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Personality Traits and the Perception of Macroeconomic Indicators – Survey Evidence

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Andreas Orland

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Survey Evidence

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Andreas Orland[1]

Personality Traits and the Perception of Macroeconomic Indicators – Survey Evidence

Abstract

I examine the determinants of both perceived inflation and unemployment in one single survey and include personality traits (BFI-S) in the analysis. This is the first survey on this topic in Germany. My sample consists of 1,771 students from different fields and levels. Using PhD students' estimates as a reference, I create categories for underestimation and overestimation of both variables. Multinomial logit regressions show that females overestimate both variables. Education and news consumption reduce misestimation. A higher level of Neuroticism is related with a higher probability to overestimate unemployment. Overstating (understating) one indicator is associated with overstating (understating) the other.

JEL Classification: C20, D12

Keywords: Survey; inflation perception; unemployment perception; personality traits; cross-sectional heterogeneity

July 2013

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1 INTRODUCTION

A large body of research focuses on cross-sectional perception and forecasting of macroeconomic variables. Especially the heterogeneity of inflation perceptions of the general public received much attention (Jonung, 1981; Souleles, 2004; Duffy and Lunn, 2009). Most macro models assume that rational agents form identical expectations or at least that these expectations converge over time. Empirical studies find that biases are found among the same socioeconomic and demographic groups in various countries and that the mean of perceived inflation rate is higher than the official one (Bryan and Venkatu, 2001a, 2001b). Females, minorities, less wealthy and less educated people state significantly higher inflation rates (Christensen, 2006). But the misperception goes in both directions: The afore mentioned groups are among those who in general both overestimate *and* underestimate inflation (Duffy and Lunn, 2009). Fewer studies examined unemployment perceptions with similar findings for the same socioeconomic groups (Blanchflower and Kelly, 2008; Malgarini and Malgarini, 2008).

In this paper I examine the heterogeneity of perception of both inflation and unemployment with a unique dataset that contains both perceived inflation and unemployment and a self-assessment of personality traits, the 'Big Five Inventory-SOEP' (BFI-S) by Gerlitz and Schupp (2005). To my knowledge, this is the first study on individual perceptions of macroeconomic variables in Germany. My two research questions are: (1) Does the perception of macroeconomic indicators vary with personality traits? Which personality traits relate to the misperception of inflation or unemployment rate? (2) Are the perceptions of inflation and unemployment related to each other and if so, how?

Personality traits are dimensions that describe human personality. They are stable over time (Roberts and Del Vecchio, 2000) and robust across (most) elicitation methods (Lang et al., 2011). They have been used by psychologists for years and recently economists have started to explain and predict outcomes with their help. But as Borghans et al. (2008, p. 1035) state:

> "[R]ecognizing the importance [of non-cognitive traits] is not enough. It is also essential to identify *which* traits are important for which outcomes. Such an understanding not only leads to better measures and richer models, but ultimately provides direction for policy and intervention".

The findings so far are rich, for overviews see Borghans et al. (2008) and Becker et al. (2012). For studies on inequality of labour market success see Heineck and Anger (2010) and Sutin et al. (2009). Therefore I am convinced that the application of personality traits on the problem of biased perception of macroeconomic variables is promising.

Armantier et al. (2011) show experimentally that subjects' unincentivized stated beliefs about inflation are related to their behaviour in an investment decision with possible payoffs up to USD 600 per subject. Subjects who stated high beliefs about inflation chose on average a corresponding switching point between a fixed amount and an inflation-indexed investment. With links established that both personality and perceptions are related to behaviour, I examine whether there is a connection between personality traits and perceptions as well.

Besides the growth rate, the unemployment rate and the inflation rate are considered the two most important macro variables. Theoretically, each of the variables affects the

wellbeing of different groups in the economy to different degrees[1]: The wealthy suffer more from inflation, whereas people who rather depend on their labour income face a higher risk from unemployment. I consider it an advantage to examine the perceptions of these two potential dangers in one single survey. This allows analyzing whether the risks that both variables bear are actually perceived differently by the groups mentioned above or, as it also may be the case, both variables are perceived as a general economic risk. If the latter is the case, then the rates' perceptions would not be related to the groups most threatened by their dangers, but both rates would be overestimated in general.

Economic agents' choices about saving, borrowing and consumption are affected by the current and expected future inflation rate in the economy. Therefore biases have many consequences and might partly explain distributional differences. Agents who overestimate inflation save less than optimal and suffer from a too low income from these savings when they retire. Similar arguments hold for the unemployment rate and decisions about investments in education. Besides, employees who perceive the unemployment rate as higher than the actual rate feel themselves in a weaker position in individual wage negotiations and accept lower wage offers than they need to. Given the groups with biased perceptions that the literature identified so far, the gender wage gap and the immigrant wage gap could be partly explained by behaviour based on these perceptions. As personality differs systematically between sexes (Feingold, 1994), I examine the question whether they relate to the perception of macro indicators.

[1] See Cardoso (1992) for macro evidence that higher inflation does not affect the poor; Rezende (1998), Datt and Ravallion (1996) for the contrary; Easterly and Fischer (2001) and Scheve (2004) on individual inflation *aversion* of different socioeconomic groups. See Shiller (1996) for survey evidence on why people (laymen and economists) think inflation is harmful.

2 LITERATURE

Bryan and Venkatu (2001a, b) use data from a telephone survey by the Federal Reserve Bank of Cleveland and the Ohio State University of a representative sample of Ohioans. They find that respondents from lower income quintiles state inflation to be higher than richer respondents. Also females, younger and non-whites overestimate inflation (Bryan and Venkatu 2001a). In a follow-up paper Bryan and Venkatu (2001b) added a question to the survey asking whether the participant had heard about the Consumer Price Index. Less women than men had heard about it. Overall, those who had heard about it report a higher inflation rate than those who had not. Women in both groups report higher inflation rates than men. Bryan and Venkatu (2001b) conclude that ignorance of the CPI is not the cause of the large gender gap.

Christensen et al. (2006) use the representative Dutch DNB Household Survey which provides both qualitative and quantitative assessment of inflation and economic growth. To analyze the quantitative discrepancy between perceived and actual rates, they use an ordered probit analysis on the quintiles of the absolute deviations of perceived from actual rates. Their findings are that males, higher educated and higher income individuals have more accurate perceptions (of both current and inflation of the past five years). Extended regressions show that asset market participants and those most involved in administrative matters in the household have a more accurate perception of inflation. Accuracy of growth rate perception is also higher for males and high-income individuals (current growth) and males, older respondents and asset market participants have a more accurate perception of growth over the past five years.

Duffy and Lunn (2009) work with Irish data from the EU Consumer Survey (2002-2007). To examine the direction of misperception, they define two ranges of underestimation and overestimation for the quantitative answer of perceived inflation. To achieve the

boundaries, they set them according to the skew of the distribution of monthly CPI. According to their definition individuals who make an error smaller than -1% underestimate, whereas individuals making an error bigger than +2% overestimate. Then they run a multinomial logit regression to identify the sociodemographic characteristics that determine deviation in one direction or the other in comparison with the baseline group with accurate estimations. Females and individuals in lower socioeconomic groups are more likely to overestimate as well as to underestimate. People who manage their own household finances are more likely to have accurate perceptions. The authors also relate the forecast error to attitudes and intentions to future behaviour and find that misperception may well influence individuals' decision-making.

A related question is how accurately individuals forecast inflation. Jonung (1981) uses a Swedish survey that asked participants for quantitative estimates of how prices in general had moved during the past twelve months *and* about their inflation expectations for the next twelve months. He finds an effect on *perceived* (past) inflation only for one of the demographic variables: females have a higher perception. Females also have higher inflation *expectations* than men. Besides this gender effect, Jonung also finds an age effect. Older individuals expect lower price rises than younger ones. Also households with children expect higher prices than those without. As both past and future inflation were inquired, regressions show that perceived rates have a strong positive influence on expected rates. Jonung also gives an interpretation of the gap between men's and women's difference in perception. As food prices in the year prior to the survey had risen stronger than inflation rate and women in Sweden usually did the shopping at that time, he reasons that their perceptions are mainly driven by that impression.

Souleles (2004) also finds that people's inflation forecast errors are correlated with their demographic characteristics. The forecast bias in his data from the Michigan Consumer Survey tends to decrease with age, income and education. He finds that the bias is not constant over time but depends on the inflation regime and the business cycle.

