

Appendix for “The Trading Volume Impact of Local Bias: Evidence from a Natural Experiment”

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Abstract

This appendix contains explanations and tables that supplement the analysis in the paper. Table 1 gives an overview of the data sets used. Table 2 illustrates the distribution of legally recognized holidays across German states. Table 3 provides descriptive statistics of the stock market data. Table 4 displays the distribution of industry groups across samples. Table 5 illustrates the construction of the factors for size, value and momentum. Table 6 provides further evidence on the level of differences in shocks in absolute abnormal returns between holiday and non-holiday firms. Figure 1 compares the cumulative distribution functions of shock variables on Epiphany. Table 7 compares individual investor characteristics in holiday and non-holiday regions.

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Table 1: Overview of Data Sets

Data	Data Source	Description	Sample Period
Daily stock market data	Thomson Reuters Datastream	Adjusted and unadjusted daily closing prices, market capitalization, book values, the number of daily shares traded, the number of total shares outstanding, adjustment factors, the primary exchange as well as industry membership for a final sample of 792 stocks of firms headquartered in Germany	June 13, 1988 - January 15, 2009
Daily trading records of retail clients	German Online Discount Broker	316,134 stock transactions of about 3,000 individual investors; out of these, 136,125 transactions are conducted by 2,901 investors with regard to 965 firms headquartered in Germany	January 1, 1997 - April 17, 2001
Analyst coverage	I/B/E/S	Recommendation and review dates for a total of 51,497 stock buy/hold/sell-recommendations published by 196 brokers, covering about 80% of sample firms	January 1, 1993 - December 31, 2008
Media coverage	Genios, Factiva	126,125 hand collected firm-specific news articles published in three leading German daily business papers (Financial Times Deutschland, Sueddeutsche Zeitung, Handelsblatt), covering about 94% of sample firms	January 1, 2000 - January 15, 2009
Ad hoc disclosures and corporate news	Deutsche Gesellschaft fuer Ad-hoc-Publizitaet (DGAP)	Time-stamped ad hoc disclosures for all sample firms, time-stamped corporate news for half of sample firms	January 1, 2000 - January 15, 2009
Internet search frequencies for firm names	Google	Standardized daily time-series of search frequencies for the names of sample firms, constructed from Google's application "Insights for Search"	January 1, 2004 - January 15, 2009
Index membership	Deutsche Boerse AG	Time Series of historical DAX and MDAX index composition	June 13, 1988 - January 15, 2009
Individual investor characteristics	SAVE study	Quantitative information on various economic and socio-psychological characteristics of a broadly representative sample of German individual investors based on a rich panel questionnaire study	Yearly data from 2005 - 2009
Metropolitan regions	Initiative European Metropolitan Regions in Germany	Detailed information on the borders of the eleven German metropolitan areas as defined by the Conference of Ministers for Spatial Planning	
Firm headquarters	Thomson Reuters Datastream, Deutsche Boerse AG, firm homepages	Address of firm headquarter location	

Table 2: Legally Recognized Holidays in German States

This tables illustrates the distribution of legally authorized holidays across German states. The illustration is constructed on the basis of an overview provided by the Ministry of the Interior (see www.bmi.bund.de for details). Holidays covered in the analysis (Epiphany, All Saints' Day, Corpus Christi) are highlighted in bold type. Note that, while Reformation Day is another regional holiday (celebrated in most of the former German Democratic Republic), less than 5% of sample firms are located in the affected area (see also figure 1).

Holiday	Date	BW	BA	BE	BRA	BR	HA	HE	MWP	LS	NRW	RP	SAA	SAX	SAXA	SH	TH
New Year's Day	January 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Epiphany	January 6	X	X												X		
Good Friday	Easter Sunday minus 2 days	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Easter Sunday					X												
Easter Monday	Easter Sunday plus 1 day	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
May Day	May 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ascension Day	Easter Sunday plus 39 days	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Whit Sunday	Easter Sunday plus 49 days	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Whit Monday	Easter Sunday plus 50 days	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Corpus Christi	Easter Sunday plus 60 days	X	X					X			X	X	X				
Augsburger Friedensfest	August 8	A															
Assumption	August 15	k											X				
Day of German Unity	October 3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Reformation Day	October 31				X				X					X	X		X
All Saints' Day	November 1	X	X							X	X	X	X				
Day of Repentance	Wednesday before November 31													X			
Christmas	December 25 and December 26	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

