

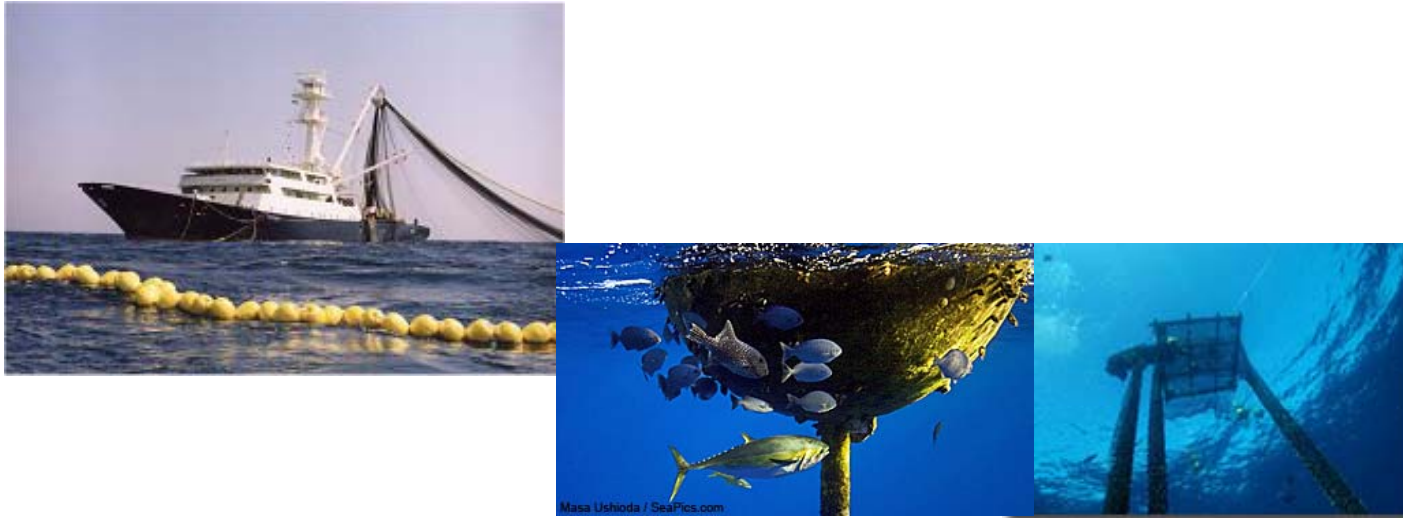


The respective roles of vessel, skipper and environment in tuna catches

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Montpellier, 18 October 2012



What drives the use of FADs? Impact of FADs on Catches?



2 MADE papers:

-Guillotreau P., Salladarré F., Dewals P., Dagorn L. (2011), Fishing tuna around FADs vs free swimming schools: skipper decision and other determining factors, *Fisheries Research* 109: 234-242

-Wolff F.C., Squires D., Guillotreau P. (2012), The firm's management in production: Management, firm and time effects in an Indian ocean tuna fishery, *American Journal of Agricultural Economics* (accepted October 12th 2012)

Hypothesis The variability of catches within a tuna fishery depends on:

- the nominal level of fishing effort (fishing hours, number of sets)
- the nature of fishing effort (free schools vs FADs)
- the experience of skippers (learning-by-doing effect)
- the length of job tenure (association vessel-skipper)
- the natural conditions (catchability of fish)
- the vessel type (firm effect)
- the skipper skill (firm's management)

Model Cobb-Douglas technology with 3 types of Fixed Effects:

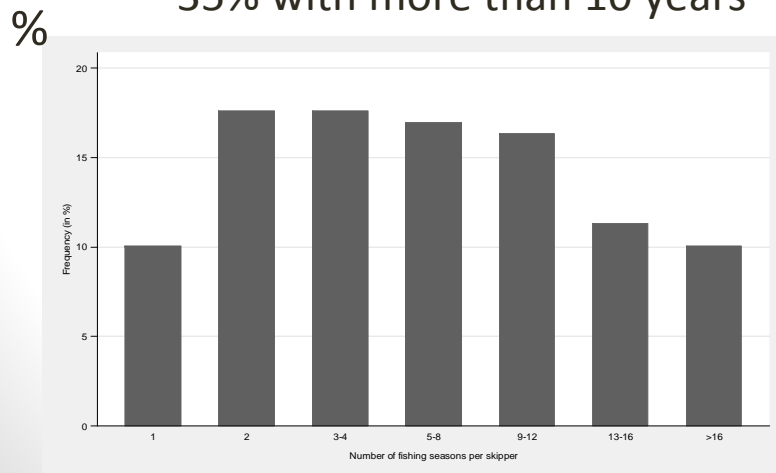
$$\ln Q_{it} = \ln A + \alpha \ln L_{it} + \beta \ln K_{it} + \gamma \ln H_{it} + \delta + \eta_i + \theta_t + \epsilon_{it}$$

