Comparison between Romania and Sweden Based on Three Dimensions: Environmental Performance, Green Taxation and Economic Growth

Roxana Maria Bădîrcea 1, Nicoleta Mihaela Florea 1-*, Alina Georgiana Manta 1, Silvia Puiu 2, and Marius Dalian Doran 3

1 Department of Finance, Banking and Economic Analysis, Faculty of Economics and Business Administration, University of Craiova, 13 A.I. Cuza, 200585 Craiova, Romania; roxana.badirea@feea.ucv.ro (R.M.B); alina.manta@edu.ucv.ro (A.G.M.)
2 Department of Management, Marketing and Business Administration, Faculty of Economics and Business Administration, University of Craiova, 13 A.I. Cuza, 200585 Craiova, Romania; silvia.puiu@edu.ucv.ro
3 Doctoral School of Economic Sciences, Faculty of Economics and Business Administration, University of Craiova, 13 A.I. Cuza, 200585 Craiova, Romania; doran.dalian@yahoo.com
* Correspondence: nicoleta.florea@edu.ucv.ro

Received: 4 April 2020; Accepted: 6 May 2020; Published: 7 May 2020

Abstract: One of the European Union’s (EU) objectives regarding climate change is a 40% reduction in greenhouse gas emissions by 2030, ensuring that member states focus on sustainable development. The aim of this study was the comparison of a three-dimensional relationship between green taxation, environmental performance and economic growth for the time period between 1995 and 2017 in Romania and Sweden. The novelty consists of simultaneously using the double dividend theory and environmental Kuznets curve theory for Romania. The autoregressive distributed lag (ARDL) method was used for testing the cointegration relationship. The Granger causality estimation based on the ARDL-error correction model was applied to identify the causality relationship between the variables and the pairwise Granger causality test to detect the direction of causality. The implementation of the tests led to the conclusion that environmental taxes will have a significant influence on the reduction of greenhouse gas emissions in the long run in both Romania and Sweden, while in the short run, no such influence will be noticed. Also, in Romania, in the long term, there was a bidirectional causality relationship between economic growth and greenhouse gas emissions, while in Sweden, the causality relationship was from economic growth to greenhouse gas emissions.

Keywords: greenhouse gas emissions; environmental tax; double dividend theory; environmental Kuznets curve (EKC) theory

1. Introduction

Climate change has become a reality nowadays, and all governments, individuals and private companies should take serious measures to diminish the extent of these changes and combat them, this being one of the goals included in the UN 2030 Agenda for Sustainable Development. According to the Committee of Experts on International Cooperation in Tax Matters [1], carbon dioxide (CO2) represents “80 per cent of the total greenhouse gas emissions emitted globally”.

The European Union (EU) made a commitment to take action against climate change both at the international level and at the EU level through the Paris Agreement on October 5, 2016. The EU objectives referred to reducing greenhouse gas emissions (GGEs) by 20% until 2020 and by at least 40% by 2030, compared with the level in 1990. As a long-term objective, the EU has set to reduce GGEs by 80%–95% by 2050 as part of the efforts considered necessary by developed countries. It is
important to adjust to the negative consequences brought by climate change in order to reduce the extent of the effects and raise the resilience and level of preparedness in the face of future effects. In these conditions, government should implement policies meant to reduce greenhouse gas emissions, the most important tool being carbon taxes [2]. Some aspects that should be considered: the level of tax rates; the specifics of the country (e.g., developing or developed, poor or rich, dependence on carbon industries and the competitiveness of some sectors); the way revenues will be used; the risks for some sectors that could be exempted for a time period; and support measures for some sectors or individuals that cannot afford a high carbon tax. The level of tax will vary in accordance with the effects on gas emissions. In order to reduce the reluctancy of the population from developing countries regarding green taxation, the government may offer some facilities such as reducing other taxes or investing revenues from these taxes in green technologies, green public transportation, developing the infrastructure and implementing educational programs that will increase awareness towards climate changes.

According to the Organisation for Economic Co-operation and Development (OECD) [3], carbon prices are not high enough to slow the environment deterioration and the gap among OECD countries is particularly important. This can be explained by the way green taxation is perceived in some countries (as a financial burden in poorer countries or as something that affects their growth in countries with industries dependent on carbon). The consequences for not implementing environmental policies are far more dangerous than green taxation: “climate change, biodiversity loss, water scarcity and health impacts of pollution” [4].

The OECD [5] states that developing countries have increased emissions of greenhouse gas, even if their share in the total level is “minor” at the moment as compared to other developed countries. Thus, green taxation is seen as the right path to green growth and sustainable development of developing countries, in accordance with the 2030 Agenda. These taxes are a tool specific to free markets, being more efficient than “command-and-control instruments” [5]. Environmental taxes determine changes in the way companies develop their businesses, stimulate innovation and competitiveness and contribute to technological progress, and this, in the end, leads to a greener economy.

According to Eurostat [6], greenhouse gas emissions in EU countries in 2017 decreased by 22% compared with the level registered in 1990, the equivalent of 1 240 million tons of CO₂, thus creating the foundation for exceeding the target for 2020 (a 20% reduction of GGEs) and 2030 (a 40% reduction of GGEs). Among the EU-28 countries, Germany registered the highest level of greenhouse gas emissions in 2017 (21% of the EU total), followed by United Kingdom and France. The most important progress was registered in Lithuania, Latvia, Romania and Estonia (–57%, –56%, –54% and –48% GGEs, respectively, compared to the level in 1990). The countries with the highest increase of GGEs between 1990 and 2017 were Cyprus (56%), Portugal (23%) and Spain (22%).

Environmental policies become quite controversial, especially when the relationship between economic growth and the environment is taken into account. A restrictive environmental policy reduces aggregate production because it entails an additional pressure on the established production possibilities. In order to reduce pollution, companies develop activities to reduce emissions which translates into increased production costs. The higher production costs reduce the return on capital and discourage investments, and less investments lead to slower economic growth [7]. Precisely because of these controversies, the present study set out to identify the relationship between economic growth, green taxation and environmental performance in Romania and Sweden.

2. Literature Review

The literature review took into account three components of the analysed relationship: environmental performance, green taxation and economic growth.

Brandt and Svendsen [8] analysed the possibility of implementing a common CO₂ tax in all countries without taking into account their share of global emissions. Their point of view is of interest, because they considered that a part of the collected revenues could be used to fight corruption and
create more ethical institutions. The differences among EU countries in terms of CO₂ taxes were also highlighted by Zimmermannova et al. [9] who see this tool as a way to create balance in the fuel market.