X=legal holiday	BW=Baden-Württemberg	LS=Lower Saxony
A=only in Augsburg	BA=Bavaria	NRW=North Rhine-Westphalia
k=legal holiday in predominantly catholic municipalities	BE=Berlin	RP=Rhineland Palatinate
	BRA=Brandenburg	SAA=Saarland
	BRE=Bremen	SAX=Saxony
	HA=Hamburg	SAXA=Saxony-Anhalt
	HE=Hesse	SH=Schleswig-Holstein
	MWP=Mecklenburg-Western Pomerania	TH=Thuringia

Table 3: Summary Statistics Based on Weekly Data

This table provides various summary statistics for our sample based on 792 German firms in the period from June 13, 1988 to January 15, 2009. Panel A describes cross-sectional differences in time-series averages of firm characteristics. *Firm market capitalization* is measured in million Euro. *Firm book/market - ratio* is the balance sheet value of the common equity in the company (Worldscope item 03501) divided by the market value of equity. *Firm turnover* is the weekly number of shares traded scaled by the number of total shares outstanding. *Firm weeks* is the number of weeks the firm is in our sample. Panel B describes time-series characteristics of weekly cross-sectional (equally- and value-weighted) averages. *Number of firms* is the number of active firms in our sample in a given week.

Panel A: Cross-sectional Statistics					
Variable	Mean	Median	SD	5th Percentile	95th Percentile
Firm return	0.09%	0.16%	0.58%	-0.95%	0.67%
Firm return volatility	7.33%	6.37%	5.99%	2.97%	12.94%
Firm market capitalization	1,148	123	4,704	17	4,190
Firm book/market-ratio	0.52	0.44	1.36	0.09	1.04
Firm turnover	1.42%	0.93%	1.68%	0.01%	4.55%
Firm weeks	556	515	322	95	1,075

Panel B: Time-series Statistics					
Variable	Mean	Median	SD	5th Percentile	95th Percentile
Value-weighted return index	0.16%	0.31%	2.54%	-4.22%	3.96%
Equally-weighted return index	0.21%	0.35%	1.73%	-2.69%	2.48%
Value-weighted turnover index	2.04%	1.86%	0.98%	0.80%	3.69%
Equally-weighted turnover index	0.98%	0.85%	0.56%	0.33%	2.09%
Number of firms	411	409	151	183	620

Table 4: Distribution of Industry Groups Across Holiday and Non-Holiday Regions

This table shows the concentration and composition of industries (as given by the Datastream Level 2 industry classification) across holiday and non-holiday regions for the case of Epiphany, All Saints' Day, and Corpus Christi, respectively. Panel A (B) shows an equal-weighted (value-weighted) analysis, where the weight of each industry group is determined by the fraction of holiday firms in that industry group (by the relative market capitalization of industry group observations). In Panel B, DAX 30 blue chips (about 6% of observations) are excluded to prevent a small fraction of large firm dominating the analysis. In both panels, the Herfindahl index of industry concentration is computed as the sum of squared industry group weights.

