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The impact of mandatory economic education on adolescents' attitudes

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Abstract

Various studies have examined how the study of economics affects students' views on economic phenomena, yet there is little evidence regarding its impact on teenagers. We study the effect of a recent curriculum reform introducing mandatory economic education on teenagers' attitudes towards economics in Southwest Germany. Our findings reveal that students affected by the reform show, on average, more interest in economics, see money as more important and expect more social responsibility from companies. Conversely, we don't observe differences in attitudes towards competition. Regarding socio-economic characteristics, our data reveal strong gender differences already before adulthood.

JEL-Classification: A21, D14, I20

Keywords: Pre-college economic education, economic attitudes, economic competence, gender gap

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1 Introduction

After the global financial crisis in 2008, the way we teach economics has been increasingly criticized, voicing concerns about young individuals being indoctrinated by the neoclassical paradigm. This view has partly been fuelled by a large body of literature documenting that economists behave significantly different than other individuals (see Kirchgässner, 2005; Hellmich, 2019 for reviews), with a higher tendency to free-ride (Marwell and Ames 1981), different attitudes towards fairness (Kahneman, Knetsch, and Thaler 1986), a preference for profit-maximizing behavior (Rubinstein 2006; Cipriani, Lubian, and Zago 2009) or a higher tendency to apply the price system in allocation problems (Frey and Meier 2003; Haucap and Just 2010). While there widely is a consensus that economists behave differently than other individuals, sources of these differences are poorly understood.

Some studies document that these behaviors and attitudes are influenced by economics teaching, concluding that frequent confrontation with neoclassical concepts may motivate students to adjust their views towards that paradigm (Marwell and Ames 1981; Frank, Gilovich, and Regan 1993; Ahmed 2008; Bauman and Rose 2011; Haucap and Müller 2014; Klimczak 2018). Conversely, several studies document a parallel effect of self-selection, i.e. people already possess these traits before they decide to study economics and the discipline may attract individuals with beliefs that are different from those of non-economists (Haucap and Heimeshoff 2014; Dzionek-Kozłowska and Rehman 2017). Beside unexplained heterogeneity and methodological concerns about the assessment of behaviors, many of these studies are conducted among university students relying on non-representative convenience samples. Therefore, little is known about the impact of formal economic education on these attitudes among school students. So far, most studies examining economic or financial education programs in schools focused on capabilities or behaviors rather than on attitudes or beliefs (see Kaiser and Menkhoff 2019 for a rigorous meta-analysis).

In the course of a recent curriculum reform in the German federal state of Baden-Württemberg, we study the role of mandatory economic education on different attitudes towards economics among teenagers in early secondary school education at the end of grade eight. For this purpose, we employ both already existing and newly developed attitude scales derived from a competence model underlying economic education standards in Germany, and the economic education curriculum of the federal state our study is set in (Retzmann and Seeber 2016). We specify four attitude dimensions as outcome-domains: competition, social responsibility of companies, money and interest in economic matters. By surveying two representative distinct groups of 8th-graders (those affected and not affected by the reform) in 2018 and 2019, we provide an empirical comparison into the ex-post levels of attitudes towards economics and explore differences across the two distinct cohorts as well as observable student characteristics. In contrast to the cohort of 2018, the cohort surveyed in 2019 received two years of mandatory instruction. The curriculum reform provides the opportunity to use exogenous variation in exposure to economic education relative to the previous cohort not affected by the reform. Therefore, our study design aims to disentangle potential indoctrination effects from selection effects. The natural experiment was conducted with a total number of 2,988 students in 144 schools.

Our study results in three main findings: First, we document significant differences in three of four attitude dimensions in the cohort affected by the reform. Affected students show a significant increase in interest in economic matters which is in line with two rigorous studies evaluating singular school financial education interventions in Germany (Lührmann, Serra-Garcia, and Winter 2015, 2018). Moreover, students affected by the natural treatment see money as more important and assign companies a stronger social responsibility. However, in contrast to existing findings among adults, we don't observe significant differences in attitudes towards competition. Second, we scarcely observe meaningful heterogeneous curriculum effects for all attitude dimensions among potentially disadvantaged demographic subgroups.

Specifically, the new curriculum does not affect girls in particular, students with low socio-economic status, or respondents who spoke a foreign language in their childhood. However, we document that the overall effect of the curriculum reform on interest in economic matters is highly conditional on students visiting the highest school track (*Gymnasium*). This school track prepares students for university studies and is typically attended by children being of higher socio-economic status. Third, we document substantial gender differences in attitudes towards economics already at these young ages of 14 and 15 years, with girls favoring social responsibility in companies and boys showing higher interest in economic matters. In line with previous findings (e.g. Gneezy and Rustichini, 2004; Niederle and Vesterlund, 2011), our data also reveal a substantial gender gap in attitudes towards competition being favored by male respondents.

Our findings contribute to the existing literature in two ways: First, in contrast to most studies, we study the impact of economic education on teenagers rather than on adults by means of a representative sample. Attitudes towards economics, especially with respect to interest in economic matters, are already crucial at young ages and may have cumulative effects over a life span and may serve as a prerequisite to acquiring economic competences (Lusardi, Mitchell, and Curto 2010; Lührmann, Serra-Garcia, and Winter 2015). Mandatory economic education may therefore help young individuals to deal with economic matters in today's demanding environment and avoid making mistakes early on that may be of costly consequences in the future. Second, as a consequence of empirical findings on indoctrination effects, there is an ongoing debate in western countries on how to teach economics, with opponents arguing for a potential risk of indoctrinating students with a one-sided economic perspective (Gibson 2008; Willis 2008, 2017). These authors see financial and economic education as measure 'to naturalize neo-liberalism' (Gibson 2008, 66) and as an ideologically based project: 'The form of the market, with its inherent principle of competition, has to be accepted by individuals as the natural order' (Stieger and Jekel 2019, 11). In Germany, the public debate has in particular

intensified with the introduction of the aforementioned mandatory school subject. Due to our natural design with no possibility of self-selection, we are the first ones to contribute empirical data to this discussion. Our results partly contradict existing findings on indoctrination effects, thereby intensifying concerns about endogeneity bias that is apparent in many studies. On the other hand, this particular school economic education intervention covers a broader range of perspectives which may lead to different outcomes than university courses. The curriculum particularly highlights social and systemic perspectives. Therefore, the results may be highly relevant for future educational politics and curricular decisions on school and university-level.

The paper proceeds as follows: The second section roughly sketches the competence model underlying the school's economic education curriculum (see Retzmann et al. 2010; Oberrauch and Kaiser 2019 for further details). Section 3 describes our study design, including demographic characteristics of our sample (3.1), the psychometric properties of the attitude scales (3.2) and economic competences (3.3) as well as the empirical strategy employed (3.4). Section 4 presents our results in three steps: First, we present descriptive results with respect to the curriculum reform (4.1), then we discuss demographic determinants of attitude dimensions (4.2) and finally present heterogeneous curriculum effects (4.3). Section 5 discusses the results and concludes.

