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# The Marine Economy and Regional Development

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## The Marine Economy and the Regional Development

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**Abstract**

The economic impact of the marine economy is poorly understood at both a national and regional level in Ireland. A recent paper by estimated the economic value of the marine sector for Ireland at the national level. This paper presents a follow up analysis of the Irish marine sector at the regional level for 2007. The paper examines the impact of the marine sector in addressing regional disparities in Ireland, and the key marine sectors that drive regional economic performance within the marine sector. The analysis finds that in absolute values Dublin and the South West provide the highest levels of marine GVA, however, as a percentage of regional GVA, the marine sector is more important in the West and South West region. In terms of employment, the West and South-West provide the highest levels of marine employment, and this relationship is maintained when one examines marine employment as a percentage of regional employment. Finally, productivity rates for the sector were highest in the Dublin region. However, productivity in the marine-based sector was higher than the overall regional rate for five of the eight Irish regions.

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## 1. Introduction

The widening income disparities among EU regions since the mid-1980s has led to an intense debate on the impacts that increased economic integration and globalisation has on regional growth rates of members or non-members of a regional trading block (Morgenroth, 2003; O'Leary, 2003; Heidrenreich and Wunder, 2008). Within the EU, the move to a single market has led to an increased recognition that not all countries would benefit from deepening EU integration (Braunerhjelm et al., 2000). To predict how globalisation and increased international integration may effect individual industries across space and to make appropriate national and regional policy recommendations, one needs to know something about the importance and strength of geographical processes on growth within a country and its regions (Midelfort-Knarvike and Steen, 1999).

The study of spatial economics –or more specifically the location of production, has a long, but somewhat neglected history (Krugman, 1998; Morgenroth, 2003). As Krugman (1998) points out, Von Thunen's (1826) analysis of land rent and usage around an isolated city; Weber's location analysis (1909), Christaller and Losch's central place theorem (1933 and 1940), Isard's regional science and Henderson's (1974) theory of urban systems are old and well-established ideas. The tendency of activity and people to cluster in space and form big agglomerations and the mechanisms which give rise to this was first discussed by Marshall (1890). However, it is only since the publication of Krugman's (1991) paper on what has come to be called New Economic Geography (NEG) that a dynamic and sustained interest has taken place on how to capture and endogenize the effect of 'geography' on regional and national growth (Morgenroth, 2003; Naceur-Sboui and Hammas, 2010).

Why do firms and industries concentrate geographically? An analytical starting pointing is the observation that to maximise profits firms seek to reduce inputs. Close proximity to factors of production (i.e. natural resources) and trade partners significantly reduces transaction and information costs. Once established agglomerations become self-reinforcing and are sustained via endogenous forces including localised technological spillovers, labour market pooling, non-traded inputs and positive backward and forward market linkages. The first three forces constitute

technological externalities (see Duranton and Puga, 2004 for a discussion of these three externalities). The fourth, market linkages, refer to externalities created due to market interdependence within a sector (Venebles, 1996). Spatial proximity of interlinked industries is regarded as influencing the performance of sectors and agglomerations in both the short- and long-term (Maskell, 2001). Titze et al., (2011) provide an overview of the literature on the underlying dynamics of linkages within an agglomeration. The existence of positive market linkages implies that the establishment of a new firm not only increases competition, but also enhances the profitability of existing firms. Interaction between increasing returns to scale and transaction costs that arise due to geographical distance reinforces the positive effects of agglomeration within a sector. This therefore ensures that at any particular point in time, some areas are more attractive than others and may be seen as 'locational assets' for production activities (Dicken, 1998).

The underlying spatial dynamics of agglomerations implies that these 'locational assets' draw mobile firms or sectors, thus creating a core-periphery structure (Krugman, 1991; Gruber and Soci, 2010). Consequently, one region ends up as the industrial core attracting the majority of industrial production. The remaining becomes the periphery whose main role involves supplying resource based products to the core and importing industrial goods from the core region (Gruber and Soci, 2010). In this context, the main objective of regional development is to develop mechanisms to counter balance agglomerative forces, building industries around local comparative advantages such as natural resources, to counter growth poles.

*The Marine Sector - Agglomeration Theory and Pecuniary Externalities*

From Von Thumen's (1826) initial analysis of land usage up to the economic geography literature, the natural resource sector (traditionally depicted as the agricultural sector) has been posited in a role that consists of producing generic commodities to the 'core', while development is characterised by the growth of the industrial sector, absorbing excess labour from the 'periphery' (Gruber and Soci, 2010; Fujita and Thisse, 2002). Within these models the natural resource sector is taken as immobile, without product differentiation, innovation or knowledge externalities (Gruber and Soci, 2010). However, in terms of the multi-sectoral marine economy such a hypothesis is not true. While agriculture does have a specific characteristic of

being bound to land and the ownership of land, the marine economy is not bound by property rights. Firms within the marine economy are therefore inherently more footloose than within the agriculture sector.

