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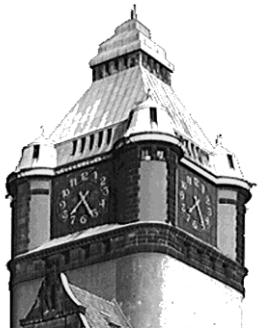

WHAT DO PEOPLE KNOW ABOUT THE ECONOMY?

A TEST OF MINIMAL ECONOMIC KNOWLEDGE IN GERMANY

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Abstract:

This research evaluates Minimal Economic Knowledge (MEK) in Germany—that is, basic knowledge of economic facts, concepts, and causal relationships needed for understanding and successfully participating in the economy. It is addressed to gain an understanding of the level of Minimal Economic Knowledge in the German public. To fulfill this goal we conducted three studies: The first study developed a scale for measuring MEK using a Delphi method approach. The resulting questionnaire comprises 24 questions in four economic domains: finance, labor economics, consumption, and state economics, testing for three kinds of knowledge within each domain—facts, concepts, and causal relationships. Our second study tested the MEK level in a representative sample of German adults (N=1,314), with a mean result of 59.4 (of 100) indicating a considerable lack of economic knowledge. It further analyses the influence of demographic drivers such as gender and age. A third, explorative study (N=243) determined additional drivers for MEK such as a person's origin, life experience, use of media, and social circumstance.

JEL-Classification: A29, C42, D83

Keywords: economic literacy, drivers, education, laypersons, minimal economic knowledge

WHAT DO PEOPLE KNOW ABOUT THE ECONOMY?

A TEST OF MINIMAL ECONOMIC KNOWLEDGE IN GERMANY

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October 2012

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Short Abstract. This research, comprised of three studies, evaluates Minimal Economic Knowledge (MEK) in Germany —that is, basic knowledge of economic facts, concepts, and causal relationships needed for understanding and successfully participating in the economy. The first study developed a scale for measuring MEK in four economic domains: finance, labor economics, consumption, and state economics, testing for three kinds of knowledge within each domain—facts, concepts, and causal relationships. Our second study tested the MEK level and influence of demographic drivers in German adults (*N*=1,314), indicating a considerable lack of economic knowledge. A third, explorative study determined additional drivers for MEK.

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WHAT DO PEOPLE KNOW ABOUT THE ECONOMY?

A TEST OF MINIMAL ECONOMIC KNOWLEDGE IN GERMANY

1. INTRODUCTION

Modern society is characterized by an economization of all aspects of life. Consequently, a basic understanding of economic issues is, increasingly, a key requirement for an educated citizenship (Jappelli 2010; Steiner 2001). Logic supports the view that the economic education of individuals is important—for the individuals themselves, for the society, and for the governments that regulate economic policies for those individuals. Measuring the degree of a population's minimal economic knowledge (MEK)—that is, basic knowledge of the economic facts, concepts, and causal relationships needed for understanding and successfully participating in the economy—is relevant in several aspects with regard to individuals, makers of public policy, and effective reform.

First, the necessity for effective measurement of the general economic knowledge develops, in part, from the need to recognize that an information deficit exists. Measurement will reveal the breadth of the problem, which has much greater impact than the personal difficulties of individuals who have insufficient understanding of fiscal matters. Though having a low level of economic knowledge does not prevent individual citizens from taking action as if they were economically literate (Steiner 2001), the lack of knowledge may, unfortunately, lead them to make unsound economic decisions (Lusardi/Mitchell 2011). Consequently, a problem that occurs at the individual level—the lack of economic knowledge—has the potential to escalate into a problem affecting the global economy. For this reason, particularly, it is extremely important that the public (i) be educated about basic economic principles, (ii) be aware of current economic developments, and (iii) be able to understand the economic ramifications of government policies or political platforms. It is equally important to

recognize the degree to which the public does—or does not—understand these matters, and this can only be accomplished through accurate assessment.

Second, although policymakers maintain an ideal of citizens as mature consumers (Federal Republic of Germany 2005; Reisch 2004), biases in laypersons' perceptions of policies are often due to inadequate economic knowledge (Enste/Haferkamp/Fetchenhauer 2009; Roos 2007). Because public opinion affects government policymaking (Hill/Hinton-Anderson 1995; Page/Shapiro 1983), however, it is important to increase the economic literacy of the population. For policymaking, when there is better understanding of causal relationships of the policies that improve individual and social welfare, or that are Pareto-efficient, those policies can gain greater acceptance within the populace (Huston 2010).

Third, against the background of the world economic crisis, a number of governments are addressing educational reforms to advance economic education of the public. In order to do so, the economic education of elementary, secondary, and university students is undergoing reform by the governments of such nations as Germany, Great Britain, and France, using the framework of the Bologna Process. Education in general, as well as economic education in particular, is thus clearly an issue of political concern. In order to determine the efficiency of educational measures, the ability to measure Minimal Economic Knowledge (MEK) is an important tool. It may also provide a basis for decisions affecting future educational development programs.

The present study addresses the important issue of fundamental economic education, and aims to develop an innovative scale for testing the degree to which adult citizens satisfy these criteria for MEK. We support our paper with three studies: Study I uses a Delphi method approach to develop a questionnaire for assessing economic knowledge at the individual level; Study II tests the status quo of the general population's MEK and the influence of demographical drivers; and Study III analyses further exploratory drivers of MEK.

The paper is divided into five sections. Section 2 discusses the current level of research on economic knowledge and introduces our hypotheses. Section 3 presents Study I, describing the development of the MEK questionnaire by using the Delphi method. Section 4 describes the empirical Studies II and III, and presents the results. The discussion and conclusion are elaborated in Section 5.

2. LITERATURE REVIEW AND HYPOTHESES

Knowledge is traditionally defined as 'justified true belief' (Nonaka 1994), and it is a 'critical resource that enables individuals […] to solve problems' (Evanschitzky et al. 2007: p. 272). Accordingly, economic knowledge encompasses all knowledge that enables economic problems to be solved (Steiner 2001). The problems that must be solved by economic agents range from everyday purchase decisions to complex financial investment decisions, and the ability of those persons to make better decisions is a result of economic learning—gained through experience and through education (Steiner 2001; van Witteloostuijn 1990). For our focus on minimal economic knowledge (MEK), we define the concept as basic knowledge of the economic facts, concepts, and causal relationships needed for understanding and participating in the economy. The understanding of these economic facts, concepts and causal relationships is likely to contribute to sound economic decision-making. If people do not know what is meant by conceptual economic terms on a linguistic level, they are unlikely to make good decisions. However, as we target the practical relevance of this focus on knowledge about the economy, we make a further distinction between knowledge about the economy and knowledge of economic ideas.

A clear understanding of MEK is conveyed by the relevant literature on economic knowledge and opinions. As a foundational issue, Walstad and Allgood (1999) demonstrate that the general public has little knowledge of basic economics, and that even college or university

graduates who had taken an economics class could not correctly answer many basic economics questions.

Knowledge and opinions on current issues in American economic politics were also examined in a representative study by Blinder and Krueger (2004). Their evaluation of nine knowledge questions revealed that the average responses were correct to a relatively high extent, but the standard deviation was relatively large (M=42.9%, SD=16.7). Participants' knowledge was dependent on their socio-economic status and level of political engagement. Among the demographic variables, an especially strong influence was seen for gender, race (white or black), age, and education.

