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Government support and profitability effects – Vietnamese offshore fisheries

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ABSTRACT

Bioeconomic theory and empirical evidence have demonstrated that open-access fisheries tend to break even and also that intra-marginal rent may be generated in heterogeneous fleets. Theoretically, input and output subsidies are expected to increase profit in the short term, but not in the long term. Vietnamese government subsidies of offshore fishing vessels are investigated and quantified, and their profitability effects are examined, through representative surveys of costs and earnings data. The subsidy schemes had positive effects on vessel profitability, with the quasi-lump sum fuel cost support having the greatest effect. The largest vessels received relatively more support than the smaller ones and earned most of the super-profit as well as the intra-marginal rent generated. However, higher subsidies for larger vessels did not help all of them achieve higher economic performance. The subsidisation programmes may come from infant industry arguments, the strategic rent-shifting incentives of neighbouring countries, social and geopolitical objectives, and because of South China Sea border security reasons.

1. Introduction

It is well known in the fisheries economic literature that, in an open-access fishery, the availability of profits, especially when combined with subsidies, will lead both to an expansion of the operations of existing firms and the entry of new firms [1–3]. Thus, after an initial rise in the profits of existing firms, the increase in effort stimulated by the potential growth in profits can lead to an increase in catch and a substantial decline in the fish population [3,4]. Ultimately, fishing costs rise and revenues fall, leading to a gradual erosion of profits over time. However, in the case of Vietnam, the government has tried to create incentives to counter the disincentive to fish when this is likely to exacerbate the tragedy of the commons problem. Hence, it may be appropriate to first ask whether a subsidised open-access fishery creates any net benefits at present.

Since 1997, the Vietnamese government has made strenuous efforts to develop its offshore fishing industry [5].[1] There are at least two reasons for the introduction of the offshore fisheries development programme in Vietnam. First, the Vietnamese Exclusive Economic Zone (EEZ), which is part of the South China Sea (SCS), was considered to be abundant in marine resources yet under-exploited, with its maximum sustainable yield (MSY) estimated at about 1.1 million tonnes [5]. Second, with some international fishing disputes in the SCS and the lack of an internationally recognised delineation of the sea, the government wanted to encourage the presence of its country's own vessels in these areas. Under the open-access regime, with and without government support, fishers have thus been attracted to shift their fishing from the partially over-exploited inshore waters to the less exploited offshore waters.

In 1997, Vietnam introduced an investment programme for offshore vessels and, in 2008, introduced fuel cost compensation subsidies, along with another subsidy programme in 2010. These subsidies have encouraged the growth of under-developed offshore fisheries with the expansion of the fleets and an increase in production [5,7]. Theoretically, it may be argued that the distribution of natural resources in the coming period will be dependent on the agents' extraction of that resource in the past [8]. If future agreements on the SCS's EEZs and fish shares among countries are based on track records, it may make sense for Vietnam to increase its historic share by use of subsidies. This is a kind of investment for a better future bargaining position when history-dependent allocations in quantity regulation may be expected [9,10].

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[1] Fishing in the sea areas outside the 24 nautical mile limit from the coast to the outer limit of Vietnam's sea areas is referred to as offshore fishing, and offshore vessels are equipped with engine capacity of 90 HP or more [6].

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Fishing subsidies, which may have been considered favourably by the industry when the government attempted to develop an under-developed fishing industry,[2] can be seen as a tool to implement an ‘infant industry’ strategy, where government aid in the early stages results in a rapid development of the industry. Temporary protection for such an infant industry is expected to help modernise the fleet, acquire the fishing experience and skills needed to compete effectively with foreign vessels, and overcome short-term difficulties so that the industry may then become self-sustaining [4]. In addition, the Vietnamese government may have considered that offshore fisheries have long-term (strategic) potential, and it wishes to foster and protect it for future socio-economic growth and development. This is additionally promoted by several exemptions on subsidies, for which developing countries (e.g., Vietnam) would be authorised to apply in the context of new World Trade Organisation (WTO) fisheries subsidies rules [7,11,12].[3] However, the questions over the long-term sustainability of these fisheries may put this into doubt.

It is well known that, in one way or another, the behaviour of a firm is affected by the existence of any government's action or inaction [13]. The perceived benefits to a fishery will motivate fishing firms to modify their behaviour [14]. The usual method of determining the benefits of a subsidy to the industry, or to the fishing firms in the industry, is to determine whether, and to what extent, the profits are altered by such subsidies. Thus, an important step on the way to evaluate subsidies is to evaluate their effects on the profitability of a fishery, allowing us to determine the reactions of the industry, and therefore the effect of the subsidy on resources and on the sustainability of the fisheries [4]. This implies that all subsidies have both short- and long-term effects [13]. The long-term effects of subsidies are often caused by the impact of changes in behaviour triggered by short-term effects. However, analysis of the long-term effects is a complex issue, and such an examination is outside the scope of this study (although see Fig. 1). Indeed, with the knowledge and information currently available, longer term aspects are difficult to assess.

This study firstly investigates and quantifies Vietnamese government subsidies of offshore fishing vessels, and then examines the effect of these subsidies on the profitability of the vessels. It presents the costs and earnings findings, with and without subsidies, based on 2011 and 2012 data, which was collected through representative surveys of two offshore fleets: gillnet and hand-line vessels in the province of Khanh Hoa, operating in the SCS. Economic performance (EP) indicators are used to evaluate vessel profitability, and to examine whether intra-marginal rent (IMR) exists in these two fleets. The effects of the government subsidies are analysed by a static comparison of the EP of vessels, including and excluding subsidies.

The remainder of this paper is organised as follows. Section 2 provides background information on the investigated fisheries. Section 3 describes the theory and methods used. The data are presented in Section 4. Section 5 is devoted to the research results. Section 6 focuses on discussion of the results. The findings and concluding remarks are summarised in Section 7.

[2] VIFEP et al. [7] found that Vietnam’s subsidy policies on fuel and vessel building, upgrading, and infrastructure have focused on solving short-term issues (and are not likely to remain in the long term).

[3] That is, a list of subsidies could be directly linked to public policy objectives specific to developing countries, such as support for food security, subsistence and small-scale fishing, and emergency actions [11,12]. In the Vietnamese case, these exemptions fall under Special and Differential Treatment for Developing Countries. However, under the WTO negotiations on fisheries subsidies, policies on fuel, credits for vessel building, infrastructure, tax, and vessel renewal and upgrading are still debated and these require further consideration [7].

2. Background

Khanh Hoa is a coastal province in Southern Central Vietnam with a coastline of 520 km. This coastline is made up of territorial waters and more than 200 islands. Khanh Hoa's fishing vessels numbered about 10,000 units in 2012, of which the offshore fleet was 1041 units [15]. The major offshore gears are gillnet, longline/hand-line, trawl, set netting and lift net. Among these vessels, 258 (25%) and 153 (15%) are gillnet and hand-line vessels, with a total capacity of 78,211 horsepower (HP) (on average 303 HP/unit) and 42,942 HP (283 HP/unit), respectively.

The offshore fishery has been open-access since its inception and a minor resource tax was abolished in 2008 [16,17]. In addition, the offshore vessels have been supported by government subsidies. The 2010 subsidy programme mainly included fuel cost support and insurance subsidies and has been implemented since 2011 [18,19]. The fuel cost subsidies were based on the engine size of vessels and all vessels could be supported to a maximum of four trips per year.[4] This support appears as quasi-lump sum subsidies per trip. Insurance subsidies cover 50% of vessel insurance costs and 100% of accident insurance costs for fishers. Some vessels have been supported with loans at below market interest rates.

The fishing takes place all year round, from October to September of the following year and is divided into two fishing seasons: the northeast monsoon (from October to March) and the southwest monsoon (from April to September). Offshore vessels often stay onshore for repairs and maintenance from either August to September or September to October. The target fish species of the gillnetters and hand-liners are migratory pelagic species (e.g., tuna species). The main target species in the gillnet fishery include striped tuna (*Sarda orientalis*), skipjack tuna (*Katsuwonus pelamis*) and mackerel species, such as the Indo-Pacific king mackerel (*Scomberomorus guttatus*), wahoo (*Acanthocybium solandri*), and narrow-barred Spanish mackerel (*Scomberomorus commerson*), as well as some other species caught as incidental bycatch. For the hand-line fishery, yellowfin tuna (*Thunnus albacares*) and bigeye tuna (*Thunnus obesus*) are the main target species caught, while a small amount of other species is referred to as bycatch.

The fishing grounds are the offshore waters of the central sea region (11°30'N–14°00'N, 109°30'E–114°00'E) and the waters of the southeastern and southwestern areas, as well as high sea waters (6°00'N–11°30'N, 105°00'E–114°00'E). In the northeast monsoon, tuna species are often found in the offshore sea areas of the central provinces from Phu Yen to Vung Tau and the central SCS (10°30'N–14°00'N, 110°00'E–114°00'E). The offshore vessels move to the southeastern waters and southwest of the Spratly Archipelago (6°00'N–10°30'N, 105°00'E–114°00'E) in the southwest monsoon. Tuna is also fished in the territorial waters of the provinces from Phu Yen to Binh Thuan, located at a distance of about 50–100 nautical miles from the shore in this second season.

The average total catches of the two fleets in 2011 and 2012 were larger than those in 2004, 2005 and 2008 (Table 1). It is important to note that, in 2011 and 2012, compared to previous years, the average engine capacity of an offshore vessel was greater, and that the average total fishing days in a year was higher [20–23]. Furthermore, the number of Vietnam's offshore vessels operating in the SCS has increased from around 20,000 vessels in 2004 to nearly 28,000 vessels in 2012 (an increase of 4.2% p.a.), this corresponds with an increase in total capacity from 2642 to 5996 thousand HP (an increase of 10.8% p.a.), respectively [24].

[4] Vessels with an engine from 90 HP to less than 150 HP were supported with 18 million VND per trip, vessels with an engine from 150 HP to less than 250 HP received 25 million VND per trip, vessels with an engine from 250 HP to less than 400 HP received 45 million VND per trip, and vessels with an engine of 400 HP or larger were supported with 60 million VND per trip [18,19].

Table 1
Average total catch of offshore gillnet and hand-line vessels in Khanh Hoa (unit: tonnes/vessel/year).

	2004	2005	2008	2011	2012
Gillnet	n/a	87.4[a]	77.0[b]	98.2 (28.0)	88.5 (26.5)
Hand-line	16.4[c]	n/a	17.4[d]	22.2 (4.9)	20.0 (4.9)

Note: Due to unavailable data, the 2004, 2005 and 2008 average catches are calculated by taking gross revenue divided by regional average prices of fish in each year, respectively. We use information of gross revenue from published independent research papers for the Khanh Hoa's offshore fisheries ([a] Kim Anh et al. [20], [b] Duy et al. [21], [c] Long et al. [22], [d] Nga [23]). Price data are collected from traders who buy fish directly from fishers, with the same (common) prices among vessels for each year. The 2011 and 2012 own data and calculations are from the samples of surveyed 57 gillnetters and 39 hand-liners, with standard deviation in parentheses.