Furthermore, although no standard definition of what constitutes a national marine sector currently exists, the marine economy is much wider than the marine resource sector (fishing and aquaculture) alone. This wider definition exists mainly because sectors that are marine-based may directly or indirectly use the marine resource within their process of production. As such, marine based industries are based on two broad categories Kildow and McIlgorm (2010):

- Industries which involve the direct use of marine resources, for example the sea-fisheries sector.
- Industries which create value through the provision of products and/or services indirectly associated with the marine environment, for example the seafood processing sector.

Industries that directly use the marine resource include the marine food, transportation and energy industries. Industries which indirectly use the marine resource include the seafood processing, marine tourism, marine commerce, and high tech services sectors. Table 1 provides an overview of the Irish marine economy. Thus, the majority of industries, given their downstream or indirect intersectoral linkages with the marine are not tied geographically to the resource itself. However, a number of papers have encapsulated the importance of intersectoral linkages, within the marine sector.

Examining the vertical linkages within the marine sector, although an aspatial analysis, Kwak et al., (2005), use input-output analysis to highlight the importance of backward linkages and production-inducing effects within the South Korean the marine sector. In terms of a marine based analysis and the existence of agglomerations, Virtanen et al., (2001) examined the regional socio-economic impact of the fisheries industry in Finland using location quotients. Their analysis found that while fishing activity is widely dispersed along the marine resource, the downstream industries – processing and wholesale – are highly concentrated in two regions, where the fishing industry

itself is most concentrated. These results are unsurprising given the strong significance of buyer (processor/wholesaler)-supplier (fishers) links within an industry (Midmore et al., 2006). Using econometrical analysis to test for the presence of agglomeration forces Midelfort-Knarvik and Steen (1999), examine the Norwegian marine sector. They define the sector, as a regional industrial agglomeration and find significant economies of scale across nine marine industries. Their results indicated that the Norwegian marine sector consists of two self-reinforcing regional agglomerations. From their analysis, Midelfort-Knarvik and Steen (1999) conclude that the strength of intersectoral linkages ensures the regional, coastal location of the marine companies will be self-reinforcing and specific regional policy must be devised for the sector to evolve further.

Tveteras and Buttese (2006) examine the influence of regional agglomeration externalities on productivity in the salmon aquaculture sector in Norway. Using Stochastic Frontier Analysis and an econometrical based production model, they found that regional agglomeration forces had a strong positive effect on productivity in the sector. Thus, indicating the positive effect agglomeration may have in a natural resource based sector such as the multi-sector marine. In terms of the marine economy, this indicates that although certain sectors do not require proximity to the marine resource and there location of production is mobile, vertical linkages between sectors and cost reductions mean that there is an economic rationale for marine industries to cluster around the marine resource and around other marine based industries.

Thus, while examining the marine sector at the national economy is important from a national policy point of view (Morrissey et al., 2011; Kildow and Mcilgorm, 2010), the contemporary focus on Marshallian agglomeration economies and Porter's (1990) identification of regional successes based on spatial concentrations of interlinked industrial activities indicate that it is even more important from a regional policy perspective. Somewhat taken for granted, the relative role of the marine sector in regional development is not empirically addressed in the current regional literature. Previous studies on the regional or rural impact of the Irish marine sector have tended to examine the seafood sector (Wiium, 1998; O'Donnchadha et al., 2000; Collier, 2001) and have not examined the whole of Ireland. Internationally, two regional reports from Canada, for Nova Scotia (Gardner et al., 2009) and British Columbia

(BC Ministry of Environment's Ocean and Marine Fisheries Division, 2008) have estimated the contribution of the marine economy for both regional economies, these reports only examine the region in question and do not provide relative comparisons between other regions.

Acknowledging the importance and potential of the marine resource in Ireland, Sea Change – A Marine Knowledge, Research and Innovation Strategy for Ireland 2007-2013 (Marine Institute, 2007) seeks to increase the competiveness and sustainability of the sector. However, underpinning this agenda is the realisation that economic evidence at both a national and sub-national is required to inform public policy, governance and regulation across the sector. Given the renewed interest in regional development (O'Leary, 2003; Morgenroth, 2008) and policy mandate to reduce inter and intra-regional economic heterogeneity via the National Spatial Strategy (2002; 2010), an analysis of the role of the marine sector in addressing regional economic disparities is timely both from an Irish and international perspective. The paper continues as follows: Section 2 provides an introduction to regional and rural development and the current perception of regional development in Ireland. Section 3 provides an introduction to the Irish marine economy and data used in this paper. Section 4 provides an analysis of the economic impact of the marine sector in Ireland at the regional level. Section 5 offers some concluding comments.