Table 1 (available in the online materials) provides a comprehensive overview of the most citied studies that test economic knowledge and/or that develop a model of economic knowledge. The main finding from our review is that a substantial heterogeneity exists regarding measurements, models, and subjects. Taking into account the globalization of the economy, it is astonishing that studies testing economic knowledge are predominantly limited to the U.S.. To the best of our knowledge only a limited number of studies outside the US address economic knowledge (with notable exceptions such as Bucher-Koenen/Lusardi 2011; Enste et al. 2009; Jappelli 2010; Oehler 2012). However, the specific economic knowledge relevant for the US is not entirely generalizable to other countries, given the differences in (economic) systems of various countries, and other sociological factors—for example, general education level and cultural meaning of the economy. Further, those studies target other or much narrower aspects of economic knowledge, such as the sub-area of financial literacy, which is defined as the ability to understand financial tasks and to make informed and effective decisions through an understanding of finances (Chen/Volpe 1998). However, financial literacy is a very specific domain. In everyday life a broad range of *economic* literacy is needed, such as labor economics and consumption decisions. These differentials illustrate the need for a distinct questionnaire to measure *economic* knowledge in Germany.

Against this background, the aim of our study is to contribute to the economic literature by testing the level and drivers of economic knowledge in countries outside the US, specifically in Germany. We consider Germany a suitable subject of study for a number of reasons. First, Germany has a very large market economy, which means that economic issues hold great importance in national as well as international concerns. Second, with a 2011 gross domestic product of € 2,570.0 billion (Federal Statistical Office of Germany, 2012) it is the largest economy in the European Union and the fourth largest worldwide. Germany's role in the post-2008 economic rebuilding efforts remains very strong. Moreover, an additional reason for the value of observing economic knowledge in Germany is the restructuring of the higher education system that is taking place, which puts specific emphasis on preparation for employment in a global society, and for integrating students into a competitive international environment. In addition to Germany's participation in the Bologna Process, a strategic plan for reforming university systems across Europe, most sectors of the German educational system are implementing a progressive educational program (Jappelli 2010). Educational reforms such as streamlining the program at gymnasia (the secondary school system that prepares students for university) by reducing the required attendance from nine years to eight, and restructuring the university diploma into a bachelor's/master's degree, have already taken place. Germany is clearly sensitive to the importance of (economic) education in the complex and increasingly global concerns for the professions. A third reason for looking at German economic knowledge levels is that, taking into account the reality that cultural and sociological factors may play a decisive role in economic education (Taylor 1997), the strong cultural heterogeneity of Germany and, even more so, its history as a nation that was separated in the era when East Germany was under Communist control, makes it particularly interesting as a subject of study in this area.

Previous economic literature has not satisfactorily explained the development and drivers of economic knowledge in Germany. Our objective is to reduce this research gap by testing

several drivers at confirmatory and exploratory levels, which we demonstrate through two studies—Study II, testing several confirmatory drivers and elaborating on their strength of influence, and Study III, investigating a number of exploratory drivers and their strength of influence.

Confirmatory hypotheses of Study II

Gender. Due to different types of socialization that take place within the family, academics, and the economy, gender is assumed to have an influence on levels of economic knowledge. Accordingly, studies support the notion that economic understanding can be predicted by gender (Siegfried 1979). A reason for this situation may be that, socio-historically, men have a more deeply rooted background in business and economics; this historical pattern of heightened interest has resulted in generally better economic knowledge among males (Walstad/Soper 1989; Williams/Waldauer/Duggal 1992). Furthermore, women continue to face economic disadvantages, as in the example of the wage gap that can be observed in many professions (Weck-Hannemann 2000). This gender differential is borne out in previous studies that show women typically scoring slightly lower on economic tests and surveys (Bucher-Koenen/Lusardi 2011; Gleason/van Scyoc 1995; van Scyoc/Gleason 1993; Walstad/Soper 1988). We therefore test the hypothesis that *in Germany women have a lower MEK than men (H_1)*.

Education. A broad spectrum of knowledge acquired through years of learning provides people with an 'adaptive toolbox' (Gigerenzer 2001) for solving problems. People with more (general) education are likely to be more literate, and better able to understand economic issues; hence, they have greater economic knowledge (Caplan 2002; Christelis/Jappelli/Padula 2010; Jappelli 2010; Walstad/Larsen 1992). As well, research has confirmed that economic knowledge is related to education (Walstad, 1996). We therefore predict that *in Germany the more education a person has, the higher his or her MEK is (H_2)*.

Age. Though mental fitness increases with age, it reaches a peak level, after which it begins to decline (Baltes/Staudinger/Lindenberger 1999). In the typical life span, physical strength and brain tissue increase up to age 40, or even 50 (Horn 1968; Kaplan et al. 2000). With respect to (economic) knowledge, this suggests that the older a person is, the more that person knows, having over time accumulated personal experience with, and knowledge about, the economy (Gleason/van Scyoc 1995; Walstad 1997; Walstad/Rebeck 2002). At a certain age, however, cognitive functions start to decline (Nilsson et al. 2009). With this diminishing of somatic tissue (Kirkwood 1990) and mental productivity, it is reasonable to expect that economic knowledge also declines (Bucher-Koenen/Lusardi 2011). We therefore hypothesize that *in Germany there is an inverted U-shaped quadratic relationship between age and MEK (H_3)*.

Exploratory hypotheses of Study III

A further goal of our research was to use an explorative approach to identify potential drivers of minimal economic knowledge. As a basis, we developed several investigative hypotheses regarding the effect that a person's origin, life experience, use of media, and social circumstance has on MEK level.

Socialization. Experience is necessary for the evolution of knowledge (Nonaka 1994; Popper 1984). In societies where the members have fewer opportunities to engage in new experiences, less knowledge can be expected. For instance, those persons who lived in the former communist East Germany are less likely to have had opportunity to participate in a free market economy. This created a lack of experience with, and therefore knowledge of, economic principles (Howard 2003). In contrast, a relatively free economic system dominated in the former West Germany, giving those residents a stronger basis for understanding economic issues. The divergent experience with the economies of East and West Germany have resulted in a continuing structural inequality between the two regions of a unified Germany (Boltho/Carlin/Scaramozzino 1997). Even twenty years after a social market

economy was introduced to East Germany, the historical situation of the economy may continue to effect economic knowledge at the individual level (Bucher-Koenen/Lusardi 2011; Jappelli 2010). Therefore, our hypothesis is that *in Germany citizens who have been socialized in East Germany have a lower MEK than citizens who have been socialized in West Germany (H_4)*.

Size of hometown. In general, people living in the countryside have a lower level of education than people living in cities (Weber/Weber 2008) which is also likely to be true for Germany. A study by Walstad and Soper (1982) extends the relationship of location to that of economic knowledge, indicating that the size of the hometown has a positive effect on students' achievements in economics: The economics of scale in larger school districts may enable more economics course electives to be offered throughout a high school program, may permit the districts to hire better teachers, or allow for more specialized curriculum assistance' (Walstad/Soper 1982: p. 51). As people in the countryside tend to have less contact with economic issues, we hypothesize that *in Germany people who live in the countryside have a lower MEK than people who live in a city (H_5)*.