Anderson et al. (2010) provide evidence of learning in the context of inflation expectations in the US. They use the short panel dimension of the Michigan Consumer Survey and test if survey respondents asked a second time (six months after their first participation) make a forecast error of the same magnitude. Forecast accuracy had increased for re-interviewing non-white females, low-income individuals, younger individuals (aged 18-34) and households with children (the groups that had made the biggest errors when asked the first time).

Malmendier and Nagel (2012) use 54 years of data from the Michigan Consumer Survey and find that past experiences play an important role in how individuals form inflation expectations. Younger individuals' expectations are dominated by recent observations, while older individuals form their expectations using a more extended data set. This explains the heterogeneous inflation expectations between old and young individuals in the survey.

Blanchflower and Kelly (2008) provide one of the few studies that examine unemployment rate expectations. Using GfK data from the UK, the authors find that females, those who left school under the age of 16 and skilled manual workers overstate the expected unemployment rate.

Malgarini and Malgarini (2008) examine unemployment expectations across Italian individuals with different working conditions. They find that the error of expectations is

significantly correlated with subjective beliefs on the personal economic and financial situation and with the fact whether subjects take into account the effects of a certain labour market reform. Self-employed and retired depend less on changes in the Italian labour market regulation and their expectations are more correlated with past unemployment trends. Employees are unable to incorporate the effects of the labour market reform into their predictions.

All authors find similar determinants for the misperception of the macroeconomic variables, namely gender, income or wealth, age and education. I expect similar effects in my sample. No paper examines the impact of personality on perception. I include them in my analysis to tackle the question whether they relate to the perception of the macroeconomic variables. Doing this, I include a wide range of control variables to account for known drivers of misperception.

The studies reviewed here all focus on either inflation or unemployment rate. None of them examines them together. Christensen et al. (2006) examine the perceived inflation *and* growth rates, but do not consider how they relate to one another. This is my second research question.

Duffy and Lunn (2009) consider the direction of misperception with classifications of over and underestimation that are constructed with the help of CPI skewness. I refine their approach by using more economically educated individuals' perceptions in my sample to define categories of under and overestimation of both inflation and unemployment rate.

3 Material and Methods

3.1 Survey participants

I use a unique dataset that was singled out of a survey with a broader scope collected by our institute. To tackle the research questions, I will focus on only two questions from this survey and neglect the other items apart from the personal details[2]. We collected 1,771 completed questionnaires of students from four different fields at Ruhr University Bochum: majors of engineering, medicine, management and economics (M&E) and the humanities. From all four groups we collected questionnaires from both freshmen and advanced undergraduates (I use this term for all students who are not in the first semester anymore). Master and PhD students and post docs of the Faculty of Economics also participated. In Bochum, there is one combined undergraduate program in M&E, management and economics, while Master programs are further specialized (management *and* economics, management, economics), and supplemented by East Asian economics whose students also participate in lectures of the Faculty of Economics.

Comparing the number of participants to the official statistics of the university, almost all of the beginners in M&E participated (303 of 304 freshmen with a share of 42% females). In medicine 187 out of 296 beginners participated (share of females 61%). There is no distinct number for beginners in humanities as students are registered in various programs of different faculties and could therefore be counted twice if registered in two humanities fields. If we consider the students who chose humanities either as first or second subject (this is not the number of individuals, many students take two humanities fields), 235 of 773 freshmen returned the questionnaire. For engineering the share of participants is smaller: 86 of 1,326 freshmen participated. For

[2] Other questions asked for e.g. normative evaluations of the participants concerning economic questions. We will use this data for further work.

the Master students the sample consists of 24 (out of 45) economics students, 80 (of 231) management students and 43 (of 91) M&E students. Their mean number of semesters ranges from 7 to 7.3. In the sample, we find 208 advanced bachelor students in engineering, 98 advanced students in medicine, 266 in M&E and 191 in humanities. The average number of semesters in all this groups is similar (3.5 to 4.2). Table A1 in the appendix gives a summary of the participants. Even though the key characteristics of the sample and that of the population population do not match exactly, the participants' are quite close to the populations' variables from the rector's office.

3.2 Questionnaire

The questionnaire consisted of 38 questions concerning the economy (labeled "Questions about the German Economy") and about 20 questions asking for personal details[3] plus a 15-item version of the Big Five, the BFI-S (Gerlitz and Schupp, 2005). Even though we asked the participants to fill out the questionnaire completely, not all questions were answered. Therefore the number of observations in the following analyses differs.

In this paper, I focus on two questions from "Questions about the German Economy" only: an estimation of the inflation rate and the unemployment rate for 2011.[4] The wording of the two questions was:

[3] Master and PhD students' questionnaires included a few more items than undergraduates'. They were e.g. asked for the university where they did their undergraduate degree.

[4] The survey was conducted in two waves: one from mid September to mid October 2011, the other in January 2012. The official annual inflation rate for 2011 was announced in February 2012, the official annual unemployment rate in July 2012. Forecasts and official numbers are published constantly (e.g. the monthly inflation rate by the Federal Statistical Office and the monthly unemployment rate by the Federal Employment Agency). In all surveys that ask for the estimation of rates of macroeconomic variables one can ask what is measured: the degree to which participants are informed about the economy or how they perceive the economy. Tackling this question is beyond the scope of this paper. I will use both definitions interchangeably.

Please state or guess (up to one decimal place) the current yearly…

… inflation rate in % _____

… unemployment rate in % _____

The personal detail section asked for usual socio-demographic characteristics like gender, year of birth, number of siblings, … More specific questions were asked e.g. for the field of study, the number of semesters already completed, whether the participant lives with his or her parents, the parents' professions, whether the parents were born in Germany and the language spoken at home. Section 4 explains the variables in more detail.

The last part of the survey consisted of the Big Five inventory also used in the German Socioeconomic Panel (SOEP) developed by Gerlitz and Schupp (2005). The personality traits described by the inventory are Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness. The BFI-S version of the Big Five has 15 items and is based on the longer BFI-25. The BFI-S combines the informational value of the BFI-25 with a short survey time (two minutes are in general needed to answer the 15 questions).

3.3 PROCEDURE

The survey was conducted paper-based. Freshmen undergraduate students were asked to participate during the voluntary introductory courses or during their very first lecture to ensure that they have not been subject to any discipline-specific teaching. The M&E students at Master level were asked during different lectures covering all fields of specialization in the first two weeks of the semester. As those students had already been subject to at least three years of economic education I assume that having had one or two lectures at Master level does not change their answers from one day to the other. All these groups were asked within a period of four weeks to ensure the comparability of

answers. We conducted the survey from mid September until mid October 2011. In January 2012, we asked advanced Bachelor students in the other three disciplines. During that time the euro crisis was subject to heavy media coverage. Rescue plans, austerity packages and meetings of Europe's top officials had been in the news for more than one and a half years. The uncertainty about the future of Europe's common currency had not changed in the time of the survey and the macroeconomic environment in Germany also had not changed much.

Students who took part in the survey and filled out the questionnaire took part in a lottery of Amazon vouchers in order to incentivize participation. Funding for the vouchers was provided by the Institute for Macroeconomics of Ruhr University Bochum.

4 VARIABLE DESCRIPTION AND HYPOTHESES

In contrast to the other surveys introduced so far, my pool of respondents is homogeneous in many respects. As they all are university students, they have a high school degree. They are young and all in the same age. The cohort effects that Jonung (1981) and Malmendier and Nagel (2012) find will not play a role in my sample. As my main focus is the association between personality traits and perception, I want to control for covariates that are relevant and have variation within the group I examine. To achieve this, I include proxy variables in the analyses that are of importance to the sample of young people.

The variable "female" accounts for the gender gap (females in general misperceive more strongly than males) that all previous studies found. The effect of education is also strong and I include both the final school grade from the German Abitur ("final school grade") and the number of semesters already enrolled to university ("semester"). The studies conducted so far usually measure education only by years of education or

highest degree (where increasing years of education lower misperception). I hypothesize that the final school grade's effect also goes in the same direction. Notice that the German grading system is different from other countries'. The best grade in Germany is 1 and 4 is needed to pass (Abitur grades are given with one decimal place precision). Therefore I hypothesize that a worse grade (a higher value) is associated with higher probability to misperceive macro indicators.

In the US, non-whites were found to misperceive inflation (Anderson et al., 2010). To account for a similar effect I constructed the variable "migration background", a dummy for students who stated that one or both parents were born abroad (doing so I follow the German Federal Statistical Office's definition). My definition is broader than the one used by Anderson et al. (2010) but I use their finding as an indication for a minority effect that I control for.

