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Uncovering Norway's Regional Disparities With Respect To Natural Riches

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UNCOVERING NORWAY'S REGIONAL DISPARITIES WITH RESPECT TO NATURAL RICHES

Abstract

This study aims at unveiling regional development differences in Norway with respect to various natural resource-based activities that take place in the NUTS3 regions. Norway's natural riches range from agricultural and forest resources to fisheries, mines, petroleum and gas. Considering the possible spatial links for various regional characteristics of the Norwegian economy, this study does not only reveal the wide-ranging distribution of resource-based activities, but also sheds light on divergent income and population patterns in the Norwegian regions. Besides, these patterns are investigated through a number of models that test the impact of employment, investment and value added in natural resource sectors on regional differences. The main findings suggest that mining and quarrying as well as oil and gas extraction activities generate significant advantages for regional income generation whereas each resource type affects the distribution of population in a different way.

JEL Codes: Q32, O13, R12, C23

Keywords: natural resources, regional differences, panel data analysis

1. Introduction

The role of natural resources in economic development and sustainability has gained increasing attention over the last twenty years due to the diverging experiences of various resource-based economies. While some resource-rich countries such as Australia, Canada, Norway and New Zealand succeeded in utilizing their resource revenues efficiently and achieved high levels of per capita income and development, some others remained less-developed and ended up in the so-called “resource curse”.

The resource curse corresponds to the situation that a resource-rich country is disposed to slower economic growth rates in comparison to a resource-poor one owing to a number of factors (Auty, 1993). Among these factors are the volatility of resource revenues (especially in the case of point-source resources), crowding out of manufacturing due to Dutch Disease effects and institutional defects (corruption, political instability, lack of rule of law, etc.). Furthermore, the influence of misusing natural resource wealth is not only on income-related measures but also on other socio-economic indicators such as employment patterns, population distribution, income inequality and democratization. Besides, these effects can be region-wide as well as country-wide. However, the implications of natural resource richness for regional development within a country have been less of a concern comparing to the large academic work on cross-country comparisons (Auty, 1993, 2001, 2007; Sachs and Warner, 1997, 1999).

The main motivation of this study is to unbundle regional development differences in Norway accounting for varying levels of natural resource activity in each Norwegian region. We aim at answering whether the abundance of and/or reliance on specific resources in Norwegian regions bring about special advantages or disadvantages for each region’s development. For instance, what consequences does the oil-related economy in the Vestlandet generate in terms of regional income growth, diversity of economic sectors, employment patterns and investment? Do the rich fish resources and related fishing activity in Nord-Norge enable a sustainably functioning economy in the region without bearing resource curse symptoms? Are all resource types equally important and effective in promoting regional development and successful in constructing industrial linkages or are there specific resources in the Norwegian economy that facilitate higher

income growth and constitute dynamic comparative advantages? These central research questions will first be visualized vis-à-vis visualizations. Given the possible spatial links for various regional characteristics of the Norwegian economy, we believe observing the spatial links will not only question the early remarks regarding the regional disparities but also will shed light on the externalities as well as spatial spillovers realized among the territory of Norway. Above all, these patterns will be finally questioned by estimating a number of models that test the impact of natural resources on regional differences in Norway.

Section II summarizes the theoretical debate regarding the link between natural resource abundance and level of economic activity. Following this, Section III aims to scrutinize how regional economic activity is dispersed in Norway and to what extent this pattern looks familiar with the spatial dispersion of resource-based production. Employment potential, investment accumulation as well as the value added of the related lines will be investigated at local level. After having the initial idea about regional differences of economic activity level as well as natural resource dispersion, Section IV contains the information coming from the panel models testing the impact of natural resources on regional differences in Norway. Finally Section V concludes.

2. Theory and Relevant Literature

Earlier explanations of the resource curse hypothesis are linked to the development of staples economies that relied heavily on the trade of raw materials and staples. In an effort of understanding Canadian economic development, Innis (1930, 1956) argued that it was the export of cod fish, fur, lumber, agricultural products and minerals to European countries that had accelerated economic growth in the 1920s and 1930s due to the spread effects of the export sectors. Soon enough, criticisms arose regarding the drawbacks of high reliance on commodity exports. Since commodity prices as well as supply of raw materials are highly volatile, a resource-dependent country might fall into a development trap and it might not be easy to escape this trap unless linkages with the rest of the economy are strongly formed (Watkins, 1963).

Later on, the Dutch Disease experience of the Netherlands after the discovery of Groningen gas brought about more concerns on the effects of a huge currency inflow due to the gas exports leading to the appreciation of the national currency, making non-resource sectors less competitive than the resource sector and even resulting in the contraction of manufacturing sectors.

More recent explanations of the resource curse relate the decline of resource-dependent countries to institutional mechanisms such as the role of corruption, rent-seeking, lack of democratic governance, etc. (Auty, 2001; Brunnschweiler, 2008). Resource-rich states tend to have more autonomous governments that do not have to generate other sources of income and are less accountable to their citizens. There are a few exceptions of this (such as Norway and Botswana) that have experienced desirable economic outcomes and escaped the resource curse.

From a regional development perspective, Goldberg et al. (2008) and Freeman (2009) link the economic development of individual US states to natural resource intensity in order to investigate the existence of a resource curse. Both studies demonstrate that higher resource dependence results in poorer economic growth, worse developmental performance and less competitive politics in the US states, pointing to an economic resource curse as well as a political one. Another study that associates regional development and underdevelopment with natural resource reliance is Carson (2009), which examines the Northern Territory as a highly resource-abundant region and Australia as a whole, and finds that the Northern Territory suffers from a lower concentration of employment and higher levels of population mobility than Australia as a whole. A more recent study by Acar and Zola (2012) questions how and why the northern part of Sweden has been lagging behind other Swedish regions in terms of income growth and population growth. They evidence the existence of a regional curse when the effects of employment shares in agricultural resources on gross regional product (GRP) are considered. However, they find limited evidence of a negative impact of mining and quarrying on GRP. They attribute the possible causes of the regional curse to lower degree of diversification in the resource-reliant regions, lower linkages with the other sectors in the regional economies and over-confidence of political bodies in natural resources. What is more, they find a negative impact of mining on regional attractiveness

measured by population growth, which might be stemmed from the fact that that mining industry is known to be highly capital-intensive and less labor-demanding.

There are a few studies that focus on Norwegian regional inequalities. Among those, Rattsø and Stokke (2011) are concerned about regional income growth in Norway investigating dynamic agglomeration effects in the period 1972-2008. They point out that the regional differences in terms of income growth are rooted in the heterogeneity of economic activities in each municipality and argue that small regions with resource based activities such as oil extraction, electricity production and salmon production have experienced substantial growth. Linking the local resource curse to institutional bottlenecks, Borge et al. (2012) test the paradox of plenty hypothesis (i.e. resource curse hypothesis) and rentier state hypothesis examining the Norwegian municipalities in terms of their income derived from hydropower. Their main argument is that the exploitation of natural resources could have different implications for efficiency. Here they use the ratio of aggregate output from six service sectors to available resources as an efficiency indicator. Their results evidence the existence of a natural resource curse where the municipalities with more hydro potential have devoted less income for better local services leading to lower efficiency in the use of resources. On the other hand, they reject the rentier state hypothesis meaning that income from hydropower does not have a more damaging impact on efficiency than income from other sources (Borge et al. 2012: 8).

