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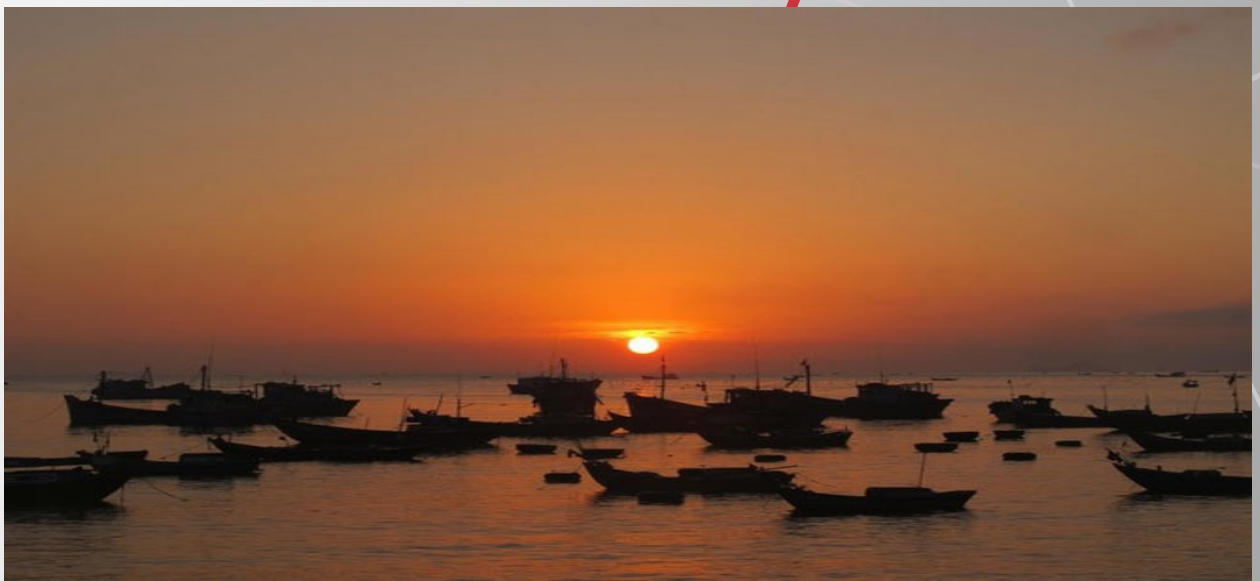
Fishery subsidies and profitability effects: average treatment effects based on propensity scores

Nguyen Ngoc Duy – Nha Trang University, Vietnam
Ola Flaaten – UiT T



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2) Research objectives
3) Theory and methodology
4) Results
5) Discussion and Conclusion

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1. Introduction

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- Vietnam's fisheries: open access
- Coastal fisheries: overexploited and overfished
- Offshore fisheries: underdeveloped with underexploited resources (international open access)

- Government's policy: develop offshore fisheries through some support schemes.

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1. Introduction (cont.)

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- Key subsidies for offshore fisheries in Vietnam:
  - 1997 – 2001: capital credit for the construction of vessels
  - 2008: fuel cost support program
  - 2011 – now: the 2010 support program (2011 – July 2014)
    the 2014 subsidy program (Aug 2014 – now)
    - Fuel cost support: based on engine size
    - Insurance support: vessel and crewmembers
    - Loans at favorable interest rates

