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An Investigation of Factors Affecting the Willingness to Invest in Renewables among Environmental Students: A Logistic Regression Approach

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Abstract: Renewable energy sources (RES) have gained increased popularity across the world mainly due to their ability to contribute to environmental protection through the generation of infinite 'clean' energy. To achieve a greater diffusion of renewables, however, small-scale investments implemented by individuals are critically important. In contrast to citizens whose attitudes have been consistently explored by research, there is little evidence on the attitudes towards investments among environmental students who will occupy positions of responsibility and play key roles in the environmental sector in the future. Hence, the purpose of the present study is to identify the most important factors that affect environmental students' willingness to invest in renewable energy (RE) by developing a logistic regression model. According to our analysis, the participants in their majority expressed their willingness to invest, while environmental values, the low risk and profitability of renewable investments, as well as preferences for certain energy types were significant factors determining this willingness. However, willingness to invest was irrespective of the current taxation and subsidies, suggesting that significant improvements are required in these areas. The present study could be particularly useful for policymakers since the necessary steps to create favorable investment environments in Greece and elsewhere are highlighted.

Keywords: willingness-to-invest; energy investments; renewable energy sources (RES); perceptions; attitudes; department of forestry; environmental science; university students

1. Introduction

For a fourth consecutive year, the worldwide net capacity additions for renewable energy significantly exceeded those for fossil fuels and nuclear power, while renewables accounted for more than one-third of the total global installed power capacity in 2018. During the same year, a total of USD 36.3 billion was invested in small-scale distributed capacity (i.e., investments in solar photovoltaics systems smaller than 1 MW), a 15% decrease compared to 2017 [1].

Regarding Greece, the development of renewable energies shows a definite upturn [2] while the Renewables 2019 Global Status Report placed the country among the nine countries in the world which present more than 20% electricity production from renewables [1]. According to the latest reports [3], in Greece, the share of renewable sources accounted for 31% of electricity production in 2016 with the main renewable sources being solar, wind, and hydropower. More analytically, solar power production witnessed a striking growth since it rose from 0.16 TWh in 2010 to 3.9 TWh in 2016. Likewise, wind energy production increased from almost nonexistent levels in the end of the 1990s to 5.1 TWh in 2016, which corresponds to 10.5% of the total electricity production. At the same time, hydropower has been experiencing a steady increase in its share of renewable electricity, but with significant annual

fluctuations—reaching 5.5 TWh in 2016 which accounts for 11.4% of the total production. During the same year, the share of electricity from bioenergy covered less than 1% of the total production [3]. At the same time, the country is renowned for its impressive implementation of solar installations and Greece is one of the pioneers in terms of solar systems' use, with the first systems being installed in the late 1970s, whereas in 2016, the country had already achieved one of the highest shares of solar photovoltaics in the total primary energy supply among IEA countries [3].

The impressive share increases mentioned above were driven mainly by supporting policies and in specific by a series of feed-in-laws, namely Law No 3468/2006, Law No 3734/2009, and Law No 3851/2010 [4–6]. These laws established fixed prices for renewable electricity, forming an attractive investment environment. Law No 3851/2010 is still in effect today and was initially established to address the numerous pending applications for the approval of photovoltaic system applications which had brought the domestic photovoltaic market close to collapse. The same law also foresaw the simplification and acceleration of administrative processes which concerned the permits of installations. In addition to the feed-in laws and the simplification of procedures, various programs and mechanisms have been introduced to aid the development of renewable energies in Greece. For instance, the Financial Program "Save Energy at Home II" provides financial support for upgrading the energy of residences. Beneficiaries, who are selected based on the residence's initial energy category and their income, are offered support through fractional subsidization combined with favoring bank loans from contracting bank institutions. The actions following the provision of finance enhance the energy of the residence with the focus being placed on shell improvements and upgrades in heating/cooling systems as well as warm water usage [7]. Simultaneously, the country is designing competitive auctions for larger wind and solar installations as well as market-based premiums to prevent high-cost overruns [3]. With regard to these new policies and measures, the renewable sector can be expected to experience further development and attract considerable small- and large-scale investments which will in turn help the country to further increase the share of its renewable electricity production.

Beside large investments implemented by the state and private investors, small-scale investments made by citizens can contribute significantly to the achievement of the targets and the rapid diffusion of renewables [8]. To increase small-scale investments, however, citizens need to be adequately willing to invest their savings or part of their income in renewable energies. In Greece, the public responded positively to incentives for photovoltaic systems (enacted with Law 3468/2006) and laws forming an attractive investment and licensing climate. Moreover, the applications were so numerous that the licensing for specific photovoltaic categories had to be suspended [6]. This reflected the increased interest of householders to invest in their own microgeneration system when the conditions in terms of incentives and legislation were deemed favorable. In addition, it is interesting to observe that citizens' positive response to investments in photovoltaics was recorded during the time of economic crisis.

In a broader perspective, the public needs to be positively inclined towards investments in environmentally friendly energy technologies to proceed with the investment. Acknowledging the effect of personal attitudes on decision-making regarding investments, a growing body of research has been examining attitudes indicating that attitudes comprise the key to predict investment behaviors [9,10].

In the relevant literature, most previous studies have typically focused on the willingness of individuals to pay for renewable energy [11–19], while a substantial number of studies has explored individuals' willingness to invest in renewable energy [9,20–24]. As observed, no study has so far examined explicitly young respondent groups such as undergraduate students whose study field is closely related to the environment. Nevertheless, it is quite relevant to examine the attitudes of students majoring in environmental sciences not only because these students have an adequate understanding of energy topics, but mainly because in their future careers they will be required to take a stand towards renewable energy and their decisions will affect the deployment of renewable energy. Hence, the primary aim of the present study is to identify the factors that affect the willingness to invest in renewables among students majoring in the Department of Forestry and Management of

the Environment and Natural Resources at the Democritus University of Thrace. Moreover, the study also builds participants' profiles by collecting data relating to their sociodemographic characteristics and their views on energy-related topics.

The present study and its findings could be particularly useful to policymakers, developers, and marketers in their efforts to create favorable investment environment in Greece and elsewhere. In addition, our results reveal new insights into individuals' investment willingness, thereby contributing to the relevant literature strand and enabling researchers to build on the findings to carry out further studies. Furthermore, the novelty of the present paper is the focus on students' awareness about RES by examining the factors that affect their willingness to invest in renewable energy in their later life through the performance of logistic regression analysis.

The paper is structured as follows. In the next section, the findings of previous relevant studies are presented and discussed. Then, Section 3 describes the area of study as well as the methodology the authors followed to perform the study and to develop the logistic regression model. The results are thoroughly presented in Section 4 and discussed in Section 5. Afterwards, in Section 6, conclusions based on our analysis and discussion are drawn.

2. Literature Review

The diffusion of renewable energies is a prerequisite for achieving a low-carbon energy system that can alleviate pressing environmental issues such as climate change [25,26]. Nowadays, citizens are given the option to participate in this endeavor by investing in renewable energy and, in this regard, discovering the attitudes of the public towards investments is an integral part of strategies aimed at increasing investments. Acknowledging the role of the public, a growing body of literature has examined its perceptions and attitudes in an attempt to identify the factors that affect the willingness to invest in renewables. Overall, these studies illustrate that environmental values, confidence in the technology of renewable energy systems, previous experience in investments, age, place of residence, educational level, preference for comfort, social class, and house ownership are factors that can determine the investment willingness of the public [9,10,20,24,27–29].

In terms of environmental values, in countries which are known for their successful implementation of renewable energy, citizens were mainly driven by their environmental values to invest in RES. Indicatively, in a qualitative study on household adoption of small-scale electricity production in Sweden, environmental concerns were what motivated adopters' decisions to install the systems, while the respondents emphasized the need to think about the environment and live 'as ecologically sustainably as possible' [30]. Similar results emerged in another study in the US [31] with the development of a fuzzy logic reference model indicating that for consumers who had already adopted photovoltaics in US, the perceived environmental benefit was positively related to their decision-making. Likewise, in Canada it was observed that environmental values could predict the adoption of sustainable technologies among citizens [27]. The important role of environmental values was also detected in Austria, Italy, and Germany, where relevant studies examining the socio-psychological patterns of RES investments concluded that the desire to make a contribution to environmental protection comprised a key factor for making investments favoring the environment [23,29]. It is also noteworthy that environmental awareness was identified as an important investment factor in countries which present a relatively lower installed RES capacity such as Tunisia, Egypt, Lebanon, Jordan, [28] and Turkey [32]. This indication suggests that environmental awareness is universally influential and to some degree independent of financial restrictions.

