Going Green: Does it Depend on Education, Gender, or Income?*

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Abstract

Sustainable development entails meeting our present needs without compromising the ability of future generations to meet their needs. This requires us to treat economic, social and environmental aspects in an integrated way, but little is known about the nature of individual preferences towards the trade-offs involved in this effort. For the first time, we study individual preferences towards the environment, social wellbeing, and financial wellbeing using a survey of over 1400 households in the Netherlands. Using nonparametric, parametric, and matching methods, we find that gender and education are important factors for sustainability rather than income levels. Moreover results indicate that educated females put the greatest value on going green whilst being socially minded.

JEL Classification: G1, I31, Q01.
Keywords: Sustainability, financial wellbeing, heterogenous preferences.

1 Introduction

Money is essential to both ecological and social progress, so it is a constant dilemma for policy makers to balance the trade-offs needed to reconcile the three pillars of sustainable development–economic wellbeing, the environment, and social development. It has become increasingly obvious that we have to scale back our standard of living in order to maintain the environment at its current level. Whether we are willing to give up part of our standard of living in the form of economic, environmental or social issues is a highly individualistic choice. As Stevens (2010) points out, if we only stress the environmental and social dimensions of sustainable development in the absence of economics, we neglect the growth in financial capital. Similarly, if we only build up the economic and social pillars of

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sustainable development without paying attention to the environment, we would degrade the natural capital required to ensure sustained economic wellbeing. Lastly, if the focus is only on economics and the environment, neglecting social wellbeing, we would have growing income disparity and rising unemployment.[1] Thus, addressing only two of the three pillars will result in development that is not sustainable. However, in order to achieve this goal we need to understand the heterogeneity in preferences among groups of individuals towards these trade-offs. The recent financial crisis has highlighted the need for improved corporate responsibility and accountability. Coupled with a widening gap between the rich and the poor,the US and the UK find themselves at places 66 and 50 respectively on the 2008 Sustainable Society Index. Both the US and the UK have the fastest growing divides between rich and poor in the OECD area. Currently, the focus has been tilted heavily towards economic growth at the cost of both the environment and social welfare.

As far as we know, this paper provides the first systematic analysis in measuring the extent to which individuals rate these trade-offs between the three pillars of sustainable development. We concentrate on individuals and attempt to measure their sustainable values, focusing on the trade off in terms of social welfare, the environment and financial wellbeing. Little is known about how heterogeneity affects these values. Hence, we explicitly ask a representative sample from the Dutch population – more than 1,400 individuals – about their preference to live in a society which strives towards greater financial wellbeing or a society which strives towards reducing carbon emissions. We ask a similar question regarding social welfare and the environment.

The literature on environmental sustainability is not new. Eichholtz *et al.*, (2010) examine the relationship between commercial real estate prices and the energy star ratings of these buildings. Their results indicate that 'green' buildings' rental rates are about 3 percent higher. Waddock and Graves (1997) mention that 'Corporate Social Responsibility (CSR)' has become a social norm when firms consider their production inputs. According to Social Investment Forum (2010), evaluation of CSR has become an investment decision for some. Firms believe that better CSR policies could outperform other strategies. Turban et al., (1997), Fombrun and Shanley (1990) note that good CSR policies could

[1] See Stevens (2010) for an insightful overview.

improve a company's reputation. Baron (2001) and Lyon and Maxwell (2011) show that better CSR policies could lead to less scrutiny from governments or other concerned organizations.

It has generally been observed that gender has as an effect on value-based decisions. The current literature shows that there are significant gender-related differences in making financial decisions. Watson and McNaughton (2007) link gender to risk taking and find that women tend to be more risk-averse than men and this affects their choice of retirement investments. Lusardi and Michell (2008) also find that gender-related differences can be seen with respect to financial literacy. Women are also more financially illiterate when it comes to making financial decisions, which is a concern for old age and retirement provision. How much of a role does gender play in establishing social and environmental values within the sustainability debate is open to question. Furthermore, do age, education, work status and if one is a homeowner or not affect these decisions?

In this study, we are able to shed some light towards understanding how the heterogeneity in society affects how individuals value the trade-offs between people, planet and profit. Evaluation of these trade-offs helps policy makers take these preferences into account when structuring policy towards green social economic growth. To our knowledge, this is the first paper to analyse the effects of gender and education on individual preferences on environmental sustainability and financial welfare and/or social welfare using field survey data. Our results, using parametric, nonparametric, and matching methods, show that values towards people, planet and profit are indeed strongly heterogenous. We find significant evidence that education and gender play an important role in determining the trade-offs between these domains. Interestingly, educated females put the greatest value on going green. We also find that age, being a homeowner, and work status are vital factors. Less important factors are income levels, whether the main residence is in a city, or the number of children. Economic policy that takes account of this heterogeneity will be more effective in achieving the goal of sustained economic development. Further implications of the results are directed towards decisions for sustainable businesses. If individuals have different values towards people, planet, and profits, then investors might be found to value companies differently, which would affect corporate financial decision making. Furthermore, consumers would value products differently, which would affect the demand for sustainable products, which would

influence pricing decisions.

The paper is structured as follows. In Section 2 we presents the methodology behind the survey data. In Sections 3 and 4 we gives the description of data and describes the empirical analysis. Non-parametric results using Racine and Li (2004) method are presented in Subsection 4.1. In Subsections 4.2 and 4.3 we provide further empirical results using reduced form and matching estimation procedures. Finally in Section 5, we concludes, by providing a discussion of the results and the implications for sustainable policy and decision making within the context of policy towards sustained economic development.