From 2011 to 2012, the average total catch decreased by 9.9% for both fleets (Table 1). This reduction in catch may be due to stochastic ecosystem variations or lower stock levels (possibly due to a range of reasons, such as crowding pressures as a result of increased fleet size, over-exploitation, migration, weather or other biological factors), rather than the reduction in the price of fish or demand.

3. Theory and methods

3.1. Intra-marginal rent and the impacts of revenue-enhancing lump sum subsidies

The traditional economic model of Gordon [25] is extended to illustrate the existence of IMR for an open-access fishery with heterogeneous vessels and the static effects of revenue-enhancing lump sum subsidies on the fishery. Given competitive vessels having heterogeneous cost structures, the industry marginal cost is an increasing function of fishing effort [26,27]. Thus, the industry long term total cost curve (*TC*) and total revenue curve (*TR*), with a constant price of catch, are as shown in Fig. 1. The open-access bioeconomic equilibrium point is where the industry average revenue equals the industry marginal cost, i.e., $AR(E)=MC(E)$ (Fig. 2).

In an unregulated open-access fishery, where the property rights of fish resources are not defined, the existence of above normal positive economic profit will attract new entrants to the industry, resulting in reducing the industry average revenue of

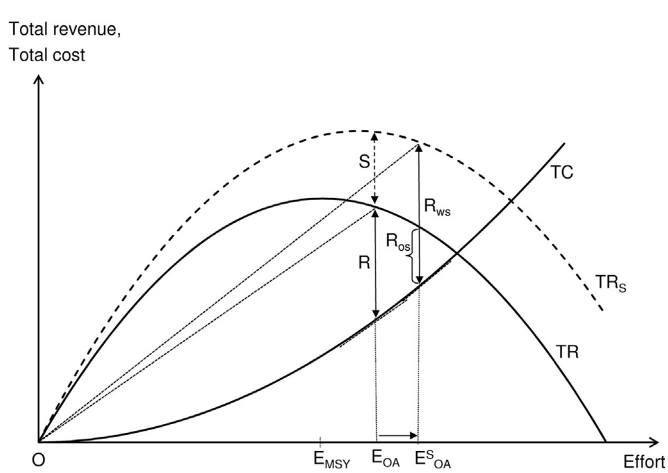

Fig. 1. IMR and impacts of revenue-enhancing lump sum subsidies under open-access in the case of heterogeneous vessels. *Sources*: Adapted from Flaaten and Wallis [1].

effort until equalling the industry marginal cost of effort. Thus, there will be an open-access equilibrium of the effort level, E_{OA} (Fig. 1). At this equilibrium effort, there is a welfare economic, also called social surplus, for the fishery (Fig. 1, the line segment *R*), which is called IMR. The potential return to the resource (resource rent) is dissipated in this situation, but the IMR is generated from the most cost-efficient vessels earning above normal profits.[5] Therefore, profits which are above normal for an average vessel would indicate the existence of IMR for the open-access fishery with a heterogeneous fleet.

We are assuming that total government financial transfers (S_{sub}) are defined as an increasing function of fishing effort (*E*), e.g., linear $S_{sub}=sE$, where *s* is the average subsidy per unit of effort. These subsidies increase the total revenue received at each level of vessel effort, resulting in shifting the total revenue curve from *TR* to TR_S (Fig. 1). This may have the short-term effect of creating an economic surplus for existing fishers (signified by the line segment *S*) in an open-access fishery [1]. This attracts new entrants to the fishery. Thus, the long-term effect of revenue-enhancing lump sum subsidies is that a new equilibrium effort (E_{OA}^S) in this case shifts further away from the level of MSY effort (E_{MSY}). At the new equilibrium effort E_{OA}^S, the economic surplus (with subsidies) for the open-access fishery is indicated by the segment R_{ws}, of which the actual economic surplus (without subsidies) accruing from fishing operations is signified by the segment R_{os}. It is clear that $R_{os}<R$. In other words, the welfare economic surplus for the fishery when the government's subsidy action takes place is smaller than the surplus without this action. This welfare economic surplus may be positive, zero or negative, depending on the magnitude of the subsidies. When the subsidy value is high, the social surplus for the fishery is likely to be dissipated. Intra-marginal vessels still exist due to the different cost structure of the vessels. Some vessels will possibly earn negative economic profits when excluding the subsidies, but the average vessel's economic profit is positive when including the subsidies, noting R_{ws} in Fig. 1. This will be discussed further below.

The effects of cost-reducing subsidies can easily be derived from the use of a similar model to the revenue-enhancing subsidies. The industry cost curve $TC(E)$ would shift downward as an effect of a cost subsidy. The industry effects will be similar to that which has been described above.

3.2. Behaviour of heterogeneous vessels influenced by subsidies under open-access

This subsection briefly describes the effects of revenue-enhancing lump sum subsidies on the behaviour of heterogeneous vessels in an open-access fishery. Given that the industry is competitive and that individual vessels are not able to impact the market price of fish, all vessels face the same marginal revenue (equivalent to the industry average revenue) at a given point in time [28].[6] For the objective of profit maximisation, an individual vessel's profit is maximised at the level of effort at which its marginal cost equals its marginal revenue. For a heterogeneous fleet, this creates IMR at the bioeconomic equilibrium [26].

At the industry level, Fig. 2 shows that, in the absence of subsidies, the open-access equilibrium level of fishing effort is defined by the intersection of the industry marginal cost curve of effort (*MC*) with the average revenue curve of effort (*AR*). At any time period (e.g., one year) in an open-access fishery, some vessels are

[5] In this context, normal profits are referred to as zero economic profits. Vessels earning normal profits are called marginal vessels [28].

[6] For the sake of illustration of the existence of intra-marginal vessels, the fishing vessels are assumed to be heterogeneous in cost structures rather than in fishing effort in this section.

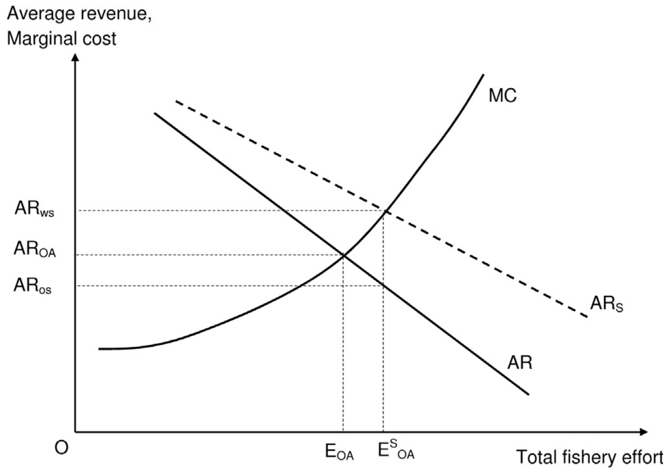

Fig. 2. Heterogeneous fishing fleet in an open-access fishery with revenue-enhancing lump sum subsidies. *Source*: Adapted from Coglan and Pascoe [28].

likely to be earning economic profits (IMR), while others are making economic losses (extra-marginal rent, or EMR) [28]. Vessels making economic losses after capital costs, may, however, operate in the short term if their marginal revenue of effort is more than the minimum average variable cost of effort but, in the long term, they will be forced to exit the fishery.

Total subsidies are, as assumed, an increasing linear function of fishing effort. The introduction of this subsidy policy will shift the fishery's average revenue curve from AR to AR_S in Fig. 2, given a constant price of fish. The new open-access equilibrium is at the point where the level of effort is E_{OA}^S and the fishery's average revenue, including the effort subsidy, is AR_{ws}. At this level of effort, the actual average revenue from fishing operations (excluding the subsidies), AR_{os}, is equal to the AR_{ws} level minus the average subsidy per unit of effort, s. When the fishery's average revenue increases from AR_{OA} to AR_{ws}, vessels will increase their individual fishing effort to maximise profits. Therefore, some formerly unprofitable vessels become profitable and total effort expands. Even though the marginal revenue of effort is lower than the minimum average variable cost of the individual vessel effort, fishers may still operate in the short term, as long as they have a positive operating cash flow, including the subsidies. Similarly, even if vessels' revenue (without the subsidies) is not able to cover all costs, they may continue operations in the long term, as long as they have positive economic profits including the subsidies.

The impacts of cost-reducing subsidies on vessel behaviour and equilibrium can be described in a similar way as those for revenue-enhancing effort subsidies. Because of the effect of an effort cost subsidy, the average cost of effort will be reduced and the industry marginal cost curve will shift downward. The equilibrium effects will be similar to that as described above.

3.3. Costs and earnings analysis

The costs and earnings definitions (Table 2) used in this study correspond in principle to those used in business economic analysis in general and also in previous profitability analyses of fishing vessels in industrialised countries [29–32]. Income is an important indicator for share systems. Earnings before interest, taxes and depreciation (EBITDA) mainly reflects the cash a fishing firm has earned from its fishing operations.[7] A positive EBITDA indicates that the gross revenue (GR) exceeds the vessel owner's operational and labour costs [30–32], and that there may exist IMR in the short term for the owners [21,26]. Meanwhile, rent is an EP indicator that measures the efficiency of a producer from society's perspective. Rent (i.e., IMR) is referred to as the economic profit to society of employing the owner's capital in the fishing activity after subtracting all expenses, including the opportunity cost of this capital [31]. Since the revenue generated by the industry exceeds the real cost of the factors of production, the resultant positive rent implies that the fishery is efficient and profitable for society [31]. If rent is negative while EBITDA is positive, vessel owners may be commercially viable in the short term, but not operating optimally, based upon a long-term analysis of allocating society's resources efficiently [30,31].

Table 2
Definition of the performance indicators.

	Gross revenue (=Landings value)
	– Variable operating costs (i.e., costs for fuel, lubricant, ice, provision, minor repairs)
=	Income
	– Fixed operating costs (i.e., repair and maintenance costs and insurance)
	– Labour costs
=	Earnings before interest, taxes and depreciation (EBITDA)
	– Depreciation
=	Operating profit (EBIT)
	– Interest payment on loans
=	Pretax profit (EBT)
	– Calculated interests on the owner's capital
=	Rent (i.e., IMR or EMR)
	Operating cash flow (OCF) margin=EBITDA/Gross revenue
	Operating margin=EBIT/Gross revenue
	Profit margin=EBT/Gross revenue
	Return on capital value (ROC)=(EBT+Interest payment on loans)/Total capital value
	Return on equity (ROE)=EBT/Vessel owner's capital

Note: EBIT is earnings before interest and taxes; EBT is earnings on ordinary activities before taxes; IMR and EMR are intra- and extra-marginal rent, respectively. Note that the concepts of Rent, IMR and EMR are for the cases without subsidies. If there are subsidies it would be better to call this bottom line 'super-profit' instead of rent.