Apart from environmental awareness, attitudes towards the financial aspect of investments in renewables are important to discuss. As indicated, the decision to make investments is often based on the individual's evaluation of the expected profitability which if deemed adequate, the investment proceeds [33]. This resonates with Bergek et al. [8] who claimed that investments in renewable energy are made when an opportunity is identified and when the value of exploiting this opportunity is high enough. Building on this, the same research team concluded that the potential value of an

opportunity, namely the profit, is a notable motive behind the decision, while accessibility of financial resources affects further investment willingness. At the same time, although incentives had initially paved the way to citizen investment, their long-term effectiveness is often disputed. On one hand, financial incentives have undoubtedly assisted the diffusion of renewable energies across different countries [32,34]. Nevertheless, the positive impacts of financial incentives are often unexpectedly temporary and unstable because individuals tend to revert to their previous behavior once rewards are removed, whereas individuals who are intrinsically motivated to act altruistically respond negatively to extrinsic rewards [35].

In contrast to the positive influence of environmental values and perceived profitability, the lack of trust in the technology of renewable systems can affect adversely an individual's decision to invest. In particular, it was indicated that potential investors' low degree of confidence in the effectiveness of the technology was negatively related to their decision-making [24]. Furthermore, homeowners were less likely to invest when they misunderstood the functioning of the technology [29] or when they considered that the renewable systems were new on the market and therefore disadvantageous to purchase [30]. The lack of confidence can thus to some extent account for the fact that the diffusion of RES is relatively slow and that microgeneration technologies are often described as 'resistant innovations' in many European countries [10].

As with all types of investments, experience is considered an influential factor in the final decision to invest in renewables. However, existing research findings are conflicting about whether previous investment experience causes positive or negative responses to RE investments. In particular, Leete et al. [36] found that investors who were experienced in marine renewable energy were less likely to do so again since they understood the scale, cost unpredictability, and the required time for developing these technologies. Conversely, Masini and Menichetti [24] as well as Ek et al. [33] argued that former experience with investments increases the likelihood to invest in renewable energy. Regardless of these studies, it appears that in the case of photovoltaic panels, which are widely implemented in some European countries, such as Germany and Denmark [37], being able to 'experience' and observe the functioning of the systems on the rooftops of neighboring houses can stimulate the interest of individuals and induce them to invest [27] as was the case with California where the early installation of solar photovoltaic panels in the neighborhood of potential investors rapidly diffused the installation of solar panels [38].

In addition to the above factors, the age of potential investors has been found to affect an individual's inclination to invest; however, age seems to exert an ambiguous influence on investment decisions. On one hand, there is evidence that younger individuals are more open to RES compared to their older counterparts [24]; but, on the other hand, different findings indicated that older people were more likely to be aware of microgeneration technologies and hence more likely to adopt them [10]. That being said, recent findings detected that older respondents were unwilling to invest in renewable technologies probably because they were discouraged by the long payback periods [28]. It can thus be suggested that the influence of age as a factor affecting investments is multifaceted and unclear, thereby calling for further investigation.

Another factor that has been found to be substantially influential is the type of place an individual resides with studies showing that rural dwellers are generally more positively inclined towards renewable investments [39]. For example, city inhabitants in Ireland were unaware of renewable microtechnologies [10], whereas rural residents in Germany were more willing to switch from their current conventional energy situation to a sustainable domestic energy system compared to the city inhabitants who participated in the same study [29]. The same applied to Swedish respondents living in rural areas who regarded investments in micropower plants as a 'logical and practical option' which enabled them to become self-sufficient and energy independent but also resonated with their chosen lifestyle and wish to use the available natural resources [30].

Other variables affecting investment willingness encompass educational level, house ownership, as well as preference for maintaining comfort, status quo, and social class. Of these, high educational

level [29,34] and house ownership [23] have been found to have a positive effect on an individual's willingness to invest in renewable energy, while higher educational levels are also linked to increased concerns about the ecological impacts of renewable installations [40]. Meanwhile, in their decision to change their current fossil fuel-based energy system, homeowners can be affected by social norms [9] and their wish to maintain their accustomed comfort and current status quo [29]. In relation to this point, the application of behavioral economics revealed that individuals have the tendency to make social comparisons, follow other people's behavior, and comply with social norms, namely the explicit and implicit rules, guidelines, and behavioral expectations [35]. In this regard, individuals are expected to invest if other people in their close environment have done so and vice versa. As for social class, so far it has been indicated that those belonging to the upper-middle classes are more aware of microgeneration technologies [10] and hence more likely to adopt them.

As observed, the literature on investment willingness relating to renewable energy has mainly focused on analyzing the perceptions and intentions of citizens in different countries. In relation to university students, there is a plethora of relevant studies exploring students' knowledge, perceptions, and attitudes towards renewables in different countries [41–46], whereas the existing studies analyzing undergraduate students' willingness either to pay for or invest in renewable energy are scarce. Indicatively, so far it has been indicated that Chinese undergraduate students were willing to pay additional amounts of money for clean energy or for switching from their current conventional energy systems to renewable energy-based or forest bioenergy-based systems [43]. Likewise, Canadian and Romanian students were positively inclined towards paying for renewable energy-based electricity [47]. Meanwhile, a considerable share of Palestinian university students (60.3%) expressed their willingness to invest in RES projects if such an opportunity emerged, while 71.3% of respondents regarded investments in these projects as successful [48]. It can be seen that only a few studies have, inter alia, examined the investment willingness of university students while no study has performed further analyses to understand the factors that determine their willingness or unwillingness to make renewable investments in the future.

The main conclusion to be drawn from the previous research efforts on attitudes towards investments in renewables, given the aim of this paper, is that overall there exists substantial interest in this special type of investments. With the exception of environmental awareness, which has a profound impact on potential investors, certain factors have emerged as complex and thus further research is needed to understand them. Their investigation should, however, not be neglected because these factors can pave the way for increasing investments. In addition, the understanding of potential investors' mindset can become an effective tool in the hands of policymakers and developers to create a favorable investment environment that will attract more investments among citizens who wish to make profit, but also citizens who look to express their environmental values through investing in environmentally friendly energy production systems.

3. Materials and Methods

3.1. Area of Study

The Area of Study was the Department of Forestry and Management of the Environment and Natural Resources of the Democritus University of Thrace, which is located in the town of Orestiada in northern Greece. The Department was founded in the academic year 1999–2000 and its current enrollment rate is 105 new students per year. It is worthwhile to note that the Department of Forestry and Management of the Environment and Natural Resources aims at promoting the Sciences of Forestry and the Environment while advancing scientific knowledge in the area of Natural Resources Management. The graduates are highly qualified and capable of conducting research and using advanced technologies for the development, improvement, protection, and management of forests, forest lands, and the natural environment. Another objective of the Department is to contribute to the development of the Science of Forestry through academic training, research, scientific publications, and textbook

development. Finally, the Department and its graduates can help improve the management of forests in Greece and protect the country's natural environment. The duration of the undergraduate studies is five years and the curriculum includes multiple courses. Beside the explicitly environmentally- and forestry-related courses, students also attend renewable energy-related courses, such as "Renewable Energy Sources", "Energy and Environment", and "Forest Energy". In addition, there are courses which aim at enhancing students' environmental awareness such as "Environmental Education", "Environmental Communication", "Environmental Policy", and "Forest Policy" [26].

3.2. Methods

The findings which are presented in this paper are part of wider research which investigated the awareness levels of the students majoring in the Department of Forestry and Management of the Environment and Natural Resources about renewable energy sources.

For the purposes of the study, a structured questionnaire consisting of 21 closed-ended questions was designed (the full version of the questionnaire can be seen in Karasmanaki and Tsantopoulos [26]). The closed-ended type was considered appropriate since it requires little time and effort to be completed. To ensure that the questionnaire could give coherent and accurate results, it was tested on a limited scale and minor changes were made. Once the final form was ready, the questionnaire was administered to the participants at the beginning of regular class periods with the consent of the professors. The respondents of the sample were undergraduate students of all years of study and, in total, 214 students took part in the study.

