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UNDERSTANDING NATIONAL RENEWABLE ENERGY CONSUMPTION THROUGH THE LENS OF HOFSTEDE'S CULTURAL DIMENSIONS: INSIGHTS AND RECOMMENDATIONS FOR POLICYMAKERS

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Abstract

This thesis focuses on investigating the ever-evolving relationship between renewable energy consumption and cultural dimensions, aiming to reevaluate the findings from a previous study, and delve deeper by qualitatively analyzing the reasons behind these relationships. The results highlight the relationship between higher levels of renewable energy consumption and lower scores in the cultural dimension of Motivationt towards achievement and success, Uncertainty avoidance, and Power distance. Traits associated with low and high scores in these dimensions are then analyzed, describing how they facilitate or challenge renewable energy consumption using relevant examples, leading to nuanced recommendations for supranational policymakers.

Keywords: *Renewable energy*, *Cultural dimensions, Energy transition*, *Policy implications*

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1. Introduction

Fossil fuels are the major contributor to climate change, accounting for almost 90% of carbon dioxide emissions and over 75% of greenhouse gas emissions globally (UN 2023). Therefore, the pursuit of mitigating the effects of climate change has brought renewable energy sources to the forefront of discussion, as it has been proven to be a more sustainable option with vast potential (Twidell and Weir Tony 2006; Halkos and Gkampoura 2020). As countries progressively aim to transition towards a future powered by renewable energy sources, there are numerous factors influencing this process. Economic growth, politics, education, and family businesses all have some influence on a country's use of renewable energies, with policymakers mostly focusing on monetary incentives (Hast, Alimohammadisagvand, and Syri 2015). However, in pursuit of sustainable energy practices, it is crucial to not only consider the more tangible aforementioned factors, but also the cultural dimensions that shape societal behaviours and perceptions. To do so, Geert Hofstede's Cultural Dimensions theory, which provides a valuable and accredited framework, was utilized to test whether any of the cultural dimensions impact a country's energy consumption.

Building on a paper published in 2018, which explored the relationship between renewable energy consumption and Hofstede's cultural dimensions using data from 2011 to 2015 (Pelau and Pop 2018), this study aims to reassess and improve existing knowledge on the topic. As the data for Hofstede's cultural dimensions was updated in October 2023 (with some scores for dimensions changing as much as 25 points out of 100), while renewable energy consumption has logically changed over the years, the associations between renewable energy consumption and cultural dimensions have been tested again. Furthermore, in order for the paper to have significant added value, additional emphasis was placed on qualitative analysis, by explaining the reasons behind possible relationships between renewable energy consumption and national cultural dimensions. Furthermore, the study delves into the outliers observed during testing, as

understanding these exceptions is crucial for developing nuanced and targeted strategies for supranational policymakers such as the European Union.

2. Literature review

2.1 What is renewable energy?

Renewable energy is energy deriving from natural and persistent sources in the environment (Twidell and Weir Tony 2006), with the most common sources of renewable energy being solar energy, hydropower, geothermal energy, wind energy and biomass (Halkos and Gkampoura 2020). As such, the nature of renewable energy enables it to provide many advantages over traditional sources of energy such as fossil fuels and natural gas. As an alternative source of energy, it reduces fossil fuel consumption and therefore greenhouse gas emissions, which is crucial in the ongoing battle against climate change (Maradin 2021; Erickson 2017). Furthermore, renewable energy production can aid in reducing dependency on energy imports, decrease energy scarcity and stimulate the economy by boosting research and development (Maradin 2021; Schwalbach 2016). On the other hand, there are also several disadvantages tied to the production and implementation of renewable energy, such as the dependence on factors outside of anyone's control such as weather, and therefore it's unpredictability (Azarpour et al. 2012). Furthermore, the lower energy efficiency and relatively steep costs of energy production compared to more conventional energy sources hinder its growth (Maradin 2021). Moreover, renewable energy based power plants require proper site selection and their development should follow strict guidelines, in order to avoid damaging the environment where they are built (Rahman, Farrok, and Haque 2022). Nevertheless, improvements in renewable energy efficiency and the reduction in its production costs will increase its usage and be crucial in the immediate and long-term future for the decrease in CO2 emissions (S. Khan et al. 2022; Owusu and Asumadu-Sarkodie 2016).

2.2 Factors potentially impacting renewable energy consumption

As there are numerous variables with the potential of impacting renewable energy consumption, this paper focuses on the main established ones.

Results from a study carried out on OECD_15 countries show a positive correlation between GDP growth and non-renewable energy sources, and a significant negative one between GDP growth and renewable energy consumption (Matei 2017). This implies that GDP growth tends to stimulate investments in fossil fuels and discourage investments in renewable energy sources. It is important to note however, how economic growth is essential in obtaining the resources required to invest in the research and the development of renewable energy technologies (A. Khan et al. 2021). A study on developing countries in Asia which analysed the relationship between GDPpc and renewable energy consumption over a more prolonged period of time confirmed this. In fact, in countries where an increase in GDPpc is correlated to an overall lower share of renewables, as the economy grows further, the share of renewables will eventually increase (Ergun and Rivas 2023).

Various studies have found that left and centre governments are more likely to promote in and invest in renewable energies, compared to right wing ones (Nicolini and Tavoni 2017; Abban and Hasan 2021). However, in recent years the transition to renewable energies has garnered support across the political spectrum in some countries in western Europe, so much so that ambitions regarding renewable energy growth do not differ significantly based on political ideology (Thonig et al. 2021). This entails that changes in government are unlikely to drastically affect ambition levels concerning the renewable energy share in these countries (Thonig et al. 2021). Another study also evaluated the influence of government system on renewable energy investments and found that parliamentary governments promotes renewable energy investments significantly more compared to presidential governments (Abban and Hasan 2021).