2 Theoretical Framework

Our test of economic competence refers to a competence model published to offer a blueprint for developing competence standards, as well as for designing test items for schools and research. The model's structure is based upon educational reasoning (Retzmann et al. 2010). Being a model for economic competences it covers financial competencies as a subset (Retzmann and Seeber 2016). The authors define 'economic competence as the ability to act and decide adequately in economically shaped life situations' (Kaiser, Oberrauch, and Seeber

2020). The model offers an approach to define all relevant competences to master these situations. For this purpose it differentiates relevant life situations of consumers, earners (incl. entrepreneurs), and citizens. The model now encompasses three competence areas, also relevant for our survey on attitudes (see Table 1).

Table 1: Competence Areas within the Integrative Model of Economic Competence and Respective Attitudes

Competence Areas		Perspective		Attitudes	
Decision-making and Rationality (D+R)	→	<i>individual</i>	←	Money	General Attitudes towards Economics (Interest)
Relationship and Interaction (R+I)	→	<i>collective</i>	←	Social Responsibility of Enterprises	
System and Order (S+O)	→	<i>systemic/societal</i>	←	Competition	

These areas are not content driven but differentiate perspectives: i) planning and decision-making from an individual perspective; ii) the individual interacts with other agents (collective perspective), iii) the individual reflects on the system and order of the market-economy (societal perspective). The competence goals within these three areas are (Retzmann et al. 2010):

1. Decision-making and rationality (D+R): Individuals make economically motivated and reasonable economic decisions , choosing among given alternatives while pursuing their own legitimate interests.
2. Relationship and interaction (R+I): Individuals consider the interests and benefits, wishes and values of others responsibly in interactions for an economic purpose.

3. System and order (S+O): Individuals understand mechanisms of the economic system, that a political framework shapes that system, and the extent to which it requires a political order.

Both the test items as well as the administered attitude items mirror this differentiation, and both study cognitive aspects of competence and attitudes. The test explores contextually assigned competences, i.e. items use roles as context and are distributed over all competence areas.

Attitudes are beliefs about, and affects connected with an object. A third component is the ‘disposition to take action with respect to the object’ (Krech, Crutchfield and Ballachey 1962). Studies on attitudes in correlation to economic expertise usually focus on the cognitive and behavioral components assuming a possible change in attitudes by learning. Our study concentrates on cognitive aspects since we seek to explore effects of the school subject on students’ mindset. Is their judgement on economically shaped situations, or on economic systems (here: competition) as well as on socially embedded questions (here: social responsibility of enterprises) different from the view of students without former instruction?

3 Context, Study Design and Methods

In this section, we describe the curricular framework (3.1), our study design and sample characteristics (Section 3.2), methods for measuring attitudes towards economics (Section 3.3) and economic competences (Section 3.4), and the empirical strategy employed (Section 3.5).

3.1 Curricular Settings

Baden-Württemberg introduced the school subject of economics with a curricular revision in 2016. The school subject addresses the secondary-I-level from grade 7 to 10 (MfKJS-BW Ministerium für Kultus, Jugend und Sport Baden-Württemberg 2016). The first school students

affected by the reform passed grade 7 in the schoolyear 2017/18. The syllabus of competence goals is similar for all kinds of secondary schools, with the exception of the Gymnasium. This school type of the highest level starts at grade 8, and quantitatively the goals are as broad as these of the lower school types, but they address a higher cognitive level. Schools are bound to pursue all goals within the given time slot of four or three years. The timeframe comprises a total amount of 160 school hours, covering an hour a week in average.

The core structure of the curriculum is similar to the structure of the competence model described above, but much more detailed in terms of specific life situations, and with references to other domains as well as to interdisciplinary competences. Schools are autonomous in organizing curricular contents. An exemplary sequence provided by the governmental department starts with consumer problems including rational choice, price mechanism, and consumer protection. Similar to this example, all further roles include competence goals within all areas. While the main goal is to prepare the youth for complex economically shaped decisions in everyday life, objectives are not narrowed down to practical instructions. The curriculum explicitly emphasizes a so-called science-orientation. The goal is to allow students to use economic analysis instruments when confronted with real life problems. The document names examples such as price-quantity-graphs, economic circuit, and behavioral economics (MfKJS-BW 2016).

3.2 Sample

We initiated the sampling procedure by dividing the whole population of interest, i.e., teenagers attending a public school (about 90 percent of all students) in the German federal state Baden-Württemberg, into subgroups by school type and degree of urbanization. Thus, the classification of the total population of interest resulted in twelve strata (four school types within three degrees of urbanization (‘high’, ‘medium’, ‘low’). After the 4th grade, the German school system typically offers children four different kinds of secondary schools into which students

are separated according to their academic abilities. While the most sophisticated school type (*Gymnasium*) provides in-depth general education and prepares students for university studies, the lower tier school types (*Realschule* and *Werkrealschule*) lead to a vocational entrance qualification and cover schooling years from grade 5 up to 10. The recently introduced comprehensive school type (*Gemeinschaftsschule*) accommodates students of all ability levels.

We followed a two-stage sampling procedure with random selection of schools in the first stage and a random selection of one class per school in the 8th grade. We selected 8th-graders not affected by the reform in July 2018 and those affected by it one year later in July 2019. The whole survey was administered as a computer-based assessment during regular school lessons, supervised by the teacher. The number of selection elements is adapted to the proportion of the relevant stratum in the whole target population (probability proportional to size) (see Kaiser, Oberrauch, and Seeber 2020 for details). We account for remaining disproportionalities by including design weights defined as the inverse of selection probability.

Our final sample consists of 2,988 8th grade students (1,641 affected and 1,346 not affected by the reform) out of 158 classes in 144 schools (68 affected, 76 not affected). The mean age is 14.7, and 54 percent of the whole sample are male. With regard to socio-economic characteristics, we find that a substantial share of 40 percent speaks either a foreign language or a foreign language and German at home. 30.1 percent of all respondents reported to have less than 25 books at home, our proxy for socio-economic status (OECD 2014). The German school system sorts secondary school teenagers into different ability-tracks. We note that 30.1 percent of sampled students visit the most sophisticated school track (GYM) while 41.1 and 16.2 percent visit the lower tier school tracks (RS and WS) accordingly. 12.6 percent visit the recently introduced comprehensive school type (GMS). Table 2 shows individual characteristics with regard to the distinct samples. T-tests indicate that demographic characteristics on individual and school levels are widely balanced across curriculum mandates.

Table 2: Sample characteristics

	Old curriculum (n=1,346)	New curriculum (n=1,642)	t-test (p-value)
Male	53.6 %	54.4 %	0.731
Age	14.66 (0.91)	14.67 (0.79)	0.910
Foreign language	40.4 %	39.4 %	0.845
Books at home (1 = 0, 6 = several bookshelves)	3.41 (1.60)	3.52 (1.61)	0.417
School track			
GMS	13.3 %	12.1 %	0.812
WS	16.0 %	16.4 %	0.944
RS	37.7 %	43.8 %	0.459
GYM	33.0 %	27.7 %	0.497
Math abilities (1 = low, 5 = high)	3.32 (0.99)	3.33 (1.00)	0.863
Reading abilities (1 = low, 5 = high)	3.75 (0.78)	3.73 (0.74)	0.643
Low urbanization	33.4 %	30.0 %	0.695

Note: This table represents the mean of individual characteristics for those who are affected by the reform (new curriculum) and those who are not (old curriculum). In order to control students' school performance, we asked for (self-reported) reading and mathematical abilities on a scale from 1 (low) to 5 (high). The third column reports the p-values of a t-test that the coefficient of the new curriculum group is equal to zero in a linear regression with cluster robust standard errors.

