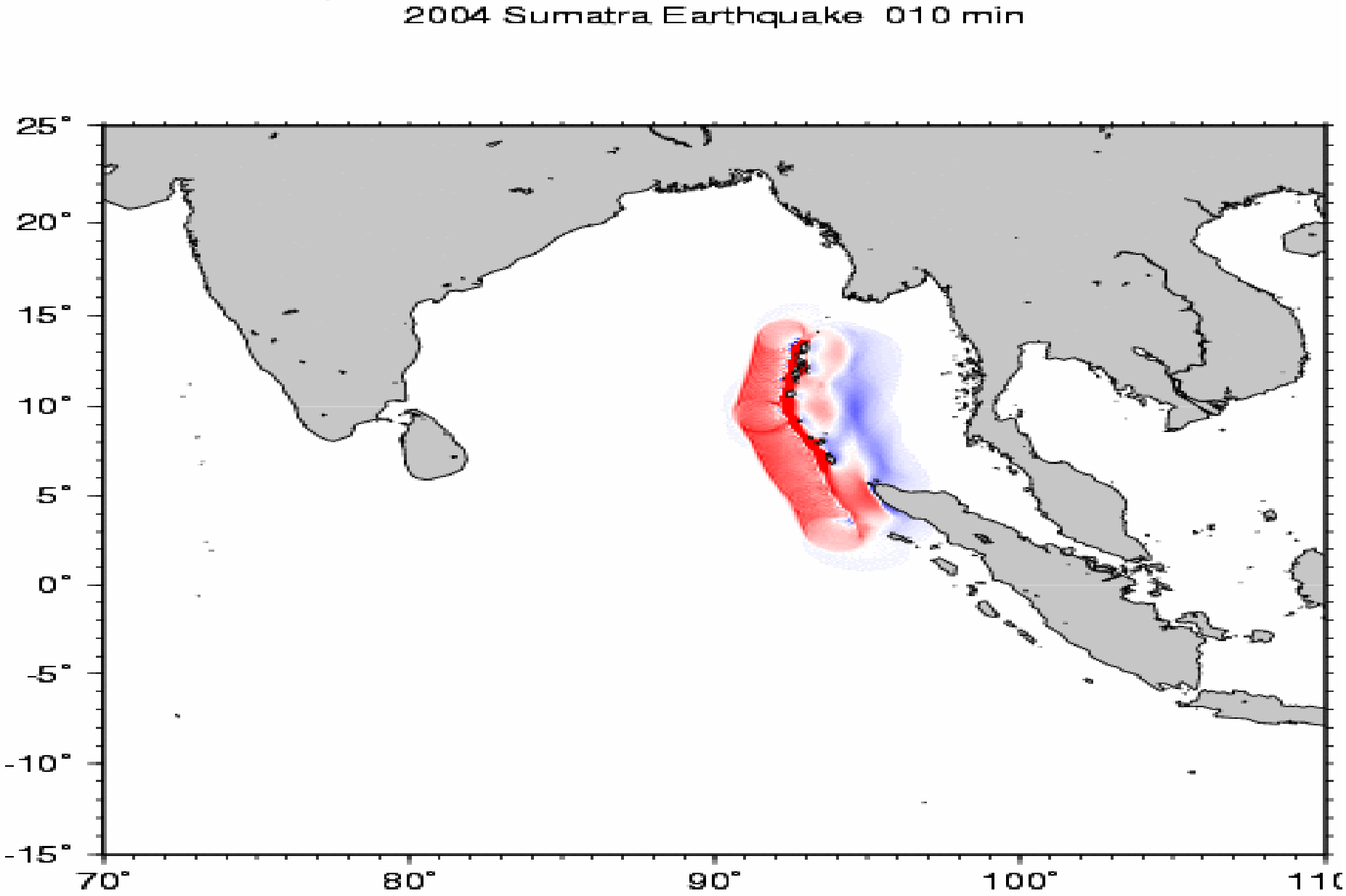
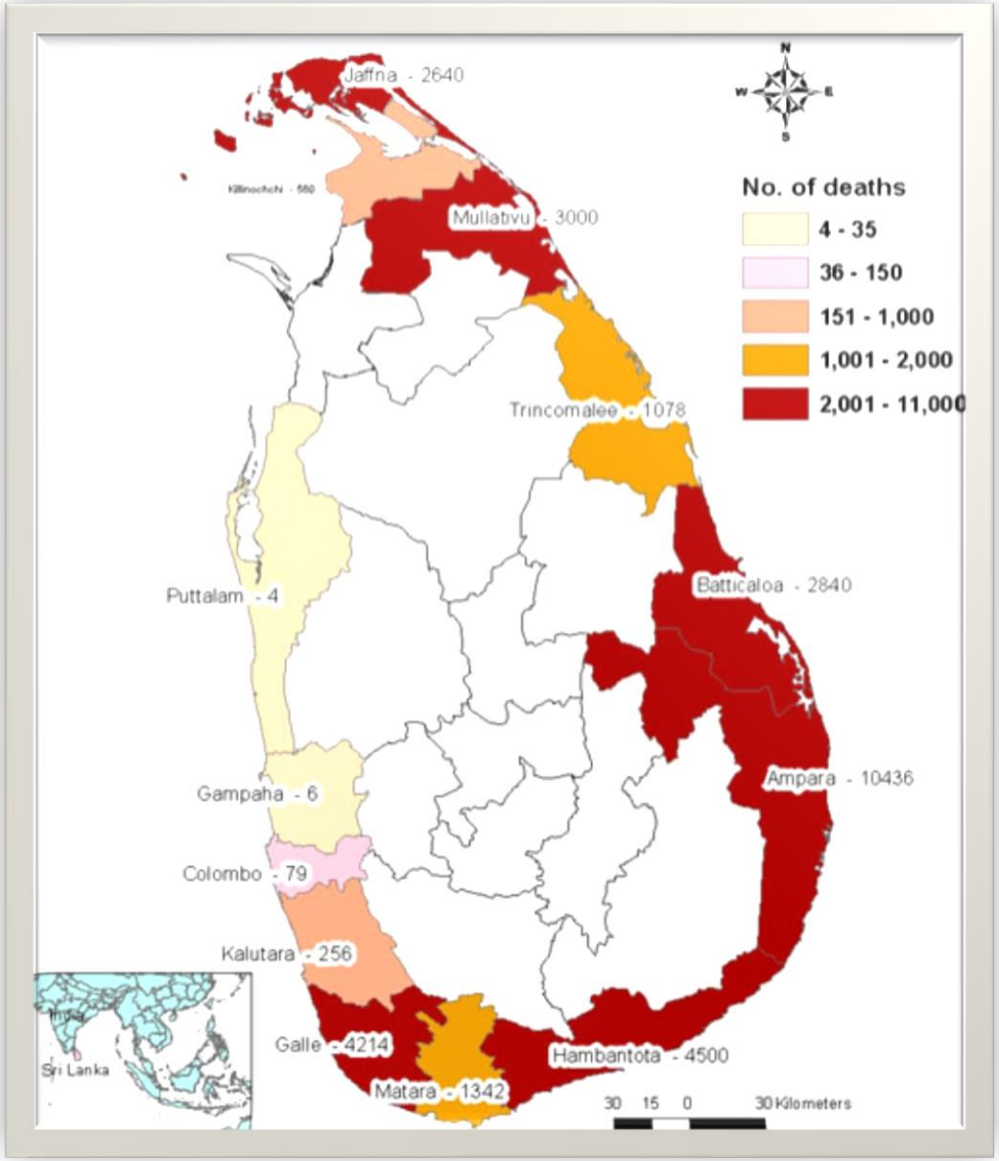
Background: Indian Ocean Tsunami 2004



