What Determines the Fuel Exports: The Case of Norway

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ABSTRACT

Energy today is a key factor in economic growth. The reason why energy is today an essential factor for the development of a country is its inelastic demand. Securing energy resources is a key component of many states' trade policy. Within this framework of energy security for many countries, Norway has a remarkable presence. The main reason is the rich mineral wealth that Norway possesses. But that's not the only reason. Many countries, although they have rich mineral resources, are nevertheless “captive” in the rich cradles of mineral resources without wishing to diversify their production (“Dutch Disease” - “The Curse of Resources”). These countries usually have the effect of revaluing their currency and linking it to the dominant world currency. Norway, because of the global energy market, must reform its energy policy in such a way that it can be competitive. This study will attempt to investigate those factors that determine energy exports. Having Norway as a case study, the present research effort will set a framework for the interpretation of energy exports. The methodology applied is multiple Regression Analysis - Ordinary Least Squares (OLS).

Keywords: Fuel Exports, Norway, OLS.

I. INTRODUCTION

Energy products in today's times are particularly important. The importance of energy is mainly based on the contribution of energy to the economic development of a country. The optimal use of energy can lead directly to the acceleration of economic growth and indirectly through the promotion of exports due to the fact that the optimal use of energy makes the use of the factors of production efficient [1]. Basically, the optimal use of energy resources with energy saving policies leads to GDP growth [2]. According to Georgescu-Roegen, energy is the most important primary component of production in today's era [3]. Norway is a country with a significant presence in the international energy system. Norway's position is very important especially considering the energy dynamic relationship with Europe [4]. According to Hamlehedar and Aslani [5], Norway possesses the second largest reserves of natural gas in Europe, is rich of petroleum and natural gas and is one of the richest nations in the world. They also mention that Norway's exports are for the most part crude oil and natural gas. The question that needs to be answered is this: what are the factors that determine the exports of Norway’s fuel products? The answer to this question will be attempted by this research.

The purpose of this study is to explain the causes of the fuel exports of Norway. The remainder of this paper is constructed as follows: the second part mentions the review of the literature. The third part of this research cites the methodology. In the fourth part the results of the regression are cited. The final part concludes. This research it was based on the Linear Regression Analysis - Ordinary Least Squares (OLS). The next section shows a short reference to the literature.

II. REVIEW OF THE LITERATURE

Exports of fuel products are a key aspect of international economic relations. The literature of the fuel products is actually divided between three basic categories. The first category is about the importance of energy in a country's economy, the second is about the fuel price formation and the third is about energy consumption. The reason why energy exports have become an important part of the international economy is the importance of energy in a country's economy. References [6]-[12] are the first attempts to investigate the relationship between energy (oil price shocks) and economic activity. References [13]-[22] have shown the relationship of energy products with aspects of the economy. References [23]-[27] have shown that fuel exports do not have a positive effect on economic growth. Much of the existing literature has focused on fuel price formation. Important aspect of this matter is the “Dutch disease”. Many surveys analyze the “Dutch disease” [28]-[31]. The “Dutch disease” affects the other productive sectors negatively due to the real appreciation of the national currency. References [32]-[41] explain the “Dutch disease”. There are two kinds of researchers that show a unidirectional relationship between energy consumption and economic growth. The first group indicate a unidirectional causality from energy consumption to economic growth [42]-[46] and the second group indicate a unidirectional causality from economic growth to energy consumption [47]-[49]. Moreover, there are researchers that show a bidirectional relationship. They indicate a bidirectional causality specially between economic growth and energy consumption [50]-[55]. References [56]-[58] found no causal connection between economic growth and...
energy consumption. The following segment mentions the methodology and the data of this study.

III. METHODOLOGY AND DATA

The present study tries to examine the factors that determine the fuel exports of Norway. The trading partners selected are France, Sweden, United Kingdom, Germany, Netherlands. The countries have been selected because for most of the period under review they are among the five export destinations of Norway. The time period is 1993-2018. The time period and the examining country has chosen firstly and mostly due to the availability of data. Moreover, the time period has chosen due to the fact that covers a sufficient time period analysis.

This study uses multiple-regression model as an estimator of annual time series data. The dependent variable is the percentage of Norway Fuels Export Product Share. The study model expresses the fuels exports of Norway (NO) as a function of firstly, the revealed comparative advantage (RCA) of Norway, the export product share of Norway’s intermediate goods, the exchange rate (XR) of Norway, the multifactor productivity (MFP) of Norway, the industrial production (IPI) of Norway’s trade partners France (FRAN), Sweden (SE), United Kingdom (UK), Germany (DE), Netherlands (NL) and finally the Gross Domestic Product (GDP) growth of Norway’s trade partners. The above are the independent variables. The study uses the traditional Multiple Regression technique, particularly the traditional Ordinary Least Squared (OLS) technique [59]. The database for this study is WITS [60]-[62], OECD [63]-[65] and World Bank [66].