3.3 Measuring Attitudes towards Economics

We employ measurement scales on four different attitude dimensions: interest in economics, attitudes towards competition, attitudes towards social responsibility of enterprises and attitudes towards the importance of money; with interest standing in for a general attitude towards economics. The three other item batteries are coordinated according to the perspectives differentiated in the underlying model. It is not possible to classify these items exactly into particular sections of the school curriculum. As mentioned, the curriculum details economic roles and assigns relevant competences of all categories. Then, for example, money in an individual perspective is picked out as a topic when discussing consumer problems or those of an investor. Social responsibility of enterprises is, e.g., part of lessons on entrepreneurial problems, and competition is relevant in numerous contexts, e.g., when learning about the cartel law.

Interest in economics

In 1983, Soper and Walstad (1983) measured ‘high school students’ attitudes towards economics (ATE) as a subject (p. 13). For the dimension of interest we used three items of their Survey on Economic Attitudes (SEA) (see also Walstad and Soper 1983) and complemented these with nine self-developed items (see Table 3). These items elicit the general attitude on economic issues in everyday life. Other studies on economic competence questioned students about their interest as a potential proxy of volitional and motivational dispositions. Interest then can be seen as a motivational pre-condition to gain knowledge about a subject (Lührmann, Serra-Garcia, and Winter 2015) or as a facet of domain-related competence (Retzmann and Seeber 2016).

While former studies in Germany stated a rather low interest in economic matters among school students (Seeber et al. 2018) , a rigorous study by Lührmann et al. (2015) found substantial positive effects of a short financial education program on teenagers’ interest. Our study seeks to complement these studies by exploring potential short-term effects of mandatory economic training on teenagers’ interest in economic phenomena.

Individual perspective: Importance of money

A commonly used instrument to measure attitude towards money is the Money Attitude Scale (MAS) developed by Yamauchi and Templer (1982). We rely on one battery of an existing scale by Lim and Teo (1997) based on the MAS and translated by Barry and Breuer (2012) for German speaking countries. With regard to pre-college education, a study by Amagir et al. (2020) found a stronger agreement with the MAS subscale ‘power and prestige’ among students visiting lower high school tracks. In our study, we use the four-items-scale called ‘importance of money’ (Barry and Breuer 2012) to explore possible effects of mandatory economic education on this attitude dimension.

Collective perspective: Social responsibility of enterprises

In public debates about the implementation of mandatory economic education in schools, opponents often assume a more positive attitude towards entrepreneurs, respectively towards enterprises, and their interests as one potential outcome. For this reason, we integrated a newly developed scale with statements on social engagements of enterprises. Sceptics hypothesize a negative correlation between the effects of pre-college economic education and the affirmation of social engagement among enterprises. In conclusion, students could have learnt that ‘the social responsibility of business is to increase its profits’ (Friedman 1970).

Societal/systemic perspective: Competition

Competition is seen as one of the fundamentals of functioning markets in economic theory. When students learn about so-called market mechanisms or market economy as a system of order, teachers confront them with this perspective. In essence, opponents of a school subject economics often evaluate it as a ‘project to create the ideal market, in which market participants behave according to the rules through internalized norms of competition’ (Stieger and Jekel 2019, 12).

Studies with explicit focus on relations between economic knowledge or understanding and competitive orientation are particularly scarce. However, there are findings on issues such as the willingness to contribute to university social programs (e.g., Bauman and Rose 2011), behavior in ultimatum and prisoner’s dilemma games, or on the willingness to contribute to the public good instead of free-riding. All these laboratory designs have in common to elicit and show a tendency to unsocial behavior among economists (Etzioni 2015; Dzionek-Kozłowska and Rehman 2017). Conversely, some studies show a correlation between the study of economics and pro-social behaviors, with a higher willingness to return found cash to its owner, or a higher conscientiousness in paying contributions to students’ associations in comparison to their fellow students of other disciplines (Etzioni 2015). Most of these studies confirm the

named negative outcomes to be a result of self-selection, i.e., students are already prone to these behaviors before treatment, instead of those behaviors being the result of indoctrination.

Studies on competitiveness usually use multi-dimensional scales to explore respective attitudes. For example, Orosz et al. (2018) developed a multidimensional inventory composed of four factors. Fülöp et al. (2008) also differentiate four. For our purpose, we use their factor ‘personal positive attitude: positive functions of competition for the individual’. It fits numerous other studies understanding competitiveness as ‘the enjoyment of interpersonal competition and the desire to win and be better than others’ (Spence and Helmreich 1983, 14).

All attitude scales administered were psychometrically validated in a pre-test study comprising 212 participants. In order to determine the construct validity of the scales, we use Principal Component Analysis (PCA) (e.g., Pedhazur and Schmelkin 2013) with varimax rotation. Table 3 shows results from the PCA with component loadings, i.e., correlations of single items with the underlying component. Missing values are dealt with by following a multiple imputation approach based on a PCA model (Husson and Josse 2016). All single variables show missing proportions below two percent which appear randomly, i.e., no correlations between missing proportions and demographic variables were found. In essence, we find that four factors explain the majority of the variance (see Table B1 in Appendix B for details). By using four factors, all single loadings indicate meaningful correlations with the respective component supporting the relevance for the measured constructs. With regard to reliability, we find that single and compound values for Cronbach’s alpha (Cronbach 1951) are above 0.7, indicating sufficient consistency within the attitude scales (see Table B2 and B3 in Appendix B for further details). In the subsequent regression analysis, we use the principal component score of the first component representing the relative position of the respondent to the respective attitude dimension.

Table 3: Attitudes towards Economics: Items and Factor Loadings

	(1)	(2)	(3)	(4)
<i>Interest in economics (Source of item 1,2 and 3:Walstad and Soper 1983)</i>				
I enjoy reading articles about economic topics.	0.719			
Economics is easy for me to understand.	0.613			
Economics is dull.	0.697			
I'm interested in economics.	0.818			
I have nothing to say in economic matters.	0.525			
I like to talk about economics.	0.781			
I get bored in conversations about economics.	0.591			
I like to bring discussions to the topic economics	0.678			
I follow economic news.	0.653			
I wish I didn't have to learn economics.	0.644			
I learn a lot of interesting stuff when economics is discussed.	0.728			
I think it is important to have a good knowledge about economics.	0.663			
<i>Attitudes towards competition (Source: Fülöp et al. 2008)</i>				
Life would be very boring without competition.		0.680		
Competition gives people a goal, something to strive for.		0.781		
Competition is a fundamental aspect of human nature.		0.681		
Competition motivates people to achieve goals.		0.804		
Competition could bring each individual to improve.		0.782		
<i>Attitudes towards money importance (Source: Lim & Teo 1997)</i>				
Money is important.			0.823	
Money is an important factor in the lives of all of us.			0.750	
Money is valuable.			0.768	
I value money very highly.			0.827	
<i>Attitudes towards social responsibility</i>				
Companies should make money available for social purposes.				0.849
Companies should donate part of their revenues to charity.				0.830
Companies should financially advocate for society.				0.796
Companies should support non-profit associations with money.				0.703

Note: This table shows factor loadings from a Principal Component Analysis with varimax factor rotation on four distinct factors. Missing values are multiple imputed by a PCA model with R package *missMDA* (Husson and Josse 2016). We translated the items of the first two scales into German, adopted the translation of Barry and Breuer of the third scale, and translated the fourth scale into English to use in this table.