3. Spatial Distribution of Economic Activity and Natural Resources in Norway

Today Norway is one of the most developed countries classified as a high-income OECD country. Her gross domestic product (GDP) amounted up to \$ 485,803,392,857 (current US\$) in the year 2011 whereas life expectancy at birth was as high as 81 in 2010 (World Bank, 2012). Her natural riches range from forestry, fisheries and hydro power to oil and gas resources. In the beginning of 1970s, Norway started to extract oil from its North Sea coast. Henceforth, she has leaned on the petroleum sector, which is comprised of extraction of crude oil and natural gas, the service industry including drilling and the pipeline transport industry. Norway has constituted a government fund which invests in

abroad in order to utilize oil revenues efficiently and ensure the well-being of future generations.

To have a better view of natural resources' contribution to Norwegian GDP, we can examine the shares of various natural resource rents in total GDP between 1970 and 2010. Data from the World Development Indicators (2012) reveal that oil and natural gas rents make up most of the natural resource rents in Norwegian GDP whereas the shares of forest, coal and mineral rents remain marginal. As of 2010, total natural resources rents were as high as around 13% of GDP rising from a ratio of 0.6% in 1970.

Norway as a developed Nordic country deviates from the peripheral Europe in terms of the behavior of the economic activity dispersion in the form of North and South duality. Keeping in mind high prosperity countries in the Northern Europe and relatively low income countries in the Southern Mediterranean European countries, intra-country observations also underline that within the Europe continent, countries generally experience north-south income differences (i.e. Spain, Italy and Greece). Yet the regional distribution of intra-regional income in Norway is divergent. As can be observed from the combined findings from Figures 1 to 3, Southern Norway seems to outperform the northern geography of this Northern European country (see Appendix-I for Figures and Tables). We believe this different pattern is worth examining. There are 19 NUTS3 regions in Norway (see Appendix-I for the list of the regions), which makes investigation of its geography difficult in terms of its spatial interactions. One reason behind this issue is that locations (especially in the Northern geography) are wide in terms of surface and moreover the number of neighboring regions is low coming from the unique shape of the territory. Keeping this in mind, observing the spatial dispersion of the economic activity in Norway is still crucial. Figures 1, 2 and 3 exhibit the dispersion of per capita income, regional income and population density as of years 1997 and 2007.

>>> *Insert Figure 1, 2 and 3 Here* <<<

Noteworthy issue is related with the north-south duality just as the reverse of the peripheral Europe and most of the European countries. The northern locations of Norway

seem to lag behind the Norwegian average in terms of regional income dispersion. While three big regions in the northern geography of Norway seem to be middle income regions, low population density in the locations is a sign for the relatively low levels of economic activity. Above all, these figures regarding the agglomeration of income mostly around the south-west locations of Norway together with the clustering of the population activity signals that there exists a geographical pattern in Norway less centralized yet much or less diverged towards the peripheral Europe. Note that although this divergent pattern is unlike the overall distribution of economic activity in rest of Europe, it still makes sense once Krugman-based New Economic Geography (NEG) models are considered: economic activity spills over towards high market potential areas (Krugman, 1991).

Sticking with the central research question, we believe observing the regional dispersion of natural resources is valuable as such examination will shed light on the regional differences and its divergence from the peripheral Europe. To examine the dispersion of natural resources, three indicators are considered: employment, gross fixed capital formation and gross value added in major lines of natural resource-based production are observed.¹ Figures 4 to 9 visualize how employment, gross fixed capital formation and gross value added within the regional economy are shaped around the 19 territorial regions of Norway between 1997 and 2007. Other than the sub-groups, the figures also contain total employment in resource-based activities.

Comparison of the 1997 and 2007 figures indicate that except agriculture, forestry and hunting, dispersion of employment seems to have a persistent pattern during the investigated time period. There is a limited change through time in agriculture, forestry and hunting in the northern geography. A second crucial issue apparent from Figures 4 and 5 is that the regions with higher shares of employment in oil and gas extraction (with and without related services) are the ones that have per capita income above the Norwegian average. There is also fishing and fish farming in other high income locations, but above all, keeping in mind the divergent pattern of the oil and gas extraction, there

¹ Considered lines are as follows: 1- Agriculture, forestry and hunting, 2- Fishing and fish farming, 3- Mining and quarrying, 4- Oil and gas extraction (with and without related service activities). All the data is gathered from the National Statistics Institute of Norway (SSB).

seems to be strong co-movement behavior with this line of production and regional economic activity both measured by regional per capita income and population density (revisit Figures 1, 2 and 3).

>>> *Insert Figure 4 and 5 Here* <<<

Next, once gross fixed capital formation of regions are considered in Figures 6 and 7, we pinpoint that other than oil and gas extraction (with related services) there is some sort of a rigid pattern with very limited change in the geographical dispersion during the investigated time period. Once more, it is worth mentioning that there is high interconnection between oil and gas extraction investments in the locations and level of economic activity in these regions.

>>> *Insert Figure 6 and 7* <<<

Finally, Figures 8 and 9 display the comparison of gross value added generated from the resource lines during the 1997 and 2007 period. Findings are more or less the same compared with the previous observations. Again the highest interconnection seems to be running from oil and gas extraction. Above all, these findings are very preliminary yet contain valuable information. First, regarding the total lines, there seems to be a homogenous pattern in almost all regions of Norway. However once total natural resources are disaggregated, we come to realize that oil and gas extraction seems to significantly deviate from the others showing high correlation with local economic activities.

>>> *Insert Figure 8 and 9* <<<

After having a general idea about the spatial concentration of major natural resources in Norway, a second vital issue is to investigate how these natural resource activities deviate from the Norwegian average to understand the historical pattern of inequalities. As for the deviation issues, first the NUTS3 regions of Norway are investigated focusing on

their relative positions with respect to the Norwegian averages of employment, gross fixed capital formation and gross value added (see Tables 1, 2 and 3). For agriculture, forestry and hunting, the regions like Hedmark, Nord-Trøndelag, Oppland and Sogn og Fjordane deviate (positively) from the Norwegian average. For fishing and fish farming, Finnmark Finnmark, Møre og Romsdal, Nordland, Sogn og Fjordane and Troms Romsa are the regions that are outperforming the Norwegian average. When mining and quarrying is considered, we realize that Finnmark Finnmark, Møre og Romsdal, Nordland, Nord-Trøndelag, Rogaland, Sogn og Fjordane, Telemark and Vestfold exceed the average at least once in the investigated years. Finally for oil and gas extraction, the figures indicate the dominance of Rogaland well above the average of Norway.

>>> Insert Table 1, 2 and 3 <<<

To sum up, there seems to be almost no change in regional differences between 1997 and 2007 when regional per capita income and population densities are considered. However inequality in total regional income seems to have decreased in the south whereas it increased in the north. Besides, inequalities tend to diminish in the same period, when employment, investment and gross value added in natural resource-based activity patterns are examined. There is an increase in the north in terms of some activities such as oil and gas extraction (including related services) from 1997 to 2007.

4. Relating Regional Differences to Economic Activity Based on Natural Resources

Disaggregating natural resource activity into four lines; namely 1) agriculture, hunting and forestry, 2) fishing and fish farming, 3) oil and gas extraction, and 4) mining and quarrying; we examine the effects of natural resource dependence on gross regional product and population density. While doing this, we use three different indicators to represent natural resource activity. These are employment, gross fixed capital formation and gross value added in each type of activity, respectively. We take shares of each indicator in total population; as such we use per capita measures of natural resource related economic activity. The abbreviations, units and descriptive statistics for the

variables are listed in Appendix-II.A and II.B. The data set covers the 1997-2007 period and 19 Norwegian NUTS3 regions.