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2. Research objectives

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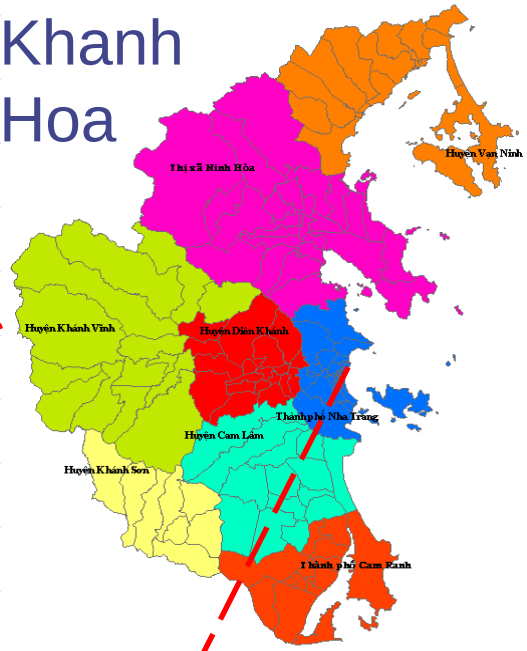
- How does a subsidy program effect on vessel profitability?
- What would have happened to vessel profitability if the subsidy program had not been implemented? (counterfactual outcomes)

➔ To evaluate the treatment effect of the 2010 subsidy program on the profitability of offshore gillnet vessels.

➔ To compare profitability after Government subsidies to profitability without such subsidies.