3.4 Measuring Economic Competences

Beside the impact of the recent curriculum reform on students' attitudes, we additionally analyzed ex-post levels of economic competence and its correlation to the administered attitude scales. Therefore, we employed a performance test based on the competence model described in section 2. A current definition of competence includes cognitive abilities, as well as volitional, social and motivational aspects of problem solving in various domain-related situations (Weinert 2001). The test concentrates on cognitive aspects of competence measured by selected response items, constructed responses with objective scoring items, and constructed responses with subjective scoring items. The items cover all the three modelled competence areas. The students are e.g., asked to compare two different offers of financial investment, to interpret a demand curve, to recognize solidarity as one reason for the scaling of contributions in Germany's social insurance, to identify opportunity costs in a given everyday life situation, etc. These examples shall just give an idea of the test content. An English translation and in-depth validation of the complete test has already been published (Kaiser, Oberrauch and Seeber 2020).

The performance test used, was developed for secondary school students and its 30 items showed valid psychometric characteristics (see detailed information about test characteristics in Kaiser, Oberrauch and Seeber 2020). As our test items naturally appear to be binary (i.e. true/false), we analyze economic competences by using Item Response Theory (IRT) (Hambleton and Swaminathan 1985; Baker and Kim 2017). In contrast to factor analysis, IRT models assume a logistic relationship between item response and the underlying construct. To extract item characteristics and person abilities, we employ a 3-parameter logistic model (Birnbaum 1968) following the equation

$$P(X_i = 1|\theta, \sigma, a, c) = c_i + (1 - c_i) \frac{\exp\{a_i(\theta_v - \sigma_i)\}}{1 + \exp\{a_i(\theta_v - \sigma_i)\}} \quad (1),$$

where θ_v denotes estimated ability for person v , and σ_i estimates item difficulty for item i on a common logit scale. a_i defines a discrimination parameter evaluating how accurate item i discriminates between low-ability and high-ability students. As most items in the performance test are selected-response items, the IRT model estimates a guessing parameter c_i for each item accounting for low-ability students to randomly solve an item correctly. Appendix Table A1 shows item characteristics from the IRT model as well as descriptive statistics of Classical Test Theory (CTT). Overall, the administered test items show sufficient discrimination and evenly distributed difficulties.

To investigate relationships between the competence measure and attitudes, we examine intercorrelations of all five variables, with results reported in Table 4. We find no correlations significantly different to zero between the four attitudes scales and therefore demonstrate that all attitude dimensions are distinct from each other. However, we see significant correlations between economic competences and attitude scales. As expected by theory, we see a moderate but significant relationship between economic competences on attitudes towards competition accounting for four percent of the variance. Interestingly, economic competences are slightly correlated with attitudes towards social responsibility reflecting the social perspective in the competence model described in chapter 2. Corresponding to recent findings (see also Oberrauch and Kaiser 2019), we found a positive association between economic competence and interest in economic topics as expected, accounting for six percent of total variance.

Table 4: Intercorrelations of Attitude Scales and Economic Competences

	(1)	(2)	(3)	(4)	(5)
(1) Economic competence	1				
(2) Competition	0.201*	1			
(3) Social responsibility	0.126*	0	1		
(4) Money	0.016	0	0	1	
(5) Economic interest	0.241*	0	0	0	1

Note: This table shows bivariate correlations (Pearson's r) between various attitude dimensions and economic competences. * indicates p-values below 0.01.

3.5 Empirical Strategy

To analyze determinants of different attitude dimensions, we follow a hierarchical regression specification that allows intercepts to vary across school types. The random intercept model takes up the form

$$y_{is} = \gamma_{00} + \beta_1 T_i + \beta_2 X_{is} + u_{0,s} + \varepsilon_{is} \quad (2),$$

where y_{is} denotes the attitude dimension represented by the factor score for individual i in school s , γ_{00} represents the mean attitude value, and $u_{0,s}$ the group-dependent deviation. T_i is a dummy variable equal to one for participants affected by the curriculum reform. X_{is} denotes a covariate vector at individual and school level as specified in Table 2. ε_{is} denotes the cluster-robust error term in which we assume independence across schools and correlation within schools. In addition, we probe heterogeneous curriculum effects by interacting the treatment dummy with various socio-demographic and structural characteristics that are known to have different levels of *ex-ante* economic and financial literacy. Specifically, we explore the possibility of heterogeneous effects of the curriculum reform for four characteristics: Male, foreign language in childhood, socio-economic status and affiliation to the most sophisticated school track: Gymnasium.

4 Results

In this section, we first assess mean differences in students' attitudes towards economics and economic competences with respect to the curriculum reform (Section 4.1). In the second part, we investigate various determinants of attitudes following the specification in equation (2) (Section 4.2). Finally, heterogeneous curriculum effects for three demographic subgroups are examined (Section 4.3).

4.1 Descriptive Results

Table 5 reports means and standard deviations for four attitude dimensions represented by factor scores as well as economic competences represented by the IRT score with respect to the curriculum reform. P-values for mean differences are calculated by means of a hierarchical regression using a dummy variable equal to one for participants affected by the reform as single predictor and clustered standard errors at school level. The results show different tendencies:

Table 5: Summary Statistics

	Old curriculum		New curriculum		Significance
	N	Mean (SD)	N	Mean (SD)	
Competition	1,346	0.029 (1.014)	1,642	-0.01 (0.983)	$p > 0.1$
Social responsibility	1,346	-0.042 (1.008)	1,642	0.044 (0.986)	$p < 0.1$
Money	1,346	-0.056 (1.027)	1,642	0.021 (0.97)	$p < 0.1$
Economic interest	1,346	-0.128 (0.975)	1,642	0.104 (0.994)	$p < 0.01$
Economic competence	1,343	-0.038 (0.954)	1,642	0.054 (1.043)	$p > 0.1$

Note: This table shows means and standard deviations in parenthesis for those 8th-graders who are not affected (old curriculum) by the curriculum reform and those who are affected (new curriculum) for various attitude dimensions as described in section 3.2 as well as for economic competences as described in section 3.3. We surveyed 8th-graders not affected by the reform in July 2018 and those affected by the reform in July 2019. Due to missing responses the calculation of competence values was not feasible for three participants. Column 5 shows significance values for a hierarchical linear regression with clustered standard errors at school level.