The questionnaire consisted of six sections with the first involving a set of questions collecting participants' sociodemographic characteristics. The second section included questions which investigated students' awareness about RES but also their views on various environmentally- and energy-related topics. Then, the third section examined their willingness to invest in renewables, to work in the RES sector and to pay for the development of RES. Afterwards, the fourth section explored respondents' feelings about energy scarcity due to resource depletion and their preferences for various energy types. The fifth section investigated their perceptions of ways and approaches to transition to a low-carbon energy system as well as reasons to adopt RES. Finally, the last section explored their views on environmental responsibility and their preferences for different types of media. It should also be noted that the questions were rated on five-, six-, and ten-point Likert scales, while there were also questions with dichotomous ("yes/no") answers.

Once the collection of the questionnaires was completed, the data were analyzed with the Statistical Package for Social Sciences (SPSS). Initially, descriptive statistics were estimated for all variables. Then, logistic regression was employed to estimate the parameters of a logistic model. According to Hosmer et al. [49] logistic regression is a statistical method for analyzing a dataset in which there are one or more independent variables which determine an outcome. The outcome is estimated with a dichotomous variable (in which there are only two possible outcomes). In logistic regression, the dependent variable is binary or dichotomous meaning that it only contains data coded as 1 (such as 'True', 'Yes') or 0 ('False', 'No'). If the dependent variable is continuous, it can be dichotomized at some logically meaningful cut point. The goal of logistic regression is to find the best fitting and logically reasonable model to describe the relationship between an outcome (dependent or response variable) and a set of independent (predictor or explanatory) variables [49]. Moreover, unlike the classic linear regression where the parameters are computed using the least squares method, logistic regression estimates the parameters using the likelihood ratio. In this way, the response variable (predicted) is a function of the likelihood that a particular observation (individual) will be in one of the two categories of the dichotomy.

In the present study, since the dependent variable was binary (dichotomous), the function of the binary logistic regression was:

$$f(\text{Z}) = \frac{e^z}{1 + e^z} = \frac{1}{1 + e^{-z}} \tag{1}$$

where Z is the input variable and $f(Z)$ its outcome. One of the advantages of this function is that the input variable takes positive and negative values, whereas the outcome $f(Z)$ ranges between 0 and 1. More analytically, the variable Z represents the combined influence of a set of variables, while $f(Z)$ defines the likelihood of a specific outcome resulting from this action.

In addition, variable Z expresses the measure of the overall contribution of all participating independent variables to the model and is defined as:

$$z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k \qquad (2)$$

where, β_0. is the intercept of the regression line and β_i the coefficients of the independent variables, expressing the contribution of each variable.

When a coefficient takes a positive value, the explanatory variable increases the likelihood of a successful outcome (i.e., the realization of the event). Conversely, a negative coefficient value means that the variable decreases the likelihood of the outcome. In addition, a high value of the coefficient would signify that the independent variable significantly affects the likelihood of the realization of the event, whereas a low value would denote a small effect of the independent variable on the likelihood of having the relevant result.

4. Results

First, the results of descriptive statistics concerning the sociodemographic characteristics of the students participating in the survey are presented. The next part of the results reveals students' preferences for different energy types, their views on reasons for adopting renewables, and their daily environmental habits. Finally, the logistic model that emerged from the application of logistic regression is fully described and explained.

4.1. Sociodemographic Characteristics

According to Figure 1a, 53.7% of the participants were male and 46.3% female. As for their year of study, Figure 1b shows that the second- and third-year of study presented lower participation, while first, fourth, and fifth years had greater percentages.
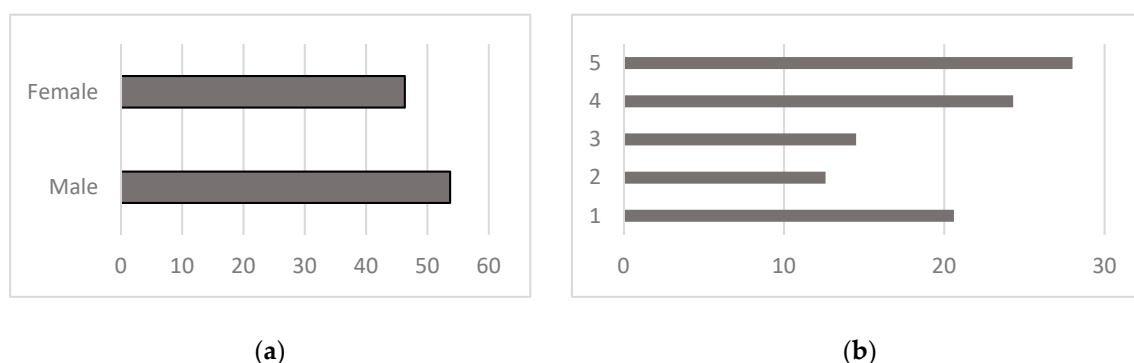

(**a**)　　　　　　　　　　　　　　　　　　　　　(**b**)

Figure 1. Percentages of (**a**) Students' gender; (**b**) Students' year of study.

The students' family background in terms of parental occupational and educational level were also examined. As given in Figure 2a, a significant share of the students' fathers was employed in the public (26.6%) and private (22%) sector. Likewise, as it appears in Figure 2b, a similar proportion of the participants' mothers were also employed in the public and private sectors (24.8% and 21.5%, respectively). Meanwhile, a substantial percentage of mothers (23.8%) were full-time housewives without being engaged in paid work. Finally, only 11.7% and 17.2% of parents were unemployed and pensioners, respectively.
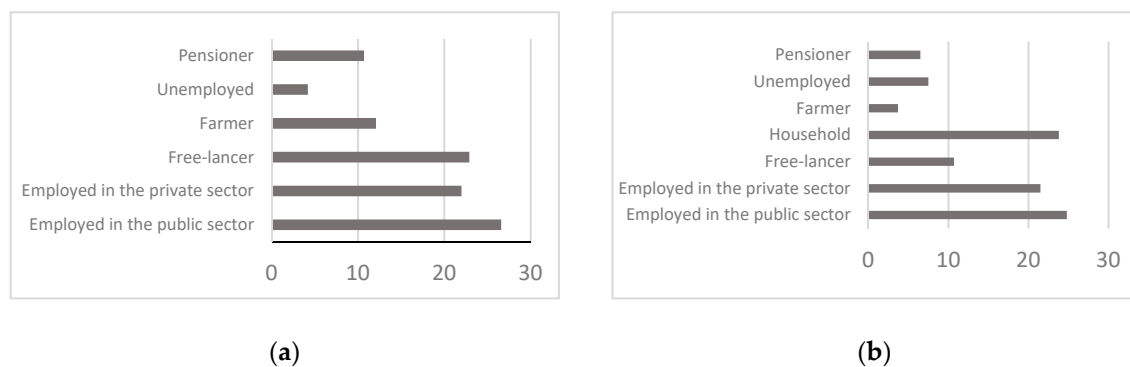
Figure 2. Percentages of (**a**) Fathers' occupation; (**b**) Mother's occupation.

With regard to parental education, overall students' parents exhibited a high educational level. A considerable proportion of fathers (36.9%) and mothers (45.3%) were higher education graduates, whereas the percentage of parents having attended merely compulsory education was notably lower (Figure 3a,b).
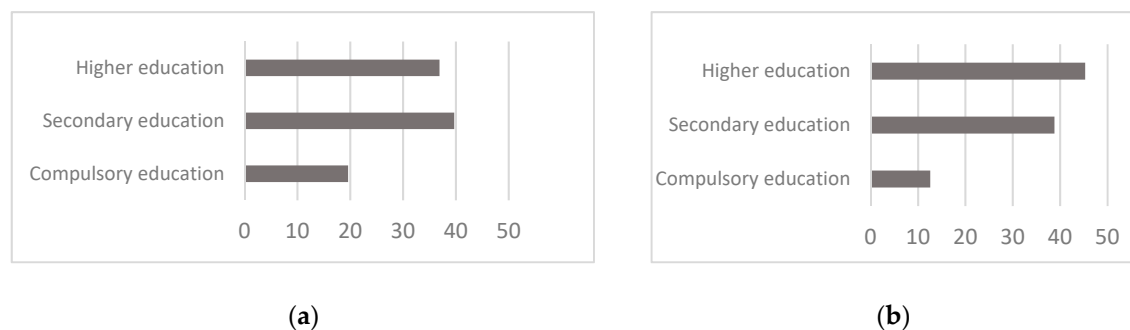

Figure 3. Percentages of Educational level of (**a**) father and (**b**) mother.

