Disaggregation of annual variable cost data of fishing

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Need for EU fleet economic data

Application	Temporal resolution	Spatial resolution	Activity resolution
Long Term Management Plans (impact assessment, evaluation)	annual	ICES (sub-) division	Fishery on target species
Marine Strategy Framework Directive	annual	Several (e.g.ICES division)	DCF fleet segment, gear type
Ecosystem Approach to Fisheries Management	annual	Ecosystem (e.g. ICES rectangle)	Several (e.g. métier)
Regional analysis e.g. within EU Annual Economic Report	annual	Region (e.g. Baltic Sea)	DCF fleet segment
Marine Spatial Planning (e.g. wind farms, pipelines)	annual (seasonal)	Several (e.g. wind farm area)	fishery on target species/using specific gear

Suitability of ECONOMIC data resolution

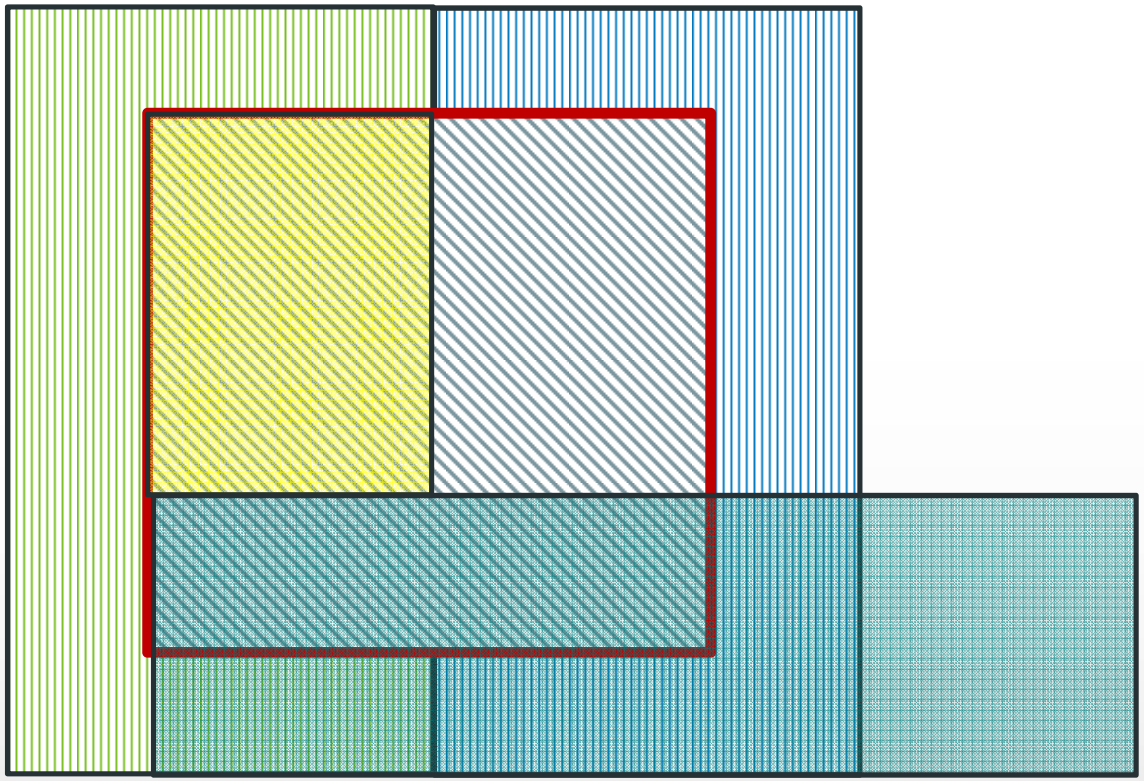
Application Requirements	DCF Economic data
Temporal resolution	
- Annual - Seasonal	- Annual
Spatial resolution	
- ICES (sub-) division - ICES rectangle - Region (e.g. Baltic Sea) - Specific (e.g. Wind farm)	Supra-Region (ICES + NAFO) or (Med + Black) or (OTHER)
Activity resolution	
- Target species - Stock - Gear type - Métier	- Fleet Segment (dominant gear × length class)