Even if there are positive consequences of green taxation (e.g., revenues that can be used by governments, environment protection), there are also some downsides, especially in developing countries where companies fear that their competitiveness will be affected and that there will be negative consequences for employees because of the increased costs [10]. Poverty and climate change are two problems faced by many developing countries [10]. For this reason, governments should implement support measures for the sectors facing a higher risk in order to prevent a decline in the economy and also choose wisely the level of the CO₂ tax. The OECD [11] considers that the disadvantages brought to some sectors (e.g., jobs that disappear or sectors that will not be competitive anymore) by green taxation can be diminished by the rise in green industries and the development of other jobs and markets. Recently, the OECD [11] has included in its models other greenhouse gases than CO₂ because CO₂ represents only 60% of the total emissions.

According to the European Environment Agency [12], there are two approaches used by EU Member States: emission trading and carbon taxation. The Agency also highlights that revenues from environmental taxes exceeded the growth of the gross domestic product in EU countries between 2009 and 2014, and that sometimes environmental objectives can conflict with the economic and social ones. Similarly, Pegels [10] mentioned that there is a change in poverty and climate, at least for some developing countries. Miller and Vela [13] analysed the impact of green taxation on the countries that apply these measures, and they concluded that those with higher revenues are also those which succeeded to reduce pollution and the CO₂ emissions. This can be explained by the way those countries use the revenues. The CO₂ taxes contribute to a decrease in pollution but also to changes in production and consumption. In addition, the OECD has concluded [11] that the disadvantages become advantages because newer and greener sectors appear.

Sterner and Kohlin [14] appreciate that environmental taxes are playing a more important role in the EU than in the United States of America or other non-EU countries and also that the revenues brought by these taxes have a higher share in the gross domestic product of EU countries. The authors explain this by an increased “acceptance of taxes” and “a greater reliance” on this type of taxes in the environmental policy of European countries. Cottrell et al. [15] consider environmental taxes as having an important role for the public budget thus contributing to a smoother transition to a greener economy. The authors appreciate that green taxation brings benefits not only for the environment but also for the fiscal policy, thus aiming for two main goals. Based on the analysis of the developing countries, Cottrell et al. [15] concluded that the effectiveness of environmental taxes is limited because of the low level of these taxes, and they see the implementation of “bold” measures (raising the taxes despite the interests of some stakeholders) as a solution.

Green taxation has many advantages for a country and for the protection of the environment, but the design of taxes (e.g., taxation base, the tax level) should take into account the peculiarities of the country (e.g., the economic development, the competitiveness of the sectors affected and the social factor). The reluctance to change from stakeholders can be diminished if governments are transparent and communicate the decisions they make. In the transition period, it is possible for some governments to offer support measures for those sectors or individuals that are seriously affected by these taxes in order to avoid a dramatic impact on the competitiveness of carbon dependent industries or on people fighting poverty.

He and Richard [16] identified three directions which analyse the relationship between economic growth and environmental pollutants. One direction takes into account the validity test of the Kuznets curve (the existence of a U-shaped inverted relationship between real GDP per capita and pollutant gas emissions or exploring the N-shaped curve), the second direction analyses the relationship between energy consumption and economic growth and the third direction is a combination of the two, analysing the dynamic relationship between energy consumption, economic growth and environmental pollutants.
Most theoretical and empirical studies conducted on Kuznets curve confirmed its validity regarding local pollutants, such as sulphur dioxide emissions, wastewater and carbon dioxide emissions, although there are more discussions on its validity regarding carbon dioxide emissions. It was found [17] that in developing countries, there is an increased interest for Kuznets curve analysis, correlated with the rapid economic growth in these countries; thus, it was considered appropriate to conduct such an analysis for Romania too. Although there are such studies of the Kuznets curve for Romania [18–20], it was also necessary to introduce in the analysis environmental taxes and their implications, because so far there are no works regarding the study of the three variables simultaneously for Romania.

There are also studies that present comparative analyses regarding the implications of environmental taxes on the reduction of gas emissions. Thus, Radulescu et al. [21] concluded that environmental taxes led to good environmental performance both in Romania and in EU. The interest regarding the impact of taxation on the economic growth always existed among researchers, and their opinions on the effects of taxes on economic growth are very different. Most of them appreciate that a high level of taxation harms economic growth.

According to economists, environmental taxes have a negative impact on economic performance [22–24]. This perspective highlights the fact that environmental taxation reduces the amount of fossil fuels and also the industrial production volume. Contrary to the economists’ opinion, environmentalists argue that taxes on carbon emissions are an extremely attractive tool that can be used to improve environment quality without seriously affecting economic growth. This has been primarily the view of some researchers [25–30]. They noticed that environmental taxation that positively affects the quality of the environment may also have a positive impact on growth. By raising taxation on carbon emissions and using revenues to reduce distorted income taxes, governments could obtain a “double dividend”—not only a cleaner environment but also a less distorted fiscal system and stimulated economic growth [28].

3. Materials and Methods

The research aimed to conduct a comparison of the three-dimensional relationship between environmental performance, green taxation and economic growth in Romania and Sweden in order to identify the most suitable solutions to improve environmental taxation in Romania and generate positive effects on the environment without affecting economic growth. Sweden, a country with important performances in economic growth and environmental policy, was chosen as the country for comparison purposes, using the Environmental Performance Index (EPI) as a selection criterion. According to this index, Sweden is the EU country placed first in this ranking system, occupying the third in the world with a score of 86.80 points, meanwhile Romania is in the 21st position worldwide with a score of 68.53 points. A comparison with Sweden was also used in another work, considering that the green taxation system in Sweden is relatively mature and well established [31]. For this analysis, annual data series from 1995 to 2017 gathered from Eurostat were used.

For the relationship to be analysed, the following variables are considered as being representative: greenhouse gas emissions (GGE) to measure environmental performance, revenues from environmental taxes (TAX) expressed as a percentage of total revenues to reflect green taxation and real gross domestic product per capita (GDP) as a representative indicator of the economic growth.

From the analysis perspective, the applicability of the two representative theories regarding the relationship between environment, taxation and economic growth was tested:

- The theory of the double dividend which supports the idea that green taxation leads, on the one hand, to a reduction in environmental degradation (green dividend) and, on the other hand, to benefits for the taxation system (blue dividend);
- The environmental Kuznets curve (EKC) Theory which analyses the relationship between environmental performance and economic growth.
Starting from these premises and the equation proposed by He et al. [31] in their study, the following equation was developed in order to determine the three-dimensional relationship among the abovementioned variables which was not analysed before for the case of Romania:

$$\ln \text{GGE}_t = \beta_1 + \beta_2 \ln \text{TAX}_t + \beta_3 \ln \text{GDP}_t + \beta_4 \ln \text{GDP}^2_{t-1} + \mu_t$$  \hspace{1cm} (1)

where $\ln \text{GGE}$ is the natural logarithm of greenhouse gas emissions, $\ln \text{TAX}$ is the natural logarithm of the revenues from environmental taxes, $\ln \text{GDP}$ is the natural logarithm of real gross domestic product per capita, $\ln \text{GDP}^2$ is the square of the natural logarithm of real gross domestic product per capita, $\mu_t$ is the residual term and $t$ is the time period.