2 Survey Data Methodology

We collect data on individuals' attitudes towards sustainability by focusing on three main questions to assess the tradeoff between people, planet, and profits. During August 2010 we sent out a separate survey to a subsection of sample population used for the Dutch National Bank (DNB) Household Survey. This enabled us to ask a number of direct questions to households about their preferences towards the environment, social wellbeing and financial wellbeing. We have a sample of 1433 households from The Netherlands. The survey is administered and conducted by CentERdata at Tilburg University. The purpose of this survey is to collect household level data to study the economic and psychological determinants of households decision making behaviour. Household members who are at least 16 years old are interviewed. CentERdata includes individual information about subjects' gender, educational attainment, homeownership, annual household and personal income, marital status, number of children, regional location, living area building environment, and host of other individual characteristics which provides us with a rich database with which to analyse attitudes towards sustainability in conjunction with heterogeneous economic variables. A good introduction to this data is given in Alessie *et al.*, (2002). They find that the data is a representative panel of Dutch households when they compare the DNB Household Survey results to national accounts data and micro data on household wealth published by Statistics Netherlands. Although no household survey can ever be entirely free of potential biases caused by non-response, their findings suggest that this problem is limited in the

DNB Household Survey.

For the present study, the questions used to evaluate households' overall attitude to sustainability was measured by asking the following question: 'To what extent would you be willing to reduce your standard of living in order to maintain the environment at the same level for the next generation?' Using a scale from 1 to 10, with 1 indicating 'not at all willing', households rated their willingness. We also look at the three direct trade off's between people, planet, and profits, by asking participants to indicate on a scale from 1 to 10. 'I prefer to live in a society that strives for financial wellbeing than striving to reduce carbon emissions'. The range = 1 [financial wellbeing] to 10 [reduce carbon emissions]). Similarly we ask participants two further trade off questions; 'I prefer to live in a society that strives for social wellbeing than striving to reduce carbon emissions'. The range = 1 [social wellbeing] to 10 [reduce carbon emissions]), and 'I prefer to live in a society that strives for financial wellbeing than striving for greater social welfare'. The range = 1 [financial wellbeing] to 10 [social welfare]). In the next section we provide summary statistics on these tradeoff questions by gender, education attainment, and homeownership.

3 Data Description

Table 1 presents summary statistics. In general, both genders and those with or without a college degree, are concerned about greenhouse gases and social welfare, and are willing to give up their current standard of living or financial wellbeing to preserve the environment for the future and for better social welfare. However, we are interested in examining differences in responses due to gender and for individuals with or without a college degree.

In the sample, we have 789 males and 644 females. Out of this 319 males and 243 females have have college degrees. These unconditional results also indicate that that females are more willing to reduce their current standard of living in order to maintain the environment for future generations compared to males. Similarly, they prefer reducing greenhouse gases than social welfare and prefer social welfare to financial wellbeing compared to men. However, there are no observable differences between males and females for preferences in reducing greenhouse gases at the expense of social welfare.

Table 1: Summary statistics by gender and education.

Variable	Male		Female	
	College	No college	College	No college
Number of observations	319	470	243	401
Willing to reduce standard of living to maintain the environment	6.047 (2.508)	5.770 (2.250)	6.630 (1.990)	6.020 (2.102)
Prefer reducing greenhouse gases than financial wellbeing	6.542 (2.367)	6.430 (2.143)	7.374 (1.927)	6.611 (2.043)
Prefer reducing greenhouse gases than social welfare	5.088 (2.332)	5.291 (2.222)	5.169 (2.144)	5.087 (1.968)
Prefer social welfare than financial wellbeing	7.445 (2.117)	7.548 (1.849)	8.008 (1.737)	7.269 (1.862)

Standard deviations are in parentheses.

When considering differences due to educational attainment these simple summary statistics indicate that individuals with at least a college education are willing to reduce their current standard of living in order to maintain the environment for future generations and prefer social welfare to financial wellbeing compared to individuals without a college education. These differences are even larger for college educated females compared to any other group.

Overall summary statistics for individual characteristics are presented in Table 2. It shows that 17% of the sample population live in the three main cities in the Netherlands (Amsterdam, Rotterdam, and Haag). Roughly equal proportions of the sample are distributed over the four quadrants of the The Netherlands when splitting the sample into North, East, West, and South regions. The average age of the sample is 55 years and the average household income is almost € 2,800 while the net personal income is just over € 1,600. Note that 78% of the survey subjects identify them as homeowners. Results also show that about 30% of the sample population is retired and only 2.6% are students. While Table 1 suggests that education and gender are important factors for 'going green,' we also need to be cautious in interpreting these results since there are no controls yet for individual characteristics. Therefore, our next section presents some indepth analysis to describe more fully the differences between education, gender and other individual characteristics has on 'going green.'

Table 2: Summary statistics

Variable	Mean (Std. deviation)	Variable	Mean (Std. deviation)
Main cities (Amsterdam,	.170	Number of children	.606
Rotterdam, and Haag)	(.376)		(.999)
North	.121	Net house hold income	2,771.33
	(.327)	per month (€)	(1,397.63)
East	.214	Net personal income	1,622.49
	(.410)	per month (€)	(1,057.67)
West	.278	Paid worker	.442
	(.448)		(.497)
South	.214	Family company	.006
	(.410)		(.075)
Densely built up	.149	Freelance	.041
	(.357)		(.199)
Built up	.259	Unemployed and	.017
	(.438)	looking for work	(.128)
Town	.225	Unemployed and	.004
	(.418)	looking for first job	(.059)
Less built up	.197	Student	.026
	(.398)		(.159)
No built up	.166	State benefits	.001
	(.372)		(.026)
Age	55.050	House worker	.105
	(15.207)		(.307)
No high school	.320	Retired	.293
	(.467)		(.455)
High school education	.288	Unable to work	.045
	(.453)		(.208)
College and above	.392	Volunteer worker	.017
	(.488)		(.128)
Homeowner	.759	Other worker	.003
	(.428)		(.059)

