The effect of compulsory schooling on vaccination against COVID-19 and influenza*

– Preliminary. Please do not circulate. –

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Abstract

We study the effect of education on vaccination against COVID-19 and influenza in Germany and Europe. Our identification strategy makes use of changes in compulsory schooling laws and allows to estimate local average treatment effects for individuals between 59 and 91 years of age. We find no significant effect of an additional year of schooling on vaccination status in Germany. Pooling data from Europe, we conclude that schooling increases the likelihood to vaccinate against COVID by an economically negligible effect of one percentage point (zero for influenza). However, we find indications that additional schooling increases fear of side effects from COVID vaccination.

Keywords: COVID, Vaccination, Education, Compulsory Schooling
JEL Classification: *I10*

1 Introduction

Vaccination is considered an important – maybe even the most important – strategy to overcome the COVID crisis, with the WHO aiming for a 70% vaccination coverage of the general population (WHO, 2022). The first vaccines were developed immediately after the outbreak of COVID and large vaccination campaigns started around end of 2020 in the developed world. While, at that time, vaccination was mainly seen as a way to stop infections and to achieve herd immunity, several mutations of the virus made this goal hardly achievable. However, the fundamental benefit of vaccination seems to be a strong reduction of severe illness and mortality after a COVID infection (Nasreen et al., 2022; Nordström et al., 2022). High vaccination rates and mutations to less lethal variants of the virus are considered the two dominating reasons that most societies largely turned back to normal life throughout the year 2022 even though COVID infections remained on a high level (Robert Koch-Institut, 2022b).

While in the first half of 2021 undersupply of vaccines was the most important problem, this was solved – for the developed world – around mid of 2021. Then, however, a second problem came up: too low vaccination rates in order to achieve herd immunity. Researchers around the world and across fields of study try to understand the determinants of vaccination willingness and hesitancy. Understanding the determinants is necessary to improve the success and acceptance of vaccination campaigns. While this is not necessarily important anymore for the current version of the Corona virus, this knowledge seems to be of high value for future pandemics but also for endemic viruses such as influenza and potential mutations of the Corona virus.

An important determinant of vaccination many scholars can agree on is education. Numerous studies report positive associations between COVID vaccination willingness and educational status around the world. See, e.g. Cascini et al. (2021) for a general overview and Borga et al. (2022), Graeber et al. (2020), Mondal et al. (2021), Bergmann et al. (2021), Walkowiak and Walkowiak (2021), Huebener and Wagner (2021), Humer et al. (2021), for a non-exhaustive list of studies. Some of theses studies use actual vaccination as outcomes, others use stated willingness. Moreover, these studies differ in important aspects such as countries, how education is measured, when the data are collected (e.g. before/after vaccination was available, during/after local peaks of infection rates). Yet, the overwhelming result is the positive association of education and vaccination willingness. This is an important finding as this education gradient can be interpreted as a problem of distributional justice that, in some way, would need to be addressed in societies that aim at preventing unjust inequalities in health. It adds to the general finding that health care and prevention are inequitably distributed (Carrieri and Wuebker, 2013; Van Doorslaer et al., 2004).

Another question is whether the relationship between education and vaccination is causal. This would be important to understand when it comes to *how* this education gradient in vaccination could be tackled. There exists some evidence of the impact of education on general health behaviours like vigorous activity (Brunello et al., 2016) or use of preventive services (like receiving flu shots, Fletcher and Frisvold, 2009). However, apart from that, to the best of our knowledge, there is no study that claims to identify the causal effect of education on vaccination, in particular vaccination against COVID. It is our main contribution to the literature to fill this gap and provide a first study in this direction.

In the first part of this paper, we study the effect of education on vaccination against COVID in West Germany using information from two different surveys administered between mid of 2021 and beginning of 2022. These surveys relate actual vaccination status to educational attainment of – in our estimation sample – around 4000 individuals. Our identification strategy makes use of changes in compulsory schooling laws and allows to estimate local average treatment effects for individuals between 59 and 91 years of age. The reforms increase compulsory schooling from eight to nine years in the 1940s to 1960s in Germany with some variation in timing across federal states. We augment the analysis using vaccination against influenza as a second outcome. Our results only hold for a specific subgroup of individuals but, arguably, a highly important one: older individuals – usually denoted the high risk group – at the lowest margin of education (those forced to increase their years of education from eight to nine years). For Germany, we do not find a significant effect of one additional year of compulsory schooling on vaccination, neither against COVID, nor against influenza.

In the second part of the paper, we extend the analysis to several European countries. We now find a significantly positive effect of education on vaccination. However, the effect size is a very small one percentage point increase in COVID vaccination (compared to around 90 percent average probability to be vaccinated against COVID). Again, effects on influenza vaccination are precisely zero. Further analyses show that health status and labor force participation do not seem to be able to explain this result.

We additionally observe that education significantly increases the likelihood to report fear from side effects of COVID vaccination in Germany. This finding is not completely new in the literature (that, again, only studied associations, however): Wu and Zhang (2022) investigate reasons given for vaccine hesitancy among not fully vaccinated individuals in the US. Within this subgroup, higher educated individuals tend to be more concerned about the safety of vaccines and do not see the vaccine as necessary. However, according to Wu and Zhang (2022) there appears to be no education gradient for trust in the vaccine.

We do not claim that our main result – no sizeable local average treatment effect of education on vaccination against COVID and influenza – has high external validity and can be generalized to other age groups or other education levels. Still, we think that this

is an important piece of evidence and a start to create a picture on the causal effect of education on vaccination. Moreover, getting results that only hold for specific subgroups of compliers is inherent to reduced-form instrumental variables regressions of all kind, not just this study.

The remainder of this paper is structured as follows. In Section 2 we describe the institutional background on COVID vaccination and education in Germany. In Section 3 we present the data and the empirical approach. Results for Germany are reported in Section 4 while Section 5 shows results for Europe. We study the effects of schooling on fear of side effects in Germany in Section 6. We conclude in Section 7.

2 Institutional Background and COVID Vaccination in Germany

In this section we present the institutional setting. This includes the German educational system, with a focus on the schooling reforms that we use as exogenous variation, as well as the course of the COVID-19 pandemic in Germany and the vaccination campaign.

2.1 Educational system and schooling reforms

In Germany, children enter primary school at the age of six.[1] After four years in primary school they attend one of the three secondary school tracks. Secondary schools in Germany can, generally, be differentiated into basic (*Hauptschule*), intermediate (*Realschule*) and high schools (*Gymnasium*). The basic track (up to 8th or 9th grade) prepares students for apprenticeship, the intermediate track (up to 10th grade) qualifies students for apprenticeship or training in white collar jobs, and the high school certificate (up to 12th or 13th) gives access to academic education in colleges or universities. Before the German educational reform, which occurred from 1946 to 1969 in West Germany, basic track schools covered grades five to eight. The reform increased the number of compulsory schooling years from eight years to nine years. Decisions and policies regarding the educational system in Germany are made at the federal state level, hence the reform was implemented in different years by the various states (**?**). Some states introduced a compulsory ninth grade earlier, while the majority of the states only introduced an additional year of schooling due to the Hamburg Accord (*Hamburger Abkommen*) in 1964 (Kamhöfer and Schmitz, 2016a). See Table **??** for the reform years. The reform was introduced due to a shortage in labor market opportunities and apprenticeships for school leavers, and to also increase the school leaving age (see **?**, for details).

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[1]This first paragraph is taken word by word from Schmitz and Tawiah (2023).

Coinciding with these extensions of compulsory schooling was the introduction of two short school years (SSY), in 1966 and 1967 in some states. The start of the school year moved from Spring to Fall but it was already in Fall for Bavaria, see Pischke and von Wachter (2008) for details. However, it is commonly found that these only have little explanatory power, which is why we do not include them in our analysis (Kemptner et al., 2011).

Table 1: Reform years and corresponding first birth cohorts

| Federal State	Pivotal birth cohort	Reform year
Schleswig Holstein	1932	1947
Hamburg	1931	1946
Lower Saxony	1947	1962
Bremen	1944	1959
North Rhine-Westphalia	1951	1966
Hesse	1951	1966
Rhineland Palatinate	1952	1967
Baden-Wuerttemberg	1952	1967
Bavaria	1954	1969
Saarland	1943	1958

Source: Begerow and Jürges (2022). Pivotal cohort is the first birth cohort the reform applies to.

2.2 COVID-19 vaccination

The first case of COVID-19 in Germany occurred in January 2020 (Rothe et al., 2020). The first vaccine was approved by the European Medical Agency (EMA) at the end of December 2020, vaccinations started in Germany shortly after (Die Bundesregierung, 2020). While at first there was a prioritization of the vaccination for those who were at risk of severe consequences of an infection (Vygen-Bonnet et al., 2021a), this was lifted in June 2021, when enough vaccines were available (Vygen-Bonnet et al., 2021b).[2] Figure 1 shows the share of the vaccinated population together with the seven day incidence between January 2021 and April 2022. The share of individuals having received at least one vaccination (red line) is increasing slowly at first due to a limited supply of vaccination doses. From April 2021 to July 2021 it increases sharply from about 12% to more than 60% and then converges to around 80%. The vaccination rate for the second COVID vaccination (green line) follows a similar pattern with a delay of two month. The third vaccination was available as of June 2021 (yellow line) and the share of vaccinated converged to a lower number of around 60%.

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[2]Everybody in the age group relevant in our sample (age 60 and older) had the possibility to get their first COVID vaccination as of April 2021.