Geographical area

Khanh Hoa



The study fleet: offshore gillnet vessels

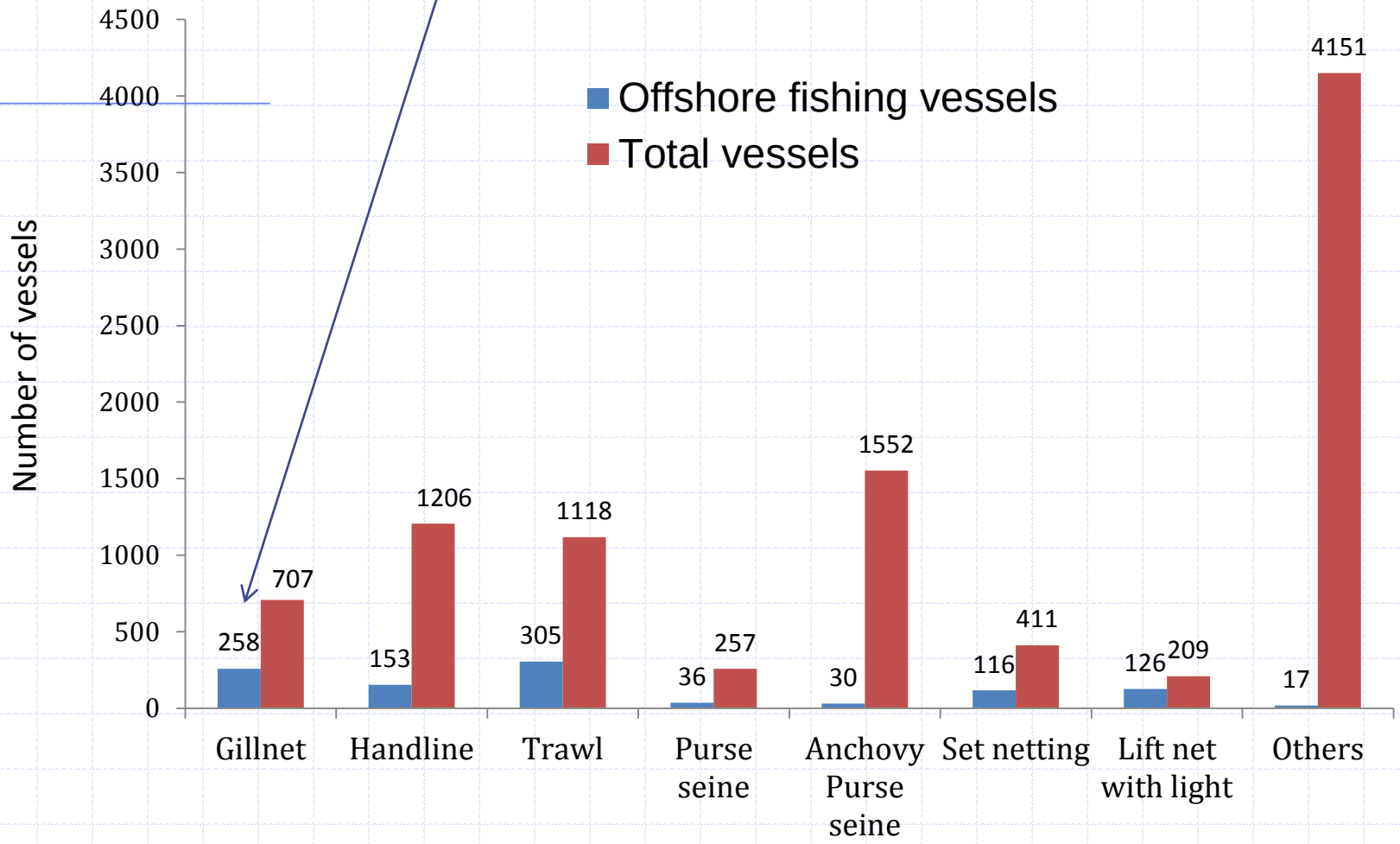


Fig.1. The offshore fleet in Khanh Hoa, Vietnam.

Source: DECAFIREP (2012)

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3. Theory and methodology

Economic performance (EP) measures

	Gross revenue (GR= landings value)
	– Variable operating costs
=	Income
	– Fixed operating costs (i.e., repair and maintenance costs and insurance)
	– Labor costs
=	Operating cash flow (OCF)
	– Depreciation
	– Interest payment on loans
=	Profit (= earnings before tax or EBT)
	– Calculated interest on the owner's capital
=	Rent (i.e., intra-marginal rent in open access)
	OCF margin = OCF/gross revenue
	Profit margin = profit/gross revenue

Fuel cost subsidies

Insurance subsidies

Loans at a subsidized interest rate

3. Theory and methodology (cont.)

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- Propensity-score matching method

Estimate propensity scores using a probit model

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Match each subsidized vessel to non-subsidized vessels on propensity scores

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Compare the means of the outcome across the two groups

3. Theory and methodology (cont.)

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❖ Data

- Surveys of costs and earnings for offshore gillnet vessels
- Balanced panel data of 57 vessels for each year: 2011 and 2012:
  - + 45 vessels participating in the 2010 subsidy program
  - + 12 non-participating vessels (not receiving the subsidies)
- The 2008 data with 52 vessels is used by inflating the 2008 values to the 2011 and 2012 values.

➔ 109 subjects for each of the years 2011 and 2012:

+ 45 vessels as subsidized (treated) observations

+ 64 vessels as non-subsidized (untreated/control) observations

4. Results

Probit Models for Propensity-Score Estimation

	2011		2012	
Variables	Coefficient	S.E.	Coefficient	S.E.
Engine power	0.004***	0.001	0.004***	0.001
Age of vessel	0.035	0.023	0.035	0.023
Age of owner	0.024*	0.012	0.024*	0.012
Constant	-2.926***	0.795	-2.985***	0.815
Log likelihood	-64.834		-64.834	
LR Chi^2	18.110		18.110	
Prob > Chi^2	0.000		0.000	
Pseudo R^2	0.123		0.123	
No. obs.	109		109	

Note.–Dependent variable: 1 = subsidized vessel; 0 = otherwise; S.E. is standard errors.
***, * Significant at the 1% and 10% levels, respectively.

4. Results (cont.)

Average treatment effects (ATET) of subsidies on EP

Indicators	2011			2012		
	NN matching	Radius matching	Kernel matching	NN matching	Radius matching	Kernel matching
Gross revenue	561.1***	568.0***	582.4***	306.7**	319.7***	324.5***
Variable operating costs	231.4***	240.3***	241.7***	239.1***	252.4***	255.1***
Income	329.7***	327.7***	340.7***	67.5	67.3	69.5
Fixed operating costs	-27.6***	-23.5***	-24.1***	-23.6**	-24.0***	-23.4***
Labor costs	38.4	16.5	21.2	-14.8	-17.8	-20.2
Operating cash flow	318.9***	334.7***	343.6***	105.9*	109.1**	113.1***
Depreciation	18.8	8.9	11.0	6.6	-2.2	0.0
Interest payment on loans	-3.1	-4.4	-4.2	-3.9	-5.2*	-4.9*
Profit	303.2***	330.3***	336.8***	103.2*	116.5**	118.1***
Calculated interest	51.6**	42.4***	46.6***	40.5***	33.3***	36.3***
Rent	251.6***	287.9***	290.2***	62.7	83.2*	81.8*
OCF margin	0.0569**	0.0630***	0.0645***	0.0216	0.0213	0.0231
Profit margin	0.0684**	0.0797***	0.0806***	0.0316	0.0368*	0.0376**
Average income per fisher	3.0	2.2	2.2	-2.0	-1.2	-1.7

