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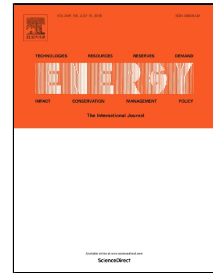
Output, Renewable and Non-renewable Energy Production, and International Trade: Evidence from EU-15 Countries

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## Output, Renewable and Non-renewable Energy Production, and International Trade: Evidence from EU-15 Countries

### 1. Introduction

Environmental degradation, especially in the form of GHGs (Green House Gases), has been giving concern to the entire world, especially in the last three decades. By and large, the international community seems to be united to curb several pollutants, including carbon dioxide (CO<sub>2</sub>) emissions, which are deemed to be causing severe depletion of the ozone layer. According to the World Resources Institute (WRI, 2015), global GHGs emissions rose considerably from 32414 to 46049 M<sub>t</sub>CO<sub>2</sub>e (million metric tons of carbon dioxide equivalent) over the period 1990-2012. The WRI reports that the amount of CO<sub>2</sub> emissions constitutes around 60% of GHGs. Fossil energy sources, such as coal and oil, are blamed for environmental degradation but they are also being used as the primary energy inputs for economic growth, as discussed in Halicioglu and Ketenci (2016).

The European Union (EU) has been particularly active in tackling global warming in regards to engaging international climate change agreements, as well as setting out clear targets to curb environmental pollutants. To this extent, the EU has been a signatory part of several climate action agreements and has set clear, long-term targets for reducing GHGs. The EU signed the global charter of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, which aims to limit global warming to below 2° C. The 1997 Kyoto protocol, which emerged from the UNFCCC, was also signed by the EU and mandated that the signatory countries would cut down their GHGs by on average 5.2% by 2012, compared with the 1990 level. The EU was amongst a few countries which met the first phase of the Kyoto targets. The EU has adopted the second of phase of the Kyoto agreement which runs from 2013 to 2020. During the second phase of the Kyoto protocol, by 2020 the EU aims to reduce its GHGs emissions by 20% in comparison to the 1990 levels. Finally, the EU has been spearheading the implementation of the legally binding Paris agreement (also known as *'the 21<sup>st</sup> Conference of the Parties'* in short COP21) on climate change, which was signed by 195 countries in 2015, which will come into effect in 2020. Even though this agreement, unlike the previous ones, does not set out any detailed timetable or country specific goals for GHGs, the agreement set a goal of limiting global warming to 1.5° C which requires zero

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