Figure 1: Vaccination status and seven day incidence in Germany
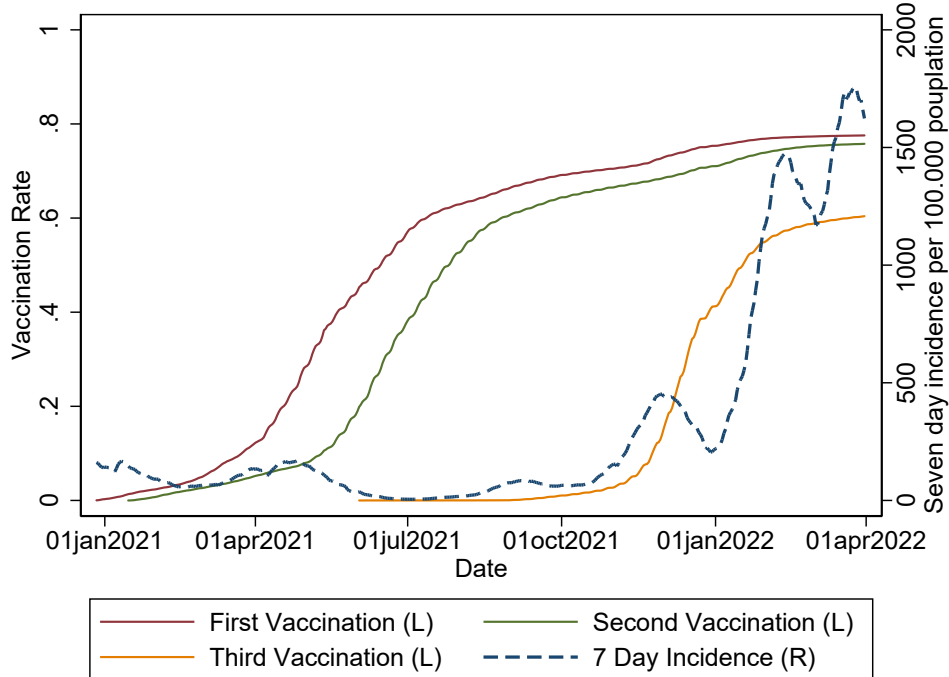
3 Data and empirical approach

3.1 Sample selection and outcome variables

We use combine two data sources. The first is the CASA monitor data set (henceforth called *CASA data*), an online-survey put together by infas 360.[3] This representative survey consists of three cross sections with each around 10.000 respondents. The first wave was conducted in February and March 2021, the second wave in July 2021 and the third in January 2022. In the Appendix we provide the questionnaire as well as a comparison of descriptive statistics with the German Socio-Economic Panel (Goebel et al., 2019) – the most prominent and long-running German representative household data set – and show that they are very similar in terms of demographics and regional coverage (Table A1). We augment this data with the German part of the Survey of Health, Ageing and Retirement in Europe (SHARE)[4] which – for wave 9 (the second COVID wave) – was in the field from June to August 2021, thereby coinciding with the second CASA wave.

Figure 2 reports the time periods when the CASA data and the 9th SHARE wave were collected in combination with COVID vaccination rates in Germany. Since only a minority

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[3]https://www.infas360.de/casa-monitor/
[4]See Börsch-Supan et al. (2013), Börsch-Supan (2022), and Scherpenzeel et al. (2020).

of individuals had the possibility to get a COVID vaccination in February 2021, we do not make use of wave 1 of the CASA data.[5]

Figure 2: Timing of the surveys
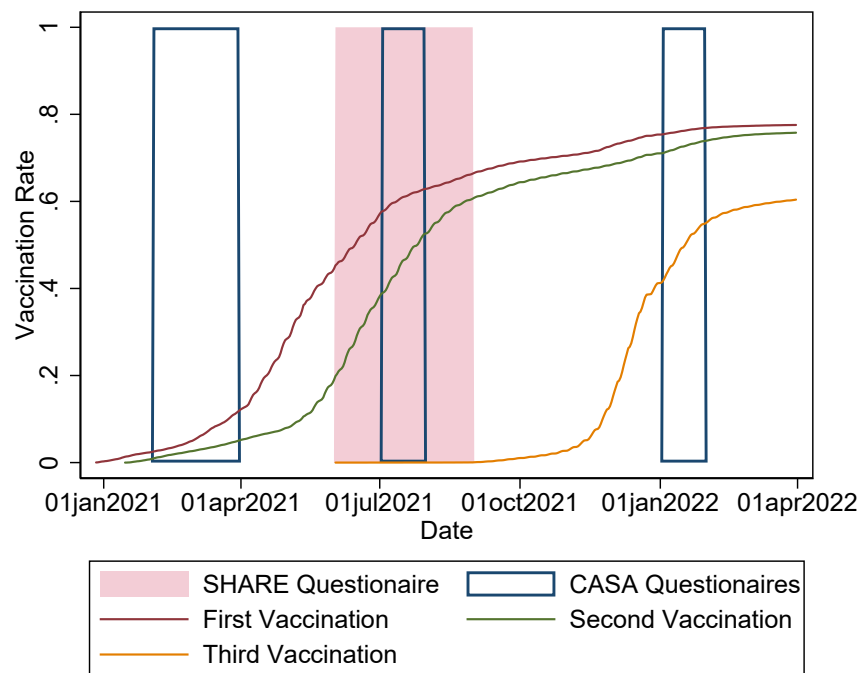
Our first outcome variable of interest is COVID vaccination status, defined as a binary indicator equal to one if an individual has received at least one COVID vaccination. The second outcome variable is an indicator of having received an influenza vaccination within the previous 12 months, included in multiple SHARE waves. Figure 3 reports vaccination rates by age and data source/wave for both outcome variables in our sample. As can be seen, the information on COVID vaccination status is included in both of the CASA waves used, as well as the 9th SHARE wave. Information on influenza vaccination status in only included in the SHARE data, more precisely in waves 1, 2, 8 and 9 (Börsch-Supan, 2019a,b, 2021, 2022).

The share of individuals with at least one COVID vaccination was above 80% for all age groups in all data sets, as can be seen in the left panel of Figure 3. This is slightly larger than the numbers in Figures 1 and 2. Note, however, that those report the numbers from the full population while only individuals older than 50 – who have higher vaccination rates – enter Figure 3. For instance, the prioritization of older individuals and those at risk of severe infection was lifted in June 2021, when enough vaccines were available and

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[5]In wave 1, individuals are asked about the willingness to vaccinate once a vaccine is available. However, we focus on actual vaccination instead of reported willingness.

Figure 3: Distribution of vaccination by age and data source
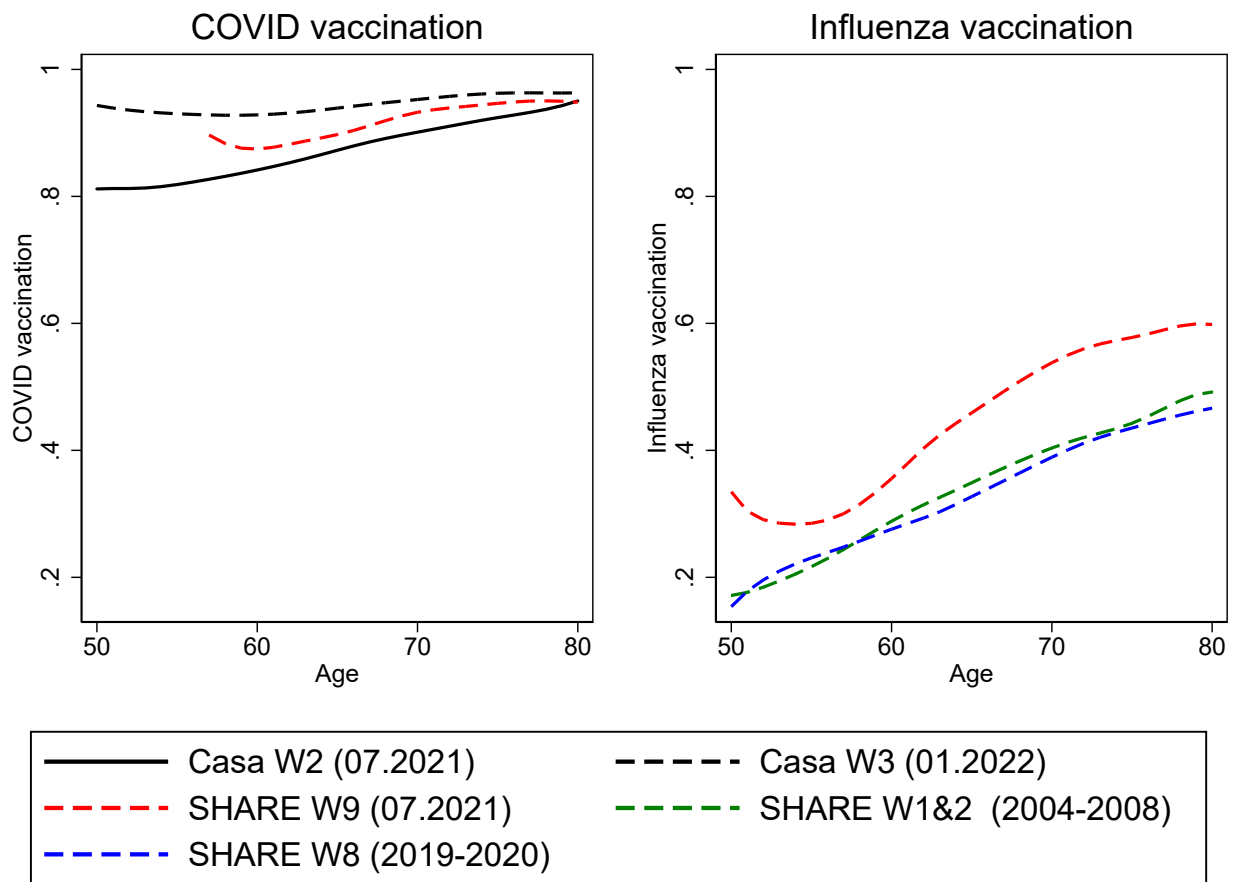
Notes: CASA and SHARE data. Data for West Germany only. No further sample restrictions (e.g. regarding birth cohorts).

90% of individuals over the age of 70 had received at least one vaccination. We observe an almost negligible age trend in the first vaccination dose.

Influenza vaccination status, defined as having received a flu vaccination in the last 12 months, was only recorded in the SHARE data. It is significantly lower than COVID vaccination status. Between waves 1 and 2, and 8, there was little change in the vaccination rate. However, the vaccination rate in wave 9 is substantially higher. Given that wave 8 was in the field shortly before Corona (starting October 2019), this jump could indicate that older individuals received an influenza vaccination to gain some protection against COVID or avoid influenza infections in a period of sparse medical resources. It could also be due to a stronger awareness of the importance to vaccinate against respiratory diseases.

We restrict the analysis to West Germany, that is, all federal states listed in Table 1. In order to focus on individuals born around the reform cohort, we only include individuals born seven years before to seven years after the pivotal cohort. In robustness checks we make different sample selections, such as five or ten years around the pivotal cohorts (Schneeweis et al., 2014) or based on birth years, specifically the years 1945 to 1960 or 1940

to 1970. Variants of these selections have been made in the literature (Pischke and von Wachter, 2008; Kamhöfer and Schmitz, 2016b; Begerow and Jürges, 2022). In our main specification, we have a sample size of 4,024 for the regressions for the COVID vaccination and 2,675 for influenza.