Family firms constitute more than 60% of all businesses in Europe (EC 2023a) and the backbone of many economies in the continent (Santos Silva and Aflaki 2023). Family businesses are generally founded and managed with the intention of being passed down to future generations. As such, their focus is on long-term success, therefore they aim to balance performance and legacy, which is a vital balance for sustainability (IMD 2019). Therefore, family businesses are more likely than non-family businesses to exercise sustainable practices (Clauß, Kraus, and Jones 2021). Additionally, family firms, particularly larger scale ones, are also more prone to seek to reduce the environmental effects of their activities by switching to renewable energy sources (Santos Silva and Aflaki 2023).

Where culture and renewable energy consumption meet

An additional aspect that influences a country's renewable energy consumption is logically the country's energy policy (Nesta, Vona, and Nicolli 2014). The majority of policymakers have placed the most emphasis on commercial incentives (Hast, Alimohammadisagvand, and Syri 2015), as affordability is known to be a major factor impacting renewable energy consumption (Bogdanov et al. 2021). However, it is important to underline that the culture context can affect the effectiveness of policies related to the energy transition (Araújo 2014), which is why it is important to always consider societal orientations, institutions and mechanisms when implementing policies (Burtraw 2013; Cherp, Jewell, and Goldthau 2011). In fact, there is strong evidence that proves cultural and demographic factors also impact the orientation of consumers towards renewable energies (Beunder and Groot 2015). For example, regarding demographics researchers have unveiled that consumers from more developed countries are willing to pay extra for renewable energy compared to non-renewables (Murakami et al. 2015). Other variables, all enclosed in the macro ones stated above, that influence the propensity towards renewable energy are a higher internet household access (Pelau and Pop 2018), a higher educational level (Sardianou and Genoudi 2013), and higher incomes (Cayla, Maizi, and

Marchand 2011). Additionally, younger people were found to be especially willing to spend more for renewable energy (Liobikienė and Dagiliūtė 2021).

Nevertheless, even in those countries where the cultural, economic and demographic variables are more favourable to the transition towards renewable energy there are still numerous people that view the renewable energy transition with distrust (Irfan et al. 2021; Crowe and Li 2020). In fact, the term "transition" commonly used to indicate the ongoing global shift from high carbon emissions to low carbon emissions can be classified as a 'socio-technical' transition. This type of transition refers to fundamental alterations in a country's structural system, with energy being one of the most strategic components. All this entails intricate and long-term reconfigurations utilising science, technology, infrastructure, cultural and social practices, and policies in reaching the goal of integrating renewable energy sources (Newell and Mulvaney 2013). These are deep rooted changes that can alter the way people conduct their business and live their life. Therefore, more emphasis should be placed on information sharing regarding the benefits of renewable energy, with the purpose of boosting its public image and increase its social acceptance (Crowe and Li 2020; Iwata, Katayama, and Arimura 2015). This would be particularly beneficial when tackling the "not-in-my-backyard" mentality, which sees people oppose even the most valuable renewable energy projects due to the project impacting them directly and a lack of knowledge on the topic (Carley et al. 2020; Kashintseva et al. 2018).

2.3 Hofstede's Cultural Dimensions

Geert Hofstede's acclaimed cultural dimensions theory was created to examine and understand the differences in cultures between countries (Nickerson 2022), and as previously seen, culture affects decision making in consumers (Yates and de Oliveira 2016). Therefore, Hofstede's Cultural Dimensions model is a convenient tool to dissect a country's culture and determine which aspects if any are related to renewable energy consumption. The most updated iteration of Hofstede's Cultural Dimensions consists of six dimensions.

- Power Distance Index: The degree to which the weaker members of an institution, organisation, or society as a whole accept and expect power to be divided unequally. People who live in high Power distance societies are accustomed to wider hierarchical gaps among people based on certain differentiators such as status, age, and sex. On the other hand, low power distance societies aim for a more balanced and flat power structure, as devoid as possible of inequalities.
- Individualism vs Collectivism: Individualistic societies prioritise the needs of the individual and the close family, placing a strong emphasis on individual achievements. In contrast, collectivist societies give more weight to the well-being and the objectives of the group as a whole, rather than only the individual and their close circle.
- Motivation Towards Achievement and Success index: The dimension was formerly known with the name of "masculinity", and it classifies whether societies are more decisive or consensus oriented. High scores indicate decisive societies that prioritize achievement, power, boldness, and competition, while lower scores imply consensus-oriented societies that value collaboration, quality of life and nurturing.
- Uncertainty Avoidance Index: The degree with which members of a society experience discomfort when confronted with ambiguity and change. A high score indicates societies which exhibit a limited uncertainty tolerance and risk-taking, preferring to avoid change in favour of solutions that have been proven to work. Conversely, a low score signifies that a society is more accepting of ambiguous situations, is less conservative regarding risk-taking and more prone to embrace change.
- Short-Term vs. Long-Term Orientation: The extent with which societies perceive their time horizon. Societies with low scores tend to have a short-term orientation, favouring immediate gratification or success and prioritizing the present over the future. On the contrary, societies with high scores have a long-term orientation which entails they

would rather postpone success and gratification in the present for more significant accomplishments in the future. Furthermore, societies with long-term orientation, have a strong propensity to save and invest.

- Restraint vs. Indulgence: This dimension considers the tendency and extent with which a society fulfils its desires. Restraint characterized societies have low scores in this dimension and tend to suppress the gratification of needs by regulating them through social norms. High scores on the other hand indicates indulgent societies, which are more prone to gratification and engaging in entertaining activities for the sole purpose of enjoying life and having fun.

(Minkov and Kaasa 2022; Hofstede 2011; Agodzo 2015; Hofstede 2023).