## 2. Regional Development

The context for regional development is constantly being reshaped by the more competitive globalised economic system (Pike et al., 2006; Moylan, 2011). There is an abundance of literature within the economic geography and regional economic framework that indicates that these globalisation forces affect regions differently and create/deepen regional economic disparities. In this light, there is a growing recognition of the pivotal role regions play in increasing national levels of competitiveness, by fostering comparative and collaborative advantage in certain sectors (Moylan, 2011). In terms of the marine sector, Midelfort-Knarvike and Stern (1999) define the Norwegian marine sector as characterised by extensive personal contacts and well-functioning networks, inter- and intra-industry labour mobility, and customer and supplier linkages'. In Finland, Virtanen et al., (2001) find strong agglomerations in the industrial marine sector – processing and wholesale – around

the key primary production locations. Generally presented as a remote or peripheral sector, tied to its production resource (the sea), this paper examines the role that the marine sector plays in regional economic activity, in terms of Gross Value Added (GVA), employment and productivity. Given the current policy focus on the marine sector and its development (Sea Change Strategy, 2007) such an analysis provides the first step to a regional economic policy for the marine sector for Ireland.

*An Introduction to the Irish Regions*

Governance in Ireland, when compared with its European counterparts, stands out as an exceptional example along a number of dimensions, namely: the degree of centralisation and the low level of autonomy at the regional level (Mullally, 2003). This section provides a brief evolution of Irish regional policy. For a full discussion of Ireland's and its regions please see O'Leary, (2003) and Moylan, (2011).

The 1950s and 1960s were a period of active regional policy in Ireland, with the establishment of the Underdeveloped Areas Act in 1952 (Morgenroth, 2008), the Shannon Free Zone, followed by the provision of advanced factories in dispersed areas in the mid-1970s (Moylan, 2011). This saw a proliferation of low to medium technology assembly branch plant enterprises established by foreign investors throughout rural Ireland (Commins, 2006). However, from the mid-1970s to the late 1980's, the main emphasis of Irish public policy focused on the macroeconomic problems and high unemployment rates rather than regional issues (Moylan, 2011). As such, much of the policy impetus and financial support for regional development in Ireland in recent decades has emanated from the European Union (EU) (Moylan, 2011), the reform of European Structural Funds in 1988 (Morgenroth, 2003) and EU cohesion policy (O'Hara and Commins, 2003).

To meet the guidelines of the reformed EU Structural Funds eight regional authorities were set up in 1994 and two regional assemblies in 1999. In terms of the Nomenclature of Territorial Statistical Units (NUTS), these eight new authorities were ascribed NUTS III status. These included authorities for counties in the Border, Midlands and West of the country as well as for Dublin, Mid-East, Mid-West, South East and South West regions. However, the launch of the governments National Development Plan (NDP) 2000-2006, which included for the first time, balanced

regional development as a fundamental national object, saw regional authorities take a more active role in public policy (O'Leary, 2003). This activity mainly centred on the preparation of submissions on the development needs and investment priorities for their respective regions for input into the National Development Plan 2000-2006. As part of the NDP, the government mandated the Department of Environment and Local Government to prepare a more detailed blueprint for balanced regional development through the National Spatial Strategy (NSS) 2002-2020 and the NSS (2010). The extent to which balanced regional development has been achieved is further developed below.

*Economic Development among the Regions*

Although Ireland is a relatively small and geographically homogenous country, regional issues attract considerable attention (Walsh, 2006; Morgenroth, 2008), much of which centres on the size of Dublin and its perceived dominant share of the national economy (Walsh, 2006). Indeed, there is a perception that any economic success prior to the 2007 recession was centred within the Greater Dublin Area (GDA) and served to increase rather than addressed regional disparities (O'Leary, 2002). Given this perception, recent years have seen a number of studies conducted on the existence and extent of regional imbalances in Ireland. Such studies include O'Leary's regional productivity analysis (2003), Walsh's regional income and labour market analysis (2006) and Morgenroth (2008) regional transfer analysis.

