Common Property Resources, Property Rights and Natural Disasters

Small Scale Fisheries in Chile

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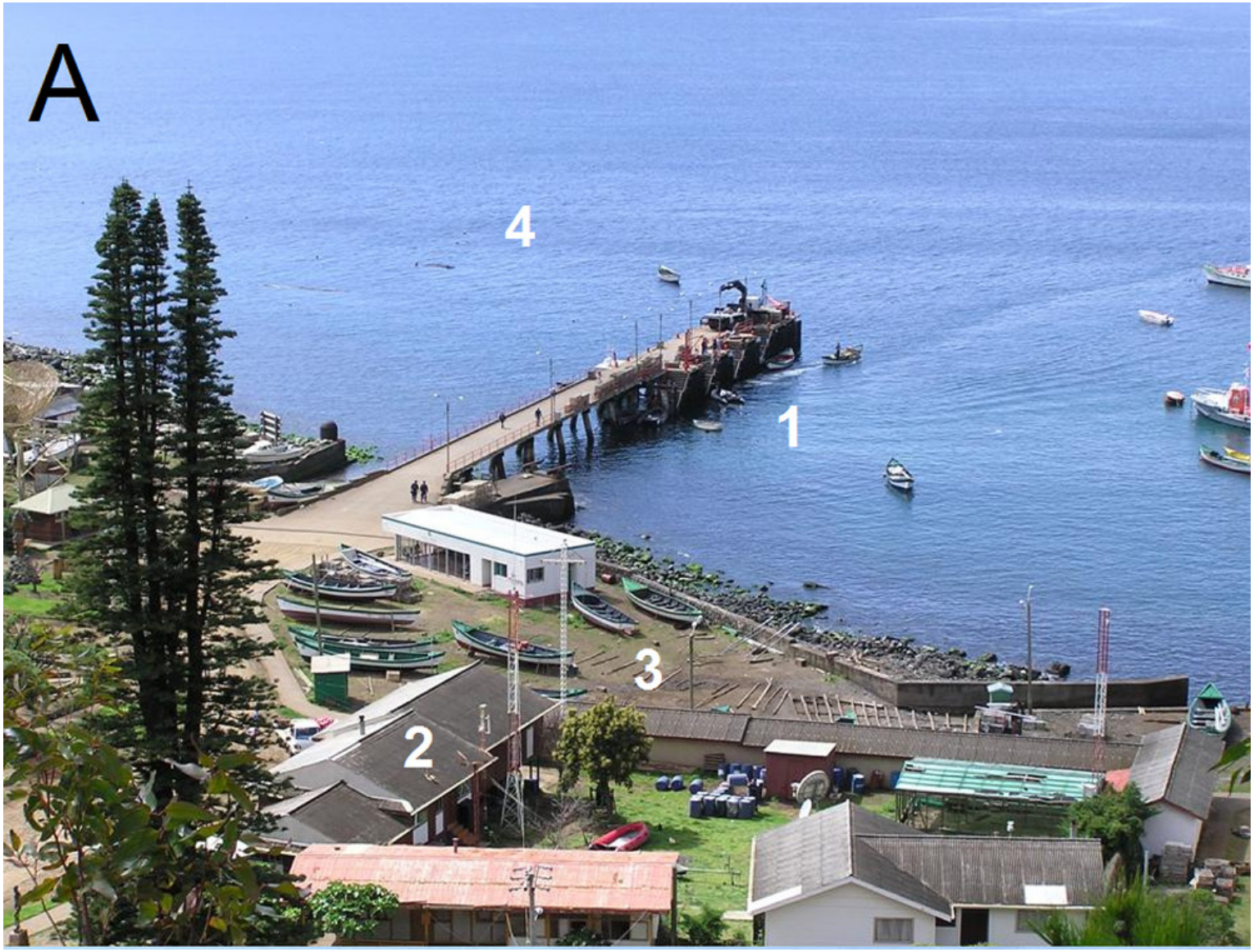
Juan Fernandez, Chile. 2004



Source: Sustainability of the Juan Fernandez lobster fishery (...). Ernst et al, 2013

Juan Fernandez, Chile. 2010

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Research question

How do property rights condition the vulnerability to and the recovery from natural disasters?