We run panel fixed effects regressions for each indicator and resource activity accounting for time fixed effects as well (see equation 1). The summary of results is listed in Table 4 below.²

$$(1) \quad y_{i,t} = \alpha + \beta NR_{i,t} + \varepsilon_{i,t}$$

According to the Fixed Effects models, natural resource related economic activity seems to bear either neutral or beneficial effects for regional income and attractiveness in most of the specifications. The exceptions are the negative effects of gross fixed capital formation in agriculture, forestry and hunting, gross fixed capital formation in oil and gas extraction, and gross value added in fishing and fish farming on population density. The explanation for these results should be searched in the characteristics of the relevant sectors. Needless to say, the distribution of population in each region is expected to be determined by the distribution of regional economic activity. Hence, activities that are more labour-demanding should lead to the concentration of more people in that region. Fishing and fish farming is one of such activities whereas oil and gas extraction is more capital-intensive in Norway since the off-shore oil and gas extraction primarily requires sophisticated technology and know-how.

More specifically, considering the effects of *employment* in natural resources, oil and gas extraction pops up as the only influential activity for income generation whereas the other resource lines do not appear to be significantly influential. The effects of resource-based employment on population density are more striking. While higher employment in fishing, mining, oil and gas generate much denser populations in the abundant regions, agricultural employment is found to be insignificant. One possible reason could be that there are limited lands for agriculture in Norway when her mountainous geography is considered. Besides, high mechanization levels in Norwegian agriculture and forestry

² The regression outputs from STATA can be provided upon request.

does not require a large labour force in this area. Increased productivity in agriculture might lead to lower population densities in agricultural lands.

Second, if we go through the effects of *gross fixed capital formation* in natural resource related sectors, only mining and quarrying investments seem to generate higher regional income per capita; yet the significance is only at 10%. On the other hand, higher investments in agriculture as well as oil and gas extraction result in lower population densities. As mentioned above, agriculture is a highly mechanized sector and new investments in this sector do not attract higher numbers of people. On the contrary, new investments in agricultural technologies, forestry equipments and so on should discourage people who end up jobless as a result of more efficient production. Similarly, the oil and gas sector in Norway is a highly capital-intensive sector which possibly crowds out the population in the corresponding locations. Surprisingly, investments in fishing and fish farming seem to attract more people in the invested regions.

Third, we examine the impact of *gross value added* in resource activities. Agricultural gross value added increases do not significantly stimulate per capita income whereas the value added in all the other resource lines are beneficial for regional income. The former result deserves more attention since the latter one is as expected. Agriculture is still one of the highly protected sectors both in Norway and among the OECD countries. This has been criticized for leading to inefficient use of resources (OECD, 2011: 126). If this is valid, it might reinforce the result that agricultural value added does not significantly affect regional per capita income. On the other hand, higher gross value added in agriculture seems to attract more people. Higher gross value added in mining, quarrying, oil and gas sectors do not result in any significant changes in local population densities.

We need to note here that the explanatory power of these regressions is not satisfactorily high. This is largely due to the fact that natural resources are not the mere determinants of regional income or regional attractiveness measured by population density. Undoubtedly, one potential factor is climate which is much harsher in the north and is expected to influence population distribution accordingly. Other factors such as employment in other sectors, unemployment rates, education levels and saving rates should be controlled for in investigating the impact of natural resource sectors.

Table 4. Fixed Effects Models, Summary of Results

| | Dependent Variable: Per Capita Income | | | Dependent Variable: Population Density | | |
|---|--|-------------------|---------------------|---|------------------------|----------------------|
| | Model A | Model B | Model C | Model D | Model E | Model F |
| Employment in Agriculture, Hunting and Forestry | 0.307 (0.936) | - | - | 0.461 (0.493) | - | - |
| Employment in Fishing and Fish Farming | -2.041 (2.559) | - | - | 4.512*** (1.325) | - | - |
| Employment in Mining and Quarrying | 3.151 (13.337) | - | - | 17.408*** (5.497) | - | - |
| Employment in Oil and Gas Extraction | 4.282*** (0.929) | - | - | 1.928*** (0.534) | - | - |
| Gross Fixed Investment in Agriculture, Hunting and Forestry | - | -0.001 (0.011) | - | - | -0.016*** (0.005) | - |
| Gross Fixed Investment in Fishing and Fish Farming | - | -0.002 (0.005) | - | - | 0.006** (0.002) | - |
| Gross Fixed Investment in Mining and Quarrying | - | 0.040* (0.024) | - | - | -0.001 (0.012) | - |
| Gross Fixed Investment in Oil and Gas Extraction | - | -0.001 (0.000) | - | - | -0.0002*** (0.0001) | - |
| Gross Value Added in Agriculture, Hunting and Forestry | - | - | 0.007 (0.006) | - | - | 0.010*** (0.003) |
| Gross Value Added in Fishing and Fish Farming | - | - | 0.003** (0.001) | - | - | -0.004*** (0.001) |
| Gross Value Added in Mining and Quarrying | - | - | 0.041*** (0.012) | - | - | -0.012 (0.010) |
| Gross Value Added in Oil and Gas Extraction | - | - | 0.002*** (0.001) | - | - | 0.0004 (0.0005) |
| Cross Section Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| R ² | 0.51 | 0.51 | 0.42 | 0.23 | 0.07 | 0.01 |
| F-Stat (p-value) | 762.56 (0.00) | 654.60 (0.00) | 853.55 (0.00) | 27.99 (0.00) | 24.69 (0.00) | 23.92 (0.00) |
| Observations | 189 | 189 | 189 | 189 | 189 | 189 |

Note: *, **, *** indicates significance at 1%, 5% and 10% respectively, s=robust standard errors in ()

To sum up, the results summarized in Table 4 are vital, yet should be observed carefully. Given that employment and value added in oil and gas extraction significantly influence the regional income gaps and that higher employment shares in this industry are expected to attract more people, we believe that this important element of natural resource-based production in Norway is working in favor of regional prosperity. Moreover value added in mining and related activities increase regional per capita income; but its impact on local population density only works over employment. On the other hand, for fishing, fish

farming, agriculture, hunting and forestry, the results are contradictory. Leaning on these findings, we cannot conclude that the Norwegian regions suffer from the resource curse in general when income is considered, whereas population outcomes depend highly on the type and characteristics of the resource activity.

5. Conclusion

Having a widely spread distribution of varying natural resources, the Norwegian regions exhibit some differences in terms of welfare and local attractiveness. This study undertakes an analysis of these spatial differences focusing on per capita income and population density in the NUTS3 regions. The aforementioned four categories of natural resources are taken into consideration. Resource related activity is examined under three headings: employment, gross fixed capital formation and gross value added. Each of these headings accommodates different aspects related to resource abundance. Employment shows the extent to which labour force is involved in resource related activity. Gross fixed capital formation shows the different investment patterns connected to each type of resource activity. Gross value added represents the value that is created during the production of these resources when intermediate consumption is deducted from the output; in other words it shows the amount of contribution of resources to total output in the region.