4 Empirical Analysis

4.1 Nonparametric Results using Racine and Li Method

Next, we draw conditional densities using the nonparametric regression technique proposed by Racine and Li (2004). The main advantage of this data-driven estimation technique is that it provides a modelling framework for the relation among variables, applying a kernel method of density estimation to discrete variables that admit no natural ordering, such as education attainment or mortgage status, which are used frequently in this study. Note that this technique has been shown to have higher predictive power than other conventional approaches in the presence of categorical variables. We consider the following empirical model

$$s_i = h(X_i) + \eta_i \tag{1}$$

where s_i is the dependent variable. We have four dependent variables (survey questions regarding households' overall attitude towards sustainability): 1) willingness to reduce standard of living to maintain the environment for future generations, 2) preference for reducing greenhouse gases rather than financial wellbeing, 3) preference for reducing greenhouse gases rather than social welfare, and 4) preference for social welfare rather than financial wellbeing. Here $h(\cdot)$ has an unknown functional form and X_i represents a set of continuous and discrete regressors. We define $X_i = X_i^c, X_i^d$ with X_i^c representing the subset of continuous variables and X_i^d the discrete variables. First we construct the conditional densities by gender. In our case, the continuous variables are log age, log household income, and number of children. Our discrete variables are gender (if gender is female then female = 1, otherwise = 0), mortgage status (if holds a mortgage then mortgage = 1, otherwise = 0), education attainment (if college educated then college = 1, otherwise = 0), and residential location (if in three main cities = 1, otherwise = 0.) The optimal smoothing parameters for $h(\cdot)$ were chosen using the 'leave-one-out cross-validation' mechanism when estimating the fitted values.[2] Figure 1 shows the conditional density or predicted responses graphs by survey question. These figures suggest that male conditional response distributions first order stochastically dominates the female distributions for all

[2] Bandwidths of variables were chosen using standard Silverman's rule of thumb, and biweight kernels when estimating results.

Table 3: Conditional distributions' differences by gender and education.

Variable	Full sample		College sample
	Female - Male	College - No college	Female - Male
Willing to reduce standard of living	.375**	.394**	.583**
to maintain the environment	(.086)	(.088)	(.030)
Prefer reducing greenhouse gases	.434**	.381**	.808**
than financial wellbeing	(.083)	(.085)	(.113)
Prefer reducing greenhouse gases	-.079	-.056	.081
than social welfare	(.080)	(.082)	(.109)
Prefer social welfare than	.391**	.572**	.568**
financial wellbeing	(.079)	(.081)	(.112)

Standard deviations are in parentheses. ** Denotes statistical significance at the 5% level and * denotes statistical significance at the 10% level.

responses other than preference to reduce greenhouse gases over improving social welfare. These results provide initial supporting evidence consistent with our summary statistics. We perform a Kolmogorov-Smirnov (K-S) test for equality of the distribution functions. We can reject the null hypothesis of equality between the distributions at the 95 percent confidence interval for all responses other than those who 'prefer reducing greenhouse gases than social welfare.' Figures 2 shows the conditional density graphs by educational achievement. K-S tests show similar patterns as in gender for college graduates. We also conduct a two sample t-test on the differences of predicted conditional densities. These results are presented in Table 3. We also estimate the conditional densities by gender for those with college degrees. In this case we see that educated females tend to care more about the green economy compared to their educated male counterparts. We have omitted the graphs but differences of these predicted conditional densities are presented in Table 3.[3]

From these conditional density figures and results in Table 3, we see an interesting pattern. We can test if the properties of completeness and transitivity hold. Females and college graduates indicate that they 'prefer to reduce current standard of living in order to maintain the environment for future generations' compared to males and individuals without college degrees. Females and college graduates

[3] Graphs can be provided upon request.