According to the EKC hypothesis and Equation (1), a series of existing relationships between environmental performance and economic development can be identified depending on the values of the coefficients $\beta$ associated to the variables. For example, if $\beta_3 \geq 0$ and $\beta_4 \leq 0$, this indicates that initially economic growth generates an increase in greenhouse gas emissions, but this will diminish when the economy reaches maturity. The same is true for environmental taxes; a positive value of $\beta_2$ will generate an increase in greenhouse gas emissions.

Unit root tests were applied to see if the data series were stationary. Two-unit root tests, of which the equations used to test cointegration among the variables of the ARDL model in this analysis are presented below, were used: the augmented Dickey–Fuller test (ADF, Equation (2)) [32] and the test proposed by Phillips and Perron (PP, Equation (3)) [33].

$$Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha \sum_{i=1}^{m} Y_{t-i} + \varepsilon_t \hspace{1cm} (2)$$

$$Z(\tau) = q \left( \frac{\sigma^2}{\hat{\sigma}^2_1} \right) - \left( \frac{1}{2} \right) \left( \sigma^2 - \hat{\sigma}^2 \right) T \sqrt{\frac{\hat{\sigma}^2 \sum_{i=2}^{T} (x_{i-1} - \bar{x}_{T-1})^2}{\hat{\sigma}^2_1}} \hspace{1cm} (3)$$

Moreover, the autoregressive distributed lag (ARDL) method [34] was used to test the cointegration relationship between greenhouse gas emissions, green taxation, and economic growth. This method is superior to traditional techniques and has the advantage of not considering the order of integration of the variables. This technique can be applied no matter if variables are integrated at I(0), I(1) or mutually integrated. This method is also appropriate for analyses with reduced data series, as is the present study.

Starting from the ARDL model, a dynamic error correction model was developed that integrated short-run causality relationships with those on the long-run without losing information regarding the latter. The equations used to test cointegration among the variables of the ARDL model in this analysis were the following:

$$\begin{align*}
\ln \text{GGE}_t &= \beta_1 + \sum_{i=1}^{n} \alpha_1 \ln \text{GGE}_{t-i} + \sum_{i=1}^{n} \alpha_2 \ln \text{TAX}_{t-i} + \sum_{i=1}^{n} \alpha_3 \ln \text{GDP}_{t-i} \\
&+ \sum_{i=1}^{n} \alpha_1 \ln \text{GDP}^2_{t-i} + \varphi_1 \ln \text{GGE}_{t-i} + \varphi_2 \ln \text{TAX}_{t-i} + \varphi_3 \ln \text{GDP}_{t-i} \\
&+ \varphi_4 \ln \text{GDP}^2_{t-i} + \varepsilon_{1t} \hspace{1cm} (4)
\end{align*}$$

$$\begin{align*}
\ln \text{TAX}_t &= \beta_2 + \sum_{i=1}^{n} \alpha_1 \ln \text{GGE}_{t-i} + \sum_{i=1}^{n} \alpha_2 \ln \text{TAX}_{t-i} + \sum_{i=1}^{n} \alpha_3 \ln \text{GDP}_{t-i} \\
&+ \sum_{i=1}^{n} \alpha_1 \ln \text{GDP}^2_{t-i} + \varphi_1 \ln \text{GGE}_{t-i} + \varphi_2 \ln \text{TAX}_{t-i} + \varphi_3 \ln \text{GDP}_{t-i} \\
&+ \varphi_4 \ln \text{GDP}^2_{t-i} + \varepsilon_{2t} \hspace{1cm} (5)
\end{align*}$$
which the cointegration relationship is confirmed. There is a cointegration among the variables of the model if the value of the F-statistic is higher than the upper critical bound values. If the value of the F-statistic is between the minimum and maximum values of the bounds test, then the existence or non-existence of a cointegration relationship among variables cannot be determined, and if the value of the F-statistic is lower than the lower critical bound, then the existence of a cointegration relationship among the variables of the model [35].

Further, in order to test the structural stability of the model, tests based on recursive residuals, among which the most relevant are the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMsq), were used.

The multivariate Granger causality estimation based on the ARDL-error correction model (ECM) and the lagged conditions were used to determine short-run, long-run and strong causality among the model [36–39]. The novelty of this equation consists in introducing two new variables, namely, revenues from environmental taxes, \( TAX \), and greenhouse gas emissions, \( GGE \), unlike the other models that use energy consumption and \( CO_2 \) emissions [31,36–39]. The equations used in the model for this study can be expressed as a system of equations as follows:

\[
\begin{align*}
\ln GDP_t &= \beta_3 + \sum_{i=1}^{n} \alpha_1 \ln GGE_{t-i} + \sum_{i=1}^{n} \alpha_2 \ln TAX_{t-i} + \sum_{i=1}^{n} \alpha_3 \ln GDP_{t-i} \\
+ \sum_{i=1}^{n} \alpha_4 \ln GDP^2_{t-i} + \varnothing_1 \ln GGE_{t-i} + \varnothing_2 \ln TAX_{t-i} + \varnothing_3 \ln GDP_{t-i} \\
+ \varnothing_4 \ln GDP^2_{t-i} + \varepsilon_{3t} \\
\ln GDP^2_t &= \beta_4 + \sum_{i=1}^{n} \alpha_1 \ln GGE_{t-i} + \sum_{i=1}^{n} \alpha_2 \ln TAX_{t-i} + \sum_{i=1}^{n} \alpha_3 \ln GDP_{t-i} \\
+ \sum_{i=1}^{n} \alpha_4 \ln GDP^2_{t-i} + \varnothing_1 \ln GGE_{t-i} + \varnothing_2 \ln TAX_{t-i} + \varnothing_3 \ln GDP_{t-i} \\
+ \varnothing_4 \ln GDP^2_{t-i} + \varepsilon_{4t}
\end{align*}
\]

The null hypothesis refers to the lack of cointegration and is denoted by the relation \( \varnothing_1 = \varnothing_2 = \varnothing_3 = \varnothing_4 = 0 \). The alternative hypothesis states the existence of cointegration \( \varnothing_1 \neq \varnothing_2 \neq \varnothing_3 \neq \varnothing_4 \neq 0 \). There is a cointegration among the variables of the model if the value of the F-statistic is higher than the upper critical bound values. If the value of the F-statistic is between the minimum and maximum values of the bounds test, then the existence or non-existence of a cointegration relationship among variables cannot be determined, and if the value of the F-statistic is lower than the lower critical bound, there is no cointegration relationship among the variables of the model [35]. It is important to mention that an equation with an error correction term (ECT) can be estimated only for those equations in which the cointegration relationship is confirmed.