More descriptive statistics for the COVID vaccination sample and for influenza vaccination sample are presented in Table 2. The average immunization rates in our sample mirror the ones from Figure 3. The birth cohort restrictions imply that our estimation sample only includes individuals between 59 and 91 years of age in the COVID sample. Given that SHARE wave 1 was in the field in 2004, the sample is a bit younger for the influenza vaccination. While the restriction to older individuals limits the generalizability of our results, we argue that this nevertheless is a very interesting subsample as, in particular, individuals older than 60 years are generally said to be the high risk group. We assign individuals their years of schooling based on their highest degree of schooling.[6] The earliest school degree obtainable in Germany is the *Hauptschulabschluss*, which can be achieved after eight or nine years, depending on the birth cohort. *Realschulabschluss* is usually granted after 10 years of schooling. The two highest school-leaving degrees in Germany are the *Fachhochschulreife* and *Abitur* obtainable after 12 and 13 years respectively. Average years of schooling in the samples are 10.45 and 9.74.

Table 2: Descriptive statistics

| | COVID sample | | | | Influenza sample | | | |
	Mean	St. dev	Min	Max	Mean	St. dev	Min	Max
Covid vaccination	0.92	0.27	0	1				
Influenza vaccination					0.37	0.48	0	1
Years of schooling	10.45	1.79	8	13	9.74	1.77	8	13
Birth year	1952.09	4.53	1930	1961	1950.09	5.74	1926	1961
Age	69.21	4.52	59	91	65.18	7.89	43	93
Male	0.54	0.5	0	1	0.47	0.5	0	1
Data source: Casa Wave 2	0.4	0.49	0	1				
Data source: Casa Wave 3	0.39	0.49	0	1				
Data source: SHARE Wave 1					0.22	0.42	0	1
Data source: SHARE Wave 2					0.06	0.24	0	1
Data source: SHARE Wave 8					0.40	0.49	0	1
Data source: SHARE Wave 9	0.21	0.41	0	1	0.31	0.46	0	1
Observations		4,024				2,675		

Notes: Casa and SHARE data after sample selection.

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[6]Note that SHARE and CASA have exactly the same questions and answer categories for the education variables and the first COVID vaccination dose and, thus, can be pooled.

3.2 Empirical approach

As a baseline model we start with the following linear regression model:

$$Y_{ics} = \beta_0 + \beta_1 S_{ics} + \beta_2 female_i + \gamma_c + \delta_s + \alpha(\eta_s \times c) + \theta_{survey} + \varepsilon_{ics} \tag{1}$$

where Y_{ics} is a binary indicator whether an individual i has received a vaccination. We use different types of vaccination separately. S_{ics} are years of schooling. $female$ is a dummy variable for being female. γ_c, δ_s and θ_{survey} are birth cohort, federal state and survey/wave fixed effects respectively. $\eta_s \times c$ accounts state-specific linear birth cohort trends. ε_{ics} denotes the individual error term.

In order to derive causal estimates for the effect of education on vaccination status, we use the changes in compulsory schooling as an instrument for years of schooling. This approach was first used by Angrist and Krueger (1991) for the US and later by Pischke and von Wachter (2008) for Germany to estimate the effects of education on wages. We use a two stage least squares (2SLS) approach where the years of schooling are regressed in the first stage on the same variables as before, including Z_i which is an indicator variable equal to one if individual i was born into a state-year cohort, for which compulsory schooling years were nine years instead of eight and zero else.

To derive a causal effect, the instrument Z needs to be valid and relevant. We argue that the instrument is indeed valid in our setting, meaning that the extension of compulsory schooling had no effect on vaccination status other than through individual years of schooling. To be considered relevant, an instrument must be highly correlated with the explanatory variable of interest. We show this in section 4.1. The instrument of compulsory schooling in Germany has been used extensively in the literature for different outcomes, such as wages (Cygan-Rehm, 2022; Kamhöfer and Schmitz, 2016b; Pischke and von Wachter, 2008), health (Kemptner et al., 2011; Begerow and Jürges, 2022) or fertility (Cygan-Rehm and Maeder, 2013), where these authors argue that use of this instrument is a suitable way to deal with endogeneity of schooling.

If our assumptions hold, the estimated coefficient of instrumented years of schooling in the IV regression can be interpreted as the causal effect of an additional year of schooling on vaccination status. Allowing for heterogenous treatment effects and additionally assuming monotonicity, we get an estimate of a local average treatment effect (Imbens and Angrist, 1994), where the complier subpopulation is the group at the lowest margin of education. In the setting at hand, monotonicity implies that individuals do not reduce their schooling years *because* of the increase of compulsory education. We argue that this is the case, especially since compulsory education is the legal lower bound for educational attainment. Therefore we identify effects for the subpopulation of compliers – individuals who would have liked to take eight years of schooling but are forced to take nine.

4 Results

4.1 Baseline specification

Table 3 reports the results from linear regression with the specification described in Section 3.2. The regressions are carried out independently for the COVID and influenza samples. Figure 3 and Table 2 in Section 3.1 makes clear which sources/waves enter the regressions. Columns (1) and (2) show OLS results, while columns (3) and (4) how results from instrumental variables regressions.

Table 3: Regressions results

	OLS		2SLS	
	COVID vaccination (1)	Influenza vaccination (2)	COVID vaccination (3)	Influenza vaccination (4)
First stage coefficient of the instrument:				
Post reform			0.368***	0.491***
			(0.086)	(0.151)
Second stage:				
Years of schooling	0.001	0.009	-0.033	0.019
	(0.003)	(0.007)	(0.051)	(0.058)
Male	0.023**	-0.050**	0.036*	-0.054*
	(0.009)	(0.021)	(0.019)	(0.030)
Casa W2	-0.020*		0.008	
	(0.012)		(0.043)	
Casa W3	0.034***		0.062	
	(0.011)		(0.043)	
SHARE W1		-0.367***		-0.371***
		(0.026)		(0.035)
SHARE W2		-0.300***		-0.302***
		(0.035)		(0.038)
SHARE W8		-0.154***		-0.154***
		(0.019)		(0.019)
Observations	4,021	2,668	4,021	2,668

Standard errors in parentheses, clustered on birth-cohort $\times$ state level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. First stage includes the same control variables as the second stage.

Starting with the OLS results, educational attainment does not seem to be related to receiving either COVID or influenza vaccination. This result contradicts findings from the literature, where it is commonly found that schooling and vaccination status are positively correlated. However, our sample is restricted to older individuals, who are more concentrated at the lower margin of educational attainment. Many were born before the German educational expansion took off and most of the individuals in our sample have basic trck education only. In Table A2 in the Appendix, we present results for the whole dataset without birth-cohort restrictions. There, a positive correlation between schooling

and vaccination status can be found. An additional year of schooling is associated with a 1.4 percentage points higher probability of being vaccinated against COVID and a 1 percentage point higher probability of being vaccinated against influenza. Yet, even this positive correlation is small. Another finding from Table 3 is that men are more likely to receive a COVID vaccination but less likely to receive a vaccination against influenza.

Next, we turn to the results of the instrumental variable estimation, presented in columns (3) and (4) of Table 3. The first row presents the estimate for the effect of the instrument on the years of schooling from the first stage regression. We use a binary indicator that is equal to one if an individual is born in a state-year cohort, for which nine years of schooling were compulsory. We find a strong positive effect of compulsory schooling on educational attainment. The increase of the compulsory schooling thus increased educational attainment by 0.368 years in the COVID sample and by 0.491 years in the influenza sample. The estimated coefficients in the previous literature range from 0.19 (Pischke and von Wachter, 2008) to more than 1 (Kamhöfer and Schmitz, 2016b). Our estimates are therefore on the lower end of first stage coefficients, more in line with Pischke and von Wachter (2008) or Kemptner et al. (2011) (with estimates ranging from 0.58 to 0.69).

The lower panel of Table 3 reports the estimates of the second stage. As with the OLS results we find no significant effect of the years of schooling on vaccination status. While this is also a matter of increased standard errors, the point estimates are close to zero, to. In the case of COVID vaccination, we even receive a negative sign and a reduced likelihood to get vaccination by 3 percentage points (not significant).

4.2   Robustness checks

In carrying out the regressions, the researcher has many degrees of freedom. This holds for the sample selection, types of control variables and even the "definition" of the reform years in Germany. We run further regressions similar to those presented in Section 4.1 to test the robustness of our estimates to these choices. The results are presented in Figure 4. The two panels represent the two outcomes, following the columns in Table 3. In the graphs, the dots represent the estimate for the effect of years of schooling on vaccination status derived from the 2SLS estimation, while the lines represent the 90% confidence interval. We include the same covariates as in Section 4.1 unless otherwise specified.

We first test for robustness against different sample selections. We first repeat our main specification using cohorts that are born up to seven years before or after the pivotal cohort. This is then compared to changing the bandwidth to five and ten years around the pivotal cohort. Next, we present specifications where the same birth cohorts are used for all states and include the birth cohorts from 1945 to 1960 and birth years 1940 to 1970.