Tsunami in Sri Lanka



- Tsunami hit 13 districts
- 35,000 deaths
- 364, 262 people lost their homes
- 502,067 people displaced
- 1 million people affected
- Tsunami damage totaled USD 1.5 billion, 5% of the country's GDP

Research question

What is the causal effect of Indian Ocean tsunami on Sri Lankan household income and consumption eight years after the event?

Data

- Pooled Cross sections of households : 85,409
- Standard Household Income and Expenditure Surveys data: five surveys 1995, 2002, 2006, 2009 & 2012
- 35,904 households pre tsunami
- 49, 505 households post tsunami
- Covered 17 Districts
- 7 tsunami affected districts out of total 13 affected districts

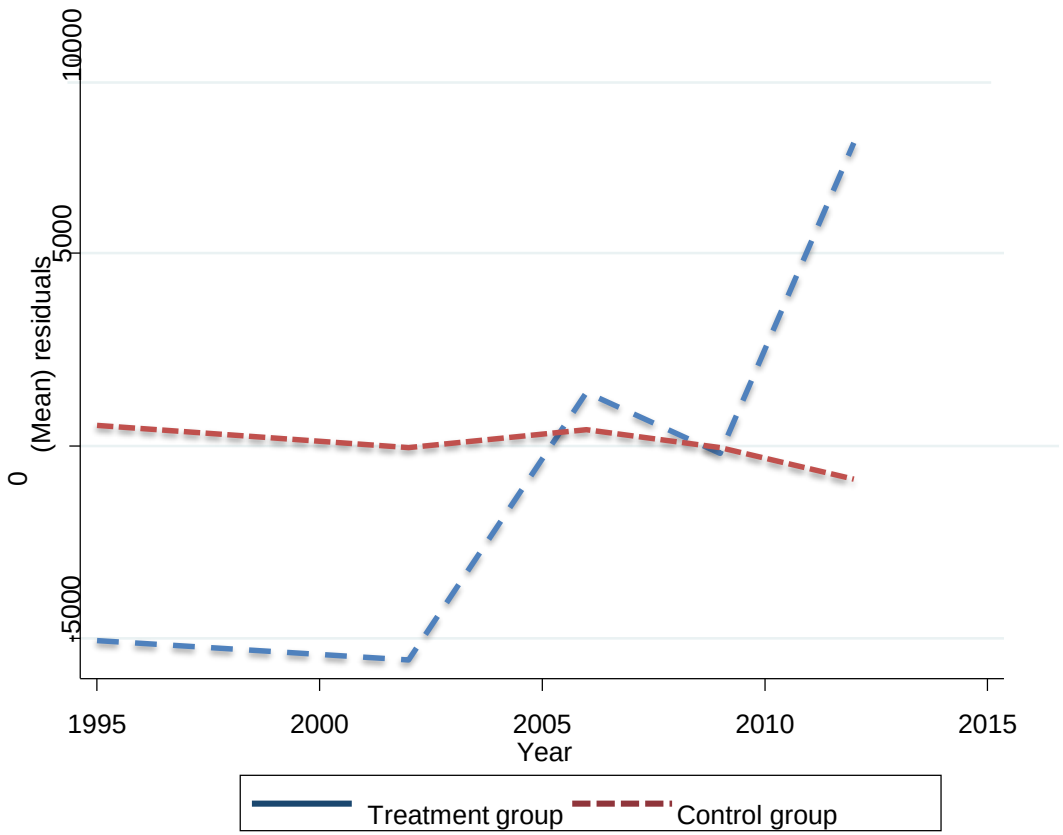
Method

- Quasi experimental (Diff-in-Diff) method

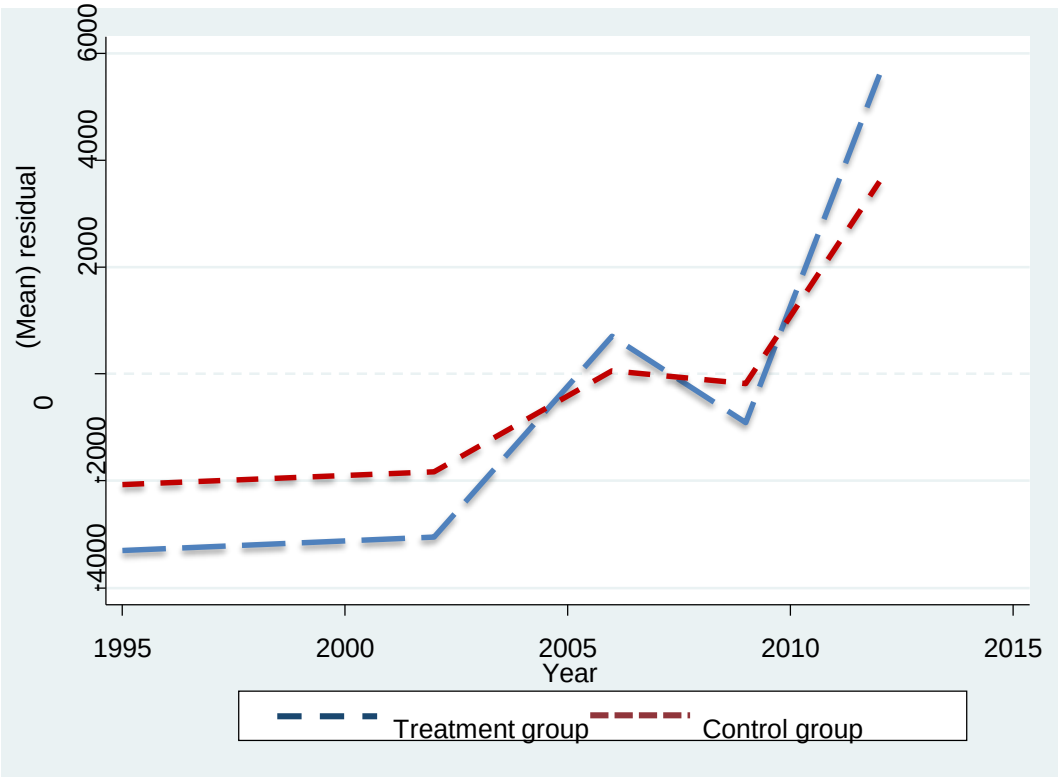
$$Y_{idt} = \beta_1 + \beta_2 Post_i T_d + \beta_3 \delta_t + \beta_4 X_{idt} + \beta_5 \gamma_d + [\beta_6 \gamma_d * t] + U_{idt}$$