Pelau and Pop's study from 2018 which tested the relationships between renewable energy consumption and Hofstede's cultural dimensions found strong evidence from their tests that various dimensions are related to renewable energy consumption. The study found that the most impactful of the cultural dimensions is Masculinity (Motivation towards achievement and success), as countries with low scores have higher renewable energy consumption compared to those with higher scores. Furthermore, the study also found acceptable evidence that countries with lower Long-term orientation and Uncertainty avoidance scores have higher renewable energy consumption compared to their peers with higher scores (Pelau and Pop 2018).

3. Motivation and research question

In 2023 the European Union's 2030 climate targets were updated to increase the share of renewable energy consumption to a minimum of 42.5% (EC 2023b). As 2030 looms closer, there is still extensive disparity with regards to renewable energy consumption among countries in Europe, with various being behind schedule on achieving their targets (EEA 2023). Concerning the renewable energy research scope, most studies so far have explored factors

considered tangible such as GDP, internet access and education level, investigating their connections to sustainable energy practices. On the other hand, there has been limited effort concerning the understanding of the underlying relationship between a country's cultural dimensions and its renewable energy consumption. Pelau and Pop's 2018 study is one of the very few which attempted this. They did so by aiming to establish the existence of a potential relationship between renewable energy consumption and Hofstede's cultural dimensions in European countries (Pelau and Pop 2018). Their study also provides implications for policymakers, highlighting how certain policies may work in some countries, but not in others due to cultural differences. However, the policy implications are almost exclusively based on the potential existence of a relationship between renewable energy consumption and a country's cultural dimensions, rather than on the underlying reasons as to why this relationship exists.

The present paper serves a dual purpose. Firstly, as mentioned in the introduction it seeks to reevaluate the findings of Pelau and Pop's study. Secondly, the current study aims to dig deeper into the topic, by also offering a valuable qualitative analysis. This qualitative interpretation of the results is an important addition to the previous research as it offers updated and comprehensive insights. As supranational policymakers are not able to affect national culture, understanding more thoroughly its effects on renewable energy consumption can help them target each country individually, by developing ad hoc policies. More specifically, by not only understanding which cultural dimensions affect renewable energy consumption, but also how and why, supranational policymakers can leverage beneficial cultural factors associated with higher renewable energy consumption and compensate for detrimental aspects tied to lower renewable energy consumption. The motivation to address the aforementioned knowledge gap led to the formulation of the following research question:

"How can the relationship between renewable energy consumption and cultural dimensions be explained, and how should it influence policymaking?"

4. Methodology

In order to fulfil the paper's aim of reevaluating the findings of Pelau and Pop's study and provide more qualitative insights, both a quantitative and qualitative analysis were carried out.

Data collection and sample

Data for each variable was gathered by means of secondary data collection.

Renewable energy consumption was chosen as it is the variable the European Union utilises for its renewable energy goals and statistics. It is defined as the share of renewable energy in gross final energy consumption of a country (EC 2023b). The data used for this variable is from 2021, compiled in 2023 by Eurostat using information provided by the various countries' administrations (Eurostat 2023). In order to analyse cultural dimensions, the data for all countries regarding Hofstede's cultural dimensions was collected utilising the Country Comparison Tool on the Hofstede insight website (Hofstede 2023). As this data was updated in October 2023, it is different to that used by the Pelau and Pop study.

The sample consists of the 30 countries from the European continent used in the Pelau and Pop study, with an addition of 4 countries to increase the sample size to 34. For the full list of countries please refer to Appendix 9.1.

Data testing

As only one year of data was collected for each of the 34 countries analysed in this study, not enough observations were gathered for the purpose of accurately carrying out multiple linear regression testing (Jenkins and Quintana-Ascencio 2020). Therefore, independent sample t-tests were carried out to determine whether there is a difference with regards to renewable energy consumption when comparing countries that have a high versus low score concerning the various cultural dimensions. The low and high score samples were obtained by using the average score for each cultural dimension to split the overall sample into two sub-samples.

Furthermore, a descriptive statistical analysis was carried out for each of the seven variables tested in this paper. The tests were carried out using the software Jamovi.

Qualitative analysis

The qualitative analysis is based on the quantitative analysis results and was executed by providing explanations and examples illustrating why and how cultural dimensions impact the energy consumption of different countries. This was done by using sources such as Hofstede's research, academic papers, and governmental agencies. Furthermore, the qualitative analysis also consists of the analysis of outliers, which are countries which contradict the quantitative results, as this provides valuable insight into those variables that outweigh cultural dimensions.

