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Abstract: Based on a survey of more than 400 students at the University of Minho in Portugal, we analyse the relationship of (1) basic economic literacy, (2) knowledge of the country's economic performance, and (3) opinions regarding appropriate economic policies, with previous economic training, and other socioeconomic variables. The results clearly show that economic training has a positive influence on students' economic literacy and knowledge of the country's current economic data and conditions. It also influences their assessment of how economic policy should be conducted. We argue that more training in Economics, both at the high school and university levels, is necessary to improve citizens' knowledge for making personal and social decisions on economic issues. This recommendation is particularly relevant for countries that recently underwent deep economic crises.

Keywords: economic literacy, knowledge of the country's economic performance, opinion on economic policies, training in Economics.

1. Introduction

Citizens' economic literacy and knowledge of the country's economic situation are fundamental for making competent decisions on economic issues, both at the personal and social levels. The ability of voters to hold governments accountable for the economic performance of the country depends crucially on their understanding of how the economy works. The recent financial and economic crises, that led to severe fiscal policy sustainability problems in several countries, including Portugal, gave additional relevance to the study of economic literacy.

Over the last decades until 2011, Portugal mainly adopted expansionary fiscal policies that were accompanied by a rapid growth of credit to the economy. However, economic growth was quite low, and domestic demand was largely satisfied by imports. At the same time, the debt service absorbed a growing share of resources, increasing the needs for external funding. The country's financial vulnerability significantly contributed to the deepening of the national crisis when the international financial crisis abruptly reversed the attitude of the markets regarding risk assessment. In 2011, Portugal lost access to market funding and, in May, the government was forced to sign a rescue program with the European Commission, the European Central Bank and the International Monetary Fund. The Economic and Financial Assistance Program implemented from 2011 to 2014 imposed severe austerity measures and structural changes to the economy. The deep economic crisis that Portugal underwent increased people's interest in economic affairs. Topics such as the debt sustainability, the size of the government, or the adequacy of the implemented economic policies to achieve the rescue program's goals captured the attention of the media and became frequent topics of discussion.

Inspired by the crisis that Portugal faced, the main purpose of this article is to analyse whether economic training influences economic literacy, knowledge of the country's economic situation, and opinions on how economic policy should be conducted. This is important for the design of educational policies intended to improve citizens' ability to make personal decisions on economic issues, and to monitor the government's economic policy decisions. To analyse the topic, a survey was carried out on 494 students of the University of Minho. To measure economic training¹ we use dummies for the type of program in which the student is enrolled, and for the number of ECTS² in economics accumulated. Our findings corroborate the hypothesis that the enrolment in economics courses increases economic literacy and makes students more knowledgeable about the economic situation of the country. It also influences their opinion regarding the role of government in the economy.

The paper proceeds as follows. Section II briefly presents previous research on the topic. Section III describes the data collection process, the survey and the key variables used in the empirical work. Empirical results are discussed in section IV. The last section concludes the paper.

¹ In this paper, economic training refers to the economic learning opportunities provided by the university, that is, economic courses.

² European Credit Transfer System (ECTS) is a generalized credit system at the European level, according to which a given amount of credits is assigned to each course, reflecting the quantity of work that such course requires relative to the total amount of work that is necessary to complete a year of study (equivalent to 60 ECTS).

2. Literature Review

Since the works of Stiegler (1963) and Bach and Saunders (1965, 1966) initiated the debate on the effects of studying economics in individual's long-term Economics' knowledge, several papers have been investigating the determinants of economic literacy,³ on the whole population and in specific groups,⁴ particularly among students. A common finding of the studies analysing the general population (Gleason and Scyoc, 1995; Walstad, 1997; Walstad and Rebeck, 2002) is that taking college courses in economics and a higher general education level have a positive influence on Economics' knowledge. Being male, Caucasian,⁵ older, and having a higher income, are also factors frequently associated with a higher level of economic literacy.

The positive role of studying economics on economic literacy that is found in analyses of the adult population is also corroborated in studies that focus on high school students (Walstad and Soper, 1988; Walstad and Rebeck, 2002; Walstad, 2013). Focusing on first-year undergraduate students' knowledge in microeconomics, Brückner *et al.* (2015 a) also found a positive influence of prior economic education., while Roos (2007) found that having good grades in the Introduction to Macroeconomics course

³ For reports on revisions of the Test of Economic Literacy see Walstad and Rebeck (2008) and Walstad, Rebeck and Butters (2013). This test is a nationally-normed and standardized measure of the economic understanding of US students. The Gallup Organization also implements several surveys on economic literacy.

⁴ For example, Wood and Doyle (2002) focused on the economic literacy of the employees of seven corporations.

⁵ Focusing on students from the University of Florida, Borg and Stranahan (2002) also found that gender and race matter in student's performance in Principles of Macroeconomics.

improved undergraduate students' knowledge. On a sample of undergraduate seniors, Walstad and Allgood (1999) corroborated the results of Walstad (1997), finding that students with higher academic aspirations performed better, as well as those with higher grades.