Another important variable is the choice the participant made for a specific field of study. I include dummy variables for all fields of study but management and economics (with all its' degrees up to post docs), which serves as a reference category. I hypothesize that students of all fields of study make bigger estimation errors than the reference category as M&E students either already have earned expertise in economics (if they are at least advanced undergraduates) or have decided to study it (if they are freshmen) and hence have demonstrate their interest in economic questions.

The participants' socioeconomic status in this age group is largely determined by their parents', so I account for it by their parents' employment relationship (Malgarini and Malgarini, 2008, found an effect of employment relationship on the perception of the unemployment rate). The variable "Parents' occupation" is a dummy that takes the value of 1 if the participant stated that one or both of the parents is either an executive

employee, a public employee, self employed or belongs to the liberal professions. In contrast to the other employment relationships in the questionnaire, e.g. blue-collar worker, homemaker or unemployed, my definition covers better-paid and safer jobs. I hypothesize that students whose parents have a higher socioeconomic status have a lower probability to misperceive macro indicators.

In addition, I use two variables that measure how strongly the participant depends on his or her own earnings and savings. In the survey I asked the participants how much different possible sources of income contribute to their expenses for their study. “Share job” and “Share savings” are variables that contain the percentages that participants stated that their own job and savings contribute. I assume that students who rely more on their own money (either from current income or from previously accumulated income) have got a better, less naïve understanding of the economy and know macro variables better. To account for a similar effect, I included the variable “Living with parents”, a dummy variable that takes the value 1 if the participant stated to live with his or her parents. I hypothesize that living with the parents increases the probability to misperceive the macro indicators.

Clearly, media consumption habits matter for knowing the unemployment and inflation rate or for having an idea about a reasonable range. To account for it, I use the probability that the participant reads the newspaper. I use the answers from a six item Likert scale to the question “How often do you read the newspaper?”. Because of the non-linearity of the answers in the questionnaire I transformed them into approximate probabilities that the subject reads the newspaper on any given day: “Newspaper”

ranges from 1 (daily/almost daily) to 0 (never/ almost never).[5] I hypothesize that misperception decreases with an increasing frequency of reading the newspaper.

"Job fear" is a dummy variable that takes the value 1 if the participant stated that she/he is afraid of finding no adequate job after their university studies. I hypothesize that those participants who state that they have this fear rather overestimate the unemployment rate. I also included the number of siblings ("# siblings") into the analysis. As there is an inverse relationship between the number of siblings and the socioeconomic background of the family and the children's educational attainment in the US (Downey, 1995), I include this variable to capture this effect. I hypothesize that the misperception increases in the number of siblings.[6]

Now I turn to the personality traits as introduced by McCrae and Costa (1985, 1992). Neuroticism refers to the degree of emotional stability, impulse control, and anxiety. Extraversion is displayed through a higher degree of sociability, assertiveness, and talkativeness. Openness is reflected in a strong intellectual curiosity and a preference for novelty and variety. Agreeableness refers to being helpful, cooperative, and sympathetic towards others. Finally, Conscientiousness is exemplified by being disciplined, organized, and achievement-oriented. Table A2 in the appendix gives a summary of the personality traits and their facets from Mueller and Plug (2006).

[5] I approximately linearized the Likert scale like this: (1) Daily/Almost daily [1], (2) Two to three times a week [.5], (3) Once a week [.2], (4) One to three times a month [.1], (5) Less often [.05], (6) Never/Almost never [0].

[6] For Germany there is no conclusive evidence for a relationship between parents' socioeconomic status and the number of children in their family, see Bundesministerium (2008). There is a u-shaped distribution of families with a large number of children (defined as families with more than three children) across the education of the parents (with large number of children in the groups of parents that are either relatively uneducated of relatively educated). But also other factors play a role, religious families and families with migration background also have a higher probability to have large families (Eggen and Rupp, 2006). Therefore I decide against including an additional quadratic term in the regressions.

Each personality trait is covered by three items in the survey (with the same wording and coding of the answers as in the BFI-S). Participants were asked to rate their personality by attributing up to seven points to each statement on a Likert scale. For each personality trait except Openness one item was reverted. For my analysis, I calculated the sum of the three items of each personality trait (taking account of the reverted items) and calculated the means for each participant. The personality traits therefore range between 1 and 7 (the highest value for each trait). Table A3 in the appendix supplies summary statistics for the personality traits. Scale reliability for all five personality traits is acceptable and comparable to Gerlitz and Schupp (2005): Neuroticism (Cronbach's α 0.63), Extraversion (0.75), Openness (0.61), Agreeableness (0.53) and Conscientiousness (0.66).[7]

I expect that Neuroticism, Openness and Conscientiousness are influential for the perception of macro variables. Neuroticism is defined as "the degree to which a person experiences the world as threatening and beyond his/her control" (Hogan and Hogan, 2007). People who worry a lot might rather overestimate inflation and unemployment, therefore I hypothesize that a higher level of Neuroticism is related with a higher probability to overestimate both macro variables[8].

Openness is defined as "the degree to which a person needs intellectual stimulation, change and variety" (Hogan and Hogan, 2007). As Openness is related to curiosity and learning[9], I hypothesize that more open individuals know both rates better.

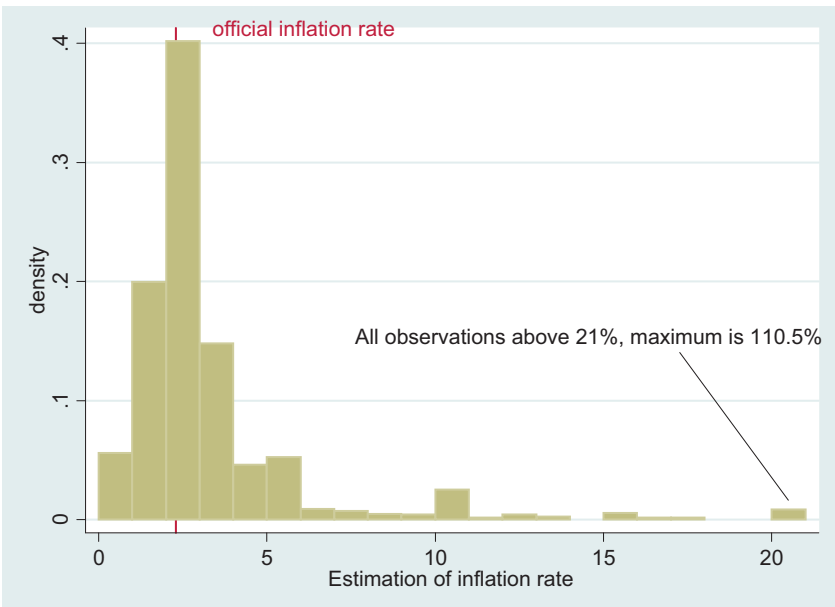
[7] Four of the trait's αs are below the usually assumed value of 0.7. Gerlitz and Schupp also find this and attribute it to the low number of items for each trait. The mean inter-item correlations are also in the same range as Gerlitz and Schupp so I am convinced that the internal consistency of the personality traits in my sample is acceptable.
[8] See Sjöberg (2003) for evidence that the factor of Neuroticism has a positive, weak but consistent correlation with the risk perception over many contexts (though none of them economic).
[9] Openess is the best predictor of the Big Five traits for years of education (Borghans et al., 2008).

Hogan and Hogan's (2007) definition of Conscientiousness is "the degree to which a person is willing to comply with conventional rules, norms and standards". This personality trait is reflected in more dutiful and self-disciplined individuals[10]. I expect more conscientious individuals to know both rates better.

5 Results

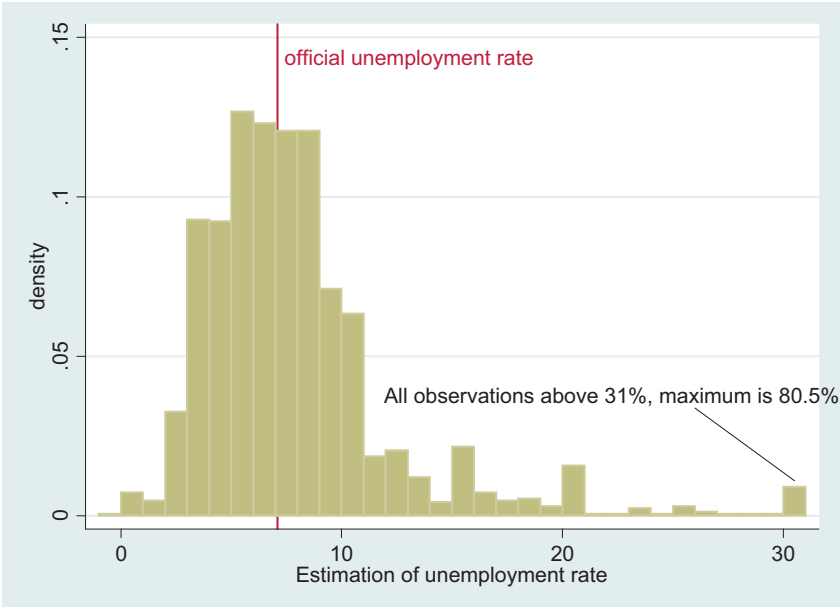
Official numbers for inflation and unemployment in Germany in 2011 were 2.3% (Federal Statistical Office) and 7.1% (Federal Employment Agency), respectively. The participants' answers together with official rates are given in histograms in Figure 1 and 2. More detailed numbers by field of study, gender and number of semesters enrolled are supplied in Table 1 (different numbers of observations in contrast to table A1 are due to missing observations).