Personal relevance. People for whom the economy has increased personal relevance (such as having major investments, being unemployed, or being self-employed) should pay greater attention to pertinent economic information, and should gather more information about economic issues (Genova/Greenberg 1979; Williamson/Wearing 1996). We therefore expect that *in Germany people who recently had a personal relevance to engage with the economy have a higher MEK score than people who recently did not have a personal relevance to engage with the economy (H_6).*

Economics course. An economics course should improve understanding of the economy (Walstad 1996). It is logical to conclude that people with a higher level of economic education will have a higher MEK, because they have had more exposure to economic issues and should generally be better trained in economics (Gleason/van Scyoc 1995; Walstad 1997).

As well, if the economics course was an elective, participation would reflect personal interest in the economy or economic matters (Walstad/Soper 1982). Therefore, we expect that *in Germany people who took an economics course have a higher MEK score than people who did not (H_7).*

Television consumption. Although television can provide a vast amount of information (Gripsund 1999), people with high television consumption levels typically have a lower level of education (Hancox/Milne/Poulton 2005; Razel 2001). We expect that there is also a correlation between high television consumption and economic knowledge, and hypothesize that *in Germany the more television a person watches, the lower his or her MEK score will be (H_8).*

Yellow press and sensationalist television news. That a person makes an effort to be informed about the economy is important, but the level of economic knowledge will also depend upon the sources of information. We expect that the type of newspaper and television consumed will affect economic knowledge, and we hypothesize that *in Germany readers of the yellow press have a lower MEK score than readers of 'serious' newspapers (H_9)* and that *viewers of sensationalist television news have a lower MEK score than viewers of 'serious' news (H_{10}).*

Opinion. We assume that a person's degree of economic knowledge will affect what he or she thinks about current socio-political topics (Caplan 2002; Walstad 1997). With increased knowledge, people should be better equipped to understand the principles of the economic issues and policy making, and to form their opinions accordingly. We therefore assume that *in Germany higher versus lower levels of MEK will be associated with differences in socio-political opinion (H_{11}).*

3. STUDY I: SCALE DEVELOPMENT

Development of the MEK questionnaire

As mentioned, one aim of this article is to develop a valid scale for assessing the MEK of an individual in Germany. The basis for our scale development was the methodology used to develop a scale for minimal medical knowledge (MMK; Bachmann et al. 2007). Accordingly, we drew on the recommendations of economics and business professors who had been asked to suggest a range of economic questions. The objective was to produce a set of questions that represents different levels of economic knowledge, but that would be reasonable for people with only a high school degree and/or moderate interest in the economy to answer correctly.[1]

We classified the questions by specific economic domains and types of questions. Minimal economic knowledge covers four domains: finance, labor economics, consumption, and state economics. Within each domain, we distinguished three kinds of knowledge according to our definition: facts (e.g., 'How high is the unemployment rate in Germany right now?'), concepts (e.g., 'What is meant by the liquidity of an enterprise?'), and causal relationships (e.g., 'What effect does a jump in value of the US dollar have on the German economy?'). On that basis, a first questionnaire with 24 questions (4 domains * 3 kinds of questions * 2 questions per category) was constructed. All questions have five possible answers, only one of which is correct. The correct answers yield one point and the wrong answers yield zero points. All points are totaled and then multiplied by the factor 4.17 (=100/24) to standardize the results. The possible values of the MEK thus range between 0 and 100.

To validate the first version of the questionnaire, we obtained opinions from a committee of independent experts. Fourteen experts—colleagues drawn from business, economics, and finance—were invited to participate in a committee based on the Delphi method (Linstone/Turoff 1975). Seven of those experts—six professors and one assistant professor—

[1] Certainly, economic experts and persons with a university degree in economics have knowledge far superior to the minimal economic knowledge that we define here, and that we pose as essentially important. However, it was not the goal of our questionnaire to test expert knowledge, but rather the knowledge of laypersons.

agreed (expert names and affiliations are provided in additional File 2 in the online materials). In an iterative process, the experts then reviewed the questionnaire in a first round. We collected and compared their annotations and, based on their comments, modified the questionnaire.

To test the revised version of the MEK questionnaire, we ran a telephone pre-test, applying computer-assisted telephone interviews (CATIs) for a sample of 96 participants. First, the proportion of MEK was determined. The average MEK was *M*=58.5 (*SD*=14.2); values ranged from 28 – 92. If sample participants had difficulty understanding the wording of questions, we adjusted the language. Some questions had to be replaced entirely because they were either too easy or too difficult to be answered by laypersons.

In the next step, we sent the revised questionnaire to the committee of experts, with indications of the amendments, as well as the results of the first survey, the results of which had been used to construct the final version of the questionnaire, as described above. The experts considered this set of questions to be valid for assessing minimal economic knowledge.

We then tested the final questionnaire in a second survey, interviewing 54 participants through CATIs. For this survey the average MEK was *M*=67.6 (*SD*=15.0) and the range was 36 – 92. This difference of almost 10 points in mean MEK can be explained by the revised set of questions. All questions could be answered by between 10% and 90% of the interviewed participants. The second pre-test, using the final form of the questionnaire, effectively confirmed that the questions were neither too easy (>90%) nor too difficult (<10%).

Final MEK questionnaire

The terms “minimal”, “economic” as well as “knowledge” are highly subjective and it is perfectly clear that these terms are interpreted differently. For this reason we ran a Delphi study to discuss and communitize those terms. We further put highest effort in putting

together the questionnaire that fulfills the measurement of measuring this minimal economic knowledge.

On the basis of the Delphi study and the two telephone surveys, a final version of the questionnaire emerged (see additional File 1), with 24 knowledge questions covering four domains (finance, labor economics, consumption, and state economics) and three kinds of knowledge (facts, concepts, and causal relationships). We also established additional measures for Studies II and III in order to test the hypotheses.

Additional measures for Study II. Danaher and Crandall (2008) expanded the view proposed by Williams *et al*. (1992) that women typically score lower on economic tests, showing that girls who were asked to indicate their gender before being tested in mathematics had weaker scores than girls who did not indicate their gender; for females, apparently, designating gender activates negative stereotypes and thereby decreases performance (Schmader/Johns/Forbes 2008). In order to avoid stereotyping, we did not assess *gender* (‘0=female’, ‘1=male’) until the end of the questionnaire. Other demographic information integrated into the questionnaire included *age* (in years); *highest educational degree* (‘1=Haupt- oder Realschulabschluss’, comparable to general or intermediate secondary school, ‘2=Lehre oder Ausbildung’, comparable to an apprenticeship or vocational training, ‘3=Meister’, comparable to master craftsman, ‘4=Abitur’, comparable to A-Levels, ‘5=Studium’, equaling university or college studies, ‘6=Promotion’ equaling PhDs or professors). Additional items questioned *income* (net household income in €), *information behavior*, and *self-assessment* of economic knowledge. People were asked to rate their economic knowledge prior to the knowledge questions, and then were asked to rate it again after answering the knowledge questions, using a scale from ‘1=I belong to the worst 20% of the population’ to ‘5=I belong to the best 20% of the population.’ The purpose of asking participants to respond to this question twice was to capture the affective as well as the

cognitive aspects of self-assessment, and to avoid common-method bias (Podsakoff et al. 2003).