The multivariate Granger causality estimation based on the ARDL-error correction model (ECM) and the lagged conditions were used to determine short-run, long-run and strong causality among the model [36–39]. The novelty of this equation consists in introducing two new variables, namely, revenues from environmental taxes, \( TAX \), and greenhouse gas emissions, \( GGE \), unlike the other models that use energy consumption and \( CO_2 \) emissions [31,36–39]. The equations used in the model for this study can be expressed as a system of equations as follows:

\[
\begin{align*}
\ln GGE_t &= \delta_1 + \delta_{11,1} \ln GGE_{t-i} + \delta_{21,1} \ln TAX_{t-i} + \delta_{31,1} \ln GDP_{t-i} + \delta_{41,1} \ln GDP^2_{t-i} + \phi_1 ECT_{t-1} + u_{1,t} \\
\ln TAX_t &= \delta_2 + \delta_{12,2} \ln GGE_{t-i} + \delta_{22,2} \ln TAX_{t-i} + \delta_{32,2} \ln GDP_{t-i} + \delta_{42,2} \ln GDP^2_{t-i} + \phi_2 ECT_{t-1} + u_{2,t} \\
\ln GDP_t &= \delta_3 + \delta_{13,3} \ln GGE_{t-i} + \delta_{23,3} \ln TAX_{t-i} + \delta_{33,3} \ln GDP_{t-i} + \phi_3 ECT_{t-1} + u_{3,t} \\
\ln GDP^2_t &= \delta_4 + \delta_{14,4} \ln GGE_{t-i} + \delta_{24,4} \ln TAX_{t-i} + \delta_{34,4} \ln GDP_{t-i} + \phi_4 ECT_{t-1} + u_{4,t}
\end{align*}
\]

where \( ECT \) is the lagged error correction term, and \( u_{1,t}, \ldots, u_{4,t} \) are the serially independent random errors. The estimated values of the error correction term show the speed of adjustment from short-run to long-run equilibrium in the models depending on the sign of the associated coefficient. Although the existence of at least one causality relationship can be identified using this system of equations, this does not show us the direction of the causality among variables.

### 4. Empirical Results and Discussion

Before moving to the econometric analysis, it was necessary to briefly present descriptive statistics of the variables included in the model (Table 1) as well as to offer a graphical representation of their progress within the analysed time frame.
Table 1. Descriptive statistics of the variables in Romania and Sweden.

|               | Romania |       |       |       | Sweden |       |       |       |
|---------------|---------|-------|-------|-------|--------|-------|-------|-------|
|               | lnGGE   | lnTAX | lnGDP | lnGDP²| lnGGE  | lnTAX | lnGDP | lnGDP²|
| Mean          | 1.911   | 2.090 | 9.323 | 87.240| 1.969  | 1.734 | 10.485| 110.005|
| Median        | 1.887   | 2.060 | 9.353 | 87.495| 2.028  | 1.750 | 10.530| 110.888|
| Maximum       | 2.128   | 2.520 | 10.189| 103.832| 2.186 | 1.840 | 10.856| 117.866|
| Minimum       | 1.757   | 1.843 | 8.597 | 73.923| 1.704  | 1.568 | 10.039| 100.783|
| SD            | 0.115   | 0.185 | 0.566 | 10.563| 0.150  | 0.071 | 0.258 | 5.409  |
| Skewness      | 0.385   | 0.726 | −0.017| 0.018 | −0.477 | −0.744| −0.260| −0.235 |
| Kurtosis      | 2.199   | 2.668 | 1.407 | 1.421 | 1.856  | 2.807 | 1.744 | 1.729  |
| Jarque–Bera   | 1.182   | 2.128 | 2.431 | 2.390 | 2.129  | 2.158 | 1.770 | 1.760  |
| Probability   | 0.553   | 0.344 | 0.296 | 0.302 | 0.344  | 0.339 | 0.412 | 0.414  |

Note: lnGGE is a natural logarithm of greenhouse gas emissions, lnTAX is a natural logarithm of the revenues from environmental taxes, lnGDP is a natural logarithm of the real gross domestic product per capita and lnGDP² is a square of natural logarithm of real gross domestic product per capita.

Sweden is one of the first EU countries that included in their fiscal system a carbon tax in 1991, after Finland. Initially, the carbon tax was set at a lower level of 23 euros per ton of emitted fossil carbon dioxide and was gradually raised to 110 euros in 2020, thus offering households and companies the time needed to adjust and accept more easily the increase in taxes [40]. According to the EU Effort Sharing Decision, Sweden must reduce GGEs by 17% for 2020 compared to the level registered in 2005 and, according to the EU Effort Sharing Regulation, reduce GGEs by 40% for 2030 compared to the same year [41]. Romania, which joined the EU in 2007, introduced the first tax on greenhouse gas emissions in 1995. Each year between 1995 and 2017, Romania had lower gas emissions than its yearly targets. Romania must avoid an increase in gas emissions by more than 19% compared to the level in 2005 for 2020, according to the EU Effort Sharing Decision, and reduce them by 2% for 2030 compared to 2005, according to the EU Effort Sharing Regulation [42].

The total greenhouse gas emissions represent the aggregated emissions from the Kyoto basket of the six greenhouse gases. This indicator measures greenhouse gas emissions: carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF₆), measured by global warming potential (GWP). The GWP refers to the contribution of various gases to global warming relative to that of carbon dioxide on a time horizon of 100 years [43]. Taking into consideration the importance of greenhouse gas emissions, it was considered necessary to insert this variable in the developed model unlike the other studies that emphasize the importance of CO₂ emissions [8,9,13,18,19,21,31].

The results of the descriptive statistics (Table 1) and Figure 1a,c show a level of greenhouse gas emissions and especially of GDP higher in Sweden than in Romania, although only the first variable presents a downward trend, whereas the GDP variable is on a continuous upward trend.
Jarque–Bera [44] is a test statistic used to test if the series has a normal distribution. It measures the series skewness and kurtosis compared with those in a normal distribution. The probability for the Jarque–Bera test to be higher than the observed value under a null hypothesis is the reported probability. If the probability value is low, the null hypothesis of the normal distribution is rejected. From the results obtained from the data series, it can be concluded that these have a normal distribution, the value of the probability for each test indicating that the null hypothesis cannot be rejected.

