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The Short-Run Effects of the Covid-19 Pandemic on Vocational Education in Germany

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Abstract

In this paper, we investigate the short-run effects of the Covid-19 pandemic on vocational education and training after the first lockdown in the year 2020 in Germany. We exploit rich establishment-level survey data to estimate the causal effects of the pandemic by applying difference-in-differences estimation, contrasting trends in outcomes between establishments more and less negatively affected by the pandemic. We find that, due to the pandemic, establishments not only trained less but also retained less of their recent graduates. Our findings foster concerns of the pandemic to increase future skills shortage in the labour market and dampen young peoples' career prospects.

Zusammenfassung

In diesem Artikel untersuchen wir die Kurzfrist-Effekte der Covid-19 Pandemie auf die betriebliche Ausbildung nach dem ersten Lockdown im Jahr 2020 in Deutschland. Wir nutzen detaillierte Daten einer Betriebsbefragung, um die kausalen Effekte der Pandemie mittels eines Differenz-von-Differenzen Ansatzes zu schätzen, der die Entwicklung von Ergebnisgrößen zwischen mehr und weniger von der Pandemie betroffenen Betrieben vergleicht. Wir finden, dass Betriebe aufgrund der Pandemie nicht nur weniger ausgebildet, sondern auch einen kleineren Teil ihrer aktuellen Ausbildungsabsolventinnen und Absolventen übernommen haben. Diese Ergebnisse stützen Befürchtungen, dass die Pandemie in Zukunft den Fachkräftemangel auf dem Arbeitsmarkt verschärft und die Karriereperspektiven junger Menschen trübt.

JEL classification

J17, J21, J24

Keywords

Covid-19 pandemic, Corona crisis, Difference-in-differences, Vocational training

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1 Introduction

In Germany, as well as in other countries, the outbreak of the Covid-19 pandemic has raised concerns that vocational education and training is being neglected during the crisis. Hubertus Heil, Germany's Minister of Labour and Social Affairs, expressed these concerns by stating, "We cannot permit ourselves a Corona cohort" (original: „Wir können uns keinen Corona-Jahrgang erlauben“; see Deutschlandfunk 2020). This statement reflects fears about skills shortage becoming more severe in the future and long-term career disadvantages arising for the “Corona generation”.

Neglecting vocational education and training during the crisis is potentially problematic for both young people and establishments alike. For young people, acquiring productive skills and a smooth transition from education into work are important steps for their career development. Negative long-term effects of youth unemployment on future labour market participation, earnings and work quality, so-called “scarring effects”, are often visible far into the working career, particularly for less skilled youth (cf. Gregg 2001, Riphahn/Zibrowius 2016, Schmillen/Umkehrer 2018). Additionally, the labour economics literature frequently reports persistent career losses for young people being unfortunate to enter the labour market during a recession. For German apprenticeship graduates into the 1992-1996 recession, for instance, Umkehrer (2019) finds substantial losses in real average earnings over the first 14 years after graduation. Similar findings are reported by Oreopoulos/von Wachter/Heisz (2012) for Canada or by Altonji/Kahn/Speer (2016) for the USA. Strikingly, again these losses appear to be particularly pronounced for less skilled youth (see von Wachter 2020, for a summary of this literature). Not even being able to start or complete vocational education during the pandemic might arguably have even more severe negative career effects, especially for disadvantaged young workers.

For establishments, long-term trends, like demographic and skill-biased technological change (Autor/Levi/Murnane 2003), are likely to further increase the demand for skilled workers. Vocational education and training are seen as one important pillar for establishments to cover this demand (Stevens 1994). Not investing in the training of young people during the crisis will probably increase skills shortage afterwards once the economy recovers.

In this study, we analyse how the Covid-19 pandemic affected establishments’ vocational education and training activities in the first year of the crisis in Germany.[1] From a theoretical point of view, the effects of an economic downturn on the amount of training are ex-ante ambiguous; see the discussion in Muehlemann/Pfeifer/Wittek (2020) and the references therein. On the one hand, declining productivity may lead to a decline in the demand for labour and therefore to a reduction in the number of trainees, especially in some occupations and industries (Eichhorst/Marx/Rinne 2021), for instance. On the other hand, the less costly labour of trainees may be increasingly used to substitute for the more costly labour of regular employees and therefore the number of trainees may not drop or even increase during a downturn (Wolter/Ryan 2011). A further explanation for why training could increase during an economic crisis are reduced

[1] Given the particular timing of the field phase, our survey data capture the effects of the pandemic after the first Covid-19 associated lockdown in Germany from March to May 2020. This has to be taken into account when interpreting our results as the subsequent lockdown measures might have reinforced the overall impact of the pandemic.

opportunity costs for instructors or limited outside options for trainees. Ultimately, it remains an empirical question how vocational provisions react to the Covid-19 pandemic.