5. Results

5.1 Quantitative analysis

Descriptive results

Table 1. Descriptive analysis of variables

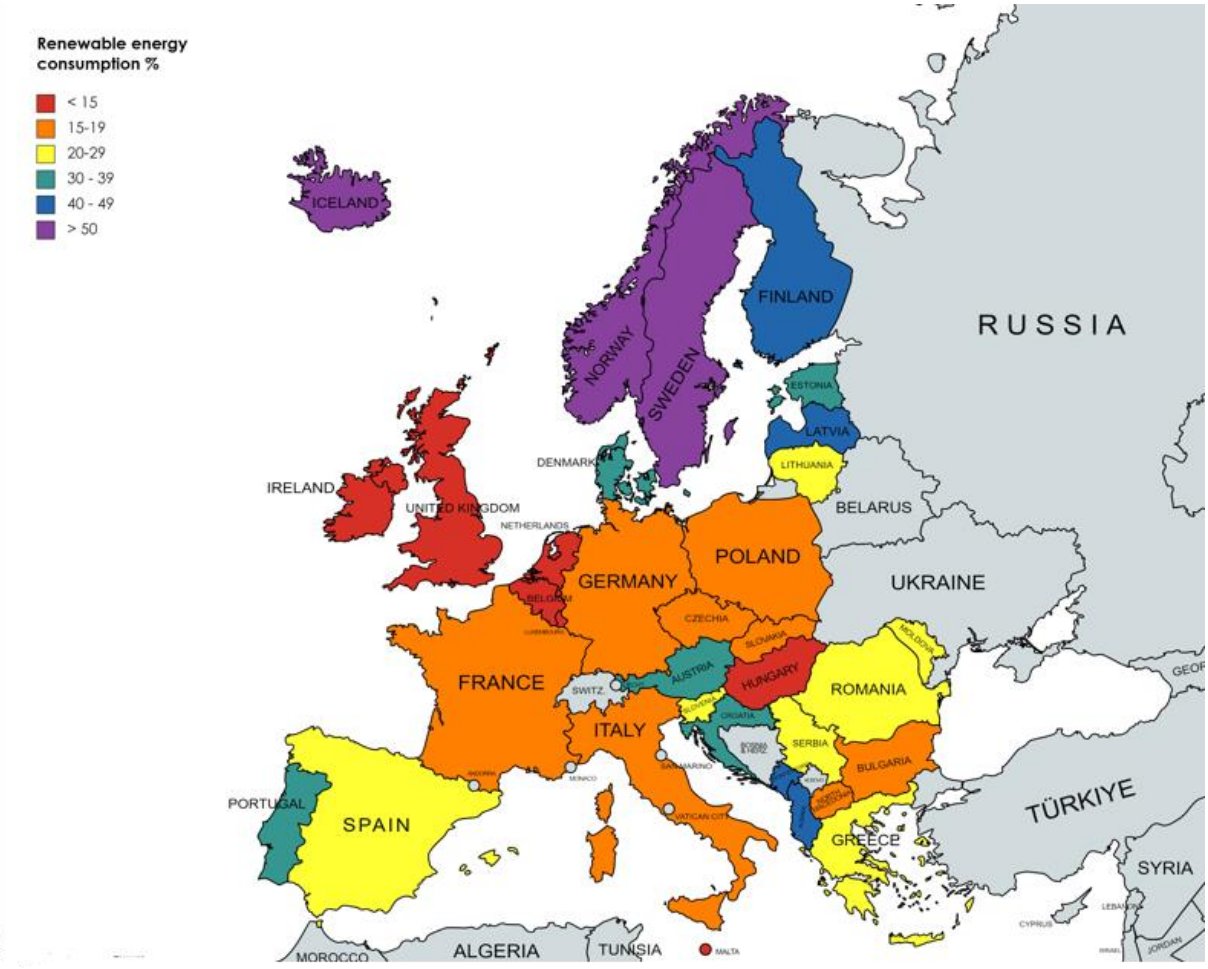
Descriptives

	N	Mean	SD	Minimum	Maximum
Renewable energy consumption	34	28.3	17.7	12	86
Power distance index	34	55.7	23.7	11	100
Collectivism vs Individualism index	34	62.7	18.5	27	100
Motivation towards achievement and success index	34	44.6	24.4	5	100
Uncertainty avoidance index	34	71.8	21.4	23	100
Short-term vs. Long-term orientation index	34	52.3	10.2	32	71
Restraint vs. Indulgence index	34	41.5	19.8	13	78

As can be seen from Table 1 above, the mean of the share of renewable energy consumption across the 34 countries is 28.3%, with the minimum value of 12% belonging to Luxembourg, Malta, and the Netherlands, while the maximum of 86% is Iceland's. Regarding the Power distance index, the mean is 55.7, with the minimum value of 11 being Austria's, and the maximum value of 100 belongs to Slovakia. The average for the Collectivism vs individualism

index is 62.7, the minimum is 27 belonging to Moldova, Montenegro, and Albania, while the maximum value is the Netherlands' 100. Regarding the Motivation towards achievement and success index, the mean is 44.6, with the minimum value being Sweden's 5, and the maximum Slovakia's 100. The Uncertainty avoidance index average is 71.8, the minimum score of 23 belongs to Denmark while the maximum score of 100 is Greece's. The Short-term vs Long-term index mean is 52.3, with the minimum score being Romania's 32, while maximum score is 71 belonging to Estonia. Finally, the Restraint vs Indulgence index average is 41.5, with Latvia's 13 being the minimum score and Sweden's 78 being the maximum one. Detailed results for all variables can be found in Appendix 9.2. For a visual representation outlining the renewable energy consumption of all tested countries please refer to Figure 1 below.

Figure 1. Renewable energy consumption %



Independent sample t-tests results

Table 2. Low vs high power distance

Independent Samples T-Test

		Statistic	df	p	Mean difference	SE difference
Renewable energy consumption	Student's t	1.93 [a]	32.0	0.063	11.3	5.84

Group Descriptives

	Group	N	Mean	Median	SD	SE
Renewable energy consumption	low power distance	16	34.3	31.5	23.1	5.78
	high power distance	18	23.0	21.5	8.51	2.01

As can be seen in Table 2, due to the p value being between 0.05 and 0.1 it can be stated with a 90% significance level that renewable energy consumption is significantly higher in countries with low Power distance scores, compared to countries with high scores. In fact, the average for countries with low scores is 34.3%, compared to the mean 23% of higher scoring countries.

Table 3. Collectivism vs individualism

Independent Samples T-Test

		Statistic	df	p	Mean difference	SE difference
Renewable energy consumption	Student's t	-1.62 [a]	32.0	0.115	-9.60	5.93

Group Descriptives

	Group	N	Mean	Median	SD	SE
Renewable energy consumption	Collectivism	18	23.8	22.0	9.58	2.26
	Individualism	16	33.4	23.0	23.1	5.76

On the other hand, the p value is above 0.1 in Table 3, which indicates that there is no significant difference between renewable energy consumption in countries with scores indicative of a collectivist society and an individualistic one.