Students affected by the reform show no significantly higher affinity for competition which contradicts recent findings according to which students affected by economic training programs seem to become less cooperative (e.g., Haucap and Just 2010). Regarding attitudes towards social responsibility, we see a slight positive impact of the recent curriculum reform. Students affected by the reform show a mean increase on the scale by 0.09 standard deviations. Students affected by the reform also show a slightly higher approval towards the importance of money (row 3), with a mean difference of 0.08 standard deviations on a 10-percent significance level. The strongest effect of the curriculum reform is found on the interest scale. Students affected by the reform show a 0.23 SD higher in interest score. Regarding effects on economic

competence, we found no significant differences after adjusting the standard errors to the clustered sample structure.

Next, we turn to investigating pre-existing gaps in attitudes towards economics by gender, foreign language, socio-economic background (number of books at home), and school type based on estimates obtained through the control cohort, with results shown in Table 6. We find statistically significant and quantitatively meaningful gender differences in attitudes towards economics. Being male increases a general approval to competition by 0.26 standard deviations (SD). This gap widely corresponds with results given by previous studies in which women tend to be less competitive than men in most contexts (Haucap and Müller 2014; Kesebir et al. 2019). It should be noted, however, that these studies use incentivized experiments to measure effort in competitions. Conversely, we find a reversed gender effect in attitudes towards social responsibility. Being female increases the approval to social activities of enterprises by 0.39 SD. Corresponding to research examining the role of financial behavior and literacy (Bucher-Koenen et al. 2017; Lusardi and Mitchell 2008) we also find a substantial gender gap in favor for male teenagers' attitudes towards money. Perception of the importance of money to boys is on average about 0.31 SD larger than that of girls. Gender difference in interest and competence is less pronounced.

In contrast to gender, attitudes do not significantly vary by mother tongue. There is, however, a consistent and significant gap in economic competence that has been well documented in previous studies (e.g., Oberrauch and Kaiser 2020). With regard to socio-economic background, we see a slightly decreased approval on competition, social responsibility and interest when students reported to have 25 or less books at home. In line with previous studies documenting lower financial and economic capabilities among respondents with low socio-economic status (e.g., Kaiser et al. 2020), our data reveal lower test results by 0.28 SD units. Affiliation to the highest German school track (Gymnasium) does not predict attitudes towards

economics across all four dimensions. However, we find substantially higher levels of economic competence among these respondents. This result may reflect the structure of the German school system that is academically and socially selective due to its early sorting (Glaesser and Cooper 2011).

Table 6: Outcomes obtained by the Control Group

Dependent variable	N	Mean	SD	Predictors			
				Male	Foreign language	≤25 books at home	School track 'GYM'
Competition	1,305	0.029	1.014	0.276***	-0.069	-0.133**	0.102
Social responsibility	1,305	-0.042	1.008	-0.396***	-0.006	-0.187***	0.051
Money	1,305	-0.056	1.027	0.381***	0.067	0.116*	0.137
Economic interest	1,305	-0.128	0.975	0.111***	0.097	-0.141***	0.005
Economic competence	1,305	-0.038	0.954	-0.025**	-0.426***	-0.284***	0.636***

Notes: This table reports the mean and the standard deviation of the outcome variables for the control cohort under columns Mean and SD. Each outcome from row 1 to 4 displays the attitude dimension as specified in chapter 3.3. The last row shows outcomes for economic competences as specified in chapter 3.4. The table also reports regression coefficient estimates (OLS) for the variables: male, foreign language, ≤ 25 books at home and the most sophisticated school type 'GYM'. The OLS regression includes following control variables: Math abilities, Reading abilities and low urbanization. We estimate robust standard errors, clustered at school level. *** p<0.01, ** p<0.05, * p<0.1.

4.2 Hierarchical Analysis on Attitudes towards Economics

In this section, we extend the previous analysis by using the entire sample and by also taking the clustered data structure into account. Table 7 shows results of the hierarchical regression model specified in equation (2). Essentially, we see no qualitative deviations in our results from Table 5 after examining them for various demographics demonstrating that quasi-randomization worked. In contrast to the linear regression shown in Table 6, we see slight but significant differences in attitudes towards economics for students visiting the highest school track 'Gymnasium' which reflects the clustered data structure in our sample. From a qualitative perspective, we see similar results on gender, foreign language and socio-economic status (number of books at home) to those in the linear regression.

Table 7: Results for the Random Intercept Model

	(1)	(2)	(3)	(4)
	Competition	Social responsibility	Money	Interest
New curriculum	-0.026 [0.051]	0.087* [0.048]	0.107* [0.058]	0.204*** [0.063]
Male	0.245*** [0.043]	-0.385*** [0.043]	0.310*** [0.037]	0.102** [0.042]
Foreign language	-0.060* [0.031]	0.011 [0.028]	0.016 [0.030]	0.051* [0.028]
≤ 25 books at home	-0.020 [0.048]	-0.122*** [0.043]	0.138*** [0.051]	-0.065 [0.043]
School track 'Gymnasium'	0.123** [0.060]	0.131** [0.060]	0.079 [0.056]	0.256*** [0.071]
Math abilities	0.101*** [0.024]	0.008 [0.022]	-0.001 [0.021]	0.159*** [0.020]
Reading abilities	0.138*** [0.036]	0.135*** [0.038]	0.067** [0.030]	0.211*** [0.031]
Low urbanization	0.024 [0.059]	-0.041 [0.050]	0.028 [0.058]	-0.013 [0.062]
Constant	-0.903*** [0.186]	-0.355* [0.188]	-0.583*** [0.182]	-1.609*** [0.159]
R-squ. (school level)	0.14	0.05	0.11	0.30
R-squ. (individual level)	0.06	0.02	0.03	0.11
Observations	2,571	2,571	2,571	2,571
Number of groups	158	158	158	158

This table shows hierarchical regression estimates on various attitude patterns as dependent variable (z-standardized principal component score). Overall sample size is reduced due to missing responses in several demographic predictors. All hierarchical regression models follow the procedure described in Chapter 3.5. Cluster-robust standard errors in brackets. School type 'Gymnasium' represents the highest track in Germany. *** p<0.01, ** p<0.05, * p<0.1

4.3 Heterogeneous effects

In this section, we examine how effects of the curriculum reform may interact with observable characteristics of the target group. We focus on four subgroups that are known to have different levels of economic and financial capabilities as well as different levels on the attitude scales and may therefore respond differently to mandatory economic education. First, gender differences in economic capabilities and attitudes have been reported in many studies (e.g.,

Gneezy and Rustichini 2004; Erner, Goedde-Menke, and Oberste 2016), with men being more competitive and showing more interest in economic topics than women. Second, Table 6 revealed associations between the primary language spoken in childhood and attitude dimensions. Third, we investigate heterogeneous effects with respect to socio-economic status of parents approximated by the number of books at home. Parental background has been identified as a main driver for acquiring financial capabilities in various studies (e.g., Grohmann, Kouwenberg, and Menkhoff 2015). Fourth, as several studies document substantial differences in financial and economic capabilities across school types in Germany (e.g., Erner, Goedde-Menke, and Oberste 2016; Oberrauch and Kaiser 2019) we explore differential curriculum effects with respect to its most sophisticated school type (Gymnasium).