Studies of the determinants of economic literacy among students on panels of countries are quite scarce. Using data for 55 countries, Jappelli (2010) found that the results in the PISA test and the percentage of the population that goes to college are positively, and significantly correlated with the country's level of economic literacy. However, generous social security systems reduce the incentives to be aware of the economy and the financial market's evolution, having a negative impact on economic literacy. Studying economic knowledge of first-year students in higher education in USA and Germany, Brückner *et al.* (2015 b) show that prior education has a positive significant effect merely on microeconomics test scores, while gender and native language are purely significant on macroeconomics test scores in both countries.

The gap between the general public and professional economists' views on economic issues has also been explored in the literature and is substantial (Blendon *et al.*, 1997). The differences are nevertheless smaller when controlling for education, self-interest and ideological bias (Caplan, 2002). The roles of knowledge, ideology, and self-interest on public opinion formation were further investigated by Blinder and Krueger (2004), who concluded that among the three, ideology is the most important, followed by economic knowledge. Additionally, income is also relevant as low-income individual's perceptions about the economy tend to be upward biased when their income is increasing (Hopkins, 2012). At last, Manz (2014) concluded that individuals with higher

economic literacy are also able to make better use of information when it comes to formulating inflation expectations.

As far as we know, no study has ever focused on the economic literacy of the Portuguese students, and only one focused on the economic literacy of the general adult population (Varum *et al.*, 2014). This paper gives a small contribution to this gap in the literature.

3. The survey

To collect the data, the survey presented in the online appendix⁶ was administered in-person to students of the University of Minho. At the end of a class, after obtaining prior consent from the teacher, the questionnaire was administered to all the students willing to take it. In the selection of the classes, a non-probability sample design was adopted, following a purposive strategy. As the main purpose of the study is to assess the effect of studying Economics on undergraduate students' economic literacy, knowledge of the country's economic performance and opinions on economic policies, it was decided that the sample should consist of three groups of similar size: students enrolled in the Economics undergraduate degree, students enrolled in degrees with at least one course unit in Economics, and students with no training in Economics. In the second group, we targeted students enrolled in degrees offered by the School of Economics and Management (Accounting, Management and Political Science), and students in Law, which have two courses in Economics. In the choice of the degrees from which students

⁶ Available at <https://www.dropbox.com/s/fm349iwwj1jh5ny/Online%20appendix.pdf?dl=0>.

were selected, we also made sure that degrees with different access grades⁷ were considered. The sampling was also intended to have students from different years of study, particularly from the degrees of Economics and Management, to widen the range of the number of courses in Economics taken by students.

Before the administration of the survey, a pilot test was conducted on October 2014. After small adjustments, the first round of data collection began also in October 2014. In this first round, 404 undergraduate students were surveyed from the following degrees: Economics, Management, Accounting, Political Science, Law, Education, Biomedical Engineering, and Biology and Geology. The second round of data collection occurred in February 2015, where 90 students were surveyed from the degrees of Economics and Communication Sciences. Therefore, the database has 494 observations corresponding to around 5% of the undergraduate student population of the University of Minho. Although the sample cannot be considered as representative of undergraduate students in Portugal, mainly because it is restricted to a specific geographic context, it captures the diversity of fields of study (students from nine undergraduate programs participated in the survey), grade of access to the university and sociodemographic characteristics of University of Minho's undergraduate students. Table 1 shows the sample composition on what concerns the sampled individuals' field of study.

⁷ In Portugal, the number of vacancies assigned each academic year to each pair university/degree is established by the government. Vacancies are assigned to students through a national tender, based on grades.

Table 1 - Distribution of the sampled individuals by degree

	Frequency	Percentage
<i>Undergraduate degree in Economics</i>	158	31.98
<i>Undergraduate degrees with some courses in Economics</i>	187	37.85
Accounting	34	6.88
Law	45	9.11
Management	92	18.62
Political Science	16	3.24
<i>Undergraduate degrees with no courses in Economics</i>	149	30.16
Biology and Geology	40	8.10
Biomedical Engineering	41	8.30
Communication Sciences	42	8.50
Education	26	5.26

The survey has three parts. Part A is an assessment on the knowledge of basic economic theory, Part B concentrates on opinions about economic policy issues and perceptions of the country's economic performance, and Part C focuses on the individuals' socio-demographic and political characteristics. The survey design was mainly inspired on the National Survey on American Economic Literacy, as well as on the previous works of Blendon *et al.* (1997), Blinder and Kruguer (2004), Walstad (1997) and Walstad and Rebeck (2002), whose survey questions were selected and adapted according to the Portuguese context.

Ten questions were included in the survey (Part A) to measure the economic literacy of students. These questions are listed in Table 2, together with the percentage

of correct answers given by respondents, and the standard deviation. For each variable 494 observations are available. An economic literacy sum score (*Econ_Literature*) was calculated based on the number of correct answers that each student gave to these questions.⁸ The mean and standard deviation of the economic literacy measure are reported at the bottom of Table 2. As can be seen from the table, the sample mean of economic literacy is 7.34. Question 4, about the responsibility to define monetary policy, has, by far, the lowest percentage of correct answers (33%).⁹ The questions about the variable that measures economic growth (Q2), the conditions for the existence of a public deficit (Q3), and who sets fiscal policy (Q5) have the highest percentage of correct answers (90%, 88%, and 89% respectively).