Figure 1: Conditional densities by gender

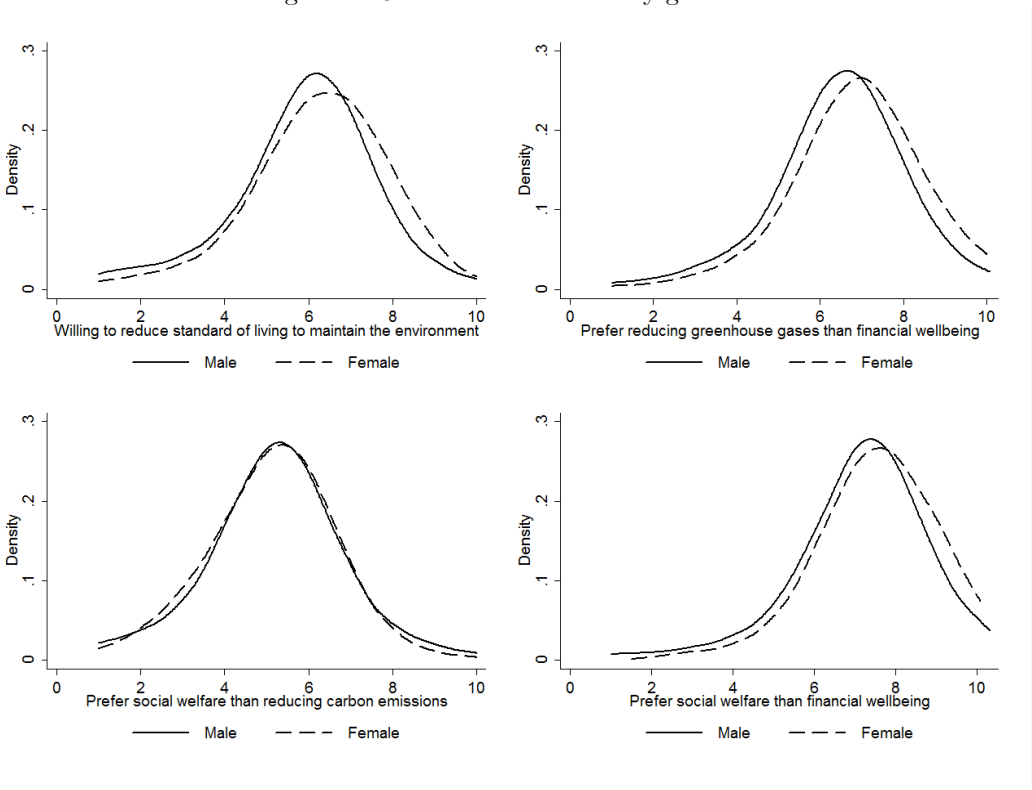
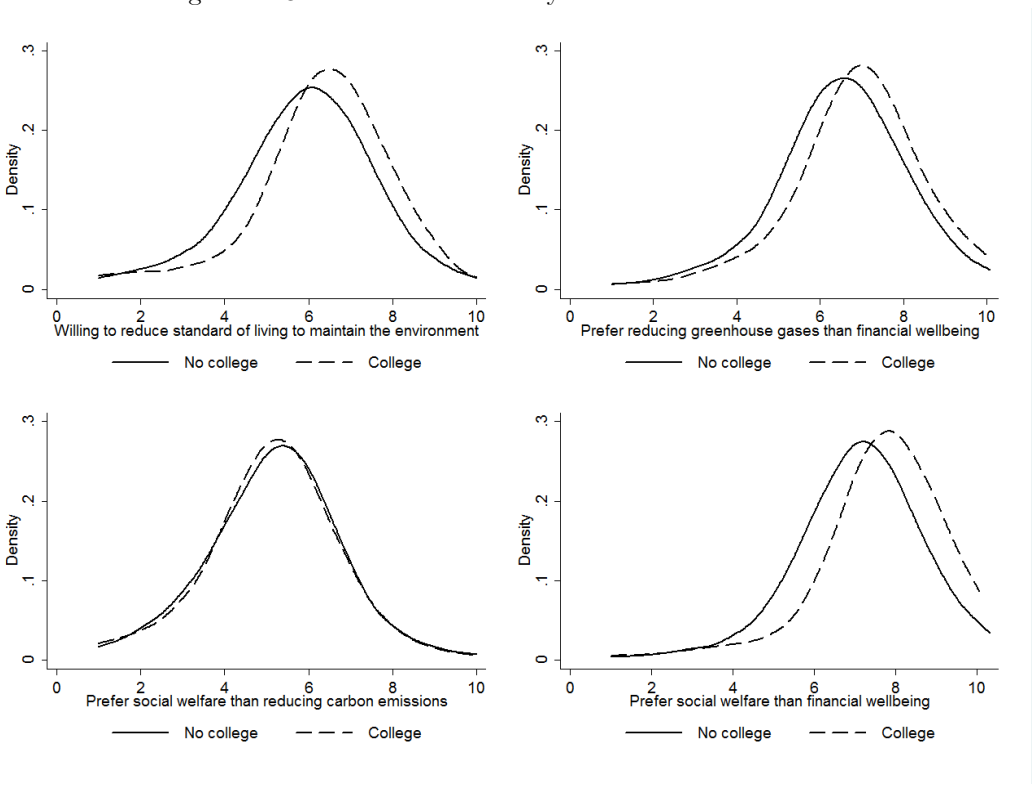


Figure 2: Conditional densities by educational attainment



also 'prefer reducing greenhouse gases than financial wellbeing' compared to males and people without a college degree. They also indicate that they are indifferent between 'reducing greenhouse gases at the expense of social welfare.' This pattern indicates that these two groups are capable of expressing preferences (or indifference) between all possible bundles and thus the property of completeness holds.[4] Next if the property of transitivity held for females and college graduates then they should prefer 'social welfare than financial wellbeing.' Our Table 3 results indicate that in fact this is the case for females and college graduates compared to males and individuals without college degrees. Similar conclusions by gender are also observed for the sample of individuals with only college degrees.

4.2 Reduced Form Estimation

In order to deepen our understanding of the patterns of survey question outcomes due to gender and education, we present a set of reduced-form regressions that show how an individual's willingness to reduce his or her own current standard of living in order to maintain the environment at the same level for the next generation varies by gender. We also look at this in the context of the preference to live in a society that strives to reduce greenhouse gases rather than striving for financial wellbeing, and the preference to live in a society that prefers reducing greenhouse gases rather than improving social welfare, and the preference to live in a society that strives for social welfare rather than striving for financial wellbeing and again see how this varies due to gender differences. We consider the flowing simple regression model,

$$s_i = D\mathbf{B} + X\mathbf{\Gamma} + \boldsymbol{\varepsilon}_i \tag{2}$$

where s_i represent the dependent variables as noted before. The independent variables include D's that control for gender and education and X's that control for individual characteristics. In D females and college graduates take the value of one. The individual characteristics are: age, number of children, homeownership, household or net personal income, residential location (by three main cities or regions),

[4] It is worth noting that those who 'prefer to reduce current standard of living in order to maintain the environment for future generations' and those who 'prefer reducing greenhouse gases than financial wellbeing' are similar in context. In this case one should expect to see that a person who indicates that they are 'willing to reduce current standard of living in order to maintain the environment for future generations' will indicate that they 'prefer reducing greenhouse gases than financial wellbeing.'

residential location by built environment (urban density or congestion measure), and employment status. Tables 4 through 7 present these OLS regression results.

Table 4 presents the results for "willing to reduce standard of living to maintain the environment for future generations." Our main interest is in examining whether there are any systematic differences due to gender or education attainment in one's response. The results indicate that females and college graduates are more willing to reduce their current standard of living to maintain the environment for future generations as compared to men. This result holds for all specifications. We also observe that age and number of children and homeownership have a positive and significant effect on the willingness to reduce the standard of living to maintain the environment for future generations. These general results also hold for almost all specifications. Income, residential location, urban density, and employment status do not tend to influence the willingness to reduce standard of living to maintain the environment for future generations. It is also interesting to examine whether education attainment affects gender differently regarding the willingness to live in a more green economy. In column 6 we therefore present results where the gender dummy has been interacted with dummy variables for education attainment. Our results provide strong support that females with college degrees are more willing to reduce their current standard of living to maintain the environment for future generations compared to any other group. This is in accordance with our Table 3 results.