What are the implications for society from having different regimes?

Property Rights

- The ability at which individuals use or transact goods and services (Barzel 1997)
- Foundation of economic institutions (Acemoglu 2005)
- Determine capital investment for any production activity (Svensson 1998)
- The problem, is that they are endogenous to each political and economic system (Diermeier 2013)*

Research approach

The objective of this work is to:

1. Establish theoretical predictions for capital investment as function of the property right regime
2. Identify a case study to validate theoretical predictions
3. Use a valid instrument to identify the role the property right regime in capital investment
4. Derive practical policy implications for both the case study and general situations

Theoretical predictions (Not included in this paper)

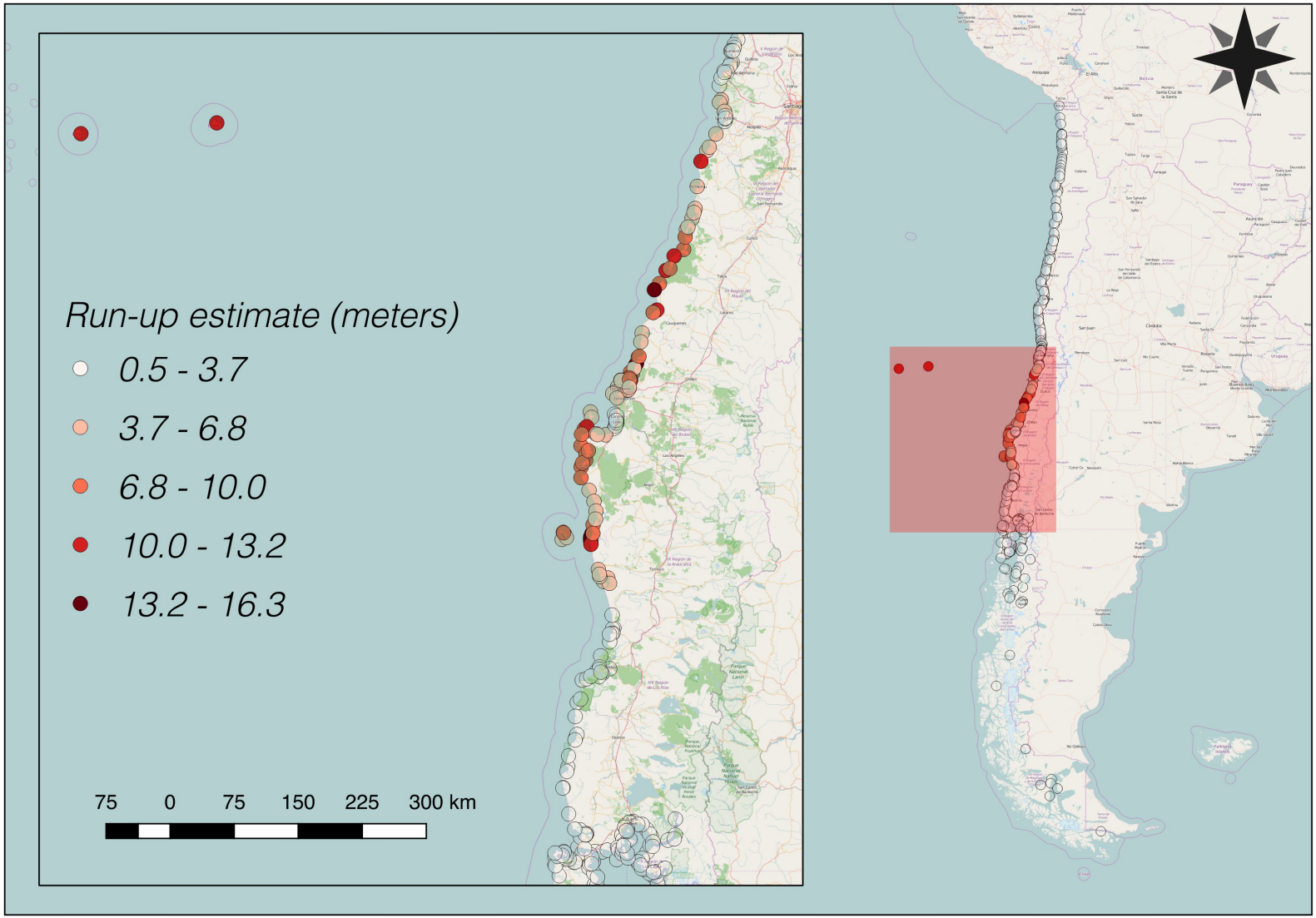
It can be shown that weaker property rights lead to excessive harvesting and overcapitalization relative to the optimal path (Boyce 1995).