Additional measures for Study III. The hypotheses proposed above for Study III required measures for eight constructs. For *socialization* we asked people over 35 years (as they are the population who grew up with and/or lived in a separated Germany) in which state they attained their highest educational degree. We then classified these states in East and West Germany. The *size of a person's hometown* was one question in the survey, with the choices: '1=countryside (up to 5,000 inhabitants)', '2=small towns (5,001–20,000 inhabitants)', '3=mid-sized cities (20,001–100,000 inhabitants)', '4=large cities (more than 100,000 inhabitants)'. For *personal relevance*, we asked whether or not they had a reason for engaging with the economy in the prior six months; for those who answered affirmatively, we asked openly about the situation or reason. For *economics course* we asked if they have ever taken an economics course and if so, what kind of course. We further asked for the number of hours of *television consumption* per day. Respondents were classified as yellow press readers if they read the 'Bild-Zeitung' at least once a week but never the 'Handelsblatt' or the 'Frankfurter Allgemeine Zeitung'. 'Serious' newspaper readers were classified as such if they read the 'Handelsblatt' or the 'Frankfurter Allgemeine Zeitung' at least once a week but never the 'Bild-Zeitung'. Respectively, we classified people as sensationalist news viewers if they watched 'RTL aktuell' at least once a week but never 'heute/heute journal' or 'Tagesschau/Tagesthemen'. 'Serious' news viewers were classified as such if they watched 'heute/heute journal' or 'Tagesschau/Tagesthemen' at least once a week but never 'RTL aktuell'. We evaluated *socio-political opinions* by asking participants whether they were in agreement with the controversial issues of the high-speed rail station project 'Stuttgart 21', the extension of operating times for German nuclear power plants, and the theses on immigration, and especially on Muslim immigration to Germany, by Thilo Sarrazin, former Executive Board member of the Central Bank of Germany.

4. STUDIES II AND III: EMPIRICAL SURVEYS

Study II: Determination of MEK status quo

Data collection and characteristics of the sample

To measure the MEK status quo for the German population, we conducted a representative study in Germany between July and August of 2010. The data were collected using CATIs from a national random sample of 1,314 adults. Of the participants, 50.5% were female and 49.5% were male. The age range was from 18 to 84 years, with a mean of *M*=46.6 years (*SD*=15.9) and a median of 46 years (*N*=1,314). Different socioeconomic backgrounds were represented in this study, and the average monthly household income (for those persons surveyed who voluntarily reported their income), ranged from 0 to 10,000 €, with a mean of 2,253 € (*SD*=1,523 €) and a median of 2,000 € (*N*=580). Responses indicated that 30.6 % of the participants held a university degree (*N*=1,303). With regard to geographic location, 16.0% of the sample currently inhabits the region that formerly comprised the states of East Germany (*N*=210), 81.6% were from the region of former West German states (*N*=1,072), and 2.4% of the sample lived in the city-state of Berlin[2]. Basing our demographic evaluation on the current population survey of the Federal Statistical Office of Germany (2010), our overall sample proved representative of the broader German population with respect to age, gender, education, income, and geographical socialization. Analyses were performed using the IBM SPSS Statistics 18.0 software package.

The overall average MEK was *M*=59.4 (*SD*=14.5, *N*=1,314, *Range*=4.25 – 95.8, see Figure 1). Differences in the level of MEK were observable between the four domains and the three kinds of knowledge, with the lowest scores in the domain of labor economics, and particularly for the question concerning causal relationships (see Table 2). State-related

[2] Because Berlin was divided between East and West Germany during the German separation, this sub-sample is excluded in the analysis of the two former parts of Germany.

economics/concepts scored the highest rate of accuracy, and labor economics/causal relationships scored the lowest results.

Figure 1 - Distribution of MEK scores in a representative survey of Germans

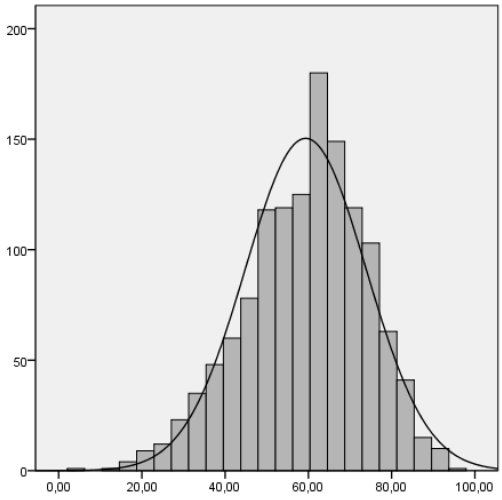

Table 2 – Correct answer rate by area and type of question

	Finance	Labor economics	Consumption	State-related economics	ø
Facts	75.5%	45.8 %	41.3 %	62.5 %	56.3 %
Concepts	72.5 %	44.6 %	81.9 %	82.3 %	70.3 %
Causal relationships	58.0 %	29.2 %	46.9 %	35.3 %	42.4 %
ø	68.7 %	39.9 %	56.7 %	60.0 %	

Income correlated with MEK *r*=.27 (*N*=580). The mean of the affective self-assessment was 3.2 (*SD*=0.9) and the mean of the cognitive self-assessment was 3.4 (*SD*=1.0), with a resulting average mean of 3.3 (SD=0.9). Notably, women expected their own knowledge to be lower (*M*=3.00, *SE*=0.04) than did men (*M*=3.53, *SE*=0.04). Results showed that 18.2% of the participants underestimated their economic knowledge, whereas 37.9% overestimated their economic knowledge. 43.9% of the participants could accurately predict the level of their

economic knowledge. Regressing the individuals' self-assessments on their level of MEK resulted in an adjusted R^2 of 6.3% (β=.25[3]), which indicates that the persons in this study could rate their own economic knowledge to only a limited degree.

We also asked participants to indicate the sources of their economic information. Table 3 lists the percentage of use for the ten most frequently accessed sources. General news in print, television, and radio were the most popular sources of information, followed by specific radio broadcasts, television programs, and print media (newspapers or magazines) (Blinder/Krueger 2004). On average, each participant reported three sources of information. The correlation between the number of sources a participant used and her or his MEK value was positive but small, r=.09).

Table 3 – Sources of information about the economy

Source	%
General news (print, TV, radio)	66.9
Specific radio and television programs with an economic focus	59.5
Specific print media with an economic focus	54.2
Specific online media with an economic focus	35.9
Elementary or secondary school	31.7
Job	30.2
College and university studies/apprenticeship	28.9
Discussions with friends or colleagues	28.9
On-the-job training (e.g., internal continuing education)	11.1
Training in spare time (e.g., adult education, lectures)	9.8

We used a multiple regression analysis to study the linear joint contribution of the independent variables on minimal economic knowledge. We set up a regression analysis in order to examine the influence of gender, age, age-squared, highest educational degree,

[3] Our large sample size in Study II (N=1,314) obviously produces small p-values in the regression analysis and the t-test-comparisons. To make the article simple and readable, unless noted otherwise, all p-values are p <.001 when we report an effect (except for Table 4). All others will explicitly indicate that there is no effect (for a discussion on the usage of statistical significance please refer to Krämer 2011; Krämer/Gigerenzer 2005).

income, and region, which enabled us to estimate the individual influence of the drivers on MEK. A regression analysis on these three drivers led to the following regression equation:

Regression 1: $MEK=\beta_0 + \beta_1 \text{ GENDER} + \beta_2 \text{ EDUCATION} + \beta_3 \text{ AGE} + \square$.

