

**ECONOMIC PERFORMANCE OF OFFSHORE FISHERIES – THE CASE OF  
TRAWLING AND PURSE SEINING IN BEN TRE PROVINCE, VIETNAM**

**Kim Anh Thi Nguyen and Dien Van Nguyen**

**Nha Trang University**

[sonanhcc@gmail.com](mailto:sonanhcc@gmail.com)

**Abstract**

Ben Tre, located on the Tien Delta Triangle--with a coastline of 65 km and the 20,000 km<sup>2</sup> Exclusive Economic Zone--is one of the Mekong Delta's 13 provinces. Given both its vast access to coastline and the EEZ, fisheries is one of the Ben Tre's key economic sectors. This study specifies some factors affecting revenues of trawling and light purse seining vessels by using a multivariate regression model. Data was collected through direct and intensive interviews with vessel owners and fishermen. The results seem to demonstrate that single boat trawlers achieved the highest return on investment, followed by pairtrawlers and light purse seiners, respectively. Factors including the vessel length, engine capacity, captain's experience, fishing gears, and vessel age have considerable effects on revenues of single-boat trawlers and lighted purse seiners. Based on these findings, this study provides some recommendations to offshore fisheries in Ben Tre province, Vietnam.

**Key words:** trawling, light purse seining, revenues, multivariate regression model

**INTRODUCTION**

With a natural area of 2,356.85 km<sup>2</sup>, Ben Tre province accounts for 5.84% of the Mekong Delta Region. Adjacent to the South China Sea, Ben Tre has 65-kilometer-long coastline within the EEZ. Inshore stock is estimated to be between 19,000 to 24,000 tons; offshore stock is from 1 million to 1.2 million tons, with allowable catch limit ranging from 540,000 tons to 630,000 tons [3]. However, fishing practices in Ben Tre has not been without problems. Concrete projects are required to diversify fishing grounds, as a result of which, fishing income is bettered and conflicts are resolved among fishing gears. In addition, potential depletion of the inshore fishery resources has led to the increase in the number of offshore catching vessels which are still very

unorganized. To date, Ben Tre province has not had any researches or long-term orientation to help fishermen effectively invest in offshore catching activities. Therefore, a thorough research on economic performance of offshore fisheries in Ben Tre province is significant for fishery management.

### **Research Objectives**

To evaluate the economic performance of the offshore vessels in Ben Tre province;

To establish and verify the theoretical model of determinants which affect the revenues of offshore vessels; and

To suggest some possible solutions so as to enhance the revenues of the offshore vessels in Ben Tre province.

### **Scope of the Study**

This study focuses on the actual state of the offshore vessels in Ben Tre province including single-boated trawling, pair-boated trawling and lighted purse seining. Data were collected in 2007 and 2008.

### **Methodology**

This study utilizes quantitative analysis with data collected from questionnaire interviewing fishermen and offshore vessel owners.

## **DESCRIPTIVE STATISTICS**

### **Revenues and Profit**

*Single-boated trawling.* Average revenues of single-boated trawling in 2007 were VND1,314,958,000/vessel with fixed costs of VND129,143,000/vessel, variable costs of VND970,183,000/vessel, average profit of VND215,632,000/vessel, ROI index 33.57% and ROE index 40.07%.

In 2008 the average revenues were VND1,521,607,000/vessel with fixed costs of VND131,862,000/vessel, variable costs of VND1,140,816,000/vessel, average profit of VND248,929,000/vessel, ROI index 38.06% and ROE index 54.84%.

In comparison with the power capacity of the vessel, the 90CV - <250CV group has the least profit of VND63,943,000/vessel in 2007 and VND73,505,000/vessel in 2008; the 400CV- <700CV group has the most profit of VND426,572,000/vessel in 2007 and

VND495,672,000/vessel in 2008. This study shows that there has been an increase in profit from the lower power capacity to the higher one.

*Pair-boated trawling.* Average revenues of pair-boated trawling in 2007 were VND2,561,000,000/vessel with fixed costs of VND266,725,000/vessel, variable costs of VND1,958,430,000/vessel, average profit of VND335,845,000/vessel, ROI index 20.54% and ROE index 22.82%.

In 2008 the average revenues were VND3,251,000,000/vessel with fixed costs of VND285,270,000/vessel, variable costs of VND2,612,240,000/vessel, average profit of VND353,489,000/vessel, ROI index 20.87% and ROE index 25.62%.