We should note that the concepts of Rent, IMR and EMR are for the case without subsidies. This corresponds to the line segment R in Fig. 1. If, however, there are subsidies, and this arrangement has been working for some time, it is likely that the equilibrium of effort and stock has changed, as indicated in Fig. 1, from E_{OA} to E_{OA}^S. Now the line segment R_{os} indicates a lower IMR than pre-subsidies but, for the fishing fleet, R_{ws} is the result of adding the subsidies to R_{os} and it may be that the average profitability of the fleet is higher than without subsidies. Thus, it is important to distinguish between the welfare economic rent concepts and the business economic profit concepts.

Depreciation is calculated based on market value (the current value estimated by the owner) and the owner's estimated remaining lifespan of the fixed capital items [22,29]. Annual vessel depreciation includes hull, engine, equipment and gear. The calculated interest (I) (opportunity cost) on the owner's capital in the year of the profitability analysis (2011 and 2012 in the present study) is calculated by using the formula $I=(V-L)r$, where r is the interest rate, V and L are the market value of total fixed capital and the remaining debt (the remaining balance on the loan) respectively, at the time of the calculation, and hence $V-L$ is the vessel owner's capital at the time of the calculation. The real interest rate (r) is the interest rate adjusted for inflation as measured by the average consumer price index.[8]

[7] Le Floc'h et al. [32] defines this indicator in the term of gross surplus while others refer it as gross cash flow (e.g., Whitmarsh et al. [31]).

[8] The real interest rates were 11% p.a. for 2011 and 8% p.a. for 2012. The data on the average consumer price index were available in [24,33]. Statistics on the average interest rates of Vietnam's commercial banks are available in STOXResearch [34].

To analyse the effect of fisheries subsidies on the profits of vessels, this study follows the costs and earnings analysis principles presented in Westlund [13, p. 45–49]. The subsidy values and earnings and costs survey data are organised into a format allowing the calculation of a profit and loss account with subsidies (representing the actual situation), and one in which the subsidies are removed. According to the classification of Westlund [13], the government fuel cost subsidies can be classified as direct financial transfers, while loans on favourable terms and insurance schemes for vessel and fishers are referred to as services and indirect financial transfers. To analyse their impact on the profits, it is important to know precisely in what way they influence the financial situation of vessels, and to provide information on which revenues and costs are being affected [13]. Therefore, subsidies influencing profits are divided into revenue-enhancing and cost-reducing subsidies.

The 2010 government fuel cost subsidies appear as quasi-lump sum subsidies per trip, payable directly to fishers for a limited number of trips per year (footnote 4). Fishers have to accept the market fuel price in their fishing operations; in reality, the fuel cost support was income support for fishers, although it may seem like an effort subsidy. Hence, this subsidy item is referred to as a revenue-enhancing subsidy [21]. Support for vessel insurance costs and accident insurance costs for fishers, and loans at a subsidised interest rates are defined as cost-reducing subsidies. These two insurance cost items are component parts of fixed operating costs [35]. Interest payment on loans is estimated by using the subsidised interest rate for the subsidy case and commercial interest rates for the non-subsidy case.

When evaluating the profitability effects of subsidies, it would have been ideal to have a counterfactual estimate of the performance measure, which requires an understanding of what the EP would have been in the absence of the subsidies. However, empirical knowledge of fishing vessel investment behaviour since 1997, response to changes in input and output prices, as well as to changes in government support of investment (long-term) and operation (short-term), means that a proper counterfactual analysis is not possible. Therefore, the results of the previously published studies on the same fleets are used for discussion in the absence of the counterfactual analysis, although this study focuses on an assessment that constitutes a snapshot of the current situation. Even if this may be insufficient, it is believed that it is an inevitable and important step towards a better understanding of the impact of fisheries subsidies in the longer term [13].

4. Data

Surveys of offshore gillnet and hand-line vessels were administered to collect data for the fishing year-seasons 2011/2012 and 2012/2013, called the 2011 and 2012 seasons, respectively. Following Long et al. [22], the questionnaire was adjusted to obtain data on the gillnet and hand-line vessels in the Khanh Hoa province. Vessel owners and/or their wives were interviewed face-to-face. Two main types of information were collected from the surveys: a description of the vessel's technical and operational characteristics, and costs and earnings data with and without the subsidies.

Data were obtained from 22.1% ($N=57$) of the gillnet vessels and 25.5% ($N=39$) of the hand-line vessels. The technical and operational characteristics of the surveyed vessels are summarised in Table 3 (see more in Appendix A, Table A.1). The engine HP and hull length were the physical characteristics used to test the samples' representativeness. A t-test was conducted to compare the engine power and hull length between sample and population. The results demonstrate that these samples of 57 gillnetters and 39 hand-liners are representative samples of Khanh Hoa's offshore gillnet and hand-line population, respectively (Appendix B).

Table 3
Technical and operational characteristics of the surveyed vessels.
Source: Own data and calculations.

	Gillnet ($N=57$)				Hand-line ($N=39$)			
	2011		2012		2011		2012	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Engine (HP)	311.9	117.7	311.9	117.7	264.2	96.6	264.2	96.6
Length (m)	16.5	1.5	16.5	1.5	15.5	1.0	15.5	1.0
Age of vessel (years)	10.6	6.4	11.6	6.4	9.8	3.7	10.8	3.7
Gear[a]	278.1	52.9	278.1	52.9	181.4	68.3	181.4	68.3
Total operating months (months)	10.2	1.2	10.2	1.1	10.0	1.1	9.9	1.1
Number of trips fished (trips)	12.6	5.6	12.5	5.1	10.0	1.1	9.9	1.1
Number of days fished (days)	237.9	35.5	240.8	34.5	209.5	27.0	208.9	26.6
Fuel consumption (1000 l)	37.2	12.0	37.3	11.9	37.7	8.3	37.7	8.2
Crews (persons)[b]	10.4	1.3	10.4	1.3	7.6	1.0	7.6	1.0

Note: S.D. means standard deviation; N shows number of the surveyed vessels.
[a] 'Gear' indicates the average number of nets and hooks of gillnetters and hand-liners, respectively.
[b] Crew size includes captain.

Table 4
Average support of the surveyed vessels.
Source: Own data and calculations.

Type of support	Gillnet ($N=57$)				Hand-line ($N=39$)			
	2011		2012		2011		2012	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Fuel cost	123.1	93.4	122.9	93.1	148.2	61.4	146.7	59.8
Insurance[a]	4.9	3.5	5.0	3.4	4.7	3.1	4.7	3.0
Loan interest	1.4	3.5	1.2	2.9	1.7	5.8	1.6	5.7
Total	129.4	95.6	129.1	94.9	154.6	64.2	153.0	62.2

Note: S.D. means standard deviation; N shows number of the surveyed vessels; unit is in million VND.
[a] Support for vessel insurance cost and accident insurance cost for fishers.

5. Results

5.1. Government support

Table 4 shows that the average total subsidies in 2011 and 2012 were 129.4 and 129.1 million Vietnamese dong (VND)[9] for the surveyed gillnet vessels, and 154.6 and 153.0 million VND for the hand-line vessels. The average fuel cost support accounted for around 95% of the total subsidies of both fleets, with wide ranges for this type of support. While some vessels were paid the maximum fuel cost support of 240 million VND per year, 18 out of the 57 gillnetters (31.5%) and one hand-liner received nil. For the insurance costs support, the average hand-liner's subsidised values were about 4.7 million VND in both years, whereas the average gillnetter was supported by around 5.0 million VND. Interest support (low-interest loans) occupied the smallest amount in the average total subsidies of the two fleets (Table 4). The subsidised interest rates varied from 0.6% to 1.2% per month, with an average

[9] Corresponding to 5197€ and 5186€ in 2011 and 2012, respectively.

Table 5
Performance indicators of the surveyed vessels, with and without subsidies.
Source: Own data and calculations.

	Gillnet ($N=57$)				Hand-line ($N=39$)			
	2011		2012		2011		2012	
	Subs.	Excl. subs.	Subs.	Excl. subs.	Subs.	Excl. subs.	Subs.	Excl. subs.
Gross revenue	2574.8	2451.6	2086.7	1963.7	2144.4	1996.2	1706.7	1560.1
	(759.2)	(707.3)	(619.4)	(572.8)	(464.1)	(438.5)	(397.2)	(371.3)
Variable operating costs	1148.2	1148.2	1255.8	1255.8	1028.5	1028.5	1097.7	1097.7
	(350.2)	(350.2)	(383.2)	(383.2)	(193.9)	(193.9)	(217.5)	(217.5)
Income	1426.6	1303.4	830.8	707.9	1115.8	967.6	609.1	462.4
	(512.1)	(468.0)	(367.4)	(340.6)	(329.6)	(315.2)	(261.5)	(249.0)
Fixed operating costs	70.7	75.6	77.4	82.4	65.7	70.5	76.4	81.1
	(25.1)	(26.6)	(28.6)	(30.0)	(14.5)	(15.8)	(14.7)	(15.6)
Labour costs	503.0	503.0	332.8	332.8	483.8	483.8	277.1	277.1
	(187.5)	(187.5)	(120.8)	(120.8)	(157.6)	(157.6)	(94.0)	(94.0)
EBITDA	852.8	724.8	420.7	292.8	566.3	413.4	255.6	104.3
	(339.6)	(288.9)	(266.9)	(240.8)	(171.6)	(153.7)	(175.7)	(170.7)
Depreciation	218.4	218.4	207.9	207.9	66.8	66.8	55.8	55.8
	(64.6)	(64.6)	(56.5)	(56.5)	(15.0)	(15.0)	(12.8)	(12.8)
EBIT	634.4	506.4	212.8	84.9	499.5	346.6	199.8	48.5
	(309.3)	(266.0)	(251.5)	(240.5)	(166.7)	(150.9)	(172.4)	(169.4)
Interest payment on loans	4.9	6.3	4.3	5.5	3.9	5.6	3.1	4.7
	(12.9)	(15.9)	(11.1)	(13.6)	(9.9)	(14.4)	(7.8)	(13.1)
EBT	629.4	500.1	208.5	79.4	495.6	341.0	196.8	43.8
	(308.4)	(265.0)	(251.8)	(240.8)	(162.8)	(148.3)	(171.6)	(170.7)
Calculated interest	203.7	203.7	150.5	150.5	69.9	69.9	51.8	51.8
	(89.1)	(89.1)	(66.8)	(66.8)	(27.6)	(27.6)	(20.8)	(20.8)
Rent	425.8	296.4	58.0	-71.1	425.7	271.1	144.9	−8.1
	(279.8)	(252.1)	(249.4)	(254.3)	(157.2)	(146.7)	(169.7)	(171.7)
Total capital value	1930.1	1930.1	1930.1	1930.1	664.7	664.7	664.7	664.7
	(841.2)	(841.2)	(841.2)	(841.2)	(266.3)	(266.3)	(266.3)	(266.3)
Owner's capital	1851.8	1851.8	1881.0	1881.0	635.5	635.5	647.8	647.8
	(810.3)	(810.3)	(835.5)	(835.5)	(251.0)	(251.0)	(259.9)	(259.9)
OCF margin[a]	0.324	0.291	0.191	0.141	0.261	0.202	0.138	0.050
	(0.074)	(0.070)	(0.101)	(0.100)	(0.030)	(0.041)	(0.079)	(0.104)
Operating margin[a]	0.236	0.199	0.089	0.031	0.228	0.167	0.104	0.013
	(0.079)	(0.078)	(0.108)	(0.112)	(0.034)	(0.046)	(0.083)	(0.111)
Profit margin[a]	0.235	0.196	0.086	0.028	0.226	0.163	0.102	0.010
	(0.080)	(0.079)	(0.109)	(0.113)	(0.034)	(0.048)	(0.083)	(0.112)
ROC[a]	0.356	0.291	0.117	0.053	0.829	0.577	0.318	0.069
	(0.199)	(0.179)	(0.163)	(0.146)	(0.344)	(0.281)	(0.273)	(0.265)
ROE[a]	0.385	0.310	0.123	0.053	0.864	0.599	0.326	0.068
	(0.267)	(0.219)	(0.186)	(0.158)	(0.383)	(0.315)	(0.282)	(0.272)
Average income per fisher	48.2	48.2	32.0	32.0	63.7	63.7	36.3	36.3
	(15.8)	(15.8)	(10.3)	(10.3)	(19.7)	(19.7)	(11.4)	(11.4)