Suitability TRANSVERSAL versus ECONOMIC

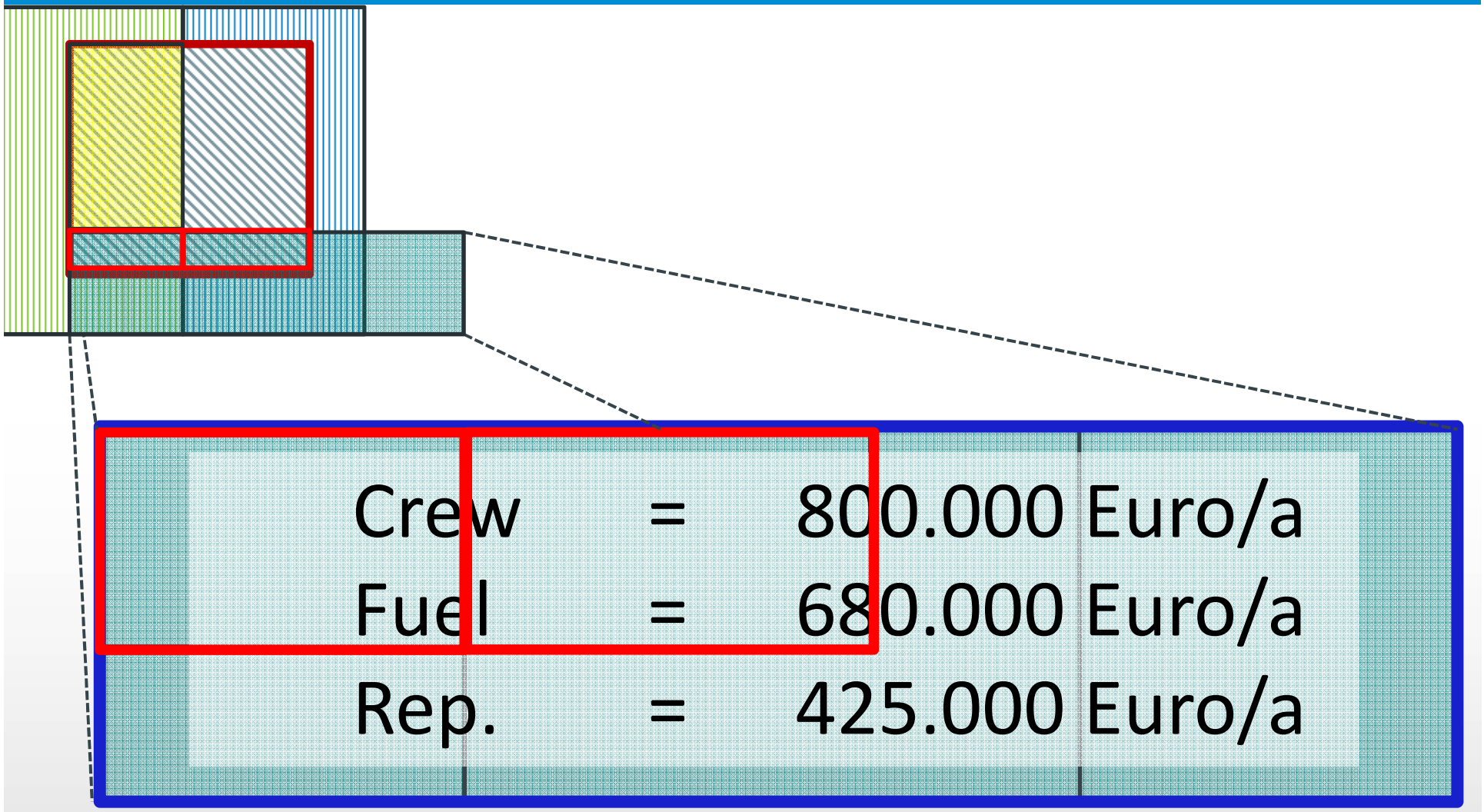
Transversal	Requirements	Economic
Temporal resolution		
- Month	- Annual - Seasonal	- Annual
Spatial resolution		
- Fishing ground (e.g. ICES rectangle)	- ICES (sub-) division - ICES rectangle - Region (e.g. Baltic Sea) - Specific (e.g. Wind farm)	Supra-Region (ICES + NAFO) or (Med + Black) or (OTHER)
Activity resolution		
- All by vessel × trip (or even haul)	- Target species - Stock - Gear type - Métier	- Fleet Segment (dominant gear × length class)

Management Plan Example: 1 Stock - 2 Metiers

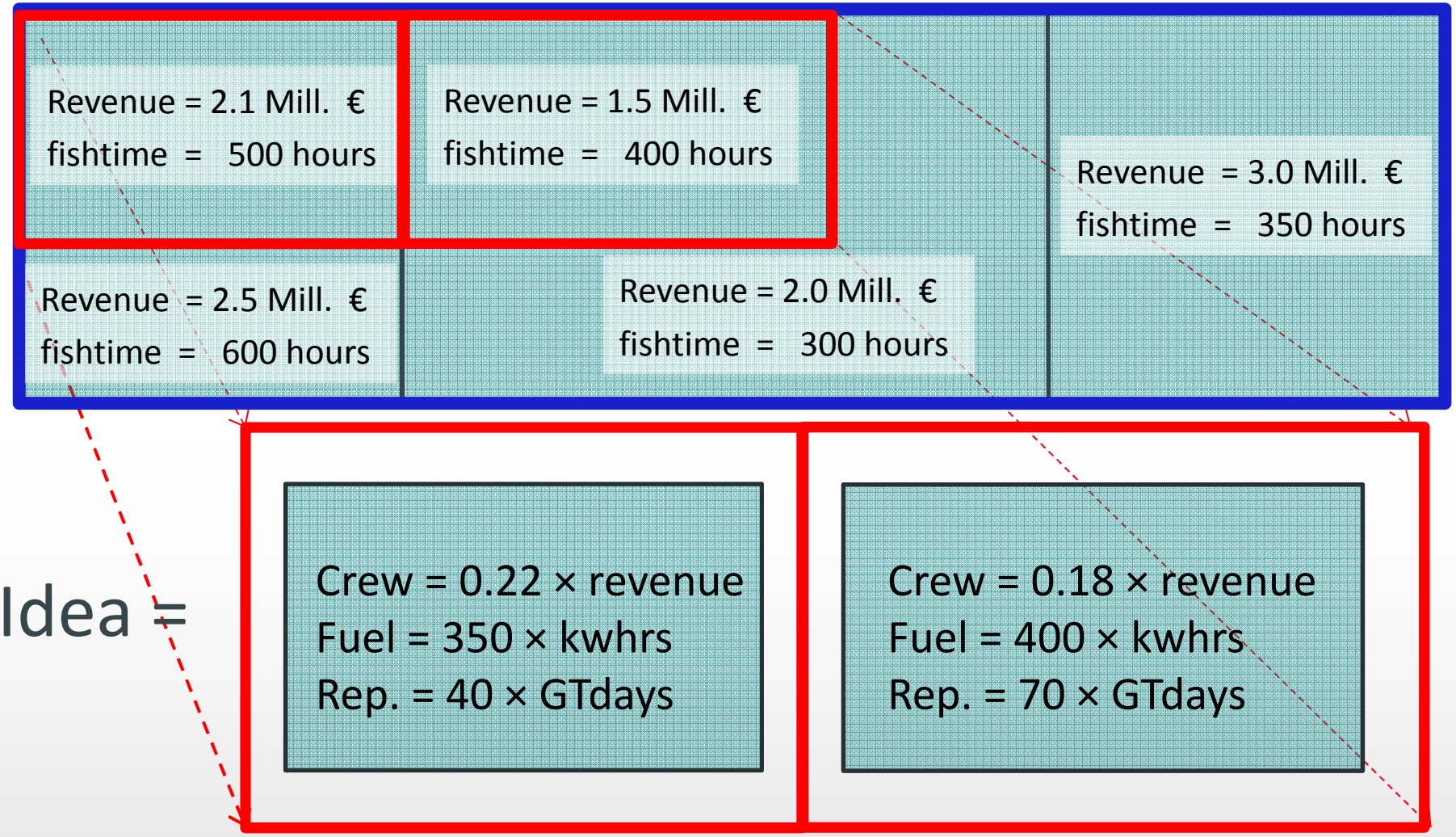
Stock × Area | Metier 1 | Metier 2 | Fleet Segment 1 | Fleet Segment 2