In comparison with the power capacity of the paired vessel, the 250CV - <400CV group has the least profit of VND233,203,000/vessel in 2007 and VND281,593,000/vessel in 2008; the 400CV-<700CV group has the most profit of VND438,486,000/vessel in 2007 and VND425,386,000/vessel in 2008.

*Lighted Purse Seining.* Average revenues of the lighted purse seining in 2007 were VND2,494,571,000/vessel with fixed costs of VND461,757,000/vessel, variable costs of VND1,613,254,000/vessel, average profit of VND419,560,000/vessel, ROI index 20.54% and ROE index 22.82%.

In 2008 the average revenues were VND2,761,286,000/vessel with fixed costs of VND471,840,000/vessel, variable costs of VND1,866,671,000/vessel, average profit of VND422,775,000/vessel, ROI index 20.87% and ROE index 25.62%.

In comparison with the power capacity of the vessel, the 250CV - <400CV group has the least profit of VND348,380,000/vessel in 2007 and VND393,199,000/vessel in 2008; the 400CV-<700CV group has the most profit of VND490,290,000/vessel in 2007 and VND452,350,000/vessel in 2008.

Of the three types, the 400CV-<700CV group has the most profit.

**Table 1: The Economic Outcomes of the Offshore Vessels in Ben Tre**

Unit: VND 1,000

No	Content	Single-boated trawling		Pair-boated trawling		Lighted purse seining	
		2007	2008	2007	2008	2007	2008
1	Average investment		575,585		1,472,000		2,027,826
2	Average revenues	1,314,958	1,521,607	2,561,000	3,251,000	2,494,571	2,761,286
3	Average depreciation	98,085	98,085	183,054	183,054	377,409	377,409
4	Average major repair costs	33,779	34,921	84,500	88,125	93,417	94,500
5	Average fixed costs	129,143	131,862	266,725	285,405	461,757	471,840
6	Average variable costs	970,183	1,140,816	1,958,430	2,612,240	1,613,254	1,866,671
7	Average profit	215,632	248,929	335,845	353,849	419,560	422,775
8	ROI (%)	33.57	38.06	22.28	23.98	20.54	20.87
9	ROE (%)	40.07	54.84	26.84	28.75	22.82	25.62

Source: own data

### **Fishermen Earnings**

Over 50% of the surveyed fishermen stated that the catching yield has decreased during the past five years.

Over 50% of the vessel owners stated that they only sell their catch to middlemen.

In 2007, the annual earnings of the captain of a single trawling boat was VND66,481,000, a paired trawling boat VND60,283,000 and a lighted purse seining boat VND67,831,000; the annual earnings of each crewmember of a single trawling boat was VND27,701,000, a paired trawling boat VND27,823,000 and a lighted purse seining boat VND31,921,000.