In terms of regional productivity, O'Leary (2002) found considerable productivity divergence between regions during the mid to late nineties in Ireland. This divergence was driven by the growth in the mostly foreign owned multinationals manufacturing sector in Dublin/Mid-East, the Mid-West, the South West, and the West, which was more than twice the rates in the Border, Midlands, and South-East. Examining income and employment statistics Walsh (2006) found that while regional disparities do exist, this gap is much smaller than indicated by productivity indicators. However, while regional disparities in productivity and labour remain an important part of the regional debate, the issue of public expenditure across regions has become the focus of debate. Research by Morgenroth (2008) indicates that once the tax system and public expenditure is taken into account, regional disparities are removed. However, such redistribution effects are due to substantial resource transfer from Dublin and the

South-West (Cork and Kerry) to poorer regions. Thus, regions particularly in the West and North-West rely on transfers rather than on indigenous production to achieve regional balance.

Updating a number of key indicator discussed by O'Leary (2002) and Walsh (2006), Table 1 presents some of the key characteristics of the eight NUTS 3 regions in terms of size and economic development for 2007. Firstly, using an index of per capita GVA, Table 1 shows that there is a significant gap, 75.4%, between the region with the highest GVA (Dublin) and the region with the lowest GVA (Midlands) (CSO, 2010). However, as Morgenroth, (2008) points out, output variables are susceptible to biases due to commuting patterns and transfer pricing by international firms. Thus, it is also important to examine personnel income and labour market statistics as an indicator of regional disparities. Table 1 also presents the relative income position of the regions using an index of per capita disposable income which is expressed as a percentage of the national average (CSO, 2010). Using personal income as an indicator of regional balance, the gap between the richest (Dublin) and poorest (Midlands) region is immediately decreased to 10.5%. Examining disparities in the regional labour market, Table 5 presents regional unemployment rates (QNHS, 2007). From Table 1, one can see the low rate of unemployment in Ireland in 2007, as well as the low variation in rates between areas.

Using output indicators as a measure of regional economic disparity indicates that there is a large gap between the richest regions (Dublin and the South West) and the poorest regions (Midlands, Border, and West) in terms of economic performance in 2007. When one uses income and labour market statistics as an indicator of relative regional disparity, the gap between the richest region and poorest region closes substantially. These findings are similar to those presented by O'Leary (2003) and Walsh (2006). However, although the gap does decrease depending on the indicator used, both in terms of output and per capita income, Dublin and the South East outperform the Border, Midland, and West region. Table 1 establishes that regional divergences in the national economy exist across the national economy. The following analysis draws upon the marine database developed by Morrissey (2010) and the indicators used in Table 1 to examine the impact of the marine economy at the regional level and its role in addressing regional disparities.

**Table 1 Key characteristics of the eight NUTS 3 regions in terms of size and economic development.**

| | Population ('000) 2007* | Indices of GVA per capita 2007** | Indices of Income per capita 2007** | Unemployment Rate* | GVA % 2007** | Persons at Work % 2007* |
|---|---|---|---|---|---|---|
| Border | 481 | 70.1 | **92.3** | 5.5% | 7.8% | 10.5% |
| Midlands | 260 | 65.8 | 91.2 | 4.4% | 3.9% | 5.8% |
| West | 419 | 70.6 | 93.6 | 3.9% | 6.8% | 9.4% |
| **Border, Midlands West Region** | **1,160** | **69.3** | **92.5** | **4.7%** | **18.5%** | **25.7%** |
| Dublin | 1,210 | 141.2 | 111.7 | 4.6% | 27.9% | 29.3% |
| Mid-East | 497 | 78 | 103.7 | 3.6% | 11.4% | 11.9% |
| Mid-West | 365 | 84.6 | 97.6 | 5.1% | 8.4% | 8.2% |
| South-East | 474 | 73.4 | **93.4** | 4.9% | 10.9% | 10.5% |
| South-West | 632 | 123.5 | 95.7 | 4.1% | 14.6% | 14.4% |
| **Southern Eastern Region** | **3,178** | **111.2** | **102.9** | **4.5%** | **81.5%** | **74.3%** |
| **State** | **4,338** | **100** | **100.0** | **4.5%** | **100%** | **100%** |

* Source: QNHS, 2007, ** Source: National Accounts, 2007, CSO

## 3. The Irish Regional Marine Economy

The realisation that the world's oceans play an important role in climate regulation and many territory activities, notably food production, coupled with economic changes and the rapid advancement in ocean technology have seen a shift in the perception of the importance of the marine resource (Morrissey et al., 2011). Ireland's ocean resource consists of 900,000km$^2$ of seabed (Shields et al., 2005) and 1448km of coastline (Cooper, 2009). Of the eight NUTS3 regions, seven have a coastal border (Hynes and Farrelly, 2009). In Ireland, research on the economic value of the marine sector has been limited to date. This is mainly due to the difficulties in empirically measuring a multi-sector resource such as the marine (See Peng 2006).