Table 2 - Economic literacy: Descriptive statistics

Question (correct answer)	Mean	Standard-Deviation
Which one of the following is the most widely used measure of inflation? (a. The Consumer Price Index)	0.621	0.486
Economic growth is measured by a change in which of the following? (c. The Gross Domestic Product)	0.901	0.299
There is a deficit in the national budget when: (a. government spending is greater than revenues)	0.879	0.327
Who sets monetary policy in Portugal?	0.326	0.469

⁸ The Cronbach alpha of this score is of approximately 0.7.

⁹ The original question from the National Survey on American Economic Literacy had just three possible answers, none of which correct for the Portuguese case. In order to have four options for each question included in the literacy test we added option d) Portugal does not have monetary policy independence, which is the correct answer. The right answer for the US (the Fed), was adjusted to the Portuguese context by replacing the Fed by the Bank of Portugal.

(d. Portugal does not have monetary policy autonomy)		
Who makes fiscal policy in Portugal? (c. The government)	0.889	0.315
Which of the following is an example of fiscal policy? (b. A change in the income tax rates)	0.791	0.407
Which of the following is most likely to improve the wages of Portuguese workers? (c. An increase in productivity)	0.783	0.412
The purchasing power of people's income is most affected by the: (a. Inflation rate)	0.872	0.334
The prices of most products in a competitive market are determined by: (c. supply and demand)	0.696	0.460
What is the expected effect on Portuguese exports of an increase in the value of the euro? (b. A decrease in exports)	0.577	0.495
Economic Literacy Sum Score (<i>Eco_Literacy</i>)	7.338	2.000

The survey also included questions about the students' opinion on economic policy issues (Part B, questions 1 to 5). Five dummy variables were constructed from answers to these questions. *Independent_Central_Bank* equals one when the individual agrees that monetary policy should be conducted by an independent central bank, and zero if she thinks the government should be responsible for it. *Income_tax_deficit* assumes the value of one if the student thinks that increasing corporate income taxes is a good measure to reduce the budget deficit and zero if she does not. *Gov_Exp* identifies students who are in favour of increasing public expenditures to stimulate the economy in a time of recession. *Debt_Renegotiation* equals one for individuals who think that the Portuguese public debt should be renegotiated, and zero for the ones who do not. *Diminish_Social_Exp* equals one for the students who agree that public social expenditures should be diminished, and zero for those who disagree.

Table 3 contains the number of observations, the mean and the standard deviations for the variables analysed in this topic. In these opinion questions, the "No

opinion” answers were coded as 0. The highest mean was obtained for the question regarding public debt renegotiation: 59% of the respondents agree that it should be renegotiated. A considerable percentage of students (45%) is in favour of reducing public social expenditures, and only 20% agree that increasing government spending is a good policy measure to fight a recession. These answers are not surprising given that public debt represented 130% of GDP by the time of the survey (2014), and the country was under severe austerity measures imposed by the recovery program funded by the IMF and the European Union. Table 3 also reveals that only 24% of the students agree that increasing corporate income taxes is an appropriate policy to reduce the deficit. Regarding monetary policy, 53% of the respondents think that it should be defined by an independent central bank, whereas 47% prefer the government or do not have an opinion on the matter.

Table 3 - Opinions regarding appropriate economic policies: Descriptive statistics

Question (answer) ¹⁰	Observations	Mean	Standard-Deviation
Monetary policy should be set by: (a. An independent Central Bank)	494	0.534	0.499
Do you think raising corporate income taxes is a good way to decrease the budget deficit? (a. Yes)	494	0.235	0.424
Do you think raising public spending is a good way to fight recessions? (a. Yes)	494	0.196	0.398
Do you think the Portuguese public debt should be renegotiated? (a. Yes)	494	0.593	0.492
Do you think government’s social expenditures should be diminished? (a. Yes)	494	0.445	0.498

¹⁰ Since these are opinion questions, the answer between parenthesis does not stand for the correct answer, but only to the answer to which was attributed the value of 1.

The survey also intended to capture students' knowledge about the country's economic performance. Based on answers to questions 6 to 17 of section B of the survey, 12 dummy variables were created that take the value of one when the student answered the question correctly, and zero otherwise. To measure what students know about the Portuguese economy (*Knowledge_Country_Econ*) a sum score was computed that equals the sum of correct answers that each student gave. The descriptive statistics of these variables are reported in Table 4. For each variable 494 observations are available. The two questions with the highest percentage of correct answers refer to the evolution of the number of full-time jobs (89%) and the unemployment rate (77%), in the last six years. Most of the respondents (51%) also answered correctly the question about the value of the unemployment rate. Therefore, students show better knowledge about the Portuguese economy on issues related to employment, which probably has to do with the fact that unemployment was abnormally high, and one of the most covered topics by the media. On the other extreme, questions related to the inflation rate and the GDP growth rate were the ones with the highest percentage of incorrect answers. The mean value of *Knowledge_Country_Econ* is 4.77, which means that, on average, each student gave less than five correct answers to the 12 questions included in the measure.