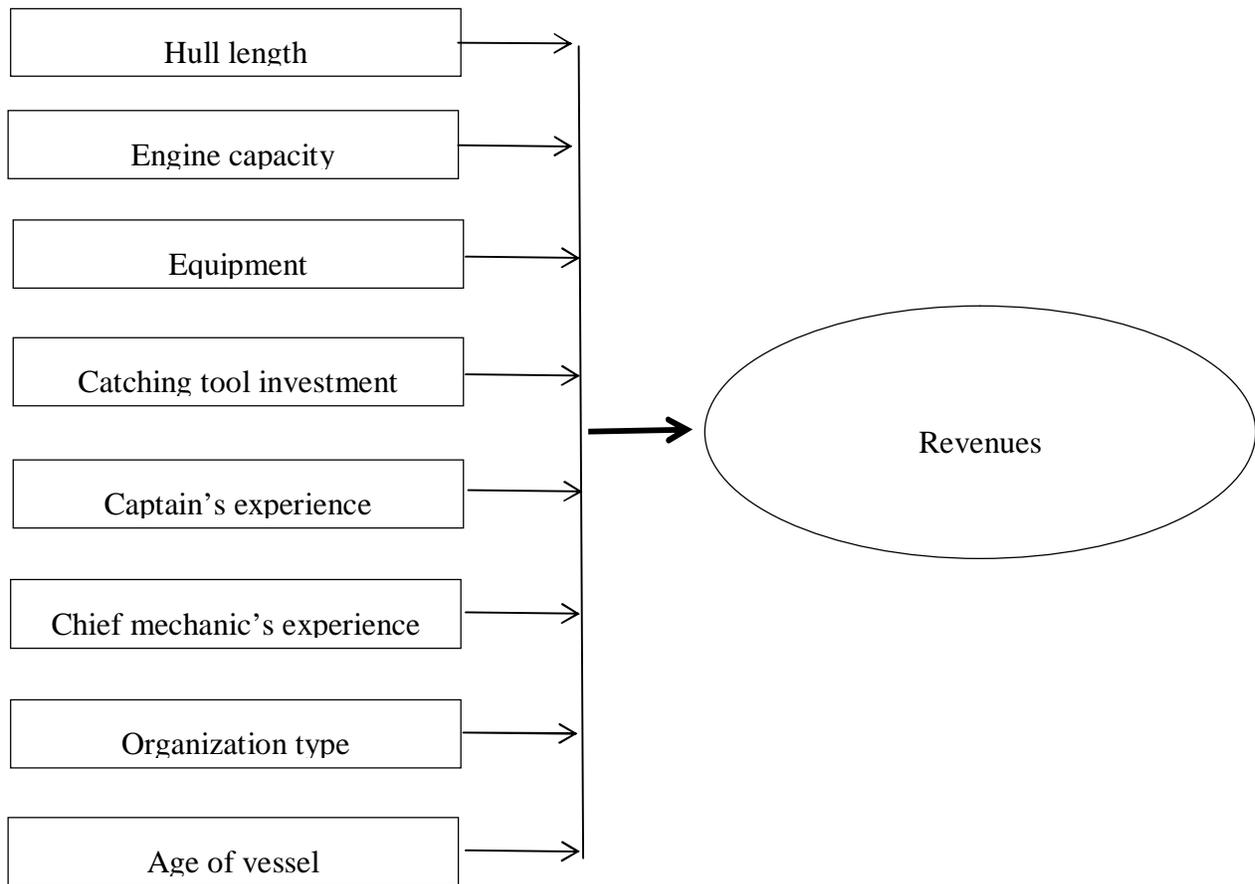
In 2008, the annual earnings of the captain of a single trawling boat was VND74,920,000, a paired trawling boat VND74,181,000 and a lighted purse seining boat VND75,111,000; the annual earnings of each crewmember of a single trawling boat was VND31,217,000, a paired trawling boat VND34,238,000 and a lighted purse seining boat VND35,346,000.

The average number of laborers is 7 persons/vessel of single-boated trawling, 14 persons/vessel of pair-boated trawling and 18 persons/vessel of lighted purse seining.

From 47% to 50% of the fishermen in this survey said that fishery can ensure their living in the future.

**ANALYSIS OF TECHNICAL DETERMINANTS AFFECTING REVENUES OF THE OFFSHORE VESSELS IN BEN TRE**

**Suggested Model**



**Research Design**

**Data Source**

Primary data: collected from questionnaire and extensive interviews of fishermen and vessel owners in Binh Dai and Ba Tri Districts, Ben Tre Province.

Secondary data: collected from Ben Tre Aquatic Resource Protection and Exploitation Bureau, Ben Tre Department of Agriculture and Rural Development [1, 2], Ben Tre Provincial People Committee [3] and from associated journals and scientific reports et al. in and out of Vietnam as well as fishery course-books.

### ***Sample***

This study consulted 123 fishing households correlated to 11.23% of the totality for regression analysis and instant evaluation of the offshore catching economic performance. The sample includes 44 units (44/704) of single-boated trawling, 37 units (37/302) of pair-boated trawling, and 42 units (42/92) of lighted purse seining.

### ***Analytic Tools***

Microsoft Excel is utilized for raw data from questionnaires and interviews.

Eview 5.0 software is used for White verification.

SPSS 11.5 software is used for regression analysis to identify the technical determinants of offshore catching revenues.

### ***Econometric Model***

Under the study of the relation between the dependent variable and each of the independent variables, models are suggested:

Suggested model:  $\text{Ln}(R) = \beta_0 + \beta_1 \text{Ln}(L) + \beta_2 \text{Ln}(H) + \beta_3 \text{Ln}(I) + \beta_4 \text{Ln}(E) + \beta_5 \text{Ln}(C) + \beta_6 \text{Ln}(S) + \beta_7 \text{Ln}(T) + \beta_8 \text{Ln}(A) + e$

Variables:

R: revenues (VND); L: hull length (m); H: head engine capacity (CV); E: equipment investment (VND); I: investment of catching tool (VND); C: captain's experience (year); S: Chief mechanic's experience (year); T: Production organization; A: age of vessel (year); e: accidental error of overall regression function.