Table 8 shows results on the investigation of heterogeneous effects for all four subgroups described above, with binary indicators for each subgroup interacted with the treatment dummy. While we scarcely observe meaningful heterogeneous curriculum effects across the first three subgroups, the impact of mandatory economic lessons on interest in economic matters is highly conditional on the affiliation to school type Gymnasium (*Panel D*), indicating that the overall effect in Table 6 is mainly driven by respondents in the highest school track. Conversely, our results suggest that mandatory economic training doesn't have any meaningful effects among potentially disadvantaged subgroups in particular. However, as Hellmich (2019) pointed out, panel data could be a way to properly identify heterogeneity in educational effects for certain individuals.

Table 8: Heterogenous Effects for Demographic Subgroups

	(1)	(2)	(3)	(4)
	Competition	Social Responsibility	Money	Interest
<i>Panel A: Gender</i>				
New curriculum	0.011 [0.062]	0.116* [0.061]	0.146** [0.067]	0.232*** [0.072]
Male	0.301*** [0.062]	-0.413*** [0.066]	0.382*** [0.047]	0.101* [0.052]
New curriculum × Male	-0.070 [0.084]	-0.026 [0.083]	-0.136* [0.070]	0.017 [0.078]
Constant	-0.145*** [0.048]	0.169*** [0.048]	-0.261*** [0.053]	-0.185*** [0.051]
Observations	2,988	2,988	2,988	2,988
R-squ. (school-level, ind.-level)	(0.02, 0.02)	(0.11, 0.04)	(0.04, 0.03)	(0.08, 0.03)
<i>Panel B: Foreign language</i>				
New curriculum	-0.026 [0.066]	0.054 [0.065]	0.135** [0.059]	0.268*** [0.076]
Foreign language	-0.140*** [0.051]	-0.057 [0.059]	0.071 [0.067]	0.011 [0.065]
New Curriculum × Foreign Language	0.005 [0.080]	0.108 [0.081]	-0.109 [0.086]	-0.112 [0.083]
Constant	0.063 [0.049]	-0.019 [0.049]	-0.085* [0.050]	-0.133** [0.054]
Observations	2,850	2,850	2,850	2,850
R-squ. (school-level, ind.-level)	(0.03, 0.01)	(0.11, 0.04)	(0.04, 0.03)	(0.08, 0.03)
<i>Panel C: Socio-economic status</i>				
New curriculum	-0.081 [0.056]	0.042 [0.054]	0.063 [0.056]	0.232*** [0.073]
≤ 25 books at home	-0.229*** [0.060]	-0.260*** [0.077]	0.095 [0.074]	-0.187*** [0.059]
New curriculum × ≤ 25 books at home	0.154* [0.087]	0.147 [0.095]	0.076 [0.098]	-0.006 [0.078]
Constant	0.092** [0.038]	0.035 [0.040]	-0.088* [0.046]	-0.069 [0.052]
Observations	2,988	2,988	2,988	2,988
R-squ. (school-level, ind.-level)	(0.06, 0.01)	(0.09, 0.01)	(0.02, 0.01)	(0.13, 0.03)
<i>Panel D: School track 'Gymnasium'</i>				
New Curriculum	-0.030 [0.059]	0.093 [0.057]	0.106 [0.069]	0.118* [0.070]
School track 'GYM'	0.205** [0.088]	0.203** [0.083]	0.101 [0.086]	0.165* [0.099]
New Curriculum × School track 'GYM'	0.020 [0.116]	0.017 [0.114]	-0.101 [0.106]	0.421*** [0.134]
Constant	-0.043 [0.048]	-0.110** [0.047]	-0.086 [0.059]	-0.178*** [0.057]
Observations	2,988	2,988	2,988	2,988
R-squ. (school-level, ind.-level)	(0.08, 0.01)	(0.10, 0.01)	(0.02, 0.03)	(0.31, 0.05)

Note: This table shows heterogenous effects for three different subgroups by means of hierarchical regressions with 158 clusters. Panel A shows results by gender, with 'Male' indicating male respondents. Panel B shows interactions between the curriculum reform and speaking a foreign language at home. Panel C shows results by socio-economic status, with respondents having 25 or less books at home. Panel D shows results with respect to the most sophisticated school type Gymnasium. Overall sample size is reduced due to missing responses in several demographic predictors. Cluster-robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

5 Discussion and conclusions

This paper examines the effect of mandatory economic training on several attitudes towards selected economic phenomena among teenagers. The investigation was motivated by findings in various studies with university students showing indoctrination effects as a result of studying economics. In addition, rigorous research has shown that dealing with economic matters at young ages may have large effects on their whole life and therefore help young individuals to be equipped with a certain set of skills to make thoughtful decisions (e.g., Lusardi, Mitchell, and Curto 2010). Thus, understanding the effects of a curriculum mandate may be highly relevant for policy makers in the educational domain.

One striking result of our study is a lack of a one-sided indoctrination effect. This result is highly relevant regarding the ‘nature or nurture’-discussion (Haucap and Just 2010). To a large extent the school subject adopts the perspective of economic theory and its methods of analysis. While university students often show changing opinions towards the neo-classical paradigm when progressing in their study programs (Haucap and Heimeshoff 2014; Etzioni 2015; Fischer et al. 2015), school students in our study, affected by economic instruction, showed slight differences in attitudes towards money, and unexpectedly in attitudes towards social responsibility of companies. We assume that economic training has rather generated an awareness to problems such as social dilemmas and did not change their perspective in particular. At least, lessons do not necessarily indoctrinate students.

Two circumstances regarding our sample and the underlying method of analysis need to be addressed. First, our students are much younger than those questioned in almost all other existing surveys, meaning that our results are not contradictory to findings in studies comprising university students but highlight that there is not necessarily an indoctrinating effect of instruction. In total, the effect of school lessons on attitudes is small and other predictors have been identified to be more relevant. Second, our measurement is a cross-sectional study. As

students without economic instruction were surveyed one year before those affected by it, a potential confound may be exogenous political or economic events that may have influenced students' attitudes. In the absence of substantial economic disturbances between 2018 and 2019, however, we think it unlikely that attitudes among treated students were driven by unanticipated shocks.

We further tested economic competences and explored intercorrelations. One result is a positive correlation between the level of competence and attitudes towards competition. It's noteworthy that our test – although not testing factual or theoretical knowledge – is derived from commonly agreed standards in Germany (Kaiser, Oberrauch, and Seeber 2020) corresponding to a more or less traditional understanding of economics. A higher competence in our test may therefore correlate with perspective on common economic principles. The slightly stronger positive attitude towards competition may then be an expectable result. But Fülöp et al. (2008, 23) '... did not find any relationship between the general and personal attitude towards competition and the perception of the economic role of competition'. This role reflects the understanding of competition as a driver of innovation in market economies. The competence effect in our study may be a hint for subsequent self-selection processes in higher education (e.g., Bauman and Rose 2011; Fischer et al. 2015). The intercorrelation of interest in economics and competence supports this hypothesis. Competent and interested young people may tend to study economics more often than others. Nevertheless, studying economics may still have a further effect, as Fisch et al. (2015) showed with regard to political attitudes.