Table I shows the dependent variable and the explanatory variables of the model.

The study sets up the estimated multiple-regression model to test the above stated hypotheses as follows:

\[
\text{FuExpNor}_t = \beta_0 + \beta_1 \text{FuRCANor}_t + \beta_2 \text{IntGExpNor}_t + \beta_3 \text{ExcRatNor}_t + \beta_4 \text{IndProdFr}_t + \beta_5 \text{IndProdSw}_t + \beta_6 \text{IndProdUK}_t + \beta_7 \text{MultProdNor}_t + \beta_8 \text{IPI}_t + \beta_9 \text{GDP}_t \\
\text{GrFr}_t + \beta_{10} \text{GDPGrFr}_t + \beta_{11} \text{GDPGrSw}_t + \beta_{12} \text{GDPGrUK}_t + \beta_{13} \text{GDPGrGer}_t + \beta_{14} \text{PPGrNeth}_t + \epsilon_t
\]  

(1)

Table II displays the description of the variables of the model.

The next section presents the results of linear regression.

IV. RESULTS

Table III presents the regression results. The outcomes of linear regression approve the functionality of the above model. The conclusions of this study are demonstrated in the following section.

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TABLE II: THE VARIABLES OF THE MODEL

| Variables | Description |
|-----------|-------------|
| \(\text{FuExpNor}_t\) | Norway Fuels Export Product Share to World in % 1993-2018 |
| \(\beta_0\) | the constant amount or the intercept |
| \(\beta_1-\beta_{14}\) | are coefficients of the explanatory variables |
| \(\text{FuRCANor}_t\) | Norway Fuel Revealed comparative advantage (RCA) to World 1993-2018 |
| \(\text{IntGExpNor}_t\) | Norway Intermediate goods - Export Product Share (%) 1993-2018 |
| \(\text{ExcRatNor}_t\) | Norway Exchange rate (XR) Total, National currency units/US dollar 1993-2018 |
| \(\text{MultProdNor}_t\) | Norway Multifactor productivity (MFP) Total, 195=100. 1993 – 2018 |
| \(\text{IndProdFr}_t\) | Industrial production (IPI) Total 2015=100. 1993 – 2018 France |
| \(\text{IndProdSw}_t\) | Industrial production (IPI) Total 2015=100. 1993 – 2018 Sweden |
| \(\text{IndProdUK}_t\) | Industrial production (IPI) Total 2015=100. 1993 – 2018 United Kingdom |
| \(\text{IndProdGer}_t\) | Industrial production (IPI) Total 2015=100. 1993 – 2018 Germany |
| \(\text{IndProdNeth}_t\) | Industrial production (IPI) Total 2015=100. 1993 – 2018 Netherlands |
| \(\text{GDPGrFr}_t\) | GDP growth (annual %) 1993-2018 France |
| \(\text{GDPGrSw}_t\) | GDP growth (annual %) 1993-2018 Sweden |
| \(\text{GDPGrUK}_t\) | GDP growth (annual %) 1993-2018 United Kingdom |
| \(\text{GDPGrGer}_t\) | GDP growth (annual %) 1993-2018 Germany |
| \(\text{GDPGrNeth}_t\) | GDP growth (annual %) 1993-2018 Netherlands |
| \(\epsilon_t\) | the error term |
| \(t\) | the year from the period 1993-2018 |
| \(i\) | the country |

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TABLE II: REGRESSION RESULTS

| Dependent Variable: \(\text{FuExpNor}_t\) |
|----------------------------------------|
| \(\text{FuRCANor}_t\) | -3.585** (-6.245, -0.871) |
| \(\text{IntGExpNor}_t\) | -2.504*** (-3.444, -1.565) |
| \(\text{ExcRatNor}_t\) | -0.880 (-2.726, 0.967) |
| \(\text{MultProdNor}_t\) | -0.171 (-0.729, 0.387) |
| \(\text{IndProdFr}_t\) | 0.177 (-0.434, 0.789) |
| \(\text{IndProdSw}_t\) | 0.408 (-0.114, 0.931) |
| \(\text{IndProdUK}_t\) | 0.041 (-0.514, 0.596) |
| \(\text{IndProdGer}_t\) | -0.270* (-0.532, -0.008) |
| \(\text{IndProdNeth}_t\) | -0.587* (-1.159, -0.016) |
| \(\text{GDPGrFr}_t\) | 1.195 (-1.004, 3.394) |
| \(\text{GDPGrSw}_t\) | -0.324 (-1.420, 0.772) |
| \(\text{GDPGrUK}_t\) | -0.191 (-1.295, 0.912) |
| \(\text{GDPGrGer}_t\) | 0.645 (-0.620, 1.911) |
| \(\text{GDPGrNeth}_t\) | -0.888 (-2.011, 0.234) |
| \(\epsilon_t\) | 0.162 (-0.673, 0.996) |