Figure 1: Histogram of inflation estimations



[10] Borghans et al. (2008) reports that Conscientiousness is the best predictor of the personality traits for grades and job performance.

Figure 2: Histogram of unemployment estimations



As can be seen in the table, for both variables the median is identical or very close to the official numbers. But the means are in general higher (as indicated by many very high observations). In Table 1 it can be seen that, on average, females perceive both indicators as being higher than males. Students with one or both parents born abroad perceive them as higher than students whose parents were both born in Germany. Estimations differ among fields with humanities students on average making bigger errors for both indicators. For many fields being enrolled for a longer time lowers errors.

In a first step, I use OLS regressions to test my hypotheses on if and how personality traits and socioeconomic characteristics drive the perceptions of inflation and unemployment. To give a first impression of the data, I calculate the deviation from the official rates and their absolute values and use them as dependent variables. Table 2 shows the regression outputs. Many of the variables already known as drivers of

misperception of macroeconomic indicators are significantly different from zero. As the personality traits have not yet been included, I shortly focus only on them. Extraversion relates positively to the misperception of the deviation of perceived inflation from the official rate, a finding not hypothesized. Neuroticism is positively related to the absolute deviation of perceived unemployment from the official rate, as hypothesized.

As can be seen in Table 1, some observations are ten times higher than the official numbers. As outliers can drive results and OLS in this specification does not allow distinguishing the direction of misperception, I use another approach for the main analysis. I collapse the variables' realizations into three categories. By doing this, I avoid to declare extreme values either ad hoc or by one of the rivalizing rules in order to exclude them. In the following, I will contrast overestimation and underestimation of the two macro indicators with the reference category of correct estimation.

Table 1: Inflation rate and unemployment rate by respondents' characteristics

			Inflation rate						Unemployment rate					
Field			n	Min	Max	Mean	Median	SD	n	Min	Max	Mean	Median	SD
Engineering	Freshmen	Male	64	0.1	30.0	3.60	2.05	4.85	66	0.5	20.5	7.61	7.25	3.89
		Female	28	1.2	60.0	6.64	3.00	11.25	29	2.0	40.0	7.82	7.00	6.89
		Total	92	0.1	60.0	4.53	2.20	7.47	95	0.5	40.0	7.68	7.00	4.96
	Advanced	Male	144	0.3	30.0	2.62	2.10	2.99	143	2.3	60.0	7.44	6.50	5.77
		Female	45	0.3	110.5	6.93	2.00	20.22	43	3.2	63.0	10.81	8.10	10.20
		Total	190	0.3	110.5	3.65	2.05	10.26	187	2.3	63.0	8.20	7.00	7.14
Medicine	Freshmen	Male	68	0.1	40.0	3.28	2.10	5.27	70	0.1	20.0	6.98	7.00	3.36
		Female	104	0.1	40.0	3.51	2.10	4.76	108	0.5	30.0	7.84	7.10	5.226
		Total	172	0.1	40.0	3.42	2.10	4.95	178	0.1	30.0	7.50	7.00	4.62
	Advanced	Male	34	1.0	6.8	2.34	2.00	2.34	34	4.0	11.1	7.16	7.00	1.69
		Female	64	0.0	30.0	2.91	2.00	4.24	64	3.2	30.9	8.14	7.00	4.59
		Total	98	0.0	30.0	2.71	2.00	3.50	98	3.2	30.9	7.80	7.00	3.85
BSc management & Econ	Freshmen	Male	164	0.2	30.0	3.06	2.40	3.28	164	2.0	36.2	7.45	6.90	4.70
		Female	121	0.3	60.0	4.28	2.50	7.17	124	0.3	38.9	8.79	6.40	7.63
		Total	285	0.2	60.0	3.58	2.40	5.31	288	0.3	38.9	8.03	6.80	6.16
	Advanced	Male	141	0.6	12.5	2.40	2.30	1.32	140	0.3	20.5	6.69	6.80	2.71
		Female	117	0.2	30.0	3.40	2.50	3.35	115	0.4	30.0	7.81	6.50	5.29
		Total	258	0.2	30.0	2.85	2.30	2.50	255	0.3	30.0	7.19	6.50	4.11
Humanities	Freshmen	Male	67	0.2	25.2	4.22	2.40	4.42	66	1.8	80.5	9.01	6.55	10.47
		Female	127	0.1	110.0	8.04	3.00	13.15	130	0.1	58.1	10.46	7.15	9.60
		Total	19	0.1	110.0	6.72	3.00	11.09	196	0.1	80.5	9.97	7.00	9.90
	Advanced	Male	37	0.4	5.6	2.28	2.00	1.20	39	2.0	17.3	6.16	5.20	3.18
		Female	127	0.1	40.0	4.87	3.00	5.92	132	-0.3	40.5	9.60	8.00	6.28
		Total	164	0.1	40.0	4.29	2.50	5.35	171	-0.3	40.5	8.81	7.90	5.89
MSc Business/Econ		Male	69	0.5	8.0	2.44	2.50	0.91	70	2.0	21.0	6.76	7.00	2.97
		Female	77	1.0	32.2	3.24	2.70	3.51	75	2.0	29.8	7.96	7.50	4.26
		Total	146	0.5	32.2	2.86	2.50	2.65	145	2.0	29.8	7.38	7.00	3.73
PhD/PostDoc Econ		Male	23	1.6	3.0	2.32	2.50	0.40	23	4.2	10.0	6.85	7.00	1.44
		Female	17	1.5	3.0	2.11	2.00	0.52	17	5.0	10.5	7.48	7.50	1.31
		Total	40	1.5	3.0	2.23	2.15	0.46	40	4.2	10.5	7.12	7.05	1.40
All		Male	812	0.1	40.0	2.89	2.20	3.21	816	0.1	80.5	7.27	6.95	4.92
		Female	829	0.0	110.5	4.70	2.50	8.66	839	-0.3	63.0	8.87	7.10	6.92
		w/Migr	418	0.1	85.0	4.79	2.50	7.42	422	0.3	80.5	8.83	6.70	8.14
		wo/Migr	1,225	0.0	110.5	3.46	2.30	6.28	1,235	-0.3	58.1	7.82	7.00	5.14
		Total	1,643	0.0	110.5	3.80	2.30	6.61	1,667	-0.3	80.5	8.08	7.00	6.06

Table 2: OLS regressions of errors

	Deviation from official inflation rate	Absolute deviation from official inflation rate	Deviation from official unemployment rate	Absolute deviation from official unemployment rate
Neuroticism	0.075 (0.244)	0.067 (0.240)	0.194 (0.147)	0.214* (0.123)
Extraversion	0.300* (0.182)	0.275 (0.178)	0.177 (0.147)	0.169 (0.124)
Openness	-0.106 (0.173)	-0.150 (0.168)	0.186 (0.124)	0.109 (0.099)
Agreeableness	-0.209 (0.222)	-0.154 (0.218)	-0.121 (0.165)	-0.133 (0.132)
Conscientiousness	-0.369 (0.231)	-0.345 (0.227)	0.009 (0.136)	0.076 (0.105)
Female	1.713*** (0.495)	1.671*** (0.486)	0.958*** (0.363)	0.921*** (0.305)
Migration background	0.919** (0.469)	0.878* (0.453)	0.103 (0.458)	0.494 (0.390)
Parents' occupation	-0.642 (0.414)	-0.631 (0.403)	-0.448 (0.366)	-0.527* (0.306)
# siblings	0.695 (0.568)	0.642 (0.564)	0.475** (0.192)	0.375** (0.171)
Share job	0.008 (0.012)	0.008 (0.012)	-0.009 (0.006)	-0.005 (0.005)
Share savings	0.000 (0.008)	-0.001 (0.008)	-0.008 (0.008)	-0.003 (0.006)
Final school grade[1]	0.080 (0.458)	0.013 (0.450)	0.201 (0.286)	0.583 (0.229)
Semester	-0.207*** (0.055)	-0.208*** (0.053)	-0.104** (0.051)	-0.225*** (0.041)
Dummy engineering	1.256* (0.657)	1.694*** (0.644)	0.170 (0.455)	0.392 (0.386)
Dummy medicine	0.055 (0.405)	0.409 (0.385)	-0.138 (0.428)	0.025 (0.334)
Dummy humanities	2.204*** (0.622)	2.364*** (0.606)	1.268** (0.518)	1.289* (0.438)
Living with parents	0.091 (0.316)	0.110 (0.304)	0.627** (0.302)	0.403* (0.245)
Newspaper[2]	0.046 (0.542)	-0.050 (0.527)	-1.278*** (0.413)	-0.817** (0.338)
Job fear	0.010 (0.402)	0.018 (0.387)	-0.338 (0.408)	-0.462 (0.343)
Constant	0.832 (3.018)	1.669 (2.978)	-1.635 (1.525)	0.212 (1.277)
R^2	0.078	0.080	0.062	0.037
Adjusted R^2	0.065	0.067	0.049	0.036
AIC	6.645	6.582	6.402	6.009
BIC	-675.099	-762.474	-1030.397	-1904.74
#	1,389	1,389	1,399	1,399