Available DCF cost data



Available DCF transversal data



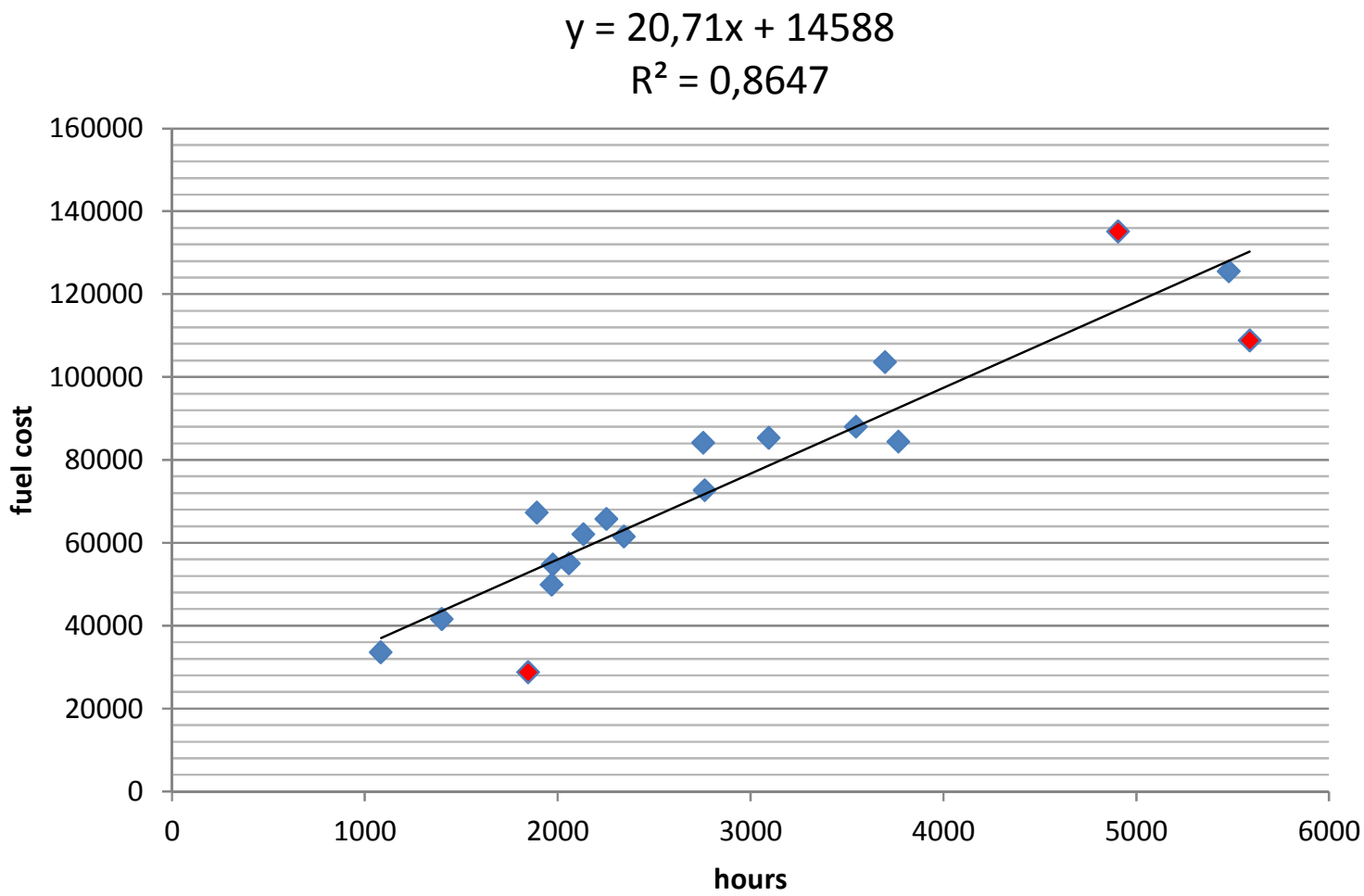
Approach

- Search for **correlations** between transversal and economic data
- Data for **individual vessels** required
- **Group vessels** (e.g. DCF fleet segment)
- Apply **models**

- **Some hypotheses:**
  - Crew paid by share of revenue
  - Fuel consumption/costs depend on time at sea and kW
  - Repair and other variable costs depend on time at sea and GT