Table 5 presents the results on individuals' preferences to reducing greenhouse gases compared to being financially well off. This survey question is very similar to the question posed on the "willingness to reduce standard of living to maintain the environment for future generations" and can be used as a robustness check for Table 4 results. Again, the results indicate that females and individuals with at least a college education prefer reducing greenhouse gases to being financially well off as compared to men. This result holds for all specifications. As in our conditional density estimation we see that homeowners prefer financial wellbeing instead of reducing green house gases compared to non-mortgage holders. Considering other variables, we observe that age has a positive effect on the dependent variable. However, number of children, income, residential location, urban density, and employment status do not really influence the wiliness to reduce greenhouse gases rather than being financially well off. These

Table 4: Regression results for 'willing to reduce standard of living to maintain the environment.'

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Female	.487**	.479**	.477**	.478**	.572**	.158
	(.119)	(.122)	(.122)	(.122)	(.127)	(.215)
College and above	.480**	.493**	.485**	.464**		.212
	(.144)	(.144)	(.145)	(.145)		(.208)
College and above × Female						.610**
						(.286)
High school education	.184	.186	.176	.178		.057
	(.147)	(.148)	(.149)	(.148)		(.208)
High school education × Female						.247
						(.296)
Mortgage owner	.366**	.385**	.378**	.444**	.449**	.390**
	(.152)	(.147)	(.148)	(.148)	(.149)	(.148)
Log of age	1.072**	1.070**	1.060**	1.118**	.980**	1.118***
	(.196)	(.199)	(.199)	(.200)	(.277)	(.201)
Number of children	.111*	.111*	.110	.120*	.113	.106
	(.066)	(.066)	(.067)	(.067)	(.068)	(.066)
Log of net house hold income	.058					
	(.136)					
Log of net personal income		-.002	-.002	-.002		-.014
		(.027)	(.027)	(.027)		(.027)
Main cities (Amsterdam, Rotterdam,	.128	.130			.138	
and Haag)	(.175)	(.175)			(.176)	
Regional effects			Yes			
Urban density effects				Yes		
Employment status effects					Yes	
Number of obs.	1433	1433	1433	1433	1433	1433
Adj. R^2	.034	.033	.032	.036	.025	.034

Robust standard errors are in parentheses. ** Denotes statistical significance at the 5% level and * denotes statistical significance at the 10% level.

Table 5: Regression results for 'prefer reducing greenhouse gases than financial wellbeing.'

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Female	.491**	.540**	.540**	.547**	.607**	.072
	(.113)	(.117)	(.118)	(.117)	(.121)	(.215)
College and above	.589**	.520**	.515**	.501**		.101
	(.144)	(.143)	(.144)	(.144)		(.200)
College and above × Female						.928***
						(.277)
High school education	.205	.182	.175	.174		.020
	(.141)	(.141)	(.142)	(.142)		(.197)
High school education × Female						.316
						(.281)
Mortgage owner	-.269*	-.328**	-.330**	-.264*	-.242*	-.313**
	(.140)	(.131)	(.131)	(.132)	(.131)	(.130)
Log of age	1.125**	1.107**	1.099**	1.145**	1.182**	1.187***
	(.186)	(.188)	(.188)	(.189)	(.265)	(.188)
Number of children	.063	.071	.076	.074	.064	.070
	(.064)	(.064)	(.065)	(.065)	(.065)	(.064)
Log of net house hold income	-.185					
	(.154)					
Log of net personal income		.026	.027	.027		.010
		(.028)	(.028)	(.029)		(.028)
Main cities (Amsterdam, Rotterdam,	-.114	-.122			-.126	
and Haag)	(.158)	(.159)			(.160)	
Regional effects			Yes			
Urban density effects				Yes		
Employment status effects					Yes	
Number of obs.	1433	1433	1433	1433	1433	1433
Adj. R^2	.043	.042	.041	.044	.034	.048

Robust standard errors are in parentheses. ** Denotes statistical significance at the 5% level and * denotes statistical significance at the 10% level.

general results also hold for all the specifications. Again in accordance with Table 3 results, Table 5 results indicate that females with college degrees are more willing to reduce greenhouse gases compared to being financially well off compared to any other group.

Table 6 presents the results on preference to reduce greenhouse gases compared to improving social welfare. Here, we observe that there are no statistical differences in the responses between either males and females, or for individuals with and without a college degree, and also not for homeowners and non-homeowners. This result holds for all specifications. Finally, in Table 7, we present the results for preference for improving social welfare compared to being financially well off. From the early results, we can see that, in general, more females than males and more college graduates than non-

Table 6: Regression results for 'prefer reducing greenhouse gases than social welfare.'

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Female	-.037	.002	-.002	-.002	.044	-.091
	(.115)	(.121)	(.121)	(.120)	(.123)	(.227)
College and above	-.056	-.092	-.103	-.111		-.234
	(.146)	(.150)	(.150)	(.151)		(.211)
College and above × Female						.305
						(.294)
High school education	.013	-.014	-.019	-.024		.028
	(.142)	(.144)	(.145)	(.145)		(.207)
High school education × Female						-.121
						(.287)
Mortgage owner	-.172	-.152	-.145	-.152	-.210	-.144
	(.143)	(.136)	(.136)	(.138)	(.136)	(.136)
Log of age	.778**	.730**	.734**	.746**	.948**	.766***
	(.195)	(.196)	(.196)	(.196)	(.274)	(.198)
Number of children	-.008	.003	-.001	.007	.007	-.000
	(.064)	(.065)	(.065)	(.065)	(.066)	(.065)
Log of net house hold income	.041					
	(.130)					
Log of net personal income		.035	.033	.034		.028
		(.026)	(.026)	(.026)		(.027)
Main cities (Amsterdam, Rotterdam,	-.013	-.013			-.016	
and Haag)	(.153)	(.153)			(.154)	
Regional effects			Yes			
Urban density effects				Yes		
Employment status effects					Yes	
Number of obs.	1433	1433	1433	1433	1433	1433
Adj. R^2	.010	.011	.010	.014	.009	.010

Robust standard errors are in parentheses. ** Denotes statistical significance at the 5% level and * denotes statistical significance at the 10% level.

college graduates are willing to reduce their standard of living to maintain the environment for future generations, prefer reducing greenhouse gases to being financially well off, and are similar to males in their responses regarding preference for reducing greenhouse gases over improving social welfare. In this case, one should expect women and college graduates to respond favourably, compared to men and non-college graduates, to improve social welfare over being financially well off. Our results support this conjecture and hold for all specifications including the specification in column 6 where we have interacted education attainment dummies with a female dummy.

