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COVID-19: a crisis of the female self-employed*

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Abstract

We investigate how the economic consequences of the pandemic, and of the government-mandated measures to contain its spread, affected the self-employed relative to employed individuals in Germany and, secondly, to what extent the female self-employed were more strongly hit than their male counterparts. For our analysis, we use representative real-time survey data in which respondents were asked about their situation during the COVID-19 pandemic. Our findings indicate that self-employed individuals were much more likely to suffer income losses than employees. Among the self-employed, women were 35% more likely to experience income losses than men, as women are disproportionately working in industries that are more severely affected by the COVID-19 pandemic. We conclude that future policy measures intended to mitigate such shocks should account for this variation in economic hardship.

Keywords: Self-employed, COVID-19, income, gender, representative real-time survey data, decomposition methods
JEL codes: L26, J16, J31, J71, I18.

*Correspondence to: Alexander Kritikos, University of Potsdam, August-Bebel-Str. 89, 14482 Potsdam, Germany, Email: kritikos@uni-potsdam.de. The authors declare that they have no conflict of interest. This survey is part of the project "SOEP-CoV The Spread of the Coronavirus in Germany: Socio-Economic Factors and Consequences", funded by the German Federal Ministry of Education and Research (BMBF). The data can be accessed via the research data center of the SOEP. We would like to thank Charlene Kalenkoski, Johannes König, Julia Schmieder and Diemo Urbig for valuable comments. The authors declare they have no conflict of interest.

1 Introduction

The unprecedented shutdown of businesses in specific industries, social distancing guidelines, and overall insecurity caused by the COVID-19 pandemic resulted in the temporary closure of major parts of the economy in many countries. The service sector, which often necessitates physical proximity between supplier and consumer, was particularly affected. At the same time, this sector depends more on self-employed individuals than, for instance, the manufacturing sector, where the vast majority of workers are dependent employees.

First descriptive evidence shows that the self-employed population is suffering relatively more from this disruption than other parts of the working population. In Germany, 60% of the self-employed faced sales and income losses between March and May 2020, a period dominated by the nationwide shutdown, while less than 20% of employed individuals confronted earnings losses (Kritikos et al., 2020).

Moreover, the COVID-19 pandemic triggered a public debate as to what extent the female working population, in particular the female self-employed, experienced greater income and employment reduction (Kalenkoski and Pabilonia, 2020). This is relevant given that women are often the primary caretakers in the family and, as such, were also affected by the closure of schools and daycare centers (Alon et al., 2020). There is first descriptive evidence pointing to stronger negative effects for female self-employed individuals, reinforcing the notion that public policies implemented to contain the pandemic hit them particularly hard.[1]

Therefore, the main aim of this paper is twofold. First, we analyze how the COVID-19 pandemic and non-pharmaceutical interventions (NPI) affected self-employed individuals, both generally and in comparison to employed individuals. Second, we investigate to what extent self-employed women were more strongly influenced by the economic consequences related to the pandemic than their male counterparts.

In Germany, around 4.2 million individuals (about ten percent of the working population) are self-employed, either without any employees (so called non-employers) and sometimes

[1] see e.g. Ifo Institute and forsa (2020) for Germany and Kalenkoski and Pabilonia (2020) for the U.S..

with hourly earnings around the minimum wage (Sorgner et al., 2017) or with employees, often running micro businesses with fewer than 10 employees (employers). This diverse population of self-employed people that grew strongly since the 1990s is an increasingly important part of the German economy, from both the labor market and economic perspectives. This role is not limited to creating their own and other jobs. In several parts of the service sector, such micro businesses are the backbone of the economy, where the largest share of individuals, more than 30% of all workers, are employed in firms with 10 or fewer employees (Audretsch et al., 2020). Given the relevance of the sum of all self-employed workers (non-employers and employers) for the German economy and given that a large share of them are facing strong losses in sales and incomes during the COVID-19 crisis, their survival and ongoing struggles are of high concern for policy makers.

In order to contain the virus, the German government imposed strong restrictions beginning in March 2020. The NPIs included the closure of schools, daycare centers, restaurants, most shops – with exceptions made for grocery stores – and service companies in the field of personal hygiene. Furthermore, all events were canceled, travel restricted, and hotels were allowed to be open for minimum services only. Moreover, meetings in public were restricted to two individuals, while people were required to keep a minimum distance of 1.5 meters from other people in public spaces.

The German government also introduced several policy measures to mitigate the economic consequences of the COVID-19 pandemic, including *Kurzarbeit*, the well established short-time work compensation scheme through which the government covers up to 67% of employees' net earnings, and an emergency aid package of €50 billion for self-employed workers and micro-enterprises. This program supported self-employed individuals who faced strong losses in sales, with lump sum payments of up to €15,000, the use of which was limited to cover fixed operating costs. In addition, the self-employed received somewhat easier access to unemployment benefits II (*Arbeitslosengeld 2*) (Federal Ministry for Economic Affairs and Energy, 2020).

Self-employed workers in other countries suffered in a similar way: For the U.K., Blundell and Machin (2020) show that three out of four self-employed individuals report a reduced work load. Further, the number of active business owners declined by about 22% in the U.S. This is the largest drop ever recorded (Fairlie, 2020). Kalenkoski and Pabilonia (2020), who focus on unincorporated self-employed workers, reveal that they were about 57 percentage points less likely to be employed in April 2020, relative to February. In Canada, self-employment also fell very strongly. Beland et al. (2020) report an activity decline of 14.8% for incorporated and 10.1% for unincorporated entities. These examples show that the decline of self-employment in response to the pandemic is a global phenomenon.

Our analysis proceeds in two steps. We start by documenting the differential impact of the COVID-19 pandemic on self-employed and employees. In the second step, we analyze the gender gap in the labor market outcomes of the self-employed. For this purpose, we use the Socio-Economic Panel-CoV (SOEP-CoV), a data set sufficiently rich to allow for such a comparison because it enables us to control for individual-level heterogeneity to a large extent. SOEP-CoV is a randomly selected subset of respondents from the SOEP who were asked to answer a wide array of questions about their economic situation, family situation, health, the use of public support instruments, as well as attitudes during the COVID-19 pandemic. The SOEP is a representative household panel in Germany that surveys respondents annually since 1984 (Goebel et al., 2019). By design, the SOEP-CoV allows us to link individual respondents to their pre-crisis information. Thus, we can exploit rich information on the respondents, including their pre-crisis household income, education, household characteristics, personality traits, and employment experience, among others. Therefore, we are also able to analyze whether other individual characteristics, known to be important for entrepreneurial status, influenced outcomes during the COVID-19 pandemic.[2]

With this data at hand, we perform multivariate analyses to compare the gap in labor market outcomes between employed and self-employed respondents. We show that the differ-

[2]See Parker (2018) for an extensive overview over which individual characteristics influence entrepreneurial development.

ence in the influence of the COVID-19 pandemic and associated NPIs is not primarily driven by differences in characteristics or selection into different industries, but by differences in the association of these characteristics with the respective outcomes. Rather, the pandemic shock hit them harder across the board. A likely driver for this differential impact are wage rigidities. The main mechanisms through which employees with fixed employment contracts may face income losses or reductions in working hours are job losses or their employer's participation in short-time work schemes (*Kurzarbeit*). This serves as a protective shield for employees - one that the self-employed do not have.

Turning to gender differences in the influence of the COVID-19 pandemic on the self-employed, we find that self-employed women are about one-third more likely to experience income losses due to the COVID-19 pandemic compared to self-employed men. Decomposing this gender gap in income losses using the Gelbach decomposition (Gelbach, 2016)[3], we find that the largest share of this gender difference is attributable to industry characteristics, suggesting that self-employed women are disproportionately working in industries that are more severely affected by the COVID-19 pandemic compared to men. Conversely, we do not find a gender gap in income losses among employees. We also note a gender gap in the extent to which self-employed individuals are affected by policy measures (rules), notably regulations of opening hours, which likely translates into income losses. This is consistent with the observation that self-employed women work more frequently in service industries.[4]

We contribute to the literature in two ways. To date, there are several studies investigating the effects of the COVID-19 pandemic on the overall employment (Cajner et al., 2020; Chetty et al., 2020; Coibion et al., 2020; Forsythe et al., 2020; Juranek et al., 2020), and on gender specifically (Adams-Prassl et al., 2020; Alon et al., 2020; Blundell et al., 2020). A number of studies have also begun to document the impact of COVID-19 on self-employment (Adams-Prassl et al., 2020; Bartik et al., 2020; Blundell and Machin, 2020; Fairlie, 2020;

[3]This method, developed by Gelbach (2016), allows us to decompose different set of covariates into their individual contribution to the gender gap.

[4]In 2013, 94% of self-employed women worked in services according to the OECD, as opposed to 78% of men (OECD, 2016).

Kalenkoski and Pabilonia, 2020). We add to the literature by putting a particular emphasis on the comparison between the self-employed and employees. Both public debate and policy measures focus more strongly on the employed population. However, self-employment is an increasingly important economic force in Germany and in other industrialized economies (Federal Statistical Office of Germany, 2018; OECD, 2018). Therefore, it is crucial for policymakers to understand how the economic impact on these groups differs in order to be able to design effective policy.