4.2. Descriptive Statistics

The surveyed students were asked whether they were willing to invest in renewable energy in the future. Results depicted in Figure 4 show that the clear majority of students, by 85%, was inclined to make a RE investment in their later life.
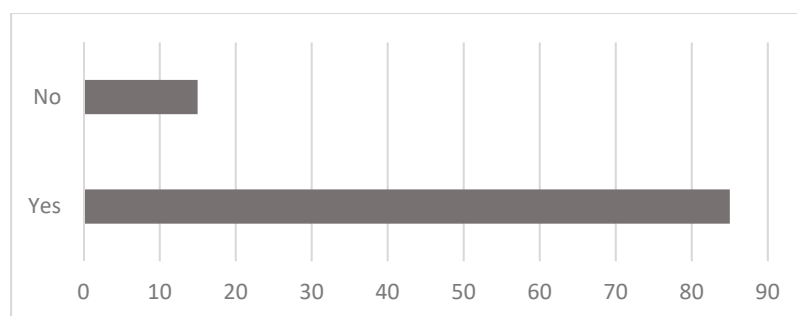

Figure 4. Percentages of students' willingness to invest in renewable energy sources (RES).

Afterwards, the students evaluated different energy production technologies based on the types they preferred to be further developed in Greece. For this evaluation, the students were given a 10-point scale (where 1 stands for "to be less developed" and 10 for "to be more developed") on which they marked their preference. As Figure 5 depicts, approximately seven out of ten students supported the development of solar energy and almost six out of ten supported wind energy. Conversely, only about one out of ten students favored nuclear fuels or coal combustion.
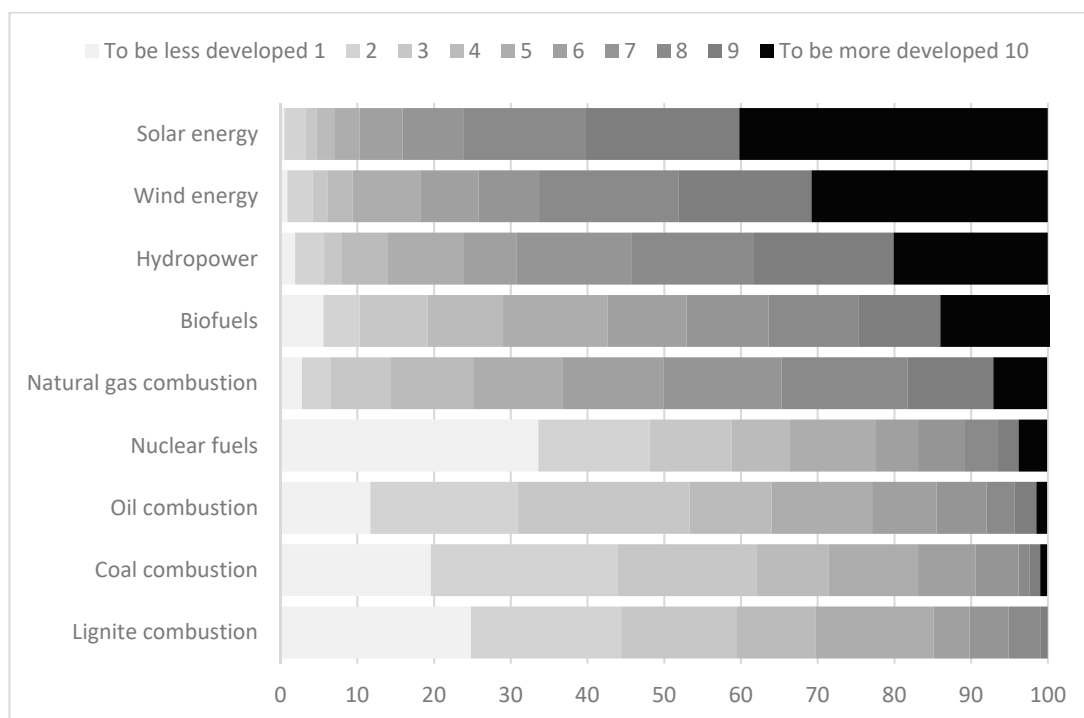
Figure 5. Students' assessment of energy production technologies to be developed in Greece.

Afterwards, students were asked to what degree they agreed or disagreed with various reasons for adopting renewable energy. Specifically, the students evaluated, using a five-point scale ranging from "strongly disagree" to "strongly agree", a variety of reasons for installing an RE system, such as wind energy or photovoltaics. According to our results (Figure 6), approximately eight out of ten students perceived that reduced pollution levels, country's increased energy independence, and improved air quality were the most important reasons for installing a renewable energy system.
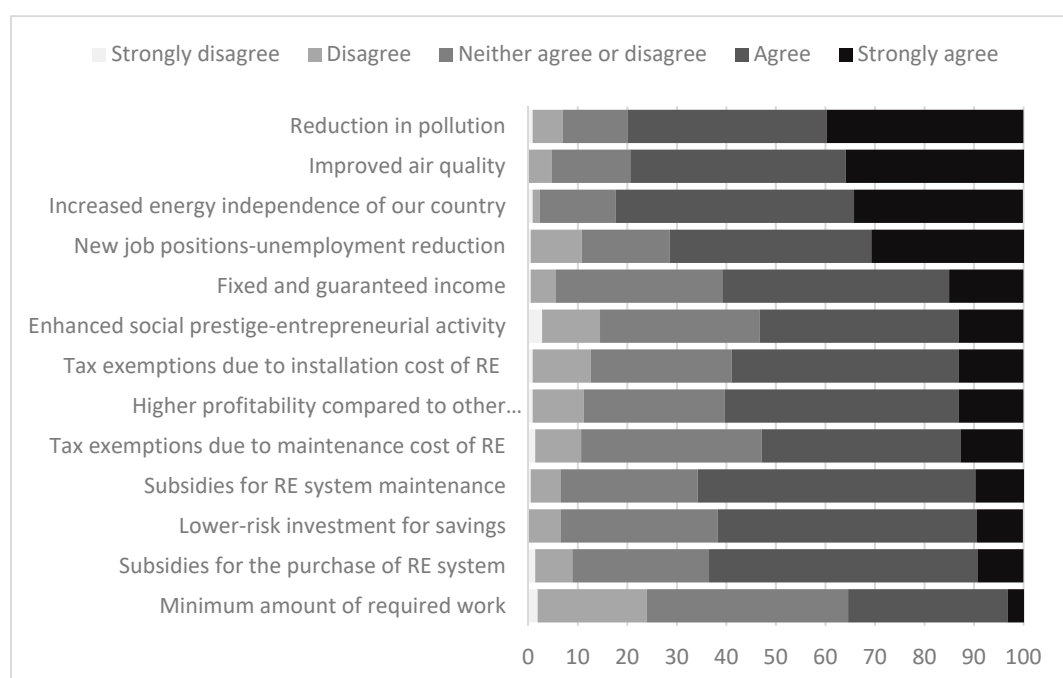

Figure 6. Students' degree of agreement with reasons for adopting RE systems.

To discover respondents' environmental attitudes, students evaluated their daily practices and habits on a five-point scale. Results given in Figure 7 indicated that relative to transportation, approximately eight out of ten students were willing to use the bicycle or cover short distances on foot to lower their individual environmental impact. As for energy saving, about eight out of ten students were willing to switch off the lights when leaving a room or opt for energy-efficient light bulbs and to turn off the tap while brushing teeth or shaving. Yet, the examination of their eating habits showed that only three out of ten participants were willing to reduce the consumption of meat and cured meat products for the sake of the environment.
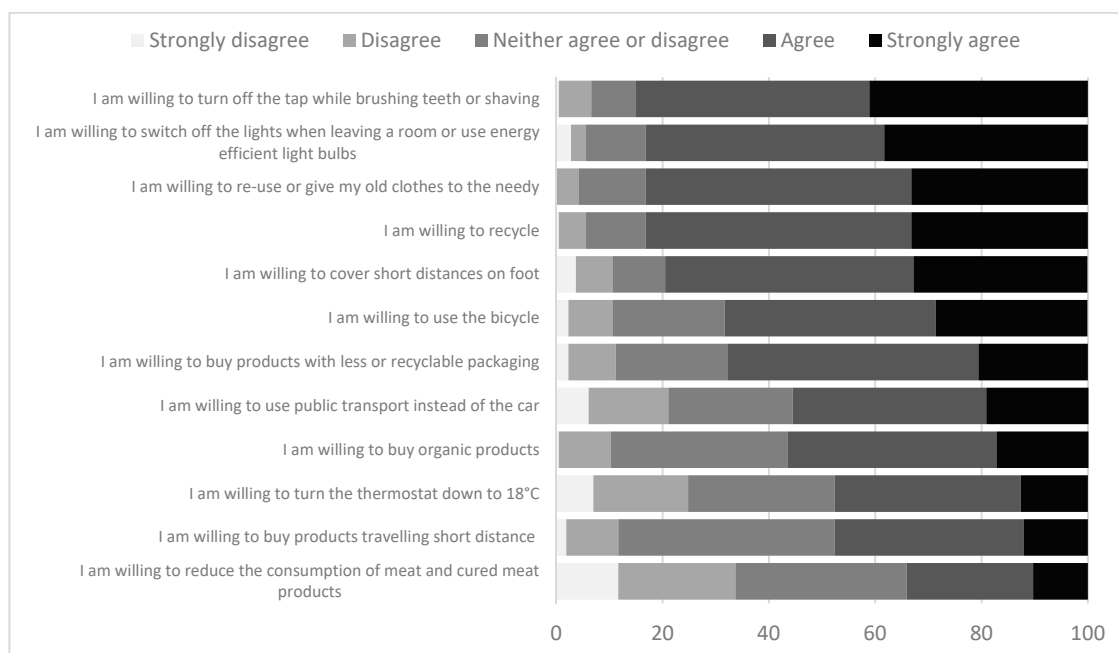