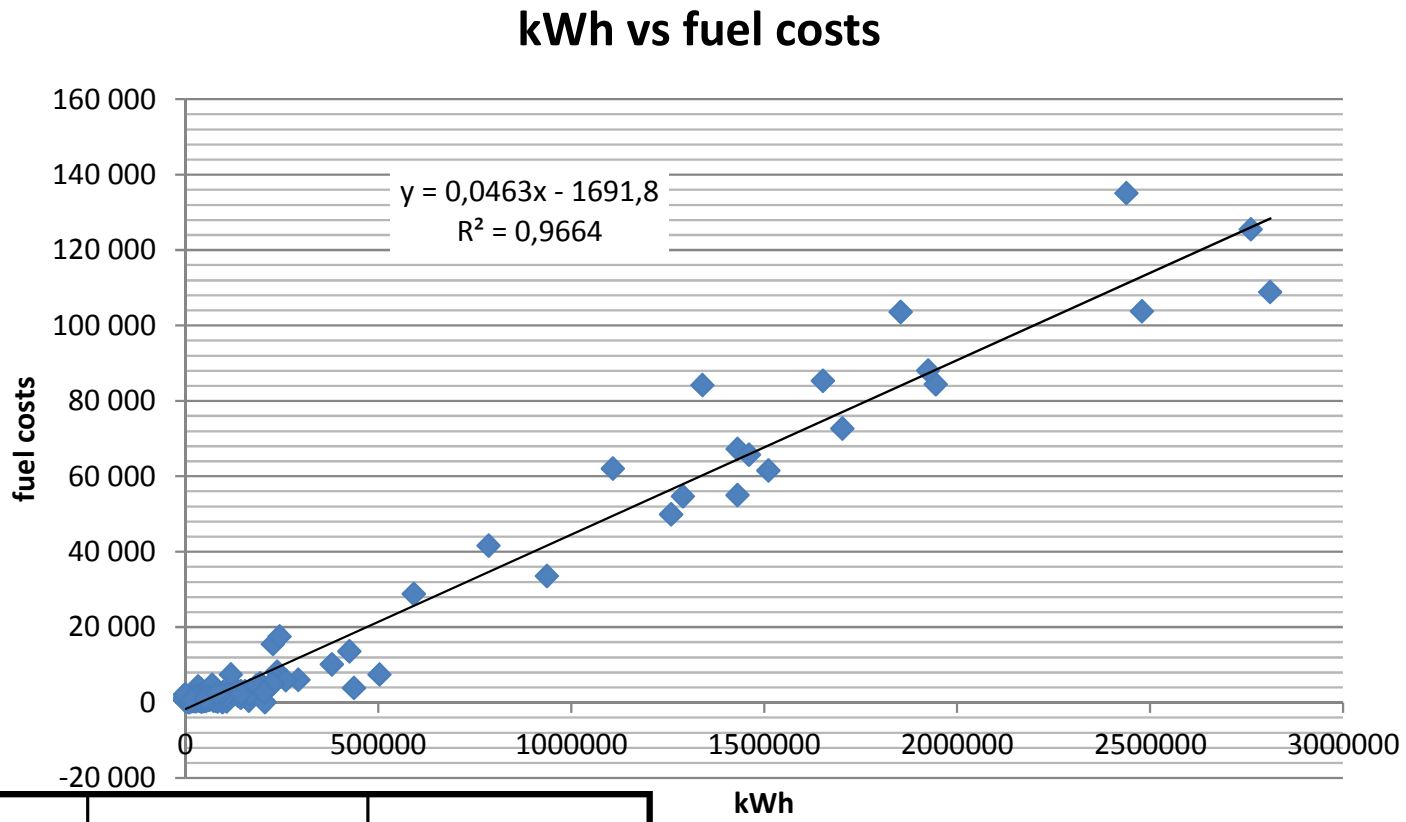
Example:
Fuel cost vs hours at sea

Pelagic trawlers
24 – 40m



Example:
Fuel cost vs kWhours at sea; metier

207 vessels

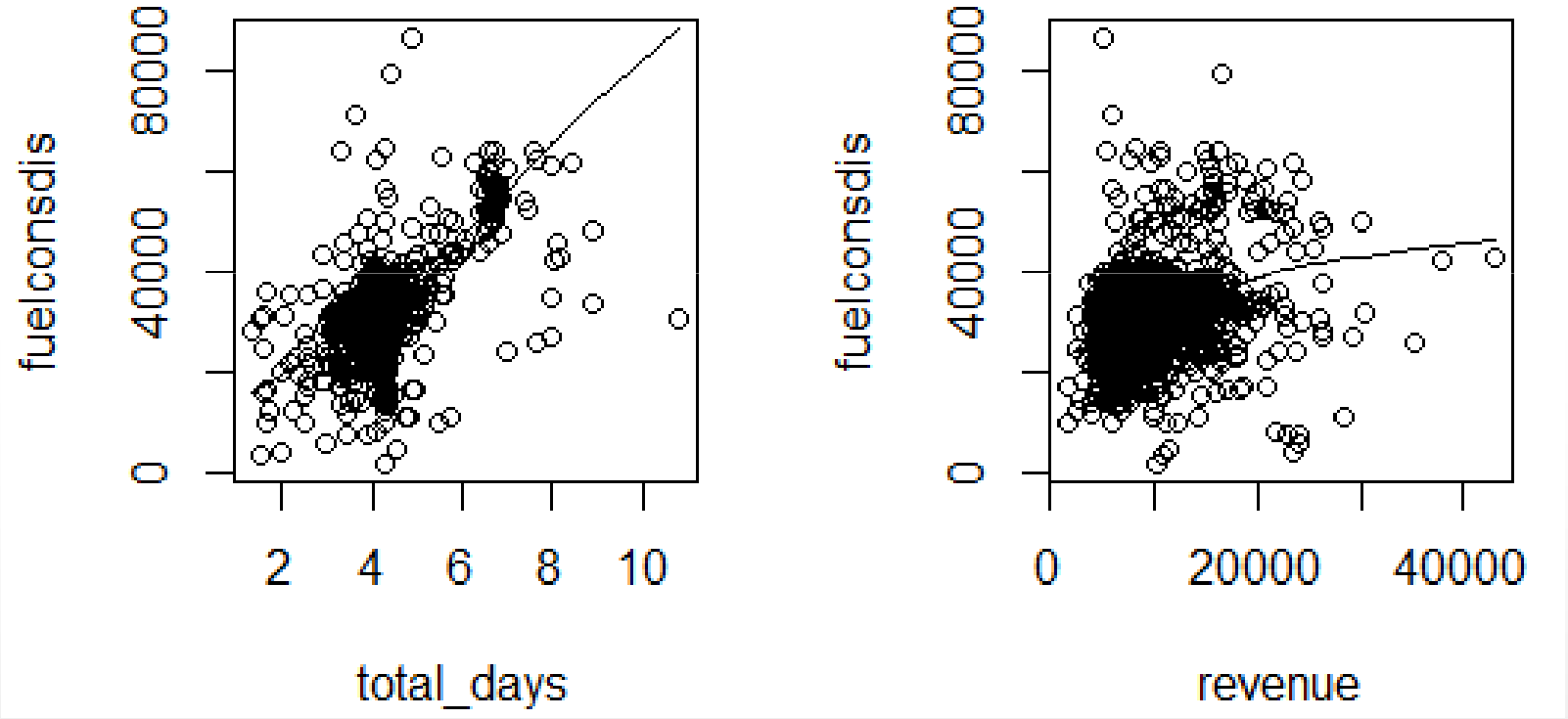


Model	R	R Square[b]	Adjusted R Square	Std. Error of the Estimate
1	,988[a]	,977	,976	4076,4997183