### Model Imperfection Check

Before processing regression, the model must be checked for any violation to the very theories such as multicollinearity, alternative variance and autocorrelation.

*Multicollinearity.* In the process of regression in SPSS software, alternative variance happens when VIF values of the variances in the model are more than ten. The unsuitable variances must be eliminated, beginning with the variance with the most VIP.

*Alternative variance.* Working on White model means to check Prob value of  $F > \text{Prob of Chi square}$  and  $> 0.05$ . It is resulted in regression model that alternative variance does not happen with reliability of 95%.

*Variance Autocorrelation.* Checking d value of Durbin-Watson in SPSS software. The regression model is with no autocorrelation of  $1 < d < 3$ .

### Check Results

*Autocorrelation.* The Durbin-Watson test was performed using SPSS. The result shows that d-value of Durbin-Watson check is equal to 1.48. This means the regression model has no autocorrelation.

*Multicollinearity.* The results show that variances as L, H, E, C, S, I, A all have a VIF value between 1.21 to 9.93. This interprets that the model has no multicollinearity to happen.

*Alternative variance.* To check alternative variance, Eview software has been used so as to check White model. The result shows:

Prob of  $F = 0.80 > \text{Prop of Chi square} = 0.73$

Consequently, the regression model has no happening of alternative variance with reliability of 95%.

Confirmed by the above methods, there are no variances with statistic significance. Therefore, the analytic regression model is applicable.

### Determinant Analyses of Offshore Vessel's Revenues

#### *Single-boated trawling*

Regression results of 1b model:

$$\text{Ln(R)} = 2.97 + 0.73\text{Ln(L)} + 0.36\text{Ln(H)} + 0.23\text{Ln(C)} + 0.29\text{Ln(I)} - 0.30\text{Ln(A)} \quad (1b')$$

$R^2$  is 0.742. This implies that revenue variance is correlated to hull length, engine capacity, captain's experience, catching tool investment, and vessel age.

The findings of (1b') in that hull length, engine capacity, captain's experience, catching tool investment, and vessel age affect revenues significantly. Among the verified determinants, hull length has the most impact, followed by engine capacity, vessel age, catching tool investment, and captain's experience respectively.

### *Lighted Purse Seining*

Regressive result of 2b model is as followed

$$\ln(R) = 0.57 + 0.93\ln(L) + 0.25\ln(E) + 0.18\ln(I) + 0.34\ln(C) + 0.32\ln(H) - 0.12\ln(A)$$

(2b')

$R^2$  is 0.767. This 76.70% of revenue variance is derived from hull length, equipment investment, catching tool investment, captain's experience, engine capacity, and vessel age.

Similar to 2b' model, determinants as hull length, equipment investment, catching tool investment, captain's experience, engine capacity, and vessel age affect revenues significantly. Among these determinants, hull length has the most impact, followed by captain's experience, engine capacity, equipment investment, catching tool investment and vessel age in range, respectively.

## CONCLUSION AND RECOMMENDATIONS

### Conclusion

This study shows that the offshore vessels in Ben Tre continue to enjoy effective performance. Profit variance among the fleets differs upon method, the catching tools, and fishing grounds. The study also seems probative that size and profit are directly proportional. The lighted purse seining has the highest profit and the single-boated trawling does the lowest; notwithstanding, the single-boated trawling is profit ratio is highest.

Econometrics has revealed the determinants affecting revenues of offshore fisheries. In single-boated trawling, determinants including hull length, engine capacity, captain's experience, catching tool investment, and vessel age affect revenues significantly. The hull length has the greatest impact, followed by engine capacity, vessel age, catching tool investment and captain's experience. In lighted purse seining, determinants are hull length, equipment investment,

catching tool investment, captain's experience, engine capacity, and vessel age. The hull length has the greatest impact, followed by captain's experience, engine capacity, equipment investment, catching tool investment and vessel age.

### **Recommendations**

According to the statistic results and econometric model, revenues of single-boated trawling is highly affected by the hull length, engine capacity, vessel age, catching tool investment, and captain's experience. That of lighted purse seining is affected by hull length, captain's experience, engine capacity, equipment investment, catching tool investment, and vessel age. So this study focuses on recommendations on statistically significant determinants in order to raise the revenues of single-boated trawling and lighted purse seining vessels.

#### ***Recommendation on Hull Length***

Hull length varies greatly from one fishing performance to another.

