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АНАЛИЗ ПОЛИТИКИ СТРАН ЕС В РАМКАХ СИСТЕМЫ ТОРГОВЛИ ВЫБРОСАМИ УГЛЕРОДА

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Политика ЕС в отношении углеродных тарифов направлена на сокращение выбросов и содействие использованию возобновляемых источников энергии. Государства – члены ЕС в первую очередь принимают ряд мер налогово-бюджетной и налоговой политики, таких как льготная налоговая политика, политика государственных закупок и политика финансовых субсидий, в отношении системы торговли выбросами углерода, содействие созданию, использованию и развитию возобновляемых источников энергии. В статье проводится множественный линейный регрессионный анализ переменных интенсивности выбросов углерода и потребления энергии на душу населения, индекса промышленного производства и ВВП на душу населения на основе соответствующих данных из 8 стран Европейского союза с 2013 по 2019 г. Финансовые субсидии, правила зеленых закупок и налоговое законодательство стран ЕС, участвующих в системе торговли выбросами углекислого газа, подробно изучаются. На основе полученных результатов, авторы предлагают другим странам использовать полезный практический опыт.
Ключевые слова: система выбросов углекислого газа, углеродный тариф.

POLICY ANALYSIS OF EU COUNTRIES UNDER THE CARBON EMISSIONS TRADING SYSTEM

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The carbon tariff policy of the EU seeks to lessen emissions and promote the use of renewable energy sources. EU member states primarily undertake a number of fiscal and tax policy measures, such as taxation and preferential tax policies, government procurement policies, and financial subsidy policies, in relation to the carbon emissions trading system. to promote the creation, use, and development of renewable energy. The article does multiple linear regression analysis on the variables carbon emission intensity and per capita energy consumption, industrial production index, and per capita GDP based on pertinent data from 8 nations in the European Union from 2013 to 2019. The financial subsidies, green procurement regulations, and tax laws of EU nations participating in the carbon emissions trading system are examined in detail based on the findings, offering other nations useful real-world experience.
Keywords: carbon emission system, carbon tariff.

Introduction

The international community has widely recognized the central role of carbon pricing in the transformation of the energy economy and has put it into practice. Currently, 61 carbon pricing mechanisms are being implemented or planned to be implemented around the world, of which 31 are carbon emissions trading systems and 30 are carbon taxes, covering a total of about 12 billion tons of CO_2, accounting for about 22% of global greenhouse gas emissions. More than half of the 189 parties to the Paris Agreement that have submitted emission reduction commitments have said they will use carbon pricing tools. Currently, internationally accepted carbon emission reduction policies mainly include energy efficiency and emission standards, public technology research and development, and carbon pricing tools (including carbon tax and carbon emissions trading system). Policy analysts generally believe that to achieve deep carbon emission reductions in a cost-effective manner, carbon pricing tools covering the entire economy will be a necessary component of policy [20]. Given the diversity of carbon emission sources, the design of traditional energy efficiency and emission standards is very challenging and will result in unnecessarily high costs [6]. The key advantages of carbon pricing tools are its flexibility and effective incentives that can bring about optimal overall cost-effectiveness for the economy [8]. In addition, carbon pricing can also reduce long-term emission reduction costs by inducing climate-friendly technological changes [16].

Only 10% of the world's carbon emissions come from the EU, and this means that the EU cannot halt global warming on its own. The greatest strategy to minimize global carbon emissions and stop «carbon leakage» (the shifting of carbon-intensive manufacturing to nations with lower carbon prices) would be for major emitters to come to an agreement on a carbon pricing floor. Lacking such a deal, carbon leakage may be stopped by charging the same carbon price for equivalent goods wherever they are produced. The world's first «carbon tariff» bill legislative process came to an end when the European Parliament and the Council of the European Union voted to approve the EU Carbon border adjustment mechanism (commonly known as «carbon tariff», hereinafter referred to as CBAM) in April 2022. On May 17, the appropriate law was go into effect. The measure will enter the substantial implementation stage in 2026 after completing its transition period, which will last from October 2023 until the end of 2025. The EU's «European Green Deal» policy package, which aims to control carbon emissions, stop carbon leakage, and encourage the accomplishment of carbon reduction targets, includes CBAM as a key component.

Methodology

As a result, this paper chooses pertinent data from 2013 to 2019 and uses pertinent regression analysis on the current state of low-carbon economy in eight EU nations to understand the carbon tariff policy. The final selection is based on «Carbon emission intensity (thousand tons/per euro per person) Y» as the explained variable, and «per capita energy consumption (tons/person) X1», «industrial output value index X2", and «per capita GDP» as the determining variables. The least squares method is used to set up the model as a trivariant linear regression. All variables are handled logarithmically to reduce the difference between sample values, and the resulting formula is as follows:

$$lnY = alnX1 + blnX2 + clnX3 + e,$$

where Y – green economy development level;

a – energy consumption coefficient;

$X1$ – capita energy consumption;

b – industrial development coefficient;

$X2$ – Industrial development level;

c – capitalization rate;

$X3$ – capitalization level;

e – compensation constant.