Table 4. Low vs high motivation towards achievement and success

Independent Samples T-Test

		Statistic	df	p	Mean difference	SE difference
Renewable energy consumption	Student's t	2.76 [a]	32.0	0.009	15.3	5.54

Group Descriptives

	Group	N	Mean	Median	SD	SE
Renewable energy consumption	low motivation towards achievement and success	18	35.5	29.5	20.1	4.74
	high motivation towards achievement and success	16	20.2	17.0	9.79	2.45

As per Table 4, the p value is below 0.01 which implies that with a 99% significance level, renewable energy consumption is significantly higher in countries with low Motivation towards achievement and success scores, compared to countries with high scores. The average for countries with low scores is in fact 35.5%, compared to higher scoring countries with a mean of 20.2%.

Table 5. Low vs high uncertainty avoidance

Independent Samples T-Test

		Statistic	df	p	Mean difference	SE difference
Renewable energy consumption	Student's t	2.52 [a]	32.0	0.017	14.2	5.63

Group Descriptives

	Group	N	Mean	Median	SD	SE
Renewable energy consumption	low uncertainty avoidance	16	35.8	35.5	22.6	5.65
	high uncertainty avoidance	18	21.6	20.0	7.41	1.75

As can be seen in Table 5, the p value is between 0.01 and 0.05, indicating that with a 95% significance level, renewable energy consumption is significantly higher in countries with low Uncertainty avoidance scores, compared to nations with high scores. The mean for countries with low scores is in fact 35.8%, opposed to higher scoring countries with an average of 21.6%.

Table 6. Short vs long-term orientation

Independent Samples T-Test

		Statistic	df	p	Mean difference	SE difference
Renewable energy consumption	Student's t	-1.23 [a]	32.0	0.227	-7.47	6.06

Group Descriptives

	Group	N	Mean	Median	SD	SE
Renewable energy consumption	short term orientation	19	25.0	22.0	12.2	2.79
	long term orientation	15	32.5	22.0	22.6	5.84

The p value in Table 6 is above 0.1, which indicates that there is no significant difference in renewable energy consumption between countries with scores indicative of Short-term and Long-term orientation.

Table 7. Restraint vs indulgence

Independent Samples T-Test

		Statistic	df	p	Mean difference	SE difference
Renewable energy consumption	Student's t	-0.917 [a]	32.0	0.366	-5.58	6.09

Group Descriptives

	Group	N	Mean	Median	SD	SE
Renewable energy consumption	Restraint	18	25.7	23.0	9.65	2.27
	Indulgence	16	31.3	21.5	23.8	5.94

Similarly, the p value is above 0.1 also in Table 7, demonstrating that there is no significant difference in renewable energy consumption between countries with scores indicative of Restraint and indulgence.

5.2 Qualitative analysis

After a succinct overview comparing the results with those of the Pelau and Pop study, this section offers a deep qualitative analysis of the quantitative results, aimed at improving our understanding of these results and why certain relationships exist.

The overall quantitative results are quite similar to those of the 2018 study carried out by Pelau and Pop, while still showcasing some differences. The results confirm that countries with lower Motivation towards achievement and success and Uncertainty avoidance scores, have higher renewable energy consumption compared to those with higher scores. Another similarity is the fact that no relationship was found between the dimensions of Collectivism vs individualism and Restraint vs indulgence, and renewable energy consumption. On the other hand, one of the differences is that the Pelau and Pop paper found that countries with scores indicative of a Short-

term orientation have higher shares of renewable energy consumption. Conversely, this study observed the absence of the relationship between renewable energy consumption and the Short-term vs Long-term orientation dimension. Additionally, the results from the current paper indicate that countries with lower Power distance scores have higher shares of renewable energy consumption, while this relation was not observed in the previous study (Pelau and Pop 2018).

The relationship between Motivation towards achievement and success and renewable energy consumption should not come as a surprise, as Hofstede describes countries with low Motivation towards achievement and success as relationship oriented and prioritizing environmental protection over economic growth. Oppositely, those with higher scores are considered to be ego oriented, and prioritizing economic growth over environmental protection (Hofstede 2001). This can be clearly seen in countries which have higher scores in this dimension such as Hungary, Poland, Slovakia, and the Czech Republic for which the 2030 renewable energy goals are at risk. However, this could be remedied by collaborating across borders with neighbouring countries in order to leverage each country's natural strengths related to renewable energy generation (Czyzak and Popp 2023; EC 2022). On the other hand, the culturally Scandinavian countries Norway, Finland, Sweden, Denmark, and Iceland have very low scores in this dimension. These first instance of collaboration between these countries dates back to 1915, when an underwater energy cable was laid between Sweden and Denmark. More recently they have all been collaborating closely with the help of the Nordic Council since its inception in 1952 (Norden 2023). Since then, Nordic co-operation on energy has become the most unified and mutually beneficial regional system in the world (Norden 2023).

Also the relationship between Uncertainty avoidance and renewable energy consumption can be seen as logical, as Hofstede describes cultures that exhibit low Uncertainty avoidance as being open to change and innovation, while those with high scores in the dimension as eyeing change with distrust and therefore being resistant to it (Hofstede 2001). Greece embodies the

epitome of an uncertainty avoiding society, having the maximum score in this dimension (100), and a below average renewable energy consumption share, at 22%. On paper, Greece has always had the potential of becoming a hub for solar-based energy sources, such as photovoltaics, due to its 250 days of sunshine a year (Mamara et al. 2017). However, there have been several barriers rooted in the uncertainty of consequences that have impeded Greece's transition from traditional energy sources to renewables (Nikas et al. 2020). The ambiguous effects of a solar-based transition on the Greek economy due the ongoing recession, coupled with limited acceptance levels from the general public regarding renewable energy initiatives, steep technological costs, and instability in regulatory frameworks have discouraged its implementation (Nikas et al. 2020). On the other end of the spectrum, we have Sweden, a country with a low score in Uncertainty avoidance (29), which has been systematically implementing innovative solutions in its energy sector, leading to an impressive 63% in renewable energy consumption. The country is a powerhouse when it comes to innovation in the energy sector. In fact, successful cooperation among energy companies, start-ups and academia, coupled with copious research on innovative sustainable energy solutions are some of the reasons as to why Sweden is one of the leaders in renewable energy (Hemström 2022).