At first glance, regional per capita income and population densities do not signal a change through the years 1997 to 2007. Nevertheless, inequality in total regional income seems to have decreased in southern Norway while it has increased in the north. Besides, inequalities tend to diminish in the same period, when employment, investment and gross value added in natural resource-based activity patterns are examined. There is a striking increase in the north in terms of some activities such as oil and gas extraction (including related services) from 1997 to 2007.

The main findings from the econometric analysis reveal that oil and gas extraction is a significant advantage for regional income generation. Both employment and gross value added in this sector increase per capita income in the abundant regions, especially in Rogaland. Besides, mining and quarrying activities are also favorable in terms of per

capita income. However, agriculture, hunting and forestry do not seem to be significantly influential for regional income. If we focus on the regions such as Hedmark, and Oppland, where agricultural activity is more intensive, it is noticeable that these are the most lagging regions in terms of regional per capita income. It can be concluded that natural resources generally bear favourable outcomes for regional income whereas their implications for attracting more people differ according to the type of resource activity. While employment in natural resource sectors is mainly beneficial for regional attractiveness, investment and value added in resource sectors evidence mixed findings.

What makes oil, gas and mining sectors beneficial for regional income is that these sectors are most likely forming backward and forward linkages with other sectors of the regional economies. For instance, iron is essential for the steel industry and iron extraction provides inputs for those industries that have to integrate iron or steel into their production. Similarly, oil and gas sectors are highly capital intensive sectors which generate spillover effects for the rest of the economy. Although renewable energy is on the rise in Norway, oil and gas are likely to be used as energy sources for some industries in the easily reachable regions. Norway developed innovation systems to exploit offshore oil and gas attaching roles to different actors such as Statoil, which is the national oil company, foreign petroleum companies, research bodies and the Petroleum Directorate (Sæther et al. 2011: 377). The key points in improving these innovation systems have been first, the flow of knowledge from non-resource sectors to resource-based industries and second, technology transfer from foreign sources (Fagerberg et al. 2009). Nevertheless, the efficiency of these systems depends on the operation of the institutional framework, which is also favourable in Norway. Sæther et al. (2011) also put forward the idea that the shift of labour and capital towards the extraction of resources, such as minerals, oil and gas, stimulates better-educated workers when higher wages are offered in the extractive sector.

Needless to say, our attempt to examine the impact of natural resources on regional income and population density falls short of explaining the inclusively. One should check the effects of other factors that might foster or discourage regional income as well as change population distribution across regions. Education outcomes, sectoral

diversification, research and development levels and climatic conditions might be underlying regional disparities.

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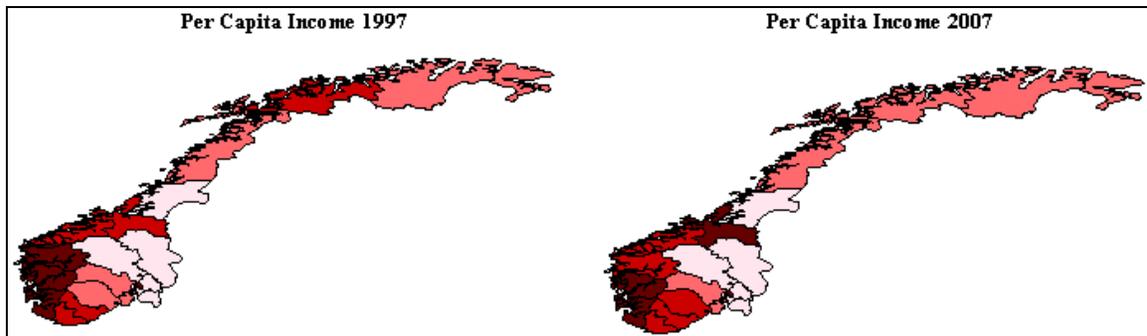
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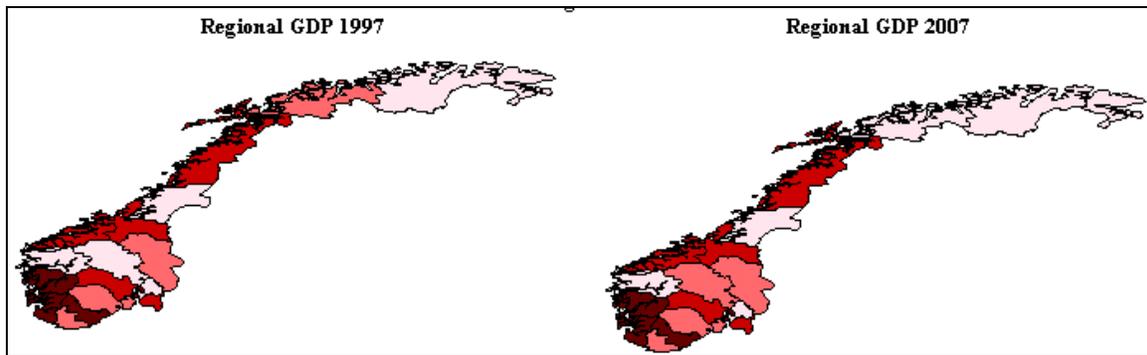
Appendix- I for Figures and Tables

Figure 1 Regional Per Capita Income (1997-2007)



Source: Statistics Norway (SSB)

Figure 2 Regional GDP (1997-2007)



Source: SSB

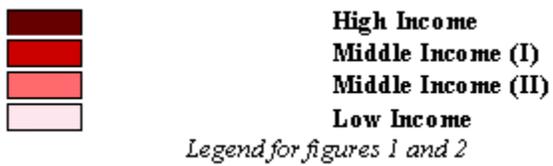
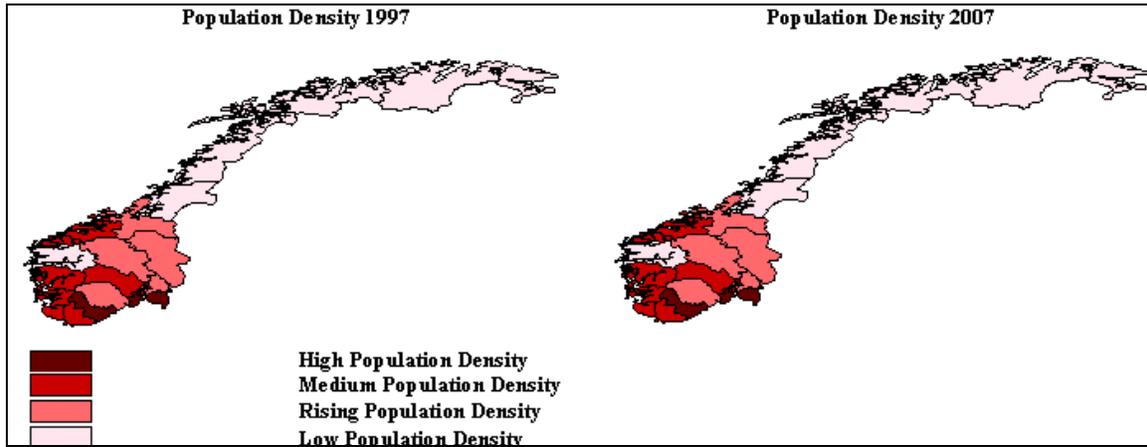
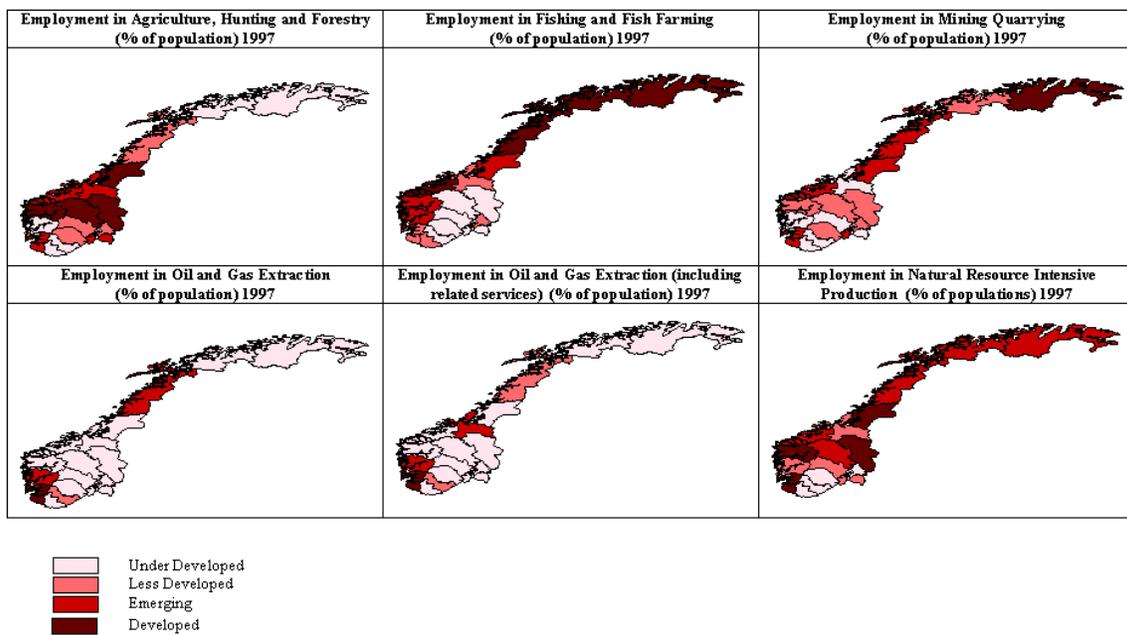