4. Results (cont.)

Different ATET of subsidies on EP by engine power categories

	2011 (kernel matching)		2012 (kernel matching)	
	HP < 400 (N=29)	HP ≥ 400 (N=12)	HP < 400 (N=29)	HP ≥ 400 (N=12)
Gross revenue	499.7***	< 782.1***	258.3***	< 484.7***
Variable operating costs	191.0***	364.1***	199.7***	388.9***
Income	308.8***	< 417.9***	58.6	< 95.8
Fixed operating costs	-27.7***	-15.4**	-28.1***	-12.2
Labor costs	25.9	9.8	-22.8	-13.9
Operating cash flow	310.5***	< 423.6***	109.5**	< 121.9**
Depreciation	-8.8	58.9***	-18.7**	45.2***
Interest payment on loans	-3.0	-7.0**	-3.3	-8.7***
Profit	322.3***	< 371.7***	131.6**	> 85.5*
Calculated interest	10.6	133.7***	9.8	100.5***
Rent	311.8***	> 237.9***	121.8**	> -15.0
OCF margin	0.0631***	0.0680***	0.0243	0.0200
Profit margin	0.0831***	0.0746***	0.0427**	0.0253
Average income per fisher	4.2	-2.5	-0.8	-3.9**

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5. Discussion and Conclusion

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- Profitability when the Government's subsidy action takes place is greater than profitability without this action.
- The increased profitability of the vessels is a result of both revenue-enhancing and cost-reducing subsidy schemes:
  - Positive effects of the fuel support
  - Negative effects of insurance subsidies
  - Negative effects of capital cost subsidies

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5. Discussion and Conclusion

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- Do the subsidies provide a rosy prospect for the fishery?
  - The decreasing effects on vessel profitability, no change of the support schemes
  - A decrease in the counterfactual profitability
  - A reduction in the average catches of the gillnetters
- Positive impacts on the OCF of large vessels but negative effects on their IMR, while the positive effects on the rent of the small vessels.
- More benefits for the owners than for the crewmembers.

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Thank you for your attention!

3. Theoretical framework

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- The Gordon-Schaefer bio-economic model: the industry level