In order to build a model for testing the cointegration relationship among variables, it is necessary for all variables to be stationary in level or at first difference. The graphical representations show that the variables register upward or downward trends in time in both countries, suggesting that they are non-stationary in level.

To confirm the above, the results of the unit root tests that were applied (i.e., ADF and PP) on the selected variables are presented in Table 2. Additionally, the stationarity of time series and second difference was also tested, because there is not always a unit root for all variables.
Table 2. Unit root test results for the variables in Romania and Sweden.

| Variables | Intercept | Trend and Intercept | None |
|-----------|-----------|---------------------|------|
| ADF PP    | ADF PP    | ADF PP              |      |
| t-stat    | p         | t-stat              | p    |
| lnGGE     | −1.535 0.49 | −1.585 0.47 | −3.003 0.15 | −2.168 0.48 | −1.489 0.12 | −1.576 0.15 |
| dlnGGE    | −4.162 0.00 | −2.883 0.06 | −4.188 0.01 | −2.899 0.18 | −3.779 0.00 | −2.814 0.00 |
| lnTAX     | −2.337 0.16 | −2.434 0.14 | −2.561 0.29 | −2.618 0.27 | 0.105 0.70 | 0.088 0.70 |
| dlnTAX    | −3.973 0.00 | −3.851 0.07 | −2.857 0.19 | −3.842 0.03 | −4.177 0.00 | −2.814 0.00 |
| lnGDP     | 0.440 0.98 | 0.200 0.96 | −1.846 0.64 | −2.047 0.54 | 5.293 1.00 | 4.099 0.99 |
| dlnGDP    | −2.877 0.06 | −2.829 0.07 | −2.876 0.18 | −2.926 0.17 | 0.105 0.70 | 0.088 0.70 |
| lnGDP2    | −1.219 0.64 | −2.576 0.11 | −1.747 0.69 | −1.561 0.77 | 5.800 1.00 | 7.002 1.00 |
| dlnGDP2   | −4.422 0.00 | −4.523 0.00 | −4.566 0.00 | −7.143 0.00 | −0.799 0.35 | −2.04 0.04 |
| dlnGDP2   | −1.087 0.70 | −2.229 0.20 | −1.858 0.64 | −1.830 0.65 | 5.715 1.00 | 6.901 1.00 |

Note: lnGGE is a natural logarithm of greenhouse gas emissions, lnTAX is a natural logarithm of the revenues from environmental taxes, lnGDP is a natural logarithm of real gross domestic product per capita, lnGDP² is a square of the natural logarithm of real gross domestic product per capita, ADF is the augmented Dickey–Fuller test, PP is the Phillips and Perron test, t-stat is t-statistics, p is p-value.

Although the ARDL test does not involve a prior testing of these variables, this can be applied only for the analysis of the variables that are integrated of at most order one, as is the case with the variables selected for this study. Thus, based on the results obtained after applying unit root tests, ARDL models were established to test the causality relationship between environmental performance, green taxation and economic development in Romania and Sweden.

Based on the four variables included in this analysis, four ARDL models using each of these variables as a dependent variable were formulated. Before this, it was especially important to establish the optimal lag for each variable. After this step, a Bound test was applied to establish if there was a cointegration relationship among variables. The results of these tests are presented in Table 3.

If the calculated F-statistics associated to the Bound test is higher than the critical values at all levels of significance, then there is a cointegration relationship among the variables. In this case, all values of F-statistics were above the critical values, so it can be concluded that there were three cointegrating vectors in Romania and Sweden and that there was a long-run relationship among the variables.

After checking the existence of a cointegration relationship between greenhouse gas emissions, green taxation and economic growth, the ordinary least squares (OLS) approach was used to see to what extent environmental taxes and GDP per capita explain the environmental performance.
Analysing the results reported in Table 4, several aspects regarding the connection among variables can be formulated.

**Table 3. ARDL cointegration analysis in Romania and Sweden.**

| Estimated Models | LAG | F-Statistics |
|------------------|-----|--------------|
| $F(\ln GGE/\ln TAX, \ln GDP, \ln GDP^2)$ | 2,0,1,1 | 7.222 |
| $F(\ln TAX/\ln GDP, \ln GDP^2, \ln GGE)$ | 2,0,0,0 | 9.626 |
| $F(\ln GDP/\ln GDP^2, \ln GGE, \ln TAX)$ | 1,1,0,1 | 14.165 |
| $F(\ln GDP^2/\ln GGE, \ln TAX, \ln GDP)$ | 1,0,1,1 | 13.935 |

**Critical Value Bounds**

| Significance (%) | $I_0$ Bound | $I_1$ Bound |
|------------------|-------------|-------------|
| 10               | 2.72        | 3.77        |
| 5                | 3.23        | 4.35        |
| 2.5              | 3.69        | 4.89        |
| 1                | 4.29        | 5.61        |

Note: $\ln GGE$ is a natural logarithm of greenhouse gas emissions, $\ln TAX$ is a natural logarithm of the revenues from environmental taxes, $\ln GDP$ is a natural logarithm of the real gross domestic product per capita, $\ln GDP^2$ is a square of natural logarithm of the real gross domestic product per capita, ARDL is autoregressive distributed lag, $I_0$ Bound is lower critical value, $I_1$ Bound is upper critical value.

**Table 4. ARDL-ECM cointegration analysis in Romania and Sweden.**

| Dependent Variables | Romania | Sweden |
|---------------------|---------|--------|
| $\ln GGE$          | coefficient | $t$-stat | $p$ | coefficient | $t$-stat | $p$ |
| long-run estimates  |         |         |     |            |         |     |
| $\ln TAX$          | $-0.099$ | $-0.739$ | $0.4726$ | $0.382$ | $6.385$ | $0.0000$ |
| $\ln GDP$          | $4.140$  | $2.020$  | $0.0644$ | $7.584$ | $4.796$ | $0.0003$ |
| $\ln GDP^2$        | $-0.234$ | $-2.142$ | $0.0516$ | $-0.389$ | $-5.125$ | $0.0002$ |
| short-run estimates |         |         |     |            |         |     |
| $d\ln TAX$         | $-0.069$ | $-0.761$ | $0.4601$ | $0.661$ | $7.284$ | $0.0000$ |
| $d\ln GDP$         | $-9.976$ | $-2.428$ | $0.0304$ | $-15.136$ | $-2.251$ | $0.0409$ |
| $d\ln GDP^2$       | $0.532$  | $2.467$  | $0.0283$ | $0.745$ | $2.344$ | $0.0343$ |
| $ECT_{t-1}$        | $-0.699$ | $-4.435$ | $0.0007$ | $-0.951$ | $-11.286$ | $0.0000$ |

Note: $\ln GGE$ is a natural logarithm of greenhouse gas emissions, $\ln TAX$ is a natural logarithm of the revenues from environmental taxes, $\ln GDP$ is a natural logarithm of the real gross domestic product per capita, $\ln GDP^2$ is a square of the natural logarithm of the real gross domestic product per capita, ARDL-ECM is autoregressive distributed lag-error correction model, $ECT_{t-1}$ is lagged error correction term.

