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Article

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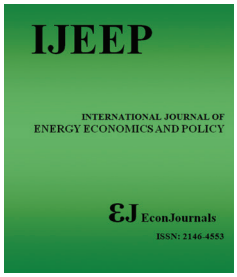
Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Reference: Huseynli, Bahman (2023). Effect of exports of goods and services and energy consumption in Italy's service sector. In: International Journal of Energy Economics and Policy 13 (3), S. 254 - 261. https://www.econjournals.com/index.php/ijeep/article/download/14175/7304/33243. doi:10.32479/ijeep.14175.

This Version is available at:
http://hdl.handle.net/11159/630246



International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2023, 13(3), 254-261.

Effect of Exports of Goods and Services and Energy Consumption in Italy`s Service Sector

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Received: 15 January 2023 **Accepted:** 28 April 2023 **DOI:** https://doi.org/10.32479/ijeep.14175

ABSTRACT

The aim of this study is to examine the service sector in Italy, one of the Mediterranean countries, and the relationship between the energy consumption affecting this sector and the factors of export of goods and services. The data set used in the model tested by panel analysis method covers the years 1997-2021. When the values related to the analysis result are examined, it is understood that the model is generally significant at the 95% confidence level. The R2 coefficient, which is important in the model, is approximately 95%. Exports of goods and services, one of the explanatory variables in the model, were found to be significant in explaining the commercial service exports of this country. In other words, the 1% increase in Italy's exports of goods and services explains this country's exports of commercial services at the level of 86%. This relationship between variables has a positive meaning. The relationship between energy consumption and exports of commercial services was found to be significant at the 5% probability level. The relationship between these two variables is also positive. It was concluded that a 1% increase in energy consumption explains this country's commercial service exports by approximately 27%.

Keywords: Energy Consumption, Service Sector, Exports of Goods and Services, Italy
JEL Classifications: Q49, L80, N74

1. INTRODUCTION

Import and export of goods and services have an important place in the economic development of countries. Firms try to improve the quality of products and services based on consumer feedback. All these processes take place with energy consumption. In this sense, energy consumption is accepted as an important input for countries (Sarkhanov and Huseynli, 2022). Worldwide energy consumption is increasing rapidly due to the increase in human population, continued pressure for better living standards, the emphasis on large-scale industrialization in developing countries, and the need to maintain positive economic growth rates (Bianco et al., 2009).

It has been determined that exports are important in determining economic growth and that economic growth affects exports significantly (Singh, 2015). Energy is a very important production factor for economic growth. The fact that a country's exports are high is important in terms of providing foreign currency input to that country and affecting the production sectors in the country to work more. Energy is required to combine the factors of production and produce output (Huseynli, 2022a). The increasing importance of service sectors in terms of their impact on export growth can be underlined (Mishra et al., 2011). Export growth is often an important determinant of output growth. As Herzer et al. (2006) have pointed out, this is especially true for countries with limited or small local markets. It has been stated that real cross-border traded services are by-products of international production activities or transactions (Stern and Hoekman, 1987; Deardorff, 2001).

It should be noted that higher economic growth rates are observed in economies where exports of goods are dominant (Kalaitzi and Cleeve, 2018). Since exports of goods and services are an important component of aggregate demand, its growth can

support GDP growth (Bacovic, 2021). Economic development and planning process are accepted as increasing economic real national incomes over a long period of time. The idea that there is an increasing tendency in developed countries to substitute services for exports of goods or to meet this as a strategic economic goal, although it has not yet been realized, is often supported by policy makers. Indeed, this view of the transformation of industrial economies into service economies seems to be confirmed by the steady growth of trade in services (Damien, 2012). There are studies in the literature examining the close relationship between services and exports of goods (Broussolle, 2012; Eichengreen and Gupta, 2013; Lennon, 2008; Lodefalk, 2012; Nordås, 2010).