*Robust standard errors in parentheses. Significance level of coefficient: *** 1%, ** 5%, * 10%*
1 A higher value of Final school grade means a worse grade
2 A higher value of Newspaper implies more frequent newspaper reading

The most obvious way to define the correct estimations would be to specify identical ranges for the two variables' categories (similar to Duffy and Lunn, 2009). For three reasons I decide to refine this approach: i) I have two indicators and the observations of

the unemployment rate that are more dispersed than the ones of the inflation rate[11], therefore I want to use different cut off points for the two variables' categories; ii) as the distance of the official number of inflation to the zero lower bound is smaller than for unemployment I use asymmetric upper and lower bounds around the official numbers to define the correct range; and (iii) as I have a rich dataset that also contains perceptions of individuals with different degrees of expertise I want to use the data itself to define the reference ranges.

Therefore I use the PhD student and postdocs' range of estimations as a category for "correct" estimation (separately for both macro variables). Their range for the inflation rate is between 1.5% and 3% (-0.8 and + 0.7 percentage points around the official number of 2.3%), for the unemployment rate between 4.2% and 10.5% (-2.9 and +3.4 percentage points around the official 7.1%). The PhD students' estimates range almost symmetrically around the official numbers, though the range for the correct unemployment rate is wider. As for the rest of the sample, among PhD students and post docs is also a higher uncertainty about the unemployment rate than about the inflation rate. I think this justifies a wider range (based on more experienced participants' estimations) for the reference category of the unemployment rate compared to the one for the inflation rate for all participants.

After constructing the categories, the relative sizes the variables are split into are the following: 59.4% (65.2%) stated an estimate of inflation (unemployment) as PhD students, 25.6% (15.5%) overestimated and 15% (19.4%) underestimated. So even though the estimations of unemployment vary more, the proportions of the categories

[11] Unemployment in the Ruhr area is higher than the unemployment rate for the whole country in 2011 (11.1% in contrast to 7.1%). This may influence the higher variance of both PhD students/post docs and students in general in comparison to the inflation rate.

for the two variables are very similar. Tables A4 and A5 in the appendix supply summary statistics for the independent variables in the three categories.

As the three categories are unordered, I use a multinomial logit specification (as Duffy and Lunn, 2009) to examine how the independent variables affect the perception. The multinomial logit approach explains the probabilities of the outcome of the dependent variable as a function of explanatory variables, using a logistic function. The probability of being in other categories is compared to the probability of being in the reference category. Different from linear regression models, this model is estimated using maximum likelihood procedures and allows me to distinguish the statistically significant factors associated with overestimation and underestimation.

In contrast to a simple binary specification, a multinomial logit regression can distinguish the direction of misperception and outliers of the dependent variable do not drive the results. I use the category of correct estimation as reference category to examine which variables have an influence on over or underestimating. For both inflation and unemployment estimations I estimate the following two equations simultaneously:

$$\log\left(\frac{\Pr\,(Y=underestimation)}{\Pr\,(Y=correct\ estimation)}\right) = constant_{under} + \beta_{under}\ demographics \qquad (1)$$

$$\log\left(\frac{\Pr\,(Y=overestimation)}{\Pr\,(Y=correct\ estimation)}\right) = constant_{over} + \beta_{over}\ demographics \qquad (2)$$

I conducted seemingly unrelated regression-based Hausman tests of the assumption of independence of irrelevant alternatives (IIA). Multinomial logit models assume that the odds for each specific pair of outcomes do not depend on other outcomes available (and deleting outcomes should not affect the odds among the remaining outcomes). The tests cannot reject the null of independent alternatives for both inflation and unemployment.

Table 3: Multinomial logit regression of inflation accuracy

Inflation	Underestimation (<1.5%)			Overestimation (>3%)		
	(1)	(2)	(3)	(4)	(5)	(6)
	Odds ratio	Coef		Odds ratio	Coef	
Neuroticism	0.970	-0.031	(0.066)	1.014	0.014	(0.061)
Extraversion	0.897	-0.109	(0.067)	1.010	0.010	(0.059)
Openness	0.917	-0.086	(0.069)	1.014	0.014	(0.063)
Agreeableness	1.041	0.040	(0.080)	0.975	-0.025	(0.072)
Conscientiousness	1.114	0.108	(0.081)	0.978	-0.022	(0.068)
Female	1.339	0.292	(0.184)	2.434***	0.889***	(0.162)
Migration background	1.416	0.292	(0.208)	2.137***	0.759***	(0.171)
Parents' occupation	1.035	0.034	(0.172)	0.861	-0.149	(0.151)
# siblings	0.896	-0.110	(0.081)	1.000	-0.000	(0.060)
Share job	0.998	-0.002	(0.003)	0.999	-0.001	(0.003)
Share savings	1.000	0.001	(0.004)	1.002	0.002	(0.004)
Final school grade[1]	1.058	0.056	(0.138)	1.440***	0.364***	(0.126)
Semester	0.946*	-0.055*	(0.031)	0.898***	-0.108***	(0.030)
Dummy engineering	3.812***	1.338***	(0.228)	1.907***	0.645***	(0.225)
Dummy medicine	2.660***	0.978***	(0.253)	1.907***	0.645***	(0.244)
Dummy humanities	2.812***	1.034***	(0.238)	3.330***	1.203***	(0.186)
Living with parents	1.196	0.179	(0.165)	1.292*	0.256*	(0.149)
Newspaper[2]	0.657*	-0.421**	(0.220)	0.649**	-0.432	(0.192)
Job fear	1.061	0.060	(0.198)	0.930	-0.073	(0.163)
Constant		-1.736**	(0.732)		-2.401***	(0.671)
#	1,374					
Log Ps Likelihood	-1178.26					
Count R^2	0.630					
Adjusted Count R^2	0.085					

*Robust standard errors of coefficient in parentheses. Significance level: *** 1%, ** 5%, * 10%*

1 A higher value of Final school grade means a worse grade

2 A higher value of Newspaper implies more frequent newspaper reading

I also conducted LR and Wald tests to check whether dependent categories could be combined. The hypothesis that categories could be collapsed was rejected for both inflation and unemployment rate with both tests.