Beside slight effects of the new curriculum on attitudes towards money and social responsibility, the regression analysis reveals a substantial treatment effect on interest in economic matters. This finding corresponds with results of a study evaluating a short-term financial education intervention in German schools (Lührmann, Serra-Garcia, and Winter 2015). Thus, receiving mandatory economic education may help young individuals to cope with

economically shaped life situations, as interest may serve as prerequisite for acquiring competences. Heterogeneity analysis suggests, however, that the overall treatment effect on the interest dimension is mainly driven by students visiting the highest school track (Gymnasium). This effect may be explained to a large extent by the structure of the German school system that sorts students into different ability-tracks at very young ages. Students in the highest school-track therefore exhibit the most sophisticated learning capabilities. However, Table C1 in Appendix C shows that respondents speaking a foreign language at home are slightly less prevalent the treated group which may explain the heterogeneous effect to a small degree. The heterogeneous effect cannot be attributed to less noise in the data among this group as missing proportions in the attitude survey are in general fairly low across all school types.

With regard to heterogeneity across observable student characteristics, our data reveal substantial gender differences across all attitude dimensions already at these young ages. First off, we see a decreased approval of 0.39 standard deviations among boys revealing the strongest gender effect on all observed attitudinal categories. As we employed a newly developed attitude scale for covering this dimension, we cannot contrast this result to other findings. However, the result may serve as further suggestive evidence that women are more collaborative than men in general (Dzionek-Kozłowska and Rehman 2017; Kesebir et al. 2019). Next, corresponding to a large body of literature in psychology, we find that girls show substantial lower approval to competition already at early ages (Ahlgren and Johnson 1979; Sutter and Glätzle-Rützler 2015). Finally, our study reveals that girls show less interest in economic matters and see money as less important than boys. The result on attitudes towards money corresponds with findings by a Dutch study evaluating financial literacy among 15-year-old high schools students (Amagir et al. 2020, 11). The authors conclude that boys happen ‘to be more concerned with money as a status symbol’. It should be an important goal for policy-makers to address strong gender differences in dealing with economic matters at young ages – a worrying phenomenon that is already well documented among adults.

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Appendix

(online appendix not intended for print publication)

to accompany

‘The Impact of Mandatory Economic Education on Adolescents' Attitudes’

Appendix A: Measuring economic competences

In this section, we provide detailed item characteristics for measuring economic competences as described in section 3.4. To select a model, we assessed the goodness-of-fit for IRT models with one to four parameters by means of the commonly used fit index ($S - \chi^2$) (Orlando and Thissen 2003). Based on fit indices, the model selected for our analysis includes three parameters. Moreover, it appears to be the best suited for our items because the item responses are dichotomously scored (1=correct, 0=incorrect), and may be subject to guessing due to the multiple-choice format. The item analysis shown in Table A1 reveals most items discriminate sufficiently between students (Column 3) and represent a broad range of difficulty levels (Column 5). To accompany results from the IRT model we additionally consider parameters from Classical Test Theory (CTT). Column 1 shows the relative frequency of correct responses (Column 1) and r_{it} denotes the corrected item-total-correlation (Column 2).

Table A1: Parameter Estimates from the 3-PL-Model and from Classical Test Theory (CTT)

Item	CTT		IRT					
	<i>Frequency</i>	<i>r_{it}</i>	<i>a</i>	<i>a(SE)</i>	<i>σ</i>	<i>σ(SE)</i>	<i>c</i>	<i>c(SE)</i>
1	0,74	0,237	1,738	0,194	0,652	0,064	0,612	0,012
2	0,699	0,457	1,401	0,054	-0,794	0,035	0	0,021
3	0,69	0,254	0,653	0,028	-1,329	0,063	0	0,026
4	0,674	0,368	1,285	0,078	-0,139	0,047	0,281	0,018
5	0,66	0,344	1,199	0,076	-0,081	0,049	0,277	0,017
6	0,65	0,369	1,343	0,083	0,006	0,045	0,282	0,017
7	0,646	0,422	1,171	0,049	-0,602	0,039	0	0,02
8	0,644	0,425	1,442	0,077	-0,162	0,039	0,202	0,017
9	0,641	0,211	0,523	0,029	-1,153	0,078	0	0,024
10	0,616	0,464	1,582	0,081	-0,083	0,036	0,173	0,016
11	0,584	0,376	1,831	0,127	0,462	0,04	0,335	0,013
12	0,574	0,429	1,108	0,051	-0,285	0,04	0	0,018
13	0,558	0,327	0,758	0,044	-0,303	0,054	0	0,019
14	0,555	0,444	2,105	0,132	0,414	0,034	0,27	0,013
15	0,555	0,384	1,038	0,058	-0,028	0,045	0,087	0,016
16	0,54	0,42	2,067	0,139	0,539	0,036	0,289	0,013
17	0,53	0,52	1,441	0,065	-0,002	0,034	0	0,014
18	0,513	0,436	1,102	0,054	0,018	0,04	0	0,015
19	0,417	0,182	0,397	0,03	1,151	0,106	0,036	0,015
20	0,414	0,265	1,339	0,099	1,352	0,062	0,263	0,011
21	0,384	0,291	1,702	0,129	1,305	0,052	0,244	0,011
22	0,382	0,385	0,915	0,047	0,708	0,05	0	0,013
23	0,35	0,366	1,967	0,136	1,151	0,041	0,186	0,01
24	0,341	0,297	2,334	0,201	1,383	0,046	0,235	0,01
25	0,306	0,437	1,532	0,077	1,049	0,038	0,074	0,009
26	0,281	0,199	1,213	0,079	2,067	0,081	0,183	0,009
27	0,25	0,307	2,09	0,161	1,591	0,05	0,155	0,009
28	0,232	0,314	1,521	0,086	1,66	0,052	0,109	0,008
29	0,186	0,417	1,27	0,052	1,597	0,049	0	0,006
30	0,113	0,157	3,349	0,333	2,043	0,052	0,083	0,006

Note: This table shows parameter estimates and standard errors for the IRT model specified in equation (1) as well as indicators from Classical Test Theory (CTT).

Appendix B: Measuring attitudes towards economics

In this section, we provide supplementary statistics with regard to attitude measurement. We conducted a Principal Component Analysis with varimax rotation. The analysis shown in Table B1 reveals four meaningful components explaining the majority of overall variance. Although there is still a reasonable proportion of unexplained variance, the 4-factor solution is preferred as the 5-factor solution explained only five percent more of the total variance but would be much more challenging to interpret. Extracting independent factors with oblique rotation does not lead to meaningful differences in the PCA results.

In order to test for sufficient reliability within the attitude scales, we provide internal consistency measures, with results for all attitude scales shown in Table B2 and results for each single item shown in Table B3. The commonly used reliability coefficient Cronbach's alpha (Cronbach 1951) shows how closely associated the items within the relevant scale are. We find that all attitude scales and single items show values above 0.7, indicating a sufficient internal consistency.