Data Unbalanced panel dataset of **1197 obs.** for French Purse –seiners operating in the Indian Ocean (IRD Observatoire Thonier – P. Dewals):

- **28** years (1980-2007)
- **150** skippers
- **60** vessels
- **320** matched skipper-vessel combinations

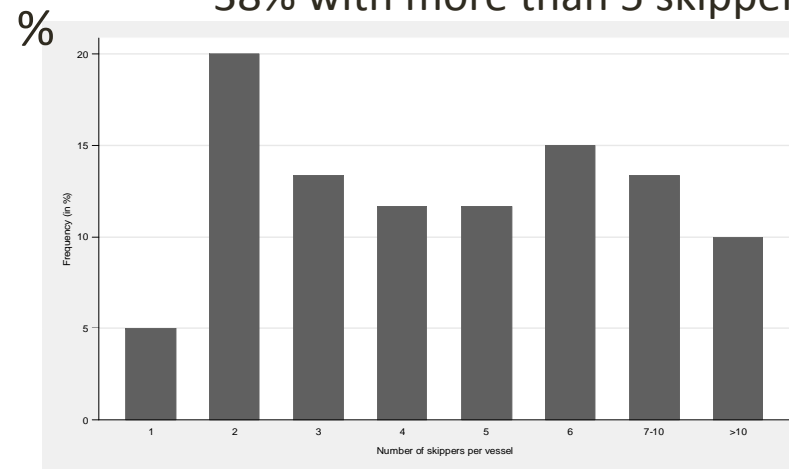
Number of fishing years per fisher
(Mean=7.5 years)

35% with more than 10 years



Number of skippers per vessel
(Mean=5.3)