We also add to the literature on gender differences in the labor market (e.g. Blau and Hendricks, 1979; Blau and Kahn, 1992, 2017; Goldin et al., 2017; Granados and Wrohlich, 2020). These studies document a gender gap in wages and earnings, which they, among others, attribute to selection of women into occupation or sectors that are associated with lower average wages. Evidence from other countries suggests significant gender differences in the labor market impact of COVID-19 (Adams-Prassl et al., 2020; Alon et al., 2020). However, we find that this is true for self-employed women, but not for female employees in Germany. This outcome can, by and large, be explained by the fact that self-employed women tend to select into sectors that are disproportionately affected by the COVID-19 pandemic and associated NPIs.

The rest of the paper is organized as follows. Section 2 describes the data set used in the empirical analysis and provides descriptive evidence. The econometric strategy and the results are explained in Section 3; Section 4 concludes.

2 Data

2.1 SOEP-CoV

For our analysis, we use a unique data source to estimate the effect of the COVID-19 pandemic on the self-employed. The SOEP-CoV survey was launched in April 2020 to investigate the socio-economic consequences of the COVID-19 pandemic in Germany.[5] In this special survey, respondents, interviewed in nine waves between April and July 2020, were asked about their economic status, family situation, health information, and attitudes during the COVID-19 pandemic (Kühne et al., 2020). Importantly, the SOEP-CoV questionnaire includes a set of questions targeting self-employed individuals.

What makes the SOEP-CoV attractive is its integration within the German SOEP. The SOEP is a representative longitudinal survey of households in Germany that started 1984 and has been administered to households and the households' members on a yearly basis since then. As of 2020, it includes approximately 20,000 households with more than 30,000 adult household members. The SOEP contains information on the households and its members' economic situation, education, and attitudes, among others (Goebel et al., 2019).[6] The respondents surveyed in the SOEP-CoV are a random subset of the SOEP population. Thus, it combines the wealth of longitudinal, pre-pandemic information from the SOEP with a wide array of questions that are related specifically to the COVID-19 pandemic. These unique features make the SOEP-CoV the ideal data set to analyze our two research questions.

2.2 Outcome variables

In our main analysis, we investigate the differential influence of the COVID-19 pandemic by self-employment status and gender. We focus on the outcome variables income, working

[5]This is part of the project "SOEP-CoV - The Spread of the Coronavirus in Germany: Socio-Economic Factors and Consequences," funded by the German Federal Ministry of Education and Research (BMBF).

[6]In addition to a rich set of socio-economic variables, the SOEP also includes short versions of established psychological inventories of traits in several waves. This allows us to analyze the influence of these traits in conjunction with a variety of socio-economic variables in the current crisis.

hours, and home office. These three dimensions allow for examining differences between employees and the self-employed. While the former are partially protected from income losses when they have fixed employment contracts, this does not apply to the self-employed. The main mechanisms through which employees can face changes in income and working hours are job losses and participation of their employer in short-time work schemes (*Kurzarbeit*).

Furthermore, employees and self-employed individuals may select into different industries. To the extent that these industries are hit by the crisis to varying degrees, the likelihood of reductions in incomes and working hours will differ. The same argument applies to gender differences. To the extent that women select into different industries and occupations than men, along with the extent that these are differently affected by the pandemic, its effect on income and hours will be different. Further, the potential for home office can vastly differ for different sectors and jobs (Alipour et al., 2020; Von Gaudecker et al., 2020). While front-line workers continued to be potentially exposed to the virus throughout the pandemic (if production was not completely stopped), it was more easily possible for those individuals working in office jobs to work remotely from home. In contrast, the arts and entertainment industry has come to an almost complete halt. Thus, in our main analysis, we shed light on the heterogeneous influence of the COVID-19 pandemic on these core outcomes, which jointly determine how individuals have experienced the Covid-19 crisis to a significant degree.

2.3 Descriptive analysis

We provide descriptive statistics on how self-employed individuals (sorted by gender) were affected by the pandemic and how their experience differs from those of employees. Panel A of Table 1 shows respondents' answers to questions specifically addressed to self-employed. Panel B compares the responses to questions targeted at both self-employed and employees.

Table 1: Labor market outcomes

	(1)	(2)	(3)	(4)	(5)	(6)
		Self-employed		Employees	P-value of difference	
	All	Male	Female	All	(2)-(3)	(1)-(4)
Panel A: Impact on the self-employed						
Changes in working situation						
affected by regulation of opening hours	0.478	0.398	0.599		0.014	
	(0.500)	(0.491)	(0.491)			
suppliers unable to deliver	0.140	0.159	0.112		0.400	
	(0.347)	(0.366)	(0.316)			
customers cancelling orders	0.458	0.446	0.477		0.712	
	(0.499)	(0.499)	(0.501)			
at least one of above	0.672	0.630	0.734		0.178	
	(0.470)	(0.484)	(0.443)			
use short-time work	0.186	0.220	0.135		0.234	
	(0.390)	(0.416)	(0.343)			
use paid vacation	0.065	0.087	0.031		0.190	
	(0.246)	(0.283)	(0.174)			
use unpaid vacation	0.006	0.006	0.005		0.874	
	(0.077)	(0.080)	(0.072)			
laid off workers	0.019	0.001	0.047		0.116	
	(0.138)	(0.029)	(0.213)			
Sales						
Sales February 2020 (€)	25157	34619	12036		0.208	
	(103240)	(131973)	(32925)			
...increased	0.035	0.035	0.034		0.990	
	(0.183)	(0.184)	(0.183)			
...decreased	0.567	0.525	0.630		0.199	
	(0.496)	(0.501)	(0.484)			
...unchanged	0.388	0.440	0.312		0.112	
	(0.488)	(0.498)	(0.465)			
...decreased by (%)	60.366	60.277	60.489		0.978	
	(31.935)	(31.171)	(33.178)			
Liquidity reserves						
...up to 3 months	0.472	0.376	0.605		0.015	
	(0.500)	(0.486)	(0.491)			
...up to 6 months	0.162	0.138	0.194		0.424	
	(0.369)	(0.347)	(0.397)			
...up to 12 months	0.209	0.221	0.192		0.711	
	(0.407)	(0.417)	(0.396)			
...more than 12 months	0.158	0.264	0.009		0.000	
	(0.365)	(0.443)	(0.095)			
if Sales decreased: use govt. support	0.480	0.504	0.450		0.618	
	(0.501)	(0.503)	(0.500)			
if Sales decreased: loan from friends	0.050	0.032	0.097		0.512	
	(0.220)	(0.179)	(0.304)			
Panel B: Self-employed vs. employees						
Working hours						
...increased	0.102	0.056	0.171	0.110	0.027	0.746
	(0.303)	(0.230)	(0.377)	(0.312)		
...decreased	0.519	0.521	0.514	0.200	0.930	0.000
	(0.500)	(0.501)	(0.501)	(0.400)		
...unchanged	0.380	0.423	0.315	0.690	0.172	0.000
	(0.486)	(0.495)	(0.466)	(0.463)		
...increase by (hours)	10.714	7.663	12.227	6.215	0.128	0.018
	(9.648)	(4.920)	(11.061)	(4.577)		
...decrease by (hours)	16.289	16.616	15.796	14.854	0.773	0.397
	(12.674)	(13.447)	(11.499)	(12.144)		
Income						
...increased	0.023	0.021	0.027	0.025	0.713	0.817
	(0.151)	(0.144)	(0.162)	(0.158)		

Continued on next page

Table 1 – continued from previous page

	(1)	(2)	(3)	(4)	(5)	(6)
	Self-employed			Employees	P-value of difference	
	All	Male	Female	All	(2)-(3)	(1)-(4)
...decreased	0.563	0.499	0.659	0.160	0.047	0.000
	(0.497)	(0.501)	(0.475)	(0.366)		
...unchanged	0.400	0.464	0.305	0.803	0.047	0.000
	(0.491)	(0.500)	(0.462)	(0.398)		
...decrease by (€) (median)	1,300	2,000	1,000	350	0.000	0.000
	(7,698)	(11,475)	(2,711)	(374)		
Probability of event (%)						
home office	0.475	0.428	0.546	0.366	0.142	0.012
	(0.500)	(0.496)	(0.499)	(0.482)		
short-time work				0.187		
				(0.390)		
Observations	339	173	166	3,583		

Note: Panel A of Table 1 shows respondents' answers to selected questions of the SOEP-CoV questionnaire about the impact of COVID-19 on the self-employed. Panel B compares answers of self-employed individuals and employees on a set of questions both groups were asked. If not indicated otherwise, each row in columns (1) to (4) displays the share of respondents for whom the statement is true. The standard deviation is shown in parentheses. Columns (5) and (6) show the p-values corresponding to the differences in mean between self-employed men and women, and the self-employed and employees, respectively. The depicted statistics are weighted.

As shown in Table 1, almost half of the surveyed self-employed report that they were affected by regulations of opening hours; women significantly more often than men. Around 46% state that customers canceled their orders or that demand had collapsed. In every seventh firm, production had to be stopped due to delivery problems of preliminary products. Two-thirds of all self-employed individuals state that they were affected by such changes, among the female self-employed it is 73%. Almost half reported that they worked from home because of the pandemic, again with females being over-represented.