Figure 3 Population Density (1997-2007)



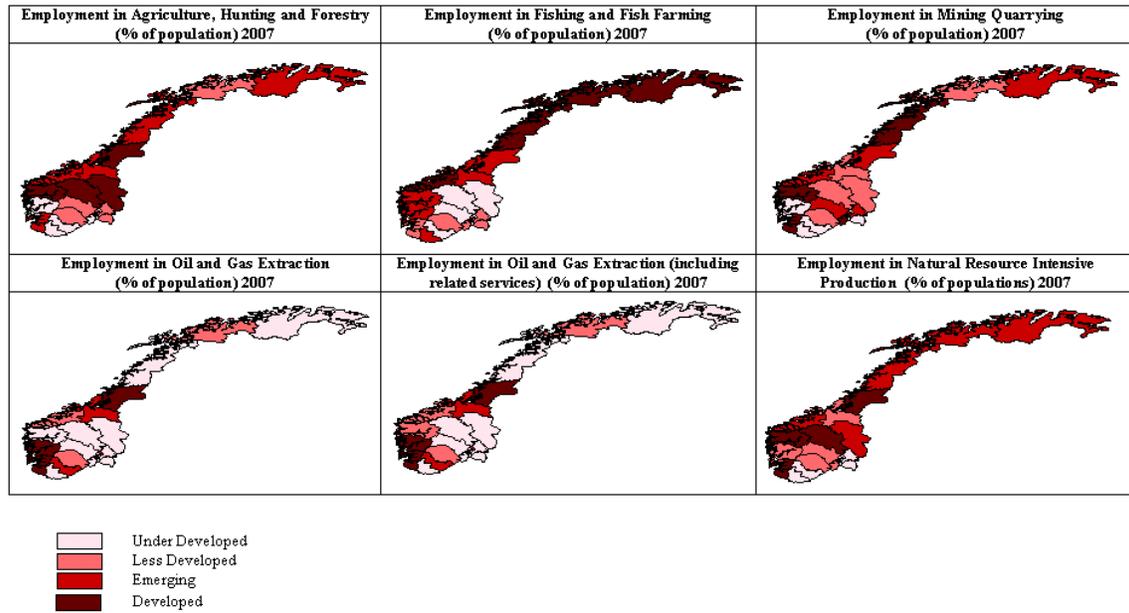
Source: SSB

Figure 4 Spatial Dispersion of Employment 1997



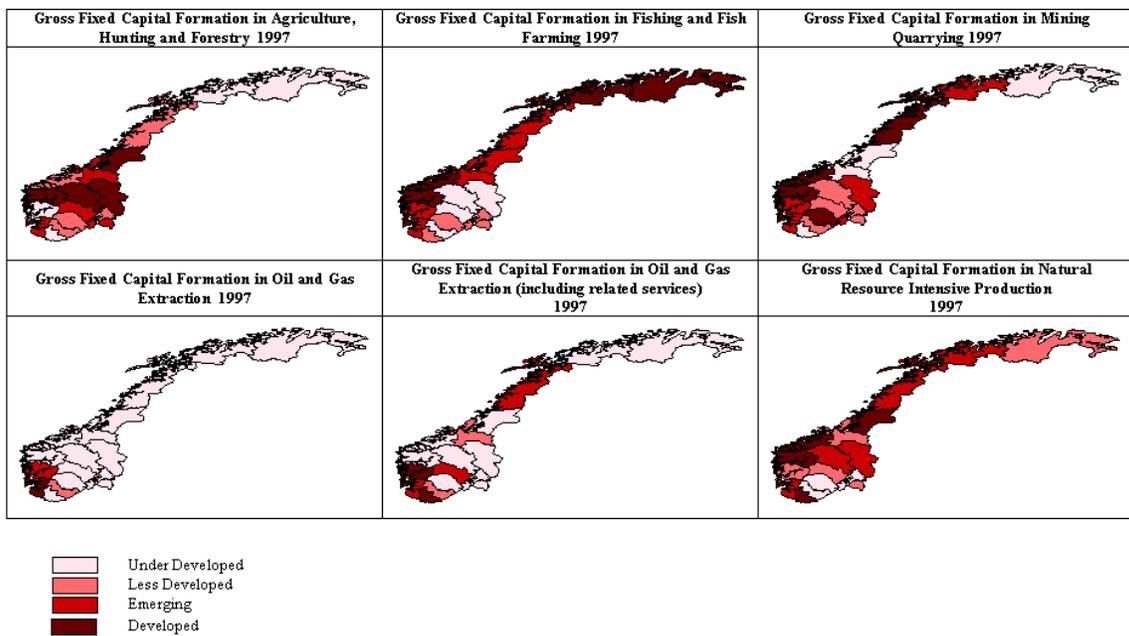
Source: SSB

Figure 5 Spatial Dispersion of Employment 2007



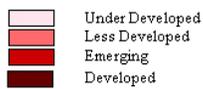