Table 4 – Knowledge about the country’s economic performance: Descriptive statistics

Question (correct answer)	Mean	Stand. Dev.
In which interval are the forecasts for the Portuguese deficit in 2014? (c.4% to 4.9% of the GDP)	0.362	0.481
What is the approximate value of the Portuguese unemployment rate (value for the 4 th quarter of 2014)? (c.13.5%)	0.506	0.500
In comparison to 2008, the Portuguese unemployment rate is (c. Higher)	0.771	0.420
In the last six years, the number of full-time jobs in Portugal has (a. Decreased)	0.889	0.315
What is the estimated value for the Portuguese inflation rate in 2014? (c. -0.3%)	0.184	0.388
In comparison with 2008, the Portuguese inflation rate is now: (a. Lower)	0.215	0.411
What is the approximate value of public revenue as a percentage of GDP in Portugal (value for the end of 2013)? (b.43.7%)	0.360	0.481
What is the approximate value of public spending as a percentage of GDP in Portugal (value for the end of 2013)? (c.48.7%)	0.302	0.459
What is the approximate value for the Portuguese GDP growth rate in 2013? (a.-1.4%)	0.097	0.296
What is the approximate value of the Portuguese public debt as a percentage of GDP (value for the end of 2013)? (c.129%)	0.407	0.492
What is the approximate value of interest payments on government debt as a percentage of GDP in Portugal (estimated value for 2014)? (c.5%)	0.332	0.471
What is the approximate value of social expenditure as a percentage of GDP in Portugal (estimated value for 2014)? (b.19.5%)	0.339	0.474
Knowledge of the Country’s Economic Performance Sum Score (<i>Knowledge_Country_Econ</i>)	4.765	1.751

Finally, the survey also included questions to capture the students’ socio-economic and demographic features, their political values and the amount of economic training (economic courses) taken. Based on the answers to the first group of questions, eight variables were constructed. *Age* represents the age of the student. *Male* and *Worker* are dummy variables that, respectively, identify males and students who work while in college. *Year* indicates the year of the undergraduate program in which the student is. *Admission_grade* is the admission grade to university, while

Average_grade_university is the average grade in university courses. *Family_Income*, measure the family's income.¹¹

To characterize students politically three variables were constructed. *Voter* is a dummy variable that equals one if the student participated in all legislative and presidential elections since the age of 18 years old, and zero otherwise. *Ideology* is a categorical variable that represents the students' position in the political spectrum, where one corresponds to the extreme left and six to the extreme right. Finally, *Political* is a dummy that identifies students who were able to position themselves politically. To measure training in Economics acquired by students, five variables were created (these are our treatment variables): a discrete variable (*ECTS*) that quantifies the number of ECTS accumulated in Economics courses, and four dummies that capture the kind of training in Economics students have. *Economics* identifies students from the Economics undergraduate degree. *SEM* is equal to one when the student is from an undergraduate degree that is not in Economics but is administered by the School of Economics and Management (SEM).¹² *Freq_Eco* assumes the value of one when the student is from an undergraduate degree that is not administered by the SEM but has at least one course that is taught by the Department of Economics. Finally, *High_School* equals one if the student was enrolled in the social science track in economics in high school.

Table 5 contains the descriptive statistics for the three groups of variables previously described. 32% of the students who participated in the survey are enrolled in

¹¹ Information related with mother and father's education were also collected, but such variables were not considered, because they were never statistically significant in the regressions.

¹² Accounting, Management and Political Science are the other courses held by the School of Economics and Management that are considered in this study.

the undergraduate degree in Economics, 29% in programs administered by the SEM, 9% in programs that have at least one course in Economics but are not run by the SEM, and the remaining 30% have no university courses in Economics. 26% of students attended the social science track in Economics in high school. The average age of the students analysed is 20.6, 34% are male and 11% work. Their average admission grade to the university was higher (15.8 over 20) than their average grade in university courses (13.6 over 20). The average family gross monthly income is between 1001 and 1500 euros. The majority of students (67%) voted in all presidential and legislative elections since they were allowed to do so, and was able to position itself politically (55%). On a scale of 1 to 6, the average ideological position of students is 3.7 which is very close to the median value.

Table 5 - Socio-economic, political and treatment variables: Descriptive Statistics

Variable	Observations	Mean	Stand. Dev.	Min.	Max.
<i>Year</i>	493	2.207	0.750	1	5
<i>Age</i>	494	20.571	4.413	17	56
<i>Male</i>	494	0.340	0.474	0	1
<i>Worker</i>	494	0.111	0.315	0	1
<i>Admission_grade</i>	463	15.868	1.489	10	20
<i>Average_grade_University</i>	378	13.598	1.544	10	18
<i>Family_income</i>	445	3.072	1.370	1	6
<i>Voter</i>	483	0.671	0.470	0	1
<i>Political</i>	492	0.545	0.499	0	1
<i>Ideology</i>	271	3.668	1.280	1	6
<i>Left</i>	494	0.235	0.424	0	1

<i>ECTS</i>	493	24.775	30.953	0	96
<i>Economics</i>	494	0.320	0.467	0	1
<i>SEM</i>	494	0.287	0.453	0	1
<i>Freq_Eco</i>	494	0.091	0.288	0	1
<i>High_school</i>	493	0.260	0.439	0	1

4. Results

The empirical analysis has three parts. The first examines the determinants of economic literacy. The second focuses on students' knowledge about the country's economic performance, and the third on their opinions on economic policy issues.