Figure 7. Students' daily environmental practices and habits.

4.3. Logistic Regression Model

Next, to predict "Students' willingness or unwillingness to invest in RE", Logistic Regression was conducted. The dependent variable was the "Students' willingness or unwillingness to invest in RE" (V1) and as independent variables the factor scores resulted from a factor analysis to the multivariates "Students' preference for energy sources to be developed" (V2), "Reasons for RE adoption" (V3), and "Participants' daily habits" (V4) were used. Factor analysis has been performed in previous work [26] and its outcomes are used here as input variables in the logistic regression model. The factors of the three multivariate variables are described below.

The multivariate "Students' preference for energy sources to be developed" (V2), gave three factors with significant loadings (V2_1, V2_2, V2_3). Factor V2_1 can be referred to as "Renewable sources and natural gas" since it includes the renewable energy types and natural gas ("Wind energy", "Hydropower", "Solar energy", and "Natural gas"). The second factor (V2_2) can be termed "Conventional energy types" because it involves explicitly fossil fuel-based energy technologies such as "Coal combustion", "Lignite combustion", and "Oil combustion". The third factor V2_3 can be referred to as "Nuclear fuels and biofuels" since it contains only these two energy sources.

The second multivariate "Reasons for RE adoption" (V3) examined participants' views on reasons for adopting renewables. The factor analysis resulted in five important factors (V3_1, V3_2, V3_3, V3_4, V3_5). Factor V3_1 can be termed "Environmentally- and energy independence-related reasons" because it contains the variables "Improved air quality", "Increased energy independence of our country" and "Reduction in pollution". The second factor (V3_2) can be referred to as "Reasons related to financial motives and minimum work" as it includes the variables "Subsidies for the purchase of the

RE system", "Subsidies for the maintenance of the RE system", "Fixed and guaranteed income", and "Minimum amount of work". The third factor (V3_3) contains the variables "Lower-risk investment for savings" and "Higher profitability compared to other investments" and thus can be called "Investment reasons". The fourth factor (V3_4) contains distinctly reasons related to tax exemptions that adopters are entitled to when they install an RES system ("Tax exemptions due to installation cost of RE" and "Tax exemptions due to maintenance cost of RE") and thereby V3_4 can be termed "Tax exemptions". The fifth and last factor (V3_5) can be termed "Socially- and employment-related reasons" because under this factor the variables "Enhanced social prestige-entrepreneurial activity", and "New job positions—unemployment reduction" were loaded.

The multivariate "Participants' daily habits" (V4) gave three factors. The first factor (V4_1) can be termed "Energy/water saving and recycling/reusing habits" since it includes the variables relating to energy/water saving and recycling habits. More specifically, these were "I am willing to switch off the lights when leaving a room or use energy-efficient light bulbs", "I am willing to recycle", "I am willing to re-use or give my old clothes to the needy" and "I am willing to turn off the tap while brushing teeth or shaving". The second factor (V4_2) can be referred to as "Transport and heating habits" since it contains variables concerning transport and heating choices which were "I am willing to use the bicycle", "I am willing to cover short distances on foot" and "I am willing to turn the thermostat down to 18 °C". Finally, since the third factor (V4_3) includes variables which relate to participants' behavior as consumers and their willingness to use public transport it can be termed "Consumer habits and willingness to use public transport". More specifically, the included variables are "I am willing to buy products travelling short distance", "I am willing to buy organic products", "I am willing to reduce the consumption of meat and cured meat products", "Instead of the car I am willing to use public transport", and "I am willing to buy products with less or recyclable packaging".

The scores of the above described factors were used to perform the logistic regression analysis and derive the model of Equation (2), with the students' willingness to invest in renewable energy as dependent variable. All factors (independent variables) were included in the analysis and the stepwise procedure with forward selection of variables was implemented to find out the significant ones. Table 1 shows the output of the logistic regression analysis related to the model fit tests and statistics.

Table 1. Logistic regression results—model fit indices.

Omnibus Tests of Model Coefficients				
		Chi-Square	**Degrees of Freedom**	**Significance**
Step 3	Step	4.850	1	0.028
	Block	29.925	3	0.000
	Model	**29.925**	3	**0.000**
Model Summary				
		−2 Log likelihood	**Cox & Snell R Square**	**Nagelkerke R^2**
	Step 3	150.647 [a]	0.130	0.229
Hosmer and Lemeshow Test				
		Chi-square	**Degrees of Freedom**	**Significance**
	Step 3	11.528	8	0.174

[a] Estimation terminated at iteration number five because parameter estimates changed by less than 0.05.

The Omnibus test of model coefficients gives a Chi-Square of 29.925 on 3 df, significant beyond 0.001, rejecting the null hypothesis that adding the variables to the model has not significantly increased our ability to predict the decisions made by the Students' (willingness or unwillingness) to invest in RE.

Under "Model Summary" (Table 1) we see that the −2 Log likelihood statistic is 150.647. This is the value that was compared to the −2 Log likelihood for the null model in the Omnibus test of model coefficients and resulted in significant predictability for the model. The R^2 values (Cox & Snell and

Nagelkerke's) are approximations of how much variation in the outcome is explained by the model. Nagelkerke's R^2 value indicates that the model explains roughly 23% of the variation in the outcome.

The Hosmer & Lemeshow test demonstrates the goodness-of-fit of the model, since the value of Chi-Square = 11.528 corresponds to a statistical significance greater than 0.05.

Next, the classification table (Table 2) compares the observed willingness of the students to invest in RE with that predicted by the model. The overall percentage of correct prediction is almost 90% (observations correctly classified), indicating a very good performance of the model.

Table 2. Classification table.

			Predicted		
Observed			**Invest in RE**		**Percentage Correct**
			Yes	**No**	
Step 3	**Invest in RE**	Yes	181	1	99.5
		No	26	6	18.8
	Overall Percentage				87.4

The results showed that only three variables were significant, that is V2_3, V3_3, and V4_1. Accordingly, Equation (3) took the following form:

$$V1 = 2.097 + 0.500 \; V2\_3* + 0.599 \; V3\_3* + 0.840 \; V4\_1* \tag{3}$$

where V1 is the dependent variable and V2_3 - V3_3 - V4_1 are the independent variables and (*) indicates the statistically significant beta coefficients at $p < 0.001$ level.

Table 3 presents the regression coefficients (B), the standard error (S.E.) of each coefficient, the Wald statistic (for the statistical significance testing), and the odds ratio (Exp (B)) for each variable in the model. All regression coefficients are statistically significant (at 0.01 level, except for V2_3 which is significant at 0.05 level) and positive, indicating that increasing influence of all variables is associated with increased odds of willingness to invest in RE. The 0.607 odds ratio for V2_3 indicates that the odds of investing are more than 60% for each one-point increase in V2_3 score. That is, for each one-point increase of V2_3, there is a 60.7% increase of the odds that the student will invest in RE. Similarly, for each one-point increase in the scores of V3_3 and V4_1, an increase of 55% and 43.2%, respectively, is expected in the odds that the student will invest in RE.

Table 3. Statistical significance of the variables in the model.