This article's data sources are all drawn from the Eurostat platform. Below are the findings and discussions.

$$lnY = 0.6714lnx1 + 1.1445lnx2 - 1{,}9076lnx3 + 18.3749.$$

Result

There is a positive correlation between the dependent variable and the a coefficient, a negative correlation between the dependent variable and the c coefficient, and both positive and negative b coefficients, at the same time a is the per capita energy consumption factor, b is the industrial level, c is the capitalization factor. Every formula in the table has an R^2 value greater than 0.9. The regression simulation shows a negative association between per capita GDP and the explained variables and a positive correlation between the industrial output of the EU and per capita consumption.

The EU8 countries are subjected to regression analysis, some data are processed logarithmically to reduce errors (Table).

Regression modeling coefficient table for EU8 countries, 2013–2019*

	a	b	c	e	R^2
Belgium	0.7890	–1.1117	–0.3441	8.6155	0.9828
Denmark	1.6162	–0.3629	–1.0970	11.7149	0.9927
Germany	0.7633	0.7026	–1.5066	14.7783	0.9950
France	0.1335	1.5768	–2.2996	19.1553	0.9892
Netherlands	2.1131	–0.6909	–0.7154	8.8617	0.9768
Austria	1.2331	0.1420	–0.8369	7.2253	0.9887
Finland	1.1085	1.7238	–3.2701	24.9757	0.9826
Sweden	1.0769	–0.3179	–0.4490	4.7017	0.9146

* *Source*: URL: https://ec.europa.eu/eurostat/data/database

Based on the data in Table, we obtain the following.

Belgium's equation can be written as $y = 0.7890X1 - 1.1117X2 - 0.3441X3 + 8.6155$. It shows that Belgium's industrial output and capital output are negatively correlated with Belgium's green economy, while their impact on Belgium's energy consumption is positively correlated. The most important factor affecting Belgium's green economy is the direction of industrial output, followed by energy consumption, and finally per capita GDP.

Denmark's equation can be written as $y = 1.6162X1 - 0.3629X2 - 1.0970X3 + 11.7149$. It shows that Denmark's industrial output and capital output are negatively correlated with Denmark's green economy, while it is positively correlated with Denmark's energy consumption. The most important factor affecting Denmark's green economy is energy consumption, followed by per capita GDP, and finally the direction of industrial output.

The equation for Germany can be written as $y = 0.7633X1 - 0.7026X2 - 1.5066X3 + 14.7783$. It shows that Germany's industrial output and capital output are negatively correlated with Germany's green economy, while their impact on Germany's energy consumption is positively correlated. The most important factor affecting Germany's green economy is GDP per capita, followed by energy consumption, and finally the direction of industrial output.

France's equation can be written as $y = 0.1335X1 - 1.5768X2 - 2.2996X3 + 19.1553$. It shows that France's industrial output and capital output are negatively correlated with France's green economy, while their impact on France's energy consumption is positively correlated. The most important factor affecting France's green economy is GDP per capita, followed by the direction of industrial output, and finally energy consumption.

The equation for Netherlands can be written as $y = 2.1131X1 - 0.6909X2 - 0.7154X3 + 8.8617$. It shows that the industrial output and capital output of the Netherlands are negatively correlated with the Dutch green economy, while the impact on the Dutch energy consumption is positively correlated. The most important factor affecting the Dutch green economy is energy consumption, followed by the direction of industrial output, and finally per capita GDP.

Austria's equation can be written as $y = 1.2331X1 - 0.1420X2 - 0.8369X3 + 7.2253$. It shows that Austria's industrial output and capital output are negatively correlated with Austria's green economy, while their impact on Austria's energy consumption is positively correlated. The most important factor affecting Austria's green economy is energy consumption, followed by per capita GDP, and finally the direction of industrial output.

Finland's equation can be written as $y = 1.1085X1 - 1.7238X2 - 3.2701X3 + 24.9757$. It shows that Finland's industrial output and capital output are negatively correlated with Finland's green economy, while their impact on

Finland's energy consumption is positively correlated. The most important factor affecting Finland's green economy is GDP per capita, followed by the direction of industrial output, and finally energy consumption.

Sweden's equation can be written as $y = 1.1085X1 - 1.7238X2 - 3.2701X3 + 24.9757$. It shows that Sweden's industrial output and capital output are negatively correlated with Sweden's green economy, while their impact on Sweden's energy consumption is positively correlated. The most important factor affecting Sweden's green economy is GDP per capita, followed by the direction of industrial output, and finally energy consumption.