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Figure 4: Robutness checks and effect heterogeneity
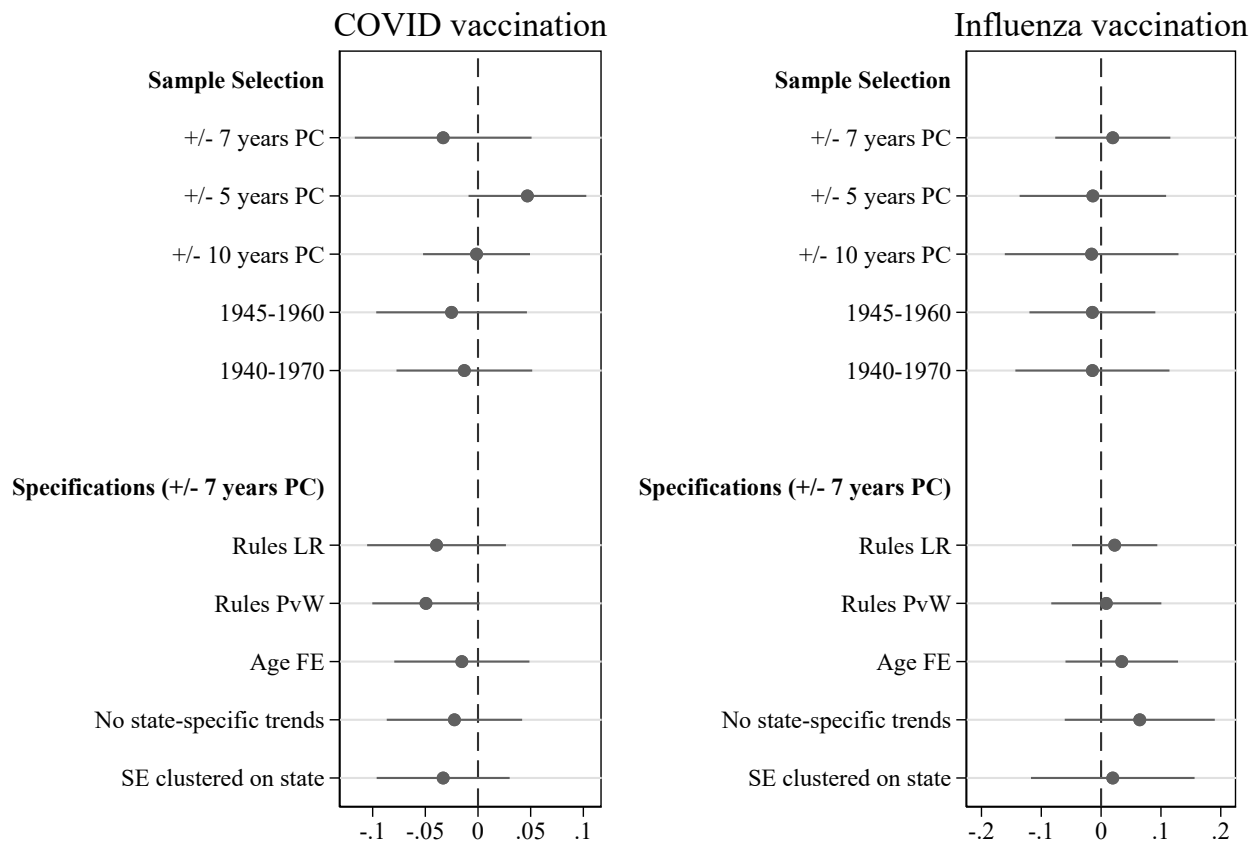
Notes: CASA and SHARE data. Note: 90% confidence intervals only. Each dot is a regression coefficient from 2SLS regressions as before with the same covariates as before.

We also try different specifications. We use our main sample selection, using the birth cohorts seven years around the pivotal cohort. First, we include the specification of compulsory schooling laws as they are described in Leschinsky and Roeder (1980) and used by Cygan-Rehm and Maeder (2013) that slightly differ from those used by Begerow and Jürges (2022). In the same way we use the compulsory schooling reforms are described in Pischke and von Wachter (2008) in the second row. In the third specification, we include age fixed effects instead of birth cohort fixed effects. In the following row, we exclude the state-specific birth cohort trends. We cluster standard errors on the state-level instead of the birth-cohort × state level in the fifth specification.

The results seem to be sensitive to these changes and the estimated coefficients fluctuate around zero. Yet, none of the coefficients is large in economic terms and taken together the additional regressions leave the impression of a robust finding of basically no sizeable effect of an additional year of compulsory schooling, neither on vaccination against COVID nor against influenza. Nevertheless, a small sample size and, thus, potential problems of

statistical power are important drawbacks of our analysis. Thus, in the next section, we pool information from several European countries to gain power.

5   Europe-wide analysis

We make use of the fact that the SHARE is collected for multiple countries and extend our analyses to several European countries. While it can be argued that education systems differ between countries, reducing the comparability, we argue that pooling significantly increases sample size and can, thus, can provide further insights in addition to our country specific analysis. Many recent papers have studied effects of compulsory schooling reforms in Europe on different outcomes in pooled analyses (e.g. Schneeweis et al., 2014, Brunello et al., 2016, Schiele and Schmitz, 2023). For Germany we use the same educational reforms as before, following Begerow and Jürges (2022). For the additional countries we use the reform described in Schiele and Schmitz (2023). An overview over the reforms, together with the sample size per country, we use can be found in Table 4. We use the same sample restrictions as before, including individuals born seven years surrounding the pivotal cohort.

Figure 5 reports regression results in the same spirit as for the robustness checks before. We use the same specifications as in the previous section but replace federal state dummies with country dummies. In line with Table 3, no association between schooling and influenza vaccination status can be found, now however with smaller standard errors. Regarding COVID vaccination, we do observe a small positive correlation. One additional year of education goes along with a oe percentage point higher likelihood to vaccinate against COVID.

Going through the IV results across separate specifications the same coefficients as in OLS appear, by and large. One additional year of education increases COVID vaccination for the compliers of compulsory schooling reforms by around one percentage point and does not affect influenza vaccination at all. The confidence bands are considerably smaller than in the previous section and all confidence bands in the Europe-wide analysis lie within the bands when using Germany alone and, thus, the results appear plausible. Even though significant at the ten percent level (sometimes also at the five percent level), the effect sizes are very small only, also for the COVID vaccination. Thus, we conclude that both approaches (a uniform educational system but small sample vs. pooled countries but larger sample) lead to the same conclusions.

We also separate effects by gender. While there seems to be no difference regarding COVID vaccination, the effect of schooling on influenza vaccination is even slightly negative for women (but not significantly different from zero). Finally, we ask for potential reasons for

Table 4: Compulsory schooling reforms in Europe and number of observations

			Number of observations	
	Change in years	Pivotal cohort	Sample COVID	Sample influenza
Austria	8-9	1951	1,273	2,636
Belgium: Flanders	8-9	1939	580	1,776
Czech Republic	8-9	1947	1,371	4,012
Denmark	4-7	1947	815	2,645
France	8-10	1953	1,109	3,319
Greece	6-9	1963	971	1,965
Italy	5-8	1949	1,804	3,944
Netherlands	7-9	1936	137	1,620
Spain	6-8	1957	702	1,900
Germany			841	2,682
BW	8-9	1952		
BY	8-9	1954		
HB	8-9	1944		
HH	8-9	1931		
HE	8-9	1951		
NI	8-9	1947		
NRW	8-9	1951		
RLP	8-9	1952		
SL	8-9	1943		
SH	8-9	1933		
Total			9,603	26,499

Notes: The table shows compulsory schooling reforms for each country together with the change in years of compulsory schooling and the first cohort affected by the reform. Information on schooling reforms taken from Begerow and Jürges (2022) for Germany and Schiele and Schmitz (2023) for additional countries.

the small effects of education on vaccination. One factor that comes to mind is health status. Especially at the beginning of the COVID vaccination campaigns, people with underlying health conditions were prioritized to receive a vaccination against COVID-19 (Vygen-Bonnet et al., 2021a; WHO, 2022), as they were most at risk for severe consequences of infection. In line with this it is commonly found that those at risk for severe consequences of a COVID infection are also more likely to get vaccinated (an overview can be found in Cascini et al., 2021). Now, if education improves health, but better health reduces the likelihood to vaccinate against COVID or influenza, it may well be that a direct effect of education on vaccination is offset by an indirect negative effect through the channel of health. It should be noted that the evidence on health effects of compulsory schooling is mixed and many studies find zero effects, see, e.g. Hamad et al. (2018) and Schmitz and Tawiah (2023). We nevertheless test for this by controlling for health status. Specifically, we carry out the same regressions as before but, additionally, we control for binary indicators whether an individual has ever had chronic lung disease, high blood pressure, stroke, cancer or a heart attack or whether they have been sad or depressed in the last month. It is obvious that these variables are potentially endogenous and that a proper mediation

Figure 5: Regression results Europe
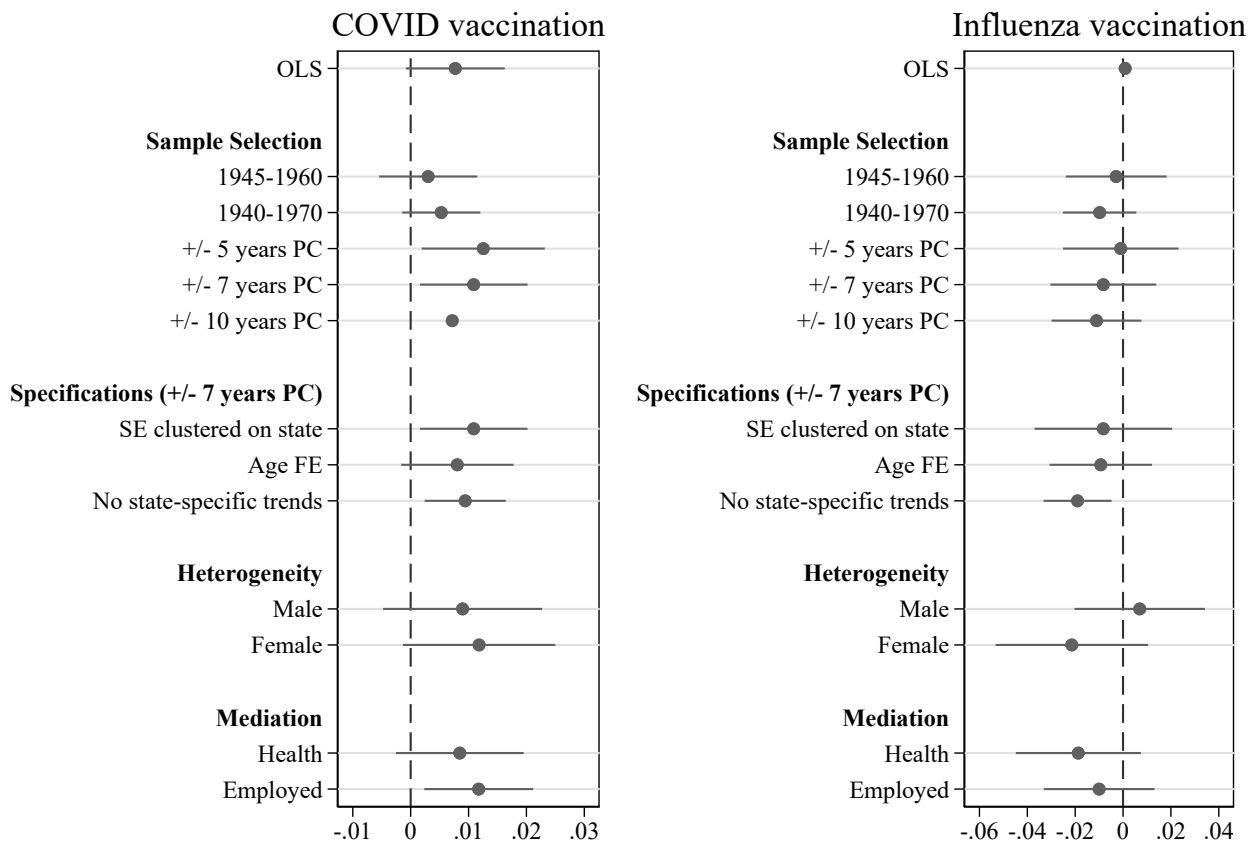
Notes: SHARE data. Note: 90% confidence intervals only. Each dot (except for the first line) is a regression coefficient from 2SLS regressions as before with the same covariates as before.

analysis would also instrument those (as, for instance, done by Frölich and Huber, 2017). Nevertheless, this analysis can give suggestive evidence of the potential relevance of health as a potential channel. A similar analysis was performed by Eibich (2015) and Decker and Schmitz (2016). The result show, that the potential room for health being the reason for the small effect is negligible as the result are almost unaffected by the inclusion of health status.