- Y_{idt} household consumption & income /month
- T_{di} is the treatment dummy
- β_2 is the treatment effect
- X_{idt} household covariates
- δ_t Year fixed effects
- γ_d District fixed effects
- $[\gamma_d * t]$ District-specific linear time trends
- U_{idt} is un observed effect

Normalized Income



Normalized Consumption



Results (1): Impact on HH Income

Independent variables	(i)	(ii)
Treatment_2006	7048	7022
	(1872) ***	(2898) ***
	[1435, 12061]	[472.3, 14006]
	(0.01)	(0.03)
Treatment_2009	5870	5787
	(1690) ***	(2474) ***
	[837, 10249]	[1044, 12278]
	(0.02)	(0.01)
Treatment_2012	15142	15066
	(2797) ***	(4802) ***
	[6816, 22928]	[5806, 25551]
	(0.00)	(0.00)
Household covariates	Yes	Yes
District fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
District linear time trend	No	Yes
R-squared	0.49	0.52
Number of observations	84393	84393

Impact on HH Income : by Source

Income sources	Paid income	Agricultural Income	Non-agricultural Income	Remittance	Transfers	Dividends	Rents and other income
Treatment*2006	994	-1030	6934	42	144	-18	-155
	(1282)	(574) *	(2777) ***	(133)	(110)	(26)	(243)
Wildbootsrap CI	[-1907, 4222]	[-2775, 25.91]	[-858.9, 13714]	[-297.9, 304.9]	[-91.69, 480.9]	[-73.37, 43.87]	[-686.9, 568.4]
P value	(0.58)	(0.06)	(0.09)	(0.78)	(0.23)	(0.56)	(0.56)
Treatment*2009	172	-1456	7242	59	23	-9	-44
	(1214)	(657) **	(2917) ***	(126)	(197)	(33)	(355)
Wildbootsrap CI	[-3075, 2689]	[-3054, -38.82]	[-250.8, 13954]	[-245.2, 310.4]	[-408.5, 572.3]	[-76.75, 78.4]	[-870.3, 925.8]
P value	(0.91)	(0.04)	(0.05)	(0.65)	(0.92)	(0.81)	(0.90)
Treatment*2012	4243	-1544	10675	839	789	67	-179
	(2181) **	(660) **	(4024) **	(256) ***	(205) ***	(43)	(360)
Wildbootsrap CI	[-702, 9151]	[-3006, -114.4]	[-237.8, 20447]	[317.6, 1402]	[371, 1383]	[-23.08, 168.2]	[-932.5, 826.1]
P value	(0.10)	(0.03)	(0.05)	(0.004)	(0.002)	(0.14)	(0.67)
R-squared	**0.35**	**0.15**	**0.24**	**0.06**	**0.08**	**0.01**	**0.03**

Results (1): Impact on HH Consumption

Independent Variables	(i)	(ii)
Treatment_2006	1235	1343
	(500) ***	(735) *
	[105, 2575]	[-291.4, 3117]
	0.04	(0.10)
Treatment_2009	214	333
	(279)	(500)
	[-545.5, 808.9]	[-824.5, 1501]
	(0.04)	(0.53)
Treatment_2012	1235	2981
	(500) ***	(925) ***
	[-368.9, 5003]	[842.2, 4996]
	(0.09)	(0.01)
Household covariates	Yes	Yes
District fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
District linear time trend	No	Yes
R-squared	0.28	0.29
Number of observations	84393	84393