However, energy efficiency, one of the pillars of the EU's Energy Union strategy, has been proposed as a solution as a highly effective way to improve the economic competitiveness and sustainability of the European economy, reduce emissions, reduce energy dependence, and increase security. The service sector is less important given its limited energy use. However, this view of energy use in the service sector can be challenged for at least two reasons. First, as economic development continues, the service sector is growing relatively fast worldwide (in absolute terms and as a share of GDP), resulting in a relatively rapid increase in energy consumption in the service sector. Second, energy consumption patterns in the service sector are changing as a result of drastic changes in production processes in the service sector, particularly in response to the emergence of Information and Communication Technologies (ICT) (Mulder et al., 2014). The increase in the world population increases the demand for goods and services. Continuous production is made to meet endless human needs. Today, energy demand has become a necessity for the realization of production (Huseynli, 2022b).

Considering all these, the main purpose of this study is to examine the relationship between the service sector and the energy consumption affecting this sector and the factors of export of goods and services. Energy consumption and exports of goods and services, which have significant effects on the service sector, are considered as independent variables in the model. The model has been empirically tested in the case of Italy.

2. THEORETICAL BACKGROUND

2.1. Exports of Goods and Services

The export of goods and services of a country is very important in terms of macroeconomic indicators of that country, and it affects the welfare of the people of this country. There is always an energy demand for the realization of almost all kinds of direct and indirect production (Huseynli, 2022a). Francois and Hoekman (2010) found that service sectors have a positive effect on the overall competitiveness of the country.

In a study conducted by Nguyen (2020), the relationship between various factors such as foreign direct investment, foreign aid, exports and economic growth in Vietnam between 1997 and 2018 was examined. As FDI inflows affect the volume of countries' service exports, greater access to the Internet may ultimately affect the way countries diversify their service exports, either through greater service export diversification or through a higher degree of service export concentration (Ansari and Ojemakinde, 2003; Grünfeld and Moxnes, 2003; Huang and Viana, 1995; Wren-Lewis and Driver, 1998; Wong et al., 2009). According to Broussolle (2012), the export of commercial services sectors depends on demand from both the export of goods and manufacturing through FDI. Lapatinas (2019), on the other hand, empirically investigated the effect of the internet on economic complexity (i.e., the complexity of exported products).

In a study conducted by Harris and Moffat (2015) on UK factories, it was found that although the results were stronger in the manufacturing sector than in the service sector, productivity was higher in facilities that export and import goods and services. In a study conducted by Schwarzer (2017), it was determined that the export tendency in the service sector is significantly lower than in the manufacturing sector. Sandri et al. (2016) found that trade in services positively affects the economic performance in Jordan.

Ceglowski (2006), while examining whether the gravity models fit the services trade in the sample of 28 OECD countries during the 1999-2000 period, found that there is a link between the trade in services and the trade in commodities. In a study conducted by Lennon (2008), trade in goods and Other Business Services in 28 OECD countries from 1999 to 2002 reinforced each other. Karmali and Sudarsan (2008) investigated the effect of trade in goods between countries from different income groups on trade in services, using panel data in the 1985-2003 period. Nordås (2010) even emphasizes that trade in services closely follows trade in goods, suggesting that tasks (represented by services) and components (represented by goods) can be complementary. In a study by Damien (2012), the links between exports of goods and services were discussed. This study also explains the reasons why exports of services are likely to be linked to exports of manufacturing and purely to exports of goods. Crozet et al. (2013) found that French wholesalers serve countries with smaller market size and higher trade costs relative to the average destination.

Gabriele (2006) points out that services exports are a positive determinant of economic growth in the long run, but the effect is weaker in developing countries than in developed countries. Cattaneo et al. (2010) find that the services sector is important for GDP growth. Bacovic et al. (2020) find that travel services exports are a strong determinant of GDP growth in the short run, while its effect is less significant in the long run. In a study conducted by Bacovic (2021), the effect of service exports on GDP and productivity growth was examined in the sample of 38 European countries for the period 2000-2019. In a study conducted by Ertaş and Batı (2021), the relationship between annual changes in GDP, population and exports of goods and services of 32 countries during the period 1991-2016 was examined.