Regarding the impact of environmental taxes on greenhouse gas emissions, although from a statistical point of view the result is not significant, these have a positive impact on environmental performance in Romania in the long run, meaning that for a 1% increase in environmental taxes, there will be a reduction of greenhouse gas emissions of 0.099. In the short run, the effect was the same, but
with a lower intensity; thus, for a 1% increase in environmental taxes, there was a reduction in GGEs of 0.069. This explains the fact that Romania was, in 2017, one of the countries with the most important reduction of greenhouse gas emissions compared to the level in 1990 (−54%). In Sweden, an increase of 1% in environmental taxes will generate, both in the long term and in the short term, an increase of greenhouse gas emissions of 0.382 and 0.661, respectively, both being significant from a statistical point of view at a significance level of 1%.

Starting from the fundamentals of EKC theory, Romania is on an inverted-U shape curve (conventional EKC) in the long run as shown in Figure 2a, because the coefficient associated to the linear term GDP per capita was positive and that associated to the nonlinear term (GDP^2) was negative. This result supports EKC theory [45] according to which greenhouse gas emissions would increase within the first phase of economic growth and decrease after reaching a certain threshold. Therefore, an increase of one percent of GDP will generate in the long term, within the first phase, an increase of 4.14 of greenhouse gas emissions, followed by a decrease of 0.234. In the short term, the phenomenon is reversed, and an increase of 1% of GDP leading to the improvement of environmental performance with 9.97% in the first phase, thus Romania would be on a U-shaped curve trajectory as shown in Figure 2b, followed by an increase in greenhouse gas emissions of 0.532.

![Figure 2. The EKC: (a) inverted U-shaped curve; (b) U-shaped curve.](image)

A similar situation is visible also for Sweden, where there would be registered an increase of one percent of GDP per capita in the long term, within the first phase, a more accelerated increase of greenhouse gas emissions compared with the situation in Romania, approximately 7.58%. This fact can be explained by the much more developed industry in Sweden as the main generating factor of greenhouse gas emissions. After the economy reaches a certain level of development, an increase of one percent of GDP will generate a reduction of greenhouse gas emissions of 0.389. According to the p-value associated to GDP and GDP^2 variables, these were significant from a statistical point of view both for Romania and Sweden.

On the other hand, the values of the lagged error correction term (ECT_{t-1}) were negative both in Romania (−0.699) and in Sweden (−0.951), indicating the existence of a long-run relationship among the variables included in the model and were significant from a statistical point of view. Thus, it can be concluded that the speed of adjustment of greenhouse gas emissions from the short run to the long run was 69.9% in Romania and 95.1% in Sweden.

The CUSUM and CUSUMsq tests were used to test the stability of the model. These tests [46] are based on the cumulative sum of the recursive residuals. The CUSUM test plots the cumulative sum together with the 5% critical lines. The test identifies the parameter instability if the cumulative sum goes outside the area between the two critical lines. The graphical results (Figures 3 and 4) for the CUSUM and CUSUMsq tests for the two countries show the stability of the parameters both in the long run and short run at a level of significance of 5%.
will decrease but, at the same time, GDP will decrease too. These results support the theory of the Kuznets curve regarding the performance was identified. These results support the theory of the Kuznets curve regarding the fact that in the future, the focus will be oriented on the environment after reaching a certain level of economic development.

The existence of a cointegration relationship among the variables of the model imply the existence of a causality relationship at least from one direction. To determine the causality relationship between greenhouse gas emissions, environmental taxation, GDP and GDP$^2$, the Granger test based on the ARDL-ECM framework was used. This test shows whether there is a short-run, long-run or strong causality among the variables. To explain the long-run causal effects, the $t$-statistics of the ECT were analysed. If the value of the $t$-statistics is negative, then there is a long-run relationship among variables.

According to the results in Table 5, there was a strong causality relationship of environmental taxes and GDP on greenhouse gas emissions in the long term in Romania. At the same time, analysing the results for the equations where GDP and GDP$^2$ were dependent variables, a strong causality relationship in the long run among these variables and environmental taxes and environmental performance was identified. These results support the theory of the Kuznets curve regarding the fact that in the future, the focus will be oriented on the environment after reaching a certain level of economic development.

In Romania, a significant impact of economic growth on environmental taxes in the short term can be noticed, a situation that changes in the long term when there is no causality relationship. Also, there can be seen a significant influence of greenhouse gas emissions on economic growth. The situation is as normal as possible, because industry, which is the main engine of an economy, is also the main source of greenhouse gas emissions. Thus, if the industrial production decreases, greenhouse gas emissions will decrease but, at the same time, GDP will decrease too.
of the GDP level. This situation is intuitive, because an increase of taxes will determine an increase of production costs, a fact that will hinder the decision to invest thus leading to slower economic growth. In the short run, this relationship was available only in the case of economic growth at a significance level of 10%. Sweden is one of the countries with a green taxation system sufficiently developed, this being reflected in the concern for efficient energy consumption and thus for reducing air pollution.

It is important to notice that in the long term there is no causality relationship between greenhouse gas emissions and economic growth on environmental taxes, this being observed only in the short term when GGE have an impact on the revenues from environmental taxes. As for the effects on the economic growth, the most significant ones were those determined by the level of environmental taxes which at a change with a positive sign of one percent will generate a reduction of the GDP level. This situation is intuitive, because an increase of taxes will determine an increase of the production costs, a fact that will hinder the decision to invest thus leading to slower economic growth.

The results previously obtained for the two countries were connected with the results from applying the pairwise Granger causality test to detect the direction of causality on the long-run and short-run relationship among variables (Figure 5).

### Figure 5. Summary of the Granger causality relationships in Romania and Sweden.

The direction of causality in the short run in Romania is from greenhouse gas emissions to gross domestic product and from this one to revenues from environmental taxes. This means that in Romania, in the short run, the level of environmental taxation does not have any influence on environmental...
performance or on economic growth. In the long run, things change and a bidirectional causality between environmental performance and economic growth can be noticed. In the long run, a green taxation system also has an impact both on greenhouse gas emissions and economic growth.