Table 4: Multinomial logit regression of unemployment accuracy

Unemployment	Underestimation (<4.2%)			Overestimation (>10.5%)		
	(1)	(2)	(3)	(4)	(5)	(6)
	Odds ratio	Coef		Odds ratio	Coef	
Neuroticism	1.045	0.044	(0.059)	1.177**	0.162**	(0.069)
Extraversion	1.042	0.041	(0.060)	1.012	0.012	(0.071)
Openness	1.000	0.000	(0.064)	1.205***	0.187***	(0.084)
Agreeableness	0.983	-0.017	(0.074)	0.899	-0.106	(0.084)
Conscientiousness	1.024	0.024	(0.070)	1.102	0.097	(0.085)
Female	1.132	0.124	(0.162)	2.209***	0.793***	(0.190)
Migration background	1.135	0.127	(0.178)	1.014	0.015	(0.196)
Parents' occupation	0.862	-0.149	(0.155)	0.746*	-0.293*	(0.174)
# siblings	0.969	-0.031	(0.060)	1.211***	0.191***	(0.064)
Share job	1.000	-0.000	(0.003)	0.995	-0.006	(0.004)
Share savings	1.003	0.003	(0.004)	0.992	-0.008*	(0.005)
Final school grade[1]	1.467***	0.383***	(0.134)	1.286*	0.252*	(0.138)
Semester	0.893***	-0.113***	(0.031)	0.873***	-0.137***	(0.035)
Dummy engineering	1.772***	0.572***	(0.206)	1.608*	0.474*	(0.268)
Dummy medicine	1.292	0.256	(0.228)	1.118	0.165	(0.272)
Dummy humanities	1.408*	0.343*	(0.197)	2.078***	0.732***	(0.209)
Living with parents	0.799	-0.225	(0.148)	1.145	0.136	(0.169)
Newspaper[2]	1.111	0.105	(0.191)	0.532***	-0.631***	(0.228)
Job fear	0.829	-0.187	(0.169)	0.969	-0.031	(0.187)
Constant		-2.255***	(0.684)		-3.796***	(0.828)
#	1,384					
Log Ps Likelihood	-1135.78					
Count R^2	0.662					
Adjusted Count R^2	0.021					

*Robust standard errors of coefficient in parentheses. Significance level: *** 1%, ** 5%, * 10%*
1 A higher value of Final school grade means a worse grade
2 A higher value of Newspaper implies more frequent newspaper reading

The foregoing tables show the regression outputs for the inflation rate (Table 3) and the unemployment rate (Table 4). The first columns show the odds ratios for underestimating (1) and overestimating (4), the following two columns give the regression coefficients and their robust standard errors.

First of all, personality traits do not have a significant effect on inflation perceptions. Higher values of Neuroticism and Openness are related with the overestimation of unemployment. As discussed in the introduction, the unemployment rate is a more important economic indicator for the sample as it contains information about the situation in the labour market. Considering the student sample this result seems reasonable as individuals who worry more in this sample rather worry about (future) employment possibilities than about inflation. The finding that Openness is positively related to the overestimation of unemployment contradicts my hypothesis. Though Openness involves intellectual curiosity, according to Costa and McCrae (1992) also active imagination, aesthetic sensitivity, attentiveness to inner feelings and preference to variety are correlated with this domain of the Big Five. I conclude that the three items of Openness in my survey rather measure the openness to (cultural and aesthetic) experience than the curiosity towards news and economic questions. Conscientiousness is not related to the perception of neither inflation nor unemployment rate.

Comparing the two categories for inflation and unemployment shows that in contrast to previous studies, I find asymmetric effects of the socioeconomic variables on underestimating and overestimating. Females, in contrast to previous research are not more prone to understate neither inflation nor unemployment. But they are twice as likely as males to overestimate both variables. The consequences of these misperceptions might be that lower offers in individual wage negotiations are accepted by females than by males. This observed misperception of macroeconomic variables might constitute a channel for the gender wage gap.[12]

[12] A similar point cannot be made for the inflation rate. There is no evidence for a gender savings gap: Ameriks et al. (2003) do not find a significant difference between males and females when net worth or gross financial assets are controlled for key life-cycle variables.

Education plays a very important role as both the final school grade and the number of semesters influence both variables' perceptions. The probability to overestimate inflation is lower for students with better school grades. The probability of misperceiving the unemployment rate is also lower for students with a better grade. The number of semesters in university lowers the probability to misperceive (in both directions) unemployment and inflation.

Another important variable is the frequency of newspaper reading. Reading the newspaper daily or almost daily (in contrast to never or almost never, the lowest level of the variable) have a more than 30% lower probability to misperceive the inflation rate. The probability to overestimate the unemployment rate is almost 50% lower when newspaper consumption is increased as mentioned before.

The coefficients for most of the fields are highly significant, as expected. Students of other fields than M&E in general misperceive both macro indicators. Especially students of the humanities misperceive both macro variables in contrast to M&E students, also engineering students misperceive both variables. Medicine students misperceive the inflation rate (but not the unemployment rate).[13]

The results of two control variables are that students with migration background overestimate inflation and that the source of income on the other hand does not play a role in the perception of inflation and unemployment rate.

Now I turn to the question whether the perceptions of the two variables are related. Do people systematically misperceive the two macro variables together? The correlation coefficient of stated inflation and unemployment rate is 0.45 and the categorical

[13] Given that the survey was conducted later among the students of the fields other than M&E the coefficients might even underestimate the effect as students of engineering, medicine and the humanities had the chance to acquire more accurate information about the two macroeconomic indicators.

variables' Spearman rank correlation coefficient is 0.23 (both significant at Pr=0.000). Table 5 gives a contingency table of the two variables' categories. Both Pearson's χ^2 (164.9517, Pr=0.000) and the likelihood-ratio χ^2 (145.0527, Pr=0.000) reject the hypothesis of independent rows and columns. I find evidence that the misperception of both macro indicators is related. Individuals who state a higher inflation rate also state a higher unemployment rate.

Table 5: Contingency table of both variables' accuracy categories

	Underestimation Unemployment	Correct Estimation	Overestimation Unemployment	Total
Underestimation Inflation	78	133	25	236
	(0.05)	(0.08)	(0.02)	(0.15)
Correct Estimation	170	718	86	974
	(0.11)	(0.45)	(0.05)	(0.60)
Overestimation Inflation	58	213	132	403
	(0.04)	(0.13)	(0.08)	(0.25)
Total	306	1,064	243	1,613
	(0.19)	(0.65)	(0.15)	(1.00)

Including PhD students. Cell frequencies and sample joint distribution in brackets.

I repeat the multinomial logit regressions for inflation and unemployment with dummies for underestimation and overestimation of the other variable (the omitted category of correct estimation serves as reference). Tables 6 and 7 show that there is a highly significant relationship between the two variables. Participants who underestimate one variable (either inflation or unemployment) double the probability to underestimate the other variable as well. The effect is even stronger for overestimation: Participants who overestimate one variable almost quadruple the odds

of overestimating the other. Some of the odds ratios change in these regressions (in contrast to the ones without the dummy variables), but the main results survive.

Table 8 summarizes the findings. Contrary to previous findings, females only overestimate. Education plays a major role: the number of semesters in university lowers the probability to misperceive the two variables and the final school grade has similar effects. More frequent newspaper readers show the same tendency. Higher levels of Neuroticism and Openness are related with a higher probability to overestimate the unemployment rate. Adding dummies for misperceiving the other macro variable to the regressions shows that overstating (understating) inflation is associated with overstating (understating) unemployment and vice versa.

Table 6: Multinomial logit regression of inflation accuracy, including dummies for unemployment accuracy

Inflation	Underestimation (<1.5%)			Overestimation (>3%)		
	(1)	(2)	(3)	(4)	(5)	(6)
	Odds ratio	Coef		Odds ratio	Coef	
Underestimation						
Unemployment	2.137***	0.759***	(0.184)	0.963	-0.038	(0.198)
Overestimation						
Unemployment	1.370	0.315	(0.266)	3.723***	1.315***	(0.192)
Neuroticism	0.965	-0.036	(0.067)	0.984	-0.016	(0.063)
Extraversion	0.895*	-0.111*	(0.067)	1.009	0.009	(0.061)
Openness	0.918	-0.086	(0.068)	0.976	-0.024	(0.065)
Agreeableness	1.004	0.041	(0.079)	0.992	-0.008	(0.073)
Conscientiousness	1.116	0.110	(0.081)	0.961	-0.040	(0.069)
Female	1.308	0.269	(0.183)	2.219***	0.784***	(0.165)
Migration background	1.405	0.340	(0.207)	2.256***	0.812***	(0.175)
Parents' occupation	1.060	0.058	(0.170)	0.900	-0.105	(0.154)
# siblings	0.895	-0.111	(0.083)	0.952	-0.049	(0.060)
Share job	0.999	-0.001	(0.003)	1.000	0.000	(0.003)
Share savings	1.001	0.001	(0.004)	1.004	0.004	(0.004)
Final school grade[1]	1.001	0.001	(0.136)	1.418***	0.349***	(0.130)
Semester	0.962	-0.038	(0.030)	0.912***	-0.092***	(0.031)
Dummy engineering	3.627***	1.289***	(0.229)	1.841***	0.610***	(0.223)
Dummy medicine	2.589***	0.951***	(0.254)	1.916**	0.650**	(0.255)
Dummy humanities	2.697***	0.992***	(0.239)	3.083***	1.126***	(0.191)
Living with parents	1.225	0.203	(0.168)	1.257	0.228	(0.153)
Newspaper[2]	0.636*	-0.453*	(0.224)	0.716*	-0.333*	(0.196)
Job fear	1.085	0.081	(0.197)	0.928	-0.074	(0.171)
Constant		-1.846***	(0.745)		-2.285***	(0.688)
#				1,374		
Log Ps Likelihood				-1140.98		
Count R^2				0.647		
Adjusted Count R^2				0.126		