2.2. Energy Consumption

Global energy consumption, which was approximately 5Gtoe in 1970, increased to approximately 12G toe in 2010 with the great contributions of countries such as China and the USA (Aydin et al., 2016). Today's global energy system relies heavily on fossil fuels, which account for 81% of the total primary energy supply

(Bompard et al., 2020). Jannuzzi and Schipper (1991) examined electrical energy consumption for the residential sector in Brazil. Harris and Liu (1993) examined the dynamic relationships between electricity consumption and potentially relevant variables such as weather, price, and consumer income.

In a study by Ranjan and Jain (1999), the electrical energy consumption pattern in Delhi for the 1984-1993 period was examined as a function of population and weather sensitive parameters. Alesina et al. (2005) show that regulatory reforms in sectors traditionally protected from competition (transport, communications, and energy) have had a significant positive impact on investment levels. Issues related to improving energy efficiency in enterprises (Lawrence et al., 2018), industrial sub-sectors, or whole society perspectives (Wang et al., 2018) have also been extensively explored from an economic perspective.

Serviceization, a shift from a product-centric business model to a service-centric business model and logic (Kowalkowski et al., 2017) has traditionally helped manufacturing firms stabilize their businesses in turbulent times (Kwak and Kim, 2016). All these processes are one of the activities that increase energy consumption. The output of all these activities is reflected in economic growth.

Lee (2006) examined the causal relationship between energy consumption and GDP in G-11 countries. Chontanawat et al. (2008) investigated Granger causality between energy and GDP using a dataset of 30 OECD and 78 non-OECD countries. Jalil and Feridun (2011) examined the effects of financial development, economic growth, and energy consumption on environmental pollution in China during the 1953-2006 period. A study by Sadorsky (2011) analyzed the impact of financial development on energy consumption in 9 cases of border economies in Central and Eastern Europe. A related study was conducted by Al-mulali and Sab (2012) investigating the impact of energy consumption and CO_2 emissions on GDP growth and financial development in 30 sub-Saharan African countries from 1980 to 2008. In a study conducted by Çoban and Topçu (2013), the relationship between financial development and energy consumption in the EU for the period 1990-2011 was analyzed using the system-GMM model.

Abalaba and Dada's (2013) study examined the relationship between energy consumption, real output, financial development, monetary policy rate and consumer prices. Islam et al. (2013) analyzed the relationship between financial development, energy consumption and GDP in Malaysia covering the years 1971-2009. Öztürk and Acaravci (2013) investigated the causal relationship between financial development, trade, economic growth, energy consumption and carbon emissions in Turkey for the period 1960-2007. In a study by Shahbaz et al. (2013), the relationship between energy use and economic growth was examined in the sample of China for the period 1971-2011.

Salman and Atya (2014) analyzed the causality flow between financial development, economic growth and energy consumption in Algeria, Egypt, and Tunisia. In a study by Mahalik and Mallick (2014), the relationship between energy consumption, economic growth and financial development in India was examined using annual data for the period 1971-2009.

In a study conducted by Farhani and Öztürk (2015), the causal relationship between CO2 emissions, real GDP, energy consumption, financial development, trade openness and urbanization in Tunisia during the 1971-2012 period was analyzed. Ali et al. (2015) investigated the dynamics of financial development, economic growth, energy prices and energy consumption in Nigeria for the period 1972Q1-2011Q4 using an ARDL bounds testing framework. In a study by Chang (2015), the nonlinear effects of financial development and income on energy consumption were examined in a sample of 53 countries for the period 1999-2008.

The COVID-19 pandemic has caused a massive worldwide economic meltdown as customer demand, industry activity and confidence collapsed. Business activity in the eurozone fell to a record low in March 2020, and US industrial production showed the largest monthly decline since the end of the Second World War (Badkar and Greeley, 2020). In the post-COVID-19 period, product and service exports of countries are increasingly trying to catch up with the previous level.