The same holds for another potential mediator, namely labor force participation. While our sample mainly consists of older individuals outside the labor force, some are around retirement age. Again, education might affect labor force participation and, in turn, labor force participation might affect vaccination. Again, taking an indicator of current employment into account does not affect the results.

6   Further mechanisms: fear of side effects

Turning back to the case of Germany, one advantage of the CASA data is that individuals were asked why they choose to get vaccinated against COVID or why not. In both cases it was possible for individuals to choose multiple options. The following analyses were again carried out using the data on Germany alone.

The reasons for deciding for a vaccination, given by vaccinated individuals, are presented in Figure 6. This question was only included in wave 3. Each bar represents the share of individuals who stated the given option as a reason for receiving a vaccination. The most important reason was *Self Protection*, being important for more than 90% of respondents, followed by *Protection of others*, stated by almost three quarters of participants. In 2021 in Germany, many parts of public life required either COVID vaccination or evidence of absence of COVID infection (that is, a current negative official test result). This was an important factor for more than 40% of the respondents. Other factors played only minor roles for individual decisions.

Figure 6: Reasons for receiving a vaccination
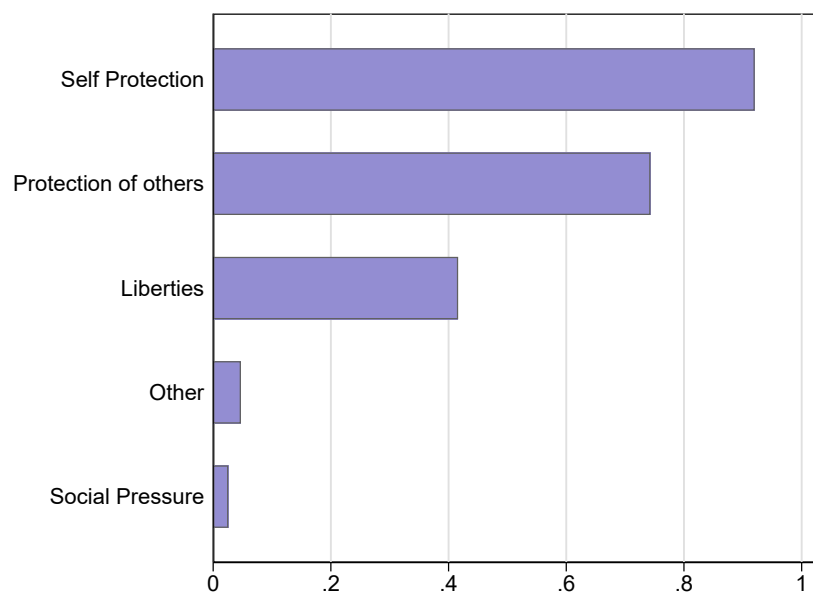
Notes: CASA data. Number of observations: 1,631. Question: "What were the motives for getting vaccinated?"; Answers: *Self Protection* = "To protect my own health.", *Protection of others* = "To protect others." or "Because I have at-risk patients in my environment.", *Liberties* = "Because vaccinated people have more liberties." or "Because the vaccination saves me tests." or "Due to 2G regulations, I can no longer participate in life without vaccination." (*2G* refers to *Geimpft oder genesen* (vaccinated or recovered). 2G regulations meant that only vaccinated or recovered individuals were allowed to enter certain establishments, such as restaurants), *Social Pressure* = "Because of social pressure.".

Figure 7 displays the opposite: reasons why unvaccinated participants did not get vaccinated. This information was collected in waves 2 and 3. We focus on answers that indicate fear of vaccination in any form rather than, e.g., religious beliefs or general distrust in the government. The most important reason against a vaccination was that 45% of the

individuals were afraid of side effects. One fourth wanted to wait to see whether the vaccines are safe or said they were afraid of allergic reactions. 20% said, they did not trust the vaccines in general, while 12% were waiting for results of long-term studies.

Figure 7: Reasons for not receiving a vaccination
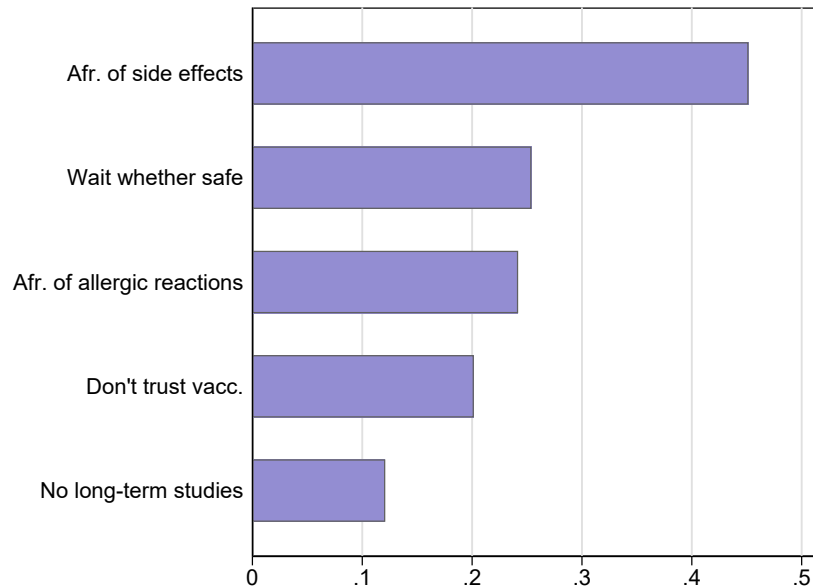
Notes: CASA data. Number of observations: 248. Question: "Why do you not want to be vaccinated or why are you unsure whether you will be vaccinated?"; Answers: *Afr. of side effects* = "I am afraid of side effects.", *Wait whether safe* = "I will wait and see if the vaccine is safe and maybe get vaccinated afterwards.", *Afr. of allergic reactions* = "I am afraid of an allergic reaction to the vaccine.", *Don't trust vacc.* = "I don't trust the vaccination.", *No long-term studies* = "I wait for long-term studies.".

We next investigate whether years of schooling had an impact on reporting fear of side effects. We use OLS and a 2SLS regression in a similar fashion as before – including the same sample selection. The results are presented in Table 5. The outcome variable is a binary indicator equal to one if individuals were afraid of the vaccination, indicated by stating at least one of the options depicted in Figure 7, and zero else. We argue that all indicators measure some sort of fear of side effects. Since only unvaccinated individuals were asked why they did not receive a vaccination, the outcome is not observed for vaccinated individuals. In columns (1) and (3), we include only those individuals who did not receive a vaccination, while in columns (2) and (4) we also include individuals, who received a vaccination. We argue that receiving a vaccination is revealed preference that fear of side effects are *not* a reason for not getting vaccinated and, thus, code the outcome variable as zero.

The OLS results, presented in columns (1) and (2), indicate economically and statistically insignificant associations between education and fear of side effects. The results for the IV estimations are presented in columns (3) and (4). According to them, an additional year of schooling increases fear of side effects by 20 percentage points within the group of unvaccinated individuals. However, this estimate is based on a small sample size and

should thus be interpreted with caution, especially since it is only significant at the 10% level. However, even when including vaccinated individuals the estimate remains positive and large (almost 5 percentage points). Even if it is statistically insignificant, we take from this that education makes individuals more afraid of side effects in our sample.

Table 5: Regressions of fear of side effects

	(1) OLS Sample: No vaccination	(2) OLS Sample: All	(3) IV Sample: No vaccination	(4) IV Sample: All
	Dep. var: Fear of side effects			
Years of schooling	-0.022	-0.001	0.207*	0.047
	(0.020)	(0.002)	(0.116)	(0.033)
Male	-0.033	-0.023***	-0.013	-0.041***
	(0.067)	(0.008)	(0.079)	(0.014)
CASA W2	-0.210***	0.021***	-0.226**	0.022***
	(0.077)	(0.008)	(0.088)	(0.008)
Birth cohort FE	yes	yes	yes	yes
State FE	yes	yes	yes	yes
State-specific birth cohort trend	yes	yes	yes	yes
Observations	238	3,184	238	3,184

Standard errors in parentheses, clustered on birth-cohort $\times$ state level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Only CASA data used here.

7   Conclusion

The literature has shown a positive association between education and vaccination against COVID. Individuals with higher educational attainment are more likely to receive vaccination. However, it is still unclear how this relationship can be explained and whether or not it is causal. Our main contribution to the literature is to present first evidence on the effect of education on COVID vaccination.

We use data on West German individuals from two different data sources to estimate the effect of eduction on COVID and influenza vaccination status. We exploit the widely adopted instrument of compulsory education reforms in an instrumental variables approach as exogenous variation of years of schooling. We do not find any evidence for an effect of schooling on vaccination status in Germany. By extending our analysis to several European countries, we find that years of schooling have a positive but close to zero impact on vaccination status. We do find, however, that education seems to be related to the fear of side effects in Germany. The compliers in our sample report stronger fear of side effects from COVID vaccination as the reason not to be vaccinated due to an additional year of education.