4.1. Economic literacy

To investigate the factors influencing students' economic literacy, the following model was estimated:

$$Eco_Literacy_i = \beta_0 + \beta_1 Socio-Demog_i + \beta_2 Political_i + \beta_3 Treatment_i + e_i, \quad (1)$$

where *Eco_Literacy* represents the sum score of economic literacy of student *i*; *Socio-demog* and *Political* are, respectively, vectors of socio-demographic and of political variables characterizing the student; *Treatment* is a vector of variables representing the type of training in Economics each individual has. The variables included in each of these vectors were described in the previous section. β_0 is a parameter to be estimated; β_1 , β_2 , and β_3 , are vectors of parameters to be estimated; and finally, e_i is the error term.

We started by estimating the model by Ordinary Least Squares, and then by the Tobit model because the dependent variable is bounded between 0 and 10. The

estimation results are presented in Table 6.¹³ Robust standard-errors that correct for heteroscedasticity are reported, and there is no suspicion of multicollinearity problems since the correlations between the independent variables are very low. As can be seen from the table, the results for the OLS and Tobit models are quite similar, with the main difference being that the variable *Age* turns out to be statistically significant in the Tobit models, but not in the OLS. Given that the Tobit model is more appropriate, we focus on the Tobit estimations reported in columns 3 and 4 when interpreting the results.

As can be seen from column 3, two of the dummies that specify students' training in Economics at the university are highly statistically significant. Relative to the students who did not study Economics at all, those enrolled in the Economics degree have, on average, and keeping everything else constant, a score that is approximately 1.6 units higher in the Economic Literacy sum score. Compared to the same group, the score of students from the School of Economics and Management (but not from Economics) is approximately 1.2 units higher. A Wald test for the equality of the estimated coefficients for the variables *Economics* and *SEM* does not allow us to reject the hypothesis that they are equal. This result is not surprising since we are defining economic literacy as knowledge in basic economic theory. Students enrolled in programs that are not administered by the School of Economics and Management, but who have had at least one economics course performed similarly to those who had no economics courses at all. However, having been enrolled in the social science track in economic in high school

¹³ The variable related to the year in the academic program in which the student is enrolled was excluded from the regression since it did not reveal to be statistically significant.

(*High_School*) seems to have a significant impact on the economic literacy of undergraduate students.

Table 6 - Determinants of economic literacy

Variables	OLS (1)	OLS (2)	Tobit (3)	Tobit (4)	Tobit (5)	Tobit (6)
Male	0.670*** (4.025)	0.739*** (4.508)	0.884*** (4.436)	0.960*** (4.929)	0.801*** (4.114)	0.876*** (4.563)
Age	0.0395 (1.368)	0.0241 (0.843)	0.0618** (2.466)	0.0393 (1.635)	0.167*** (4.388)	0.119*** (3.193)
Worker	-0.401 (-1.416)	-0.229 (-0.757)	-0.518* (-1.667)	-0.321 (-1.055)	-0.853*** (-2.678)	-0.607* (-1.916)
Admission_Grade	0.116** (2.370)	0.0856* (1.883)	0.134** (2.115)	0.107* (1.817)	0.147** (2.370)	0.124** (2.143)
Family_Income	0.127** (2.061)	0.120** (2.045)	0.142** (2.098)	0.140** (2.122)	0.115* (1.722)	0.118* (1.807)
Voter	0.467** (2.584)	0.415** (2.347)	0.507*** (2.617)	0.441** (2.319)	0.497*** (2.608)	0.446** (2.375)
Left	0.481*** (3.096)	0.565*** (3.597)	0.593*** (2.715)	0.688*** (3.213)	0.620*** (2.881)	0.691*** (3.266)
Economics	1.589*** (6.941)		1.856*** (7.464)		1.900*** (7.779)	
SEM	1.160*** (5.392)		1.208*** (4.924)		1.249*** (5.206)	
Freq_Eco	0.379 (1.103)		0.408 (1.175)		0.631* (1.841)	
High_School	1.130*** (6.029)	1.078*** (5.809)	1.478*** (6.392)	1.411*** (6.326)	1.523*** (6.721)	1.450*** (6.563)
6_10_or_12ECTS		0.688*** (3.223)		0.723*** (3.236)		0.856*** (3.845)
At_least_24ECTS		1.791*** (8.513)		2.026*** (8.597)		1.993*** (8.597)
N. Observations	413	413	413	413	409	409
Adj. R-squared	0.368	0.395				
LR (chi2)			216.9	232.4	224.7	234.7