Note: *N* shows number of the surveyed vessels; unit is in million VND; mean values with standard deviation in parentheses. 'Including subsidies' and 'Excluding subsidies' are abbreviated to 'Subs.' and 'Excl. Subs.', respectively. Own calculations based on the sharing rules of the two vessel groups – the rules are not affected by the actual subsidy arrangements.

[a] These indicators are estimated relative to standard deviation and measured in decimal numbers.

of 1.0% for gillnetters and 0.95% for hand-liners. Meanwhile, the average market interest rate was about 1.4% per month, with a range from 1.33% to 1.54%.[10]

In both years, total subsidies increased on average with the engine size of the two fleets (Appendix A, Table A.2). None of the gillnet vessels with less than 150 HP received fuel cost support and none of the hand-line vessels with less than 250 HP received interest support.

5.2. Economic performance with and without subsidies

Table 5 presents the EP indicators of the surveyed gillnet and hand-line vessels in 2011 and 2012, with and without subsidies. Overall, for these two fleets, the indicators of GR, income, EBITDA, EBIT, and EBT on average decreased during these two years, while variable, fixed operating and labour costs increased. The average gillnetter's annual GR from fishing operations was 2451.6 and 1963.7 million VND in 2011 and 2012, respectively. Meanwhile, this indicator for an average hand-liner was 1996.2 and 1560.1 million VND in 2011 and 2012, respectively.

Without subsidies, the most important indicators for an average vessel of each fleet, namely income, EBITDA, EBIT and EBT, were all positive, whereas rent in 2012 was negative. Without the 2012 subsidies, five gillnetters and 15 hand-liners would have had a negative EBITDA, and 20 gillnetters and 18 hand-liners would have had a negative EBIT and EBT. In 2011, there was only one gillnetter whose EBIT and EBT without subsidies was negative. The average annual crew shares in 2012 were about 32.0 million VND for gillnet vessels and 36.3 million VND for hand-line vessels, corresponding to a decrease of 34% and 43% in comparison with those in 2011, respectively (Table 5).

Due to the fuel cost quasi-lump sum subsidies, the average vessel's GR in 2011 and 2012 increased by 5.0% and 6.3% for gillnetters and by 7.4% and 9.4% for hand-liners, respectively (Table 6).

[10] Depending on the time of lending, different market interest rates, which are available in STOXResearch [34], were used to calculate interest support for individual vessels.

Table 6
Average contribution of the subsidies to economic performance (%).
Source: Own data and calculations.

Type of support/ indicator		2011			2012		
		Gross revenue	EBITDA	EBT	Gross revenue	EBITDA	EBT
Gillnet	Fuel cost	5.0	17.0	24.6	6.3	42.0	154.8
	Insurance	–	0.7	1.0	–	1.7	6.3
	Loan interest	–	–	0.3	–	–	1.5
Hand-line	Fuel cost	7.4	35.8	43.5	9.4	140.7	334.9
	Insurance	–	1.1	1.4	–	4.5	10.7
	Loan interest	–	–	0.5	–	–	3.7

The insurance support schemes reduced the fixed operating costs in these years by 6.5% and 6.1% for an average gillnetter and by 6.7% and 5.8% for an average hand-liner, respectively (Table 5). Together, these two types of support contributed to increasing the average EBITDA of gillnet vessels by 17.7% and 43.7%, and that of hand-line vessels by 36.9% and 145.2% in 2011 and 2012, respectively (Table 6). When including the interest support of the loans, the average gillnetter's and hand-liner's EBT in 2011 increased by 25.9% and 45.4%, respectively, in comparison with the case of excluding all subsidies. For 2012, the three subsidies combined contributed to increasing the EBT by 162.6% for the gillnetters and 349.3% for the hand-liners, on average (Table 6). Furthermore, including subsidies in 2012, the number of vessels earning a negative EBITDA and a negative EBT were two and 12 vessels of the gillnet fleet and one and four vessels of the hand-line fleet, respectively. This finding is in contrast to 2011 when all vessels in the two fleets had positive EBITDA and EBT.

There was a significant change in the relative EP due to the subsidies. In 2012, the OCF, operating and profit margins were 19.1%, 8.9% and 8.6% for the average gillnetter and 13.8%, 10.4% and 10.2% for the average hand-liner, respectively (Table 5). Without subsidies, on average, these indicators significantly decreased. In addition, with the 2012 subsidies, the average gillnet vessels' ROC and ROE were 11.7% and 12.3%, respectively, which were lower than those of hand-line vessels. This because the total capital value and the owner's capital of gillnetters were nearly three times higher than those of hand-liners. In both fleets, the vessel ROCs and ROEs had relatively large variances because of great differences in EBT, as well as wide ranges in the total capital value and owner's equity of vessels.

A breakdown of the sample according to engine size shows that GR with and without subsidies increased on average with engine size in both 2011 and 2012 (Appendix A, Tables A.3 and A.4). In each fleet, most cost items followed the same trend as for revenue and engine size. In 2012, vessels covered all their expenses and received a positive super-profit, including subsidies, except for gillnet vessels with engines of 150–250 HP and over 400 HP that, on average, earned a negative super-profit. Vessels with engines of more than 400 HP, in both offshore fleets, on average in 2012 would have had negative EBIT and EBT without subsidies. For both years and both fleets, the vessel group of 250–400 HP engines had the best EP indicators and created the largest surplus in both the subsidy and non-subsidy cases.

6. Discussion

The results demonstrate that vessels in both fleets in 2011 and 2012, on average, had positive EBITDA, EBIT and EBT, even when excluding government subsidies. The owner of an average offshore vessel was not only capable of covering all the cash costs and depreciation, but also turned a pretax profit for the two operating years, even when excluding the subsidies. In addition, the average annual income per crew member was higher than in the previous years (Table 7) and greater than the average income per capita of the Khanh Hoa province and the nation [36]. Since offshore vessels are exposed to high risks, these positive results are both encouraging and interesting in light of Khanh Hoa's open-access offshore fisheries.

Offshore vessels have relatively high capital investment and operational expenses, while they often face the risk of damaging and losing fishing gear, vessels and workers. For gillnet vessels, gear often represents as much as half of the capital invested. In the SCS, the high density of various types of vessel activities on the fishing grounds, as well as difficult weather conditions and the remoteness of the fishing grounds, combined with migratory and variable tuna stocks, also present challenges. An additional concern is the competition for fishing in the SCS, not just with other Vietnamese fisheries entities, but also with neighbouring countries' fleets (e.g., China, Indonesia, Malaysia, The Philippines and Taiwan).

Fishers not only face high production (catch) risks, but also price and cost fluctuations. The average tuna price in 2011 increased by 85% and 160% compared with 2008 and 2004–2005, respectively. The EP indicators of the investigated offshore fleets, on average, were better in 2011 than those in the previous fishing years (Tables 5 and 7). However, from 2011 to 2012, the tuna price, on average, fell by around 12.5%, while the catches of the two surveyed fleets decreased by about 10% (Table 1). Therefore, without subsidies, the average EBITDA and EBT of Khanh Hoa's gillnet and hand-line vessels in 2012 were no better than those of

Table 7
Performance indicators of Khanh Hoa's offshore fisheries in previous studies (unit: million VND).

	Gillnet						Hand-line			
	Kim Anh et al. [20]		Duy et al. [21]		Pham et al. [37][c]		Long et al. [22] [d]		Nga [23] [d]	
	2005[a]	2012[b]	2008[a]	2012[b]	2010[a]	2012[b]	2004[a]	2012[b]	2008[a]	2012[b]
Engine (HP)	126.4		249.6		169.1		121.9		126.1	
Gross revenue	856.7	1850.9	1044.6	1690.9	1346.7	1743.6	568.3	1329.5	845.1	1275.1
EBITDA	235.5	508.8	166.6	357.2	441.8	572.0	93.3	218.3	160.4	242.0
EBT	103.4	223.5	21.4	142.5	204.4	264.6	69.0	161.4	63.4	95.7
Average income per fisher	14.8	31.9	17.1	25.8	21.3	27.6	14.5	33.9	21.2	32.0

[a] Values in the fishing operating year, without subsidies.
[b] Values are adjusted by the inflation calculator to reflect 2012.
[c] This presents the results of the offshore gillnet vessels in Da Nang city.
[d] The previous longline vessels are hand-line vessels at present.

previous years or those of the Da Nang gillnet fleet in 2010 (Tables 5 and 7). In addition, the rent of vessels in 2012 on average was negative. To some extent, these results indicate that the government's intervention by use of subsidies led to a reduction of the actual surpluses of the two fisheries (in 2012) compared to no intervention. This does not contradict the theory discussed above.