Study case

To evaluate these predictions I use the case of small scale fisheries in Chile and the external shock caused by a devastating tsunami in 2010:

1. Comprehensive data set for capital investment
2. Different property regimes for the same resources
3. Capital was heavily impacted due to the tsunami

Tsunami 2010



Property right has spatial excludability

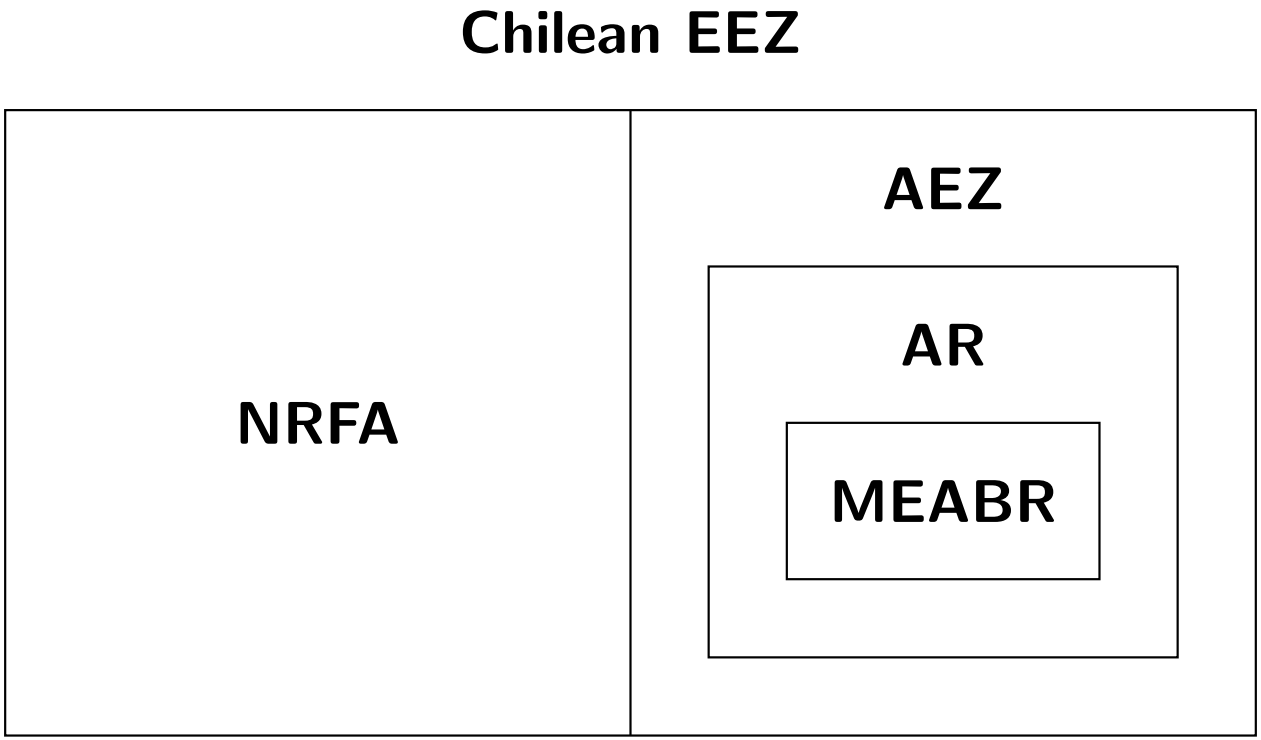


Figure: Schematic of the spatial excludability assigned by the different regimes in Chilean fisheries.

Empirical approach

So, why don't we just count the boats (production capital) across different regimes and validate the predictions? Not possible, the government only keeps track of new registrations.