However, a methodology developed by Morrissey et al., (2011) to overcome these empirical difficulties found that in 2007, the Irish marine sector provided €1.44 billion

in Gross Value Added (GVA) to the Irish economy and employed approximately 17,000. This represented a 66% increase in GVA and a 7% in employment between 2003 (the last time a comprehensive value was placed on the sector) and 2007 (Morrissey et al., 2011). Using the data and methodology developed by Morrissey et al., (2011), this paper provides the first multi-sectoral, inter-regional analysis of the value of the Irish marine sector.

*Data and Output Indicators*

This paper presents the first national and international inter-regional economic analysis of the marine sector. As indicated in Section 1, in the past such an analysis has been hindered by the difficulties in empirically measuring a multi-sector resource such as the marine (Peng, 2006). The fragmented, cross sectoral nature of the marine economy and the difficulty in distinguishing between land-based and marine-based activities (Kildow and McIlgorm, 2010) has meant that no standard definition of what constitutes a national marine sector currently exists. As a consequent, national economic datasets do not explicitly contain a marine sector. To address this definitional issue and acknowledging the need for a wider definition of Ireland's marine economy to encompass sectors that indirectly use the marine within their process of production, Shields et al., (2005) redefined the sector to encompass a diverse range of industries. These industries may be categorised into three broad sectors; marine resources, marine services and marine manufacturing (Shields et al., 2005). Table 2 provides an overview of the sectors that are defined as marine based within the Irish economy.

Drawing on the definition of the marine used by Shields et al., (2005) and the methodology devised by the National Oceans Economic Programme (NEOP) in the US (Kildow and McIlgorm, 2010), Morrissey et al., (2011) quantify the national value of marine sector to Ireland in 2007. Estimating the value of the marine sector across four different parameters, turnover, Gross Value Added (GVA), employment and indirect GVA, it was found that the marine economy had a turnover of €3.4 billion in 2007, of which €1.44 billion was attributable to GVA. The marine economy employed approximately 17,000 individuals in the same period. Ireland's total Gross Domestic Profit (GDP) in 2007 was €189.7 billion. Hence, 1% of GDP was derived

by the marine sector. For a full discussion of the data and methodology used, please see Morrissey et al., (2011).

**Table 2 The Industries within the Irish Marine Sector**

| **Marine Services Sector** | **Marine Resources Sector** | **Marine Manufacturing** |
|---|---|---|
| Ship Owners | Fisheries | Boat Building |
| Port & Maritime Logistics | Aquaculture | Marine Construction |
| Marine Tourism | Seafood Processing | Marine Engineering |
| International Cruise | Seaweed & Biotechnology | Other Marine Manufacturing |
| High Tech Services | Oil & Gas | |
| Marine Commerce | Renewable Energy | |
| Other Services | | |

However, in terms of this paper, a key aspect of the database compiled by Morrissey (2010) is its spatial referencing. Unlike previous estimates of the Irish (Shields et al., (2010)) and international (refs) marine sectors, the data collated by Morrissey (2010), may be disaggregated to the regional level. Using the database compiled by Morrissey (2010), an estimate of the value of the marine for each of the eight NUTS3 regions may be established. Using this database the remainder of this paper examines the regional impact of the marine sector in Ireland and its ability to readdress the issue of regional imbalance using productivity and labour indicators as presented in Table 1.

*The Irish Regional Marine Economy –Gross Value Added*

This section looks at the contribution of the marine economy to each region in terms of GVA. Table 3 presents the relevant data of interest. From Table 3, one can see that the South West and Dublin derive the largest proportion of marine-based GVA, €393 million (26%), and €372 (27%) million, respectively. The Midlands, followed by the Mid-East have the lowest proportion, €8 million (> 1%), and €40 million (3%), respectively. This would seem to indicate the two regions with the greatest share of national GVA (see Table 1), also have the largest share of marine-based GVA. However, when one examines the relative share of marine GVA as a percentage of total regional GVA this relationship changes. From table 3, one can see that the West, (2%), Border (1%), and South West (1%) derive the highest percentage of regional GVA from the marine. In contrast, the Midlands and Dublin derive the lowest.