In 2012, with subsidies, the average return on the owner's capital of each fleet was more than the presumed opportunity cost rate, and the majority of vessels earned positive super-profits this year, after calculated capital costs, and fewer vessels made losses. Thus, with the 2012 subsidies the super-profit of an average vessel in each fleet could be positive without contradicting the theory of open-access fisheries [26]. This result indicates that, even though the two fleets do not operate optimally, based upon a long-term analysis of allocating society's resources efficiently, vessel owners still receive a positive super-profit owing to the support from the government.

Of the three types of subsidies, the fuel cost quasi-lump sum subsidies had the largest effect on the profitability of offshore vessels (Table 6). This support was far higher in 2011 and 2012 than that in 2008 [21,23]. Since fishers still had to face the market price of oil, the design of the financial support per trip is better than supporting a direct price reduction per litre of fuel [21]. However, the high amount of revenue-enhancing subsidies based on engine sizes is likely to lead to changes in the behaviour of vessel owners in the future. Although subsidies of capital costs had the smallest profitability effect (Table 6), this subsidy type could still encourage investment in vessels and lead to higher than normal profit [3]. Subsidies of fixed operating costs raised the profit of intra-marginal vessels, possibly resulting in increased effort. In principal, these three types of subsidies all had qualitatively the same effect on fishing effort. When no controls are in place, this leads to the expansion of fishing effort and capacity through investment in engine capacity and new vessels, and possibly the more intensive use of existing vessels. Hence, in the long term, a new equilibrium with subsidies may be established when the profit of the marginal vessel has been eroded to a level where only the normal costs of capital are covered [3]. However, we should recall that Vietnam is just one of the SCS fishing nations. Stock levels are affected by effort from several countries and are not purely endogenous variables at equilibrium, as in Fig. 1.

Overall, the subsidy schemes significantly contributed to increasing the profit of the vessels, relatively more for the largest vessels. The largest vessels (with engines over 250 HP) received the highest fuel cost subsidies. Larger vessels with higher values of capital invested and more crew members received greater insurance support. These vessels could also access capital credit funded with preferential interest rates by the government more easily than others. These results are in accordance with the objectives of the 2010 government incentive programme of developing offshore fleets [38]. From an economic point of view, the design of these subsidy schemes may provide incentives to invest in large-scale offshore vessels with more powerful engine capacities.

It is not always the case that 'the biggest are the most beautiful'. In both fleets, vessels with engine sizes ranging from 250 to 400 HP earned the largest IMR, as well as super-profit. Furthermore, although the vessels with engines over 400 HP on average mostly had EP indicators worse than those in the group of 250–400 HP in both the subsidy and non-subsidy cases, they had the highest GR from their actual fishing operations and the greatest support from the government. The key reason for this finding was that the largest engine size group had lower cost efficiency. The existence of the large rent for the largest vessels in the previous years [21,23] and the previous incentive programmes to develop offshore fisheries may have led to investments in engine capacity and the rapid growth of vessels in the group of larger than 400 HP in later years, resulting in lower EP for them. These results indicate that, from an efficiency point of view, higher subsidies for larger vessels do not necessary help them achieve higher fishing efficiency and cost efficiency. This subsidy scheme can lead to a continuous increase in fishing effort and capacity, in principle, resulting in over-fishing and stock depletion, leading to falling catch per unit of effort and ultimately to the IMR disappearance [3,4,39].

The offshore catch of Vietnam is about 55% of the total MSY level [5]. This may be the reason why the subsidies have not yet contributed to collapsed fish stocks in the offshore fishery. The subsidies may have helped developing Vietnam's infant offshore fisheries, by modernising fleets, acquiring offshore fishing experience and skills, and by reducing the pressure on already over-fished near-shore resources.

By comparing 2012 with 2011, the results show that fish catches and revenues decreased, while costs increased and that there were more offshore vessels. Is this just a short-term change or does it indicate that previously under-fished offshore stocks may have become over-fished, hence providing a smaller sustainable yield than before? Even though the exploitation of offshore fish stocks beyond their biological limits may be occurring, partly due to subsidies, as well as increased fishing pressure from other nations, the government of a developing country such as Vietnam may argue that subsidies prevent unemployment and the collapse of the offshore fishing communities. However, in sustaining such large subsidies, such as the current support scheme, the depletion of offshore fish stocks in the future may be unavoidable.

It is important to note that one nation's subsidies of fleets may stimulate other nations to adopt such a policy if there is non-cooperative fishing of shared stocks and if countries anticipate future track-record based management systems. Thus, countries may have a strategic rent-shifting incentive to maintain large and excessively subsidised national fleets in international fisheries [40]. For instance, since neighbouring countries have a history of large fuel subsidies for their fleets [41], the same action by Vietnam may be recognised as straightforward. A consequence of using subsidies may thus be starting an international fishing war among countries sharing fish stocks, possibly leading to rent dissipation, welfare reduction, and the depletion of shared fish stocks [40]. Hence, whether subsidies are necessary for offshore fleets and for cooperation between countries are really questions for the policymakers of neighbouring countries sharing international fish stocks. In addition, as with nearby countries, the subsidisation of fishing has been pursued as a means to maintain at sea presence and border security in recent years because the presence of fishers and fishing in the SCS is considered to be of great geopolitical importance, as well as important for border security [7].

7. Conclusion

Based on surveys of 57 offshore gillnetters and 39 offshore hand-liners in Khanh Hoa, Vietnam, the economic analysis shows that, on average, the vessels of each fleet in 2011 and 2012 earned a positive OCF margin, operating margin and profit margin, even when all subsidies are excluded. Moreover, the crew members earned their opportunity cost of labour or above in these working years. By showing a lower EBITDA, EBIT and EBT (excluding the subsidies) on average, comparing 2012 to the previous year, and a negative rent, this study demonstrates that the offshore fisheries could be profitable for the vessel owners in the short term, without being socially optimal in the long term. Some vessels make good earnings even when excluding the subsidies, probably due to the introduction of cost-saving practices. This implies that, even in open-access fisheries, some vessels in the heterogeneous fleets may create net benefits to society.

The surveyed offshore vessels have received three main types of subsidies. These arrangements have had a great positive effect on the profitability of the surveyed vessels, with the fuel cost support having the largest effect, owing to its large subsidies. The largest vessels (i.e., engines with high HP) earned most of the super-profit, as well as IMR generated, but there were some exceptions. Furthermore, the subsidy schemes brought about relatively more benefits for these vessels than for small ones, but higher subsidies for larger vessels did not help all of them achieve higher performance. The current government support could lead to an economically inefficient industry and distort decision-making by fishers, with adverse impacts on investment and the operational aspects of the industry in the long term [3].

The 2010 subsidy schemes for offshore fisheries may have been based on arguments related to under-developed fishing industries, infant industries, and social objectives. Although these policies are likely to lead to long-term economic inefficiency in the industry and increase the probability of over-exploitation of offshore fish stocks, it is important to note that, in the short term, subsidies prevent unemployment and the collapse of fishing communities in developing countries such as Vietnam. However, subsidies do tend to artificially attract human and capital resources to the industry where they are likely to lead to a lower return than if the resources had been employed in the wider economy, leading to a deadweight loss for society [3]. Therefore, the criteria for applying subsidy programmes should be reviewed and assessed before implementation continues in the long term, in order to avoid stimulating fishers to invest more in offshore fishing in the future. Reviewing and assessing the subsidy programmes should address the economic, environmental, and social outcomes, potential tradeoffs and cost-effectiveness, as well as take into account the size of the impacts and the probabilities associated with the potential outcomes [3].

The paper discusses the possibility that Vietnam's subsidies are stimulated by the strategic rent-shifting incentives of neighbouring countries to maintain their subsidised national fleets in the shared stock fishery in the SCS. The long-term sustainable solution would be for the neighbouring countries to cooperate in sharing fish stocks and avoid the fuelling of an international fishing war. Since the subsidisation of offshore fishing in many countries may come from geopolitical objectives and border security reasons, sustainable fisheries and territorial solutions can only be reached through international negotiations and dispute settlement, based on international law.

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Appendices A and B. Supplementary material

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.marpol.2015.07.013.