Model Variables	B	S.E.	Wald	Significance	Exp(B)
V2_3	0.500	0.235	4.532	0.033	0.607
V3_3	0.599	0.218	7.529	0.006	0.550
V4_1	0.840	0.222	14.281	0.000	0.432
Constant	2.097	0.246	72.849	0.000	0.123

V2_3: "Nuclear fuels and biofuels" to be developed
V3_3: "Investment reasons" (risk and profitability)
V4_1: "Energy/water saving and recycling/reusing habits"

5. Discussion

The purpose of this study was to analyze the factors that influence the willingness of environmental students to make investments in renewables. To that end, logistic regression analysis computed various factors to discover which of them affected participants' willingness to invest the most, and "Energy/water saving and recycling/reusing habits" was identified as a factor with great influence. In other words, the likelihood to invest in renewable energy increases when respondents adopt pro-environmental behaviors, particularly in terms of energy/water saving and recycling. This finding resonates with

the observations of theoretical social psychology which indicated that individuals with positive environmental attitudes are likely to adopt a responsible behavior that involves a lower environmental impact [50], which could possibly involve investments in technologies that produce clean energy. Hence, our study confirms the findings of previous studies showing that citizens who install renewables were mainly motivated by their environmental awareness and positive environmental attitudes [23,27–31].

Additionally, the analysis revealed that "Lower-risk investment for savings" and "Higher profitability compared to other investments" was another investment affecting factor. Therefore, the likelihood to invest in renewables will increase when the involved investment risk is low and when the expected profitability is higher than that of other types of investments. Moreover, in view of this finding, it is possible to assume that students may have acknowledged that renewable investments can be long-term and perhaps more secure than other investments activities such as buying bonds and shares.

The third factor, which according to our analysis was important to investments, was "Nuclear fuels and biofuels", showing that investments will increase if these energy types are further developed in Greece. Here, the term 'biofuels' refers to fuels which are produced from biomass; however, as with other agricultural procedures, biofuel feedstock production can have impacts on sustainability which are context-specific [51], with the most severe impacts being greenhouse gas emissions, changes in land-use and water-use, as well as water and air pollution [52,53]. These impacts can result from the cultivation of plants and crops which are necessary for the production of biofuels which is often criticized as unsustainable [54]. On the other hand, nuclear power is commonly regarded as exceedingly hazardous, thereby causing negative public reactions [55,56]. Despite the drawbacks of these two energy types, both nuclear power and biofuels comprise technologies with low carbon emissions which are less implemented in Greece and this can perhaps explain why 'Nuclear fuels and biofuels' emerged from the analysis as an important investment factor. To understand students' mindset in relation to these contentious energy production technologies, qualitative-oriented studies would be effective as they could reveal how environmental students perceive energy technologies which often receive skepticism.

According to our analysis, "Tax exemptions" and "Reasons related to financial motives and minimum work" were found to be unimportant to investments and thus are of the greatest interest to discuss. The indicated unimportant role of tax incentives is in sharp contrast with other studies which have shown that tax incentives are able to attract investments [57,58]. This implies that the current taxation for investments in renewable energies in Greece is unfavorable and as such it does not comprise a factor that will increase small-scale investments. Likewise, it is interesting that the variables "Subsidies for the purchase of the RES system", "Subsidies for the maintenance of the RES system", and "Fixed and guaranteed income" were not indicated as significant investment factors. Again, this may suggest that the respondents were not satisfied with the provided subsidies or with the income that microgenerators receive for the produced electricity (feed-in-tariffs). However, this is inconsistent with the findings of studies conducted in other countries showing that subsidies and feed-in-tariffs played a significant role in attracting small-scale investments [23,32,59].

In the present study, students in their overwhelming majority reported their intention to invest in renewables in the future, thereby resonating with previous findings which have also revealed willingness among university students to make renewable investments in the future [43,47,48]. Furthermore, the willingness that was recorded in our survey could have been related to the participants' sociodemographic characteristics, such as their education level. In specific, although the surveyed students have not graduated yet, they could be regarded as having a high level of education since they have been studying at the university for at least one year. In this light, their high educational level could have positively influenced their willingness to invest and this interpretation is validated by other studies showing that highly educated individuals are more positively inclined towards renewable energy investments [29,34].

As mentioned earlier, the age of potential investors appears to be influential to individuals' intention to invest without, however, knowing whether this is a positive or negative influence since the findings of the relevant literature are conflicting. Our sample explicitly consisted of undergraduate students and thus most respondents were aged between 19 and 23, while they clearly expressed their willingness to invest. Hence, our results suggest that young age is positively related to investment willingness, thereby confirming similar former findings [24].

Moreover, students' stated preference for solar and wind power in specific resonates with other studies conducted in Greece [34,60–62] as well as studies performed in other countries [63,64]. With regard to Greece, solar and wind are not only implemented to a higher degree in comparison to other renewables, but also their installations are located in different areas and in more apparent places than the plants of other RES such as biomass and hydropower [65]. From this perspective, it is reasonable to assume that respondents favored mostly solar and wind power because they were more familiar with these two renewable types.

In contrast to their support for renewable types, participants expressed a remarkably limited preference for fossil fuel-based energy production technologies. Again, their background of environmental studies could explain their little support for conventional fuels. That is, students' knowledge of the detrimental impacts of this technology on the environment is likely to have played a role in forming negative attitudes to fossils and raising their awareness about renewable energies.

Another interesting finding was that respondents rated the energy independence of the country as the most important reason for installing renewable energy. To contextualize this finding, it is important to note that, currently, Greece imports fossil fuels to meet the greatest part of its energy needs; however, fuel imports can have negative effects on the economy of a country because fuel prices are subjected to abrupt increases due to geopolitical crises. In this context, students must have been conscious about the economic impacts of fuel imports and must have acknowledged that higher installed capacities of renewable energies can help the country to become energy independent and secure its economy from fuel price fluctuations. Respondents may also have known that Greece could become energy independent because it presents an impressive renewable energy potential and is greatly advantageous regarding its wind and solar energy potential [66].

In terms of their environmental behavior, respondents have mostly adopted energy and water saving habits probably because they know through their studies that all daily habits involve a certain environmental impact regardless of how simple they may seem. Nevertheless, the participants did not express the same awareness about the consumption of meat and seemed to be unwilling to reduce its consumption for the sake of the environment. Interestingly, this finding is consistent with that of a previous study [62] which also detected reluctance to decrease meat intake among secondary school students in Northern Greece. The reported unwillingness in both cases could be related to the absence of large meat industries in Greece and to the fact that the country imports the biggest part of beef, while only a small amount is produced locally. This means that the contribution of the meat industry's methane emissions to environmental issues has not been discussed sufficiently, suggesting that the respondents were probably ignoring that the frequent consumption of meat involves a negative impact on the environment. However, since they have clearly reported their intention to be careful about their environmental behavior in terms of energy and water consumption, it can be stated that the students would possibly also become mindful of their diet habits if they knew more about the impact of the meat industry on the environment.

6. Conclusions

Knowing the factors which affect investment decisions is a crucial step in order to increase the amount of investments made in renewables. With regard to our findings, it can be inferred that investments increase when individuals adopt pro-environmental behaviors that focus on energy and water saving and when investments in renewables are safer and more profitable compared to other types of investments. In addition, the development of biofuels and nuclear fuels could also

increase investments as their development was also indicated as a significant factor in the final logistic regression model.

Since willingness to invest was irrespective of certain variables, it would be highly relevant to improve these areas in order to trigger investments in renewables. In particular, since tax exemptions were not identified as investment factors, further tax exemptions or tax reductions should be introduced for individuals who purchase renewable energy systems or perform maintenance on their installations. In addition, our analysis has shown that the provided financial incentives and the income from renewable investments were not positively related to respondents' willingness to invest, suggesting that the current subsidy system and the provided income from investments are not effective in attracting investments. To reverse this negative trend, a more generous subsidy system should be applied which would specifically finance the purchase and maintenance of small-scale installations, while the quota of the income from investments in renewables should be increased.

Moreover, our study has highlighted certain areas for future research. Since participants expressed a greater preference for wind and solar energy than other renewable types, the reasons behind the limited support for other renewables ought to be studied. In our discussion, we have attributed it to their higher familiarity with solar and wind as these consist the most implemented renewables in Greece. However, future research work should investigate students' knowledge of and attitudes towards hydropower, biomass, and geothermal power.

Despite the fact that the present study was conducted during a time of economic recession, the overwhelming majority of students was found willing to invest in environmentally friendly technologies. It would be of great interest to perform a similar study in times of more favorable economic conditions and compare the results of both studies to indicate whether financial difficulties were positively related to participants' increased investment willingness.