2.3. Energy Consumption and Exports of Goods and Services in Italy

Forni et al. (2010) conducted research that studied the consequences of increasing rivalry in the service sector of Italy inside the eurozone. Specifically, the research focused on the implications of this increased competition in Italy. Every sector creates products and services that may either be sold on the home market or exported to other countries. The demand for products and services on the domestic and international markets are identical in every way. The ratio between the set external price and the domestic production price, as well as the export price elasticity, determines the level of demand for Italian products on international markets (Garau et al., 2013). According to Bernard et al. (2015), direct exporting producers in Italy are larger than wholesalers in Italy, while wholesalers in Italy sell a greater variety of goods to a limited number of countries.

Soytaş and Sari (2006) conducted research on the correlation between a nation's level of energy consumption and their level of income in the G-7 nations. In a study that was conducted by Bianco et al. (2009), the authors looked at the impact of economic and demographic variables on annual electricity consumption in Italy between 1970 and 2007, with the goal of developing a straightforward and data-light electricity consumption forecasting model that could be integrated into more complex planning tools investigated for. Lee and Chien (2010) conducted research in which they examined the dynamic connections that exist between energy consumption, capital stock, and real income in the G-7 nations.

In a study that was carried out by Magazzino (2012), cointegration analyses and Granger causality tests were carried out using annual data ranging from 1883 to 2009, and the relationship between disaggregated energy production in Italy and real total income was investigated. These tests were carried out using annual data. In a

study that was carried out by Magazzino (2014), the relationship that existed between CO_2 emissions, energy consumption, and economic growth in Italy during the period of 1970-2006 was investigated, and it was shown that there was no cointegration between these three variables. This conclusion was reached because of the findings of the study.

Even though industrial energy consumption has been on a downward trend in recent years, this sector continues to be one of the main consumers of energy in the EU. As a result, the purpose of this study is to investigate the degree to which European and national policies in some countries, such as Italy and the United Kingdom, address energy efficiency in industry and whether there are any steps to encourage it (Malinauskaite et al., 2019).

Trotta (2020) conducted research using the Logarithmic Mean Divide Index I (LMDI-I), a method that is used for performing multi-sector decomposition analysis, to investigate the factors that were responsible for the changes that occurred in Italy's final energy consumption from 1995 to 2015. A study that was conducted by Ghiani et al. (2020) investigated the effects that the outbreak of COVID-19 had on Italy's mass electricity system as well as the entire electricity industry. Additionally, the researchers investigated how the restrictions and lockdowns of activities in Italy affected the energy industry. The changes in load profiles, the demand for electricity, and the pricing on the wholesale market and the market for ancillary services in Italy have all been evaluated as part of the scope of the research, which includes a full and exhaustive look at this data.

3. RESEARCH METHODOLOGY

3.1. Purpose and Data Set

In this study, the service sector in Italy, which is one of the selected Mediterranean countries, and its relationship with the factors affecting this sector are examined. The aim of this study is to examine the relationship between the service sector in Italy and the energy consumption affecting this sector and the factors of export of goods and services. Energy consumption and exports of goods and services, which have significant effects on the service sector, are considered as independent variables in the model. The model was tested by panel analysis method. The data set used in the study covers the years 1997-2021. The dataset was handled annually. The logarithmic values of the variables used in the analysis were taken and included in the analysis.

3.2. Analysis Method

It is possible to talk about two basic approaches used in regressions with panel data. These are: Fixed Effects Model (FEM) and Random Effects Model (REM). However, while estimating the model, various assumptions are made about the model's constant term, slope coefficients and error term. In the literature, there are studies on energy consumption with the time series method (Ali et al., 2015; Chang, 2015). Depending on the assumptions made about these, it is possible to predict five different models (Judge et al., 1985). On these models:

1. Both constant and slope coefficients do not change with respect to both units and time, and the error term can represent differences with respect to time and units
2. While the slope coefficients are constant, the constant term varies in units but may remain constant over time
3. While the slope coefficients are constant, the constant term can vary with units and time
4. Both constant and slope coefficients can vary by units
5. All coefficients can vary both in time and in units.