Regression 2: $MEK=\beta_0 + \beta_1 \text{ GENDER} + \beta_2 \text{ EDUCATION} + \beta_3 \text{ AGE} + \beta_4 \text{ AGE}^2 + \square$.

The first model could explain an adjusted R^2 of 19.1% of the variance of MEK (*df*=1298) and for the second regression an adjusted R^2 of 20.2% (*F* change=18.9), thereby indicating that the inclusion of a quadratic term of age improved our model.

Women yielded an MEK mean of 55.6 (*SE*=0.55, *N*=664), and men a mean of 63.2 (*SE*=0.55, *N*=650). Hypothesis H_1 predicts that there is a *gender* effect on MEK. Indeed, the standardized estimates show that male participants have higher MEK than female participants (Regr. 1: β_1=.20; Regr. 2: β_1=.22), so H_1 is supported.

On average, people with a college or university degree scored ten points higher (*M*=66.3, *SE*=.59, *N*=399) than people without a degree (*M*=56.3, *SE*=0.48, *N*=904). Hypothesis H_2 predicts that *education* has a positive effect on MEK, and the results provide support for this as well (Regr. 1: β_2=.34; Regr. 2: β_2=.34).

Age followed an inverted U-shaped quadratic function first, with an increase peaking at an age of about 60 years. The average MEK for those in the 'young' age category (below 46 years—as determined by a median split) was 57.9 (*SE*=0.56, *N*=669), while the average in the 'old' age category (46 years or older) was 60.8 (*SE*=0.57, *N*=645). Hypothesis H_3, which proposes an inverted U-shaped quadratic relationship between age and MEK, is supported by the evidence that the parameter estimate for age-squared is negative (linear effect in Regr. 1: β_3=.13 and Regr. 2: β_3=.76; quadratic effect in Regr. 2: β_4=-.63). The strongest driver of MEK was shown to be education (β_3=.34), with gender the next strongest driver (β_1=.22).

Study III: Exploring drivers of MEK

In order to test the possible drivers of MEK, we asked further questions of a subsample of Study II participants. This sample for Study III comprised 245 German citizens, of whom

49.8% were female and 50.2% were male. Mean age was 49.9 years (*SD*=15.9, *N*=245). The average monthly household income, after taxes, was 1,976 € (*SD*=1,559 €, *N*=81). In this sample, 20.8% had a university degree (*N*=243).

The MEK values in Study III ranged from 12.5 to 95.8 points. The average was 62.3 (*SD*=14.1, *N*=245), which is higher than the average MEK value of *M*=59.4 that we found in Study II. Using the results of Study III, we aim to show the potential influence of exploratory drivers on MEK.

People who were *socialized* in former East Germany (*M*=60.8, *SD*=15.1, *N*=31) reached an MEK of, on average, five points lower than people who were socialized in West Germany (*M*=65.80, *SD*=14.14, *N*=189, p=.119). Hypothesis H_4 can therefore be accepted.

Countryside inhabitants had a mean MEK of 54.8 (*SD*=11.3, *N*=19), whereas inhabitants of small towns had a mean MEK of 67.6 (*SD*=14.0, *N*=48). Inhabitants of mid-sized cities had a mean MEK of 64.4 (*SD*=14.1, *N*=107), and those of large cities evidenced a mean of 61.2 (*SD*=12.2, *N*=63). Hypothesis H_5 can therefore be accepted.

The average MEK of people who had a *personal relevance* to engage with the economy was 65.6 (*SE*=1.73, *N*=56) versus 61.3 (*SE*=1.03, *N*=187) for people who did not have a major personal relevance (*p*=.043). Respondents listed the following reasons for dealing with the economy: investment/property management (35.3%), profession (35.3%), discussions (11.8%), education (7.9%), family (3.9%), and others (5.8%). Hypothesis H_6 can therefore be accepted as well.

People who took an *economics course* scored exactly the same MEK of 63.6 (*SE*=1.78, *N*=67) as people who did not (*SE*=1.03, *N*=170). On the basis of these results, therefore, Hypothesis H_7 cannot be accepted.

Watching a significant amount of *television* decreased participants' MEK, as was proposed in Hypothesis H_9: For every hour per day a person consumed television, his or her MEK dropped by 1.5 points (*p*=.035).

Viewers of sensationalist news had an average MEK of 54.5 (*SE*=2.66, *N*=29). In contrast, the average MEK of 'serious' news viewers was almost ten points higher, *M*=63.7 (*SE*=1.34, *N*=103, *p*=.002). Similarly, *readers of the yellow press* reached an average MEK score of 56.9 (*SE*=2.93, *N*=31) and 'serious' newspaper readers had an average score of 67.0 (*SE*=1.96, *N*=29) (*p*=.006). Hypotheses H_9 and H_{10} can therefore be substantiated by the results.

The effect of economic knowledge on *socio-political opinions* differed according to the issues. We found an effect of MEK on agreement with 'Stuttgart 21' (proponents: *M*=65.9, *SE*=1.87, *N*=38; opponents: *M*=59.6, *SE*=1.36, *N*=122, *p*=.018). For agreement with extending the operating times of nuclear power plants, the mean MEK of the proponents was 63.6 (*SE*=2.31, *N*=45) and that of the opponents was 58.1 (*SE*=2.11, *N*=48) (*p*=.080). For agreement with Thilo Sarrazin's immigration theses, we found no effect of MEK (proponents: *M*=62.4, *SE*=1.48, *N*=90; opponents: *M*=62.0, *SE*=1.62, *N*=71). Hypothesis H_{11} can therefore be only partially accepted.

5. GENERAL DISCUSSION AND CONCLUSIONS

Although research acknowledges the importance of economic knowledge in the general population, little is known about the extent and drivers of such knowledge outside the US. The studies that comprise our project address the research gap by conceptualizing and testing minimal economic knowledge in Germany. As a result of our *Study I*, applying the Delphi method and calling on a committee of experts, we were able to create a questionnaire for assessing minimal economic knowledge of individuals in Germany. To test the status quo of the German population using the developed questionnaire, we conducted an empirical *Study II* with 1,314 participants. We found a severe knowledge deficiency of economic facts, concepts, and causal relationships in the population. Only a weak relationship could be found between *self-assessment* and the level of MEK, which is in line with previous studies

(Walstad 1997; Walstad/Larsen 1992). Participants who ranked their economic knowledge as good had, in general, higher scores than those who rated it as poor. However, as less than half of the sample correctly assessed their economic knowledge, the question of how to improve self-evaluation of knowledge arises.

The confirmatory drivers (being male, having a higher educational level, being older) made a positive contribution to economic knowledge. We found a *gender* effect, revealing that women had less economic knowledge than men. However, the magnitude of the difference is nevertheless surprising, given that women participate in the economy today much more than in past decades (Goldin 1994). When results from time series are available in future research, it will be very useful to observe whether this knowledge gap diminishes. We find first evidence in our data that this huge gap between men and women declines: Male participants aged 60 years and older had a mean of 65.4 (SE=0.99, *N*=190), and females in this age group had a mean of 56.1 (SE=1.3, *N*=121). We therefore find a gender difference of ten points for participants older than 60 years. This substantial difference decreases to less than three points for the young: Male participants aged thirty years and younger had a mean of 57.3 (SD=1.27, *N*=134), and females in this age group had a mean of 54.8 (SD=14.46, *N*=114, *p*=.018). A further consideration is that Ferber *et al*. (1983) and Lumsden and Scott (1987) suggest that the observed gender differences in economic tests may, in fact, be due to the multiple-choice format of the questionnaires used, noting that women tend to perform better on essay exams than men. Therefore, the differences in the gender results of the MEK questionnaire may also be due to the test format that we chose.