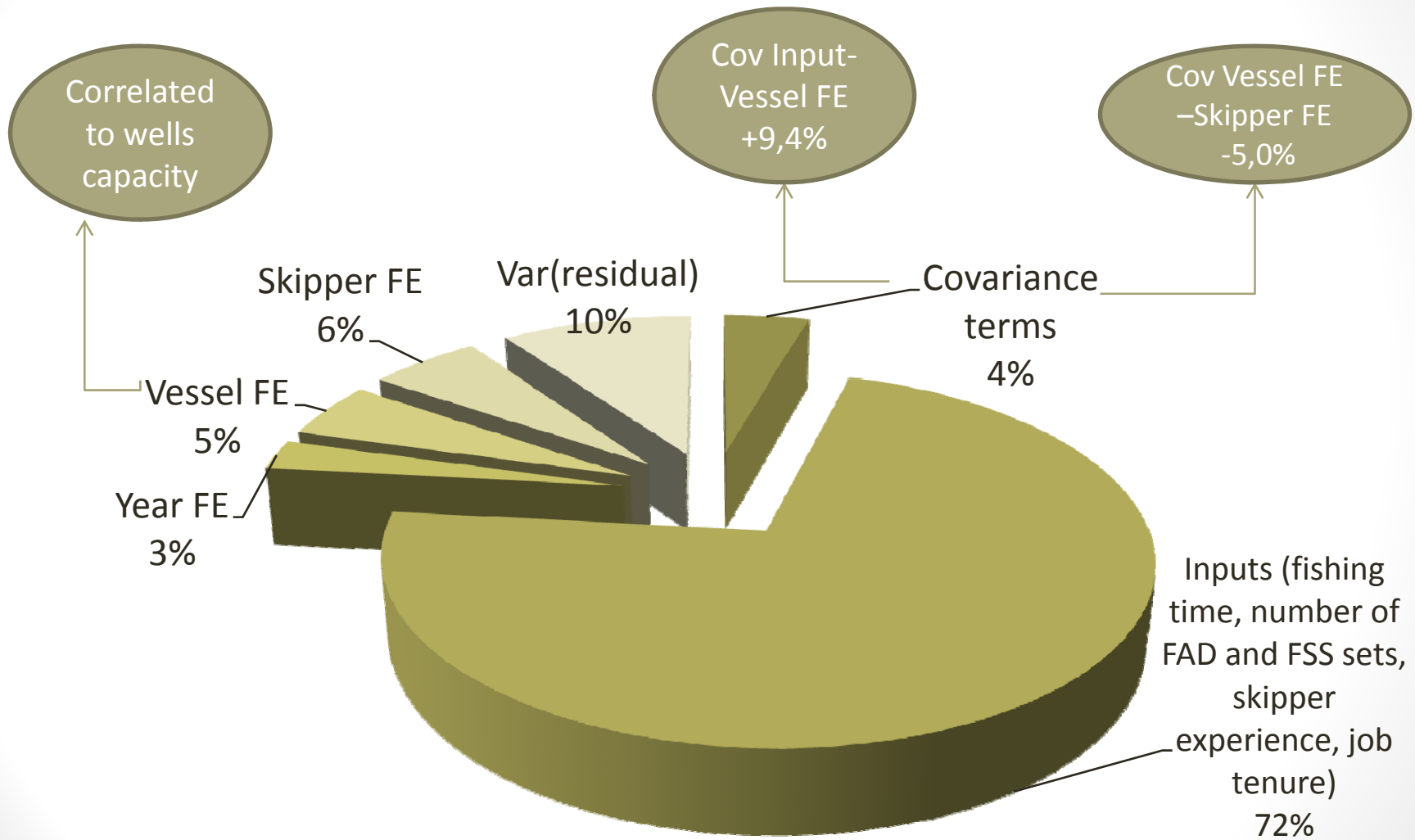
38% with more than 5 skippers



RESULTS

- Increasing by **10%** the number of fishing hours, the number of FAD sets and the number of FS sets increases the catch tonnage by **3.7%**, **4.5%** and **2.3%** respectively ($R^2=0.90$).
- Significant difference between the effectiveness of FAD sets vs FS sets for movers (skippers changing of vessels), not for non-movers (same coefficient) relying more on skipper skills and natural conditions
- Skipper overall experience and skipper-vessel specific experience play no role
- Significant influence of unobserved heterogeneity (vessel, skipper and year Fixed Effects) in the variance of catches