These developments had consequences for the income, sales, and working hours of the surveyed self-employed. Just under 40% report that their working hours remained unaffected during this period. Ten percent reported that their working hours increased, by an average of eleven hours per week. However, more than half experienced a decrease in working hours. This decrease was quite substantial, averaging 16 hours worked less per week compared to pre-crisis times.

Sales and income losses were also sizeable, with 57% experiencing a decline in turnover that was, for some, particularly severe. Among those who recorded a decline in sales, the drop averaged 60%. By contrast, 39% of the self-employed surveyed did not record any

changes in turnover and only few succeeded in increasing their sales levels. Accordingly, most self-employed individuals (56%) confronted a decline in incomes. Among the female self-employed, 66% suffered income losses, significantly more often than males. Less than three percent increased their incomes. In addition, many face tight liquidity constraints. Almost half of the self-employed who provided information on their liquidity reserves projected that these will be eaten up within the subsequent three months; among self-employed women it is 60%. While every fourth self-employed man expects to have liquidity reserves for at least more than a year, this is true for only one percent of self-employed women. Lastly, of all the self-employed who reported losses in sales, roughly half indicated that they applied for state support measures and as many make use of the *Kurzarbeit* short-time work compensation schemes, allowing them to reduce their employees' working hours.

Panel B of Table 1 compares the influence of the pandemic on the working situation and the income of the self-employed to that of employees. A drop in demand directly affects the income and workload of self-employed individuals, whereas income and working hours of employees are affected by a sales decrease in their firms only if they are sent into short-time work or laid off. While job losses following the COVID-19 pandemic are rare in Germany, at least when compared to the experience of other countries, the instrument of short-time work is used extensively.[7] Among all employees who were subject to social security contributions in 2019, around 19% were on short-time work following the pandemic. Thus, while 52% of all self-employed workers reduced their working hours, only one in five employees reports such a decrease, most of which is attributable to short-time work. Home office as a direct consequence of the pandemic is also more common among the self-employed. While 48% of the self-employed work remotely from home, about 37% of all employees do the same.

Likewise, the direct influence of the pandemic on income is strikingly different for the

[7]Of all respondents who were self-employed (employees) in 2019, but not at the time of the interview in 2020, 1.7% report that their transition into non-employment came as a result of COVID-19 (see also Table B.4 and the corresponding discussion in section 3.1) These results are somewhat more conservative than those of Adams-Prassl et al. (2020), who find that, in their sample from Germany, 5% of individuals in work at the onset of the pandemic lost their jobs by early April, compared to 20% in the U.S. and 17% in the U.K..

self-employed. While more than half of them faced income losses, this is the case for only 16% of employees. Further, the extent of these income losses differs significantly. At the median, losses were more than 3.5 times as high for the self-employed when compared with employees. Note that the smaller magnitude of income losses of employees are likely a result of *Kurzarbeit*, which cover up to 67% of net earnings. By contrast, the self-employed hardly received any compensation for their losses, as emergency funds provided by the government only covered fixed business expenses, with coverage of income expenses explicitly prohibited.

3 Multivariate analysis

Our descriptive results in the previous section show that the crisis following the COVID-19 pandemic affects the self-employed far more than employees. There is a sizable gender gap within the self-employed, most notably along the income dimension. In this section, we perform multivariate analyses to better understand how these differences emerge.

3.1 Comparison of self-employed and employees

Table 2 shows the results of a regression of indicators for decrease in income, working hours, and the probability of home office, respectively, on an indicator for self-employment. While the odd columns only include state indicators as well as week indicators, the even columns expand the set of controls to include our complete battery of controls. Self-employed workers are 42 percentage points more likely to have experienced an income loss and 30 percentage points more likely to have experienced a reduction in working hours compared to employees. Self-employed individuals are also about six percentage points more likely to work from home.[8] [9]

However, the odd columns of Table 2 also reveal that individual- and household level characteristics explain very little of the differences between self-employed individuals and employees with respect to the probability of income losses and hours reductions. The self-employment coefficient remains almost unchanged when adding controls (compare column (1) to column (2) and column (3) to column (4), respectively). Only the probability of working in home office seems to be explained by the added controls.[10]

Since our observations do not seem to be driven by differences in characteristics, we

[8] The deviation of the gender gap from Table 1 can be explained by our sample restriction, i.e. conditioning on non-missing observations of all covariates.

[9] Having a migration background appears to significantly increase the probability of suffering income losses and hours reductions, while a higher household income has the opposite effect.

[10] Individuals from more affluent households are more likely to be working from home following the pandemic, likely a result of selection into jobs that are more easily done from home (e.g. office jobs, see Alipour et al., 2020). Similarly, better educated individuals are significantly more likely to work in home office, so are parents of school kids.

next investigate whether differential associations of these characteristics with the outcome variables can explain the differential impact of the pandemic on the self-employed and employees. Therefore, we estimate our full model for each of our outcomes separately for both the self-employed and for employees. We also present p-values of Chow-tests comparing the coefficients across models.[11] Tables B.1 to B.3 show the corresponding results.

With respect to the probability of an income decrease, it appears that the association between individual-level characteristics and the outcomes differs only little between the models for the self-employed and employees. There appears to be a differential relationship with respect to unemployment experience and age, which, however, seems to be more relevant only for the self-employed (Table B.1).

With respect to the probability of a decrease in working hours, we again observe little differences between the models. The presence of school-aged children in the household, which increases the probability of a reduction in working hours by 21 percentage points for self-employed individuals, while there is no such effect for employees (Table B.2).[12] Turning to the probability of working in home office, we see that older self-employed are less likely to work from home, while there is no age gradient for employees (Table B.3). Also, the correlation with household income as well as household size operates in opposite directions for self-employed and employed individuals. Moreover, we also find some differences when it comes to personality traits (Big 5).

Conversely, it turns out that the observed strong and positive association between the probability of home office and socio-economic status (income and education) is only true for employees, but not for the self-employed. Lastly, we document some differences when it comes to household size and age.

[11] The p-values stem from a Chow-test after a seemingly unrelated regressions.

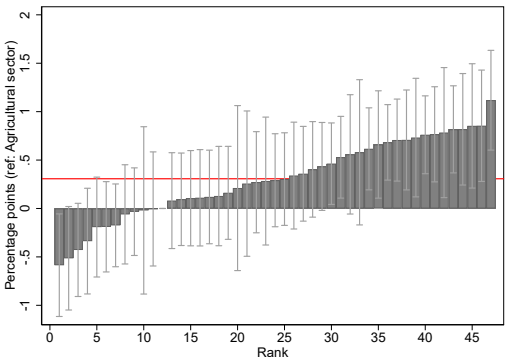
[12] Note that during the observation period, child care facilities and schools were closed or only provided services for essential workers. A potential explanation for the differences could be that employees face stronger restrictions should they desire to reduce their working time.

Table 2: Restricted and unrestricted model for difference of likelihood that income or working hours decreased or individual works in home office between employees and self-employed respondents.

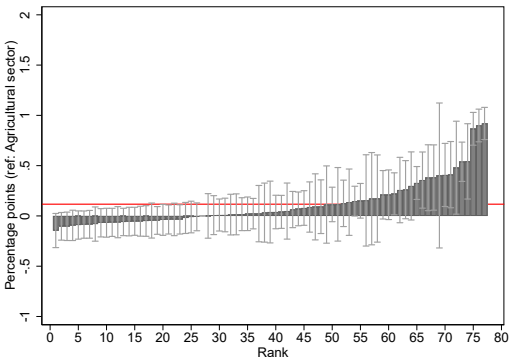
	(1) Income	(2) Income	(3) Working hours	(4) Working hours	(5) Home office	(6) Home office
Self-employed	0.418***	0.421***	0.301***	0.302***	0.061**	0.021
	(0.029)	(0.031)	(0.029)	(0.031)	(0.030)	(0.032)
Demographics:						
Gender: Female		0.019		0.022		-0.013
		(0.013)		(0.016)		(0.017)
Age		0.006		-0.003		-0.005
		(0.005)		(0.005)		(0.005)
Age squared		0.000		0.000		0.000
		(0.000)		(0.000)		(0.000)
Migration background		0.040**		0.040**		-0.026
		(0.016)		(0.019)		(0.019)
Big 5:						
Extraversion (2019)		0.000		0.011		-0.002
		(0.008)		(0.009)		(0.010)
Conscientiousness (2019)		0.014		0.009		0.035***
		(0.009)		(0.010)		(0.011)
Openness to experience (2019)		-0.014		-0.026**		0.001
		(0.009)		(0.011)		(0.011)
Neuroticism (2019)		-0.006		0.001		-0.011
		(0.008)		(0.010)		(0.010)
Agreeableness (2019)		0.006		-0.006		0.003
		(0.009)		(0.011)		(0.011)
Household context:						
HH Size (2019)		0.006		0.011		-0.008
		(0.007)		(0.008)		(0.009)
Married		0.021		0.016		-0.021
		(0.015)		(0.017)		(0.018)
School child		0.007		-0.004		0.049**
		(0.018)		(0.021)		(0.022)
Log. of HH net income (2019/18)		-0.039**		-0.034*		0.098***
		(0.016)		(0.018)		(0.020)
Education (ref. low):						
Intermediate education		0.031		0.023		0.073***
		(0.019)		(0.022)		(0.020)
High education		0.011		-0.005		0.293***
		(0.021)		(0.024)		(0.024)
Unemployment experience		0.000		0.005*		-0.005**
		(0.003)		(0.003)		(0.002)
Mean of outcome	0.169	0.169	0.222	0.222	0.395	0.395
Observations	3,531	3,531	3,518	3,518	3,533	3,533
R^2	0.11	0.23	0.05	0.13	0.03	0.31