To deal with this limitation I look into the source of revenue of each organization (benthic resources), establish the main property right regime for their source of revenue, and then look at the registration of new vessels over time (before and after the tsunami).

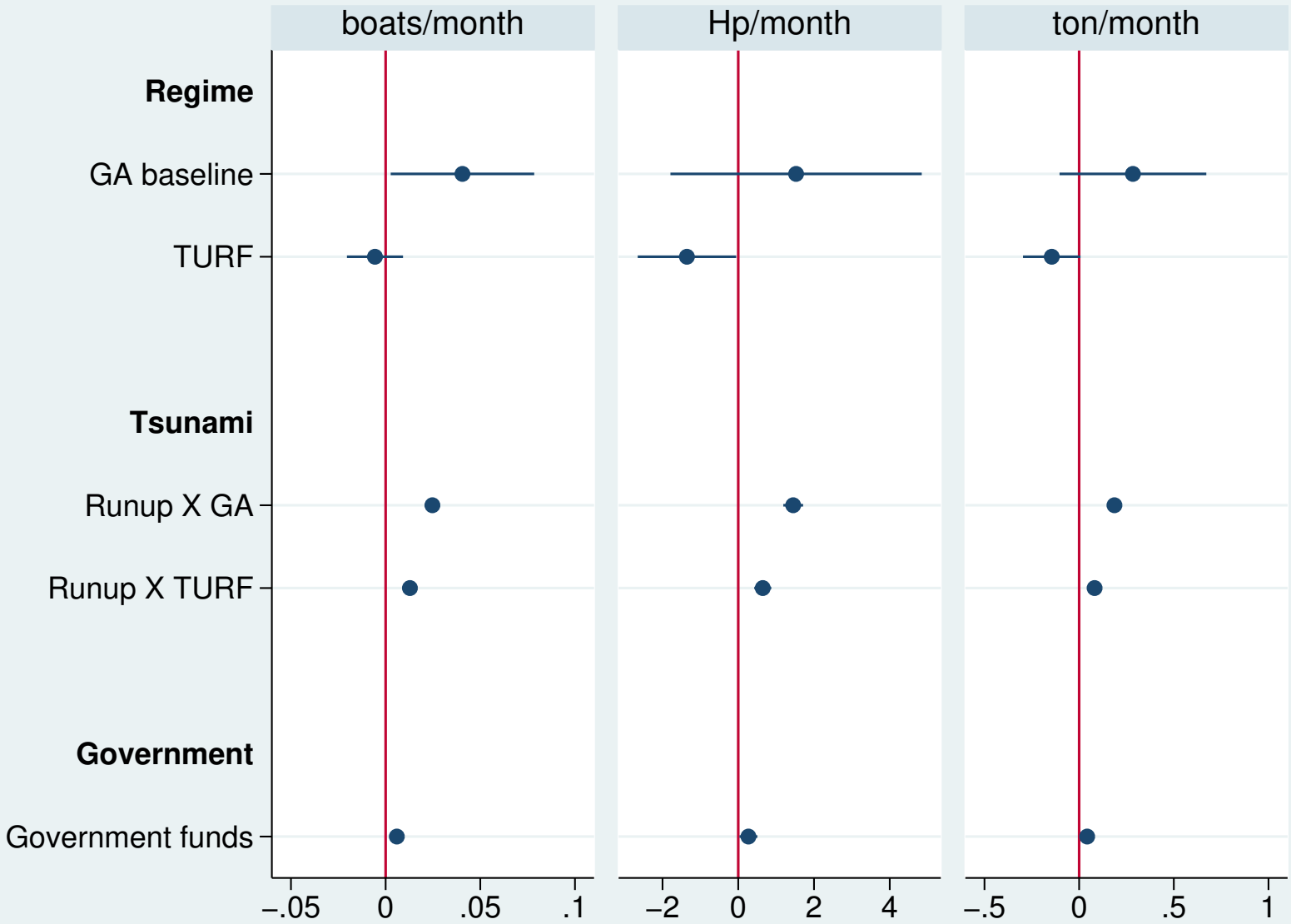
Flow of capital and output

I measure the flow of capital in terms of numbers of boats, engine power and fishing capacity by organization and month. I also extract aggregated measures of harvest and revenue by month and organization. The econometric model is as follows:

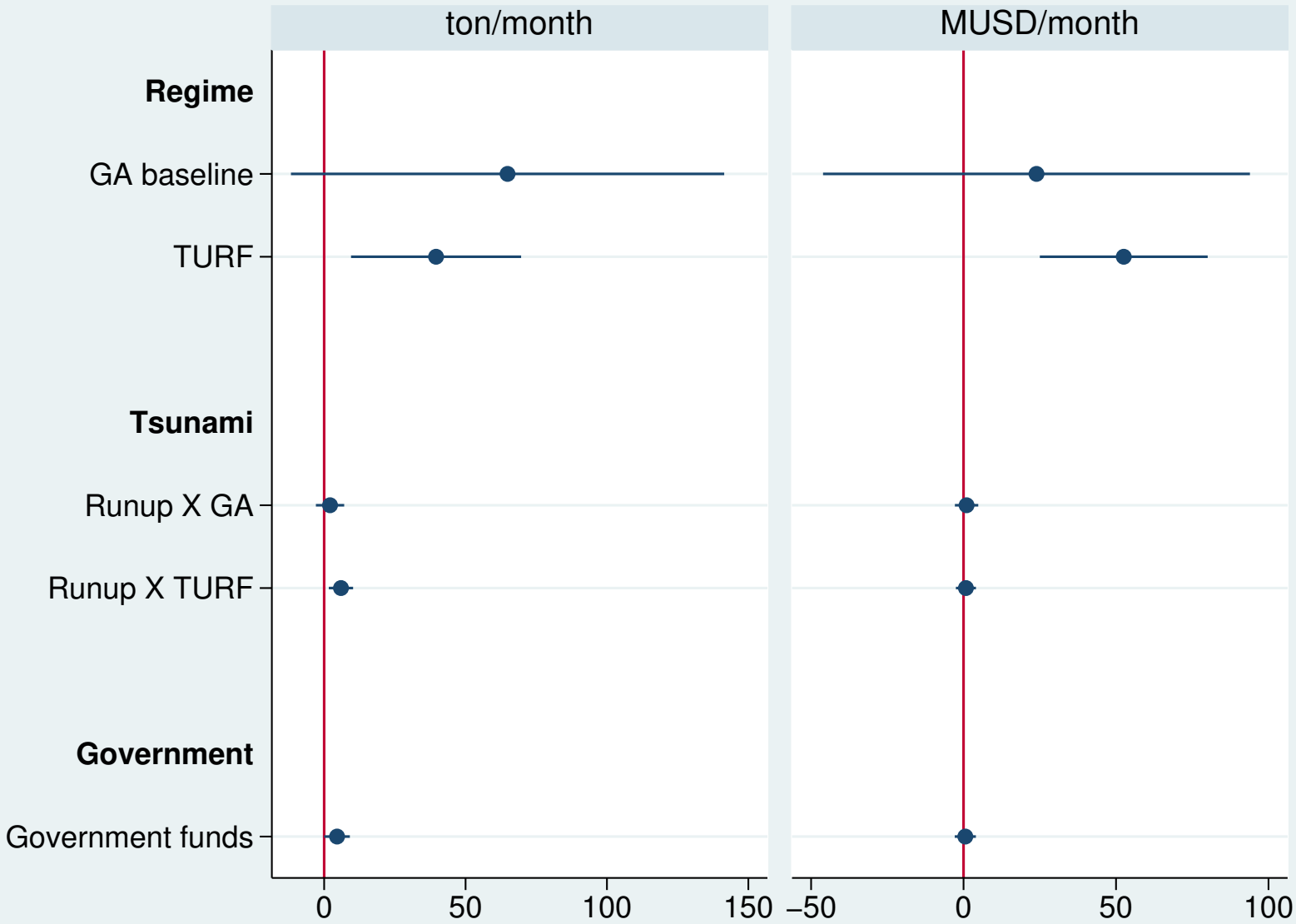
$$y_{it} = \alpha + \beta\ TURF_i + \gamma_0\ Runup_{it} + \gamma_1\ Runup_{it} \times TURF_i + \lambda\ Funds_{rt}^{(i)} + X_{rt}^{(i)}\ \theta + \epsilon_{it} \quad (1)$$

$$y_{it} = \alpha + \beta\ TURF_i + \lambda\ Funds_{rt}^{(i)} + \sum_{y=2010}^{2013} \delta_y\ Year_y^{(t)} \times\ Runup_{it} + \sum_{y=2010}^{2013} \eta_y\ Year_y^{(t)}\ Runup_{it} \times TURF_i + X_{rt}^{(i)}\ \theta + \epsilon_{it} \quad (2)$$