Examining the relevant policies and activities of the low-carbon economy in the European Union, researchers can offer policy recommendations that are applicable for their respective countries based on the research findings. These recommendations can involve alterations to legislative requirements, financial incentives for businesses to adopt low-carbon practices, or public relations campaigns to promote sustainable behavior.

Researchers must assess the effectiveness of policy suggestions at the same time. This can mean monitoring trends in energy consumption or greenhouse gas emissions over time, or it might entail analyzing how potential policy changes might impact the economy as a whole. The evaluation's objectives are to identify areas for improvement and to ascertain whether the policy achieves its stated objectives.

According to the equation above, $R2 = 0.9996$, indicating that the overall fit is excellent, $P = 0.05$ makes it obvious that these three factors have a significant influence on carbon emissions. The link between per capita GDP and the aforementioned variables for the EU region can be seen to be negative, whereas the association between per capita consumption and industrial output and carbon emission intensity is positive. The element with the greatest proportional weight is per capita GDP, while the factor with the least proportional weight is per capita energy consumption.

Conclusions

The eight EU countries' carbon emissions trading systems are examined in the following using data that has been studied from three perspectives: financial subsidies, green purchasing practices, and tax policies.

The first category includes financial and capital assistance. The EU has actively taken steps to combine maintaining economic growth with low-carbon economic transformation through strategic planning since the UK took the lead in introducing the concept of low-carbon economy, and as a result, the EU's low-carbon economic development has achieved remarkable results. The EU is putting measures in place to adapt, and other nations can learn from the EU's fiscal and tax policies that target climate change in terms of energy saving, emission reduction, and low-carbon economic development.

The green procurement policy comes in second. The EU has put in place a green purchasing strategy that mandates government organizations to give environmentally friendly goods and services first priority during the procurement process. Additionally, the European Commission published the «Government Green Procurement Manual» in 2004 as a guide for EU member states to use when implementing government green procurement. The guidebook also offers suggestions for green purchasing that are often appropriate. The primary components include green product standards, green purchasing policies, assistance and training, testing and reporting, etc.

The last component is tax policy. Many EU nations, including the UK, Finland, the Netherlands, Norway, Sweden, Denmark, and others, have implemented resource taxes, energy taxes, carbon emission taxes, transportation taxes, and environmental pollution taxes, among other measures, to encourage the development of low-carbon economies and reduce greenhouse gas emissions. These taxes are intended to encourage energy-saving and emission-reduction behaviors and lower the level of environmental pollution.

1. Costing of carbon. The method works by placing a limit on the overall permitted emissions of greenhouse gases and then issuing licenses to businesses that allow them to emit a certain amount of greenhouse gases. These licenses can be traded between businesses, creating a financial incentive to cut emissions. Another popular policy strategy for promoting energy saving and emission reduction practices is the imposition of taxes for the emission of greenhouse gases. Companies that release pollution are subject to pollution taxes in EU nations. Additionally, EU nations impose a variety of punishments through civil penalties or administrative sanctions against businesses that violate environmental protection laws by discharging pollution. Companies that violate environmental management regulations can be fined up to 500,000 euros in Germany; fines for serious environmental pollution can be up to 300,000 euros in Greece; and fines for companies that violate environmental management regulations can be up to 100,000 euros in Austria. The range of fines is €7 to €36,400.

2. Energy tax. The EU has put in place a tax on energy in an effort to promote the use of renewable energy sources while discouraging the use of fossil fuels. All energy products, including electricity, natural gas, and coal, are subject to the tax rate. Some EU nations, including Belgium, Denmark, Norway, and other nations, also levy public welfare fees for electricity or energy consumption based on a specific percentage of retail electricity prices or energy prices, and they use the fees collected to fund low-carbon development initiatives that specifically support energy conservation and emission reduction.

3. Tax incentives, mostly for energy efficiency and renewable energy. For instance, the «Environmental Protection Equipment Investment

Accelerated Depreciation Plan» was formally introduced in the Netherlands in 1991. For qualifying environmental protection equipment, depreciation can be expedited, and for items listed in the required catalog, the depreciation rate can reach 100%. Environmental protection equipment makes up the majority of this equipment. Equipment that can reduce soil, air, noise, and waste pollution, as well as consultancy fees associated with the procurement of the aforementioned equipment, can all be amortized more quickly. As a result, EU nations that have implemented carbon taxes (climate change taxes) typically enact special tax laws for businesses that agree to voluntary emission reductions. Companies that have signed voluntary emission reduction agreements, for instance, may be eligible for commensurate tax reductions, with the maximum reduction reaching 80%, in Switzerland, Denmark, the Netherlands, and the United Kingdom.

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