Notes: All regressions include a constant. Robust t-statistics in parentheses. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

To have treatment variables that more accurately measure the training in economics of each individual, dummy variables based on the number of accumulated ECTS in economics courses by the students were constructed. Using information on ECTS

in economics courses is innovative since all previous studies (Walstad and Soper, 1988; Walstad, 1997; Walstad and Allgood, 1999; Walstad and Rebeck, 2002) used dummies for the program in which students were enrolled. Because in our sample the number of ECTS in economics that students have only assumed seven values (0, 6, 10, 12, 24, 60, or 96) the variable cannot be treated as continuous. We started by creating dummies for each value of the ECTS. Wald tests did not allow us to reject the hypotheses that the estimated coefficients for the dummies corresponding to 6, 10 and 12 ECTS were equal, nor that the estimated coefficients for 24, 60 and 96 ECTS were equal. Taking these results into account, and the fact that a typical one-semester course in economics has 6 ECTS, two dummy variables were created for students who have had two or fewer courses in economics (*6_10_or_12ECTS*) and students who have had at least four courses in economics, which corresponds to at least 24 ECTS (*at_least_24ECTS*). The results shown in column four reveal that there is quite a large and statistically significant difference between the economic literacy of students who accumulated 6, 10 or 12 (equivalent to two one-semester courses) ECTS in economics courses and those who did not study economics in college at all. An even larger difference was found between the latter and the individuals who have at least 24 ECTS in economics courses (equivalent to four one-semester courses). Having 6, 10 or 12 ECTS of economics is associated with approximately 1.1 points more in the economic literacy sum score, while having at least 24 ECTS increases the score by approximately 1.8 units. As in column 3, the estimated sign for the dummy identifying individuals who were enrolled in the social sciences track in economics in high school is positive and highly statistically significant.

Among the socio-demographic and political variables, the results reveal that male students perform significantly better than female students, with an estimated

impact of nearly one point. Age seems to exert a positive influence, although its magnitude is quite small, and the variable only turned out to be statistically significant in column 3. There is marginal evidence (column 3) that working negatively affects the economic literacy of undergraduate students. Additionally, students who have a higher admission grade to the university, a higher family income, who always voted since they were legally allowed to do so, and who identified themselves as being left-wing oriented¹⁴ also performed better in the economic literacy test.

As a robustness test, since the range of students' ages spans from 17 to 56, we decided to remove from the sample students over 44 years of age.¹⁵ There are only four students in this situation (aged 50, 53 or 56), representing around 1% of the total sample. Results, reported in columns 5 and 6, reveal that the variable *age* is now highly statistically significant and with a larger estimated coefficient. One additional year of age is estimated to increase the economic literacy of students by 0.1. There is also stronger evidence that working students perform worse in the test. The coefficients associated with the remaining variables kept their sign and statistical significance.

¹⁴ *Left* equals one for respondents who chose values of 1, 2 or 3 in the ideological scale.

¹⁵ As an additional robustness test, the model was also estimated with age squared as an explanatory variable. However, this variable did not turn out to be statistically significant.

4.2. Students' knowledge of the country's economic performance

To analyse students' knowledge about the country's economic performance a model similar to equation (1) was estimated, but now the dependent variable is the sum of correct answers that each student gave to questions 6 to 17 included in section B of the survey (*Knowledge_Country_Econ_i*).

$$Knowledge_Country_Econ_i = \beta_0 + \beta_1 Socio-Demog_i + \beta_2 Political_i + \beta_3 Treatment_i + e_i, \quad (2)$$

As before, the model was estimated by the OLS and Tobit models, where the lower and the upper limits correspond to the minimum and the maximum value of the sum score (zero and twelve). Table 7 contains the results for the Tobit models that include dummies for the type of program that students are enrolled in as explanatory variables (columns 1 and 3) and for models including a dummy for students who completed at least 96 ECTS in economics courses (columns 2 and 4). This dummy was created because Wald tests revealed a significant difference between students who accumulated 96 ECTS in economics courses and those who did not, and there were no statistically significant differences among all other ECTS categories. This result implies that, while a relatively small number of economics courses has an impact on individuals' basic economic literacy, a larger number of courses is necessary to improve students' knowledge about the country's economic performance. Except for the *96ECTS* variable, all remaining variables included in columns 1 and 2 are the same as in Table 6. However, since the *Left* variable turned out never to be statistically significant, a dummy variable for students who were able to position themselves in the political scale (*Political*) was included in columns 4 and 5.