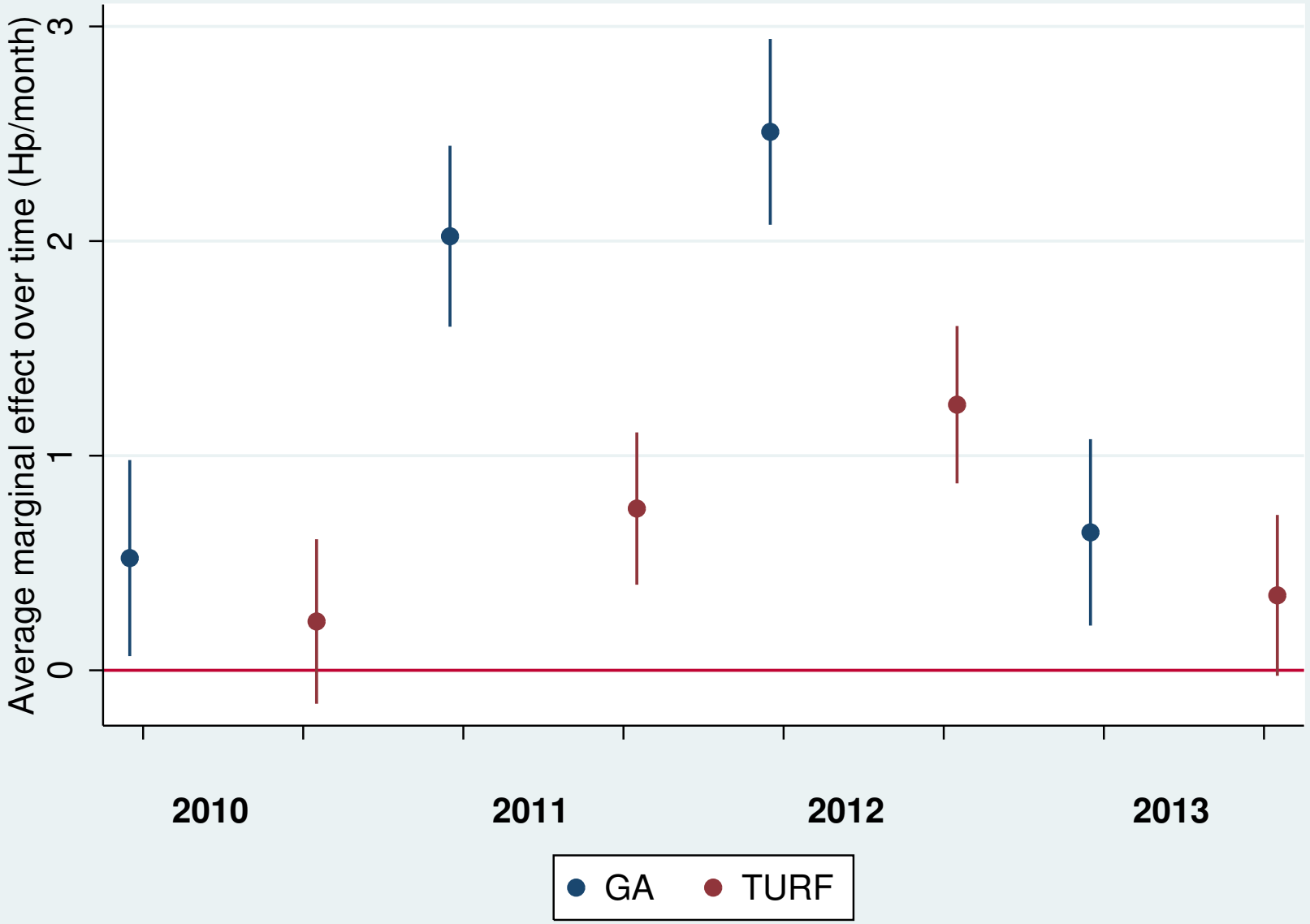
Capital flow



Harvest and revenue



Year specific effects



Conclusions

- Observations in line with predictions for the general theory.
- Stronger property rights lead:
  - Less capital intensity before the natural disaster (vulnerability)
  - Less capital intensity in the recovery path after the disaster
  - More harvest and revenue before and after the disaster
- Evidence of a perpetual course of poor institutions in terms of public funds for rebuilding capital after natural disasters
- (Upcomming) Formalization of political incentives and implications for development

Thank you!

Questions?

Table 1

	Min	Mean	Max	SD
GA (N=80)				
Boats (boats/month)	1.00	1.14	2.00	(0.25)
Engine power (Hp/month)	11.75	70.21	245.00	(42.99)
Capacity (ton/month)	3.00	8.85	28.38	(3.94)
Harvest (ton/month)	0.22	18.78	141.61	(25.90)
Revenue (MUSD/month)	0.02	0.79	7.30	(0.96)
TURF (N=105)				
Boats (boats/month)	1.00	1.10	2.00	(0.18)
Engine power (Hp/month)	5.00	45.29	125.00	(27.25)
Capacity (ton/month)	1.30	6.70	19.00	(2.68)
Harvest (ton/month)	0.99	152.17	2806.69	(384.42)
Revenue (MUSD/month)	0.46	14.33	140.71	(21.56)
Total (N=185)				
Boats (boats/month)	1.00	1.12	2.00	(0.21)
Engine power (Hp/month)	5.00	56.07	245.00	(36.97)
Capacity (ton/month)	1.30	7.63	28.38	(3.45)
Harvest (ton/month)	0.22	94.48	2806.69	(296.99)
Revenue (MUSD/month)	0.02	8.48	140.71	(17.56)

Table 2

	Boats (boats/month)				Engine power (Hp/month)				Capacity (ton/month)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Regime:												