a. Predictors: POTS_FWS, PEL_TRAWL_SPF, LONGLINE, GILL_OTH, OTTER_DEF, GILL_DEF, GILL_FWS

Example:
Fuel consumption vs days at sea per trip

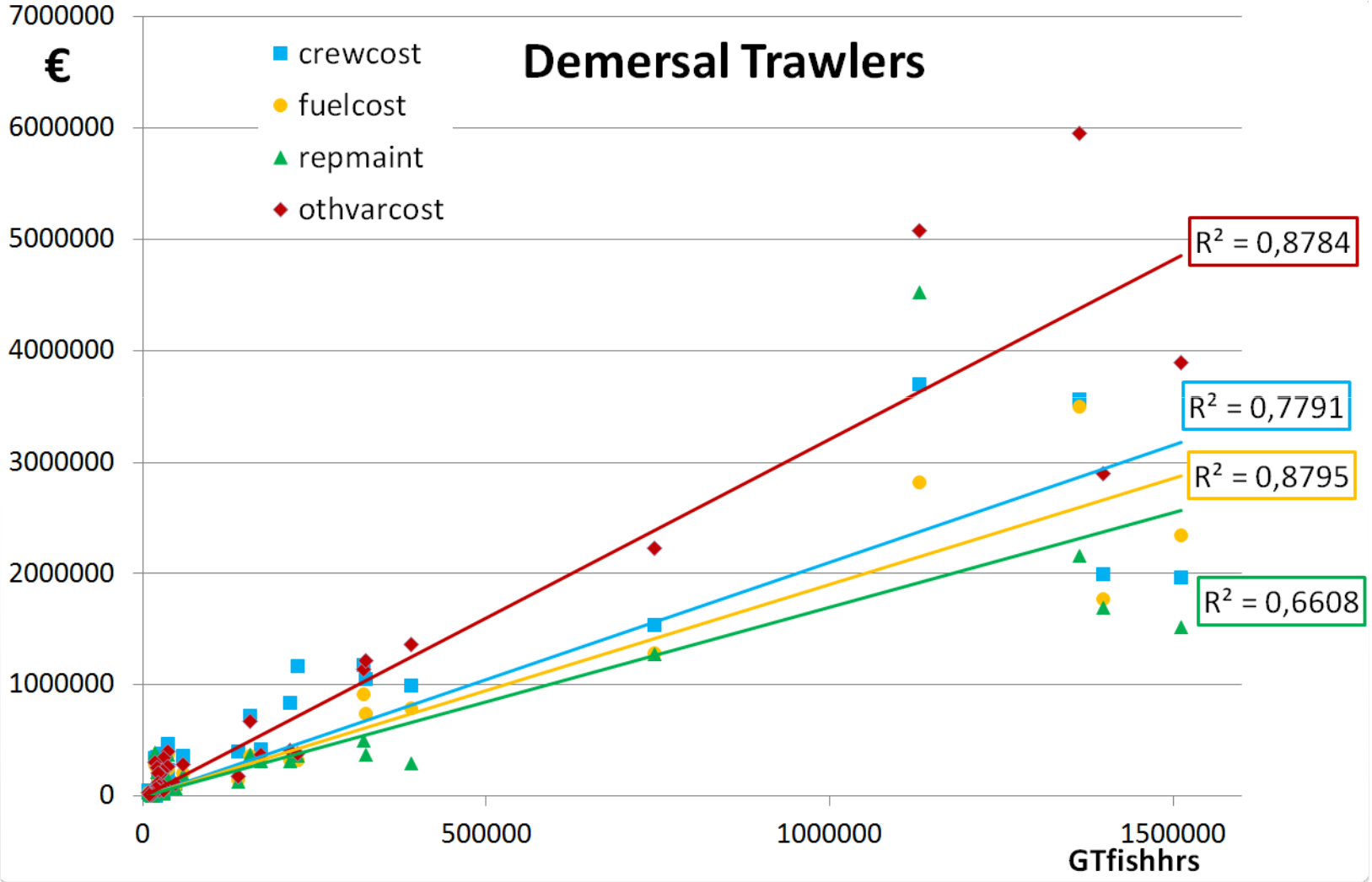
Beam trawlers > 40m



Example:
Several Variable Costs vs. GTFishing hours I

35 vessels

12-40m

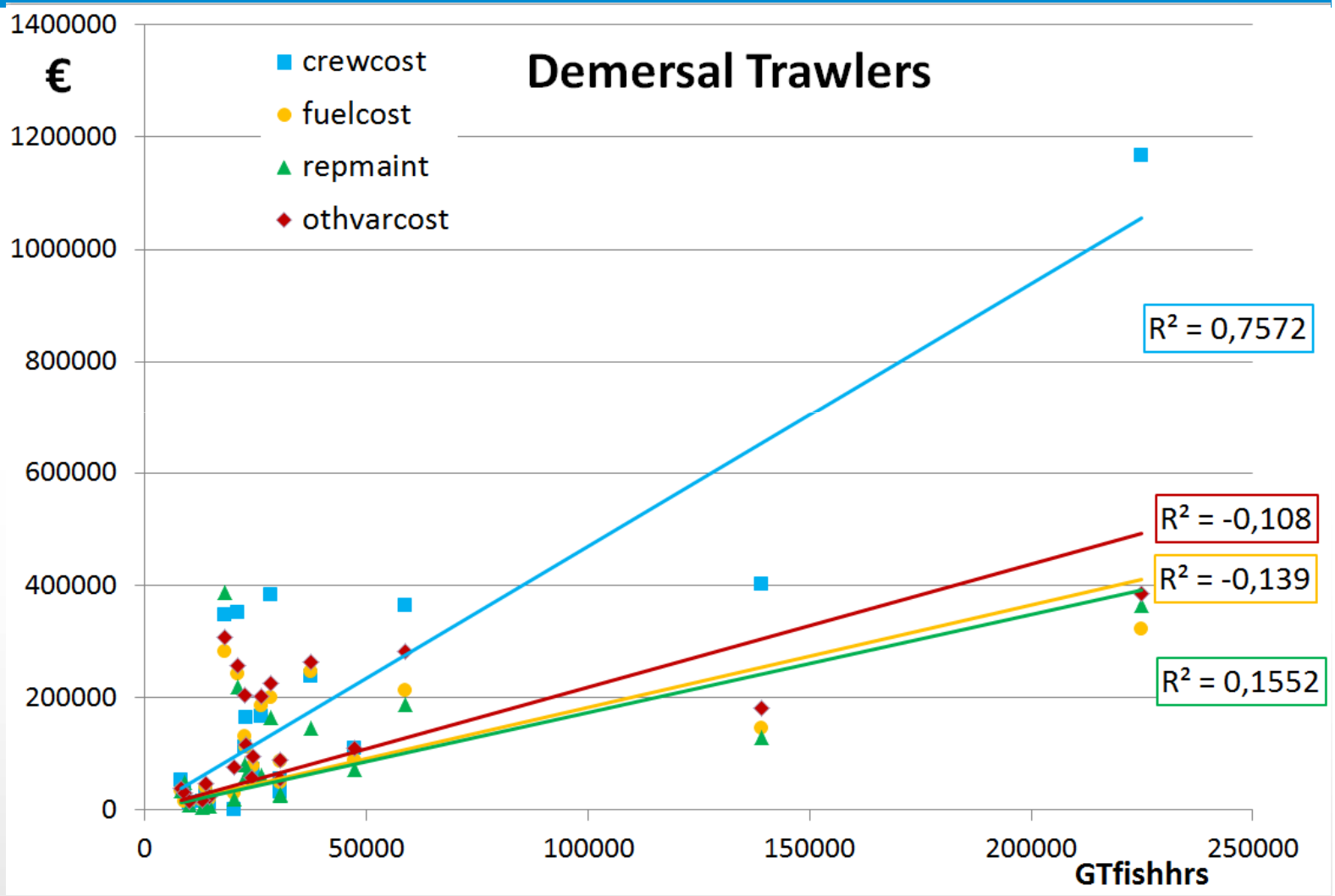


Example:
Several Variable Costs vs. GTFishing hours II

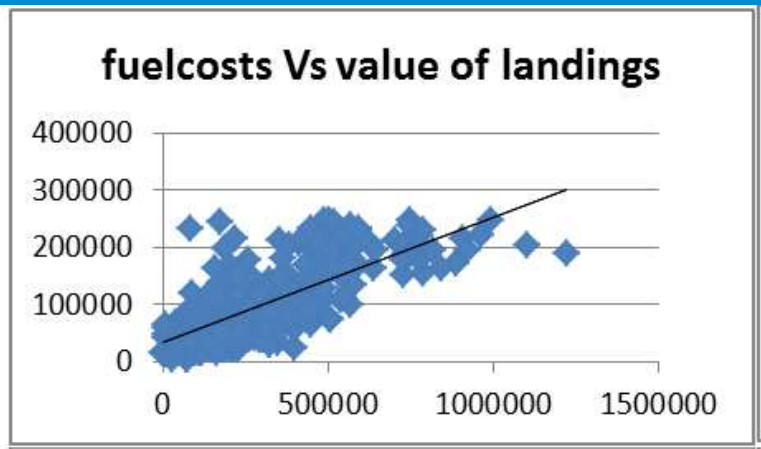
21 vessels

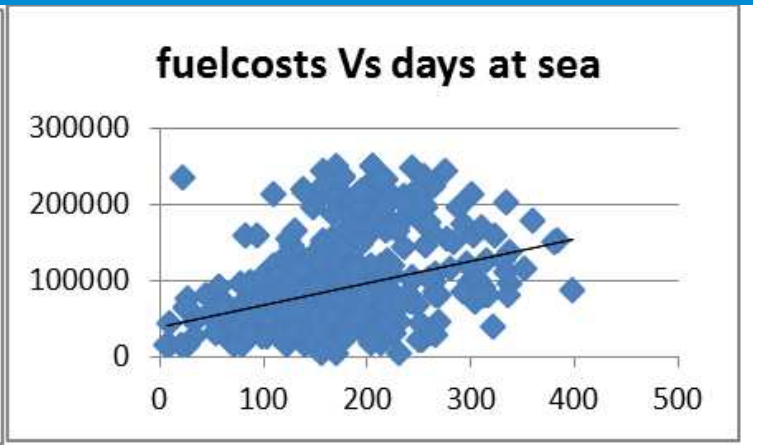
12-24m

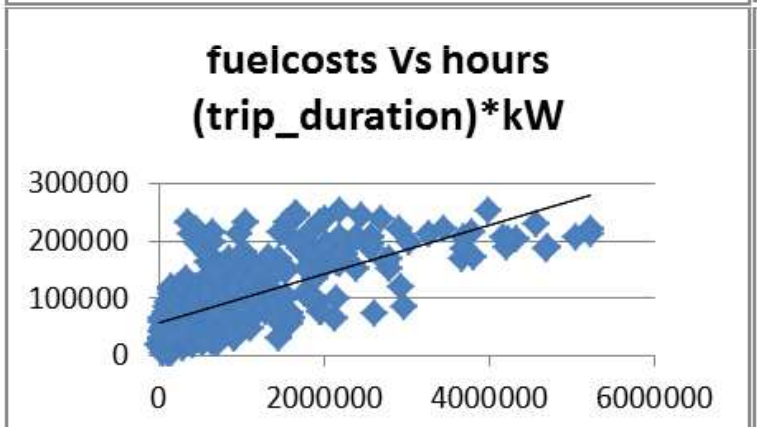
-> leverage!

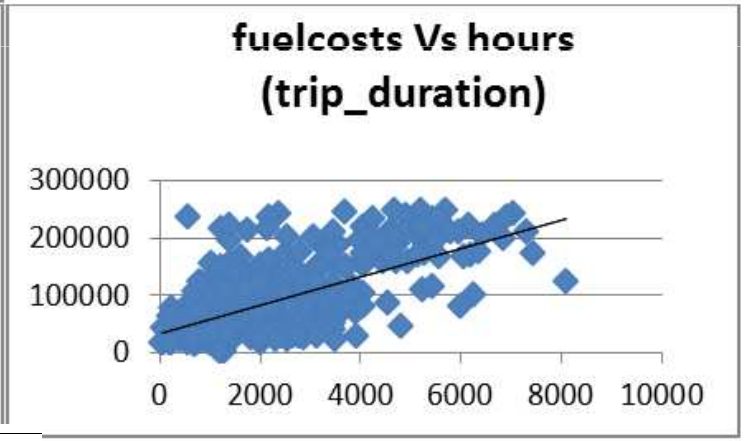


Example:
Fuel cost vs. several variables (600 vessels)









Dependent variable	Independent variable (cost driver)	R_square value
Fuel costs	Days at sea	0.1265
	Value of landings (gross revenue)	0.5429