**Table 3 Regional breakdown of GVA, percentage of marine GVA as a percentage of total regional marine GVA and, as a percentage of total regional GVA**

| | Turnover (€'000m) | GVA (€'000m) | Regional Marine GVA % of total National Marine GVA | Regional Marine GVA as a % of Total Regional GVA |
|---|---|---|---|---|
| **Border** | €398 | €167 | 12% | 1.3% |
| **Midland** | €15 | €8 | > 1% | 0.1% |
| **West** | €522 | €258 | 18% | 2.2% |
| **BMW** | €935 | €433 | 30% | 1.3% |
| **Dublin** | €908 | €372 | 26% | 0.5% |
| **Mid-East** | €96 | €40 | 3% | 0.2% |
| **Mid-West** | €158 | €73 | 5% | 0.6% |
| **South East** | €298 | €128 | 9% | 0.9% |
| **South West** | €873 | €393 | 27% | 1.3% |
| **SE** | €2333 | €1006 | 70% | 0.7% |
| **State** | €3268 | €1439 | 100% | 0.8% |

Although traditionally seen as a sector that addressed the economic disparity between peripheral and central regions, the above section showed that the two regions with the highest national GVA, Dublin and the South-West, also have the highest marine based GVA, in absolute terms. It is therefore necessary to understand this relationship. Table 4 presents a breakdown of the percentage share of each sector, manufacturing, resources, and services in overall regional marine-based GVA. As one can see, in most regions (particularly Dublin) marine GVA is derived primarily from the services sector. Indeed, only in the Midlands (manufacturing) is the highest percentage of GVA not from the marine service sector. It is interesting to note that GVA derived from marine resources and marine services are equal in the Border region. The importance of marine resources in the Border region is due to the relative dominance of Killybegs fishing port in County Donegal and its environs in terms of fishing activity. Thus, in terms of regional importance marine resources, particularly commercial fishing remains an important sector in the Border region.

Table 4 also provides the percentage breakdown of the number of marine-based service companies by region. Service industries have much low input costs compared to manufacturing and resource based sectors. Thus, they generally have higher levels

of GVA, compared to other traditional sectors. As one can see, at the regional level both Dublin and the South West have the highest percentage of marine service-based companies (27%). Thus, the gap in marine GVA between regions is accountable to the large proportion of service sectors in Dublin and the South West compared to other regions in Ireland.

**Table 4 Percentage share of each marine sector in overall regional marine-based GVA & percentage breakdown of the percentage of marine businesses that are service-based by region**

| | **Manufacturing** | **Resources** | **Services** | **Percentage of Marine Businesses that are Service based by Region** |
|---|---|---|---|---|
| **Border** | 5% | 47% | 48% | 12% |
| **Midlands** | 97% | 3% | 1% | > 1% |
| **West** | 26% | 22% | 52% | 12% |
| **Dublin** | 5% | 5% | 90% | 27% |
| **Mid-East** | 5% | 7% | 87% | 4% |
| **Mid-West** | 1% | 5% | 94% | 9% |
| **South-East** | 5% | 18% | 77% | 8% |
| **South-West** | 4% | 38% | 58% | 27% |

Examining the regional breakdown of marine GVA, this section found that, similar to the national level marine services drive the economic impact of the marine sector at the regional level. Interestingly, this analysis also showed that marine resources provide a significance share to marine-based GVA in both the Border and South West. This relationship may be associated with the fishing activity around Killybegs and the coast of Cork.

*The Irish Regional Marine Economy –Labour Market Indicators*

This section examines the impact of the marine economy on regional development in turns of regional labour market share. Table 5 presents the relevant data of interest. From Table 8 one can see that the South West (4,096 FTE) and the West (3,460 FTE) have the highest share of regional employment. The midlands (299 FTE) and Mid-East (426 FTE) have the lowest. Examining the relative regional share of marine employment as a percentage of regional employment, this relationship is maintained. The South West and West have the highest percentage share (3% and 1%,

respectively), while the Midlands and Mid-East have the lowest. Also, unlike the regional output indicator presented in Table 3, Dublin is not the dominant region in terms of marine-based employment. This relationship is again evident when one examines regional employment levels in the marine sector as a percentage of total regional employment. This indicator shows that the West and South-West derive the highest level of regional employment, and Dublin the lowest. Again, however, the low relative share of marine-based employment as a percentage of total regional employment for Dublin is related to the size of Dublin's employment market, rather than low levels of marine-related employment. Thus, as Walsh (2006) indicates, and Table 5 presents, regional disparities are much less in terms of personal income and employment levels compared to GVA.

