Ocean & Coastal Management 91 (2014) 58–64

Contents lists available at ScienceDirect

Ocean & Coastal Management

journal homepage: www.elsevier.com/locate/ocecoaman

Producing regional production multipliers for Irish marine sector policy: A location quotient approach

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ARTICLE INFO

Article history:
Available online 22 February 2014

ABSTRACT

Economic activity does not exist in a vacuum. Activities in the marine sector not only directly affect the industries in the sector but also influence other sectors through inter-sectoral linkages. Recent research in Ireland has estimated the impact of inter-sectoral linkages of the marine sector at the national level via production multipliers. However, the importance of the marine sector on regional economies has been well established. Disaggregating the national Input-Output table using location quotients has become widely accepted as a quantitative method for regional impact assessment of industry performance. Using a relatively novel location quotient, the FLQ, this paper produces a set of regional production multipliers for ten marine based sectors for the Border, Midland and West (BMW) region and the South East (SE) region in Ireland. A final analysis, using the regionalised marine production multipliers provides a preliminary case study for the potential of a seafood cluster in the BMW region. Whilst concluding comments offer an insight into how the LQ method may be used to develop a strategy for the multi-sectoral Irish marine sector.

1. Introduction

The economic importance of the marine sector in industrialised countries tends to be low, between 1% and 3% of nations GDP (Kwak et al., 2005; Kildow and McIlgorm, 2010; Morrissey et al., 2011) but the marine economy as a whole can still be significant at the regional level (Morrissey and O'Donoghue, 2012). Specific sub-sectors within the marine economy, such as fisheries (Eggert and Tveterås, 2013; Midelfart-Knarvik and Steen, 2002; Virtanen et al., 2001; Sigfusson et al., 2013) and shipping (Morrissey and O'Donoghue, 2013b; Benito et al., 2003) can have a significant impact on regional and coastal economies. Human activities in the world's oceans and coasts are at an unprecedented scale and expanding rapidly (Stojanovic and Farmer, 2013). The oceans have become a focal point for many new activities including wind and wave power, marine biotechnology, marine technology and other enterprises (Kildow and McIlgorm, 2010; Morrissey et al., 2011). In terms of public policy, research has indicated that there may be substantial gains from marine based industries for the regions (Morrissey and O'Donoghue, 2012).

From a regional development perspective, policymakers' interest in spatial concentrations or clusters has increased over the last two decades for a number of reasons. Firstly, particularly in view of enduring regional disparities (Braunerhjelm et al., 2000), regional development is increasingly understood as a context-specific process in which policymakers should understand and respond to the singularities of the regions in which they operate (Deloreux and Shearmur, 2009; Gertler and Wolfe, 2006). Secondly, policymakers now have a better understanding of innovation dynamics. Innovation is now understood as a social and evolutionary process resting on interactive learning and regional externalities (Deloreux and Shearmur, 2009; Doloreux, 2004). Weight is now given to the influence that cultural, economic, and institutional environments have on innovation. Thirdly, policymakers are increasingly aware of the impact of successful regional clusters, which have brought into focus the specific advantages that some regional contexts seem to bring to the performance and competitiveness of sectors (Deloreux and Shearmur, 2009). Previous research on the impact of the spatial concentrations of interlinked marine activities indicates that marine based industrial clusters have the potential to play an important regional role (Morrissey and O'Donoghue, 2012; Deloreux and Shearmur, 2009; Chang, 2011; Morrissey and O'Donoghue, 2013).

Acknowledging the regional importance and potential of the marine resource, applied social research on the marine resource is increasingly recognized as indispensable to management,

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http://dx.doi.org/10.1016/j.ocecoaman.2014.02.006
0964-5691/

conservation, and policy around the globe (Koehn et al., 2013; Jin et al., 2013; Morrissey and O'Donoghue, 2013a). Information and knowledge from past trends are essential to inform forecasts of the future (Hawkins et al., 2013). Drawing on current economic data on the Irish marine sector (Morrissey, 2010) this paper uses location quotients (LQ) to regionalise the Irish marine input–output (IO) table (Morrissey and O'Donoghue, 2013a). Regionalising the Irish marine IO table at the NUTSII level[1] will provide policymakers with the direct and indirect impact of the marine economy to the Border, West and Midlands (BMW) and South East (SE) regions of Ireland, as well as indicating key inter-industry linkages within the sector and provide policymakers with exploratory data on the potential for spatial clusters in the marine sector.

2. Data

Regional models typically contain far fewer sectors than the corresponding national models (Flegg et al., 1995; MacFeely et al., 2011). However, this is not the case for the study to hand. In contrast, utilising the disaggregated marine I–O model for Ireland (Morrissey and O'Donoghue, 2013a), this paper seeks to regionalise the newly created IO table into the two NUTII regions – the Border, Midland and West (BMW) region and the South East (SE) region for each of the ten marine based industries within the Irish economy.