The fact that countries with low scores in the Power distance dimension have higher levels of renewable energy consumption, can be explained by the fact that countries with low scores in this dimension promote democratic participation in society (Hofstede 2001), which encourages dialogue and support for social issues and environmental sustainability (Sun et al. 2019). On the other hand, societies with high scores are more autocratic in nature, rarely question authority, provide little room for discussion and information sharing as predominantly people in power are expected to contribute to decision-making (Hofstede 2001), and misinformation is more common (Ognyanova et al. 2020; Sheikh et al. 2021). A blaring example of a country with high Power distance is Slovakia with the highest score (100) and with a meagre 17%

renewable energy consumption. In Slovakia there have been cases of misinformation propagated by politicians with interests in the non-sustainable energy sector that cast doubt on the reliability and effectiveness of renewable energy and of the European climate policy (Martinat et al. 2013; Ružičková 2022). The country's steep Power distance entails that as people are less likely to question authority, this misinformation has damaged the public perception of renewable energy more than it would have in countries with lower Power distance. On the other hand, Austria has a very low Power distance score (11), with a good 36% of renewable energy consumption. The country's low score is indicative of participative, direct communication and authority can be questioned (Hofstede 2023). In fact, 66% of Austrians have expressed their belief that they are more preoccupied than their government concerning climate change, and 67% believe the country will not be able to meet its 2050 carbon emission reduction targets as per the Paris Agreement (EIB 2021).

Outliers

By understanding the reasons as to why certain countries diverge from the test results, policymakers can tailor their policies to specific countries and identify elements that overpower the influence of the cultural dimensions. The two most significant outliers with regards to all three cultural dimensions that impact renewable energy are Albania and The Netherlands.

Albania has a high score in Motivation Towards Achievement and Success (80), a high score in Power Distance (90) and a relatively high score in Uncertainty Avoidance (70), which while average among European countries, is still considered a high score (Hofstede 2023). Contrarily to what the results indicate, Albania has one of the highest renewable energy shares on gross final energy consumption in Europe at 41%. The nation has made significant progress in the field of renewable energy, which sets it apart from some of its Balkan neighbors. One of the reasons behind this is Albania's abundant hydropower potential, as the country is blessed with numerous rivers and a mountainous terrain, making it well-suited for hydropower generation.

This has led to almost 100% of all energy in Albania being generated by hydropower (Todorović 2023). Furthermore, Albania's ambitious plans to become an energy leader in the region and a net power exporter by 2030 has led the country's government to proactively promote renewable energy. Notably, the country has implemented favorable policies and incentives to attract investments in the sector (Todorović 2023). However, the country's renewable energy plans are not without their issues, as the nation still faces challenges in ensuring a stable energy supply (DENA 2021). Hydropower generation is subject to seasonal variations and fluctuates with weather conditions, which can lead to energy uncertainty and reliance on other sources (such as energy imports) during dry periods. In fact, in 2021 alone, Albania spent over €215 million on imported energy, which is almost half of the €481 million revenue generated by the state's electricity company for the same period (Taylor 2021). Due to these shortages, Albania faces issues related to power outages, especially during periods of low hydropower production (Todorović 2023), highlighting that while Albania is indeed one of the country's in Europe with the highest renewable energy consumption, its energy generation process has severe flaws (Taylor 2021). In fact, while a country should seek new energy sources to diminish its reliance on fossil fuels, it should do so pragmatically and meticulously as the country's energy demand still needs to be met so as to not negatively affect citizens (IRENA 2018).

On the other hand the Netherlands has a very low Motivation Towards Achievement and Success score (14), a low Power Distance score (38), and an average Uncertainty Avoidance score (53) (Hofstede 2023). Yet, it has one of the lowest renewable energy shares on gross final energy consumption in Europe at 12%. The Netherlands' slower progress in renewable energy consumption compared to other European countries can be attributed to two main hindering factors: its geographical constraints and its historic reliance on natural gas. The Netherlands is extremely densely populated with a high energy demand and limited land available for large scale renewable energy plants such as wind farms, which has made it more challenging to

expand its renewable energy capacity (CBS 2019). Furthermore, due to the country's lack of mountainous terrain, harvesting hydropower is extremely challenging as this is usually achieved using rivers flowing at an incline (CBS 2019). The Netherlands also has a long history of natural gas production and use since the discovery of the Groningen gas field in 1959 and other smaller gas deposits. Since then, the country was heavily reliant on natural gas for its energy needs until 2012, when an earthquake caused by the gas extraction highlighted security risks and damaged public opinion regarding the gas production field (Van Loo 2018). Shifting away from natural gas presents significant challenges, but the Dutch government has planned for a gradual decrease in gas production, with the eventual target of 2030 being the complete cessation of gas extraction (Van Loo 2018). To compensate for this reduction in energy, concur with public opinion, and abide to the European Union's targets, The Netherlands is working hard to grow its renewable energy share in a sustainable and efficient way. In fact, it is aiming to more than double its current share of renewable energy consumption by 2030 to 30% (EC 2023c).

6. Discussion

6.1 Implications and recommendations for policymakers

Based on the quantitative and qualitative analyses, various implications emerged, which led to the formulation of various recommendations for supranational policymakers.

Policymakers should strongly bear in mind that countries with high scores in the Motivation towards achievement and success are inclined to prioritize economic growth over environmental sustainability and be ego oriented over relationship oriented. They should therefore provide stronger incentives for collaboration to countries with higher scores in this dimension. Additionally, they should sensitize these countries to the fact that economic growth will be hindered by climate change (Wade and Jennings 2016), and so it is also in their best interest to increase renewable energy consumption in order to mitigate climate change.