One of the simplest models used to predict with panel data is the Fixed Effects Model (FEM). In FEM, the differences in the behavior of the units are tried to be revealed by the differences in the constant term. However, the slope coefficients are assumed to be constant. In this model, the constant term is called the group-specific constant term. As stated by Greene, the definition of constant here means that the coefficient may vary according to the units but is constant according to time. Individual effects that cannot be observed in the FEM are related to the explanatory variables in the model (Greene, 2003).

Contrary to what is accepted in the FEM, if the explanatory variables in the model are not relevant, the individual effects of the constant terms specific to the units; it is more appropriate to assume that it is randomly distributed according to the units and to model accordingly (Greene, 2003). In FEM, each section unit has its own constant term; In REM, the constant term gives the mean constant term (β) for all cross-section units, and the error term (μi) represents the random deviation of the constant term of each cross-section unit from this mean constant term. The effective estimation method used to estimate the REM is the Generalized

Table 1: Summary statistical values

Variable	Obs.	Mean	SD	Min.	Max.
Commercial service exports	25	10.95561	0.1108927	10.76831	11.08746
Exports of goods and services	25	11.68244	0.1322884	11.46326	11.83796
Energy use	25	3.446794	0.0452287	3.382824	3.507137

Table 2: Likelihood ratio (LR) test results

Ratios` Name	LR statistics	Probability value
Unit and time impact	0.00	1.0000
Unit impact	1.7e-13	1.0000
Time effect	0.00	1.0000

Table 3: White test results

Test statistic	Probability value
8.074437	0.1522

Table 4: Wooldridge test results

Test statistic	Probability value
22.025	0.0151

Table 5: VIF criteria results

Variable	VIF	1/VIF
Exports of goods and services	1.41	0.708166
Energy use	1.41	0.708166
Mean VIF	1.41	

Table 6: Least squares method test results

R^2	Number of observations		prob>	
0.9528	25		0.0000	
Commercial service exports	**Coefficient values**	**Standard errors**	**T statistics**	**P>|t|**
Exports of goods and services	0.8645227***	0.0271998	31.78	0.000
Energy use	0.2706354**	0.1345556	2.01	0.057
Fixed coefficient	−0.0769473	0.5757253	−0.13	0.895

Least Squares (GLS) method. If the number of cross-section units in the panel data is large and the time (n) (G) is short, REM provides more efficient estimations than FEM. On the other hand, if n is large and G is small, little difference is expected between the two estimation results, and as we mentioned before, FEM is more preferred. However, if n is small and G is large, a significant difference is expected between the two forecast results. In this case, if it is believed that the cross-sectional units are randomly drawn from the large sample, REM is considered the more appropriate model, otherwise FEM (Gujarati, 2003).

4. ANALYSES AND RESULTS

In line with the purpose of the research, analyzes were made within the scope of the research method. Before the analysis, summary values of all variables to be used were checked. After no problems were found in the summary values, the analysis was made. Summary statistical values of the variables are given in Table 1.

After looking at the summary statistical values, the model required for the study was established:

$$L\,commercial\ service\,exports = \beta_0 + \beta_1 L\,exports\,of\ goods\,and\,services + \beta_2 L\,energy\,use + \mu \quad (1)$$

Here β_0 is the constant term and μ is the error term. A loglinear model was used in order to convert the variables in the model, each of which is expressed in different units, into a common unit and to interpret the coefficients to be obtained directly as flexibility. The β_1 and β_2 parameters in the model represent the country's exports of goods and services and energy consumption, respectively.

After the model was established, the LR test was applied to test whether there is a time and unit effect between the variables. The results of the LR test are given in Table 2.

As can be seen from the results in the table, there is no effect between the variables. Our model continues with the least square's method. After the method was determined, the assumptions of the least square's method were emphasized, and necessary tests were applied. The first test was to measure whether the data provided equal variance. The preferred test was the White test. White test results are in Table 3.