TURF	-0.016*	-0.015*	-0.015*	-0.006	-2.212***	-2.020**	-2.020**	-1.356*	-0.240***	-0.232**	-0.232**	-0.145
	(0.007)	(0.007)	(0.007)	(0.008)	(0.606)	(0.642)	(0.642)	(0.663)	(0.071)	(0.075)	(0.075)	(0.077)
Tsunami:												
Runup				0.025***				1.450***				0.187***
				(0.002)				(0.134)				(0.015)
Runup X TURF				-0.012***				-0.804***				-0.105***
				(0.002)				(0.164)				(0.019)
Baseline:												
Government funds			0.000***	0.000***			0.009***	0.003*			0.001***	0.000**
			(0.000)	(0.000)			(0.001)	(0.001)			(0.000)	(0.000)
Constant	0.059***	0.054**	0.039*	0.041*	4.097***	2.297	1.522	1.527	0.512***	0.391*	0.285	0.284
	(0.005)	(0.019)	(0.019)	(0.019)	(0.457)	(1.677)	(1.680)	(1.692)	(0.054)	(0.196)	(0.196)	(0.198)
Observations	24420	24420	24420	24420	24420	24420	24420	24420	24420	24420	24420	24420
Month and region FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3

	Harvest (ton/month)				Revenue (MUSD/month)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regime:								
TURF	42.021**	43.389**	43.389**	39.577**	4.965***	5.239***	5.239***	5.253***
	(13.852)	(15.008)	(15.008)	(15.343)	(1.285)	(1.392)	(1.392)	(1.404)
Tsunami:								
Runup				2.075				0.099
				(2.552)				(0.195)
Runup X TURF				3.866				-0.022
				(3.138)				(0.240)
Baseline:								
Government funds			0.073***	0.046*			0.001	0.001
			(0.020)	(0.023)			(0.002)	(0.002)
Constant	10.540	66.007	59.555	64.858	0.431	2.455	2.357	2.392
	(10.436)	(38.796)	(38.838)	(39.081)	(0.968)	(3.576)	(3.579)	(3.571)
Observations	24420	24420	24420	24420	24420	24420	24420	24420
Month and region FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4