Regarding Sweden, in the short run, a network of influences among variables can be noticed; thus, greenhouse gas emissions change the level of revenues from environmental taxes, the latter generating effects on economic growth which will be reflected by the environmental performance. Taking into account the green taxation system, but primarily focusing on the level of economic development and level of maturity in this country, this network of relationships can be explained as follows: after reaching a certain threshold of economic growth, there were concerns raised for environmental protection and industry used less damaging means for the environment thus reducing the level of greenhouse gas emissions. Such a situation leads automatically to a decrease in revenues from green taxation because the tax base is thus reduced. This also explains the long-run relationships in which both environmental taxes and the GDP per capita determine the level of greenhouse gas emissions.

The above results prove that environmental taxes have a significant influence on reducing greenhouse gas emissions in the long term both in Romania and Sweden, while in the short term, no such influence was identified meaning that for the countries with a high level of pollution, the level of environmental taxation is important when they aim for results in the long run. At the same time, they must focus on other measures in the short run in order to reduce pollution levels as soon as possible.

5. Conclusions

Air pollution has long been a matter of general interest, but more recently it is both an environmental and development issue. A better and more responsible coordination of the relationship between economic growth, air pollution and environmental taxes has become an item of interest on the agenda of all institutions at local, national and global levels. The objective of the present study was to examine the causal relationships between greenhouse gas emissions, economic growth and environmental tax revenues for Romania and Sweden between 1995 and 2017. The research methodology consisted of using the ARDL method to test the cointegration relationship between greenhouse gas emissions, green taxation and economic growth. Based on this method, a dynamic ECM was developed integrating short-run causality relationships with those in the long-run. Then, a multivariate Granger causality estimation based on the ARDL-ECM and a Granger pairwise causality test were used to determine short-run, long-run and strong causality between the model and the direction of causality. The novelty of this research is given by combining the double dividend theory with EKC theory to investigate the existence of a relationship among the three dimensions in this analysis.

The results of the analysis show the existence of a cointegration relationship among the chosen variables, and the EKC hypothesis for greenhouse gas emissions in the inverted U-shaped curve was confirmed for Romania. The short-run causality relationships showed an industry based on energy consumption without concern for the negative effects on the environment. In the long run, the causality relationships indicated a possible orientation towards environmental protection both by finding some alternative solutions for energy consumption and by consolidating green taxation system.

Regarding Sweden, it was obvious that this country surpassed the threshold of economic development in which there are no concerns for the environment and focused on its protection, both by using the environmental taxation and by finding less damaging alternative sources for economic growth. As it results from the relationships identified in the previous section, in the long term, greenhouse gas emissions in Sweden were influenced, on the one hand, by environmental taxes and, on the other hand, by the economic growth.

The two countries chosen for this study are very different considering their level of economic development and the structure of their green taxation system. Romania, in order to reach the UN Sustainable Development Goals of 2030 Agenda, tries to implement good practice examples regarding sustainable development from developed countries in the EU, such as Sweden.
Without important changes in its environmental fiscal strategy, Romania will not register any progress regarding environment protection and will remain below other developed countries. There is a need to support the gradual increase in environmental taxes and the substantial improvement in tax collection as well as the introduction of some new tools used in Sweden.

The main limitations of the study are determined by the lack of statistical data over a longer period of time which would probably have generated more robust results. In addition, in a future study, energy consumption and environmental technology variables will also be included to obtain more reliable results.

**Author Contributions:** All five authors equally contributed in designing and writing this paper. Specific tasks were done as follows: Conceptualization, R.M.B. and N.M.F.; Investigation, S.P.; Methodology, A.G.M. and M.D.D.; Project administration, R.M.B. and N.M.F.; Supervision, A.G.M. and M.D.D.; Writing—review and editing, S.P. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding

**Conflicts of Interest:** The authors declare no conflict of interest.

**References**

1. Committee of Experts on International Cooperation in Tax Matters. Available online: www.un.org/esa/ffd/wp-content/uploads/2019/04/18STM_CRP4-Environmental-tax-issues.pdf (accessed on 20 January 2020).
2. Rodrigues, C.F.A.; Dinis, M.A.P.; Lemos de Sousa, M.J. Review of European energy policies regarding the recent “carbon capture, utilization and storage” technologies scenario and the role of coal seams. *Environ. Earth Sci.* 2015, 74, 2553–2561. [CrossRef]
3. OECD. Effective Carbon Rates. Available online: www.oecd.org/tax/tax-policy/effective-carbon-rates-2018-brochure.pdf (accessed on 20 January 2020).
4. OECD. OECD Environmental Outlook to 2030. Available online: www.oecd.org/env/indicators-modelling-outlooks/40200582.pdf (accessed on 20 January 2020).
5. OECD. Green Growth and Developing Countries. Available online: www.oecd.org/dac/environment-development/5059116.pdf (accessed on 20 January 2020).
6. Eurostat. Green House Gas Emission Statistics—Emission Inventories. Available online: https://ec.europa.eu/eurostat/statistics-explained/pdfscache/1180.pdf (accessed on 25 January 2020).
7. Ricci, F. Channels of Transmission of Environmental Policy to Economic Growth: A Survey of the Theory. *Ecol. Econ.* 2007, 60, 688–699. [CrossRef]
8. Brandt, U.S.; Svendsen, G.T. A Global CO2 Tax for Sustainable Development. *J. Sustain. Dev.* 2014, 7. [CrossRef]
9. Zimmermannova, J.; Hajek, M.; Rozensky, L. Carbon Taxation in the European Countries. In Proceedings of the Theoretical and Practical Aspects of Public Finance, Prague, Czech Republic, 7–8 April 2017; Volume 22.
10. Pegels, A. *Taxing Carbon as an Instrument of Green Industrial Policy in Developing Countries*; Discussion Paper; German Development Institute: Bonn, Germany, 2016; pp. 1–37.
11. OECD. *Environmentally Related Taxes in OECD Countries: Issues and Strategies*; OECD Publishing: Paris, France, 2001; pp. 33–35.
12. European Environment Agency. Environmental Taxation and EU Environmental Policies. Available online: https://www.eea.europa.eu/publications/environmental-taxation-and-eu-environmental-policies (accessed on 23 January 2020).
13. Miller, S.J.; Vela, M.A. *Are Environmentally Related Taxes Effective? Inter-American Development Bank Working Paper Series*; Felipe Herrera Library: Washington, DC, USA, 2013; Volume 467.
14. Stern, T.; Kohlin, G. Environmental Taxes in Europe. *Public Financ. Manag.* 2003, 3(1), 117–142.
15. Cottrell, J.; Schlegelmilch, K.; Runkel, M.; Mahler, A. Environmental Tax Reform in Developing, Emerging and Transition Economies; Studies, German Development Institute: Bonn, Germany, 2016.
16. He, J.; Richard, P. Environmental Kuznets curve for CO 2 in Canada. *Ecol. Econ.* 2010, 69, 1083–1093. [CrossRef]
17. Chowdhury, R.; Moran, E. Turning the curve: A critical review of Kuznets approaches. *Appl. Geogr.* 2010, 30, 1–9. [CrossRef]
18. Shahbaz, M.; Mutascu, M.; Azim, P. Environmental Kuznets curve in Romania and the role of energy consumption. *Renew. Sustain. Energy Rev.* **2013**, *18*, 165–173. [CrossRef]

19. Jula, D.; Dumitrescu, C.I.; Lie, I.R.; Dobrescu, R. Environmental Kuznets curve. Evidence from Romania. *Theor. Appl. Econ.* **2015**, *1*, 85–96.