*Robust standard errors of coefficient in parentheses. Significance level: *** 1%, ** 5%, * 10%*

1 A higher value of Final school grade means a worse grade

2 A higher value of Newspaper implies more frequent newspaper reading

Table 7: Multinomial logit regression of unemployment accuracy, including dummies for inflation accuracy

Unemployment	Underestimation (<4.2%)			Overestimation (>10.5%)		
	(1)	(2)	(3)	(4)	(5)	(6)
	Odds ratio	Coef		Odds ratio	Coef	
Underestimation						
Inflation	2.161***	0.771***	(0.182)	1.392	0.331	(0.264)
Overestimation						
Inflation	0.952	-0.049	(0.195)	3.777***	1.329***	(0.187)
Neuroticism	1.049	0.048	(0.060)	1.182**	0.168**	(0.071)
Extraversion	1.062	0.060	(0.060)	0.996	-0.004	(0.073)
Openness	1.009	0.009	(0.064)	1.201**	0.183***	(0.073)
Agreeableness	0.976	-0.024	(0.075)	0.903	-0.102	(0.085)
Conscientiousness	1.010	0.010	(0.071)	1.110	0.104	(0.083)
Female	1.127	0.120	(0.164)	1.866***	0.623***	(0.196)
Migration background	1.124	0.112	(0.178)	0.51	-0.161	(0.206)
Parents' occupation	0.848	-0.165	(0.155)	0.778	-0.251	(0.181)
# siblings	0.984	-0.017	(0.059)	1.216***	0.195***	(0.064)
Share job	1.000	0.000	(0.003)	0.995	-0.005	(0.004)
Share savings	1.003	0.003	(0.004)	0.990**	-0.010**	(0.005)
Final school grade[1]	1.500***	0.405***	(0.135)	1.169	0.156	(0.144)
Semester	0.892***	-0.114***	(0.031)	0.887***	-0.120***	(0.036)
Dummy engineering	1.580**	0.458**	(0.211)	1.452	0.373	(0.274)
Dummy medicine	1.210	0.187	(0.232)	1.052	0.050	(0.281)
Dummy humanities	1.343	0.295	(0.204)	1.650**	0.500**	(0.219)
Living with parents	0.791	-0.234	(0.150)	1.053	0.052	(0.175)
Newspaper[2]	1.154	0.143	(0.192)	0.568**	-0.565**	(0.238)
Job fear	0.826	-0.191	(0.170)	1.016	0.016	(0.194)
Constant		-2.467***	(0.709)		-3.912***	(0.814)
#				1,384		
Log Ps Likelihood				-1096.78		
Count R^2				0.674		
Adjusted Count R^2				0.056		

*Robust standard errors of coefficient in parentheses. Significance level: *** 1%, ** 5%, * 10%*

1 A higher value of Final school grade means a worse grade

2 A higher value of Newspaper implies more frequent newspaper reading

Table 8: Summary of factors significantly influencing the misperception of both variables

	Underestimation	Overestimation
Inflation		Female (+)
		Migration Background (+)
		Final School Grade (+)
	Semester (−)	Semester (−)
	Newspaper (−)	Newspaper (−)
	[Underestimation Unemployment (+)]	[Overestimation Unemployment (+)]
Unemployment		Neuroticism (+)
		Openness (+)
		Female (+)
		Parents' Occupation (−)
		# Siblings (+)
	Final School Grade (+)	Final School Grade (+)
	Semester (−)	Semester (−)
		Share Savings (−)
		Newspaper (−)
	[Underestimation Inflation (+)]	[Overestimation Inflation (+)]

(+)/(−) describe whether the probability of an individual falling into the respective category gets higher/lower with an increase in the independent variable

6 CONCLUSION

I examine the determinants of perception of both inflation and unemployment rate together in the same survey and extend the literature by including the Big Five personality traits (BFI-S, Gerlitz and Schupp, 2005) in the analysis. My sample consists of students of different fields at Ruhr University Bochum. I include covariates into the analysis that account for already known biases and are tailored to the relatively homogeneous group of participants: gender, family background (migration background, parents' profession, the number of siblings), own economic status (share of savings' contribution to expenses, share of job's contribution to expenses), education (semesters, final school grade, choice of field) and others (living with parents, frequency of newspaper reading, fear of unemployment).

By applying a data-driven approach to classify over and underestimation of the two macroeconomic variables and by using multinomial logit regressions (while controlling for the other socioeconomic characteristics), I find in my sample that personality traits, namely Neuroticism and Openness, are related to overestimation of unemployment. My sample focuses on young people who only recently decided what field to study and who are about to enter the work force. Supposedly they do not have accumulated high savings until now, so they should not be concerned much about the danger of inflation that might reduce their wealth but rather care about future employment opportunities. Therefore the fact that students who worry more have significantly higher estimations of the unemployment rate is reasonable. Is there an interaction of personality with other characteristics such as age (or time until retirement)? This question can only be tested with a broader sample that has more variation in variables as age, education and income/wealth. Interaction of these variables with personality traits, especially Neuroticism, seems sensible.

Further on, I find that individuals who overestimate (underestimate) one variable also tend to overestimate (underestimate) the other variable (without offsetting the most independent covariates). Both inflation and unemployment constitute risks (in contrast to growth), and the fact that the perception of both variables is related points into the direction that both variables have a core that can be interpreted as a general economic risk (with different facets) to which economic agents apply heuristics (Galí and Gertler, 1999). This rule of thumb behaviour could explain that similar groups systematically over and underestimate the two variables. A survey that also asks for the perceived growth rate could examine whether a variable that has overall positive consequences for the population is perceived in a similar way as unemployment and inflation.

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APPENDIX

Table A1: Descriptive statistics of sample and population (source: rectors' office)

Level	Discipline	Freshmen/Advanced	N	Population	Females		Mean Age		Mean # Terms		Migration Background
					in Sample	in Population	in Sample	in Population	in Sample	in Population	
BSc	Engineering	All	294	4,542	0.253***	0.175	21.58***	22.7	3.64***	6.36	0.22
		Freshmen	(86)	1,326	0.291***	(0.136)	(20.52)	20.6	0	0	(0.14)
		Advanced	(208)	3,216	0.237	(0.191)	(22.03***)	23.5	4.74***	7.33	(0.26)
Undergraduate	Medicine	All	285	1,962	0.628	0.607	22.35***	25.2	2.21***	14.83	0.16
		Freshmen	(187)	296	0.615	(0.581)	(21.91)	21.8	0	0	(0.19)
		Advanced	(98)	1,666	0.653	(0.612)	(23.19***)	25.9	4.54***	15.25	(0.10)
BSc	Management & economics	All	569	1,924	0.457	0.423	21.80***	23.0	2.93***	5.09	0.31
		Freshmen	(303)	304	0.455	(0.480)	(20.63)	20.8	0	0	(0.29)
		Advanced	(266)	1,620	0.459	(0.412)	(23.12)	23.4	5.19	5.60	(0.33)
BA	Humanities	All	426	4,154	0.744**	0.701	21.58***	24.2	2.88	5.81	0.27
		Freshmen	(235)	773	0.702	(0.713)	(20.76***)	21.7	0	0	(0.28)
		Advanced	(191)	3,381	0.796***	(0.699)	(22.59***)	24.7	5.19	12.00	(0.26)
MSc	Management, Management&Econ, Econ		151	367	0.526	0.518	24.75	24.5	6.79		0.34
PhD/Postdoc	Management & economics		41	183	0.44	0.32	29.3***	32.7	11.1		0.29
Total			1,766		0.53		22.2		2.5		0.26

*Brackets indicate numbers for sub-groups. *, ** and *** indicate difference of sample from population at 10%, 5% and 1%.*

Table A2: Description of Personality Traits (from Mueller and Plug, 2006)

Personality trait, related with higher score, and antipode (in brackets)	Facet of Personality Trait and Correlated Adjective (in brackets)
Neuroticism (Emotional Stability)	Anxiety (tense) Angry hostility (irritable) Depression (not contented) Self-consciousness (shy) Impulsiveness (moody) Vulnerability (not self-confident)
Extraversion (Introversion)	Gregariousness (sociable) Assertiveness (forceful) Activity (energetic) Excitement-seeking (adventurous) Positive emotions (enthusiastic) Warmth (outgoing)
Openness (Closedness to Experience)	Ideas (curious) Fantasy (imaginative) Aesthetics (artistic) Actions (wide interest) Feelings (excitable) Values (unconventional)
Agreeableness (Antagonism)	Trust (forgiving) Straightforwardness (not demanding) Altruism (warm) Compliance (not stubborn) Modesty (not showing off) Tender-mindedness (sympathetic)
Conscientiousness (Lack of Direction)	Competence (efficient) Order (organized) Dutifulness (not careless) Achievement striving (thorough) Self-discipline (not lazy) Deliberation (not impulsive)