References

[1] O. Flaaten, P. Wallis, Government financial transfers to fishing industries in OECD countries. OECD Working Paper 1917911, OECD, Paris, 2001.
[2] G. Munro, U.R. Sumaila, The impact of subsidies upon fisheries management and sustainability: the case of the North Atlantic, Fish Fish. 3 (2002) 233–250.
[3] OECD. Financial Support to Fisheries: Implications for Sustainable Development, OECD Publishing, Paris, 2006.
[4] W. Schrank, Introducing fisheries subsidies. FAO Fisheries Technical Paper No. 473, FAO, Rome, Italy, 2003.
[5] FAO Report of the Conference on the National Strategy for Marine Fisheries Management and Development in Viet Nam, FAO/FishCode Review No. 16, 1728-4392 2005, FAO, Rome, Italy.
[6] Decree, On management of aquatic resource exploitation by Vietnamese organizations and individuals in sea areas. Decree no. 123/2006/ND-CP of Vietnam's Prime Minister on October 27, Vietnam, Hanoi, 2006.
[7] VIFEP, WWF, UNEP, Fisheries Subsidies, Supply Chain and Certification in Vietnam. Final Summary Report Vietnam. Hanoi: Produced by Vietnam Institute of Fisheries and Economic Planning (VIFEP), World Wildlife Fund for Nature (WWF), and the United Nations Environment Programme (UNEP), 2009.
[8] H. Bergland, D.J. Clark, P.A. Pedersen, Rent-seeking and quota regulation of a renewable resource, Resour. Energy Econ. 24 (2002) 263–279.
[9] H. Bergland, D.J. Clark, P.A. Pedersen, History-dependent quantity regulation, J. Econ. 82 (2004) 225–248.
[10] L.K. Long, Regional fisheries management organisation with an endogenous minimum participation level for cooperation in straddling stock fisheries, Fish. Res. 97 (2009) 42–52.
[11] UNEP, Reflecting sustainable development and special and differential treatment for developing countries in the context of new WTO fisheries subsidies rules. An Issue and Options Paper, The United Nations Environment Programme (UNEP), Geneva, 2005.
[12] WTO, Draft Consolidated Chair Texts of the AD and SCM Agreements. Chairperson's Texts 2007 (TN/RL/W/213). Doha development agenda, World Trade Organization, Doha, 30 November, 2007.
[13] L. Westlund, Guide for Identifying, Assessing and Reporting on Subsidies in the Fisheries Sector, FAO, Rome, Italy, 2004.
[14] M. Milazzo, Subsidies in World Fisheries: A Reexamination, World Bank Publications, Washington, DC, 1998.
[15] DECAFIREP. The annual report of the number of vessels and engine power registered in 2012 (in Vietnamese). DECAFIREP Annual Report 2012. Khanh Hoa's Department of Capture Fisheries and Resources Protection, Khanh Hoa, Vietnam, 2012.
[16] O. Flaaten, Fisheries development and management – some reflections on Vietnam, IIFET 2008 Proceedings, Oregon State University, Nha Trang, Vietnam, 2008.
[17] R. Pomeroy, N.T. Kim Anh, H.X. Thong, Small-scale marine fisheries policy in Vietnam, Mar. Policy 33 (2009) 419–428.
[18] Decision. Some policies encouraging and supporting for fishing, aquaculture and fisheries service on offshore sea areas (in Vietnamese). Decision 48/2010/QĐ-TTg of Vietnam's Prime Minister on July 13, Hanoi, Vietnam, 2010.
[19] Circular. Guiding the implementation of Decision 48/2010/QĐ-TTg of Vietnam's Prime Minister on July 13, 2010 on some policies encouraging and supporting for fishing, aquaculture and fisheries service on offshore sea areas. Joint Circular 11/2011/TTLT-BNN-BQP-BTC of the Ministry of Agriculture and Rural Development, the Ministry of Defence, and the Ministry of Finance on March 14, Hanoi, Vietnam, 2011.
[20] T.N. Kim Anh, O. Flaaten, N. Tuan, T. Dung, T.N. Tram Anh, A study on costs and earnings of gillnet vessels in Nha Trang, Vietnam, IIFET 2006 Proceedings, Oregon State University, Portsmouth, England, 2006.
[21] N.N. Duy, O. Flaaten, N.T. Kim Anh, Ngoc QTK, Open-access fishing rent and efficiency–the case of gillnet vessels in Nha Trang, Vietnam, Fish. Res. 127–128 (2012) 98–108.
[22] L.K. Long, O. Flaaten, N.T. Kim Anh, Economic Performance of Open-access offshore Fisheries–the Case of Vietnamese Longliners in the South China Sea, Fish. Res. 93 (2008) 296–304.
[23] Nga, C.T.H., A Study on the Economic Efficiency of the Offshore Long Line Fishery in Khanh Hoa Province, Vietnam. Master, Norwegian College of Fishery Science, University of Tromsø, Tromsø, 2010.
[24] GSO, Statistical Yearbook of Vietnam 2012, Statistical Publishing House, General Statistics Office, Hanoi, Vietnam, 2012.
[25] H.S. Gordon, The economic theory of a common property resource: the fishery, J. Pol. Econ. 62 (1954) 124–142.
[26] P. Copes, Factor rents, sole ownership and the optimum level of fisheries exploitation. The Manchester School of Social and Economic Studies, 40, (1972) 145–163.
[27] O. Flaaten, Fisheries Economics and Management, University of Tromsø, Tromsø, Norway, 2011.
[28] L. Coglan, S. Pascoe, Separating resource rents from intra-marginal rents in fisheries' economic survey data, Agric. Resour. Econ. Rev. 28 (1999) 219–228.
[29] O. Flaaten, K. Heen, K.G. Salvanes, The invisible resource rent in limited entry and quota managed fisheries–the case of Norwegian purse seine fisheries, Mar. Resour. Econ. 10 (1995) 341–356.
[30] S. Pascoe, C. Robinson, L. Coglan, Economic and financial performance of the UK English Channel Fleet, CEMARE Research Report No. 44, Centre for the

Economics and Management of Aquatic Resources, University of Portsmouth, United Kingdom, 1998.
[31] D. Whitmarsh, C. James, H. Pickering, A. Neiland, The profitability of marine commercial fisheries: a review of economic information needs with particular reference to the UK, Mar. Policy 24 (2000) 257–263.
[32] P. Le Floc'h, F. Daurès, C. Brigaudeau, J. Bihel, A comparison of economic performance in the fisheries sector: a short- and long-term perspective, Mar. Policy 32 (2008) 421–431.
[33] GSO, Social-economic Status Report for the First Nine Months of 2013 (in Vietnamese), General Statistics Office, Hanoi, Vietnam, 2013.
[34] STOXResearch. Statistics on average deposit and lending interest rates of commercial banks by month from January 2008 to August 2013, ⟨http://www.stoxresearch.com/reports/148-statistics-on-average-deposit-and-lending-interest-rates-of-commercial-banks-by-month-from-2008-to-august-2013.aspx⟩, 2014 (accessed 02.01.14).
[35] N.N. Duy, O. Flaaten, N.T. Kim Anh, Q.T.K. Ngoc, A study on the economic performance and efficiency of o ffshore gillnet vessels in Nha Trang, Vietnam, in: IIFET 2010 Proceedings, Oregon State University, Montpellier, France, 2010.
[36] GSO, Result of the Vietnam household living standards survey 2012, Statistical Publishing House, General Statistics Office, Hanoi, Vietnam, 2012.
[37] T.D.T. Pham, H.-W. Huang, C.-T. Chuang, Finding a balance between economic performance and capacity efficiency for sustainable fisheries: case of the Da Nang gillnet fishery, Vietnam, Mar. Policy 44 (2014) 287–294.
[38] Decision, Vietnam's fisheries development strategy towards 2020, Decision 1690/QD-TTg of Vietnam's Prime Ministe r on September 16, 2010, Hanoi Vietnam.
[39] U.R. Sumaila, A. Khan, R. Watson, G. Munro, D. Zeller, N. Baron, D. Pauly, The world trade organization and global fisheries sustainability, Fish. Res. 88 (2007) 1–4.
[40] G. Ruseski, International fish wars: the strategic roles for fleet licensing and effort subsidies, J. Environ. Econ. Manag. 36 (1998) 70–88.
[41] U.R. Sumaila, L. Teh, R. Watson, P. Tyedmers, D. Pauly, Fuel price increase, subsidies, overcapacity, and resource sustainability, ICES J. Mar. Sci.: J. Conseil 65 (2008) 832–840.

Appendix A. Technical and operational characteristics and economic performance among vessel groups

Table A.1

Technical and operational characteristics of the surveyed vessels by ranges of engine

	Gillnet								Hand-line							
	HP < 150 (N = 7)		150 <= HP < 250 (N = 8)		250 <= HP < 400 (N = 27)		HP > = 400 (N = 15)		HP < 150 (N = 5)		150 <= HP < 250 (N = 10)		250 <= HP < 400 (N = 18)		HP > = 400 (N = 6)	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Engine (HP)	92.1 (17.3)	92.1 (17.3)	204.9 (47.4)	204.9 (47.4)	330.0 (30.9)	330.0 (30.9)	438.9 (61.7)	438.9 (61.7)	119.0 (20.9)	119.0 (20.9)	177.2 (29.8)	177.2 (29.8)	304.3 (20.5)	304.3 (20.5)	410.0 (6.3)	410.0 (6.3)
Length (m)	14.6 (0.8)	14.6 (0.8)	15.6 (0.8)	15.6 (0.8)	16.5 (1.2)	16.5 (1.2)	17.8 (1.1)	17.8 (1.1)	14.9 (0.5)	14.9 (0.5)	15.0 (0.9)	15.0 (0.9)	15.7 (1.2)	15.7 (1.2)	16.1 (0.6)	16.1 (0.6)
Age of vessel (years)	12.1 (8.7)	13.1 (8.7)	9.9 (4.9)	10.9 (4.9)	12.1 (6.7)	13.1 (6.7)	7.7 (4.8)	8.7 (4.8)	8.4 (0.5)	9.4 (0.5)	9.5 (2.8)	10.5 (2.8)	10.8 (3.7)	11.8 (3.7)	8.2 (5.0)	9.2 (5.0)
Gear[a]	208.6 (30.8)	208.6 (30.8)	233.6 (41.8)	233.6 (41.8)	287.1 (44.1)	287.1 (44.1)	318.0 (29.8)	318.0 (29.8)	170.0 (44.7)	170.0 (44.7)	167.5 (52.8)	167.5 (52.8)	180.6 (38.9)	180.6 (38.9)	216.7 (147.2)	216.7 (147.2)
Total operating months (months)	9.7 (1.0)	10.0 (0.6)	10.0 (1.7)	10.0 (1.7)	10.1 (1.2)	10.1 (1.2)	10.5 (0.6)	10.5 (0.6)	8.8 (2.7)	8.8 (2.7)	10.2 (0.4)	10.2 (0.4)	10.2 (0.5)	10.1 (0.5)	10.2 (0.4)	10.2 (0.4)
Number of trips fished (trips)	20.6 (10.4)	20.3 (7.9)	15.1 (5.8)	15.1 (5.8)	10.9 (2.9)	10.9 (2.9)	10.5 (0.6)	10.5 (0.6)	8.8 (2.7)	8.8 (2.7)	10.2 (0.4)	10.2 (0.4)	10.2 (0.5)	10.1 (0.5)	10.2 (0.5)	10.2 (0.5)
Number of days fished (days)	226.0 (41.3)	237.9 (39.1)	244.4 (44.0)	244.4 (44.0)	231.3 (35.1)	233.8 (33.3)	252.0 (25.7)	252.8 (26.1)	192.0 (65.3)	192.0 (65.3)	214.3 (16.5)	214.3 (16.5)	210.8 (15.3)	209.6 (15.3)	212.2 (21.5)	212.2 (21.5)
Fuel consumption (1000 litres)	23.6 (5.6)	24.1 (4.7)	28.0 (7.8)	28.0 (7.8)	37.5 (9.6)	37.5 (9.6)	47.9 (9.9)	48.0 (10.0)	27.2 (10.4)	27.2 (10.4)	35.6 (7.4)	36.1 (7.2)	38.3 (4.6)	38.1 (4.2)	48.1 (4.6)	48.1 (4.6)
Crews (persons)[b]	8.7 (0.5)	8.7 (0.5)	9.5 (0.9)	9.5 (0.9)	10.4 (1.2)	10.4 (1.2)	11.4 (0.9)	11.4 (0.9)	7.0 (0.7)	7.0 (0.7)	7.3 (0.7)	7.3 (0.7)	7.7 (0.9)	7.7 (0.9)	8.5 (1.4)	8.5 (1.4)

Source: Own data and calculations. Note: N shows number of the surveyed vessels; Mean values with standard deviation in parentheses.

[a] 'Gear' indicates the average number of nets and hooks of gillnetters and hand-liners, respectively.

[b] Crew size includes captain.