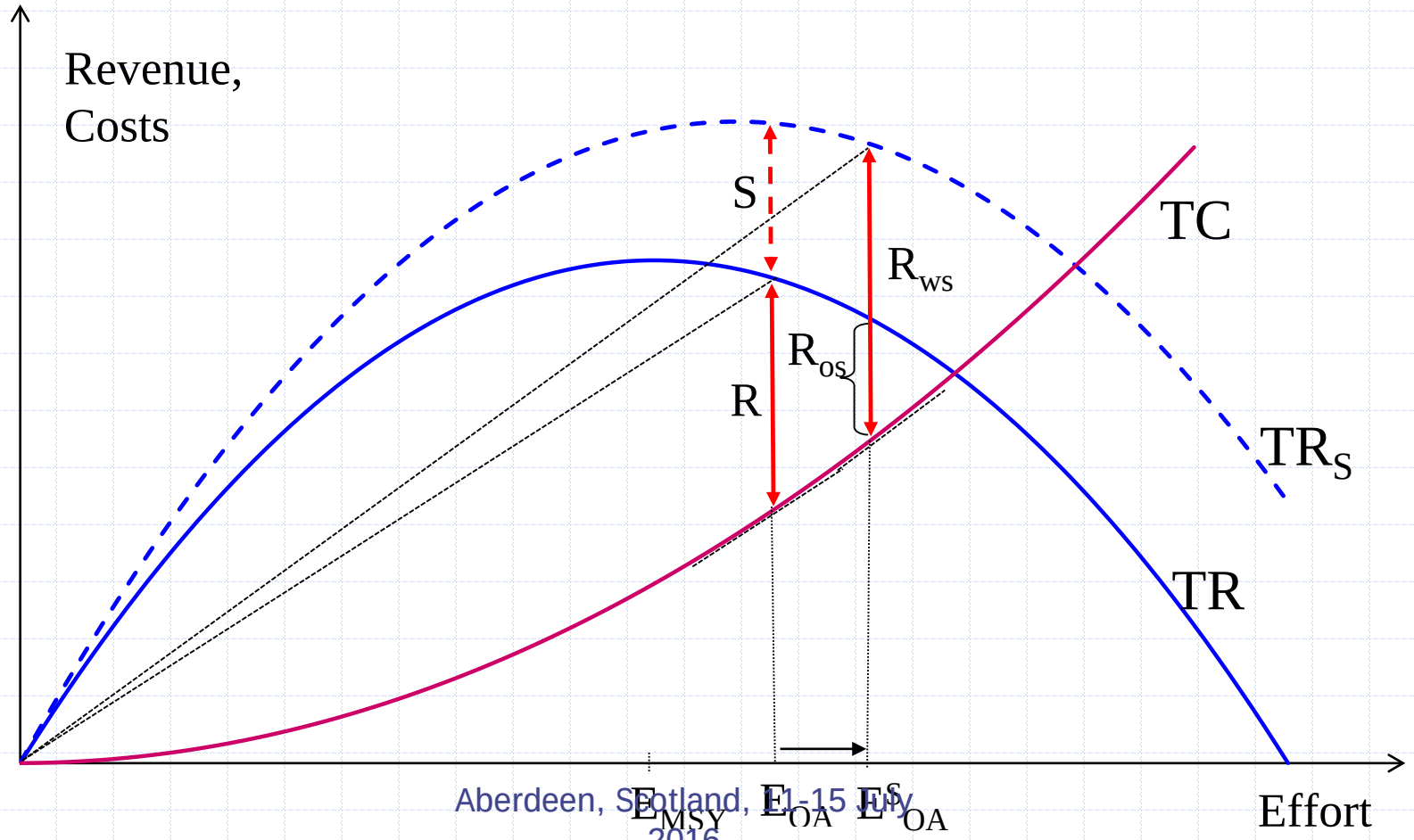

Fig. 3.