Note: Table 2 displays models with and without controls for differences between self-employed and employees. All models include state and week fixed effects. Column (1), (3) and (5) display results for the models without controls. Column (2), (4) and (6) display results for the models with controls. The unrestricted models also include NACE 2 fixed effects. Standard errors are robust and in parentheses. * p<0.10, ** p<0.05, *** p<0.01

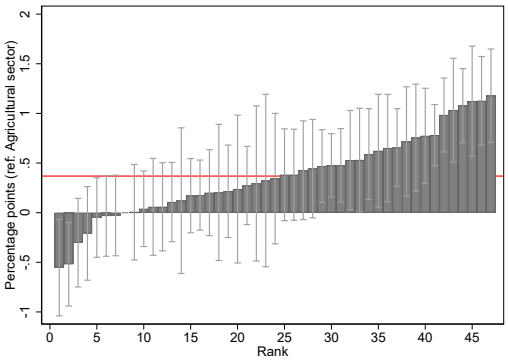
Figure 1: Industry fixed effects for the self-employed and employees



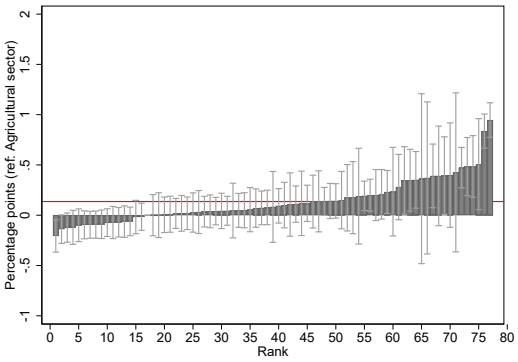
(a) Income reduction, self-employed



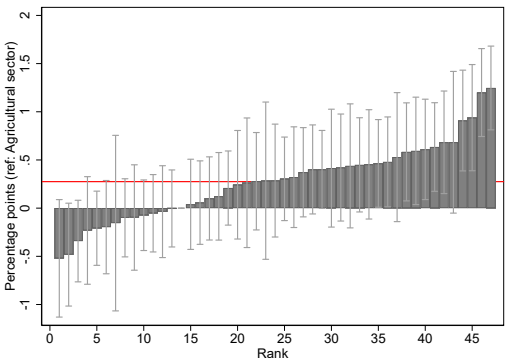
(b) Income reduction, employees



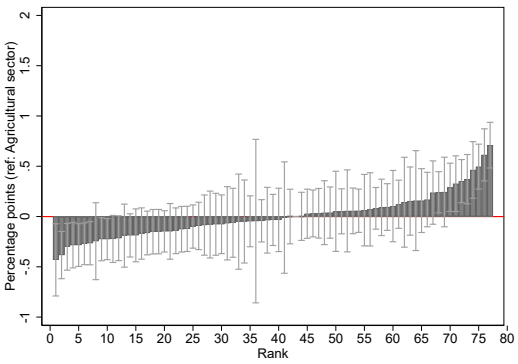
(c) Working time reduction, self-employed



(d) Working time reduction, employees



(e) Home office, self-employed



(f) Home office, employees

Note: Figures 1a to 1f display industry fixed effects and corresponding 95% confidence intervals from the regression results in Table B.1 to B.3. The horizontal line corresponds to the overall mean. Each rank corresponds to a specific industry (we use the two-digit NACE codes). Industries are ordered by the magnitude of their respective fixed effect. Since the sample size is smaller for the self-employed, there are fewer industries for which we have observations compared to employees, explaining the smaller number of ranks along the x-axis.

Similarly, we investigate the differences in the estimates of the industry fixed effects. The results are visualized in Figure 1, where we show the estimated fixed effects in increasing order of magnitude along with the associated 95% confidence intervals, separately for the self-employed and employees. The agricultural sector serves as the reference category (NACE Code 1).[13] For all outcomes, the point estimates are larger for the self-employed individuals. Moreover, the confidence intervals suggest a steeper gradient in the estimates of the fixed effects for the self-employed than for the employees throughout. Putting this together, we argue that differences in the variation of industry fixed effects between the self-employed and employees likely contribute considerably to the observable differences in the respective outcomes.

In summary, it seems that the differential impact of the COVID-19 pandemic between employees and the self-employed is not primarily driven by differences in characteristics or selection into different industries, but by differences in the association of these characteristics with the respective outcomes. The pandemic shock hit them uniformly harder. This seems plausible as employees are often shielded from job and income losses by employment contracts and job protection legislation, while such mechanisms do not exist for the self-employed.

Thus far, we focus our analysis on the population of (self-)employed individuals in 2020. However, employees may have lost their job over the course of the pandemic and self-employed individuals may have terminated their business. To account for this, we look at the working population of 2019 and investigate whether individuals who were self-employed in 2019 differ from those who were employees with respect to the probability of changes in income, changes in working hours, and job loss. The latter is defined as the proportion of individuals who transitioned into non-employment between 2019 and 2020 and who respond that this transition was due to the COVID-19 pandemic. The results are shown in Table B.4. Overall, 1.7% of those working in 2019 are non-employed in 2020 because of the pandemic. Importantly, self-employed individuals are 1.2 percentage points more likely to have terminated their business

[13]Note that the size of the fixed effects is to be interpreted relative to this reference category.

than employees are to have lost their job, albeit this difference is not statistically significant.[14] This implies that our estimated differences between self-employed individuals and employees with respect to the probability of income and hours reductions, which measure the change for those who remain in employment, constitute lower bound estimates of a combined effect of employment effects.

3.2 Gender differences among the self-employed

As discussed in Section 2.3, we observe considerable gender differences in the probability of income declines among the self-employed. In the following, we apply the Gelbach decomposition to further analyze the gender differences with respect to the likelihood of a decline in income due to the COVID-19 pandemic. The Gelbach decomposition reveals the individual contributions of covariates to the gender gap, thus assigning each covariate-bundle a proportion of the overall contribution. Importantly, it is not path dependent; that is, unlike sequential covariate addition, this decomposition is invariant to the sequence in which we would usually insert the covariates to gauge the stability of the coefficient of interest.[15]

More formally, the Gelbach decomposition answers the question of how much of the change in X_1 coefficients can be attributed to different variables in X_2 as we move from the base specification that has no X_2 covariates to the full specification that includes both X_1 and all X_2 covariates. In the context of our analysis, X_1 would refer to a gender indicator, plus week and state fixed effects, and X_2 to the full set of control variables. The decomposition links the estimates of the base- and full-specification on X_1 through the following identity:

[14]Note that the reported results for income and working hours changes slightly differ from those in Table 2. This is explained by the focus on the employment status of 2019, rather than 2020 in Table B.4. Differences result from two sources: First, employees surveyed in 2019 may have become self-employed between the times of the interview in 2019 and 2020, and vice versa. Second, individuals who were not in employment at the time of the interview in 2019 may have founded a business prior to the time of the interview in 2020. However, the differences in the reported results between Table 2 and Table B.4 are minor.

[15]Note that individual and household characteristics have shown to be relatively unimportant for the comparison of self-employed individuals with employees. Hence, a Gelbach decomposition is of little merit. Results of a Gelbach decomposition for this comparison are available upon request.

$$\hat{\beta}_1^{base} = \hat{\beta}_1^{full} + (X_1^\intercal X_1)^{-1} X_1^\intercal X_2 \hat{\beta}_2 \tag{1}$$

Re-writing the above identity and defining the change in the coefficient on the gender dummy between the base and the full model as $\hat{\delta} \equiv \hat{\beta}_1^{base} - \hat{\beta}_1^{full}$, one obtains

$$\hat{\delta} \equiv \hat{\beta}_1^{base} - \hat{\beta}_1^{full} = (X_1^\intercal X_1)^{-1} X_1^\intercal X_2 \hat{\beta}_2, \tag{2}$$

which corresponds to the omitted variable bias formula.

Let X_{2k} be the column of observations on the k^{th} covariate in X_2 and let $\hat{\beta}_{2k}$ be the estimated coefficient on X_{2k} in the full specification, then

$$\hat{\delta} = \sum_{k=1}^{k_2} (X_1^\intercal X_1)^{-1} X_1^\intercal X_{2k} \hat{\beta}_{2k}, \tag{3}$$

since the omitted variables bias formula is linear in its k_2 components.

From there, the practical implementation of the decomposition follows naturally:

1. Estimate the full model to obtain $\hat{\beta}_2$.
2. Estimate the vector of coefficients on X_1 in a set of OLS regressions with each of the k_2 covariates X_{2k} as dependent variable. This yields $(X_1^\intercal X_1)^{-1} X_1^\intercal X_{2k}$.
3. Multiply $(X_1^\intercal X_1)^{-1} X_1^\intercal X_{2k}$ by $\hat{\beta}_{2k}$ to obtain $\hat{\delta_k}$, which is the component estimated to be due to each variable k.