To our knowledge, we are the first to investigate to the causal relationship between schooling and COVID vaccination status and present a result that is in contrast to the well-established positive association between COVID vaccination and education. We stress again that we do not claim that our results can be generalized to other age groups or other education margins (e.g. individuals with higher education) but, on the other hand, argue that our specific set of compliers is a very policy relevant one: individuals who due to their age belong to the high-risk group of a COVID infection. Moreover, individuals with low educational attainment make up a large share of this age group in Germany and Europe.

An important limitation of this study is its small sample size, which we counteract with extending our analysis to multiple European countries at the other drawback of pooling different school systems. Yet the results of both approaches are extremely consistent Finally, our results provide a puzzle on the relationship of education and vaccination, as it remains unclear why an association in the overall population is commonly found while we find only weak evidence. Yet, we argue that it is of scientific value to present evidence on a first part of the general picture of effects of education on vaccination.

Acknowledgments

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Appendix

Table A1: Representativeness of CASA Monitor compared to SOEP

Variable	Mean CASA Monitor	Mean SOEP
Age < 30	0.17	0.14
30 ≤ Age < 50	0.29	0.30
50 ≤ Age < 70	0.33	0.36
70 ≤ Age	0.21	0.20
Male	0.49	0.49
Household size	2.39	2.36
Fulltime work	0.41	0.39
German	0.87	0.94
Married	0.50	0.50
Private health insurance	0.13	0.13
Basic track or less reference	0.35	0.32
Intermediate	0.31	0.32
University-entrance diploma 1	0.27	0.28
University-entrance diploma 2	0.07	0.08
Brandenburg	0.03	0.03
Berlin	0.04	0.04
Baden-Wuerttemberg	0.14	0.13
Bavaria	0.16	0.15
Bremen	0.01	0.01
Hesse	0.08	0.08
Hamburg	0.02	0.02
Mecklenburg-West Pomerania	0.02	0.02
Lower Saxony	0.10	0.10
North Rhine-Westphalia	0.21	0.21
Rhineland Palatinate	0.05	0.05
Schleswig Holstein	0.03	0.04
Saarland	0.01	0.01
Saxony	0.05	0.06
Saxony-Anhalt	0.03	0.03
Thuringia	0.03	0.03
Observations	10,251	22,101

Notes: CASA monitor data, wave 3, from January 2022 and SOEP wave 37 from 2020. Means in both samples weighted by sampling weights.

Table A2: OLS Regressions without sample selection

	(1) COVID vaccination	(2) Influenza vaccination
Years of schooling	0.014***	0.010**
	(0.002)	(0.005)
Male	0.013**	-0.020
	(0.005)	(0.015)
CASA W2	-0.078***	
	(0.009)	
CASA W3	0.058***	
	(0.009)	
SHARE W1		-0.340***
		(0.020)
SHARE W2		-0.264***
		(0.026)
SHARE W8		-0.145***
		(0.014)
Observations	17,570	5,499

Standard errors in parentheses, clustered on birth-cohort $\times$ state level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Supplementary materials: Questionnaire Casa monitor

CASA Monitor Health Januar 2022

Remark:

The values -66, -77 and -99 are always assigned as follows:

	-66	TNZ (Question not seen)
	-77	TNZ (Filtered out)
	-99	Not answered

9.2.1 1.1 (PGID 5875291)

You are… (q_4840307 - Typ 111)

sex	int	1.1	
	1	*Male*
	2	*Female*
	3	*Diverse*

9.2.2 1.2 (PGID 5875292)

Age (q_4840308 - Typ 141)

age	varchar	1.2

9.4.1 2.1 (PGID 5875303)

Have you, a family member or someone close to you been diagnosed with a Corona infection? (q_4840317 - Typ 111)

v_75	int	2.1	
	1	*No*
	2	*Yes, me.*
	3	*Yes, a member of my household.*
	4	*Yes, someone in my circle of acquaintances.*
	5	*Yes, someone at work or at the training place.*

9.4.2 2.2 Filter (PGID 5875304)

9.4.2.1 2.2 (PGID 5875305)

Can you already be vaccinated after the infection? (q_4840318 - Typ 111)

v_76	int	2.2	
	1	*Yes*
	2	*No*

9.4.3 2.3 (PGID 5875306)

Have you been vaccinated against the coronavirus? (q_4840319 - Typ 111)

v_77	int	2.3	
	1	*Yes*
	2	*No*

9.4.4 2.4 Filter (PGID 5879656)

9.4.4.1 2.4 (PGID 5875394)

When did you receive your first vaccination? (q_4840403 - Typ 131)

v_78	int	2.4_Text

(q_4840404 - Typ 131)

v_79	int	2.4_Monat	
	1	*January*
	2	*February*
	3	*March*

4	*April*	
5	*May*	
6	*June*	
7	*July*	
8	*August*	
9	*September*	
10	*October*	
11	*November*	
12	*December*	

(q_4840405 - Typ 131)

v_80	int	2.4_Jahr
	1	*2020*
	2	*2021*
	3	*2022*

9.4.5   2.5 Filter (PGID 5875395)

9.4.5.1 2.5 (PGID 5875396)

Will you get vaccinated against the coronavirus? (q_4840406 - Typ 111)

v_81	int	2.5
	1	*Yes, as soon as possible.*
	2	*Yes, but I'll wait a little longer.*
	3	*I haven't decided yet whether I will get vaccinated.*
	4	*No.*

9.4.6   2.6-2.7 Filter (PGID 5875397)

9.4.6.1 2.6 (PGID 5875398)

Are you fully vaccinated? (q_4840407 - Typ 111)

v_82	int	2.6
	1	*Yes, I am already fully vaccinated.*
	2	*No, I still need a second vaccination for full vaccination protection.*

9.4.6.2 2.7 (PGID 5875399)

What were your motives for getting vaccinated? (q_4840408 - Typ 121)

v_336		int	For own health protection
		0	*not quoted*
		1	*quoted*
v_337		int	To protect others
		0	*not quoted*
		1	*quoted*
v_338		int	Because I have high-risk patients in my environment
		0	*not quoted*
		1	*quoted*
v_339		int	Because vaccinated people have more freedom
		0	*not quoted*
		1	*quoted*
v_340	v_ebee	int	Because vaccination means I have to do fewer tests
		0	*not quoted*
		1	*quoted*
v_341		int	Due to social pressure
		0	*not quoted*

v_342	int	Due to 2G regulations, I can no longer participate in society without vaccination
	0	*not quoted*
	1	*quoted*
v_343	int	The high incidences have led me to vaccinate
	0	*not quoted*
	1	*quoted*
v_344	int	I would like to get ahead of the possible compulsory vaccination
	0	*not quoted*
	1	*quoted*
v_346	int	Other:
	0	*not quoted*
	1	*quoted*
v_347	varchar	Other:

1   *quoted*

9.4.7   2.8 Filter (PGID 5875400)

9.4.7.1 2.8 (PGID 5875401)

Have you already received a booster vaccination? (q_4840409 - Typ 111)

v_84	int	2.8
	1	*Yes*
	2	*No*

9.4.8   2.9 Filter (PGID 5875402)

9.4.8.1 2.9 (PGID 5875403)

Would you like to receive a booster vaccination? (q_4840410 - Typ 111)

v_85	int	2.9
	1	*Yes, definitely.*
	2	*No, I feel sufficiently protected as it is.*
	3	*No, I had very severe side effects from the vaccination and therefore do not want to receive my booster vaccination.*

9.4.9   2.10 Filter (PGID 5875404)

9.4.9.1 2.10 (PGID 5875405)

Why do you not want to be vaccinated or why are you unsure whether you will be vaccinated? (q_4840411 - Typ 121)

v_91	int	I am afraid of side effects.
	0	*not quoted*
	1	*quoted*
v_92	int	I am waiting for long-term studies.
	0	*not quoted*
	1	*quoted*
v_93	int	I am waiting for an inactivated vaccine to be approved.
	0	*not quoted*
	1	*quoted*
v_94	int	I am afraid of an allergic reaction to the vaccine.
	0	*not quoted*
	1	*quoted*
v_95	int	I don't know if the vaccine works.
	0	*not quoted*
	1	*quoted*

v_96	int	I do not think I need a Corona vaccination.
	0	*not quoted*
	1	*quoted*
v_97	int	I do not like vaccinations.
	0	*not quoted*
	1	*quoted*
v_98	int	My doctor did not advise me to get vaccinated.
	0	*not quoted*
	1	*quoted*
v_99	int	I will wait to see if the vaccine is safe and maybe get vaccinated after that.
	0	*not quoted*
	1	*quoted*
v_100	int	I am concerned about the cost of vaccination.
	0	*not quoted*
	1	*quoted*
v_101	int	I do not trust the vaccination.
	0	*not quoted*
	1	*quoted*
v_102	int	I do not trust the government.
	0	*not quoted*
	1	*quoted*
v_103	int	Vaccination goes against my religious beliefs.
	0	*not quoted*
	1	*quoted*
v_104	int	I am pregnant/breastfeeding/planning to become pregnant.
	0	*not quoted*
	1	*quoted*
v_105	int	Other:
	0	*not quoted*
	1	*quoted*
v_106	varchar	Other:

9.4.10   2.11 Filter (PGID 5875406)

9.4.10.1 2.11 (PGID 5875407)

Why do you think you do not need vaccination? (q_4840412 - Typ 121)

v_123	int	I already had Corona.
	0	*not quoted*
	1	*quoted*
v_124	int	I do not need vaccination because enough other people get vaccinated.
	0	*not quoted*
	1	*quoted*
v_125	int	I do not spend time with people who belong to the risk group.
	0	*not quoted*
	1	*quoted*
v_126	int	I do not belong to the risk group.
	0	*not quoted*
	1	*quoted*
v_127	int	I will wear masks for protection instead.
	0	*not quoted*
	1	*quoted*

v_128	int	I do not think corona is a serious disease.
	0	*not quoted*
	1	*quoted*
v_129	int	I do not think vaccinations are helpful.
	0	*not quoted*
	1	*quoted*
v_130	int	Other:
	0	*not quoted*
	1	*quoted*
v_131	varchar	Other:

9.4.11 2.12 Filter (PGID 5875408)

9.4.11.1 2.12 (PGID 5875409)

Would you get vaccinated if you ... (q_4840413 - Typ 311)

v_143	int	… would have the chance to win 1 million euros in a "vaccination lottery" after vaccination?
	1	*Yes*
	2	*No*
v_144	int	… would no longer have to wear a mask after vaccination?
	1	*Yes*
	2	*No*
v_145	int	… would no longer have to observe the pandemic containment measures after vaccination?
	1	*Yes*
	2	*No*

9.4.12 2.13 (PGID 5875410)

Do you have children between 12 and 18? (q_4840414 - Typ 111)

v_146	int	2.13
	1	*Yes*
	2	*No*

9.4.13 2.14 Filter (PGID 5875411)

9.4.13.1 2.14 (PGID 5875412)

Have you had your children (between 12 and 18) vaccinated? (q_4840415 - Typ 111)

v_147	int	2.14
	1	*Yes*
	2	*No*

9.4.14 2.15 (PGID 5875413)

Do you have children under 12? (q_4840416 - Typ 111)

v_148	int	2.15
	1	*Yes*
	2	*No*

9.4.15 2.16 Filter (PGID 5875414)

9.4.15.1 2.16 (PGID 5875415)

Would you like to have your child(ren) under 12 vaccinated? (q_4840417 - Typ 111)

v_149	int	2.16
	1	*Yes, as soon as this offer exists.*
	2	*I have not yet decided whether I will have my children vaccinated.*
	3	*No.*

9.4.16 (2.16 = 2 oder 3). (PGID 5875416)

9.4.16.1 2.17 (PGID 5875417)

Would you have your child(ren) under 12 vaccinated if it returned the school routine to normal? (q_4840418 - Typ 111)

v_150	int	2.17
	1	*Yes*
	2	*No*

9.4.16.2 2.18 (PGID 5875418)

Why do you not want to have your child(ren) under 12 vaccinated or why are you unsure if you will have them vaccinated? (q_4840419 - Typ 121)

v_160	int	In my circle of acquaintances, no one has their own children vaccinated.
	0	*not quoted*
	1	*quoted*
v_161	int	I am afraid of side effects.
	0	*not quoted*
	1	*quoted*
v_162	int	My child(ren) is/are too young to have it/them vaccinated.
	0	*not quoted*
	1	*quoted*
v_163	int	I think vaccination is unnecessary because everyone else gets vaccinated.
	0	*not quoted*
	1	*quoted*
v_164	int	I am afraid of an allergic reaction to the vaccine.
	0	*not quoted*
	1	*quoted*
v_165	int	I do not know if the vaccine works.
	0	*not quoted*
	1	*quoted*
v_166	int	I do not believe my child(ren) need(s) a Corona vaccination.
	0	*not quoted*
	1	*quoted*
v_167	int	I do not like vaccinations with my child(ren).
	0	*not quoted*
	1	*quoted*
v_168	int	The pediatrician did not advise me to have my child(ren) vaccinated.
	0	*not quoted*
	1	*quoted*
v_169	int	I will wait to see if the vaccine is safe and maybe have my child(ren) vaccinated after that.
	0	*not quoted*
	1	*quoted*
v_170	int	I think others need the vaccination more urgently at the moment.
	0	*not quoted*
	1	*quoted*
v_171	int	I am concerned about the cost of vaccination.
	0	*not quoted*
	1	*quoted*
v_172	int	I do not trust the vaccination.
	0	*not quoted*
	1	*quoted*

v_173	int	I do not trust the government.
	0	*not quoted*
	1	*quoted*
v_174	int	Vaccination goes against my religious beliefs.
	0	*not quoted*
	1	*quoted*
v_175	int	Other:
	0	*not quoted*
	1	*quoted*
v_176	varchar	Other:

9.4.17 2.19 Filter (PGID 5875419)

9.4.17.1 2.19 (PGID 5875420)

Why haven't you had your child(ren) between 12 and 18 vaccinated? (q_4840420 - Typ 121)

v_194	int	In my circle of acquaintances, no one has their own children vaccinated.
	0	*not quoted*
	1	*quoted*
v_195	int	I am afraid of side effects.
	0	*not quoted*
	1	*quoted*
v_196	int	My child(ren) is/are too young to have it/them vaccinated.
	0	*not quoted*
	1	*quoted*
v_197	int	I think vaccination is unnecessary because everyone else gets vaccinated.
	0	*not quoted*
	1	*quoted*
v_198	int	I am afraid of an allergic reaction to the vaccine.
	0	*not quoted*
	1	*quoted*
v_199	int	I do not know if the vaccine works.
	0	*not quoted*
	1	*quoted*
v_200	int	I do not believe my child(ren) need(s) a Corona vaccination.
	0	*not quoted*
	1	*quoted*
v_201	int	I do not like vaccinations with my child(ren).
	0	*not quoted*
	1	*quoted*
v_202	int	The pediatrician did not advise me to have my child(ren) vaccinated.
	0	*not quoted*
	1	*quoted*
v_203	int	I will wait to see if the vaccine is safe and maybe have my child(ren) vaccinated after that.
	0	*not quoted*
	1	*quoted*
v_204	int	I think others need the vaccination more urgently at the moment.
	0	*not quoted*
	1	*quoted*
v_205	int	I am concerned about the cost of vaccination.
	0	*not quoted*
	1	*quoted*

v_206	int	I do not trust the vaccination.
	0	*not quoted*
	1	*quoted*
v_207	int	I do not trust the government.
	0	*not quoted*
	1	*quoted*
v_208	int	Vaccination goes against my religious beliefs.
	0	*not quoted*
	1	*quoted*
v_209	int	Other:
	0	*not quoted*
	1	*quoted*
v_210	varchar	Other:

9.5 3 Home office & work situation (PGID 5875421)

9.5.1 3.1 (PGID 5875422)

What is or was your occupational position in your main job? (q_4840421 - Typ 111)

v_211	int	3.1
	1	*Employee*
	2	*Worker*
	3	*Official*
	4	*Academic in independent profession (doctor, lawyer, tax consultant, etc.)*
	5	*Self-employed farmer*
	6	*Self-employed in trade, hospitality, crafts, industry, services*
	7	*Contributing family member*
	8	*Other*
	9	*I have never been employed (yet)*

9.5.2 3.2 (PGID 5875423)

What is your main occupation at the moment? (q_4840422 - Typ 111)

v_212	int	3.2
	1	*Full-time employed (35 hours and more)*
	2	*Part-time employed (15 to less than 35 hours per week)*
	3	*In partial retirement*
	4	*Marginally employed in a mini-job (up to 450€)*
	5	*Occasionally or irregularly employed*
	6	*In-company training/apprenticeship*
	7	*In retraining*
	8	*In the Federal Volunteer Service / Voluntary Social Year / Voluntary Ecological Year / Voluntary Military Service*
	9	*On maternity leave, parental leave or other leave of absence*
	10	*Not employed (incl. students who do not work for money, unemployed, early retirees, pensioners)*
	11	*In education*
	12	*Employed in a "one-euro" job*
	13	*No information*

9.5.3 3.3-3.4 Filter (PGID 5875424)

9.5.3.1 3.3 (PGID 5875425)

How has your work situation changed due to the Corona virus situation? What applies to you?

(q_4840423 - Typ 311)

v_213	int	I am currently working unchanged, as before the Corona pandemic.
	1	*Yes*
	2	*No*
v_362	int	I work entirely or mostly from home (in home office).
	1	*Yes*
	2	*No*
v_363	int	I work short time.
	1	*Yes*
	2	*No*
v_364	int	I have been given notice.
	1	*Yes*
	2	*No*

9.5.3.2 3.4 (PGID 5875426)

Does your job basically allow you to work from home (at least partially)? (q_4840424 - Typ 111)

v_217	int	3.4
	1	*Yes*
	2	*No*

9.5.4 3.5-3.6 Filter (PGID 5875427)

9.5.4.1 3.5 (PGID 5875428)

In principle, what proportion of your weekly working time could you perform from home? (q_4840425 - Typ 111)

v_218	int	3.5
	1	*100%*
	2	*Less than 100%, namely %s %*
v_219	varchar	Less than 100%, namely %s %

9.5.4.2 3.6 (PGID 5875429)

Does your employer offer you to work in home office? (q_4840426 - Typ 111)

v_220	int	3.6
	1	*Yes, generally without restrictions*
	2	*Yes, during home office duty without restrictions*
	3	*Yes, but with restrictions*
	4	*No*

9.5.5 3.7 Filter (PGID 5875430)

9.5.5.1 3.7 (PGID 5875431)

Do you work less in home office than your employer offers you? (q_4840427 - Typ 111)

v_222	int	3.7
	1	*No, I work as much as offered in home office.*
	2	*Yes, I work less in home office than I am offered.*

9.5.6 3.8 Filter (PGID 5875432)

9.5.6.1 3.8 (PGID 5875433)

For what reasons do you work less in home office than you are allowed to? (q_4840428 - Typ 121)

v_348	int	Personal exchange with colleagues is important to me.
	0	*not quoted*
	1	*quoted*
v_349	int	Personal contact with superiors and personal networking within the company are

		important to me.
	0	*not quoted*
	1	*quoted*
v_350	int	My living conditions are not suitable for home office.
	0	*not quoted*
	1	*quoted*
v_351	int	The separation of work and private life is important to me.
	0	*not quoted*
	1	*quoted*
v_352	int	I work more productively at work than at home.
	0	*not quoted*
	1	*quoted*
v_360	int	Other:
	0	*not quoted*
	1	*quoted*
v_361	varchar	Other:

9.5.7   3.9 Filter (PGID 5875434)

9.5.7.1 3.9 (PGID 5875435)

In your opinion, what is the main reason your employer does not offer or restricts home office?
(q_4840429 - Typ 111)

v_224	int	3.9
	1	*Presence/face-to-face interaction with colleagues is important to supervisors*
	2	*Lack of technical equipment in home office*
	3	*My employer fears less performance in home office*

9.5.8   3.10 Filter (PGID 5875436)

9.5.8.1 3.10 (PGID 5875437)

How many full days per week did you work in home office before the pandemic? (q_4840430 - Typ 141)

v_225	varchar	3.10

9.5.9   3.11 Filter (PGID 5875438)

9.5.9.1 3.11 (PGID 5875439)

How many full days do you currently work in home office? (q_4840431 - Typ 141)

v_226	varchar	3.11

9.5.10   3.12-3.14 Filter (PGID 5875440)

9.5.10.1 3.12 (PGID 5875441)

How many full work days (per week) would you like to work in home office after the pandemic?
(q_4840432 - Typ 141)

v_227	varchar	3.12

9.5.10.2 3.13 (PGID 5875442)

How many full home office work days (per week) does your employer plan to offer after the pandemic?
(q_4840433 - Typ 141)

v_228	varchar	3.13

(q_4840434 - Typ 121)

v_229	int	Do not know
	0	*not quoted*
	1	*quoted*

9.5.10.3 3.14 (PGID 5875443)

Do you live with a partner? (q_4840435 - Typ 111)

v_234	int	3.14
	1	*Yes*
	2	*No*

9.5.10.4 3.15 Filter (PGID 5875444)

9.5.10.4 3.15 (PGID 5878241)

Does your partner work in home office? (q_4842571 - Typ 111)

v_327	int	3.15
	1	*No, my partner does not work in home office.*
	2	*Yes, my partner works %s days a week in home office.*
	3	*No, my partner is not employed.*
v_330	varchar	Yes, my partner works %s days a week in home office.