**Table 5 Regional breakdown of FTE Marine Employment, percentage of marine employment as a percentage of total regional marine employment and, as a percentage of total regional employment**

| | **FTE** | **Regional Marine FTE as a % of National Marine FTE** | **Regional Marine FTE as a % of Regional FTE** |
|---|---|---|---|
| **Border** | 2,856 | 18% | 1.2% |
| **Midland** | 299 | 2% | 0.2% |
| **West** | 3,460 | 21% | 1.7% |
| **BMW** | 6,615 | 40% | 1.2% |
| **Dublin** | 2,733 | 17% | 0.4% |
| **Mid-East** | 426 | 3% | 0.1% |
| **Mid-West** | 856 | 5% | 0.4% |
| **South East** | 1,590 | 10% | 0.7% |
| **South West** | 4,096 | 25% | 1.3% |
| **SE** | 9,701 | 59% | 0.6% |
| **State** | 16,316 | 100% | 0.7% |

To examine further what is driving the marine regional employment level, Table 6 presents a breakdown of the percentage share of each sector - manufacturing, resources, and services - in overall regional marine-based employment. In five regions (particularly the Mid-East and Dublin) marine employment is highest within the services sector. However, unlike marine GVA, three regions have higher employment levels in non-service sectors. Employment in the Border (54%) and the West (52%) regions is highest in the resource sector, while marine-based employment is

dominated by manufacturing in the midlands. As with regional marine GVA, the importance of the marine resources sector for regional employment in the Border region is driven by Killybegs port and its environs. In the West, marine based employment is spread across the fishing, aquaculture, and seaweed sector. Given its relative distance from the coast, it is unsurprising that employment in the midlands region is dominated by marine manufacturing.

It is interesting to note from this analysis that in terms of regional marine employment, the comparatively less well developed Border, Midlands, and West region, is dominated by non-service sectors compared to the South-Eastern region. Thus, in terms of regional development marine resources, including commercial sea fishing, aquaculture, seaweed, marine-based energy, and traditional manufacturing remain an importance source of marine employment in less developed regions In Ireland.

**Table 6 Percentage share of each marine sector in overall regional marine-based FTE Employment**

| | **Manufacturing** | **Resources** | **Services** |
|---|---|---|---|
| **Border** | 8% | 54% | 39% |
| **Midlands** | 92% | 7% | 1% |
| **West** | 16% | 52% | 32% |
| **Dublin** | 9% | 11% | 81% |
| **Mid-East** | 11% | 18% | 71% |
| **Mid-West** | 2% | 11% | 86% |
| **South-East** | 7% | 31% | 63% |
| **South-West** | 6% | 38% | 56% |

*The Irish Regional Economy – Productivity Market Indicators*

Productivity is the key component of growth within an economy and as such is an important determinant of output, competiveness and living standards (Cassidy, 2004). The NSS emphasis the importance of maintaining and creating high productivity jobs at national, regional and local levels in achieving balanced regional development (NSS, 2002). Productivity may be defined as the rate of inputs to outputs within a company, industry or economy. Increases in productivity allow firms and sectors achieve higher levels of value added within the broader economy and increase their competiveness in both Ireland and internationally.

There are two generally accepted measures of productivity: labour productivity and total factor productivity (TFP). Whereas labour productivity measures economic output per unit of labour, TFP relates output to the combined usage of factor inputs, namely labour and capital (Cassidy, 2004). This section focuses on regional labour productivity within the marine sector and compares it to overall regional labour productivity.

Table 7 provides a comparison of regional marine-based productivity (marine GVA per marine FTE) to overall regional productivity. From Table 7, one can see that productivity in regional marine-based sector is higher than overall regional productivity in the West (+€17,061), Dublin (+€29,636), Mid-East (+€34,118) Mid-West (+€16,749) and South East (€+19,662). One can see that Dublin had the highest levels of marine productivity in 2007, which is consistent with overall regional levels of productivity. At the national level, the productivity rate in the marine sector (€84,196 per FTE) is greater compared the overall national rate (€79,345 per FTE). However, the difference between the national and marine rate of productivity (-€4,850) is significantly smaller than the differential observed across each region.

**Table 7 Regional Marine-based Productivity and Overall Regional Productivity**

| | **Marine Productivity** | **Regional Productivity** | **Difference** |
|---|---|---|---|
| **Border** | €58,473 | €58,959 | -€486 |
| **Midland** | €26,756 | €54,364 | -€27,608 |
| **West** | €74,566 | €57,505 | €17,061 |
| **BMW** | €65,457 | €57,287 | €8,170 |
| **Dublin** | €136,114 | €106,478 | €29,636 |
| **Mid-East** | €93,897 | €59,779 | €34,118 |
| **Mid-West** | €85,280 | €68,532 | €16,749 |
| **South East** | €80,503 | €60,841 | €19,662 |
| **South West** | €95,947 | €99,096 | -€3,148 |
| **SE** | €103,701 | €86,971 | €16,729 |
| **State** | €84,196 | €79,345 | €4,851 |

To examine further what is driving marine regional productivity level, Table 8 presents a breakdown of the percentage share of each sector - manufacturing, resources, and services - in overall regional marine-based productivity. Examining

the three sub-sectors, one can see that productivity is highest in the marine service sector across all regions in 2007. This result is consistent with the national level analysis of marine productivity conducted by Morrissey et al., (2011), which found that marine services had the highest levels of productivity in 2007. At both the regional and sectoral level, it is the lower rate of productivity within the more labour intensive marine resource and the manufacturing sector that drives down productivity within the broader regional marine sector.