Access to *education* is a critical aspect in strengthening levels of MEK. People with a college or university degree demonstrated levels of MEK ten points above the average score. As is clearly observable from the regression analysis, and confirming indications from previous studies (Gleason/van Scyoc 1995; Walstad/Larsen 1992), education is undoubtedly the

strongest driver of MEK. From the standpoint that the general lack of economic knowledge must be overcome in order to develop a sustainable society (Stigler 1970), the education system is an ideal platform for such an effort.

Another driver of MEK is *age*, which in our results follows an inverted U-shaped function, demonstrating that economic knowledge increases up to a certain age, and then begins to decrease. In line with prior research (Bucher-Koenen/Lusardi 2011; Nilsson et al. 2009), a decrease in knowledge can be observed after the age of sixty years, when people become more generally forgetful. Our results also closely align with the studies of Christelis *et al.* (2010) and Dohmen *et al*. (2010), who show a positive relationship between cognitive abilities and economic decision making. Economic education should start at an early age, so that a lack of knowledge and understanding does not persist throughout a lifetime. It is important to consider age when analyzing a person's economic decisions, as the knowledge on which the decision making is based may already be declining. Economic decision making for the elderly may, therefore, necessitate a different kind of counseling than would be appropriate for younger people.

In *Study III* we posed several additional questions concerning possible drivers of MEK to a sub-sample of Study II participants. An area of inquiry related to their geographical influence— the settings in which participants have or currently do live, and the places where they have learned whatever they know of economics. People *socialized* in the former East German states had lower MEK values than people from the former West German states. The differences in both the educational programs and in the economic environments of the divided East and West Germany could explain the differences in MEK. Moreover, the knowledge of the people socialized in the former East Germany may continue to be affected by inferior economic conditions—noting that unemployment rates are higher and wages are lower in that region, still, than they are in the former West Germany (Lechner/Miquel/Wunsch 2007; Uhlig

2006). Although this effect is relatively weak, if regional conditions are to improve for the people of the former East German states, it will be essential to increase their economic knowledge.

Our analysis also considered four location sub-groups: countryside, small city, mid-size city, and large city. Of all sub-groups, the population in the countryside had the lowest MEK scores. A reason for this could be that about 45 – 49% of high school graduates from mid-sized or large cities had an economic education, compared to only 39% of those living in small towns or the countryside (Walstad 1997). Inhabitants of small towns had higher MEK values than those living in the countryside, in mid-sized cities, or even in large cities. Surprisingly, however, the MEK did not linearly increase with the *size of the hometown*. Walstad and Soper (1989) conjecture that the lower levels of MEK found in large cities (as compared to the higher levels of MEK for countryside inhabitants) may be the result of an economic education program that often faces greater disruption in the classroom, and a higher incidence of students from lower socioeconomic backgrounds, both leading to unsatisfactory outcomes.

Our results concerning the value of *economics courses* for MEK proficiency indicate that the existing training formats in economics (such as school or education center courses) do not function effectively, inasmuch as those students who took an economics course—and hence should have a better understanding of economic issues—did not achieve a higher MEK score. In view of this, the development of innovative and successful teaching formats for transferring economic knowledge deserves special attention (Becker/Greene/Rosen 1990; Hanushek 2005).

Given that people with a current reason to inform themselves about the economy evidenced higher MEK scores, it is also important to demonstrate the *personal relevance* of economic knowledge to the general public. The rationale behind this observation is that people will put

more effort into accumulating information about the economy if they enjoy learning about it and if it has personal meaning for them (Schiefele/Schreyer 1994; Williamson/Wearing 1996). Prior studies have found that personal interest has a strong influence on knowledge (Genova/Greenberg 1979; Tobias 1994). Therefore, efforts to develop strategies for raising public awareness of economic information should incorporate evidence that economic knowledge does have important personal relevance.

The *amount of television consumption* presented itself as a driver to alter economic knowledge. Generally, the more television a person watched, the less economic knowledge she or he possessed. However, the more critical issue is the very strong effect on MEK scores that results from the *source of information*—the type of information that is conveyed. A difference of about ten points was observed between the higher MEK scores that resulted from 'serious' information sources, and the lower levels resulting from the sensationalist sources (for both television and newspapers). Clearly, this outcome confirms the logical assessment of sensationalist information sources as less useful mechanisms for conveying quality economic information. However, almost all such sources are unambiguously formats that aim to entertain, not to provide economic knowledge, so are not to be faulted for the lower quality of that information. Nevertheless, one could argue that people with a low level of MEK do not watch or read 'serious' sources because they are intellectually less able to understand them, and that those serious formats, as well, are not positioned to provide a better economic education for the wider audience. The key is to cue the audiences of the sensationalist sources to understand the level of information they are receiving. A strategic plan to advance MEK levels across the broader society would recognize the value of encouraging those persons who enjoy the sensationalist information sources to access other, more educational sources in order to develop a better understanding of economic issues.

Moreover, there is potential opportunity to use the successful format of the sensational sources to develop similar mechanisms that convey higher quality economic knowledge.

Our findings provide new evidence for the critical discussion of producing an economically literate population. Ignorance of economic issues seen in many segments of the population may be due to an inability to understand the basic vocabulary and principles of the economy—matters encountered in everyday events through news organizations, politicians, and even bank customer advisors (Blendon et al. 1997). Even when there is an understanding of the importance of economic matters, the likelihood is strong that many persons do not engage with these issues simply because they do not understand the terminology. To overcome difficulties in comprehension, the economic news, the governmental or business policies, and financial decisions to make on an individual level must be transparent, and must be communicated in a way that is accessible for all segments of the population.

As is the nature of research, the present study has limitations. First, in the participant study we did not offer incentives for accuracy. However, on the basis on the study by Kenning at el. (2011), who test the influence of incentives on the accuracy of price knowledge questions, we doubt that incentives would have improved the accuracy of responses. We realize that, as a first study, the unintended effects of the survey design, the brevity of the survey, and the limited range of questions cannot be excluded from consideration when interpreting the results. Further development of the topic and of additional questions or questionnaires to assess MEK is therefore needed.

Our goal was to construct a test that can be applied in a short time, which prompted us to limit the questionnaire to 24 knowledge questions that were chosen to serve as a scale for demonstrating understanding of economic facts, concepts, and causal relationships. Though the questionnaire was designed so that all participants should have been able to reach MEK scores close to 100, the average MEK was only 59.4, indicating the general public's severe

lack of economic knowledge. Even in this limited sampling, the results demonstrate a prevalence of economic illiteracy in a representative population outside the US. Further, as the number of questions that could have been asked in this context is unlimited, we are aware that another set of experts would probably have come to a different set of MEK questions. Therefore, we are treating the questions as selected–but not exclusive–proxies for measuring MEK. Even with recognition of those limitations, however, implications deduced from our results emphasize the need for new forms of economic education, improved communication of economic issues, and cultivation of economically mature citizens.