	Capital Investment			Harvest	
	Boats (boats/month)	Power (Hp/month)	Capacity (ton/month)	Harvest (ton/month)	Revenue (MUSD/month)
Regime:					
TURF	−0.006	−1.357*	−0.145	39.661**	5.258***
	(0.008)	(0.663)	(0.077)	(15.343)	(1.404)
Tsunami (Year=2010):					
Runup	0.014***	0.523*	0.069**	1.031	−0.027
	(0.003)	(0.233)	(0.026)	(4.456)	(0.341)
Runup X TURF	−0.010*	−0.295	−0.053	9.238	0.389
	(0.004)	(0.301)	(0.034)	(5.757)	(0.441)
Tsunami (Year=2011):					
Runup	0.036***	2.022***	0.278***	2.043	0.063
	(0.003)	(0.215)	(0.024)	(4.112)	(0.315)
Runup X TURF	−0.020***	−1.269***	−0.162***	16.964**	0.809*
	(0.004)	(0.277)	(0.032)	(5.308)	(0.406)
Tsunami (Year=2012):					
Runup	0.038***	2.509***	0.281***	0.787	0.048
	(0.003)	(0.221)	(0.025)	(4.221)	(0.323)
Runup X TURF	−0.016***	−1.271***	−0.132***	−1.171	−0.389
	(0.004)	(0.277)	(0.032)	(5.309)	(0.406)
Tsunami (Year=2013):					
Runup	0.009**	0.643**	0.101***	0.321	0.063
	(0.003)	(0.222)	(0.025)	(4.236)	(0.324)
Runup X TURF	−0.002	−0.294	−0.064*	−8.728	−0.832*
	(0.004)	(0.278)	(0.032)	(5.310)	(0.406)
Observations	24420	24420	24420	24420	24420
Month and region FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6 - Hp/month

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Regime:							
TURF	−1.882**	−1.356*	−1.463*	−1.881**	−1.883**	−1.483*	−1.886**
	(0.647)	(0.663)	(0.653)	(0.648)	(0.648)	(0.666)	(0.652)
Fixed impact:							
Tsunami	8.043***			15.086	11.694		−142.562
	(0.826)			(13.291)	(6.557)		(186.887)
Tsunami X TURF	−3.037*			−5.629	−4.516		147.046
	(1.260)			(13.778)	(6.836)		(187.773)
Linear impact:							
Runup		1.450***				1.049*	
		(0.134)				(0.429)	
Runup X TURF		−0.804***				−0.258	
		(0.164)				(0.442)	
Tsunami X Runup				−1.362			58.466
				(2.564)			(70.790)
Tsunami X Runup X TURF				0.687			−57.686
				(2.618)			(70.984)
Non linear impact:							
$Runup^2$			0.307***			0.095	
			(0.029)			(0.094)	
$Runup^2$ X TURF			−0.230***			−0.123	
			(0.033)			(0.096)	
Tsunami X $Runup^2$					−0.136		−5.653
					(0.242)		(6.685)
Tsunami X $Runup^2$ X TURF					0.090		5.555
					(0.245)		(6.694)
Observations	24420	24420	24420	24420	24420	24420	24420
Month and region FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7 - Hp/month

	(1)	(2)	(3)	(4)	(5)
Regime:					
TURF	−1.356*	−1.386*	−1.394*	−1.405*	−1.398*
	(0.663)	(0.662)	(0.664)	(0.666)	(0.664)
Tsunami:					
Runup	1.450***	1.449***	1.450***	1.451***	1.450***
	(0.134)	(0.134)	(0.134)	(0.134)	(0.134)
Runup x TURF	−0.804***	−0.806***	−0.809***	−0.811***	−0.810***
	(0.164)	(0.164)	(0.164)	(0.164)	(0.164)
Harvest:					
Harvest (y)		0.000	0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)	(0.000)
Harvest (y-1)			0.000	0.000	0.000
			(0.000)	(0.000)	(0.000)
Harvest (y-2)				0.000	0.000
				(0.000)	(0.000)
Harvest (y-3)					−0.000
					(0.000)
Observations	24420	24420	24420	24420	24420
Month and region FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$