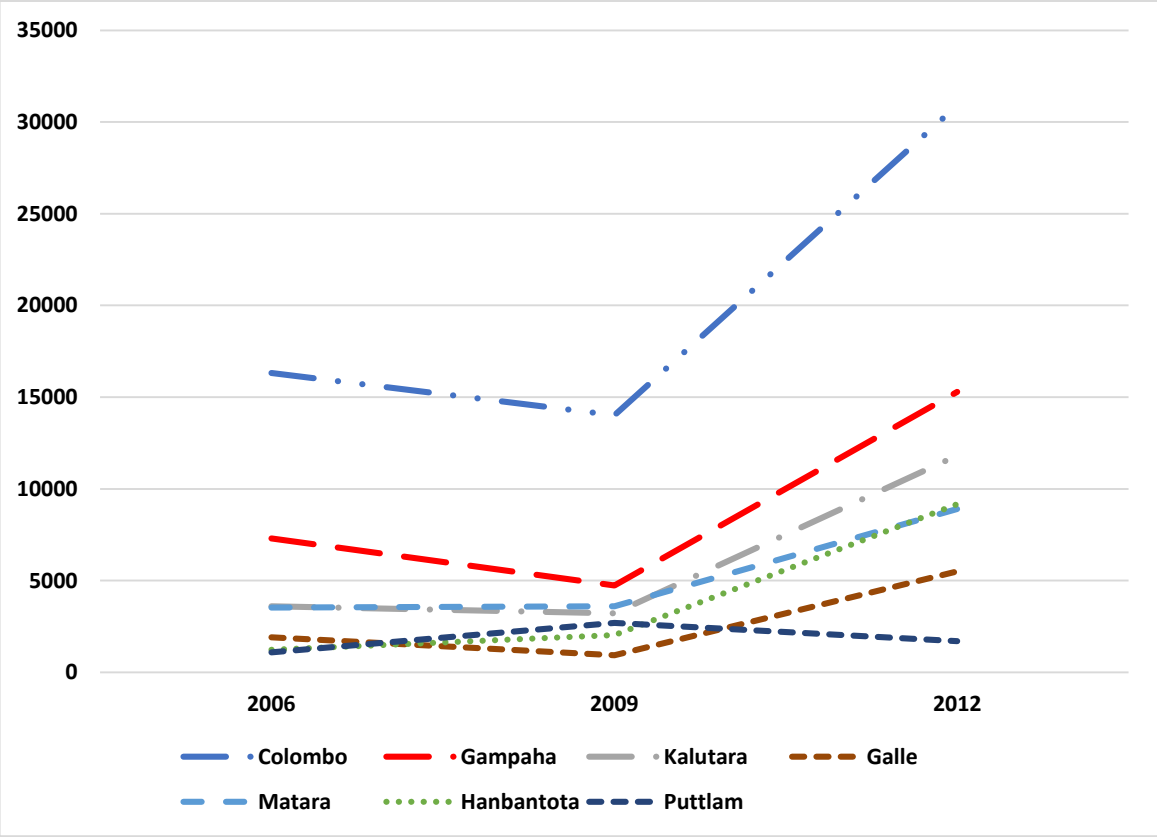
Impact on HH Consumption : by components

	Food cons	Non-food cons
Treatment*2006	597	789
	(284) **	(622)
Wildbootsrap CI	[-202.7, 1180]	[-568, 2300] (0.23)
P value	(0.10)	
Treatment*2009	711	-318
	(382) *	(375)
Wildbootsrap CI	[-350.1, 1433] (0.05)	[-1115, 513.2] (0.45)
P value		
Treatment*2012	1459	1546
	(525) ***	(776) ***
Wildbootsrap CI	[-99.99, 2468]	[-258.1, 3267] (0.07)
P value	(0.05)	
R-squared	0.27	0.23