*Single-boated trawling.* Hull length has covariance highly associated with revenues. In general, the hull length is in relation with its engine capacity. The results demonstrate that vessels have 13m-15m hull length, according with 90CV- <150CV capacity, 15m-17m hull length with 150CV- <250CV, 17m-19m hull length with 250CV- <400CV, and 19m-22m hull length with 400CV- <700CV of capacity. It is recommended that the hull length be from 19m to 22m long in order to obtain the optimum ROI.

*Lighted purse seining.* Hull length has covariance highly associated with revenues. The results demonstrate that vessels have 19m-21m hull length, according with 250CV- <400CV, and 21m-24m hull length with 400CV- <700CV of capacity. Vessels with 400CV- <700CV of capacity have the highest ratio of profit per capital. It is recommended that the hull length be from 21m to 24m long in order to obtain the optimum ROI.

#### ***Recommendation on Engine Capacity***

*Single-boated trawling.* Engine capacity has covariance highly associated with revenues. The results demonstrate that vessels with engine capacity ranging from 400CV to less than 700CV get the highest ROI in comparison with lower-powered vessels. Therefore vessels with 400CV- <700CV engine capacity are recommended.

*Lighted purse seining.* The results demonstrate vessels with engine capacity ranging from 400CV to less than 700CV garner the highest ROI in comparison with other lower-powered vessels. Therefore, investment on engine capacity ranging from 400CV to 700CV is recommended.

***Recommendation on Investment in Equipment***

Investment on equipment is statistically significant and has covariance associated with revenues of lighted purse seining. Obviously, modern equipment investment helps captains make proper catching decisions. However, it is a waste of money if bleeding-edge equipment does not match with the human capacity. Therefore, it is advisable to strengthen the fishing industry's human capital as well as implement technical supports so as to help fishermen with this matter.

***Recommendation on Enhancing the captain's capacity***

For successful catching performance, the captain's experience is one of determining factors. In modern fishery the captains need not only experience but also knowledge . To meet this demand, the Ben Tre Department of Agriculture and Rural Development should consider asking the Aquatic Resource Protection and Exploitation Bureau to plan training courses according to captain's age. Older captains should take topical courses, while younger captains are suitable for long-term courses. The training plan should be in sessions after each fishing trip and could run for some successive years.

***Recommendation on Investment in Catching Tool***

*Single-boated trawling.* The 1a' and 1b' model interpret that the cost of catching tool investment has covariance associated with revenues. In other words, catching tool investment helps increase revenues. The results demonstrate that catching tool investment raises accordingly with engine capacity. For example, the average cost of catching tool investment of VND90,000,000/vessel is the highest for vessels with 400CV - <700CV. Average catching tool cost is the lowest for vessels with 90CV - <150CV. The underlying theme is that the cost of catching tool investment should be suitable for engine capacity. The statistic results also prove that vessels with engine capacity ranging from 400CV to less than 700CV get the highest ROI. So the average cost of catching tool investment of VND90,000,000/vessel is recommended.

*Lighted purse seining.* The 2a' and 2b' model imply catching tool investment costs have covariance with revenues. The results demonstrate catching tool investment costs increase in relation to engine capacity: average catching tool investment cost of VND430,000,000/vessel is highest for vessels with 400CV - <700CV engine capacity. The results also demonstrate that vessels with engine capacity ranging from 400CV to less than 700CV achieve the highest ROI.

### ***Recommendation on Vessel Age***

Vessel age has a great effect on revenues in two models of the two fisheries. The relationship between vessel age and profit is contra-linear. The longer the vessel operates, the lower the revenues is. This is logical because when the vessel has been in use for too long, the mechanic reliability decreases. Thus, vessel owners do not risk storing more ice and fuel to travel farther, which inevitably result in lower revenues.

*Single-boated trawling.* The results demonstrate that vessels at average age of 12.8 years have revenues of VND64,000,000/vessel and vessels at average age of 8.5 years have revenues of VND427,000,000/vessel. In light of this, it is recommended that vessels be retired after 13 years of service.

*Lighted purse seining.* The results show that vessels at average age of 10.2 years have revenues of VND193,000,000/ vessel and vessels at average age of 5.2 years have revenues of VND453,000,000/ vessel. In light of this, it is recommended that vessels be retired after 11 years of service.

### **REFERENCE**

1. Ben Tre Aquatic Resource Protection and Exploitation Bureau (2008), *Report in 2007*, Ben Tre.
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