When examining the differences in responses, one concern that we have is that we may not be making as tight a comparison as possible between males and females and college graduates and non-

Table 7: Regression results for 'prefer social welfare than financial wellbeing.'

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Female	.479**	.514**	.515**	.522**	.561**	.212
	(.104)	(.108)	(.108)	(.108)	(.113)	(.202)
College and above	.838**	.786**	.779**	.775**		.535**
	(.132)	(.132)	(.132)	(.132)		(.189)
College and above × Female						.543**
						(.258)
High school education	.386**	.371**	.360**	.369**		.224
	(.131)	(.132)	(.133)	(.132)		(.190)
High school education × Female						.290
						(.262)
Mortgage owner	-.123	-.176	-.172	-.120	-.077	-.160
	(.132)	(.127)	(.127)	(.130)	(.127)	(.127)
Log of age	1.231**	1.224**	1.210**	1.254**	1.389**	1.261***
	(.186)	(.188)	(.189)	(.189)	(.255)	(.190)
Number of children	.071	.075	.082	.076	.052	.077
	(.062)	(.063)	(.063)	(.064)	(.064)	(.063)
Log of net house hold income	-.162					
	(.136)					
Log of net personal income		.017	.017	.018		.007
		(.026)	(.026)	(.026)		(.026)
Main cities (Amsterdam, Rotterdam,	-.086	-.092			-.079	
and Haag)	(.140)	(.140)			(.143)	
Regional effects			Yes			
Urban density effects				Yes		
Employment status effects					Yes	
Number of obs.	1433	1433	1433	1433	1433	1433
Adj. R^2	.063	.062	.061	.064	.037	.063

Robust standard errors are in parentheses. ** Denotes statistical significance at the 5% level and * denotes statistical significance at the 10% level.

college graduates. Therefore, in the next section, we explore this by using matching techniques in order to compare more similar individuals.

4.3 Matching Estimation

We use matching techniques to evaluate whether the treatment group (females or college graduates) compared to the control group (males or people who did not complete college) are different on their willingness to reduce their current standard of living in order to maintain the environment at the same level for the next generation. In a similar manner, we look at the other trade off for each treatment group compared to the control group. Rosenbaum and Rubin (1983) proposed propensity score matching as a method to evaluate a 'treatment effect.'[5] They defined the propensity score as the conditional probability of receiving a treatment given observable (pre-treatment) characteristics. When taken in our context, the basic idea of the matching method is to compare, for example, the outcomes of females and males who have similar distributions conditioning on the observable individual characteristics. Let $D = 1$ when we observe females (or in the analogous case, considering college graduates) and $D = 0$ when we observe males (or people who did not complete college). The variables Q_0 and Q_1 are survey question outcomes for for males and females, respectively, and we are interested in the difference in $Q_0 - Q_1$. The Average Effect of Treatment on the Treated (AETT) can be written as follows:

$$\begin{aligned} \tau &= E\{Q_{1i} - Q_{0i} | D_i = 1\} \\ &= E\{E\{Q_{1i} - Q_{0i} | D_i = 1, p(X_i)\}\} \\ &= E\{E\{Q_{1i} | D_i = 1, p(X_i)\} - E\{Q_{0i} | D_i = 0, p(X_i)\} | D_i = 1\} \end{aligned} \tag{3}$$

where X is defined as observable individual characteristics. To derive the above, three assumptions need to be satisfied:[6] balancing of observable variables, unconfoundedness, and the common-support condition. When the balancing property is met, observations with the same propensity score have the

[5] Imbens (2000) and Lechner (2001) extend the method of propensity score matching to multiple mutually exclusive programs. Frolich (2004) discusses different impact evaluation methods, including those based on the conditional independent assumption in a similar context. Also see Lechner (2002a and 2002b.)

[6] For a formal proof, see Rosenbaum and Rubin (1983) and Imbens (2000).

same distribution of observable individual characteristics independent of gender (or college graduates) status. Unconfoundedness assumes that, conditioning on observed individual characteristics, gender (or college graduates) the assignment is independent of the survey question outcome for male cases (or people who did not complete college.) Our situation is a typical matching case where the gender assignment is random. This may not be the case for the attainment of college education. In order to control for this non-random assignment, we match college graduates and people who did not complete college using a well defined set of individual characteristics. Therefore, in all cases we ensure that the balancing property is satisfied, while estimating the propensity score. Finally, the common-support condition assumes that, for each female or treated unit, there are male or control units with similar observable characteristics. When these assumptions are met, the observed outcome of males can be used to estimate the counterfactual outcome of males (or people who did not complete college) in the case of being females (or in the analogous case of being a college graduate.)

Next, we used probit models to estimate propensity scores that are employed in matching techniques. Next, we used probit models to estimate propensity scores in matching techniques. The results of the probit models are reported in Table A1. The results in column 1 indicate that, in the sample, females are younger and less educated than males. In column 2 we control for employment types. Employment types indicate that women in the sample have a higher probability to hold paid work, run family own businesses, be at home (housewives), be unable to work, or be involved in volunteer work compared to men. These results are not shown in Table A1 column 2 in order to save space and can be provided upon request. Therefore, it is even more important to match individuals with similar characteristics by gender when making inferences regarding their willingness to reduce their current standard of living in order to maintain the environment at the same level for the next generation (or other survey questions.) In columns 3 and 4 we report the probit results for college graduates. Note that the coefficient for 'female' is statistically insignificant meaning that, in this sample, equal proportions of both males and females have attained college degrees. We also want to examine the differences in males and females in the college educated sample. Therefore, we use our college only sample and estimate propensity scores to be used in the matching technique. These probit results are

reported in column 5 of Table A1.