2.1. Data for the Irish marine input–output model

Disaggregating a national IO table to encompass a new sector requires detailed sectoral data on intermediate consumption (input coefficients), output, compensation of employees and final demand (Morrissey and O'Donoghue, 2013a). Given the fragmented nature of the marine sector (Colgan, 2013), to collect and collate the necessary data to disaggregate the national IO a variety of data types or collection methods must be employed [10]. These data types may be broken down into three broad categories. Type 1 data is data that is in the public domain. Such estimates are generally confined to those sectors whose connection to the sea is clear (i.e. commercial fisheries, coastal transportation). Type 2 data is data that is publicly collected but is not released into the public domain. This data is at a lower industrial or geographical classification and is therefore considered confidential. Type 3 data is data that is not available in the public domain. The sectors where there is no publicly available data are sectors that are not easily recognisable as marine based (Morrissey et al., 2011). These sectors are often indistinguishable from their land based counterparts within economic datasets (Colgan, 2013). For example, one cannot difference between water based recreational activities and land based recreational activities. As such, to disaggregate the Irish national IO table to include a marine component, public data was not sufficient to estimate the full value of the Irish marine sector.

In terms of collating non-public data (Type 2 data), the Irish Central Statistics Office (CSO) provides data on turnover, intermediate consumption, gross value added, exports, and employment for each sector within the Irish economy. This data is collected across a number of censuses and surveys. The censuses and surveys used for the collation of the data on the marine sector include; the Census of Industrial Production (CIP), the Annual Services Inquiry (ASI) and the Census of Buildings and Construction (CBC). These three micro datasets provide detailed firm and enterprise level information on the economic activities for each company at the four digit NACE code. In order to assure consistency of treatment across different datasets, the industry estimates should operate within an established measurement of economic activity, such as the national income and production accounts [10]. The CIP, ASI and CBC datasets collected by the CSO form the basis for the calculation of Ireland's national income and production accounts. Access may be granted to researchers interested in examining the data, through the CSO officer of statistics facility.

With regard to marine based sectors where no data was available (Type 3 data) a survey was administrated to each company within each sector (Morrissey et al., 2011). The survey was prepared in line with the CSO surveys used to obtain data for the CIP, ASI and CBC datasets. This ensured that the necessary data to disaggregate the national IO table; intermediate consumption, output, final demand and compensation of employees, compiled between public and non-public data was consistent. Companies that provided both land-based and marine-based goods and services were specifically asked about their commercial marine-based activity (i.e. what percentage of their turnover was derived from marine-based activity). The central year for the study was 2007. To ensure temporal consistency, public datasets that were from earlier or later years were not included in the estimates. Data collected via survey specifically asked for company accounts for the year ending the 31st of December 2007. Table 1 indicates the data type and the data sources for each sector of interest.

3. Methodology

Using the marine based data listed above, we define the national marine IO model created by Morrissey and O'Donoghue (2013a) as:

$$\begin{aligned} x &= X_{e-} + f \\ \Rightarrow x &= Ax + f \\ \Rightarrow x &= (I - A)^{-1} + f \end{aligned} \tag{1}$$

Where matrix X represents the transaction flows between sectors of activities and is the sum of gross outputs, matrix I is an identity matrix, vector x is the sum of gross outputs, vector f represents the part of gross output sold to final demand, and A is a matrix of input coefficients defined as;

$$A = a_{ij} = \frac{z_{ij}}{x_j} \tag{2}$$

Where z_{ij} is intermediate demand for inputs between sector i and the supply sector j and x_j is the final output for sector i. $(I - A)^{-1}$ (Eq.

Table 1
Overview of marine sub-sectors and data sources used to compile the disaggregated marine input–output table.

Marine sector	Data type	Data source
Ship owners & maritime logistics	Type 2 data	ASI
Water based activities	Type 3 data	Company survey
Tourism expenditure	Type 2 data	ESRI report
Cruise	Type 2 data	UCC report
High tech services	Type 3 data	Company survey
Marine commerce	Type 3 data	Company survey
Other services	Type 3 data	Company survey
Fisheries	Type 1 data	SFPA/CSO
Aquaculture	Type 1 data	Bim report
Seafood processing	Type 2 data	CIP
Seaweed & biotechnology	Type 3 data	Company survey
Oil & gas	Type 2 & 3 data	CIP/company survey
Renewable energy	Type 3 data	Company survey
Marine manufacturing, engineering & construction	Type 2 & 3 data	CIP & CBC/company survey

CIP – Census of Industrial Production, ASI – Annual Services Inquiry, CBC – Census of Building and Construction.

[1] NUTS (Nomenclature of Territorial Units) is the spatial classification system used by the European Union.