The set of covariates we include in our Gelbach decomposition, i.e. X_2, are:

- Demographics: second order polynomial in age, indicator for a migration background,

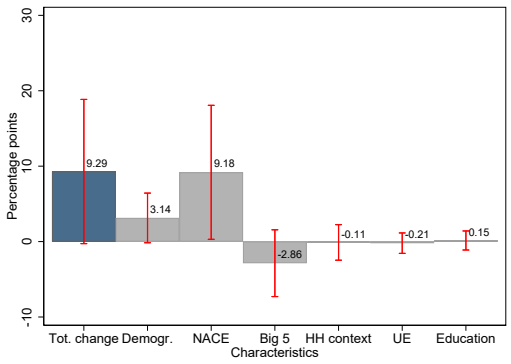
- NACE codes (2019): indicators for the two-digit NACE codes,
- Big 5 (2019): openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism,
- Household context (2019): household size, indicators for being married, presence of school children (as in 2020), the logarithm of household net income (2019/18) and
- unemployment experience (2018).

In our sample of self-employed individuals, we observe a gender gap of 17.4 percentage points in the likelihood of experiencing an income loss in our restricted model. This can be inferred from column (1) in Table 3. Relative to males, female self-employed are 31.5% more likely to have experienced an income loss because of the COVID-19 pandemic. Interestingly, as evidenced by Table B.5, there is no comparable gender gap among employees. However, in our unrestricted model in column (2) of Table 3, the gender gap decreases to 8.1 percentage points and is statistically indistinguishable from zero. This outcome implies that our controls can explain about 9.3 percentage points or 53.4% of the initial gender gap.

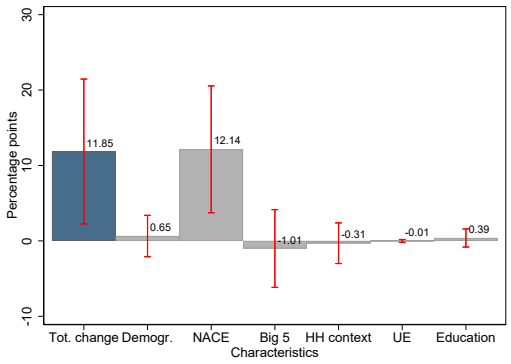
The largest share of the gender gap in income losses can be explained by the fact that females are over-represented in industries in which individuals are more likely to experience income losses. This is seen in Figure 2a of Panel 2. Figure 2 displays the results of the Gelbach decomposition: 9.2 percentage points or 98.8% of the total change can be explained by NACE fixed effects. Demographic characteristics, particularly age, explain as much as 33.8% of the total change in the gender gap between the unrestricted and restricted model. Other groups of characteristics add (nearly) nothing to the total change in the gender gap.[16]

[16]Figure A.1 shows the decomposition for employees corresponding to Table B.5.

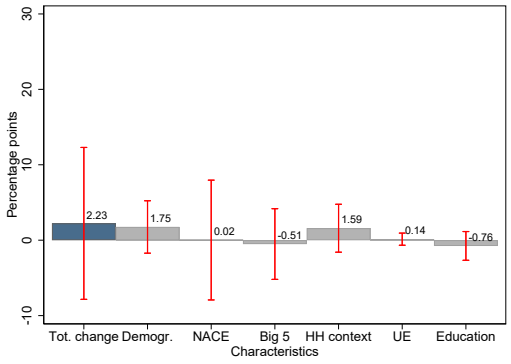
Figure 2: Gelbach decomposition of the gender gap in labor market outcomes among self-employed respondents



(a) Likelihood of income decline



(b) Likelihood of decline in working time



(c) Likelihood of working in home office

Note: Figures 2a and 2c display the Gelbach decomposition of the gender gap of the likelihood of an income and working time decline among self-employed respondents. Red bars indicate 95% confidence intervals based on robust standard errors.

Table 3: Restricted and unrestricted model for likelihood that income and working hours decreased among self-employed individuals.

	(1) Income	(2) Income	(3) Working hours	(4) Working hours	(5) Home office	(6) Home office
Gender: Female	0.174***	0.081	0.068	-0.051	-0.017	-0.040
	(0.058)	(0.073)	(0.060)	(0.073)	(0.057)	(0.069)
Demographics:						
Age		0.027		0.007		-0.042**
		(0.019)		(0.020)		(0.021)
Age squared		-0.000*		0.000		0.000*
		(0.000)		(0.000)		(0.000)
Migration background		0.064		0.120		-0.117
		(0.110)		(0.099)		(0.085)
Big 5:						
Extraversion (2019)		0.011		0.067*		0.046
		(0.040)		(0.037)		(0.037)
Conscientiousness (2019)		0.066*		0.051		0.058*
		(0.038)		(0.036)		(0.034)
Openness to experience (2019)		-0.031		-0.058		0.033
		(0.039)		(0.038)		(0.037)
Neuroticism (2019)		-0.031		-0.003		-0.013
		(0.036)		(0.039)		(0.035)
Agreeableness (2019)		-0.040		-0.067*		-0.032
		(0.035)		(0.034)		(0.033)
Household context:						
HH Size (2019)		-0.061		-0.076**		0.092***
		(0.039)		(0.036)		(0.033)
Married		0.037		-0.010		0.026
		(0.073)		(0.078)		(0.071)
School child		0.045		0.211**		-0.018
		(0.103)		(0.094)		(0.101)
Log. of HH net income (2019/18)		-0.026		0.100*		-0.146***
		(0.058)		(0.058)		(0.052)
Education (ref. low):						
Intmermediate education		-0.102		0.074		-0.108
		(0.125)		(0.114)		(0.112)
High education		-0.149		-0.026		0.057
		(0.132)		(0.120)		(0.119)
Unemployment experience		-0.026**		0.001		-0.013
		(0.012)		(0.010)		(0.011)
Mean of outcome	0.552	0.552	0.495	0.495	0.457	0.457
Observations	310	310	309	309	311	311
R^2	0.13	0.41	0.09	0.40	0.16	0.47

Note: Table 3 displays restricted and unrestricted models underlying the Gelbach decomposition. All models include state and week fixed effects. Column (1), (3) and (5) display results for the restricted models. Column (2), (4) and (6) display results for the unrestricted models. The unrestricted models also include NACE 2 fixed effects. Standard errors are robust and in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Thus, the industry-specific likelihood of an income loss is positively associated with the share of females in the respective industry.[17] In Figure A.2, we display binned scatter plots for the association between the respective industry-specific fixed effects in the likelihood of an income loss and the share of females for self-employed individuals and employees, respectively.[18] We observe a positive association between the industry fixed effects and the share of females in the respective industries. The OLS coefficient for the underlying relationship implies that a ten percentage point increase of females in the industry is associated with an income loss of about 5.6 percentage points.

Moreover, the results in columns (3) and (5) of Table 3 do not support the notion of a gender gap in the likelihood of a decline in working hours and working in home office. However, the change in the OLS coefficient for the indicator for being female between the restricted and unrestricted model and Figure 2b of Panel 2 suggest an economically significant change in the likelihood of a decline in working hours of about 11.9 percentage points, which is more than fully accounted for by the fact that, again, females are disproportionately represented in those industries hardest hit by the COVID-19 pandemic. In addition, Figure A.3a of Panel A.3 suggests a positive association between the share of females across industries and the likelihood of experiencing a decline in working hours in these industries. This constitutes evidence that the industry affiliation moderates the relationship between the likelihood of a decline in working hours and the gender of self-employed respondents, while there is no evidence for such a relationship for the probability of working from home. We also do not find support for such a relationship among employees. Table B.5 together with Figure 2b and the binned scatter plots for employees in Figure A.2 support this conclusion.

We further find suggestive evidence that the gender gap in income losses is likely driven by policy measures and other restrictions that, potentially, disproportionately affect industries in which females work. In the SOEP-CoV questionnaire, self-employed respondents are asked

[17] The share of females in the respective industries is calculated over the complete working sample, i.e. we do not distinguish between self-employed employed individuals.

[18] We calculate the share of females within our complete sample and do not distinguish between self-employed and employees because of the small sample size of the sample of self-employed individuals.

whether they have been affected by several events in the wake of the COVID-19 pandemic and associated NPIs. Among those, we focus on events that potentially have detrimental effects on the self-employed respondents' income or working time. These are "Being affected by rules or other restrictions," "Shortage of supply of intermediary goods" as well as "Shortage of demand." Table B.6 summarizes the results. We find that self-employed females are 20.2 percentage points more likely than their male counterparts to state that they are affected by rules or restrictions. We do not find such differences for the supply of intermediate goods or for demand shortages. Moreover, the Gelbach decomposition in Figure A.5a of panel A.5 along with the results in Table B.6 provide evidence that it is, once again, the disproportionate representation of females in industries most affected by non-pharmaceutical measures aimed at containing SARS-CoV-2 that explains the differential response behavior. However, while the total change in the coefficient is significant, the contribution of industry fixed effects is insignificant, albeit it is the largest.

4 Conclusion

The COVID-19 pandemic, the related government-mandated lock-down, and other measures aimed at containing the spread of the virus, are disrupting economic life in various ways: health concerns and economic insecurity alter consumption behavior that, in turn, affects the economic outlook and decision-making processes of businesses. In this contribution, we analyze how the shock affected the self-employed relative to dependently employed individuals in Germany, before we investigate gender differences in the impact of the crisis within the self-employed population.