Table A3: Personality traits by field of study and gender

Field	Semesters	Gender	n	Neuroticism		Extraversion		Openness		Agreeableness		Conscientiousness	
				M	SD	M	SD	M	SD	M	SD	M	SD
Engineering	0	Male	64	3.86	1.23	4.77	1.42	4.48	1.14	4.99	1.03	4.88	1.03
		Female	33	4.51	1.44	4.42	1.58	4.53	1.35	5.15	1.40	5.11	1.31
		Total	97	4.08	1.34	4.65	1.48	4.50	1.21	5.05	1.17	4.96	1.13
	>0	Male	155	3.81	1.21	4.58	1.25	4.48	1.10	4.95	1.07	5.06	1.21
		Female	48	4.31	1.28	4.62	1.38	4.67	1.28	5.17	1.32	5.30	1.26
		Total	203	3.93	1.25	4.59	1.28	4.53	1.15	5.00	1.13	5.11	1.22
Medicine	0	Male	71	3.91	1.09	4.87	1.16	4.46	1.05	5.22	1.08	5.28	1.02
		Female	115	4.52	1.27	4.89	1.31	4.58	1.23	5.49	1.17	5.69	1.20
		Total	186	4.29	1.24	4.87	1.25	4.53	1.16	5.38	1.14	5.54	1.15
	>0	Male	34	4.22	1.04	4.79	0.95	4.68	0.90	4.78	.94	5.58	0.85
		Female	64	4.85	1.08	4.79	1.09	4.69	0.90	5.24	.96	5.67	0.78
		Total	98	4.63	1.10	4.79	1.04	4.69	0.89	5.09	.97	5.64	0.80
BSc M&E	0	Male	158	3.91	1.16	4.80	1.17	4.56	1.09	5.13	1.12	5.03	1.10
		Female	136	3.94	1.21	5.29	1.13	4.64	1.26	5.43	1.00	5.47	1.04
		Total	294	3.92	1.18	5.03	1.18	4.60	1.17	5.27	1.07	5.23	1.09
	>0	Male	140	3.56	1.12	5.07	1.28	4.36	1.16	5.04	1.01	4.98	1.25
		Female	120	4.30	1.14	5.03	1.27	4.91	1.24	5.39	.99	5.37	1.08
		Total	160	3.90	1.19	5.05	1.28	4.61	1.23	5.20	1.01	5.16	1.19
Humanities	0	Male	69	3.95	1.24	5.11	1.26	5.16	1.26	5.30	1.14	4.88	1.13
		Female	164	4.64	1.21	5.13	1.26	5.17	1.18	5.46	.95	5.43	1.04
		Total	233	4.44	1.25	5.13	1.26	5.17	1.20	5.41	1.01	5.27	1.09
	>0	Male	38	3.80	1.38	5.07	1.59	5.07	1.05	5.15	1.19	4.93	4.93
		Female	151	4.69	1.34	5.01	1.32	4.72	1.18	5.24	1.15	5.25	1.17
		Total	189	4.51	1.40	5.02	1.38	4.79	1.42	5.22	1.15	5.18	1.19
MSc M&E		Male	70	3.75	1.12	4.82	1.24	4.24	1.22	5.3	.92	5.36	1.07
		Female	73	4.20	1.19	5.00	1.11	4.62	1.10	5.44	0.85	5.43	1.18
		Total	143	3.98	1.17	4.91	1.17	4.43	1.17	5.37	.88	5.40	1.13
PhD/PostDoc Econ		Male	21	3.33	1.06	4.84	1.25	4.75	1.07	5.09	1.10	5.43	0.87
		Female	17	4.25	.98	5.25	1.22	4.45	1.35	5.22	1.07	5.55	1.20
		Total	38	3.75	1.11	5.03	1.24	4.61	1.19	5.15	1.08	5.48	1.02

Table A4: Sample means by category of inflation accuracy

Inflation Accuracy	Underestimation (<1.5%)		Correct estimation		Overestimation (>3%)	
	Mean	SE	Mean	SE	Mean	SE
Inflation estimate	0.934	0.023	2.276	0.014	9.172	0.575
Female	0.500	0.501	0.441	0.497	0.663	0.473
Migration background	0.219	0.414	0.216	0.412	0.368	0.483
Parents' occupation	0.620	0.486	0.643	0.479	0.556	0.497
# siblings	1.277	1.150	1.364	1.107	1.440	1.209
Share job	17.927	26.885	21.115	27.715	20.154	27.741
Share savings	9.905	19.629	8.534	18.445	8.703	20.382
Final school grade	2.126	0.663	2.192	0.622	2.273	0.638
Semester	2.017	2.348	2.959	3.291	1.883	2.599
Living with parents	0.599	0.491	0.509	0.500	0.594	0.492
Newspaper	0.529	0.387	0.607	0.377	0.488	0.369
Job fear	0.732	0.444	0.709	0.455	0.610	0.488
Neuroticism	4.181	1.217	4.034	1.257	4.335	1.237
Extraversion	4.752	1.292	4.952	1.234	5.043	1.281
Openness	4.554	1.168	4.622	1.183	4.803	1.268
Agreeableness	5.287	1.045	5.212	1.042	5.251	1.114
Conscientiousness	5.368	1.129	5.248	1.137	5.266	1.102
No. and share of students of field in category						
Engineering (N=282)	n=67	23.76%	n=152	53.09%	n=63	22.33%
Medicine (N=270)	n=60	22.22%	n=148	54.81%	n=62	22.69%
M&E[1] (N=688)	n=59	8.58%	n=500	72.67%	n=129	18.75%
Humanities (N=358)	n=56	15.64%	n=147	41.06%	n=155	43.30%
# (N=1,598)	n=242	15.14%	n=947	59.26%	n=409	25.59%

*Robust standard errors of coefficient in parentheses. Significance level: *** 1%, ** 5%, * 10%*

1 M&E students' estimations are corrected for the number of PhD students and postdocs as their estimation is per definition correct

Table A5: Sample means by category of unemployment accuracy

Unemployment Accuracy	Underestimation (<4.2%)		Correct estimation		Overestimation (>10.5%)	
	Mean	SE	Mean	SE	Mean	SE
Unemployment estimate	3.215	0.049	7.150	0.050	18.432	0.611
Female	0.494	0.501	0.465	0.499	0.709	0.455
Migration background	0.271	0.445	0.240	0.427	0.300	0.459
Parents' occupation	0.580	0.494	0.641	0.480	0.567	0.497
# siblings	1.373	0.995	1.310	1.039	1.603	1.597
Final school grade	2.295	0.672	2.168	0.620	2.235	0.658
Semester	2.057	2.777	2.822	3.186	1.822	2.347
Share job	19.984	26.361	21.069	28.004	17.718	28.027
Share savings	9.773	21.641	9.073	19.112	6.049	15.443
Living with parents	0.538	0.499	0.539	0.499	0.591	0.493
Newspaper	0.568	0.370	0.593	0.380	0.465	0.371
Job fear	0.668	0.472	0.715	0.452	0.604	0.490
Neuroticism	4.177	1.217	4.029	1.243	4.474	1.288
Extraversion	4.975	1.297	4.909	1.251	5.048	1.256
Openness	4.621	1.258	4.593	1.195	4.946	1.186
Agreeableness	5.238	1.117	5.222	1.037	5.263	1.116
Conscientiousness	5.235	1.144	5.259	1.151	5.328	1.084
No. and share of students of field in category						
Engineering (N=282)	n=64	22.70%	n=179	63.48%	n=39	13.83%
Medicine (N=276)	n=52	18.84%	n=183	66.30%	n=41	14.86%
M&E[1] (N=687)	n=126	18.34%	n=486	70.74%	n=75	10.92%
Humanities (N=367)	n=75	20.44%	n=202	55.04%	n=90	24.52%
# (N=1,612)	n=317	19.67%	n=1,050	65.14%	n=245	15.20%

*Robust standard errors of coefficient in parentheses. Significance level: *** 1%, ** 5%, * 10%*
1 M&E students' estimations are corrected for the number of PhD students and postdocs as their estimation is per definition correct