Industry	Epiphany		All Saints' Day		Corpus Christi	
	Holiday	Non-Holiday	Holiday	Non-Holiday	Holiday	Non-Holiday
Total number of firms	301	491	509	283	603	189
Panel A: Equal-Weighted Analysis						
Herfindahl index of idustry concentration	0.15	0.15	0.15	0.16	0.15	0.15
Oil, Gas, Alternative Energy	3.32%	3.67%	2.75%	4.95%	2.65%	6.35%
Basic Materials	5.98%	7.13%	7.27%	5.65%	6.80%	6.35%
Industrials	22.26%	21.59%	22.79%	20.14%	22.39%	20.11%
Consumer Goods	17.28%	14.66%	16.11%	14.84%	15.92%	14.81%
Health Care	5.65%	6.11%	4.52%	8.48%	5.31%	7.94%
Consumer Services	7.97%	8.15%	9.23%	6.01%	7.96%	8.47%
Telecommunications	0.33%	1.02%	0.98%	0.35%	0.83%	0.53%
Utilities	4.32%	2.44%	4.13%	1.41%	3.65%	1.59%
Financials	18.27%	22.20%	18.27%	25.09%	19.90%	23.28%
Technology	14.62%	13.03%	13.95%	13.07%	14.59%	10.58%
Panel B: Value-Weighted Analysis						
Herfindahl index of idustry concentration	0.16	0.16	0.17	0.18	0.17	0.17
Oil, Gas, Alternative Energy	3.37%	3.79%	1.73%	4.79%	1.61%	14.41%
Basic Materials	8.56%	9.81%	10.06%	8.13%	10.59%	7.90%
Industrials	20.44%	20.99%	23.25%	19.22%	21.16%	16.32%
Consumer Goods	14.11%	12.59%	12.31%	10.40%	12.64%	8.24%
Health Care	3.52%	7.81%	3.06%	12.34%	4.37%	2.22%
Consumer Services	6.39%	7.22%	7.82%	4.63%	6.92%	7.63%
Telecommunications	1.25%	0.57%	0.93%	0.77%	0.65%	1.47%
Utilities	12.18%	3.53%	8.59%	1.57%	7.74%	3.54%
Financials	25.57%	26.59%	26.54%	31.07%	28.97%	30.97%
Technology	4.61%	7.10%	5.70%	7.08%	5.34%	7.30%

Table 5: Construction and Summary Statistics of Factors for Size, Value, and Momentum

The factors for size, value and momentum are constructed from the daily stock returns of those firms which survive the screening process as outlined in section 3. The screening process is designed to exclude very small and illiquid stocks and to identify firms with available and reliable stock market data. This procedure results in a final sample of 792 firms headquartered in Germany. With regard to the construction of value and size portfolios, we follow very closely the methodology proposed in Fama and French (1993). Specifically, in each year at the end of June, we form six value-weighted portfolios based on firm size and equity book-to-market ratio. A firm's equity book-to-market ratio is defined as the balance sheet value of the common equity in the company (Worldscope item 03501) divided by the market value of equity. To qualify for the inclusion in any of the portfolios, a firm has to meet the following requirements: 1) The stock must have valid price data at the end of June (i.e. no previous delisting and not being discarded by the screening process. 2) The book as well as the market value as computed at the end of December of the previous year have to be non-negative. To sort stocks into portfolios, we form three book-to-market equity groups (low, medium, high) based on the 30th and 70th percentile of the book-to-market-ratio as well as (independently) two size equity groups (small, big) based on the median of the market capitalization. From the intersections of these groups, the following six portfolios are constructed: Small Low, Small Medium, Small High, Big Low, Big Medium, Big High. Daily value-weighted returns on the six portfolios are calculated from the beginning of July to the end of June of the next year. The portfolios are reformed yearly. Daily factor returns for size (SMB) and value (HML) are then calculated as follows: $SMB = 1/3(SmallLow + SmallMedium + SmallHigh) - 1/3(BigLow + BigMedium + BigHigh)$ and $HML = 1/2(SmallHigh + BigHigh) - 1/2(SmallLow + BigLow)$. With regard to the momentum factor, we follow very closely the methodology proposed in Carhart (1997). Specifically, we form three equally-weighted portfolios, split by the 30th and 70th percentile of the distribution of the most recent eleven-months return lagged one month (i.e. the most recent month is skipped). This results in three momentum-sorted portfolios (Winners, Neutral, Losers), which are reformed monthly. To be included in any of the portfolios, the stock must have valid price data for the whole previous year (i.e. no previous delisting and not being discarded by the screening process). Daily returns for the momentum factor (WML) are then calculated as follows: $WML = Winners - Losers$. The following table shows summary statistics of factor returns based on monthly data from June 1988 to January 2009 (236 observations). Monthly frequency is chosen to facilitate comparison with other studies. The table displays monthly return summary statistics for the market factor (RMRF), the size factor (SMB), the value factor (HML) and the momentum factor (UMD). The market factor is computed as the monthly return of the CDAX minus the monthly risk-free rate. The CDAX is a broad German stock index with several hundred constituents. According to the index provider Deutsche Boerse Group, it reflects the performance of the overall German equity market.