We show that the more than four million self-employed individuals are 42 percentage points more likely to have experienced an income loss than employees and that they had a 30 percentage points higher chance of confronting a decline in working hours. Interestingly, this differential influence cannot be explained by differences in individual-level characteristics or selection into different industries. The self-employed were more likely to suffer income losses or reductions in working hours throughout. At the same time, they are also 1.2 percentage points more likely to transition into non-employment than employees.

Unlike for self-employed workers, employees' wages and working hours are rigid. To prevent mass layoffs, the German government has expanded the well-established short-time work scheme *Kurzarbeit*, thereby allowing for temporary reductions in wages and hours of employees. Indeed, the fraction of employees who experienced income losses (16%) is proportional to the fraction of employees in short-time work schemes (19%). At the same time, the unemployment rate increased by about 1.3 percentage points (BA, 2020). Thus, it appears that the labor market impact of the COVID-19 pandemic was mitigated by *Kurzarbeit*. However, this also implies that without this measure, the differences between the self-employed and employees in the impact of COVID-19 would likely change in that the self-employment gap in income and hours (which measures the change for those who remain in employment) would increase and the gap in job loss, i.e. transitions into non-employment, would reverse.

Furthermore, we observe that self-employed females are one-third more likely to experi-

ence income losses due to the COVID-19 pandemic than self-employed males. In contrast to the comparison of self-employed with employed individuals, our results reveal that the largest share of the gender difference is attributable to the fact that female self-employed workers are disproportionately working in industries that are more severely affected by the COVID-19 pandemic than men. This is also supported by the observable gender gap in the extent to which self-employed individuals were affected by policy measures (rules), notably regulations of opening hours that likely translates into gender differences for income losses.

Overall, our results show that measures like restricting businesses that rely on physical proximity affect self-employed individuals more strongly than employees and, among all self-employed, women more strongly than men. At the same time, the self-employed received less public financial support, as the emergency aid designed to financially support them over the first three months only covered fixed operating costs but not personal income losses or cost of living expenditures. Our descriptive analysis also reveals that many self-employed (females significantly more often than males) are unable to survive further reductions in sales for long. Consequently, the German economy is threatened by a potentially substantial decline in the number of active businesses.

Therefore, our study has important policy implications that may well be applicable for future pandemics, which still will pose a risk to civilization as long as we do not eradicate the causes (Petrovan et al., 2020). We show that self-employed individuals are hit significantly harder by the Covid-19 systemic shock than other parts of the working population. Partly rooted in structural discrimination, self-employed women are more strongly affected.[19] The design of future policy measures intended to mitigate negative economic shocks in comparable crisis situations should account for this variation in economic hardship. Moreover, most policy measures targeting the self-employed were (in Germany) aimed at helping them to cover factor costs only. However, in light of our findings, it seems worth considering that future bridging programs for the self-employed in times of such crisis are extended to cover

[19]Non-pharmaceutical measures, such as restricting businesses that rely on personal interactions, affect self-employed women more strongly than men, who disproportionately select into these sectors.

income losses and the cost of living. This is especially important for owners of micro-business, especially for non-employers and freelance artists.

Furthermore, one should not discount the potential economic impact of the psychological toll of the crisis on the self-employed. If the self-employed feel less supported by public policy measures during such systemic shocks (for which they are not responsible) than employees, society risks that individuals will start turning away from this employment form. Positive attitudes toward start-ups and self-employment are threatened. These started to develop positively only after the turn of the century in Germany, when the number of self-employed increased by about 40% to over 4 million today (Fritsch et al., 2015). Similarly, in Germany, as is the case in many countries, there is a sizeable gender gap in self-employment: at the turn of the century, the share of women among the self-employed was still below 30%. Between 2000 and 2020, it constantly increased in Germany, but remained below 40% (Federal Statistical Office of Germany, 2018). This increasing willingness of females to become self-employed might reverse, the gender gap in self-employment may re-widen. This could negatively affect growth, notably in the parts of the economy that strongly depend on self-employment. Thus, it is in the interest of the German economy and its role as an attractive location for businesses that political decision-makers pay more attention to the self-employed in their policy considerations.

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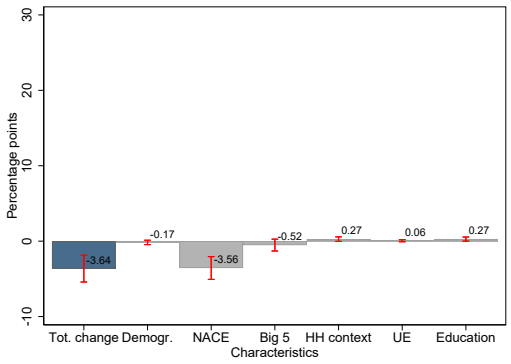
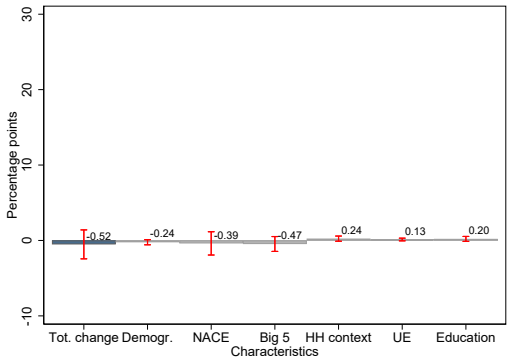
A Additional figures

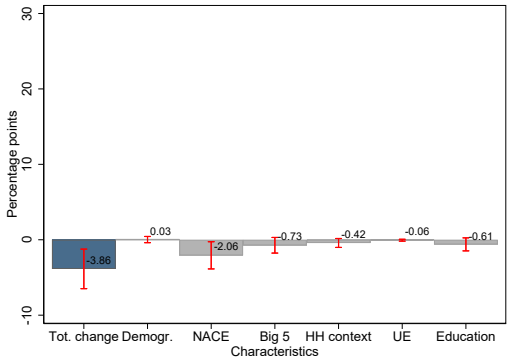
Figure A.1: Gelbach decomposition of the gender gap in labor market outcomes among employees



(a) Likelihood of income decline



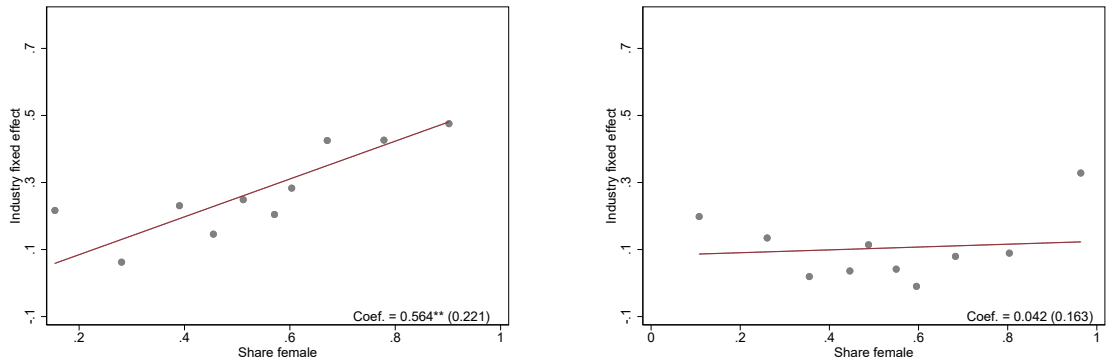
(b) Likelihood of decline in working time



(c) Likelihood of working in home office

Note: Figures and display the Gelbach decomposition of the gender gap of the likelihood of an income, working time decline as well as the likelihood of working in home office among employees. Red bars indicate 95% confidence intervals based on robust standard errors.

Figure A.2: The association between industry specific income loss fixed effects and share of females in the respective industry

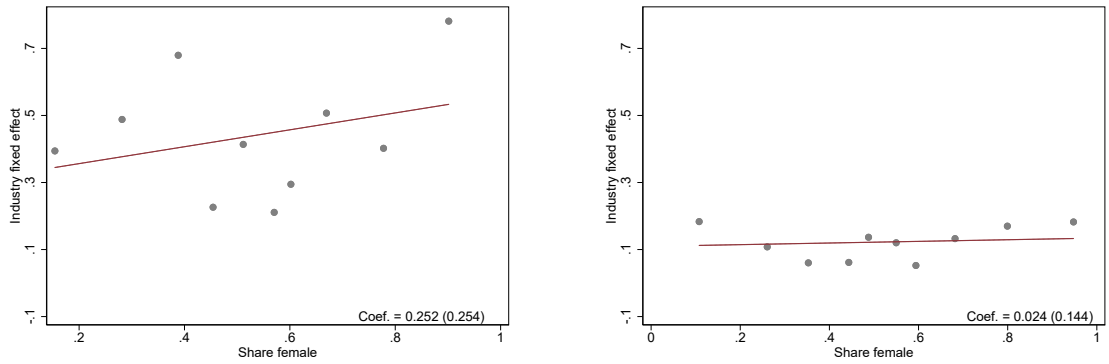


(a) Self-employed

(b) Employees

Note: Figures A.2a and A.2b display the association between industry specific income loss fixed effects and share of females in the respective industry for self-employed and employed respondents. The income loss fixed effects stem from a regression of an indicator for income decline because of the COVID-19 pandemic on industry indicators, respectively. The share of females corresponds to the share of females in the respective industry in our working sample. Both figures correspond to a binned scatterplot. The regression coefficients stem from an OLS regression of the industry fixed effects on the share of employment for the self-employed and employed individuals. Robust standard errors are in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$