Table 7 - Determinants of knowledge of the country's economic performance

Variables	Tobit (1)	Tobit (2)	Tobit (3)	Tobit (4)
Male	0.358* (1.939)	0.408** (2.211)	0.327* (1.780)	0.370** (2.010)
Age	0.102*** (4.689)	0.0963*** (4.429)	0.103*** (3.033)	0.0950*** (2.805)
Worker	-0.237 (-0.820)	-0.195 (-0.674)	-0.166 (-0.543)	-0.117 (-0.382)
Admission_Grade	0.107* (1.788)	0.0867 (1.530)	0.102* (1.710)	0.0819 (1.444)
Family_Income	-0.0461 (-0.737)	-0.0458 (-0.735)	-0.0359 (-0.569)	-0.0366 (-0.585)
Voter	-0.182 (-0.998)	-0.185 (-1.016)	-0.214 (-1.172)	-0.215 (-1.178)
Left	0.295 (1.465)	0.271 (1.354)		
Political			0.317* (1.822)	0.294* (1.691)
Economics	0.363 (1.563)		0.343 (1.483)	
SEM	0.226 (0.976)		0.199 (0.865)	
Freq_Eco	-0.245 (-0.742)		-0.359 (-1.078)	
High_School	0.246 (1.163)	0.373* (1.929)	0.262 (1.243)	0.387** (2.010)
96ECTS		0.559** (1.999)		0.555** (1.988)
N. Observations	411	411	411	411
LR (chi2)	42.87	42.70	44.90	44.05

Notes: All regressions include a constant. Robust t-statistics in parentheses. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

As can be seen from Table 7, individuals who completed at least 96 ECTS in Economics know more about the Portuguese economy than those who did not. In the models where we use dummies for the type of undergraduate program of the student (columns 1 and 3), the null hypothesis of no effect can never be rejected. The *High_School* dummy is positively signed and statistically significant in estimations (2) and (4). Among the socio-demographic variables, gender and age exert the strongest impact with an estimated coefficient of around 0.3 and 0.1, respectively. There is

marginal evidence (columns 1 and 3) that higher admission grades to the university are positively associated with knowledge about the country's economic performance.¹⁶ Finally, results suggest that although being left or right-wing oriented does not influence students' knowledge of the Portuguese economy, being able to position themselves in the ideological scale exerts a marginally positive effect.

To deepen the analysis, probit models were estimated for each of the twelve dummies used to measure students' knowledge about the country's economic performance.¹⁷ The results revealed that studying economics exerts a bigger positive effect on the probability of correctly answering the two questions related to the inflation rate and the value of the deficit. More precisely, having completed 96 ECTS in economics courses makes it more likely to know the value of the deficit, and the inflation rate, as well as whether the latter was higher or lower than in 2008. The dummy for *Economics* also turned out to be statistically significant for the questions about the inflation rate. It is interesting to recall (Table 4) that only a small percentage of students gave correct answers to these two questions.

4.3. Students' opinion on economic policy issues

In this section, we estimate probit models to assess which variables explain students' answers to five questions related to economic policy decisions. Data on questions 1 to 5 of section B in the survey were used to construct the dependent

¹⁶ As before, we also included age squared as an explanatory variable, but it turned out not to be statistically significant. The results reported in Table 6 are also robust to the exclusion of the oldest students.

¹⁷ The results are not reported but are available from the authors upon request.

variables. As explained in section III, a value of one was attributed to the answers of students who agreed that: (1) monetary policy should be set by an independent central bank, (2) raising corporate income taxes is a good policy to reduce the deficit, (3) increases in public spending should be used to fight recessions, (4) the Portuguese public debt should be renegotiated, and (5) government's social expenditures ought to be decreased. The estimated models can be described as follows:

$$Opinion_i = \beta_0 + \beta_1 Socio-Demog_i + \beta_2 Political_i + \beta_3 Treatment_i + e_i, \quad (3)$$

where *Opinion* is the dummy variable representing each of the five questions.

Table 8 shows the results for the estimated models.¹⁸ Column 1 reveals that students enrolled in the economics degree or other undergraduate program administered by the School of Economics and Management have a higher probability of agreeing that monetary policy should be set an independent central bank. The estimated impacts are of 24 and 20 percentage points, respectively.¹⁹ This is not surprising since monetary policy is a topic that is covered in most economics courses but is somewhat unknown to other people. There is also evidence that male and older students²⁰ are more in favour of having monetary policy defined by an independent

¹⁸ No opinion answers were coded as 0. As a robustness test, we also estimated regressions with the no opinion answers coded as missing values. The results were identical.

¹⁹ Alternatively, when using dummies for the number of ECTS in Economics, the results revealed that having completed until 12 ECTS increases the probability of agreeing that monetary policy should be conducted by an independent central bank by 13 percentage points, while having completed 24 ECTS or more is associated to an increase of 28 percentage points of the same probability.

²⁰ Excluding the oldest students, as in Table 6, does not change the results reported in Table 8 for variables other than *Age*.

central bank. Regarding increases in corporate income taxes as a solution to reduce the deficit (column 2), only age turned out to be statistically significant. Older students are less inclined to agree with this measure. We did not anticipate that training in Economics would influence students' opinions on the possibility of raising corporate income taxes to improve the fiscal performance of the country since this is not a consensual policy measure among economists.