Factor	Mean	Std. Dev.	t-statistic: mean=0	Min	Max
RMRF	0.25%	5.79%	0.67	-19.90%	18.63%
SMB	-0.24%	3.50%	-1.05	-13.12%	12.77%
HML	1.01%	2.86%	5.44	-8.76%	9.90%
WML	0.68%	4.65%	2.26	-22.77%	14.09%

Table 6: Difference in Shocks in Absolute Abnormal Returns: Further Evidence

This table provides supplementary material for the test on differences in shocks in absolute abnormal returns, as described in section 4.3 of the paper. Panel A reports differences in mean shocks in absolute abnormal returns. To this end, daily absolute abnormal returns for each firm during t-5 to t+5, as obtained from a German version of the Carhart (1997) four factor model, are computed. Factor loadings are estimated from time-series regressions from t-66 to t-6. For both the holiday and the non-holiday sample, firm-specific shocks are computed as the absolute abnormal return at t minus the average absolute abnormal return in t-5 to t+5 (excluding t). The table reports the difference between the mean shock value for the holiday sample and the mean shock value for the non-holiday sample, averaged across years. To mitigate the effect of extreme outliers, we winsorize the data at the 1% and 99% level before computing the mean. This is done for the holiday and non-holiday sample in each year separately. Statistical significance is assessed by bootstrapping as described in footnote 11. *Large firms* (*Small firms*) refer to stocks with a market value larger (smaller) than the median stock, measured at the beginning of the year. Statistical significance at the ten, five and one percent level is indicated by *, **, and ***, respectively. Panel B compares the frequency of extreme return events on the event day. To this end, all holiday (non-holiday) firm-level shocks are pooled. *Shock variable at least 0%* means that the idiosyncratic component of the stock's return on the event day has at least the same importance as on average in a nearby benchmark period (t-5 to t+5, excluding t). The odds ratio is computed as the ratio of the fraction of extreme events for holiday firms and the fraction of extreme events for non-holiday firms.

Panel A: Difference in Mean Shocks in Absolute Abnormal Returns				
Dependent Variable	Epiphany	All Saint's Day	Corpus Christi	Pooled
Abnormal absolute return: All firms	-0.08%*	0.02%	-0.07%	-0.04%
Abnormal absolute return: Large firms	-0.09%**	0.00%	-0.08%	-0.06%*
Abnormal absolute return: Small firms	-0.07%	0.02%	-0.06%	-0.03%

Panel B: Frequency of Extreme Return Events on the Event Day			
Event	Holiday Firm Observations	Non-Holiday Firm Observations	Odds Ratio
% of Observations with Shock Variable at least 0%	34.57%	37.09%	0.93
% of Observations with Shock Variable at least 1%	15.22%	16.04%	0.95
% of Observations with Shock Variable at least 2%	7.63%	8.68%	0.88

Figure 1: Comparison of cumulative distribution functions of shock variables on Epiphany

The following graph is intended to illustrate the economic magnitude of the difference in shock variables between holiday and non-holiday firms (see section 4.3 of the paper). As the largest difference is observed for Epiphany (see panel A of table 4 in the paper), we employ the following procedure. For each year in which Epiphany falls on a trading day, we compute the empirical cumulative probability distribution of the shock variable for holiday firms and separately for non-holiday firms. To obtain an overall distribution, we then average the resulting percentiles across time. This approach resembles the procedure used in the analysis relied on in the paper, which aimed at obtaining an estimate for the shock variable of the median firm. The following graph shows the two cumulative distribution functions. For better readability, only values above the 5th percentile and below the 95th percentile are displayed.