	Total hours (trip)	0.4052
	Total hours (trip)*kW	0.4798

Example:
Overview for 1 MS

R^2 for combination of different variables

DCF variable	CREWCOST	FUELCOST	REPMAINT	OTHVARCOST
Fuel cost	0.88			
Revenue	0.91			0.85
Days at sea	0.49	0.50	0.27	0.49
kWDay	0.87	0.98	0.72	0.87
Number of crew members	0.82			
gear		x	x	x
Region		x	x	
Steam. /fishing time		x		
LoA	(x)	x	x	x
GT	(x)	0.92	0.83	0.78
kW	(x)	0.91	0.83	0.78
Vessel age			x	
x - potentaily correlated variables (assumption)				
0.91 best scores				

Example:
Multiple regression fuelcost vs. fishhrs; by metier

Model Summary

Model	R	R Square[b]	Adjusted R Square	Std. Error of the Estimate
1	,895[a]	,802	,793	246188,107

a. Predictors: OTB_DEF_70-99 _0_0, PTB_DEF_>=105_1_120, TBB_CRU_16-31 _0_0, OTB_DEF_>=105_1_120, PTM_SPF_32-104_0_0

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	TBB_CRU_16-31 _0_0	35,812	15,956	,094	2,244	,027
	OTB_DEF_>=105_1_120	687,077	33,799	,903	20,328	,000
	PTB_DEF_>=105_1_120	380,351	523,802	,068	,726	,469
	PTM_SPF_32-104_0_0	-552,549	523,100	-,100	-1,056	,293
	OTB_DEF_70-99 _0_0	-153,572	326,068	-,021	-,471	,639

a. Dependent Variable: fuelcost

b. Linear Regression through the Origin

Some observations and considerations

- Some close correlation some high scattering.
- Hypotheses on cost drivers not always sufficiently supported.
- Additional information for modelling (e.g. metier) results in decreased number of observations.
- Fuel and crew costs incur frequently, repair less often (scattering).
- Crew costs might not include owner‘s wage (intercept?).