Table A.2

Average support among vessel groups by ranges of engine

	Gillnet								Hand-line							
	HP < 150 (N = 7)		150 <= HP < 250 (N = 8)		250 <= HP < 400 (N = 27)		HP > = 400 (N = 15)		HP < 150 (N = 5)		150 <= HP < 250 (N = 10)		250 <= HP < 400 (N = 18)		HP > = 400 (N = 6)	
Type of support	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Fuel cost	0.0	0.0	58.8	53.1	126.8	126.8	208.3	210.5	72.0	72.0	100.0	100.0	165.6	165.6	240.0	230.0
	(0.0)	(0.0)	(68.5)	(58.2)	(80.1)	(80.1)	(53.7)	(49.9)	(0.0)	(0.0)	(0.0)	(0.0)	(45.4)	(54.4)	(0.0)	(24.5)
Insurance[a]	2.4	2.5	3.6	3.5	5.0	5.5	6.5	6.0	5.0	5.0	3.7	3.7	4.9	4.9	5.5	5.5
	(3.0)	(3.0)	(4.2)	(4.1)	(3.2)	(3.4)	(3.3)	(2.8)	(2.7)	(2.7)	(3.6)	(3.6)	(3.0)	(3.0)	(2.5)	(2.5)
Loan interest	0.3	0.9	1.7	1.5	1.4	1.2	1.7	1.0	0.0	0.0	0.0	0.0	0.7	0.5	9.1	9.0
	(0.9)	(1.6)	(3.2)	(2.8)	(3.6)	(3.3)	(4.4)	(2.9)	(0.0)	(0.0)	(0.0)	(0.0)	(1.7)	(1.6)	(12.8)	(12.8)
Total	2.8	3.3	64.1	58.1	133.2	133.6	216.5	217.5	77.0	77.0	103.7	103.7	171.1	171.0	254.6	244.5
	(3.7)	(4.5)	(71.8)	(61.2)	(82.1)	(81.8)	(53.8)	(50.0)	(2.7)	(2.7)	(3.6)	(3.6)	(45.1)	(45.3)	(14.1)	(24.1)

Source: Own data and calculations. Note: N shows number of the surveyed vessels; Mean values with standard deviation in parentheses; unit is in million VND.

[a] Support for the vessel insurance cost and accident insurance cost for fishers.

Table A.3

Economic performance indicators among the gillnet vessel groups, with and without subsidies

	2011								2012							
	HP < 150 (N = 7)		150 <= HP < 250 (N = 8)		250 <= HP < 400 (N = 27)		HP > = 400 (N = 15)		HP < 150 (N = 7)		150 <= HP < 250 (N = 8)		250 <= HP < 400 (N = 27)		HP > = 400 (N = 15)	
	Subs.	Excl.subs.	Subs.	Excl.subs.	Subs.	Excl.subs.	Subs.	Excl.subs.	Subs.	Excl.subs.	Subs.	Excl.subs.	Subs.	Excl.subs.	Subs.	Excl.subs.
Gross revenue	1600.0	1600.0	1864.1	1805.4	2736.1	2609.3	3118.3	2910.0	1324.3	1324.3	1461.5	1408.4	2227.0	2100.2	2523.2	2312.7
	(309.6)	(309.6)	(468.8)	(436.8)	(688.4)	(675.2)	(380.0)	(379.2)	(250.5)	(250.5)	(359.7)	(349.8)	(567.8)	(561.8)	(296.9)	(302.1)
Variable operating costs	708.7	708.7	909.0	909.0	1180.0	1180.0	1423.8	1423.8	774.1	774.1	976.1	976.1	1296.1	1296.1	1557.3	1557.3
	(205.7)	(205.7)	(149.3)	(149.3)	(323.1)	(323.1)	(234.3)	(234.3)	(155.6)	(155.6)	(226.1)	(226.1)	(348.6)	(348.6)	(254.0)	(254.0)
Income	891.4	891.4	955.2	896.4	1556.1	1429.2	1694.6	1486.3	550.1	550.1	485.4	432.3	930.9	804.1	965.9	755.3
	(241.1)	(241.1)	(401.8)	(362.7)	(521.9)	(510.5)	(240.6)	(235.4)	(217.8)	(217.8)	(177.3)	(151.7)	(423.8)	(420.5)	(154.8)	(166.4)
Fixed operating costs	46.0	48.4	60.4	63.9	71.3	76.2	86.9	93.4	65.5	67.9	62.2	65.7	76.5	82.1	92.6	98.5
	(13.0)	(14.6)	(13.5)	(16.3)	(25.8)	(26.9)	(21.8)	(21.6)	(27.7)	(28.9)	(21.3)	(22.5)	(28.5)	(30.1)	(27.3)	(27.7)
Labour costs	353.3	353.3	354.7	354.7	548.6	548.6	569.9	569.9	244.5	244.5	248.8	248.8	346.4	346.4	394.1	394.1
	(43.7)	(43.7)	(104.5)	(104.5)	(221.3)	(221.3)	(103.5)	(103.5)	(43.0)	(43.0)	(73.3)	(73.3)	(141.5)	(141.5)	(73.6)	(73.6)
EBITDA	492.2	489.8	540.1	477.8	936.2	804.4	1037.9	823.1	240.2	237.8	174.4	117.8	508.0	375.7	479.2	262.7
	(211.2)	(210.2)	(310.7)	(270.0)	(321.6)	(298.9)	(175.7)	(165.6)	(193.3)	(192.5)	(130.5)	(93.8)	(301.0)	(287.8)	(151.3)	(156.9)
Depreciation	152.9	152.9	160.5	160.5	216.0	216.0	284.4	284.4	147.9	147.9	154.0	154.0	205.0	205.0	269.7	269.7
	(29.3)	(29.3)	(43.4)	(43.4)	(55.8)	(55.8)	(29.5)	(29.5)	(29.1)	(29.1)	(43.8)	(43.8)	(41.9)	(41.9)	(24.5)	(24.5)
EBIT	339.3	336.8	379.6	317.3	720.2	588.4	753.6	538.7	92.3	89.9	20.4	-36.2	302.9	170.6	209.4	-7.1
	(210.2)	(209.3)	(291.5)	(251.5)	(311.6)	(289.0)	(175.5)	(169.0)	(185.7)	(184.9)	(105.9)	(71.2)	(295.5)	(286.6)	(162.5)	(172.5)
Interest payment on loans	1.2	1.5	6.5	8.2	6.3	7.7	3.4	5.1	4.6	5.5	5.2	6.6	5.5	6.7	1.7	2.7
	(3.1)	(4.0)	(13.1)	(16.2)	(16.1)	(19.5)	(9.1)	(12.4)	(9.7)	(11.3)	(9.8)	(12.4)	(14.1)	(17.2)	(4.7)	(7.0)
EBT	338.1	335.3	373.1	309.1	713.9	580.7	750.1	533.7	87.7	84.4	15.2	-42.9	297.5	163.9	207.7	-9.8
	(207.8)	(206.2)	(292.0)	(252.5)	(309.6)	(286.7)	(178.5)	(173.3)	(188.5)	(188.1)	(105.6)	(71.7)	(295.0)	(286.6)	(165.0)	(175.6)
Calculated interest	117.5	117.5	144.3	144.3	182.5	182.5	313.7	313.7	82.4	82.4	106.4	106.4	135.9	135.9	232.0	232.0
	(15.4)	(15.4)	(66.2)	(66.2)	(65.1)	(65.1)	(45.5)	(45.5)	(14.5)	(14.5)	(49.8)	(49.8)	(48.9)	(48.9)	(33.8)	(33.8)
Rent	220.6	217.8	228.9	164.8	531.3	398.2	436.5	220.0	5.3	2.0	-91.1	-149.3	161.6	28.0	-24.3	-241.8
	(199.1)	(197.6)	(283.6)	(249.4)	(296.8)	(273.0)	(166.0)	(169.3)	(177.7)	(177.3)	(99.5)	(81.1)	(292.6)	(284.9)	(171.3)	(186.6)
Total capital value	1083.0	1083.0	1365.8	1365.8	1753.4	1753.4	2944.3	2944.3	1083.0	1083.0	1365.8	1365.8	1753.4	1753.4	2944.3	2944.3
	(164.7)	(164.7)	(656.0)	(656.0)	(612.9)	(612.9)	(450.6)	(450.6)	(164.7)	(164.7)	(656.0)	(656.0)	(612.9)	(612.9)	(450.6)	(450.6)
Owner’s capital	1068.7	1068.7	1311.5	1311.5	1659.3	1659.3	2851.7	2851.7	1030.6	1030.6	1329.6	1329.6	1698.6	1698.6	2900.5	2900.5
	(139.7)	(139.7)	(602.3)	(602.3)	(591.4)	(591.4)	(413.7)	(413.7)	(181.7)	(181.7)	(622.3)	(622.3)	(610.7)	(610.7)	(422.6)	(422.6)
OCF margin[a]	0.302	0.302	0.272	0.247	0.340	0.305	0.333	0.283	0.169	0.167	0.110	0.073	0.222	0.170	0.191	0.113
	(0.097)	(0.096)	(0.093)	(0.096)	(0.070)	(0.065)	(0.043)	(0.042)	(0.114)	(0.114)	(0.070)	(0.063)	(0.112)	(0.112)	(0.059)	(0.065)
Operating margin[a]	0.204	0.202	0.184	0.157	0.258	0.219	0.241	0.184	0.054	0.052	0.003	-0.038	0.126	0.067	0.082	-0.006
	(0.101)	(0.101)	(0.100)	(0.106)	(0.078)	(0.075)	(0.043)	(0.045)	(0.122)	(0.122)	(0.071)	(0.074)	(0.119)	(0.125)	(0.063)	(0.073)
Profit margin[a]	0.203	0.201	0.181	0.152	0.256	0.216	0.240	0.182	0.050	0.047	0.000	-0.043	0.124	0.064	0.082	-0.007
	(0.100)	(0.100)	(0.100)	(0.106)	(0.078)	(0.075)	(0.045)	(0.047)	(0.126)	(0.128)	(0.070)	(0.074)	(0.119)	(0.125)	(0.064)	(0.075)
ROC[a]	0.304	0.302	0.310	0.263	0.437	0.355	0.259	0.186	0.075	0.072	-0.001	-0.043	0.187	0.105	0.074	0.000
	(0.159)	(0.159)	(0.267)	(0.237)	(0.212)	(0.188)	(0.059)	(0.059)	(0.151)	(0.150)	(0.107)	(0.084)	(0.190)	(0.171)	(0.057)	(0.058)
ROE[a]	0.310	0.307	0.313	0.265	0.492	0.391	0.265	0.189	0.067	0.063	-0.004	-0.047	0.202	0.110	0.074	-0.002
	(0.168)	(0.167)	(0.267)	(0.238)	(0.320)	(0.252)	(0.056)	(0.060)	(0.167)	(0.168)	(0.107)	(0.083)	(0.222)	(0.188)	(0.058)	(0.06)
Average income per fisher	40.6	40.6	37.1	37.1	52.5	52.5	50.1	50.1	28.1	28.1	26.1	26.1	33.3	33.3	34.5	34.5
	(5.4)	(5.4)	(9.5)	(9.5)	(19.7)	(19.7)	(9.3)	(9.3)	(4.6)	(4.6)	(6.7)	(6.7)	(13.2)	(13.2)	(5.6)	(5.6)

Source: Own data and calculations. Note: Unit is in million VND; mean values with standard deviation in parentheses. ‘Including subsidies’ and ‘Excluding subsidies’ are abbreviated to ‘Subs.’ and ‘Excl.Subs.’, respectively.