As previously discussed, respondents' reluctance to reduce meat for the protection of the environment could be a result of the lack of large cattle farms in Greece and the subsequent lack of debates on methane emissions' contribution to environmental issues. Although this appears to be a reasonable explanation, its validity should be confirmed by further studies.

Moreover, to ensure that the students' investment willingness will be turned into actual investment in the years to come, policymakers and developers should create a favorable investment environment that will meet the expectations and needs of young individuals who wish to invest in renewable energy. For this special category of potential investors, loans at low interest rates could be granted, thereby enabling them to invest in their own plant or in an energy project.

Finally, a limitation of our study is that it has examined only the investment willingness of environmental students as these were considered the most suitable respondents given the purposes of our study. However, it is equally important to examine the willingness of students majoring in other disciplines in Greece and elsewhere, because they are also potential investors and their intention to invest in renewable energy ought to be examined.

References

1. REN21. *Renewables 2019 Global Status Report*; REN21: Paris, France, 2019; ISBN 978-3-9818911-7-1.
2. Ioannou, K.; Tsantopoulos, G.; Arabatzis, G.; Andreopoulou, Z.; Zafeiriou, E. A Spatial Decision Support System Framework for the Evaluation of Biomass Energy Production Locations: Case Study in the Regional Unit of Drama, Greece. *Sustainability* **2018**, *10*, 531. [CrossRef]
3. International Energy Agency. *Energy Policies of IEA Countries-Greece 2017 Review*; International Energy Agency: Paris, France, 2017.

4. Papadopoulos, A.M.; Karteris, M.M. An assessment of the Greek incentives scheme for photovoltaics. *Energy Policy* **2009**, *37*, 1945–1952. [CrossRef]

5. Lazarou, S.; Pyrgioti, E.; Agoris, D. The latest Greek statute laws and its consequences to the Greek renewable energy source market. *Energy Policy* **2007**, *35*, 4009–4017. [CrossRef]

6. Karteris, M.; Papadopoulos, A.M. Legislative framework for photovoltaics in Greece: A review of the sector's development. *Energy Policy* **2013**, *55*, 296–304. [CrossRef]

7. Forouli, A.; Gkonis, N.; Nikas, A.; Siskos, E.; Doukas, H.; Tourkolias, C. Energy efficiency promotion in Greece in light of risk: Evaluating policies as portfolio assets. *Energy* **2019**, *170*, 818–831. [CrossRef]

8. Bergek, A.; Mignon, I.; Sundberg, G. Who invests in renewable electricity production? Empirical evidence and suggestions for further research. *Energy Policy* **2013**, *56*, 568–581. [CrossRef]

9. Gamel, J.; Menrad, K.; Decker, T. Which factors influence retail investors' attitudes towards investments in renewable energies? *Sustain. Prod. Consum.* **2017**, *12*, 90–103. [CrossRef]

10. Claudy, M.C.; Michelsen, C.; O'Driscoll, A.; Mullen, M.R. Consumer awareness in the adoption of microgeneration technologies. *Renew. Sustain. Energy Rev.* **2010**, *14*, 2154–2160. [CrossRef]

11. Lee, C.-Y.; Heo, H. Estimating willingness to pay for renewable energy in South Korea using the contingent valuation method. *Energy Policy* **2016**, *94*, 150–156. [CrossRef]

12. Ma, C.; Rogers, A.A.; Kragt, M.E.; Zhang, F.; Polyakov, M.; Gibson, F.; Chalak, M.; Pandit, R.; Tapsuwan, S. Consumers' willingness to pay for renewable energy: A meta-regression analysis. *Resour. Energy Econ.* **2015**, *42*, 93–109. [CrossRef]

13. Soon, J.-J.; Ahmad, S.-A. Willingly or grudgingly? A meta-analysis on the willingness-to-pay for renewable energy use. *Renew. Sustain. Energy Rev.* **2015**, *44*, 877–887. [CrossRef]

14. Koto, P.S.; Yiridoe, E.K. Expected willingness to pay for wind energy in Atlantic Canada. *Energy Policy* **2019**, *129*, 80–88. [CrossRef]

15. Sun, C.; Yuan, X.; Xu, M. The public perceptions and willingness to pay: From the perspective of the smog crisis in China. *J. Clean. Prod.* **2016**, *112*, 1635–1644. [CrossRef]

16. Tan, R.; Lin, B. Public perception of new energy vehicles: Evidence from willingness to pay for new energy bus fares in China. *Energy Policy* **2019**, *130*, 347–354. [CrossRef]

17. Su, W.; Liu, M.; Zeng, S.; Štreimikienė, D.; Baležentis, T.; Ališauskaitė-Šeškienė, I. Valuating renewable microgeneration technologies in Lithuanian households: A study on willingness to pay. *J. Clean. Prod.* **2018**, *191*, 318–329. [CrossRef]

18. Kostakis, I.; Sardianou, E. Which factors affect the willingness of tourists to pay for renewable energy? *Renew. Energy* **2012**, *38*, 169–172. [CrossRef]

19. Zografakis, N.; Gillas, K.; Pollaki, A.; Profylienou, M.; Bounialetou, F.; Tsagarakis, K.P. Assessment of practices and technologies of energy saving and renewable energy sources in hotels in Crete. *Renew. Energy* **2011**, *36*, 1323–1328. [CrossRef]

20. Curtin, J.; McInerney, C.; Gallachóir, B.Ó.; Salm, S. Energizing local communities—What motivates Irish citizens to invest in distributed renewables? *Energy Res. Soc. Sci.* **2019**, *48*, 177–188. [CrossRef]

21. Hai, M.A. Rethinking the social acceptance of solar energy: Exploring "states of willingness" in Finland. *Energy Res. Soc. Sci.* **2019**, *51*, 96–106. [CrossRef]

22. Ebers Broughel, A.; Hampl, N. Community financing of renewable energy projects in Austria and Switzerland: Profiles of potential investors. *Energy Policy* **2018**, *123*, 722–736. [CrossRef]

23. Braito, M.; Flint, C.; Muhar, A.; Penker, M.; Vogel, S. Individual and collective socio-psychological patterns of photovoltaic investment under diverging policy regimes of Austria and Italy. *Energy Policy* **2017**, *109*, 141–153. [CrossRef]

24. Masini, A.; Menichetti, E. Investment decisions in the renewable energy sector: An analysis of non-financial drivers. *Technol. Forecast. Soc. Chang.* **2013**, *80*, 510–524. [CrossRef]

25. Papadopoulou, S.-D.; Kalaitzoglou, N.; Psarra, M.; Lefkeli, S.; Karasmanaki, E.; Tsantopoulos, G. Addressing Energy Poverty through Transitioning to a Carbon-Free Environment. *Sustainability* **2019**, *11*, 2634. [CrossRef]

26. Karasmanaki, E.; Tsantopoulos, G. Exploring future scientists' awareness about and attitudes towards renewable energy sources. *Energy Policy* **2019**, *131*, 111–119. [CrossRef]

27. Parkins, J.R.; Rollins, C.; Anders, S.; Comeau, L. Predicting intention to adopt solar technology in Canada: The role of knowledge, public engagement, and visibility. *Energy Policy* **2018**, *114*, 114–122. [CrossRef]

28. Strazzera, E.; Statzu, V. Fostering photovoltaic technologies in Mediterranean cities: Consumers' demand and social acceptance. *Renew. Energy* **2017**, *102*, 361–371. [CrossRef]

29. Michelsen, C.C.; Madlener, R. Switching from fossil fuel to renewables in residential heating systems: An empirical study of homeowners' decisions in Germany. *Energy Policy* **2016**, *89*, 95–105. [CrossRef]

30. Palm, J.; Tengvard, M. Motives for and barriers to household adoption of small-scale production of electricity: Examples from Sweden. *Sustain. Sci. Pract. Policy* **2011**, *7*, 6–15. [CrossRef]

31. Zhai, P.; Williams, E.D. Analyzing consumer acceptance of photovoltaics (PV) using fuzzy logic model. *Renew. Energy* **2012**, *41*, 350–357. [CrossRef]

32. Ozcan, M. Assessment of renewable energy incentive system from investors' perspective. *Renew. Energy* **2014**, *71*, 425–432. [CrossRef]

33. Ek, K.; Persson, L.; Johansson, M.; Waldo, Å. Location of Swedish wind power—Random or not? A quantitative analysis of differences in installed wind power capacity across Swedish municipalities. *Energy Policy* **2013**, *58*, 135–141. [CrossRef]