9.5.11   3.16-3.23 Filter (PGID 5875447)

9.5.11.1 3.16 (PGID 5875448)

In which economic sector do you work? (q_4840442 - Typ 111)

v_240	int	3.16
	1	*Agriculture, forestry and fishing*
	2	*Mining and quarrying*
	3	*Manufacturing industry*
	4	*Energy supply*
	5	*Water supply: Sewage and waste disposal and elimination of environmental pollution*
	6	*Construction*
	7	*Retail/wholesale or trade, maintenance or repair of motor vehicles*
	8	*Hospitality*
	9	*Transport and storage*
	10	*Information and communication*
	11	*Provision of financial and insurance services*
	12	*Land and housing*
	13	*Provision of freelance, scientific and technical services*
	14	*Public administration, defense; social security*
	15	*Education*
	16	*Health and social services*
	17	*Art, entertainment and recreation*
	18	*Other service activities*
	19	*Private households with domestic staff; production of goods and provision of services by private households for own use with no distinctive focus*
	20	*Extraterritorial organizations and entities*
	21	*Other:*
v_241	varchar	Other:

9.5.11.2 3.17 (PGID 5875449)

In which economic sector/industry/service sector is the company/institution in which you work predominantly active? Please state the exact designation, e.g. not "industry" but "electrical industry"; not "trade" but "retail trade" etc. (q_4840443 - Typ 141)

| v_242 | varchar | 3.17 |

9.5.11.3 3.18 (PGID 5875450)

What is the size of the company where you work? (q_4840444 - Typ 111)

v_243   int   3.18

         1   *Micro-enterprise (less than 10 employees)*

         2   *Small company (10 to 49 employees)*

         3   *Medium-sized company (50 to 249 employees)*

         4   *Large company (over 250 employees)*

9.5.11.4 3.19 (PGID 5887557)

What is the postal code of your employer? (q_4850018 - Typ 141)

v_353   varchar   3.19

9.5.11.5 3.20 (PGID 5875452)

How far is your employer from your home (one-way distance in km)? (q_4840446 - Typ 141)

v_246   varchar   3.20

9.5.11.6 3.21 (PGID 5875453)

How do you usually travel to work? (q_4840447 - Typ 111)

v_247   int   3.21

         1   *By bike/On foot*

         2   *By car*

         3   *By public transport*

         4   *I work 100% in home office*

9.5.11.7 3.22 (PGID 5875454)

How do you expect the number of employees in your company to develop in the next 6 months?
(q_4840448 - Typ 111)

v_248   int   3.22

         1   *The number will rather increase*

         2   *Rather constant*

         3   *The number will rather decrease*

9.5.11.8 3.23 (PGID 5875455)

What is the name of the company where you work? (q_4840449 - Typ 141)

v_249   varchar   3.23

(q_4840450 - Typ 121)

v_250   int   No information

         0   *not quoted*

         1   *quoted*

9.6.4   4.3 (PGID 5875462)

How fast is your Internet connection at home (according to your contract)? (q_4840455 - Typ 111)

v_254   int   4.3

         1   *50 Mbit/s or less*

         2   *100 Mbit/s*

         3   *250 Mbit/s*

         4   *500 Mbit/s or more*

         5   *I do not have a home Internet contract*

         6   *Do not know*

9.6.5   4.4-4.5 Filter (PGID 5875464)

9.6.5.1   4.4 (PGID 5875465)

How much do you pay per month for your Internet contract (also combination contracts with fixed

network, cable TV, etc.)? (q_4840456 - Typ 111)

v_255	int	4.4
	1	*Less than 20€*
	2	*20 to 30€*
	3	*30 to 40€*
	4	*40 to 50€*
	5	*More than 50€*
	6	*Do not know*

9.6.5.2   4.5 (PGID 5875466)

What is included in this contract? (q_4840457 - Typ 111)

v_256	int	4.5
	1	*Internet only*
	2	*Internet and fixed line*
	3	*Internet and additional services (cable TV, streaming subscriptions, etc.)*
	4	*Internet, fixed network and additional services (cable TV, streaming subscriptions , etc.)*

9.6.6   4.6 (PGID 5875468)

Do you have a mobile Internet contract for the smartphone? (q_4840458 - Typ 111)

v_257	int	4.6
	1	*Yes*
	2	*No*

9.6.7   4.7-4.8 Filter (PGID 5875469)

9.6.7.1   4.7 (PGID 5875471)

How much monthly data volume is included in your mobile Internet contract? (q_4840459 - Typ 111)

v_258	int	4.7
	1	*Under 1 GB*
	2	*1 to under 5 GB*
	3	*5 to under 10 GB*
	4	*10 to under 50 GB*
	5	*50 to under 100 GB*
	6	*100 GB or more or unlimited*
	7	*Do not know*

9.6.7.2   4.8 (PGID 5875472)

How much do you pay for the smartphone plan including the monthly data volume? (q_4840460 - Typ 111)

v_259	int	4.8
	1	*Less than 10€*
	2	*10 to under 20€*
	3	*20 to under 30€*
	4	*30 to under 50€*
	5	*More than 50€*
	6	*Do not know*

9.9   7 Political participation (PGID 5875500)

9.9.1   7.1 (PGID 5875501)

Which party would you vote for if federal elections were held next Sunday? (q_4840482 - Typ 111)

| v_296 | int | 7.1 |
| | 1 | *CDU / CSU* |

2	*SPD*	
3	*Bündnis 90 / Grüne*	
4	*FDP*	
5	*Die Linke*	
6	*AfD*	
7	*Another party*	
8	*Would not vote*	
9	*I am indecisive*	
10	*Do not know*	
11	*No information*	

9.9.2   7.2 (PGID 5875502)

The last federal election was on September 26, 2021. Which party did you vote for? (q_4840483 - Typ 111)

v_297   int   7.2

1	*CDU / CSU*	
2	*SPD*	
3	*Bündnis 90 / Grüne*	
4	*FDP*	
5	*Die Linke*	
6	*AfD*	
7	*Another party*	
8	*I have not voted*	
9	*Do not know*	
10	*No information*	

9.10   8 Basic questions (PGID 5875503)

9.10.1   8.1 (PGID 5875504)

Please indicate your marital status. (q_4840484 - Typ 111)

famstan   int   8.1

1	*Single*	
2	*Married*	
3	*Widowed*	
4	*Divorced*	
5	*Registered civil partnership*	

9.10.2   8.2 (PGID 5875505)

What is your highest level of schooling or education? (q_4840485 - Typ 111)

schulbil   int   8.2

1	*Still in school education*	
2	*Basic track*	
3	*Intermediate track*	
4	*University entrance diploma (Fachhochschulreife)*	
5	*University entrance diploma (Abitur)*	
6	*Without graduation*	

9.10.3   8.3 (PGID 5875506)

What is your highest professional degree? (q_4840486 - Typ 111)

ausbild   int   8.3

1	*Apprenticeship / vocational training in the dual system*	
2	*Specialized school degree*	
3	*Graduation from a technical college or university of cooperative education*	

4			*Polytechnic degree*
5			*University degree*
6			*Doctorate*
7			*I do not have a professional degree*

9.10.4 8.4 (PGID 5875507)

What is your current occupational status? (q_4840487 - Typ 111)

erwstat   int   8.4

1	*Pupil*
2	*Student*
3	*Unskilled worker (without education)*
4	*Qualified worker (with education)*
5	*Employee*
6	*Executive employee*
7	*Managing director*
8	*Authorized signatory*
9	*Civil servant (incl. judge and professional soldier)*
10	*Self-employed*
11	*Trainee*
12	*Househusband / housewife*
13	*Unemployed / Jobseeker*
14	*Unable to work*
15	*Pensioner*

9.10.5 8.5 (PGID 5875508)

What is your nationality? (q_4840488 - Typ 111)

v_302   int   8.5

1	*German*
2	*Other, namely:*
3	*German and other, namely:*

v_303   varchar   Other, namely:
v_304   varchar   German and other, namely:

9.10.6 8.6 (PGID 5875510)

Do you have private or statutory health insurance? (q_4840489 - Typ 111)

v_305   int   8.6

1	*Private*
2	*Statutory*

9.10.7 8.7 (PGID 5875511)

What is the total monthly household net income? (q_4840490 - Typ 111)

hh_eink   int   8.7

1	*Up to 1,000 euro*
2	*Over 1,000 to 1,500 euro*
3	*Over 1,500 to 2,500 euro*
4	*Over 2,500 to 3,500 euro*
5	*Over 3,500 to 5,000 euro*
6	*Over 5,000 euro*

9.10.8 8.8 (PGID 5875512)

How many people live in your household? (q_4840491 - Typ 141)

hh_groe   varchar   8.8

9.10.9 8.9-8.10 Filter (PGID 5875514)

9.10.9.1 8.9 (PGID 5875516)

How many of them are under 18 years old? (q_4840494 - Typ 141)

v_310   varchar   8.9

9.10.9.2 8.10 (PGID 5875517)

And how many of them are under 12 years old? (q_4840496 - Typ 141)

v_311   varchar   8.10

gewicht_kal   calibrated weight