| Constant | 151.761*** (88.914, 214.609) |
| Observations | 26 |
| \(R^2\) | 0.982 |
| Adjusted \(R^2\) | 0.956 |
| Residual Std. Error | 1.562 (df = 10) |
| F Statistic | 36.941*** (df = 15; 10) |
| Note: | *p<0.1; **p<0.05; ***p<0.01 |
| Year | Fuels Export Product Share to World in % (NO) | Fuel RCA to World (NO) | Intermediate goods - Export Product Share % | XR Total, National currency units/US dollar, (NO) | MFP Total, 2015=100, (NO) | IPI Total, 2015=100, (FRA) | IPI Total, 2015=100, (SE) | IPI Total, 2015=100, (UK) | IPI Total, 2015=100, (NL) | GDP growth annual % (FRAN) | GDP growth annual % (SE) | GDP growth annual % (UK) | GDP growth annual % (NL) |
|------|-----------------------------------------------|------------------------|---------------------------------------------|-----------------------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| 1993 | 51.26                                         | 5.39                   | 16.2                                        | 7,094                                         | 86.1                         | 86.8                         | 69.2                         | 80.3                         | 67.1                         | -0.62                       | -2.06                       | 2.48                        | -0.97                       |
| 1994 | 49.61                                         | 6.2                    | 17.19                                       | 7,058                                         | 89.3                         | 90.0                         | 77.0                         | 84.5                         | 69.2                         | 82.7                         | 2.35                        | 3.92                        | 3.84                        |
| 1995 | 47.28                                         | 6.22                   | 18.54                                       | 6,335                                         | 92.1                         | 92.7                         | 84.5                         | 86.0                         | 69.8                         | 85.1                         | 2.1                         | 3.93                        | 2.53                        |
| 1996 | 54.65                                         | 5.86                   | 15.28                                       | 6,450                                         | 94.9                         | 93.5                         | 85.2                         | 87.2                         | 69.4                         | 87.2                         | 1.41                        | 1.57                        | 2.49                        |
| 1997 | 53.79                                         | 6.28                   | 15.43                                       | 7,073                                         | 97.0                         | 97.5                         | 89.2                         | 89.4                         | 71.8                         | 86.7                         | 2.33                        | 3.07                        | 4.97                        |
| 1998 | 43.27                                         | 6.76                   | 18.55                                       | 7,545                                         | 96.4                         | 101.6                        | 93.3                         | 92.3                         | 75.0                         | 88.4                         | 3.58                        | 4.31                        | 3.7                         |
| 1999 | 49.94                                         | 6.56                   | 15.8                                        | 7,799                                         | 96.5                         | 104.3                        | 95.9                         | 96.5                         | 76.2                         | 91.0                         | 3.42                        | 4.24                        | 3.29                        |
| 2000 | 63.89                                         | 5.64                   | 12.55                                       | 8,802                                         | 98.9                         | 108.6                        | 101.5                        | 99.0                         | 80.4                         | 95.9                         | 3.92                        | 4.76                        | 3.5                         |
| 2001 | 61.75                                         | 5.82                   | 12.31                                       | 8,992                                         | 101.0                        | 109.9                        | 100.5                        | 101.3                        | 80.5                         | 95.9                         | 1.98                        | 1.44                        | 2.73                        |
| 2002 | 60.63                                         | 6.04                   | 13.16                                       | 7,984                                         | 102.6                        | 108.6                        | 100.5                        | 103.0                        | 79.5                         | 97.0                         | 1.13                        | 2.19                        | 2.17                        |
| 2003 | 61.17                                         | 5.04                   | 13.41                                       | 7,080                                         | 104.8                        | 107.7                        | 102.0                        | 105.8                        | 79.7                         | 95.8                         | 0.82                        | 2.3                         | 3.32                        |
| 2004 | 63.62                                         | 4.93                   | 13.54                                       | 6,741                                         | 106.6                        | 110.1                        | 107.7                        | 104.5                        | 83.1                         | 99.9                         | 2.82                        | 4.33                        | 2.28                        |
| 2005 | 67.68                                         | 4.32                   | 12.24                                       | 6,442                                         | 107.4                        | 110.0                        | 103.7                        | 137.5                        | 89.9                         | 100.2                        | 1.66                        | 2.85                        | 2.95                        |