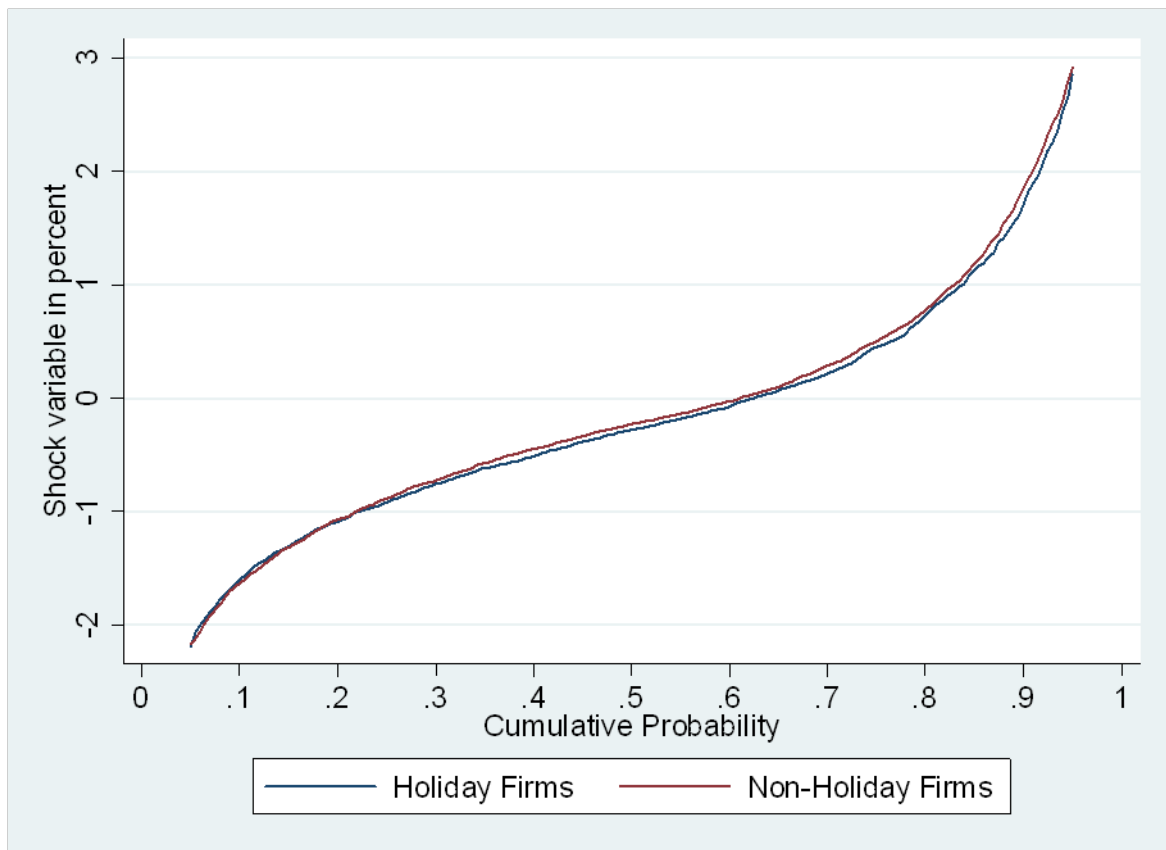


Table 7: Individual Investor Characteristics in Holiday and Non-Holiday Regions

Calculations in this table are based on data from the German SAVE study, a rich panel survey produced by the Mannheim Research Institute for the Economics of Aging. It is designed to provide quantitative information on the economic situation and on relevant socio-psychological characteristics of a representative sample of German households. For a detailed description of the design and results of the SAVE study, we refer the reader to Boersch-Supan et al. (2009). Findings reported in the following table rely on data gathered in five consecutive yearly questionnaire studies with the same households, conducted between 2005 and 2009. The table summarizes various characteristics of individual investors in holiday and non-holiday regions for each of our three holiday samples (Epiphany, All Saints' Day, Corpus Christi). If not stated otherwise, the variables represent simple means or medians constructed from the pooled sample of all yearly surveys. Relying on various sets of weighting factors to recalibrate the sample with the aim of optimized representativeness does not change the qualitative nature of our findings. The computation of all variables (with the exception of "stock market participation") is conditioned on households who invest in the stock market (e.g. via individual stocks, but also via mutual funds, REITS etc.). In Panel B, subjects could give multiple responses. "No discussion of financial matters" refers to the fraction of subjects who stated to rely neither on relatives, friends, colleagues, neighbors nor financial advisers when dealing with financial matters. In Panel C, the extent to which the advice is followed is judged on a scale from 0 (not at all) to 10 (completely). In Panel D, "Objective financial knowledge" reports the fraction of participants who answered all of three financial literacy questions correctly. This variable is computed relying only on the questionnaire of 2009. The questions therein are designed to evaluate knowledge with regard to interest rates, inflation and risk of investment alternatives, respectively (see www.mea.uni-mannheim.de for details). "Self-assessed financial knowledge" gives respondents' statements regarding their subjective measure of financial knowledge on a scale from 1 (very low) to 7 (very high). In Panel E, "self-assessed risk-taking" is evaluated by asking subjects to assess the validity of the following statement on a scale from 0 (completely false) to 10 (completely true): "I do not mind taking risks in investments". "Expectations with regard to own future economic situation" are rated on a scale from 0 (very negative) to 10 (very positive).