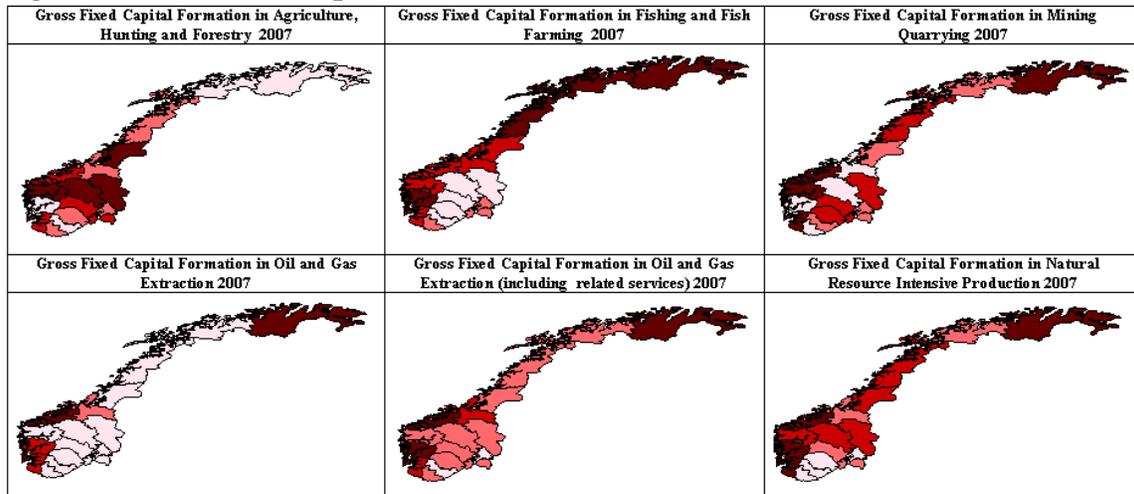
Source: SSB

Figure 6 Gross Fixed Capital Formation 1997



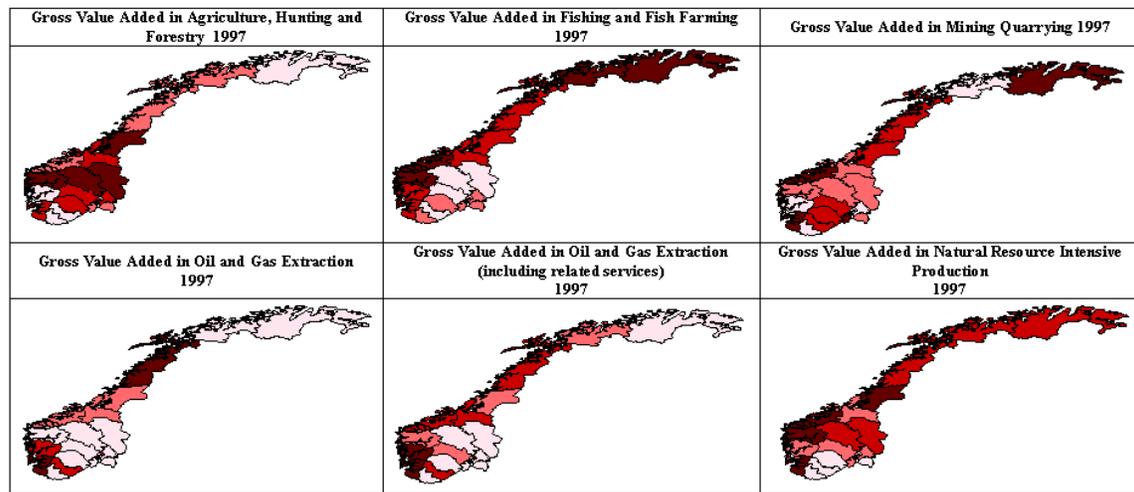
Source: SSB

Figure 7 Gross Fixed Capital Formation 2007



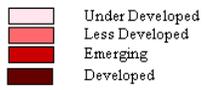
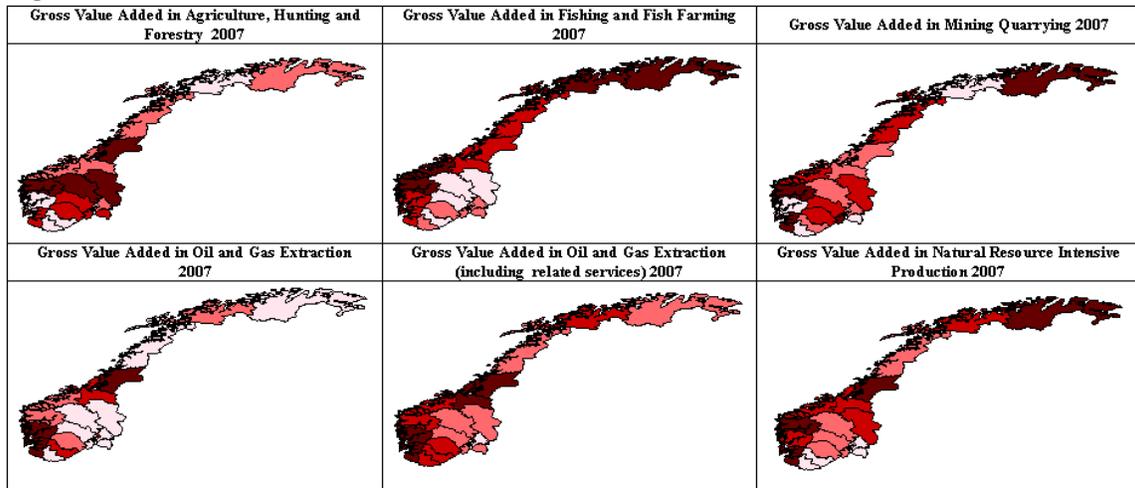
Source: SSB