| 2006 | 67.8                                         | 3.92                   | 12.47                                       | 6,413                                         | 106.5                        | 110.8                        | 138.8                        | 107.1                        | 90.9                         | 102.3                        | 2.44                        | 4.66                        | 2.69                        |
| 2007 | 64.29                                         | 3.85                   | 14.48                                       | 5,862                                         | 104.8                        | 112.0                        | 117.7                        | 106.2                        | 96.9                         | 106.5                        | 2.42                        | 3.43                        | 2.36                        |
| 2008 | 68.87                                         | 3.49                   | 11.26                                       | 5,640                                         | 101.2                        | 109.0                        | 114.6                        | 104.4                        | 97.7                         | 107.3                        | 0.25                        | -0.45                       | -0.27                       |
| 2009 | 62.98                                         | 3.74                   | 12.06                                       | 6,288                                         | 99.7                         | 95.4                         | 94.5                         | 98.4                         | 80.8                         | 99.4                         | -2.87                       | -4.33                       | -6.69                       |
| 2010 | 63.69                                         | 3.52                   | 12.62                                       | 6,044                                         | 99.3                         | 99.9                         | 103.4                        | 97.5                         | 90.4                         | 106.9                        | 1.94                        | 5.95                        | 2.07                        |
| 2011 | 68.02                                         | 3.35                   | 11.49                                       | 5,605                                         | 98.1                         | 102.4                        | 105.9                        | 91.7                         | 98.1                         | 106.4                        | 2.19                        | 3.19                        | 2.73                        |
| 2012 | 69.81                                         | 3.2                    | 9.69                                        | 5,877                                         | 98.8                         | 99.8                         | 103.5                        | 97.1                         | 97.1                         | 105.9                        | 0.31                        | -0.58                       | 0.43                        |
| 2013 | 67.62                                         | 3.21                   | 9.55                                        | 5,875                                         | 98.7                         | 99.5                         | 98.6                         | 94.1                         | 97.0                         | 106.5                        | 0.57                        | 1.18                        | 2.18                        |
| 2014 | 64.87                                         | 3.36                   | 10.29                                       | 6,302                                         | 99.1                         | 98.4                         | 97.0                         | 95.7                         | 99.0                         | 103.6                        | 0.95                        | 2.65                        | 2.86                        |
| 2015 | 57.68                                         | 4.15                   | 12.3                                        | 8,064                                         | 100.0                        | 100.0                        | 100.0                        | 100.0                        | 100.0                        | 100.0                        | 1.11                        | 4.48                        | 2.36                        |
| 2016 | 52.97                                         | 4.57                   | 13.43                                       | 8,400                                         | 100.1                        | 100.5                        | 102.1                        | 101.2                        | 101.5                        | 101.4                        | 1.09                        | 2.07                        | 1.72                        |
| 2017 | 57.18                                         | 4.42                   | 13.08                                       | 8,272                                         | 101.5                        | 102.5                        | 106.5                        | 100.3                        | 104.5                        | 102.5                        | 2.29                        | 2.56                        | 1.74                        |
| 2018 | 62.12                                         | 3.93                   | 12.02                                       | 8,133                                         | 100.8                        | 103.2                        | 109.0                        | 103.8                        | 105.7                        | 103.1                        | 1.86                        | 1.95                        | 1.25                        | 1.08                        |

TABLE 1: THE DEPENDENT VARIABLE AND THE EXPLANATORY VARIABLES OF THE MODEL
V. CONCLUSION

From the examination of the data, it is observed that the model composed in the present research has a high explanatory ability. The model presented has showed the functionality and importance of the chosen independent variables. Adjusted $R^2$ is high, with value of 0.956. This means that the model built in this research describes the connection of independent variables to the dependent one. Essentially, the bigger the Adjusted $R^2$ the better the model fits to the data. The variables FuRCANor, IntGExpNor, ExcRatNor, MultProNor, IndProdGer, IndProdNeth, GDPGrSw, GDPGrUK, GDPGrNeth, have a negative effect on the fuel exports whereas the other variables have a positive effect. Norway is a country whose presence in the energy sector is particularly important. The factors chosen in this model explain the exports of energy products. Further research is needed to establish a satisfactory analytical framework for fuel exports.

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