Concluding remarks

- Resolution of DCF economic data can not be increased
- Correlating transversal data seems viable to assign economic data to smaller units

However:

- Correlation not always satisfactory
- Not all MS have all data avaliable in one organisational unit
- Transversal data are also correlated
- Further investigation desirable

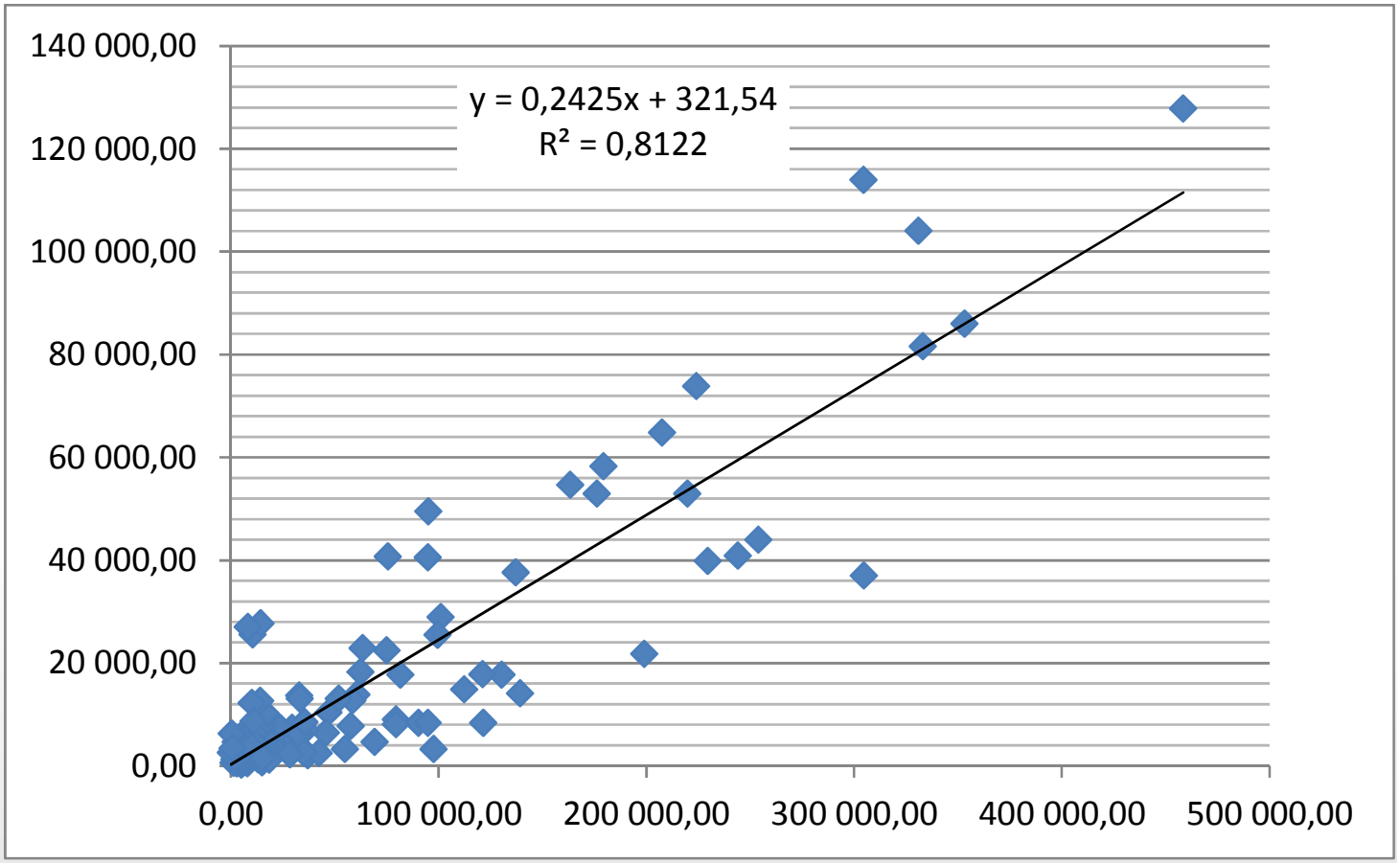
Thank you!

EU Data Collection Framework (DCF)

Resolution	Biological	Transversal	Economic
Temporal	Annual	Month	Annual
Spatial	Region	Fishing ground (ICES-Rectangle)	Supra-Region
Activity	Stock, gear	Gear	Fleet Segment (dominant gear × vessel length class)
Variables (examples)	Fish age, length, discards	Days at sea, catch weight + revenue	Costs, earnings

Example:
Crew costs vs. revenue

207 vessels, various fleet segments



Example:
Multiple regressionCrew cost vs fishing hours, by metier

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	FPO_DES_0_0_0	-10,170	71,092	-,003	-,143	,886
	GNS_DEF_>=16_0_0	-43,301	205,967	-,004	-,210	,834
	GTR_DES_>=16_0_0	7,728	18,356	,008	,421	,674
	LLD_LPF_0_0_0	18,718	16,781	,021	1,115	,265
	LLS_DEF_0_0_0	468,833	933,609	,010	,502	,616
	MIS	-132,808	220,632	-,011	-,602	,547
	OTB_DWS_>=40_0_0	24,588	1,450	,326	16,956	,000
	OTB_MDD_>=40_0_0	25,044	1,668	,300	15,012	,000
	OTM_MPD_>=20_0_0	52,221	10,805	,092	4,833	,000
	PS_SPF_>=14_0_0	333,440	227,734	,028	1,464	,144
	PTM_SPF_>=20_0_0	31,662	188,019	,003	,168	,866
	SB_SV_DES_0_0_0	61,890	411,983	,003	,150	,881
	TBB_DES_0_0_0	21,331	10,815	,037	1,972	,049
	OTB_DES_>=40_0_0	25,614	,749	,664	34,204	,000

a. Dependent Variable: crewcost

b. Linear Regression through the Origin