In Tables 8a-d , we report the effect of gender on the four survey questions. Full sample results are presented in columns 1 and 2 and the college only sample results are provided in column 3. Here, we use two matching techniques: (1) radius matching and (2) Kernel density matching.[7] In radius matching, we specify the radius to be 0.005. The counterfactual results indicate that men would have reacted very differently to these survey questions if they were females. This result holds for the college only sample too. Table 9 presents the AETT effects by college attainment. The results indicate that non-college graduates would have responded very differently to these questions if they were college graduates. The differences are very similar in magnitude and statistical significance to once shown in conditional distribution differences in Table 3 and OLS regression Tables 4 - 7 and consistent for all dependent variables.

The OLS and matching results provide the mean differences between males and females (educational attainment.) Next, as a robustness check, we test if these differences hold across the distribution as well. Therefore, we use the quantile regression technique introduced by Koenker and Bassett (1982). We restrict estimation to three quantiles–0.25, 0.50, and 0.75—and estimate the models. These models are similar to the ones we used in OLS regressions. In Table 10, we report these results. We report only the specification similar to the one used in the Racine and Li (2004) and column 1 in OLS Tables. Other results can be provided upon request and they are all qualitatively similar to the ones reported in Table 10. We are interested in examining whether there is a difference between the estimated coefficient of females' (and college graduates) across .25, .50, and .75 quantiles. The difference across the three quantiles tested from the models is statistically insignificant. However, we observe that the effect of mortgage ownership does not hold for all quantiles for question regarding those individuals who 'prefer reducing greenhouse gases than financial wellbeing' and it is significant only at the lower quantiles. Results also indicate that mortgage status does not matter when considering the questions 'prefer reducing greenhouse gases than social welfare' and 'prefer social welfare than financial wellbeing.' We

[7] A detailed discussion about how to implement these matching techniques is given by Becker and Ichino (2002).

Table 8: Matching results by gender.

Table 8a: Effect of gender on 'willing to reduce standard of living to maintain the environment.'

Matching Estimator	Full sample						College sample		
	(1)			(2)			(3)		
	Treatment n	Control n	AETT	Treatment n	Control n	AETT	Treatment n	Control n	AETT
Radius matching	638	774	.399**	617	777	.418**	212	296	.701**
($r = .005$)			(.120)			(.121)			(.235)
Kernel matching	644	766	.373**	644	788	.388**	243	311	.593**
			(.128)			(.109)			(.171)

Table 8b: Effect of gender on 'prefer reducing greenhouse gases than financial wellbeing.'

Matching Estimator	(1)			(2)			(3)		
	Treatment n	Control n	AETT	Treatment n	Control n	AETT	Treatment n	Control n	AETT
Radius matching	638	774	.402**	617	777	.443**	212	296	.741**
($r = .005$)			(.126)			(.123)			(.244)
Kernel matching	644	766	.416**	644	788	.457**	243	311	.821**
			(.112)			(.107)			(.158)

Table 8c: Effect of gender on 'prefer reducing greenhouse gases than social welfare.'

Matching Estimator	(1)			(2)			(3)		
	Treatment n	Control n	AETT	Treatment n	Control n	AETT	Treatment n	Control n	AETT
Radius matching	638	774	-.144	617	777	-.038	212	296	.168
($r = .005$)			(.114)			(.133)			(.186)
Kernel matching	644	766	-.094	644	788	-.061	243	311	.087
			(.119)			(.117)			(.188)

Table 8d: Effect of gender on 'prefer social welfare than financial wellbeing.'

Matching Estimator	(1)			(2)			(3)		
	Treatment n	Control n	AETT	Treatment n	Control n	AETT	Treatment n	Control n	AETT
Radius matching	638	774	.381**	617	777	.350**	212	296	.635**
($r = .005$)			(.102)			(.119)			(.202)
Kernel matching	644	766	.376**	644	788	.407**	243	311	.560**
			(.118)			(.088)			(.159)

** Denotes statistical significance at the 5% level and * denotes statistical significance at the 10% level. Bootstrapped standard errors are in parentheses.

Table 9: Matching results by educational attainment.

Table 9a: Effect of college on 'willing to reduce standard of living to maintain the environment.'

Matching Estimator	(1)			(2)		
	Treatment n	Control n	AETT	Treatment n	Control n	AETT
Radius matching ($r = .005$)	542	446	.467**	541	829	.316**
			(.163)			(.139)
Kernel matching	562	459	.437**	562	860	.411**
			(.147)			(.113)

Table 9b: Effect of college on 'prefer reducing greenhouse gases than financial wellbeing.'

Matching Estimator	(1)			(2)		
	Treatment n	Control n	AETT	Treatment n	Control n	AETT
Radius matching ($r = .005$)	542	446	.622**	541	829	.289**
			(.186)			(.121)
Kernel matching	562	459	.439**	562	860	.367**
			(.162)			(.125)

Table 9c: Effect of college on 'prefer reducing greenhouse gases than social welfare.'

Matching Estimator	(1)			(2)		
	Treatment n	Control n	AETT	Treatment n	Control n	AETT
Radius matching ($r = .005$)	542	446	-.009	541	829	-.204
			(.177)			(.132)
Kernel matching	562	459	-.093	562	860	-.101
			(.150)			(.126)

Table 9d: Effect of college on 'prefer social welfare than financial wellbeing.'

Matching Estimator	(1)			(2)		
	Treatment n	Control n	AETT	Treatment n	Control n	AETT
Radius matching ($r = .005$)	542	446	.840**	541	829	.456**
			(.155)			(.121)
Kernel matching	562	459	.691**	562	860	.563**
			(.137)			(.110)

** Denotes statistical significance at the 5% level and * denotes statistical significance at the 10% level. Bootstrapped standard errors are in parentheses.

also estimate a quantile model for college sample. Results are qualitatively similar to the once we observe in OLS and matching models. We do not report these results in order to save space and again can be provided upon request.