Figure 8 Gross Value Added 1997



Source: SSB

Figure 9 Gross Value Added 2007



Source: SSB

Table 1 Regional Deviation of Employment

| Employment in Population (Norwegian Average = 1.00) | | | | | | | | | | | | |
|---|-----------------------------------|------|--------------------------|------|----------------------|------|------------------------|------|---------------------------------------|-------|-------|------|
| | Agriculture, forestry and Hunting | | Fishing and Fish Farming | | Mining and Quarrying | | Oil and Gas Extraction | | Oil and Gas Extraction (inc Services) | | Total | |
| | 1997 | 2007 | 1997 | 2007 | 1997 | 2007 | 1997 | 2007 | 1997 | 2007 | 1997 | 2007 |
| Akershus | 0.53 | 0.25 | 0.00 | 0.00 | 0.43 | 0.43 | 1.41 | 1.16 | 0.19 | 1.05 | 0.42 | 0.39 |
| Aust-Agder | 0.65 | 0.54 | 0.18 | 0.24 | 0.95 | 1.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.54 | 0.40 |
| Buskerud | 0.89 | 0.66 | 0.00 | 0.00 | 0.42 | 0.89 | 0.00 | 0.00 | 0.00 | 0.00 | 0.66 | 0.43 |
| Finnmark Finnmarku | 0.31 | 1.03 | 3.77 | 3.76 | 2.54 | 1.52 | 0.00 | 0.00 | 0.00 | 0.00 | 1.03 | 1.25 |
| Hedmark | 2.10 | 1.62 | 0.00 | 0.00 | 1.03 | 0.58 | 0.00 | 0.00 | 0.00 | 0.00 | 1.57 | 1.00 |
| Hordaland | 0.42 | 0.51 | 1.21 | 0.82 | 0.45 | 0.24 | 1.47 | 2.98 | 2.44 | 2.74 | 0.66 | 1.03 |
| Møre og Romsdal | 0.94 | 1.09 | 3.83 | 2.73 | 1.59 | 1.35 | 0.00 | 0.37 | 0.00 | 0.24 | 1.47 | 1.18 |
| Nordland | 0.70 | 1.03 | 2.67 | 3.38 | 1.99 | 1.87 | 2.62 | 0.00 | 0.36 | 0.00 | 1.12 | 1.20 |
| Nord-Trøndelag | 2.74 | 2.52 | 0.70 | 0.96 | 1.51 | 1.71 | 0.00 | 2.11 | 0.00 | 1.38 | 2.19 | 2.08 |
| Oppland | 1.94 | 2.25 | 0.00 | 0.00 | 0.53 | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 1.43 | 1.38 |
| Oslo | 0.01 | 0.01 | 0.00 | 0.00 | 0.19 | 0.20 | 1.27 | 1.07 | 2.46 | 0.81 | 0.12 | 0.21 |
| Østfold | 1.12 | 0.59 | 0.07 | 0.09 | 0.40 | 0.42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.84 | 0.39 |
| Rogaland | 1.51 | 1.10 | 0.49 | 0.43 | 1.60 | 1.91 | 12.22 | 8.63 | 12.53 | 10.30 | 1.81 | 2.82 |
| Sogn og Fjordane | 1.55 | 2.53 | 2.47 | 2.10 | 0.89 | 2.08 | 0.00 | 0.00 | 0.00 | 0.28 | 1.63 | 1.95 |
| Sør-Trøndelag | 0.97 | 0.92 | 0.55 | 0.71 | 0.37 | 0.79 | 0.00 | 0.98 | 1.01 | 1.07 | 0.87 | 0.91 |
| Telemark | 0.60 | 0.60 | 0.00 | 0.15 | 1.17 | 0.66 | 0.00 | 0.82 | 0.00 | 0.54 | 0.48 | 0.54 |
| Troms Romsa | 0.52 | 0.73 | 2.71 | 3.06 | 0.63 | 0.72 | 0.00 | 0.88 | 0.00 | 0.58 | 0.92 | 1.08 |
| Vest-Agder | 0.52 | 0.50 | 0.35 | 0.46 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.45 | 0.37 |
| Vestfold | 0.99 | 0.53 | 0.00 | 0.11 | 2.32 | 1.97 | 0.00 | 0.00 | 0.00 | 0.00 | 0.81 | 0.40 |

Source: SSB

Table 2 Regional Deviation of Gross Fixed Capital Formation

| Gross Fixed Capital Formation (Norwegian Average = 1.00) | | | | | | | | | | | | |
|--|-----------------------------------|------|--------------------------|------|----------------------|-------|------------------------|-------|---------------------------------------|-------|-------|------|
| | Agriculture, forestry and Hunting | | Fishing and Fish Farming | | Mining and Quarrying | | Oil and Gas Extraction | | Oil and Gas Extraction (inc Services) | | Total | |
| | 1997 | 2007 | 1997 | 2007 | 1997 | 2007 | 1997 | 2007 | 1997 | 2007 | 1997 | 2007 |
| Akershus | 0.54 | 0.43 | 0.00 | 0.00 | 0.72 | 0.41 | 1.19 | 0.00 | 0.55 | -0.01 | 0.41 | 0.14 |
| Aust-Agder | 0.70 | 0.54 | 0.12 | 0.02 | 1.06 | 0.52 | 0.00 | 0.00 | 0.00 | 0.00 | 0.49 | 0.15 |
| Buskerud | 0.92 | 0.96 | 0.00 | 0.00 | 0.92 | 1.23 | 0.00 | 0.00 | 1.10 | 0.00 | 0.73 | 0.27 |
| Finnmark Finnmarku | 0.31 | 0.33 | 3.44 | 3.54 | -16.95 | 2.35 | 0.00 | 12.38 | 0.00 | 11.46 | 1.06 | 7.66 |
| Hedmark | 2.16 | 2.14 | 0.00 | 0.00 | 1.15 | 0.68 | 0.00 | 0.00 | 0.00 | 0.00 | 1.37 | 0.60 |
| Hordaland | 0.41 | 0.43 | 0.67 | 1.92 | 1.50 | -0.05 | 5.79 | 0.72 | 3.09 | 1.52 | 0.79 | 1.34 |
| Møre og Romsdal | 0.91 | 0.87 | 3.87 | 1.50 | 5.19 | 1.66 | 0.00 | 4.91 | 0.00 | 4.55 | 1.59 | 3.25 |
| Nordland | 0.68 | 0.76 | 2.42 | 2.49 | 4.33 | 1.29 | 0.00 | 0.00 | 0.76 | 0.00 | 1.13 | 0.36 |
| Nord-Trøndelag | 2.71 | 2.73 | 0.57 | 1.52 | 0.42 | 0.61 | 0.00 | 0.00 | 0.00 | 0.00 | 1.80 | 0.85 |
| Oppland | 1.94 | 2.15 | 0.00 | 0.00 | 1.02 | 0.33 | 0.00 | 0.00 | 0.00 | 0.00 | 1.21 | 0.60 |
| Oslo | 0.01 | 0.01 | 0.00 | 0.02 | 0.27 | 0.20 | 0.56 | 0.01 | 0.69 | 0.00 | 0.09 | 0.02 |
| Østfold | 1.13 | 0.91 | 0.04 | 0.05 | 0.55 | 0.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.71 | 0.26 |
| Rogaland | 1.48 | 1.32 | 0.74 | 1.57 | 3.70 | 2.15 | 11.46 | 0.99 | 2.46 | 1.47 | 1.43 | 1.64 |
| Sogn og Fjordane | 1.51 | 1.83 | 3.46 | 1.75 | 4.94 | 3.90 | 0.00 | 0.00 | 0.00 | 0.00 | 1.76 | 0.61 |
| Sør-Trøndelag | 0.95 | 0.80 | 0.44 | 1.53 | 0.41 | 0.11 | 0.00 | 0.00 | 0.14 | 0.01 | 0.71 | 0.32 |
| Telemark | 0.62 | 0.84 | 0.04 | 0.00 | 6.69 | 0.81 | 0.00 | 0.00 | 0.00 | 0.00 | 0.42 | 0.23 |
| Troms Romsa | 0.52 | 0.49 | 2.85 | 2.84 | 1.59 | 0.63 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.30 |
| Vest-Agder | 0.51 | 0.57 | 0.30 | 0.16 | 0.18 | -0.04 | 0.00 | 0.00 | 10.22 | 0.00 | 1.60 | 0.17 |
| Vestfold | 1.00 | 0.87 | 0.03 | 0.08 | 1.29 | 1.63 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 | 0.25 |