Improving the economic maturity of the population should be at the core of efforts to establish an economically sustainable society, as a step toward preventing future financial crises. Only those who have a minimal economic knowledge can act in an informed way, so the lack of economic understanding poses considerable concerns not only for Germany, but for all nations. There have been first studies in consumer research linking economic literacy to energy consumption and savings (Attaria et al. 2010) or to consumer behavior (Adkins/Ozanne 2005; Viswanathan/Hastak/Gau 2009; Viswanathan/Rosa/Harris 2005), but it is essential to link economic literacy to economic decision making as well. We hope that the indicators and results presented here will make a useful contribution to this important line of research.

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Appendix

Appendix 1 - Translated version of the MEK questionnaire (correct answers in bold)

No.	Question	Answers (correct answer in bold)	%
1	The price reduction on a product is called ...	a) Cash back	9.6
		b) Discount	89.1
		c) Rate	0.5
		d) Inflation	0.5
		e) Bonus	0.3
2	How high do you think the average monthly net income of a household in Germany is?	a) 501-1,000 €	3.3
		b) 1,001-1,500 €	30.8
		c) 1,501-2,000 €	49.4
		d) 2,001-2,500 €	13.6
		e) 2,501-3,000 €	2.9
3	Which type of investment has the lowest risk of loss?	a) Single stock	5.4
		b) Mutual stock fund	16.9
		c) Certificates	5.4
		d) Government bonds from Germany	69.0
		e) Corporate bonds	3.2
4	Which asset is generally the least affected by inflation?	a) Shares	2.8
		b) Government bonds	9.6
		c) Saving books	7.4
		d) Real estate	72.1
		e) Cash	8.0
5	You invest 100 € at an interest rate of 5%. How much money do you get after a year if you let the money simply 'work'? Interest on interest is not included.	a) 100.05 €	1.0
		b) 100.50 €	3.1
		c) 105.00 €	89.6
		d) 105.50 €	1.0
		e) 150.00 €	5.3
6	What do you call the knowledge that people gain by training, experience, and further education?	a) Knowledge capital	25.3
		b) Corporate capital	1.0
		c) Human capital	15.0
		d) Educational capital	57.3
		e) Working capital	1.5
7	What is meant by the liquidity of an enterprise?	**a) The solvency of a company**	72.9
		b) The bankruptcy of a company	2.5
		c) The liquid capital of a company	21.3
		d) The creditworthiness of a company	2.7
		e) The expenditure of a company	0.7
8	How high is the unemployment rate in Germany right now?	a) 2-5%	16.6
		b) 6-9%	56.0
		c) 10-13%	18.9
		d) 14-17%	3.8
		e) 18-21%	4.7

9	Which country had the highest gross domestic product per head in 2009?	**a) Luxembourg**	35.7
		b) Switzerland	40.7
		c) France	1.2
		d) Germany	13.2
		e) USA	9.3
10	What is outsourcing?	a) Sale of an entire department	11.2
		b) Transfer of individual business functions to third party companies	74.2
		c) Establishment of a subsidiary	6.1
		d) Buying up other companies	3.7
		e) Expansion of the company	4.8
11	You are 3000 € in debt. You pay a nominal interest rate of 12% per year. Each month you pay off 30 €. When will you have paid off the debt?	a) in less than five years	14.6
		b) in 5-10 years	30.6
		c) in 11-15 years	18.1
		d) in 16-20 years	10.1
		d) never	26.5
12	How high is the VAT tax on food?	a) 5%	1.3
		b) 7%	80.0
		c) 13%	2.7
		d) 17%	1.8
		e) 19%	14.2
13	You want to quit your job after two years. When in principle does termination of employment go into effect?	a) As soon as notice is given	4.5
		b) Within the statutory notice period of two weeks after notice is given	11.3
		c) Within the statutory notice period of four weeks after notice is given	16.6
		d) Four weeks from the date of notice allowed by the contract (e.g., **end of month**)	58.4
		e) Last day of the following month (e.g., the 31th)	9.1
14	What is a franchise business?	a) A company that buys products abroad which are then sold in Germany	7.0
		b) A legally independent company that pays for use of **the business model of another company**	74.7
		c) A branch of a corporate chain	9.5
		d) A company that transfers the products and services of other companies	5.8
		e) A company that sells its products exclusively in Internet markets	3.0

15	In which of these European Union countries is the euro not the official currency?	**a) Denmark**	56.2
		b) Luxembourg	4.9
		c) Monaco	18.1
		d) The Netherlands	1.1
		e) Slovakia	19.7
16	How high are the social security contributions for workers of so-called € 400 Jobs?	**a) 0%**	73.5
		b)1-5%	13.6
		c) 6-10%	6.7
		d) 11-15%	3.4
		e) 16-20%	2.8
17	What are subsidies?	a) Work support programs	7.4
		b) Research expenses	1.5
		c) Compulsory fees	1.1
		d) Government grants	87.2
		e) Performance bonuses	2.8
18	If you have purchased a product in a store as a consumer and it no longer suits you, how long do you in general have the right to return it?	**a) There is no right to return merchandise.**	29.6
		b) Seven days	6.7
		c) Fourteen days	53.4
		d) Twenty-one days	1.2
		e) One month	9.1
19	What effect does a jump in value of the US dollar have on the German economy?	a) Cheapening of business travel to the USA	6.1
		b) Decrease in commodity prices for German companies	10.6
		c) Decrease in the export of German goods to the U.S.	27.1
		d) Increase of oil prices in Germany	53.8
		e) No influence of the U.S. dollar rate on the German economy	2.5
20	In the supermarket, you notice that the countries of origin of fruits and vegetables are not always specified. Is country-of-origin labeling obligatory or not?	**a) It is generally obligatory**	64.3
		b) It is generally not obligatory	12.5
		c) It is not mandatory if the product originates in the EU	15.9
		d) It is not mandatory if the product is produced organically	0.7
		e) It is not mandatory if it is a local product	6.6
21	What do you call the economic system of the Federal Republic of Germany?	a) Central market economy	13.9
		b) Market-oriented planned economy	3.2
		c) Organized capitalism	1.6
		d) Social market economy	77.4
		e) Regulated market economy	3.9

22	In your opinion, what percentage of the total income tax revenues in Germany is paid by the highest income group (i.e., the 10% with the highest incomes)?	a) 10-19% b) 20-19% c) 30-39% d) 40-49% **e) 50-60%**	34.5 23.7 15.5 9.3 16.9
23	Who is the current Federal Minister of Economics and Technology?	a) Karl-Theodor zu Guttenberg b) Roland Koch **c) Rainer Bruederle** d) Philipp Roesler e) Michael Glos	10.4 10.3 68.8 4.2 6.2
24	What is generally higher: sales or profit?	**a) Sales** b) Profit c) Sales volume and profit describe the same thing, so they are always equal d) The profit is always 75% of sales e) It depends on the tax rate of the company	81.9 7.6 1.5 0.8 8.2

Appendix 2- Overview of studies of economic knowledge and opinion (in chronological order)