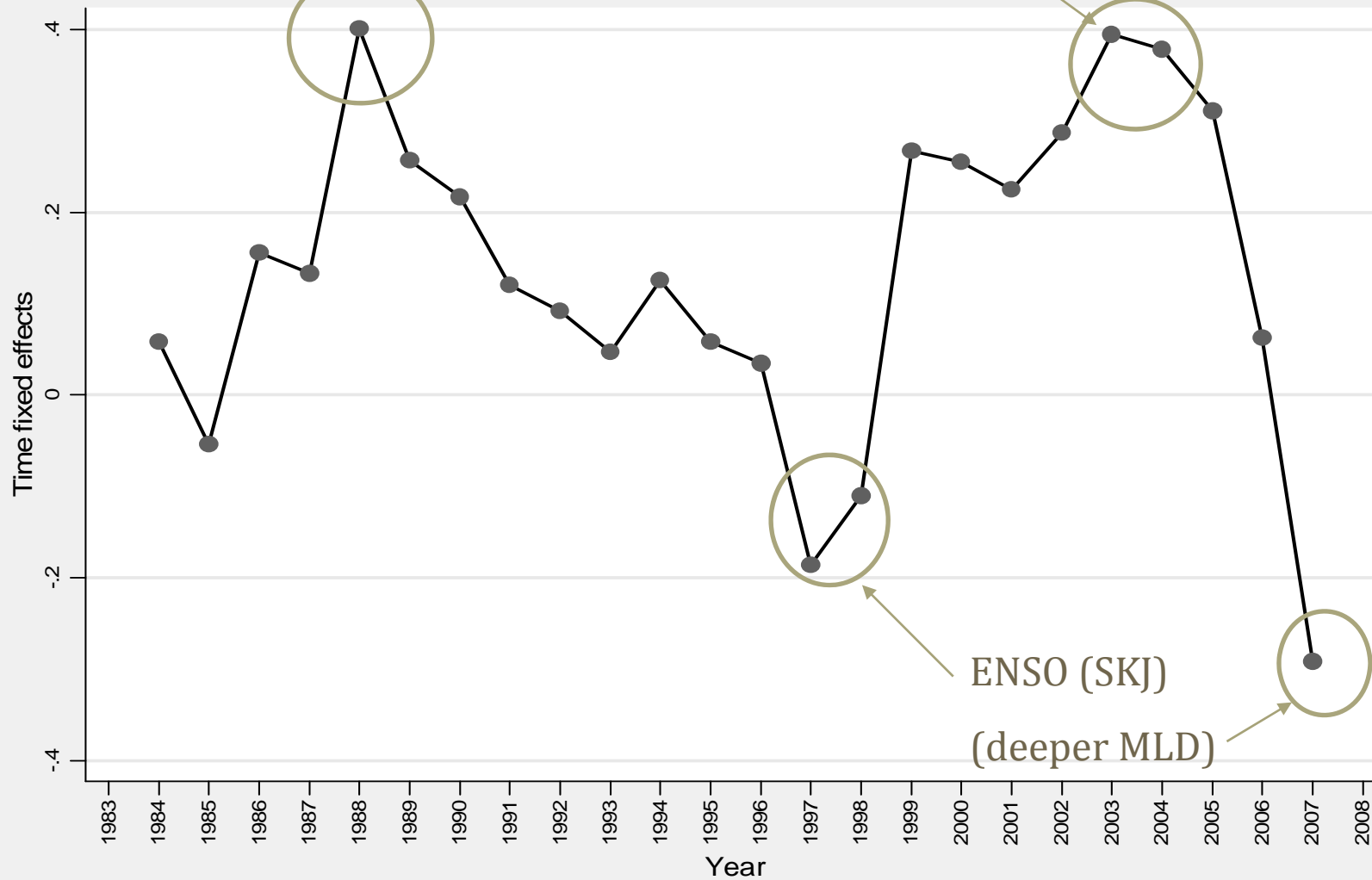
Variance decomposition of the fixed effects (FE)