The fishing firm economics: the vessel level

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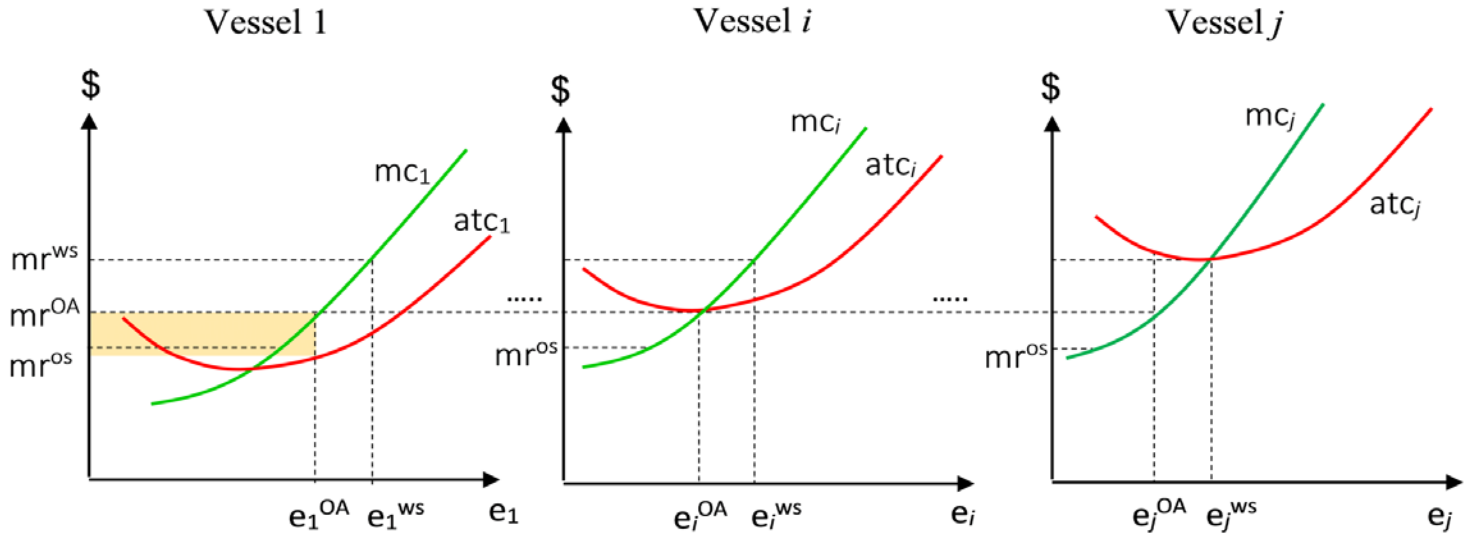

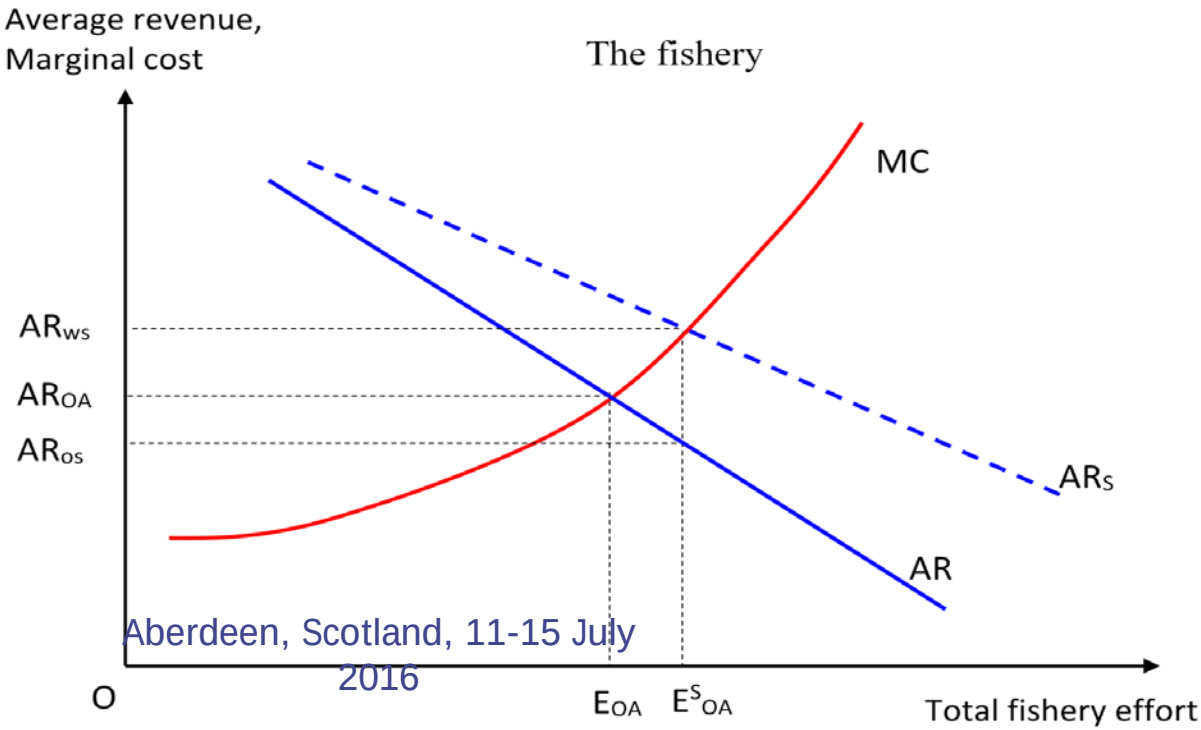

Fig.4. Distribution of benefits and incomes among heterogeneous vessels in an open-access fishery with revenue enhancing lump-sum subsidies.