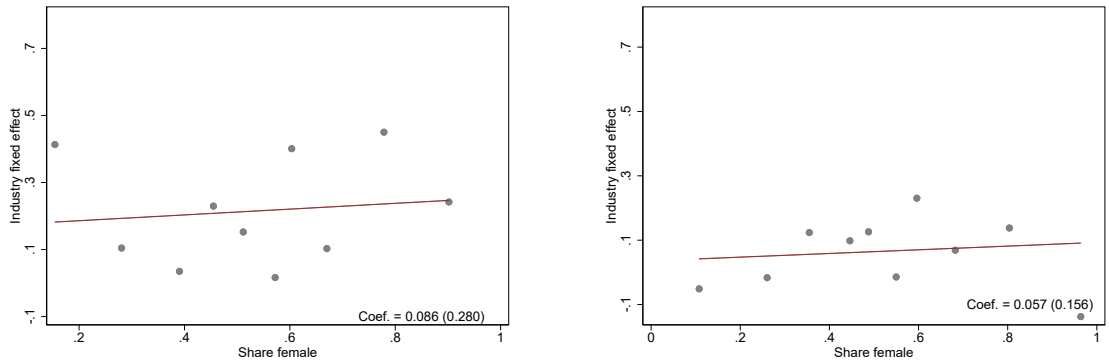
Figure A.3: The association between industry specific working time decline fixed effects and share of females in the respective industry



(a) Self-employed (b) Employees

Note: Figures A.3a and A.3b display the association between industry specific working time decline fixed effects and share of females in the respective industry for self-employed and employed respondents. The working time decline fixed effects stem from a regression of an indicator for home office because of the COVID-19 pandemic on industry indicators, respectively. The share of females corresponds to the share of females in the respective industry in our working sample. Both figures correspond to a binned scatterplot. The regression coefficients stem from an OLS regression of the industry fixed effects on the share of employment for the self-employed and employed individuals. Robust standard errors are in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Figure A.4: The association between industry specific home office fixed effects and share of females in the respective industry

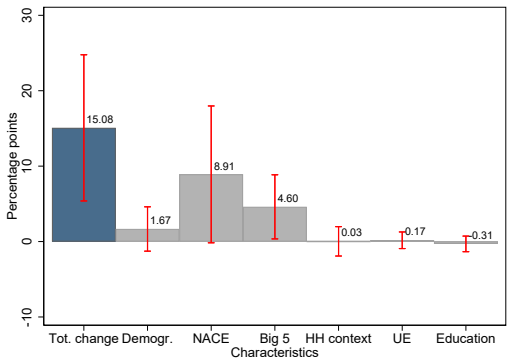


(a) Self-employed

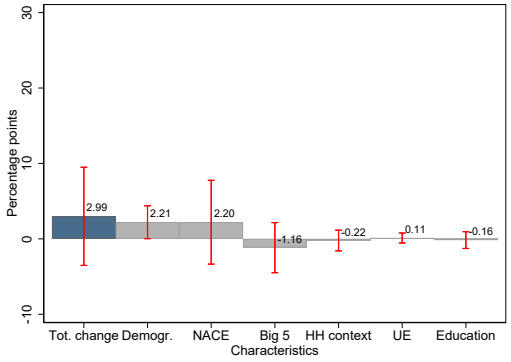
(b) Employees

Note: Figures A.4a and A.4b display the association between industry specific home office fixed effects and share of females in the respective industry for self-employed and employed respondents. The home office fixed effects stem from a regression of an indicator for home office because of the COVID-19 pandemic on industry indicators, respectively. The share of females corresponds to the share of females in the respective industry in our working sample. Both figures correspond to a binned scatterplot. The regression coefficients stem from an OLS regression of the industry fixed effects on the share of employment for the self-employed and employed individuals. Robust standard errors are in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$

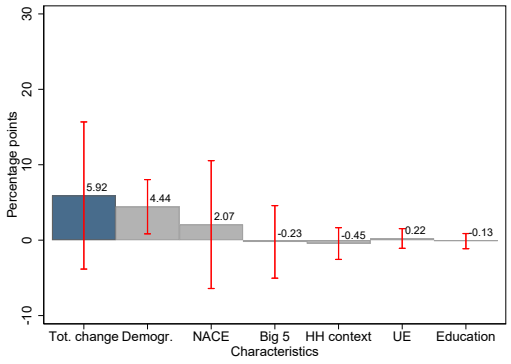
Figure A.5: Gelbach decomposition of the gender gap in various business related events for self-employed



(a) Rules or restrictions



(b) Supply of intermediate products



(c) Demand shortage

Note: Figures A.5a and A.5c display the Gelbach decomposition of the gender gap in various business related events associated with the COVID-19 pandemic among self-employed respondents. Red bars indicate 95% confidence intervals and are based on robust standard errors.

B Additional tables

Table B.1: Comparison of the models for the likelihood of an income decrease for employees and self-employed individuals.

	(1) Self-employed	(2) Employees	(3) P-value of (1)-(3)
Demographics:			
Gender: Female	0.081	0.014	0.285
	(0.073)	(0.013)	
Age	0.027	-0.004	0.057
	(0.019)	(0.005)	
Age squared	-0.000*	0.000	0.014
	(0.000)	(0.000)	
Migration background	0.064	0.041**	0.798
	(0.110)	(0.016)	
Big 5:			
Extraversion (2019)	0.011	-0.002	0.694
	(0.040)	(0.006)	
Conscientiousness (2019)	0.066*	0.007	0.062
	(0.038)	(0.006)	
Openness to experience (2019)	-0.031	-0.010	0.518
	(0.039)	(0.007)	
Neuroticism (2019)	-0.031	-0.005	0.389
	(0.036)	(0.006)	
Agreeableness (2019)	-0.040	0.000	0.173
	(0.035)	(0.006)	
Household context:			
HH Size (2019)	-0.061	0.009	0.037
	(0.039)	(0.007)	
Married	0.037	0.021	0.805
	(0.073)	(0.015)	
School child	0.045	0.014	0.725
	(0.103)	(0.018)	
Log. of HH net income (2019/18)	-0.026	-0.028*	0.961
	(0.058)	(0.016)	
Education (ref. low):			
Intermediate education	-0.102	0.035*	0.198
	(0.125)	(0.019)	
High education	-0.149	0.018	0.135
	(0.132)	(0.021)	
Unemployment experience	-0.026**	0.003	0.007
	(0.012)	(0.003)	
Observations	310	3,221	
R^2	0.41	0.17	

Note: Table B.1 separate model for employed and self-employed individuals. All models include state, week and industry fixed effects. The p-values are based on Chow test comparing coefficients after a seemingly unrelated regression. Standard errors are robust and in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table B.2: Comparison of the models for the likelihood of an working time decrease for employees and self-employed individuals.

	(1) Self-employed	(2) Employees	(3) P-value of (1)-(3)
Demographics:			
Gender: Female	-0.051	0.026	0.220
	(0.073)	(0.016)	
Age	0.007	-0.008	0.408
	(0.020)	(0.006)	
Age squared	0.000	0.000	0.344
	(0.000)	(0.000)	
Migration background	0.120	0.031	0.295
	(0.099)	(0.019)	
Big 5:			
Extraversion (2019)	0.067*	0.005	0.052
	(0.037)	(0.007)	
Conscientiousness (2019)	0.051	0.002	0.113
	(0.036)	(0.008)	
Openness to experience (2019)	-0.058	-0.014*	0.186
	(0.038)	(0.008)	
Neuroticism (2019)	-0.003	-0.002	0.985
	(0.039)	(0.008)	
Agreeableness (2019)	-0.067*	-0.005	0.037
	(0.034)	(0.007)	
Household context:			
HH Size (2019)	-0.076**	0.016*	0.003
	(0.036)	(0.008)	
Married	-0.010	0.027	0.584
	(0.078)	(0.018)	
School child	0.211**	-0.014	0.005
	(0.094)	(0.021)	
Log. of HH net income (2019/18)	0.100*	-0.044**	0.006
	(0.058)	(0.019)	
Education (ref. low):			
Intermediate education	0.074	0.016	0.551
	(0.114)	(0.023)	
High education	-0.026	-0.008	0.860
	(0.120)	(0.025)	
Unemployment experience	0.001	0.005*	0.668
	(0.010)	(0.003)	
Observations	309	3,209	
R^2	0.40	0.10	

Note: Table B.2 separate model for employed and self-employed individuals. All models include state, week and industry fixed effects. The p-values are based on Chow test comparing coefficients after a seemingly unrelated regression. Standard errors are robust and in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table B.3: Comparison of the models for the likelihood of working in home office for employees and self-employed individuals.