Year fixed effects = natural conditions

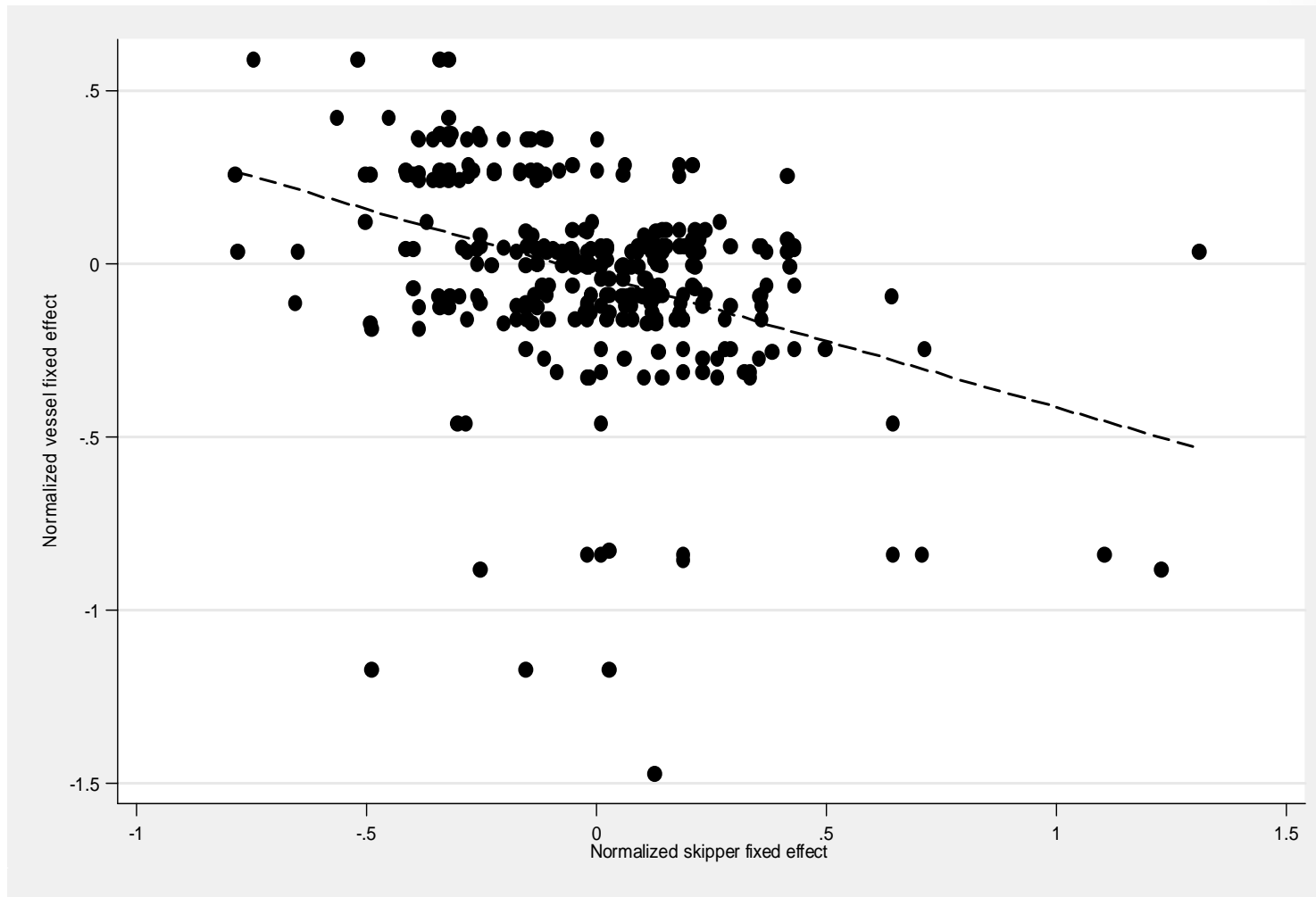
Record catches of large YFT in 1988

Squillas (YFT) years



Mitigating impacts of fishing on pelagic ecosystems: towards ecosystem-based management of tuna fisheries

Correlation between skipper FE and vessel FE



Three-way FE estimates by species (not included in the AJAE paper)

Variables	(1) Yellowfin	(2) Skipjack	(3) Bigeye	(4) Mix
Fishing hours (ln)	0.392* (1.83)	0.435 (1.49)	1.324*** (3.46)	0.168 (0.36)
Sets on floating objects (ln)	0.133 (1.40)	0.984*** (6.78)	0.630*** (3.30)	0.660*** (2.67)
Sets on free-swimming schools (ln)	0.909*** (7.48)	0.058 (0.57)	-0.009 (-0.05)	0.055 (0.25)
Skipper overall experience (ln)	-0.159 (-0.81)	-0.231 (-1.56)	-1.105*** (-3.05)	0.383 (0.84)
Skipper vessel-specific experience (ln)	0.130 (0.87)	-0.179** (-2.15)	0.502** (2.35)	0.093 (0.39)
Year fixed effects	YES	YES	YES	YES
H0: ln(FADS)=ln(free schools)				
F-stat ; prob.	44.45;0.000	52.65;0.000	8.18;0.005	4.97;0.027
Number of observations	1197	1197	1197	1197
Number of vessels	60	60	60	60
Number of skippers	159	159	159	159
R ²	0.645	0.669	0.508	0.532

Conclusions

- Fishing effort explains more than 70% of tuna catches => room for management measures on effort control (vessel day scheme, capped number of FAD buoys)
- Catch composition highly influenced by the fishing technique (FS vs FAD ⇔ large YFT vs SKJ + juveniles YFT-BET)
- Management and firm effects rather equivalent (5-6%) and prevailing over natural conditions (3%). Combined vessel and skipper effects could be neutral for catch levels.
- Innate skipper skills (no learning-by-doing effect)
- Vessel fixed effect (time invariant) positively influenced by the size (wells capacity in m³) of the boat, not by the year of construction.
- More to come on Thursday (with Arantza): comparison between French and Spanish fleets.