[a] These indicators are estimated relative to standard deviation and measured in decimal numbers.

Table A.4

Economic performance indicators among the hand-line vessel groups, with and without subsidies

	2011								2012							
	HP < 150 (N = 5)		150 <= HP < 250 (N = 10)		250 <= HP < 400 (N = 18)		HP > = 400 (N = 6)		HP < 150 (N = 5)		150 <= HP < 250 (N = 10)		250 <= HP < 400 (N = 18)		HP > = 400 (N = 6)	
	Subs.	Excl.subs.	Subs.	Excl.subs.	Subs.	Excl.subs.	Subs.	Excl.subs.	Subs.	Excl.subs.	Subs.	Excl.subs.	Subs.	Excl.subs.	Subs.	Excl.subs.
Gross revenue	1579.5	1507.5	1994.5	1894.5	2295.6	2130.0	2411.3	2171.3	1193.5	1121.5	1604.4	1504.4	1827.4	1661.8	1943.1	1713.1
	(525.5)	(525.5)	(288.9)	(288.9)	(429.1)	(427.4)	(328.8)	(328.8)	(441.1)	(441.1)	(227.1)	(227.1)	(385.4)	(383.0)	(203.7)	(191.2)
Variable operating costs	783.9	783.9	973.7	973.7	1057.6	1057.6	1236.6	1236.6	832.0	832.0	1053.1	1053.1	1123.3	1123.3	1316.4	1316.4
	(273.1)	(273.1)	(166.8)	(166.8)	(117.9)	(117.9)	(88.6)	(88.6)	(286.6)	(286.6)	(221.0)	(221.0)	(138.8)	(138.8)	(78.0)	(78.0)
Income	795.6	723.6	1020.8	920.8	1238.0	1072.4	1174.7	934.7	361.5	289.5	551.3	451.3	704.1	538.5	626.7	396.7
	(309.5)	(309.5)	(159.4)	(159.4)	(339.7)	(341.1)	(363.8)	(363.8)	(278.0)	(278.0)	(143.1)	(143.1)	(278.3)	(278.8)	(238.3)	(228.6)
Fixed operating costs	62.9	67.9	56.5	60.1	65.9	70.8	83.0	88.5	65.9	70.9	69.5	73.1	77.0	81.9	94.7	100.2
	(15.4)	(17.4)	(7.1)	(7.2)	(14.3)	(15.7)	(8.7)	(10.5)	(24.8)	(25.5)	(11.0)	(11.1)	(8.2)	(9.3)	(10.3)	(12.2)
Labour costs	361.8	361.8	460.4	460.4	536.2	536.2	467.3	467.3	183.0	183.0	257.5	257.5	308.8	308.8	292.8	292.8
	(154.7)	(154.7)	(79.7)	(79.7)	(170.6)	(170.6)	(181.9)	(181.9)	(110.0)	(110.0)	(44.1)	(44.1)	(104.1)	(104.1)	(59.3)	(59.3)
EBITDA	370.9	293.9	503.9	400.3	635.9	465.4	624.4	378.8	112.7	35.6	224.2	120.6	318.3	147.8	239.3	3.7
	(150.9)	(152.1)	(80.1)	(78.9)	(167.5)	(165.4)	(176.6)	(175.9)	(157.2)	(158.9)	(104.8)	(105.6)	(186.3)	(188.5)	(200.5)	(190.3)
Depreciation	52.2	52.2	60.1	60.1	69.3	69.3	82.6	82.6	42.4	42.4	49.9	49.9	58.1	58.1	69.8	69.8
	(12.4)	(12.4)	(11.0)	(11.0)	(12.7)	(12.7)	(14.0)	(14.0)	(8.8)	(8.8)	(8.7)	(8.7)	(11.1)	(11.1)	(10.9)	(10.9)
EBIT	318.7	241.7	443.7	340.1	566.6	396.1	541.8	296.2	70.3	-6.7	174.3	70.7	260.2	89.7	169.5	-66.0
	(141.3)	(142.4)	(78.9)	(77.5)	(168.9)	(165.9)	(172.2)	(171.5)	(149.3)	(151.0)	(98.2)	(98.8)	(187.3)	(188.7)	(198.0)	(188.0)
Interest payment on loans	0.0	0.0	0.0	0.0	5.0	5.6	10.5	19.6	0.0	0.0	0.0	0.0	3.2	3.7	10.4	19.4
	(0.0)	(0.0)	(0.0)	(0.0)	(11.1)	(12.0)	(14.8)	(27.6)	(0.0)	(0.0)	(0.0)	(0.0)	(6.6)	(7.9)	(14.8)	(27.6)
EBT	318.7	241.7	443.7	340.1	561.6	390.5	531.3	276.7	70.3	-6.7	174.3	70.7	256.9	86.0	159.1	-85.4
	(141.3)	(142.4)	(78.9)	(77.5)	(163.0)	(159.1)	(173.2)	(174.6)	(149.3)	(151.0)	(98.2)	(98.8)	(185.0)	(186.0)	(201.1)	(193.9)
Calculated interest	47.1	47.1	60.0	60.0	72.2	72.2	98.5	98.5	34.8	34.8	43.2	43.2	53.7	53.7	74.9	74.9
	(5.1)	(5.1)	(19.0)	(19.0)	(29.9)	(29.9)	(19.0)	(19.0)	(4.1)	(4.1)	(14.0)	(14.0)	(21.7)	(21.7)	(14.8)	(14.8)
Rent	271.6	194.5	383.7	280.1	489.4	318.3	432.8	178.2	35.5	-41.5	131.1	27.5	203.3	32.3	84.2	-160.3
	(137.3)	(138.3)	(81.2)	(79.6)	(162.2)	(155.9)	(171.5)	(172.7)	(146.2)	(147.9)	(93.5)	(94.1)	(184.6)	(184.0)	(203.0)	(195.7)
Total capital value	446.6	446.6	554.5	554.5	682.6	682.6	976.6	976.6	446.6	446.6	554.5	554.5	682.6	682.6	976.6	976.6
	(67.0)	(67.0)	(172.3)	(172.3)	(270.3)	(270.3)	(209.1)	(209.1)	(67.0)	(67.0)	(172.3)	(172.3)	(270.3)	(270.3)	(209.1)	(209.1)
Owner's capital	428.6	428.6	545.5	545.5	656.5	656.5	895.4	895.4	434.6	434.6	539.5	539.5	671.1	671.1	936.3	936.3
	(46.6)	(46.6)	(172.5)	(172.5)	(272.2)	(272.2)	(172.9)	(172.9)	(50.8)	(50.8)	(175.2)	(175.2)	(271.9)	(271.9)	(184.5)	(184.5)
OCF margin[a]	0.234	0.182	0.252	0.211	0.274	0.213	0.257	0.168	0.074	-0.009	0.138	0.077	0.163	0.071	0.116	-0.007
	(0.034)	(0.054)	(0.022)	(0.023)	(0.024)	(0.036)	(0.038)	(0.050)	(0.100)	(0.146)	(0.060)	(0.068)	(0.072)	(0.102)	(0.089)	(0.109)
Operating margin[a]	0.194	0.142	0.220	0.176	0.243	0.180	0.220	0.130	0.033	-0.054	0.107	0.044	0.130	0.034	0.080	-0.045
	(0.039)	(0.066)	(0.019)	(0.024)	(0.030)	(0.041)	(0.040)	(0.056)	(0.109)	(0.163)	(0.058)	(0.066)	(0.078)	(0.109)	(0.092)	(0.112)
Profit margin[a]	0.194	0.142	0.220	0.176	0.242	0.177	0.217	0.120	0.033	-0.054	0.107	0.044	0.129	0.033	0.074	-0.060
	(0.039)	(0.066)	(0.019)	(0.024)	(0.030)	(0.040)	(0.040)	(0.059)	(0.109)	(0.163)	(0.058)	(0.066)	(0.077)	(0.107)	(0.094)	(0.116)
ROC[a]	0.704	0.530	0.849	0.650	0.934	0.636	0.583	0.317	0.138	-0.036	0.313	0.114	0.413	0.117	0.193	-0.060
	(0.296)	(0.304)	(0.248)	(0.216)	(0.394)	(0.296)	(0.243)	(0.194)	(0.325)	(0.341)	(0.174)	(0.180)	(0.287)	(0.295)	(0.251)	(0.208)
ROE[a]	0.726	0.546	0.864	0.662	0.984	0.671	0.615	0.320	0.138	-0.041	0.330	0.125	0.422	0.118	0.189	-0.084
	(0.285)	(0.298)	(0.251)	(0.219)	(0.464)	(0.357)	(0.239)	(0.202)	(0.322)	(0.342)	(0.193)	(0.194)	(0.297)	(0.296)	(0.257)	(0.218)
Average income per fisher	51.5	51.5	63.2	63.2	70.1	70.1	55.8	55.8	26.0	26.0	35.4	35.4	40.3	40.3	34.6	34.6
	(20.8)	(20.8)	(10.2)	(10.2)	(21.7)	(21.7)	(21.4)	(21.4)	(15.1)	(15.1)	(5.9)	(5.9)	(12.6)	(12.6)	(5.6)	(5.6)

Source: Own data and calculations. Note: Unit is in million VND; mean values with standard deviation in parentheses. 'Including subsidies' and 'Excluding subsidies' are abbreviated to 'Subs.' and 'Excl.Subs.', respectively.

[a] These indicators are estimated relative to standard deviation and measured in decimal numbers.

Appendix B. Sample representativeness

Table B.1

Sample representativeness tests

Gear	Variable	N	Sample mean	Standard deviation	Mean of the population	t-test statistic	P-value
Gillnet	Horsepower	57	311.87	117.74	303.14	0.560	0.578
	Hull length	57	16.49	1.45	16.57	-0.425	0.672.
Hand-line	Horsepower	39	264.23	96.62	282.51	-1.181	0.245
	Hull length	39	15.46	1.03	15.50	-0.249	0.805

Source: Own data and calculations.