34. Tsantopoulos, G.; Arabatzis, G.; Tampakis, S. Public attitudes towards photovoltaic developments: Case study from Greece. *Energy Policy* **2014**, *71*, 94–106. [CrossRef]

35. Frederiks, E.R.; Stenner, K.; Hobman, E.V. Household energy use: Applying behavioural economics to understand consumer decision-making and behaviour. *Renew. Sustain. Energy Rev.* **2015**, *41*, 1385–1394. [CrossRef]

36. Leete, S.; Xu, J.; Wheeler, D. Investment barriers and incentives for marine renewable energy in the UK: An analysis of investor preferences. *Energy Policy* **2013**, *60*, 866–875. [CrossRef]

37. Jung, N.; Moula, M.E.; Fang, T.; Hamdy, M.; Lahdelma, R. Social acceptance of renewable energy technologies for buildings in the Helsinki Metropolitan Area of Finland. *Renew. Energy* **2016**, *99*, 813–824. [CrossRef]

38. Bollinger, B.; Gillingham, K. Peer Effects in the Diffusion of Solar Photovoltaic Panels. *Mark. Sci.* **2012**, *31*, 900–912. [CrossRef]

39. Carlisle, J.E.; Solan, D.; Kane, S.L.; Joe, J. Utility-scale solar and public attitudes toward siting: A critical examination of proximity. *Land Use Policy* **2016**, *58*, 491–501. [CrossRef]

40. Tabi, A.; Wüstenhagen, R. Keep it local and fish-friendly: Social acceptance of hydropower projects in Switzerland. *Renew. Sustain. Energy Rev.* **2017**, *68*, 763–773. [CrossRef]

41. Karatepe, Y.; Neşe, S.V.; Keçebaş, A.; Yumurtacı, M. The levels of awareness about the renewable energy sources of university students in Turkey. *Renew. Energy* **2012**, *44*, 174–179. [CrossRef]

42. Yazdanpanah, M.; Komendantova, N.; Shirazi, Z.N.; Linnerooth-Bayer, J. Green or in between? Examining youth perceptions of renewable energy in Iran. *Energy Res. Soc. Sci.* **2015**, *8*, 78–85. [CrossRef]

43. Qu, M.; Ahponen, P.; Tahvanainen, L.; Gritten, D.; Mola-Yudego, B.; Pelkonen, P. Chinese university students' knowledge and attitudes regarding forest bio-energy. *Renew. Sustain. Energy Rev.* **2011**, *15*, 3649–3657. [CrossRef]

44. Cotton, D.; Shiel, C.; Paço, A. Energy saving on campus: A comparison of students' attitudes and reported behaviours in the UK and Portugal. *J. Clean. Prod.* **2016**, *129*, 586–595. [CrossRef]

45. Ahamad, N.R.; Ariffin, M. Assessment of knowledge, attitude and practice towards sustainable consumption among university students in Selangor, Malaysia. *Sustain. Prod. Consum.* **2018**, *16*, 88–98. [CrossRef]

46. Alawin, A.A.; Rahmeh, T.A.; Jaber, J.O.; Loubani, S.; Dalu, S.A.; Awad, W.; Dalabih, A. Renewable energy education in engineering schools in Jordan: Existing courses and level of awareness of senior students. *Renew. Sustain. Energy Rev.* **2016**, *65*, 308–318. [CrossRef]

47. Ozil, E.; Ugursal, V.I.; Akbulut, U.; Ozpinar, A. Renewable Energy and Environmental Awareness and Opinions: A Survey of University Students in Canada, Romania, and Turkey. *Int. J. Green Energy* **2008**, *5*, 174–188. [CrossRef]

48. Assali, A.; Khatib, T.; Najjar, A. Renewable energy awareness among future generation of Palestine. *Renew. Energy* **2019**, *136*, 254–263. [CrossRef]

49. Hosmer, D.W.; Hosmer, T.; le Cessie, S.; Lemeshow, S. A comparison of goodness-of-fit tests for the logistic regression model. *Stat. Med.* **1997**, *16*, 965–980. [CrossRef]

50. Sapci, O.; Considine, T. The link between environmental attitudes and energy consumption behavior. *J. Behav. Exp. Econ.* **2014**, *52*, 29–34. [CrossRef]

51. Graham, J.B.; Stephenson, J.R.; Smith, I.J. Public perceptions of wind energy developments: Case studies from New Zealand. *Energy Policy* **2009**, *37*, 3348–3357. [CrossRef]

52. Shonnard, D.R.; Klemetsrud, B.; Sacramento-Rivero, J.; Navarro-Pineda, F.; Hilbert, J.; Handler, R.; Suppen, N.; Donovan, R.P. A Review of Environmental Life Cycle Assessments of Liquid Transportation Biofuels in the Pan American Region. *Environ. Manag.* **2015**, *56*, 1356–1376. [CrossRef]

53. Filoso, S.; do Carmo, J.B.; Mardegan, S.F.; Lins, S.R.M.; Gomes, T.F.; Martinelli, L.A. Reassessing the environmental impacts of sugarcane ethanol production in Brazil to help meet sustainability goals. *Renew. Sustain. Energy Rev.* **2015**, *52*, 1847–1856. [CrossRef]

54. Correa, D.F.; Beyer, H.L.; Fargione, J.E.; Hill, J.D.; Possingham, H.P.; Thomas-Hall, S.R.; Schenk, P.M. Towards the implementation of sustainable biofuel production systems. *Renew. Sustain. Energy Rev.* **2019**, *107*, 250–263. [CrossRef]

55. Kim, Y.; Kim, M.; Kim, W. Effect of the Fukushima nuclear disaster on global public acceptance of nuclear energy. *Energy Policy* **2013**, *61*, 822–828. [CrossRef]

56. Thomas, S. What will the Fukushima disaster change? *Energy Policy* **2012**, *45*, 12–17. [CrossRef]

57. Onuoha, I.J.; Aliagha, G.U.; Rahman, M.S.A. Modelling the effects of green building incentives and green building skills on supply factors affecting green commercial property investment. *Renew. Sustain. Energy Rev.* **2018**, *90*, 814–823. [CrossRef]

58. Rabab Mudakkar, S.; Zaman, K.; Shakir, H.; Arif, M.; Naseem, I.; Naz, L. Determinants of energy consumption function in SAARC countries: Balancing the odds. *Renew. Sustain. Energy Rev.* **2013**, *28*, 566–574. [CrossRef]

59. Baharoon, D.A.; Rahman, H.A.; Fadhl, S.O. Publics' knowledge, attitudes and behavioral toward the use of solar energy in Yemen power sector. *Renew. Sustain. Energy Rev.* **2016**, *60*, 498–515. [CrossRef]

60. Zografakis, N.; Sifaki, E.; Pagalou, M.; Nikitaki, G.; Psarakis, V.; Tsagarakis, K.P. Assessment of public acceptance and willingness to pay for renewable energy sources in Crete. *Renew. Sustain. Energy Rev.* **2010**, *14*, 1088–1095. [CrossRef]

61. Liarakou, G.; Gavrilakis, C.; Flouri, E. Secondary School Teachers' Knowledge and Attitudes towards Renewable Energy Sources. *J. Sci. Educ. Technol.* **2009**, *18*, 120–129. [CrossRef]

62. Keramitsoglou, K.M. Exploring adolescents' knowledge, perceptions and attitudes towards Renewable Energy Sources: A colour choice approach. *Renew. Sustain. Energy Rev.* **2016**, *59*, 1159–1169. [CrossRef]

63. Çakirlar Altuntaş, E.; Turan, S.L. Awareness of secondary school students about renewable energy sources. *Renew. Energy* **2018**, *116*, 741–748. [CrossRef]

64. Zyadin, A.; Puhakka, A.; Ahponen, P.; Cronberg, T.; Pelkonen, P. School students' knowledge, perceptions, and attitudes toward renewable energy in Jordan. *Renew. Energy* **2012**, *45*, 78–85. [CrossRef]

65. Karytsas, S.; Theodoropoulou, H. Socioeconomic and demographic factors that influence publics' awareness on the different forms of renewable energy sources. *Renew. Energy* **2014**, *71*, 480–485. [CrossRef]

66. Kyriakopoulos, G.L.; Arabatzis, G.; Tsialis, P.; Ioannou, K. Electricity consumption and RES plants in Greece: Typologies of regional units. *Renew. Energy* **2018**, *127*, 134–144. [CrossRef]