4. Methodology (con't)

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- Propensity-score matching (PSM) method

$D_i = 1$ if vessel i receives treatment (subsidies) and zero otherwise

Changes in the EP of vessel i: $\Delta Y_i = Y_i(1) - Y_i(0)$

Observed outcome

Unobserved outcome (counterfactual outcome)

4. Methodology (con't)

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- Propensity-score matching (PSM) method

$D_i = 1$ if vessel i receives treatment (subsidies) and zero otherwise

Changes in the EP of vessel i: $\Delta Y_i = Y_i(1) - Y_i(0)$

The average treatment effect on the treated (ATET):

$$ATET = E[Y(1) - Y(0)|D = 1] = E[Y(1)|D = 1] - E[Y(0)|D = 1]$$

the expected unobserved EP of the subsidized vessels

4. Methodology (con't)

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- Propensity-score matching (PSM) method

$D_i = 1$ if vessel i receives treatment (subsidies) and zero otherwise

Changes in the EP of vessel i: $\Delta Y_i = Y_i(1) - Y_i(0)$

The average treatment effect on the treated (ATET):

$$ATET = E[Y(1) - Y(0)|D = 1] = E[Y(1)|D = 1] - E[Y(0)|D = 1]$$

The PSM estimators for the ATET can be identified:

$$ATET = E[Y(1) - Y(0)|D = 1] = E[E[Y(1) - Y(0)|P(X), D = 1]]$$
$$= E[E[Y(1)|P(X), D = 1] - E[Y(0)|P(X), D = 0]|D = 1]$$

the mean constructed counterfactual using the matched non-subsidized vessels

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4. Methodology (con't)

❖ Data

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➔ 109 subjects for each of the years 2011 and 2012:

+ 45 vessels as subsidized (treated) observations

+ 64 vessels as non-subsidized (untreated/control) observations

5. Results: Propensity-score estimation and tests

Table 2. Assessing the balancing of individual covariates before and after matching

	Before matching		After matching								
			NN matching			Radius matching			Kernel matching		
Variables	Bias (%)	Var. ratio	Bias (%)	Bias reduction (%)	Var. ratio	Bias (%)	Bias reduction (%)	Var. ratio	Bias (%)	Bias reduction (%)	Var. ratio
Engine power	70.8***	0.55[a]	6.9	90.3	0.73	1.8	97.5	0.76	4.4	93.7	0.79
Age of vessel	3.5	1.00	-10.3	-193.8	0.92	5.5	-55.4	0.98	1.8	47.6	0.94
Age of owner	37.6*	1.64	-5.6	85.1	1.26	-6.8	81.9	1.2	-7.3	80.5	1.14

[a] The variance ratio is outside [0.55; 1.82].

***, * Significant at the 1% and 10% levels from the t-test, respectively.

5. Results: Propensity-score estimation and tests

Table 3. Overall tests of covariate balance before and after matching

	Before matching	After matching		
		NN matching	Radius matching	Kernel matching
Pseudo R^2	0.123	0.003	0.002	0.002
LR Chi^2	18.11	0.32	0.18	0.19
Prob > Chi^2	0.000	0.955	0.981	0.979
Mean standardized bias	37.3	7.6	4.7	4.5
Rubin's B (%)	86.5[b]	11.9	9.3	9.5
Rubin's R	0.850	0.600	1.920	1.560
Numbers lost to CS[a]		0	5	4
Number of matched treatment		45	40	41
No of matched controls		27	62	63

[a] Number of treated vessels falling outside the common support.

[b] Rubin's B value falling outside the limits.