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Comparison of economic analysis with financial analysis of fisheries: Application of the perpetual inventory method to the Finnish fishing fleet

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ABSTRACT

The economic performance of fisheries can be assessed in two ways, which are different by definition: economic or financial analysis. The main difference arises from the distinct treatment of capital costs. Financial analysis is based on explicit costs paid by enterprises, whereas in economic analysis, costs are based on the opportunity costs of production factors. In economic analysis, resource rent is the main interest, not the actual profit from financial statements, and the capital cost relates to the capital employed in the fisheries. To determine the depreciation and opportunity costs, one needs to measure the capital value of the fleet. This paper focuses on the application of the perpetual inventory method (PIM) to the Finnish fishing fleet. The results from economic analysis are compared with those from financial analysis in terms of profitability, and the implications of the PIM estimation for the balance indicators are analysed. It is demonstrated that although the active part of a fleet segment can be creating significant resource rent the segment as a whole may be considered imbalanced. A fleet segment with old vessels may be showing a positive result in financial statements meanwhile the long term economic analysis indicates losses when accounting for the opportunity cost of the capital invested.

1. Introduction

The European Union (EU) Common Fisheries Policy (CFP) aims to promote long-term environmentally, economically and socially sustainable fishing [1]. The Common Fisheries Policy also sets out the requirements for data collection necessary for fisheries management. The Data Collection Framework (DCF) [2,3] establishes rules on the collection, management and use of biological, environmental, technical and socioeconomic data concerning the fisheries sector.

The economic assessment of sustainability is a long-term term concept. Financial statements are based on explicit costs paid by enterprises, whereas in economic analysis, the costs are based on the opportunity costs of production factors [4–6] and the resource rent [7] 'is the sustained return society obtains from owning a stock' [8]. Jensen et al. [9] state that often in the fisheries literature, no distinction is made between opportunity costs and actual costs or, more specifically, resource rent and profit (from accounting), but these concepts are mixed and used incoherently (see e.g. Clark [10], Gould [11], Boyce [12], Bjørndal and Conrad [13] and Anderson [14]). Moreover, financial viability and economic performance are used interchangeably [15].

Jensen et al. [9] investigated the difference between opportunity costs and actual costs in the Danish case and found that these costs differ. Schuhbauer and Sumaila [15] provide a thorough review on approaches used when assessing the economic viability of fisheries. They also distinguish between the financial and economic issues that need to be taken into account when assessing fisheries in the long term. The economic viability of fisheries can be analysed based on financial indicators (financial analysis) [16,17], where a certain threshold for these indicators is set when assessing the viability. Moreover, not only the present, but also the future performance of the economic entity should be considered when the economic viability of fisheries is assessed. Cost–benefit analysis takes into account the time when assessing net benefits and is therefore a useful tool for assessing the long-term economic viability of a company. [18]

Capital invested in fishing capacity is a major production factor and at the core of sustainable fisheries: the CFP has a particular objective of adjusting the fishing capacity so that it is balanced to the levels of fishing opportunities [19,20]. Capital costs in financial statements relate to accounting rules and the financial position of enterprises; the depreciation of capital is set by a depreciation scheme based on accounting principles that relates to taxation, and financial costs depend on the financial position of enterprises. In economic analysis, capital costs relate to the capital employed in fisheries. To determine the

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depreciation and opportunity cost and hence calculate the resource rent, the capital value of the fleet needs to be measured [7]. The perpetual inventory method (PIM), developed by the Organisation for Economic Co-operation and Development (OECD) [21], has become the most commonly used international standard for the valuation of tangible capital goods [22] and is introduced in the Data Collection Framework. The method has been applied in Finland under the Data Collection Framework since 2012 [23].

In the perpetual inventory method, the past capital formation is accumulated and the value of assets that have reached the end of their service life is deducted. A well-defined retirement profile is the key when modelling the retirement process of a cohort of assets over time [22]. The perpetual inventory method requires many assumptions concerning the length of vessel component service lives, the depreciation schemes used for calculating the accumulated depreciation over time and the relative value of different components of the fleet, among others. Meanwhile, the default values used for these assumptions are left to the EU Member States to decide without thorough guidelines. These assumptions are nonetheless critical, having a major influence on the valuation of capital. Choosing the price determinant (e.g. book value or insurance value) for fishing vessels when defining the price per capacity unit affects the replacement value estimated for the fleet and thus has an additional impact on economic profitability.

This paper focuses on the application of the perpetual inventory method to data on the Finnish fleet and compares the results from economic analysis with financial analysis in terms of capital value and profitability. In addition, the balance indicators utilised by the Scientific, Technical and Economic Committee for Fisheries (STECF) when assessing the balance between fishing capacity and fishing opportunities are compared [19].