The tendency for discomfort of the unknown associated with innovation and change in countries with high scores in Uncertainty avoidance should be considered by policymakers. They should promote policies which encourage detailed information sharing with the public regarding renewable energy projects, thus tackling the lack of awareness on the topic of renewable energy, and therefore improving its acceptance (Segreto et al. 2020). Furthermore, policymakers should also promote investments in Research and Development to encourage innovation.

When dealing with countries with high Power distance scores, supranational policymakers such as the EU should consider the proclivity of said societies of rarely questioning authority, leaving little room for public discussions, and having higher instances of misinformation. Therefore, they should create policies that promote educational campaigns to raise awareness about the overall benefits and risks of renewable energy, thus increasing transparency and exposing misinformation. Furthermore, they should encourage public dialogue and engagement regarding energy related topics, allowing citizens to voice their concerns and opinions.

When analysing Albania as an outlier, it became clear that supranational policymakers should create policies that encourage diversification of renewable energy generation for countries that currently generate renewable energy from only one source. This could prevent the pitfall of a country investing mostly in one type of renewable energy generation solution due to the benefits of economies of scale of this approach (Gitelman, Kozhevnikov, and Visotskaya 2023).

Analyzing the case of the Netherlands as an outlier allows supranational policymakers to understand that even though a country might be very culturally acceptant of renewable energy (Klok, Kirkels, and Alkemade 2023), there might factors that inhibit their extensive consumption. It is therefore crucial for the relevant supranational policymaking entities to also examine countries with scores normally associated with higher renewable energy consumption levels, to determine whether these factors are present and act when necessary. Concerning geographical constraints, policymakers should promote an effective use of the available land to

maximize renewable energy output, while also encouraging collaboration with neighboring countries whenever possible (as previously seen). In addition, policymakers should tackle historical reliance on unsustainable energy sources by easing the transition by promoting the creation of a practical phase out plan in favor of renewables.

6.2 Limitations

This research only focuses on the consumption of “traditional” renewable energies generated by means of natural occurring phenomena, but does not consider other promising low carbon emission energy sources alternatives such as nuclear (Rehm 2023). Additionally, the production of green hydrogen was not considered among the renewable energy sources, as its use is still extremely limited and therefore negligible (IRENA 2019).

Furthermore, this paper analysed the renewable energy consumption and cultural dimensions of countries as a whole. While it has highlighted certain important aspects that could benefit policymakers, a more detailed insight into each country's culture is missing. In all countries in fact there are subcultures, which could be on a regional, provincial, or even on a city level (Lenartowics and Roth 2001). Therefore, analysing the cultural variations within a country would have provided more insight into the relationship between renewable energy consumption and cultural dimensions and allowed for more precise recommendations to policymakers.

Additionally, from a methodological perspective, the quantitative analysis in this study is quite simplistic. As the observations taken into consideration for this paper are 34, one per each country analysed, it was not possible to properly carry out a multiple linear regression analysis. This would have allowed to incorporate control variables when testing the various assumptions, thus rendering the tests more accurate (Austin and Steyerberg 2015).

6.3 Further research

Thus far research concerning the relationship between renewable energy consumption and

cultural dimensions has been carried out exclusively using Hofstede's Cultural Dimensions model. Future researchers should therefore consider utilizing different cultural models for testing, such as Dorfman and Howell's Model and Schwartz Culture Model (Dorfman and Howell 1988; Schwartz 2008). This should be done in order to ascertain whether the rationale behind the relationship between renewable energy consumption and cultural dimensions follows the same logic as per with Hofstede's cultural dimensions.

Furthermore, as highlighted in the limitations, there is potential for further research regarding the analysis of the relationship between regional, provincial or city level subcultures and renewable energy consumption. A study found that community-based and culturally sensitive approaches are the ideal way of engaging marginalized individuals and subverting the prevailing societal conventions regarding unsustainable energy usage and renewable energy acceptance (Goggins et al. 2022; Sovacool and Griffiths 2020). Understanding these relationships on such a micro level could help national policymakers formulate policies that specifically target each sub-culture, thus maximizing their effectiveness.

7. Conclusion

The purpose of this paper was to reassess previous findings and provide new explanations to the relationship between renewable energy consumption and cultural dimensions and offer novel recommendations to supranational policymakers based on qualitative analysis.

Countries with a lower score in Motivation towards achievement and success have higher renewable energy consumption due to their proclivity to cooperate and prioritize environmental protection, compared to those with higher scores. The latter in fact tend to prioritize economic growth and are more ego oriented. Policymakers should therefore encourage mutually beneficial international renewable energy collaborations in countries with high scores in this dimension. Similarly, countries with lower scores in Uncertainty avoidance have greater levels

of renewable energy consumption compared to countries with higher scores. This is due to the former's openness to change and innovation, while conversely countries with higher scores are more resistant to them due to their ambiguity. Policies promoting investments in Research and Development, and detailed information sharing with the public regarding renewable energy projects should be implemented by supranational policymakers in countries with high scores in this dimension. Additionally, renewable energy consumption was found to be greater in countries with lower Power distance scores compared to those with higher scores, as the former promotes democratic participation and support for environmental sustainability. The latter, on the other hand, favors a more autocratic environment which does not encourage discussion nor the questioning of authority, favoring the spread of misinformation. Policymakers should therefore encourage public dialogue and engagement, and promote educational campaigns to increase knowledge on renewable energy. Also the study of outliers provides valuable insight for policymakers. In fact, despite its high renewable energy consumption, Albania faces power supply issues due to its overdependence on hydropower. This highlights the need for policymakers to promote diversification in the power grid for countries reliant on primarily one renewable energy source. On the other hand, the Netherlands faces challenges in the form of geographical constraints and its historical reliance on natural gas. This emphasizes the necessity for policymakers to promote effective land use, cross-border collaborations and a transition plan to renewables for countries with low scores in all dimensions linked to higher renewable energy consumption, but that face similar constraints as the Netherlands.