Author (year)	Name of Study/test *(country)*	Theoretical Background	Problem	Method	Postulated Model	Main Results
1 Bach and Saunders (1965)	Test of Economic Understanding *(USA)*		Comparison of the level of economic understanding among different levels of management personnel with high school seniors and high school teachers	Survey	No postulated model	Positive relation between level of management and the level of economic knowledge.
2 Welsh and Fels (1969)	Test of Understanding in College Eco-nomics (TUCE) *(USA)*		Development of a new test of economic knowledge	Survey	No postulated model	Test is not perfect but an improvement from previous tests.
3 Siegfried (1979)		Production function for economics education	Identification of effective teaching methods for economics	Literature analysis	No postulated model	Different students learn economics in different ways. The best teaching strategy provides alternative learning methods directed toward the different needs of different students.
4 Saunders (1980)	*(USA)*		To test the lasting effects of introductory economic courses (longitudinal study)	Survey	No postulated model	The graduates retained their economic knowledge after seven years.
5 Walstad and Soper (1982)	Test of Economic Literacy (TEL), Survey on Economic Attitudes (Attitudes towards economics as a subject(ATE), Economic attitude sophisticati on (EAS), Achieveme nt in Eco-nomics (ACH),		Development of a model of economics learning in high school students	Survey	ACH/ATE/EAS=$\beta_0 + \beta_1$ IQ + β_2 gender, + β_3 junior/senior + β_4 TEL A/TEL B + β_5 taken economic course + β_6 award winning teacher + β_7 developmental economic education project-school + β_8 size + β_9 suburban district + β_{10} urban district + β_{11} northeastern region + β_{12} southern region	The model reflects a reliable and valid measure of economic knowledge for high school students

		(USA)				+ β_{13} western region + ϵ	
6	Becker (1983)		Production function	Suggestions for the development of a theoretical model of economic education	Model Development	$G_e=(A_e)^a (T_e)^t$ G_e=economic knowledge, T_e=amount of time allocated to the economic course, A_e=pre-course aptitude or knowledge measures for economics a=technology coefficient	Simplistic model, gives rise to a testable reduced form of the demand for an economic education.
7	Marlin (1991)	Test of Economic Literacy (TEL) *(USA)*		Comparison of high school students and bank executives	Survey	No model postulated	The bank executives had a better economic understanding than the high school students.
8	Walstad and Larsen (1992)	National Survey of American Economic Literacy *(USA)*			Survey	No model postulated	Not much difference in economic knowledge between high school students and the general population.
9	Gleason and van Scyoc (1995)	Test of Economic Literacy *(USA)*		Adults	Survey	SCORE=β_0 + β_1 gender + β_2 high school economics only + β_3 college economics + β_4 age + β_5 some college + β_6 college graduate + β_7 attended graduate school + β_8 low income + β_9 middle income + β_{10} high income + β_{11} very high income	Education, gender, and economic courses had a significant effect on one's knowledge
10	William-son and Wearing (1996)	*(Australia)*	The analysis of cognitive maps (Axelrod 1976))	Description of lay people's cognitive models of the economy	Interviews	Gender, age, linkage, interest, knowledge, confidence (correlations)	Every respondent had a unique model of the economy. However some broader areas of agreement could be identified.
11	Blendon *et al.* (1997)	Survey of Americans and Economists on the Economy *(USA)*		Bridging the gap between the public's and economists' view of the economy	Survey	No model postulated	The results of this study make it clear that economists need to do a better job educating the public about economic matters and spend more time communicating the implications of their research to the public.

12 Walstad (1997)	National Survey of American Economic Literacy *(USA)*		The effect of economic knowledge on public opinion of economic laypersons	Survey	EKNOW=β_0 + β_1 age + β_2 sex + β_3 race + β_4 high school economics only + β_5 college economics + β_6 post graduate education + β_7 4 year college education + β_8 2 year college education + β_9 high school education + β_{10} less than high school education + β_{11} upper income + β_{12} upper middle income + β_{13} middle income + β_{14} republican party identification + β_{15} independent public identification	Economic knowledge is affected by many factors. Economic knowledge has a direct and significant effect on public opinion about economic issues.
13 Walstad and Allgood (1999)	National Survey of American Economic Literacy, Major Field Test in Business II (MFTB) *(USA)*		Level of economic knowledge of college seniors		No model postulated	College students who had taken an economics course answered 62% of the questions correctly, those who did not 48%.
14 Caplan (2001)	Uses data from the 'Survey of Americans and Economists on the Economy' *(USA)*		Investigation what factors makes people think like economists	Survey	Education, maleness, recent and expected income growth, job security, partisan affiliation, ideology, economist/non-economist	Relevant factors: education, maleness, recent and expected income growth, job security, economist/non-economist.
15 Caplan (2002)	Uses data from the 'Survey of Americans and Economists on the Economy' *(USA)*	The rational expectations model of belief formation	Investigation of biased beliefs about the economy of economists and laypeople	Survey	No model postulated	Laypeople and experts systematically disagree in their views on the economy; rejection of the self-serving-bias-hypothesis.

16	Blinder and Krueger (2004)	*(USA)*		Detection of the determinants of public opinion among which is knowledge		Knowledge=g(education, desire to be informed, source of information, quantity/ intensity of information, x) + e (x=vector of demographic variables (race, sex, age, and income))	Knowledge about the economy influences opinion on many matters.
17	Enste et al. (2009)	*(Germany)*	Homo oeconomicus, self-interest, fixed-pie approach, parochialism, fairness-heuristics	Investigation of the biases in the perception of policies between layman and economists	Survey	No model postulated	The perception of policies differs significantly for layman. Layman use different heuristics in judgment than economists.
18	Jappelli (2010)	Inter-national panel data on 55 countries from 1995 to 2008 , SHARE *(Inter-national)*		Merging of indicators of economic/financial literacy with a large set of macroeconomic and institutional variables	Survey	No model postulated	There is substantial heterogeneity of financial and economic competence across countries. Human capital indicators (PISA test scores and college attendance) are positively correlated with economic literacy.
19	Bucher-Koenen and Lusardi (2011)	SAVE (Sparen und Alters-vorsorge in Deutschland *(Germany)*		Investigate the nexus of causality between financial literacy and retirement planning	Survey	No model postulated	Knowledge of basic financial concepts is lacking among women, the less educated, and those living in East Germany

Appendix 3 - List of experts consulted for the questionnaire development

Prof. Dr. Dieter Ahlert, Director of the Institute for Trade Management and Networking Management, University of Muenster, Germany

Prof. Dr. Marco Lehmann-Waffenschmidt[4], Head of Chair of Economics, especially Managerial Economics Technical University of Dresden, Germany

Prof. Dr. Heike Proff, Chair of General Business Administration and International Automotive Management, University of Duisburg-Essen, Germany

Priv.-Doz. Mag. Dr. René Riedl, Institute for Information Engineering, Johannes Kepler University, Linz, Austria

Prof. Dr. Marcel Tyrell, Buchanan Institute for Entrepreneurship and Finance, Zeppelin University, Friedrichshafen, Germany

Prof. Dr. Isabell Welpe, Chair for Strategy and Organization, University of Technology Munich, Germany

Prof. Dr. Ulrich Witt, Director of the Evolutionary Economics Group at the Max Planck Institute of Economics, Professor for Economics, Friedrich Schiller University of Jena, Germany

[4]Professor Lehmann-Waffenschmidt only joined the authors' team after the Delphi study was completed. He was therefore able to evaluate the questionnaire as an expert independently.

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