5 Discussion and Conclusions

This paper is the first to provide evidence of the value structure that individuals apply to the three pillars required for sustainable development, namely, economic, social and environmental concerns. Results from the analysis provide strong evidence that the willingness of households to reduce their current standard of living in order to maintain the environment at its current levels depends on heterogenous factors. We use a unique survey that asks households directly about their attitudes to sustainable values. We are able to derive the willingness of households to give up their current financial wellbeing in order to reduce carbon emissions. We find that females play a significant and positive role in establishing positive values towards both people and planet, in terms of social welfare and reducing carbon emissions, compared to men. Similar observations can be made when comparing college graduates to individuals without a college degree. Those with a university education place more value on reducing carbon emissions and on social welfare. This effect is even larger for college educated females compared to any other group. We also observe that this effect trickles down to those with a high school education when faced with the preference to live in an economy that strives towards social welfare or one that strives towards financial wellbeing. Age is also an important factor in determining willingness to reduce carbon emissions for financial wellbeing. Interestingly, income does not drive any of our results. In all cases, income is not statistically significant in determining the willingness to make any of the trade-offs. Again, our results are robust across all income levels.

Of further interest is the finding that, when households are also homeowners, they value financial welfare higher than do renters. When the household has a large amount of debt outstanding on their residential property, they appear to be more concerned with the overall financial wellbeing of society as a whole. When the question is phrased in terms of living standards, homeowners are willing to reduce their standard of living to maintain the environment, but not when phrased in terms of their financial

Table 10: Quantile regression results

Table 10a: Results for 'willing to reduce standard of living to maintain the environment.'

Variable	Quantile		
	.25	.50	.75
Female (β_1)	.473*	.303**	.257**
	(.126)	(.138)	(.128)
College and above (β_2)	.416**	.754**	.485**
	(.150)	(.166)	(.147)
Number of Obs.	1433	1433	
Pseudo R^2	.004	.023	.033

Table 10b: Results for 'prefer reducing greenhouse gases than financial wellbeing.'

Female (β_1)	.486*	.450**	.476**
	(.141)	(.143)	(.131)
College and above (β_2)	.908**	.754**	.447**
	(.170)	(.172)	(.155)
Number of Obs.	1433	1433	1433
Pseudo R^2	.028	.023	.017

Table 10c: Results for 'prefer reducing greenhouse gases than social welfare.'

Female (β_1)	.226	-.080	-.432
	(.238)	(.116)	(.263)
College and above (β_2)	-.051	-.002	-.087
	(.285)	(.139)	(.177)
Number of Obs.	1433	1433	1433
Pseudo R^2	.002	.019	.007

Table 10d: Results for 'prefer social welfare than financial wellbeing.'

Female (β_1)	.457**	.395**	.489**
	(.115)	(.132)	(.183)
College and above (β_2)	1.145**	.886**	.851**
	(.137)	(.159)	(.219)
Number of Obs.	1433	1433	1433
Pseudo R^2	.025	.054	.031

** Denotes statistical significance at the 5% level and * denotes statistical significance at the 10% level. Bootstrapped standard errors are in parentheses.
We test H_0: $\beta_1^{.25} = \beta_1^{.50} = \beta_1^{.75}$ and H_0: $\beta_2^{.25} = \beta_2^{.50} = \beta_2^{.75}$ for all Tables 10a - 10d. Our test results fail to reject H_0 for all test. These results can be provided upon request.

wellbeing. This raises some interesting concerns regarding the impact of housing wealth on sustainable values. Homeowners who have a large mortgage on their home are significantly concerned with this financial outlay. They are willing to reduce their standard of living to maintain the environment, but favor striving for financial wellbeing over reducing greenhouse gases. We had hoped that the size of the household home equity would play a significant role in addressing these values. The size of the mortgages to the value of the house is consistently large over the sample, about 95% or more. The system of tax incentives in The Netherlands aids in maintaining high debt-to-equity rates on personal property. We would like to investigate this in greater detail, with more specific information on loan-to-value ratios, since the current debt-to-equity rates are maintained at high levels throughout the term of the loan in The Netherlands. The issue of housing wealth having an influential role on sustainable values is worthy of greater investigation. The results have also been taken during the current downturn in the real estate market, so those with mortgages are likely to be much more concerned about the level of their wealth and, although when asked if they're willing to reduce their current standard of living in order to maintain the environment, they state that they are in favor of cutting their current standard of living, homeowners generally prefer to strive for financial values over the planet. The home may be regarded as the homeowner's 'financial castle' that he is not willing to give up.

An understanding of how heterogeneity plays an important role in assessing sustainable values will contribute towards making economic policy more effective in achieving the goal of sustainable development. Our results provide a first crucial step towards understanding how we can treat economic, social and environmental aspects in an integrated way in order to best meet our current needs without compromising the ability of future generations to meet their needs.

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Table A1: Probit results

	Full sample				College sample
Variable	Female		College graduate		Female
	(1)	(2)	(3)	(4)	(5)
Log of age	-.213**	-.293**	-.077	-.112	-.465**
	(.050)	(.074)	(.047)	(.071)	(.082)
Female			-.007	.037	
			(.027)	(.029)	
Number of children	-.005	-.043**	-.052**	-.036**	.000
	(.016)	(.017)	(.016)	(.016)	(.025)
Mortgage owner	-.047	-.063*			-.073
	(.034)	(.035)			(.063
High school education	-.109**				
	(.034)				
College and above	-.055*				
	(.033)				
Log of net house hold income	-.100**		.218**		-.125**
	(.031)		(.045)		(.054
Main cities (Amsterdam,	-.072**	-.062*	.019	-.007	-.041
Rotterdam, and Haag)	(.036)	(.038)	(.035)	(.035)	(.059)
Employment status effects		Yes		Yes	
Number of obs.	1433	1433	1433	1433	562
Wald χ^2	47.66	166.24	31.29	92.41	47.41
Pseudo R^2	.026	.142	.042	.053	.070

Robust standard errors are in parentheses. ** Denotes statistical significance at the 5% level and * denotes statistical significance at the 10% level.