Investor Characteristic	Epiphany		All Saints' Day		Corpus Christi	
	Holiday	Non-Holiday	Holiday	Non-Holiday	Holiday	Non-Holiday
Panel A: Financial Situation and Participation in the Stock Market						
Participation in the stock market?	26.35%	24.04%	25.81%	23.51%	25.80%	23.08%
Value of stock market investments in Euro (mean)	26,365	30,855	30,589	29,369	31,899	27,527
Value of stock market investments in Euro (median)	10,000	10,000	10,000	10,000	10,000	10,000
Total financial wealth in Euro (mean)	65,919	68,937	70,819	66,254	74,999	60,235
Total financial wealth in Euro (median)	36,000	32,849	32,075	34,488	34,000	33,000
Net monthly household income in Euro (mean)	3,079	2,988	3,099	2,932	3,156	2,828
Net monthly household income in Euro (median)	2,800	2,600	2,800	2,550	2,800	2,500
Panel B: Influence of Social Contacts (Excluding Professional Financial Advisors) on Financial Matters						
Discussion of financial matters with relatives?	28.61%	28.22%	28.41%	28.21%	27.17%	29.66%
Discussion of financial matters with friends?	23.12%	24.54%	23.18%	25.12%	23.28%	25.41%
Discussion of financial matters with colleagues?	7.82%	8.00%	7.19%	8.60%	7.16%	8.94%
Discussion of financial matters with neighbors?	0.64%	1.96%	1.37%	1.94%	1.63%	1.74%
No discussion of financial matters?	27.45%	28.09%	28.91%	27.14%	29.37%	26.25%
Panel C: Use of Financial Advice						
Discussion of financial matters with professional financial advisors?	50.14%	51.80%	51.19%	51.67%	50.73%	52.23%
If yes: Advice sought at least once a month?	4.32%	2.65%	3.12%	2.88%	3.35%	2.57%
If yes: Advice sought about four times per year?	23.26%	24.51%	24.21%	24.28%	23.61%	25.00%
If yes: Advice sought about once a year?	49.51%	50.87%	50.66%	50.54%	50.73%	50.43
If yes: Advice sought less than once a year?	22.91%	21.98%	22.01%	22.29%	22.31%	22.00%
If yes: To what extent is the advice followed? (mean, scale from 0 to 10)	6.04	6.08	5.98	6.14	6.02	6.13
If yes: To what extent is the advice followed? (median, scale from 0 to 10)	6	6	6	6	6	6
Panel D: Financial Literacy						
Objective financial knowledge (Top financial literacy score)	82.08%	78.59%	79.71%	79.10%	80.00%	78.59%
Self-assessed financial knowledge (mean, scale from 1 to 7)	4.97	4.93	4.89	4.97	4.91	4.97
Self-assessed financial knowledge (median, scale from 1 to 7)	5	5	5	5	5	5
Panel E: Self-Assessed Risk-Taking in Investments and Economic Expectations						
Self-assessed risk-taking in investments (mean, scale from 0 to 10)	2.99	3.02	3.04	3.00	3.06	2.97
Self-assessed risk-taking in investments (median, scale from 0 to 10)	2	2	2	2	2	2
Expectations with regard to own future economic situation (mean, scale from 0 to 10)	5.65	5.81	5.80	5.72	5.83	5.70
Expectations with regard to own future economic situation (median, scale from 0 to 10)	6	6	6	6	6	6