As can be seen from the table, there is no heteroscedasticity between the variables. In order to test autocorrelation in classical panel data models, Wooldridge proposed an autocorrelation test in 2002 with H_0 hypothesis as "There is no first-order autocorrelation." In this test, the first differences of the panel data model are taken, and the first differences model is estimated. There is no autocorrelation problem between the variables. The values for the Wooldridge test result are given in Table 4.

The problem of multiple correlations between the variables used in the study is an undesirable situation. Although there are several assumption tests to detect this situation, the VIF criterion test was preferred in this study. The results of VIF values are given in Table 5. As can be seen from the table, there is no multicollinearity problem in the study.

After performing the assumption tests required for the least square's method, the estimation of the final model was made. Values related to the analysis result are in Table 6.

When the values related to the analysis result are examined, it is understood that the model is generally significant at the 95% confidence level. The R^2 coefficient, which is important in the model, is approximately 95%. Export of goods and services, which is one of the explanatory variables in the model, is meaningful in explaining the commercial service exports of this country. In other words, a 1% increase in Italy's exports of goods and services explains this country's exports of commercial services at the level of 86%. This relationship between the variables has a positive meaning. The relationship between energy consumption and commercial service exports is also meaningful at the 5% probability level. The relationship between these two variables is also positive. A 1% increase in energy consumption will be meaningful in explaining the commercial service exports of this country at the level of approximately 27%.

5. DISCUSSION AND CONCLUSION

When compared to past energy patterns, the world's growing reliance on fossil fuels for energy over the past century has had detrimental repercussions that have become worse with time. If a fundamental energy revolution is not implemented, the potential to expand energy consumption from fossil fuels may lead to much more severe repercussions because of the added contribution of rapidly emerging nations who aspire to close the economic gap between rich and poor nations (Bompard et al., 2020).

The link between the elements influencing the service industry in Italy, one of the chosen Mediterranean nations, is investigated in this research. The model considers the energy consumption and exports of products and services, both of which have a substantial impact on the service sector. The panel analysis approach was used to test the model. According to the findings of a research by Forni et al. (2010), an increase in Italian GDP of 13% and

an improvement in welfare of more than 4% would follow from a decrease in price rises in Italian services to levels prevalent in the rest of the euro area. Why is this taking place. However, Chontanawat et al. (2008) discovered evidence of a causal relationship between Italy's GDP and energy.

The research by Jannuzzi and Schipper (1991) revealed that the rise in power consumption is occurring more quickly than income. The Harris and Liu (1993) research has shown that there is a significant seasonality in the demand for energy. The research by Soytaş and Sari (2003) showed a stronger causal relationship between Italy's GDP and energy usage. It has been shown that there is a unidirectional causal relationship between Italy's GDP and energy usage because of Lee's (2006) research. According to the research done by Soytaş and Sari (2006), there is a bidirectional Granger correlation between energy usage and income in Italy.

The findings of Sadorsky's (2011) research indicate a correlation between financial development and energy use that is favorable. The research by Al-mulali and Sab (2012) revealed that energy, although being used and causing substantial pollution, is crucial for boosting both economic growth and financial development in these countries. Shahbaz et al. (2013) research concluded that the ARDL limits test method, energy consumption, financial development, capital, exports, imports, and global commerce all contribute to economic growth. According to Islam et al. (2013), the population-energy link holds true only over the long term, while economic growth and financial development have a short- and long-term impact on energy consumption. As a result of the research done by Ztürk and Acaravci in 2013, it was shown that real GDP per capita is caused by employment rate in the near term rather than energy or carbon emissions per person.

When the values related to the analysis result are examined, it is understood that the model is generally significant at the 95% confidence level. The R^2 coefficient, which is important in the model, is approximately 95%. Export of goods and services, which is one of the explanatory variables in the model, is meaningful in explaining the commercial service exports of this country. In other words, a 1% increase in Italy's exports of goods and services explains this country's exports of commercial services at the level of 86%. This relationship between the variables has a positive meaning. The relationship between energy consumption and commercial service exports is also meaningful at the 5% probability level. The relationship between these two variables is also positive. A 1% increase in energy consumption will be meaningful in explaining the commercial service exports of this country at the level of approximately 27%.

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