First, different methods for measuring the value of capital are presented. Next, the perpetual inventory method and its concepts are introduced, and how the method should be applied to the fisheries sector. Thereafter, the practical aspects of applying the method to the Finnish fleet are discussed and the uncertainties remaining in the application are outlined. Then, the results from economic analysis with financial analysis in terms of capital value and profitability are compared. Finally, the balance indicators utilised by the Scientific, Technical and Economic Committee for Fisheries when assessing the balance between fishing capacity and fishing opportunities [19] are presented, with a special focus on small-scale commercial fishing and fishing activity levels.

2. Measuring the value of capital

Based on EU legislation [3], EU Member States have an obligation to collect and report data to end users on capital values, investments and capital costs, that is, interest costs and depreciation based on economic rather than financial analysis. There are several practical options for measuring the capital stock, such as to find a direct estimate of the capital stock, use book values and adjust them for inflation or to use the perpetual inventory method [4]. Direct estimates (e.g. market prices and insurance values) do not sufficiently take into account the value of capital services in case some of the capital has been rented [24]. Book values might be easily acquired, but they do not necessarily reflect the market prices very well if the fleet is comprised of older vessels.

Indirect methods, such as the perpetual inventory method, have been developed to also take into account the price and quantity of capital services [24]. One may use the vessel book values, insurance values or some direct market values in defining the price per capacity unit when applying the perpetual inventory method, as demonstrated later in this paper. The strength of the perpetual inventory method is that once all the assumptions made (vessel component service lives, the depreciation schemes and the relative value of different components of the fleet) and appropriate prices per capacity unit have been decided, the method is fairly straightforward to apply. The relevant information needed for the annual valuation can be mostly found in the fleet register.

In estimating the capital value of a vessel using the perpetual inventory method, the vessel's attributes, such as length, gross or net tonnage and carrying capacity, can be used as proxy variables to measure the capital stock. However, these proxy variables do not account for the fact that different vintages of vessels have different levels of technology, or the amount by which a stock of capital is used in a given time period [21], and this is a weakness of the method. Hulten [13] states that potentially the biggest issue of the perpetual inventory method is that the service lives used in the method are fixed for the entire period covered and do not change with time, as occurs in real life. In addition, there is often very little real-world data on the useful asset life and on retirement patterns.

Although it is mentioned in the EU legislation [3] that the perpetual inventory method developed by the OECD [21] is the preferred method for estimating the value of capital, hedonic models are also used in the fisheries literature. Hedonic modelling is based on the assumption that there is a hedonic price of a commodity, which is a function of its attributes, and economic agents value these attributes [24]. Kirkley and Squires [25] applied hedonic models to fisheries when estimating the capital stock in the New England fishery. Guyader et al. [26] also applied a hedonic pricing model and found that the value of a vessel can be broken down into tangible and intangible values; the tangible value is defined by the age and technical characteristics of the vessel and the intangible value reflects the access right to the fisheries. They found that a major share of the value of second-hand vessels comes from the operation permits and licenses and that the relative share of the intangible value increases when a vessel ages.

Even if hedonic models are eligible in the sense that they are objective, statistically sound and based on a large amount of data, they also have some weaknesses. These include the potential scarcity of data on different technical aspects of the vessels and the huge amount of work involved in collecting these data. Moreover, hedonic models might not work optimally in cases when rapid technical developments affect the market prices.

In national accounts, in addition to the perpetual inventory method, two other methods are in use: the appropriation method and capital service flow calculations. In the appropriation method, the fees, taxes and royalties collected from the companies involved in resource extraction are summed up to obtain the resource rent. When deriving the resource rent from capital service calculations, the decline in the service provided by the asset over its life is modelled. The resource rent is then obtained by deducting the capital service flows (estimated from the stock of capital) from the total economic rent. [7]

The different methods used for estimating the capital value of the fleet in member states are presented in the report of the STECF workshop on calculating capital value using the perpetual inventory method and the definition of Data Collection Framework variables [27]. Most of the member states studied used either some elementary or more sophisticated form of the perpetual inventory method (Cyprus, Finland, Denmark, Italy, Lithuania, Malta and Sweden) or were planning to use it in the near future (Bulgaria, France). However, many challenges were reported when applying the method. In addition to the perpetual inventory method, scrapping value compensation (Latvia and Poland) or book values (Romania) were used as a basis for estimation. Later in this paper, we investigate the different aspects of the perpetual inventory method that make its application challenging and the results sensitive to different choices in the assumptions made.

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