	(1) Self-employed	(2) Employees	(3) P-value of (1)-(3)
Demographics:			
Gender: Female	-0.040	-0.009	0.612
	(0.069)	(0.018)	
Age	-0.042**	0.000	0.022
	(0.021)	(0.006)	
Age squared	0.000*	0.000	0.037
	(0.000)	(0.000)	
Migration background	-0.117	-0.020	0.191
	(0.085)	(0.019)	
Big 5:			
Extraversion (2019)	0.046	-0.007	0.093
	(0.037)	(0.008)	
Conscientiousness (2019)	0.058*	0.026***	0.272
	(0.034)	(0.008)	
Openness to experience (2019)	0.033	-0.003	0.256
	(0.037)	(0.008)	
Neuroticism (2019)	-0.013	-0.009	0.889
	(0.035)	(0.008)	
Agreeableness (2019)	-0.032	0.005	0.198
	(0.033)	(0.008)	
Household context:			
HH Size (2019)	0.092***	-0.019**	0.000
	(0.033)	(0.009)	
Married	0.026	-0.031*	0.356
	(0.071)	(0.019)	
School child	-0.018	0.049**	0.436
	(0.101)	(0.023)	
Log. of HH net income (2019/18)	-0.146***	0.151***	0.000
	(0.052)	(0.020)	
Education (ref. low):			
Intermediate education	-0.108	0.069***	0.065
	(0.112)	(0.020)	
High education	0.057	0.283***	0.027
	(0.119)	(0.025)	
Unemployment experience	-0.013	-0.002	0.276
	(0.011)	(0.002)	
Observations	311	3,222	
R^2	0.47	0.34	

Note: Table B.3 separate model for employed and self-employed individuals. All models include state, week and industry fixed effects. The p-values are based on Chow test comparing coefficients after a seemingly unrelated regression. Standard errors are robust and in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table B.4: Restricted and unrestricted model for difference of likelihood that income or working hours decreased or that the individual has transitioned into non-employment between employees and self-employed respondents.

	(1)	(2)	(3)	(4)	(5)	(6)
	Income	Income	Working hours	Working hours	Job loss	Job loss
Self-employed	0.366***	0.364***	0.266***	0.267***	0.012	-0.007
	(0.031)	(0.033)	(0.031)	(0.033)	(0.009)	(0.018)
Demographics:						
Gender: Female		0.015		0.021		0.007
		(0.014)		(0.016)		(0.005)
Age		0.001		-0.003		-0.003*
		(0.005)		(0.006)		(0.002)
Age squared		0.000		0.000		0.000*
		(0.000)		(0.000)		(0.000)
Migration background		0.037**		0.042**		0.008
		(0.017)		(0.020)		(0.007)
Big 5:						
Extraversion (2019)		0.006		0.014		0.007**
		(0.008)		(0.009)		(0.003)
Conscientiousness (2019)		0.014		0.007		0.003
		(0.009)		(0.010)		(0.003)
Openness to experience (2019)		-0.011		-0.030***		-0.001
		(0.010)		(0.012)		(0.003)
Neuroticism (2019)		-0.004		0.002		0.003
		(0.008)		(0.010)		(0.003)
Agreeableness (2019)		0.002		-0.007		0.004
		(0.009)		(0.011)		(0.004)
Household context:						
HH Size (2019)		0.009		0.015*		0.001
		(0.008)		(0.009)		(0.003)
Married		0.015		0.014		0.005
		(0.016)		(0.018)		(0.006)
School child		0.014		-0.005		0.000
		(0.019)		(0.021)		(0.007)
Log. of HH net income (2019/18)		-0.044***		-0.042**		-0.009
		(0.017)		(0.019)		(0.006)
Education (ref. low):						
Intermediate education		0.045**		0.023		-0.006
		(0.019)		(0.023)		(0.008)
High education		0.031		0.001		-0.001
		(0.022)		(0.025)		(0.009)
Unemployment experience		0.000		0.007*		0.004**
		(0.003)		(0.003)		(0.002)
Mean of outcome	0.168	0.168	0.219	0.219	0.017	0.017
Observations	3,348	3,348	3,334	3,334	3,661	3,661
R^2	0.08	0.22	0.04	0.13	0.01	0.05

Note: Table B.4 displays models with and without controls for differences between self-employed and employees. All models include state and week fixed effects. Column (1), (3) and display results for the models without controls. Column (2), (4) and (6) display results for the models with controls. The unrestricted models also include NACE 2 fixed effects. Standard errors are robust and in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table B.5: Restricted and unrestricted model for likelihood that income and working hours decreased among non self-employed respondents.

	(1) Income	(2) Income	(3) Working hours	(4) Working hours	(5) Home office	(6) Home office
Gender: Female	-0.022*	0.014	0.021	0.026	-0.048***	-0.009
	(0.012)	(0.013)	(0.014)	(0.016)	(0.018)	(0.018)
Demographics:						
Age		-0.004		-0.008		0.000
		(0.005)		(0.006)		(0.006)
Age squared		0.000		0.000		0.000
		(0.000)		(0.000)		(0.000)
Migration background		0.041**		0.031		-0.020
		(0.016)		(0.019)		(0.019)
Big 5:						
Extraversion (2019)		-0.002		0.005		-0.007
		(0.006)		(0.007)		(0.008)
Conscientiousness (2019)		0.007		0.002		0.026***
		(0.006)		(0.008)		(0.008)
Openness to experience (2019)		-0.010		-0.014*		-0.003
		(0.007)		(0.008)		(0.008)
Neuroticism (2019)		-0.005		-0.002		-0.009
		(0.006)		(0.008)		(0.008)
Agreeableness (2019)		0.000		-0.005		0.005
		(0.006)		(0.007)		(0.008)
Household context:						
HH Size (2019)		0.009		0.016*		-0.019**
		(0.007)		(0.008)		(0.009)
Married		0.021		0.027		-0.031*
		(0.015)		(0.018)		(0.019)
School child		0.014		-0.014		0.049**
		(0.018)		(0.021)		(0.023)
Log. of HH net income (2019/18)		-0.028*		-0.044**		0.151***
		(0.016)		(0.019)		(0.020)
Education (ref. low):						
Intermediate education		0.035*		0.016		0.069***
		(0.019)		(0.023)		(0.020)
High education		0.018		-0.008		0.283***
		(0.021)		(0.025)		(0.025)
Unemployment experience		0.003		0.005*		-0.002
		(0.003)		(0.003)		(0.002)
Mean of outcome	0.132	0.132	0.196	0.196	0.390	0.390
Observations	3,221	3,221	3,209	3,209	3,222	3,222
R^2	0.01	0.17	0.01	0.10	0.03	0.34

Note: Table B.5 displays restricted and unrestricted models underlying the Gelbach decomposition. All models include state and week fixed effects. Column (1), (3) and (5) display results for the restricted models. Column (2), (4) and (6) display results for the unrestricted models. The unrestricted models also include NACE 2 fixed effects. Standard errors are robust and in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table B.6: Restricted and unrestricted model for likelihood that business was affected by event.

	(1) Restrictions	(2) Restrictions	(3) Supply	(4) Supply	(5) Demand	(6) Demand
Gender: Female	0.202***	0.051	-0.027	-0.057	0.052	-0.007
	(0.058)	(0.068)	(0.041)	(0.048)	(0.059)	(0.073)
Demographics:						
Age		-0.005		0.028**		0.022
		(0.019)		(0.013)		(0.019)
Age squared		0.000		-0.000**		-0.000*
		(0.000)		(0.000)		(0.000)
Migrant		0.092		0.014		0.032
		(0.090)		(0.075)		(0.097)
Big 5:						
Extraversion		0.039		-0.004		0.039
		(0.037)		(0.029)		(0.039)
Conscientiousness		-0.030		-0.009		0.055
		(0.037)		(0.027)		(0.038)
Openness		-0.025		0.021		-0.046
		(0.036)		(0.024)		(0.039)
Neuroticism		0.064*		-0.001		0.001
		(0.035)		(0.024)		(0.039)
Agreeableness		0.037		-0.038		-0.017
		(0.035)		(0.026)		(0.037)
Household context:						
HH Size		-0.001		0.024		-0.035
		(0.032)		(0.027)		(0.040)
Married		-0.019		-0.058		-0.041
		(0.073)		(0.056)		(0.079)
School child		-0.091		-0.099		-0.038
		(0.096)		(0.078)		(0.108)
Log. HH net income		-0.057		0.015		0.018
		(0.057)		(0.044)		(0.060)
Education (ref. low):						
Intermediate education		-0.110		-0.147		-0.112
		(0.105)		(0.098)		
High education		-0.054		-0.132		(0.116)
		(0.108)		(0.103)		(0.120)
Unemployment experience		-0.016		-0.011**		-0.021**
		(0.011)		(0.005)		(0.009)
Mean of outcome	0.457	0.457	0.122	0.122	0.434	0.434
Observations	311	311	311	311	311	311
R^2	0.13	0.46	0.05	0.31	0.09	0.38

Note: Table B.6 displays restricted and unrestricted models underlying the Gelbach decomposition for business events. All models include state and week fixed effects. Column (1), (3) and (5) display results for the restricted models. Column (2), (4) and (6) display results for the unrestricted models. The unrestricted models also include NACE 2 fixed effects. Standard errors are robust and in parentheses. * p<0.10, ** p<0.05, *** p<0.01