Source: SSB

Table 3 Regional Deviation of Gross Value Added

| Gross Value Added (Norwegian Average = 1.00) | | | | | | | | | | | | |
|--|-----------------------------------|------|--------------------------|------|----------------------|------|------------------------|-------|---------------------------------------|-------|-------|------|
| | Agriculture, forestry and Hunting | | Fishing and Fish Farming | | Mining and Quarrying | | Oil and Gas Extraction | | Oil and Gas Extraction (inc Services) | | Total | |
| | 1997 | 2007 | 1997 | 2007 | 1997 | 2007 | 1997 | 2007 | 1997 | 2007 | 1997 | 2007 |
| Akershus | 0.47 | 0.40 | 0.01 | 0.00 | 1.53 | 0.61 | 1.26 | 0.63 | 0.67 | 0.75 | 0.45 | 0.40 |
| Aust-Agder | 0.97 | 0.75 | 0.12 | 0.12 | 0.22 | 0.77 | 0.00 | 0.00 | 0.00 | -0.04 | 0.52 | 0.34 |
| Buskerud | 1.09 | 1.32 | 0.00 | 0.01 | 0.56 | 0.83 | 0.00 | 0.00 | 0.00 | 0.00 | 0.56 | 0.52 |
| Finnmark Finnmarku | 0.31 | 0.50 | 3.42 | 4.18 | 4.63 | 2.97 | 0.00 | 0.00 | 0.00 | 0.00 | 1.32 | 1.63 |
| Hedmark | 2.70 | 2.99 | 0.00 | 0.00 | 0.45 | 0.86 | 0.00 | 0.00 | 0.00 | 0.00 | 1.34 | 1.10 |
| Hordaland | 0.33 | 0.36 | 0.34 | 0.88 | 0.19 | 0.26 | 1.63 | 3.98 | 2.09 | 2.97 | 0.66 | 1.25 |
| Møre og Romsdal | 0.83 | 0.74 | 3.75 | 3.22 | 1.76 | 1.36 | 0.47 | 0.14 | 0.24 | 0.08 | 1.53 | 1.32 |
| Nordland | 0.63 | 0.64 | 2.22 | 2.15 | 0.99 | 1.48 | 2.66 | 0.00 | 1.40 | 0.00 | 1.21 | 0.96 |
| Nord-Trøndelag | 2.46 | 2.50 | 0.56 | 0.82 | 1.17 | 0.77 | 0.35 | 1.46 | 0.19 | 0.89 | 1.45 | 1.41 |
| Oppland | 2.04 | 2.05 | 0.00 | 0.00 | 0.40 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 1.02 | 0.76 |
| Oslo | 0.02 | 0.02 | 0.00 | 0.00 | 0.15 | 0.01 | 0.98 | 0.76 | 1.81 | 0.96 | 0.37 | 0.28 |
| Østfold | 0.84 | 0.78 | 0.03 | 0.04 | 0.37 | 0.37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.44 | 0.31 |
| Rogaland | 1.04 | 1.14 | 0.88 | 1.36 | 1.90 | 2.43 | 11.25 | 10.32 | 11.72 | 10.35 | 3.12 | 3.93 |
| Sogn og Fjordane | 1.39 | 1.52 | 4.02 | 2.58 | 0.52 | 1.48 | 0.00 | 0.11 | 0.11 | 0.10 | 1.77 | 1.42 |
| Sør-Trøndelag | 0.87 | 0.78 | 0.40 | 0.52 | 0.43 | 0.42 | 0.40 | 0.75 | 0.75 | 2.41 | 0.70 | 1.14 |
| Telemark | 0.89 | 0.86 | 0.04 | 0.03 | 0.73 | 0.95 | 0.00 | 0.34 | 0.00 | 0.22 | 0.49 | 0.44 |
| Troms Romsa | 0.83 | 0.38 | 2.87 | 2.76 | 0.32 | 0.26 | 0.00 | 0.51 | 0.02 | 0.28 | 1.17 | 1.04 |
| Vest-Agder | 0.51 | 0.46 | 0.30 | 0.29 | 0.14 | 0.22 | 0.00 | 0.00 | 0.00 | 0.04 | 0.33 | 0.27 |
| Vestfold | 0.76 | 0.83 | 0.04 | 0.02 | 2.54 | 2.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.53 | 0.46 |

Source: SSB

Appendix- II

A. List of Variables

| Abbreviation | Variable | Unit |
|---------------------|---|---|
| popdens | population density | <i>Persons per sq kilometer</i> |
| gdppc | per capita GDP, current prices | <i>Current prices (NOK)</i> |
| empa | employment in agriculture etc. | <i>Employed persons (1 000 persons)</i> |
| empf | employment in fishing etc. | <i>Employed persons (1 000 persons)</i> |
| empm | employment in mining etc. | <i>Employed persons (1 000 persons)</i> |
| empo | employment in oil and gas etc. | <i>Employed persons (1 000 persons)</i> |
| gfa | gross fixed capital formation in agriculture etc. | <i>Current prices (mill. NOK)</i> |
| gff | gross fixed capital formation in fishing etc. | <i>Current prices (mill. NOK)</i> |
| gfm | gross fixed capital formation in mining etc. | <i>Current prices (mill. NOK)</i> |
| gfo | gross fixed capital formation in oil and gas etc. | <i>Current prices (mill. NOK)</i> |
| gva | gross value added in agriculture etc. | <i>Current prices (mill. NOK)</i> |
| gvf | gross value added in fishing etc. | <i>Current prices (mill. NOK)</i> |
| gvm | gross value added in mining etc. | <i>Current prices (mill. NOK)</i> |
| gvo | gross value added in oil and gas etc. | <i>Current prices (mill. NOK)</i> |

B. Descriptive Statistics

| Variable | Mean | Median | Minimum | Maximum |
|----------|-------------|-------------|-------------|--------------|
| gdppc | 326149 | 303539 | 187152 | 909172 |
| popdens | 89.5517 | 15.0000 | 1.60000 | 1301.80 |
| empa | 0.0187348 | 0.0152504 | 0.000182277 | 0.0589516 |
| empf | 0.00485700 | 0.00188420 | 0.000000 | 0.0216044 |
| empm | 0.000909707 | 0.000717267 | 0.000000 | 0.00272057 |
| empo | 0.00114833 | 0.000000 | 0.000000 | 0.0193665 |
| gfa | 1.54816 | 1.21355 | 0.00557195 | 5.09805 |
| gff | 0.564127 | 0.223225 | 0.000000 | 4.89965 |
| gfm | 0.112916 | 0.0777114 | -0.635131 | 0.640337 |
| gfo | 3.42970 | 0.000000 | 0.000000 | 142.781 |
| gva | 4.03502 | 3.33958 | 0.0747334 | 12.8145 |
| gvf | 2.96257 | 0.609624 | -0.441516 | 17.4260 |
| gvm | 0.719262 | 0.465311 | 0.0109366 | 2.93404 |
| gvo | 1.64315 | 0.000000 | 0.000000 | 26.3882 |
| Variable | Std. Dev. | C.V. | Skewness | Ex. kurtosis |
| gdppc | 109197 | 0.334808 | 2.25189 | 7.42758 |
| popdens | 268.468 | 2.99791 | 3.93302 | 13.7238 |
| empa | 0.0129105 | 0.689115 | 1.04326 | 0.200275 |
| empf | 0.00635761 | 1.30896 | 1.20868 | 0.0187640 |
| empm | 0.000640350 | 0.703907 | 1.00731 | 0.509613 |
| empo | 0.00322789 | 2.81094 | 4.40320 | 20.5246 |
| gfa | 1.08261 | 0.699286 | 1.21986 | 0.937858 |
| gff | 0.823237 | 1.45931 | 2.12201 | 5.11700 |
| gfm | 0.129942 | 1.15078 | 0.345010 | 6.12033 |
| gfo | 16.8829 | 4.92257 | 6.42479 | 43.3187 |
| gva | 2.95463 | 0.732246 | 1.28930 | 0.957145 |
| gvf | 4.15708 | 1.40320 | 1.31294 | 0.498238 |
| gvm | 0.679665 | 0.944948 | 1.62535 | 1.90718 |
| gvo | 4.38638 | 2.66949 | 3.73153 | 14.0502 |