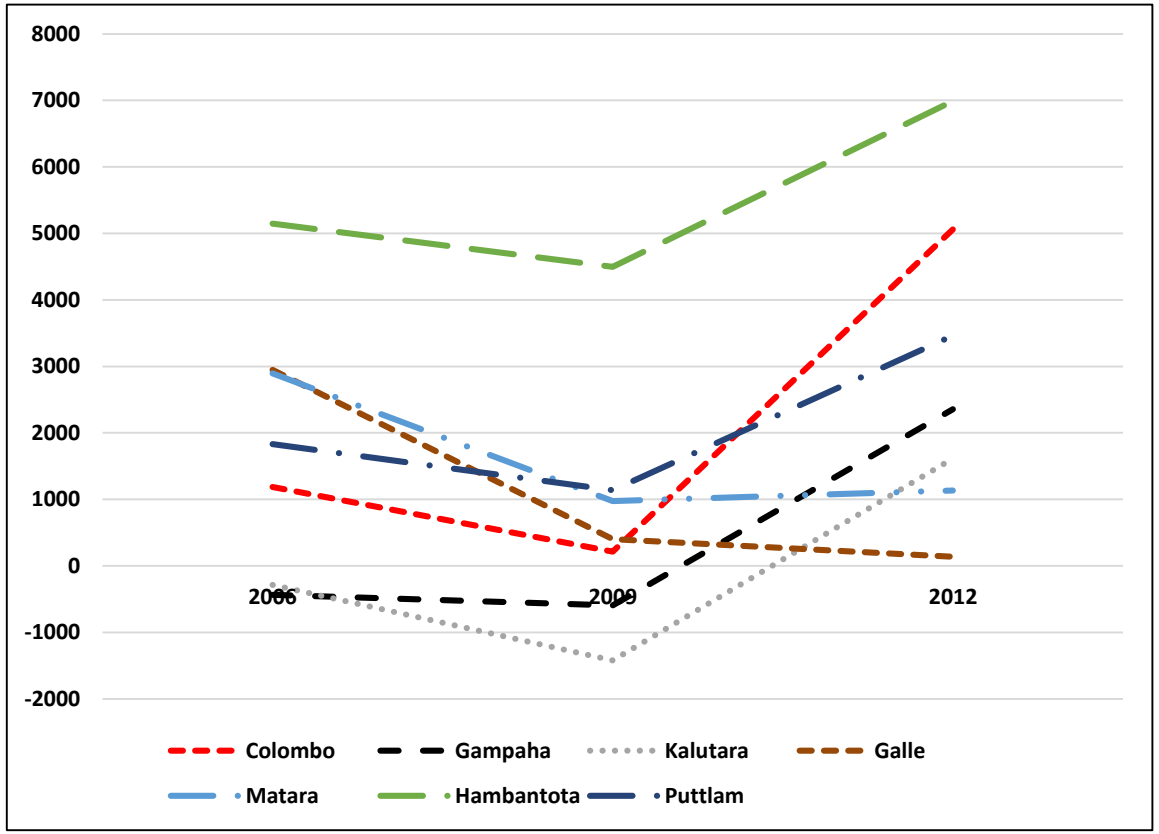
Impact on HH Consumption : by components

	Housing	Clothing	Personal care	Comm. & transp.	Education	Health	Recreation
Treatment*2006	87	112	7	147	21	45	3
	(173)	(48) ***	(15)	(94) ***	(23)	(49)	(32)
WildbootsrapCI	[-262.5, 589.9]	[23.46, 234.8]	[-36.31, 37.85]	[-91.37, 360.2]]	[-25.76, 77.04]	[-80.35, 151.5]	[-75.53, 80.89]
P value	(0.64)	(0.001)	(0.69)	(0.91)	(0.36)	(0.39)	(0.94)
Treatment*2009	2	64	-2	-119	70	26	-42
	(118)	(64)	(17)	(50) ***	(19) ***	(31)	(43)
Wild-bootsrap CI	[-242.3, 313.7]	[-68.71, 242.7]	[-45.98, 35.4]	[-230.5, .02126]	[24.86, 115.5]	[-43.82, 96.69]	[-143.7, 54.57]
P value	(0.98)	(0.52)	(0.92)	(0.05)	(0.007)	(0.46)	(0.42)
Treatment*2012	653	173	45	109	197	136	80
	(355)*	(112)	(27) *	(201)	(87) **	(66) **	(40) ***
Wildbootsrap CI	[-79.82, 1553]	[-58.35, 469.4]	[-12.08, 112.3]	[-315.4, 600.5]]	[12.59, 412.5]	[-29.77, 286.5]	[-10.33, 170.9]
P value	(0.10)	(0.18)	(0.16)	(0.63)	(0.04)	(0.10)	(0.08)
R-squared	0.30	0.16	0.27	0.12	0.06	0.03	0.01

Income



Consumption



Conclusions

- A strong association between area-wide tsunami disaster shock and increases in household consumption and income
  - large income boosts and much smaller increases in consumption
  - households in richer and moderately damaged districts experience better recovery
- Suggestive of an optimistic potential for long-lasting less adverse consequences.
- Causal channels
  - Reconstruction financing
  - Reconstruction stimulated economic growth
  - Better managed reconstruction/build back better

Thank you