Table 8 – Determinants of students' opinions on economic policy issues

Variables	Independent Central Bank (1)	More corp. taxes / deficit (2)	Pub. expend. / recession (3)	Debt renegot. (4)	Less social expend. (5)
Male	0.139*** (2.740)	0.020 (0.431)	0.105*** (2.708)	0.003 (0.048)	-0.052 (-0.997)
Age	0.022** (2.205)	-0.009* (-1.820)	0.003 (0.746)	-0.002 (-0.403)	-0.005 (-0.758)
Worker	0.099 (1.179)	-0.036 (-0.532)	-0.035 (-0.501)	0.031 (0.391)	0.110 (1.343)
Admission_grade	0.003 (0.157)	-0.012 (-0.835)	-0.011 (-0.805)	-0.021 (-1.188)	-0.050*** (-2.947)
Family_income	-0.014 (-0.767)	-0.019 (-1.220)	0.008 (0.623)	0.000 (0.005)	0.017 (0.972)
Voter	0.025 (0.487)	0.055 (1.255)	-0.005 (-0.131)	0.003 (0.049)	0.051 (0.984)
Left	0.037 (0.662)	-0.072 (-1.402)	0.082* (1.954)	0.150** (2.565)	-0.096* (-1.711)
Economics	0.240*** (3.832)	0.016 (0.279)	0.184*** (3.531)	-0.047 (-0.719)	-0.050 (-0.756)
SEM	0.196*** (3.136)	0.052 (0.930)	0.042 (0.749)	-0.083 (-1.262)	0.039 (0.597)
Freq_Eco	0.088 (0.956)	-0.090 (-0.979)	0.190*** (2.683)	0.088 (0.896)	-0.183* (-1.887)
High_School	0.026 (0.438)	0.067 (1.360)	0.004 (0.090)	0.039 (0.644)	-0.072 (-1.216)
N. Observations	413	413	413	413	413
Pseudo R ²	0.075	0.033	0.087	0.021	0.049
LR (chi2)	42.74	14.53	34.93	11.68	28.04
Akaike's criteria	550.11	452.50	392.23	570.42	564.02
Bayesian criteria	598.39	500.78	440.51	618.70	612.30

Notes: Probit regressions including a constant. Robust z-statistics in parentheses. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

As can be seen from column 3, being enrolled in the economics undergraduate program significantly augments (by around 18 percentage points) the probability of thinking that increasing government spending is a good way to fight recessions.²¹ As for monetary policy, this result comes as no surprise since the Keynesian theory is taught in most economics courses at the university level. There is also evidence that being male, left-wing politically oriented,²² or a student enrolled in a degree not administered by the School of Economics and Management, but with some economics courses positively influences the probability of agreeing with the appropriateness of this policy. Regarding public debt renegotiation (column 4), the results revealed that being left-wing politically oriented was associated with an increased probability of approximately 15 percentage points of being favourable to the renegotiation. Training in Economics does not seem to influence students' opinions on this matter.

Finally, when analysing support for government social expenditure cuts (column 5), the results indicate that students who have a higher admission grade to the university, are left-wing oriented or are enrolled in degrees not administered by the School of Economics and Management but with some economics courses have a lower probability of agreeing with such a measure.²³

²¹ Alternatively, when using dummies for the number of ECTS in economics, the results indicated that having completed 24 or more ECTS in economics increases the probability of agreeing with this economic policy.

²² The dummy for students who positioned themselves in the ideological scale (*Political*) was also included in the models reported in Table 7, but never turned out to be statistically significant.

²³ When coding the no opinion answers as missing values, there is there is marginal evidence that those who voted in all previous elections and work are more likely to support reductions in social spending.

5. Conclusion

A survey was administered to students of the University of Minho in Portugal to investigate the factors that influence economic literacy, knowledge about the country's economic performance, and opinions regarding economic policies. The results revealed that economic literacy is positively influenced by studying economics at the university level, no matter if we use dummies for the type of degree in which the student is enrolled or for the number of ECTS in economics courses that she has completed. When the study of economics is more intense at the college level (reaching 96 ECTS), it is also associated with more knowledge about the country's economic performance.

Combining the previous results with the low average score achieved by the students on the questions intended to measure knowledge of the country's economic performance (4.8 over 12), we argue that additional courses in economics, both in high school and in college, are necessary. They would contribute to a more knowledgeable and better-informed society on economic issues and, therefore, improve people's capacity to make personal and social decisions. This is particularly important in periods of crises (such as the one Portugal recently underwent) when governments are forced to adopt unpopular austerity measures.

Regarding the factors that influence opinions on how to conduct economic policy, our results reveal that students enrolled in the economics degree have a higher probability of agreeing that monetary policy should be set by an independent central bank, and that increasing government spending is an appropriate response to a recession. Both results are in line with what is taught in Economics' courses. However, no effect was found on the opinions about issues that are more specific of the Portuguese context, such as the debt renegotiation or the reduction of governmental

social expenditures, and that are also more controversial among economists. These results reinforce previous studies (e.g. Allgood and Walstad, 1999) that found that individuals are more likely to share the views of economists when they have economics education.

Although we are aware of the limitations of the present study (namely in terms of representativeness of the sample to the whole Portuguese population), we hope our analysis will stress the need to include additional courses in economics, both at the high school and college levels. Given the scarcity of research on these topics in Portugal, and the importance they may have for the future of a country that recently underwent a major economic crisis, we think that these topics deserve a more detailed analysis.

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