20. Armeanu, D.; Vintilă, G.; Andrei, J.V.; Gherghina, Ș.C.; Drăgoi, M.C.; Teodor, C. Exploring the link between environmental pollution and economic growth in EU-28 countries: Is there an environmental Kuznets curve? *PLoS ONE* **2018**, *13*, e0195708. [CrossRef] [PubMed]

21. Radulescu, M.; Sinisi, C.I.; Popescu, C.; Iacob, S.E.; Popescu, L. Environmental Tax Policy in Romania in the Context of the EU: Double Dividend Theory. *Sustainability* **2017**, *9*, 866. [CrossRef]

22. Roegen, N. *The Entropy Law and the Economic Process*, 1st ed.; Harvard University Press: Cambridge, MA, USA, 1971; pp. 330–341.

23. Meadows, D.H.; Meadows, D.L.; Randers, J.; Behrens, W.W. *The Limits to Growth*, 1st ed.; Universe Books: New York, NY, USA, 1972; pp. 23–30.

24. Daly, H. *Steady State Economics*; Island Press: Washington, DC, USA, 1991.

25. Pearce, D. The Role of Carbon Taxes in Adjusting to Global Warming. *Econ. J.* **1991**, *101*, 938–948. [CrossRef]

26. Bovenberg, L.; Smulders, S. Environmental Quality and Pollution-Augmenting Technological Change in a Two-Sector Endogenous Growth Model. *J. Public Econ.* **1995**, *57*, 369–391. [CrossRef]

27. Goulder, L. Environmental Taxation and the Double Dividend: A Reader’s Guide. *Int. Tax Public Financ.* **1995**, *2*, 157–183. [CrossRef]

28. Bovenberg, L.; Mooij, R. Environmental Tax Reform and Endogenous Growth. *J. Public Econ.* **1997**, *63*, 207–237. [CrossRef]

29. Lee, D.; Misiolek, W. Substituting Pollution Taxation for General Taxation: Some Implications for Efficiency in Pollution Taxation. *J. Environ. Econ. Manag.* **1986**, *13*, 338–347. [CrossRef]

30. Bovenberg, L.; Van der Ploeg, F. Environmental policy, public finance and the labour market in a second-best world. *J. Public Econ.* **1994**, *55*, 349–390. [CrossRef]

31. He, P.; Zhang, Y.; Yuan, Y.; Qiao, Y.; Xin, L.; Zou, X. The Relationship between Environmental Taxation, Environmental Performance and Economic Growth: Comparative Study of Sweden and China 1985–2016. *Ekoloji* **2019**, *28*, 401–410.

32. Dickey, D.A.; Fuller, W.A. Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *J. Am. Stat. Assoc.* **1979**, *74*, 427–431.

33. Phillips, P.C.B.; Perron, P. Testing for a Unit Root in Time Series Regression. *Biometrika* **1988**, *75*, 335–346. [CrossRef]

34. Pesaran, M.H.; Shin, Y.; Smith, R.P. Pooled mean group estimation of dynamic heterogeneous panels. *J. Am. Stat. Assoc.* **1999**, *94*, 621–634. [CrossRef]

35. Pesaran, M.H.; Shin, Y.; Smith, R.J. Bounds testing approaches to the analysis of level relationships. *J. Appl. Econ.* **2001**, *16*, 289–326. [CrossRef]

36. Sunde, T. The interaction of energy consumption and economic growth in South Africa: Assessment from the bounds testing approach. *Int. J. Sustain. Econ.* **2011**, *3*, 235–255. [CrossRef]

37. Odhiambo, N.M. Financial intermediaries versus financial markets: A South African experience. *Int. Bus. Econ. Res. J.* **2011**, *10*, 77. [CrossRef]

38. Nyasha, S.; Odhiambo, N.M. Economic growth and market-based financial systems: A review. *Stud. Econ. Financ.* **2015**, *32*, 235–255. [CrossRef]

39. Pao, H.T.; Tsai, C.M. Multivariate Granger causality between CO₂ emissions, energy consumption, FDI (foreign direct investment) and GDP (gross domestic product): Evidence from a panel of BRIC (Brazil, Russian Federation, India, and China) countries. *Energy* **2011**, *36*, 685–693. [CrossRef]

40. Government Offices of Sweden. Sweden’s Carbon Tax. Available online: https://www.government.se/government-policy/taxes-and-tariffs/swedens-carbon-tax/ (accessed on 22 January 2020).

41. European Commission. The Environmental Implementation Review 2019: COUNTRY REPORT SWEDEN. Available online: https://ec.europa.eu/environment/eir/pdf/report_se_en.pdf (accessed on 22 January 2020).

42. European Commission. The Environmental Implementation Review 2019: COUNTRY REPORT ROMANIA. Available online: https://ec.europa.eu/environment/eir/pdf/report_ro_en.pdf (accessed on 22 January 2020).

43. INSSE. Indicatori Statistici de Dezvoltare Durabilă. Available online: https://insse.ro/cms/files/Web_IDD_BD_ro/index.htm (accessed on 21 January 2020).
44. Jarque, C.M.; Bera, A.K. A test for normality of observations and regression residuals. *Int. Stat. Rev.* **1987**, *55*, 163–172. [CrossRef]

45. Kuznets, S. Economic growth and income inequality. *Am. Econ. Rev.* **1955**, *45*, 1–28.

46. Brown, R.L.; Durbin, J.; Evans, J.M. Techniques for Testing the Constancy of Regression Relationships over Time. *J. R. Stat. Soc. Ser. B (Methodol.)* **1975**, *37*, 149–192. [CrossRef]

47. Khan, D.; Ulucak, R. How do environmental technologies affect green growth? Evidence from BRICS economies. *Sci. Total Environ.* **2020**, *712*, 136504. [CrossRef]

© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (http://creativecommons.org/licenses/by/4.0/).