Table B1: Eigenvalues and Explained Variance

	Interest	Competition	Social responsibility	Money
Eigenvalues	5.94	3.32	2.61	1.91
% Explained	23.7	13.3	10.4	7.7
% Cumulative	23.7	37.1	47.5	55.2

Note: This table shows Eigenvalues and explained variance proportions for four principal components extracted from Principal Component Analysis with varimax rotation. The first row shows eigenvalues which is the sum of squared factor loadings within one factor across all items. The analysis is conducted with R package *psych* (Revelle 2020).

Moreover, as a further essential part of item analysis, we examine inter-item correlations that show the extent to which scores on a single item are related to scores on all other items within the attitude scale.

Table B2: Scale Reliability

	Cronbach's Alpha	Inter-item correlation	Mean	SD
Interest	0,894	0,413	2,946	0,69
Competition	0,809	0,47	3,615	0,756
Money	0,808	0,514	3,891	0,794
Social responsibility	0,821	0,535	3,635	0,814

Note: This table shows measures for internal consistency by means of Cronbach's alpha coefficients (Cronbach 1951) and inter-item correlations (e.g., Gulliksen, 1945) as well as overall means and standard deviations. The results are estimated with R package psych (Revelle, 2020).

The moderate inter-item correlations in Tables B2 and B3 indicate that the items are sufficiently correlated. This shows a) that they generally measure the same construct and b) that the correlations are not too strong such as the single item being repetitive. With regard to the single item reliability (Table B3), we additionally analyzed item-total correlations which calculates the correlation between the single item score and the overall assessment score. Our analysis reveals substantial predictive power for all items with correlation values between 0.4 and 0.8.

Table B3: Reliability of Single Items

	Cronbach's Alpha	Inter-item correlation	Item-total- correlation	Mean	SD
Interest in economics (Source for items 1, 2 and 3: Walstad and Soper 1983)					
I enjoy reading articles about economic topics.	0,883	0,407	0,688	2,361	0,989
Economics is easy for me to understand.	0,888	0,421	0,575	3,053	0,895
Economics is dull.	0,884	0,41	0,669	3,236	1,047
I'm interested in economics.	0,877	0,393	0,804	2,89	1,028
I have nothing to say in economic matters.	0,893	0,433	0,478	3,272	1,002
I like to talk about economics.	0,88	0,399	0,757	2,567	1,006
I get bored in conversations about economics.	0,89	0,425	0,552	3,325	1,02
I like to bring discussions to the topic economics	0,886	0,414	0,636	2,188	0,967
I follow economic news.	0,887	0,416	0,613	2,455	1,047
I wish I didn't have to learn economics.	0,887	0,417	0,611	3,465	1,131
I learn a lot of interesting stuff when economics is discussed.	0,882	0,405	0,707	3,049	1,017
I think it is important to have a good knowledge of economics.	0,885	0,413	0,644	3,498	1,021
Attitudes towards competition (Source: Fülöp et al. 2006)					
Life would be very boring without competition.	0,806	0,515	0,555	3,043	1,154
Competition gives people a goal, something to strive for.	0,758	0,447	0,739	3,868	0,921
Competition is a fundamental aspect of human nature.	0,788	0,497	0,598	3,555	1,015
Competition motivates people to achieve goals.	0,75	0,436	0,768	3,911	0,929
Competition could bring each individual to improve.	0,76	0,454	0,714	3,697	0,982
Attitudes towards money importance (Source: Lim and Teo 1997)					
Money is important.	0,742	0,488	0,742	4,041	0,925
Money is an important factor in the lives of all of us.	0,782	0,547	0,642	4,079	0,955
Money is valuable.	0,772	0,534	0,666	3,927	1,038
I value money very highly.	0,738	0,488	0,743	3,516	1,065
Attitudes towards social responsibility					
Companies should make money available for social purposes.	0,745	0,495	0,787	3,731	1,007
Companies should donate part of their revenues to charity.	0,758	0,512	0,76	3,835	1,048
Companies should financially advocate for society.	0,776	0,536	0,707	3,542	0,96
Companies should support non-profit associations with money.	0,817	0,598	0,604	3,433	1,018

Note: This table shows reliability parameters corresponding to Table B2. In addition, column (3) shows part-whole-corrected item-total-correlation for all items (Guilford 1953).

Appendix C: Auxiliary Sample Characteristics

Table C1: Randomization Balance across School Types

	Other school types				School type 'Gymnasium'			
	Full sample	Old curriculum	New Curriculum	p-value	Full sample	Old curriculum	New Curriculum	p-value
Male	0.556 (0.497)	0.554 (0.497)	0.558 (0.497)	0,691	0.503 (0.5)	0.554 (0.497)	0.558 (0.497)	0,691
≤25 books at home	0.389 (0.488)	0.415 (0.493)	0.369 (0.483)	0,086	0.114 (0.318)	0.415 (0.493)	0.369 (0.483)	0,086
Foreign language	0.448 (0.497)	0.428 (0.495)	0.463 (0.499)	0,368	0.29 (0.454)	0.428 (0.495)	0.463 (0.499)	0,368
Math abilities	3.235 (0.979)	3.222 (0.972)	3.244 (0.985)	0,768	3.539 (1.005)	3.222 (0.972)	3.244 (0.985)	0,768
Reading abilities	3.626 (0.719)	3.614 (0.735)	3.635 (0.708)	0,976	4.001 (0.781)	3.614 (0.735)	3.635 (0.708)	0,976
Missing proportion (Attitudes)	0.013 (0.069)	0.013 (0.058)	0.013 (0.076)	1	0.006 (0.042)	0.008 (0.056)	0.003 (0.018)	0,145
Low urbanization	0.345 (0.475)	0.404 (0.491)	0.3 (0.458)	0,171	0.255 (0.436)	0.404 (0.491)	0.3 (0.458)	0,171

Note: This table represents the mean of individual characteristics for those who are affected by the reform (new curriculum) and those who are not (old curriculum) within school tracks. Missing proportions shows the sum of missing values in attitude items divided by the total number of attitude items. The fifth and the ninth column report the p-values of a t-test that the coefficient of the new curriculum group is equal to zero in a linear regression with cluster robust standard errors.

Table C2: Sampling Proportions

School type	Urbanization	Stratum	Students (sampled)	Percentage	Students in stratum	Percentage	Diff.
Gymnasium (GYM)	high	1	386	12,9	14985	15,4	-2,5
	medium	2	283	9,5	9417	9,7	-0,2
	low	3	229	7,7	8709	8,9	-1,3
Realschule (RS)	high	4	467	15,6	11572	11,9	3,8
	medium	5	230	7,7	8450	8,7	-1
	low	6	274	9,2	11608	11,9	-2,7
Gemeinschaftsschule (GMS)	high	7	114	3,8	5745	5,9	-2,1
	medium	8	141	4,7	6267	6,4	-1,7
	low	9	143	4,8	5549	5,7	-0,9
Werkrealschule (WRS)	high	10	132	4,4	3125	3,2	1,2
	medium	11	286	9,6	5788	5,9	3,6
	low	12	303	10,1	5878	6	4,1