**Table 8 Marine Productivity by Region and Sector**

| | **Manufacturing** | **Resources** | **Services** | **Marine Productivity** |
|---|---|---|---|---|
| **Border** | €42,802 | €50,924 | €71,650 | €58,473 |
| **Midland** | €28,763 | €11,000 | €14,750 | €26,756 |
| **West** | €93,290 | €24,322 | €95,076 | €74,566 |
| **Dublin** | €72,099 | €63,540 | €152,443 | €136,114 |
| **Mid-East** | €46,844 | €36,434 | €115,384 | €93,897 |
| **Mid-West** | €58,000 | €36,030 | €92,067 | €85,280 |
| **South East** | €63,261 | €47,325 | €99,037 | €80,503 |
| **South West** | €66,007 | €95,489 | €99,336 | €95,947 |

## 4. Discussion

Regional development is a dynamic process, shaped and reshaped by the more competitive globalised economic system (Moylan, 2011; Pike et al., 2006). Increased recognition of the pivotal role regional economic performance can play in overall national developed, has seen the issue of the regional economic disparities coming to the forefront of Irish policy over the last two decades (O'Leary, 2003; Morgenroth, 2008; NSS, 2002). Somewhat taken for granted, the relative role of the marine sector in regional development is not empirically addressed in the current regional literature. The role of market linkages in sustaining agglomerations (Venebles, 1996; Midelfart-Knarvik and Steen, 1999; Gruber and Soci, 2010) indicate that the although certain marine sectors do not require proximity to the marine resource and that their location of production is mobile, vertical linkages between each sectors and increased cost reductions mean that there is an economic rationale for marine industries to cluster around the marine resource. However, in terms of addressing regional disparities, this

paper provided the first national and international inter-regional analysis of the economic role of the marine sector at the sub-national level.

The background for this paper is based on the increased acknowledgement of the importance of the regions in providing a foundation for national economic growth (Moylan, 2011), the marine sectors role in developing peripheral areas (NSS, 2002) and the downstream recognition that the development of the marine resource requires a coherent set of indicators detailing the economic impact of the sector at the national and regional level (Sea Change Strategy, 2007). Heavily influenced by international insights (Porter, 1990) on the ability of clusters to exploit competitive advantages within interlinked industries and sectors, a major review of industrial policy was instigated in the early 1990's (the 'Cullition Report). This review recommended that industrial policy should develop groups/clusters within related industries to build sources of national competitive advantage (Industrial Policy Review Group, 199, pp.73-74).

Examining the importance of industrial clusters in Ireland, Clancy et al., (2001) highlight five key areas that public policy must encompass to develop competitive, sustained clusters within Ireland. These include support for existing policies, support for the emergence of developing groupings of connected companies and industries, attraction of multi-national companies (MNC) with comparable characteristics, a strong technology focus and the support for cooperative alliances between companies. Within the marine sector, the Sea Change Strategy, (2007) encompassing both the National Marine Technology Programme and the National Marine Biotechnology Programme, is widely based on these five principles and aims to create a sustained marine technology and marine biotechnology industry with the relevant critical mass of multi-disciplinary activities within Ireland.

Within this context, one can argue that given the strong vertical linkages and presence of agglomeration effects demonstrated by international marine sectors (Kwak, 2005; Midelfort-Knarvike and Stern, 1999; Virtanen et al., 2001), there is a rationale for stand-alone regional policy to focus on the multi-sectoral marine sector as a potential industry with strong regional comparative advantages. This rationale is further strengthened by the findings of this paper. Although, Morrissey et al., (2011) found

that total GVA by the marine sector was €1.44 billion in 2007 and contributed approximately 1% to the Irish economy, this paper found that the marine sector makes a greater contribution to the local economy. It accounted for 2.2% of GVA in the West, 1.3% in both the Border and South West region. While the contribution of employment followed regional output. In terms of productivity, it was found that for five of the eight NUTS3 regions, productivity in the marine sector was higher than the overall regional rate. This paper demonstrates the role the marine sector currently plays in the regional economy, while the international research and economic geography theory points to the future economic potential of the marine sector within the regions.

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