Understanding the nature of the relationship between cultural dimensions and renewable energy consumption is crucial. The qualitative analysis of this relationship carried out in this paper provides additional detailed insights for supranational policymakers. Therefore, it would be beneficial for them to incorporate the recommendations provided in this paper, as this will undoubtedly facilitate and accelerate the renewable energy transition.

8. References

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9. Appendix

9.1 List of countries used for testing

Table 8. Complete list of countries

Albania
Austria
Belgium
Bulgaria
Croatia
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Italy
Latvia
Lithuania
Luxembourg
Malta
Moldova
Montenegro
Netherlands
North Macedonia
Norway
Poland
Portugal
Republic of Ireland
Romania
Serbia
Slovakia
Slovenia
Spain
Sweden
United Kingdom

9.2 Descriptive analysis results

Table 9. Renewable energy consumption % per country

Country	**Renewable energy consumption %**
Luxembourg	12
Malta	12
Netherlands	12
Belgium	13
Republic of Ireland	13
Hungary	14
United Kingdom	14
Poland	16
Bulgaria	17
North Macedonia	17
Slovakia	17
Czech Republic	18
France	19
Germany	19
Italy	19
Spain	21
Greece	22
Moldova	22
Romania	24
Serbia	25
Slovenia	25
Lithuania	28
Croatia	31
Portugal	34
Denmark	35
Austria	36
Estonia	38
Montenegro	40
Albania	41
Latvia	42
Finland	43
Sweden	63
Norway	74
Iceland	86

Table 10. Power distance index score per country

Country	**Power distance index score**
Austria	11
Denmark	18
Republic of Ireland	28
Iceland	30
Norway	31
Sweden	31
Finland	33
Germany	35
United Kingdom	35
Netherlands	38
Estonia	40
Luxembourg	40
Lithuania	42
Latvia	44
Hungary	46
Italy	50
Malta	56
Czech Republic	57
Spain	57
Greece	60
Portugal	63
Belgium	65
France	68
Poland	68
Bulgaria	70
Slovenia	71
Croatia	73
Serbia	86
Montenegro	88
Albania	90
Moldova	90
North Macedonia	90
Romania	90
Slovakia	100

Table 11. Collectivism vs Individualism score per country

Country	**Collectivism vs Individualism score**
Moldova	27
Montenegro	27
Albania	27
North Macedonia	40
Serbia	42
Croatia	42
Romania	46
Poland	47
Bulgaria	50
Italy	53
Lithuania	55
Slovakia	57
Republic of Ireland	58
Malta	59
Greece	59
Portugal	59
Luxembourg	60
Estonia	62
Spain	67
Czech Republic	70
Latvia	70
Hungary	71
France	74
Finland	75
United Kingdom	76
Austria	77
Germany	79
Belgium	81
Slovenia	81
Norway	81
Iceland	83
Sweden	87
Denmark	89
Netherlands	100

Table 12. Motivation towards achievement and success score per country

Country	**Motivation towards achievement and success score**
Sweden	5
Norway	8
Latvia	9
Iceland	10
Netherlands	14
Denmark	16
Slovenia	19
Lithuania	19
Finland	26
Estonia	30
Portugal	31
Moldova	39
Bulgaria	40
Croatia	40
Spain	42
Romania	42
France	43
Serbia	43
North Macedonia	45
Malta	47
Montenegro	48
Luxembourg	50
Belgium	54
Czech Republic	57
Greece	57
Poland	64
United Kingdom	66
Germany	66
Republic of Ireland	68
Italy	70
Austria	79
Albania	80
Hungary	88
Slovakia	100

Table 13. Uncertainty avoidance index score per country

Country	**Uncertainty avoidance index score**
Denmark	23
Sweden	29
Republic of Ireland	35
United Kingdom	35
Norway	50
Iceland	50
Slovakia	51
Netherlands	53
Finland	59
Estonia	60
Latvia	63
Germany	65
Lithuania	65
Luxembourg	70
Austria	70
Albania	70
Czech Republic	74
Italy	75
Croatia	80
Hungary	82
Bulgaria	85
France	86
Spain	86
North Macedonia	87
Slovenia	88
Romania	90
Montenegro	90
Serbia	92
Poland	93
Belgium	94
Moldova	95
Malta	96
Portugal	99
Greece	100

Table 14. Short-term vs Long-term orientation score per country

Country	**Short-term vs Long-term orientation score**
Romania	32
North Macedonia	35
Serbia	37
Italy	39
Croatia	40
Montenegro	40
Portugal	42
Hungary	45
Malta	47
Spain	47
Austria	47
Poland	49
Lithuania	49
Slovenia	50
Republic of Ireland	51
Bulgaria	51
Czech Republic	51
Greece	51
Sweden	52
Slovakia	53
Norway	55
Albania	56
Germany	57
Iceland	57
Denmark	59
United Kingdom	60
France	60
Belgium	61
Finland	63
Luxembourg	64
Netherlands	67
Latvia	69
Moldova	71
Estonia	71

Table 15. Restraint vs Indulgence score per country

Country	**Restraint vs Indulgence score**
Latvia	13
Albania	15
Bulgaria	16
Lithuania	16
Estonia	16
Moldova	19
Romania	20
Montenegro	20
Slovakia	28
Serbia	28
Poland	29
Czech Republic	29
Italy	30
Hungary	31
Croatia	33
Portugal	33
North Macedonia	35
Germany	40
Spain	44
France	48
Slovenia	48
Greece	50
Norway	55
Luxembourg	56
Belgium	57
Finland	57
Austria	63
Republic of Ireland	65
Malta	66
Iceland	67
Netherlands	68
United Kingdom	69
Denmark	70
Sweden	78