For our analysis, we draw on the IAB Establishment Panel, a large, representative and annually conducted survey of establishments in Germany. We find that the Covid-19 pandemic affected establishments to quite varying degrees. While 56 percent of the 7,516 training establishments participating in the 2020 survey responded that they experienced no to only weak negative economic effects due to the pandemic, the remaining 44 percent responded that they experienced medium strong to very strong negative economic effects. We then estimate the effects of the pandemic on different training outcomes applying a classical difference-in-differences estimation strategy. Specifically, we contrast changes in outcomes before versus after the start of the pandemic between establishments more and less negatively affected by it. Our strategy identifies causal estimates of the pandemic under the assumption that outcomes in more and less affected establishments would have developed at the same rate in the absence of the pandemic. We carefully explore this assumption and provide evidence that it is very likely to hold in our setting.

Our difference-in-differences estimates do not show a significant effect of the Covid-19 pandemic on the likelihood to train at all in the first year of the pandemic. However, we find that, on average, establishments reduced both current and new trainees significantly because of the pandemic. According to our preferred specification, the pandemic increased the likelihood to train fewer trainees in 2020 by 7.7 percentage points (pp) and decreased the likelihood to conclude new training contracts for the upcoming training year 2020/21 by 6.7 pp, ceteris paribus. Moreover, we find significant and sizeable reductions in the likelihood that current graduates from vocational education and training remained employed by their training establishment after graduation. On average, the pandemic reduced the take-over rate in 2020 by 9.6 pp, ceteris paribus. In our view, these estimates show not only the immediate need to foster vocational education and training during the pandemic but also to support the training-to-work transition for those young workers who are unfortunate to enter the labour market during the crisis.

The remainder of the paper is structured as follows. In Section 2, we provide background information and outline our data. In Section 3, we describe the method and present results, including robustness checks. In Section 4, we discuss the results before we conclude in Section 5.

2 Background and Data

2.1 Relevant Literature

Our study contributes to the labour economics literature in at least three ways. First, we add to the broad literature analysing employer-provided vocational training more generally; see, among others, Winkelmann (1996) on the specificity of skills conveyed during training, Harhoff/Kane (1997) for a comparison of the German system with the one in the USA (documenting that graduates from apprenticeship training in Germany occupy a similar position in the wage distribution as high school graduates in the USA), Acemoglu/Pischke (1998) on employers' training motives, Fersterer/Pischke/Winter-Ebmer (2008) on the returns to training, Dustmann/Schönberg (2009) on the role of unions, von Wachter/Bender (2006) as well as

Fitzenberger/Lickleder/Zwiener (2015) and Dummert (2020) on worker mobility and training-to-work transitions after graduation, and Muehlemann et al. (2010) on investment decisions.

Second, we complement the literature analysing the cyclicality of vocational training. Relevant studies for Germany include Dietrich/Gerner (2007), Muehlemann/Wolter/Wüest (2009), Baldi/Brüggemann-Borck/Schlaak (2014) as well as Bellmann/Gerner/Leber (2014). The two latter studies focus on vocational training during the Great Recession. Brunello (2009) provides a review of results from earlier studies and Muehlemann/Pfeifer/Wittek (2020) summarise that the majority of empirical studies document that vocational training reacts moderately pro-cyclical.

Third, we are among the first to provide evidence on the causal effects of the Covid-19 pandemic on vocational education and training in Germany. To the best of our knowledge, until now only studies that forecast the effects of the pandemic using aggregate data exist. Muehlemann/Pfeifer/Wittek (2020) as well as Maier (2020) utilise data on expectations about business cycle development or forecasts of GDP growth, respectively, to predict the likely reaction of the German apprenticeship market to the pandemic. In line with our findings, both studies predict a drop in the number of new training contracts in 2020 relative to 2019, by about 6 percent, depending on model assumptions. Ultimately, we are the first to provide causal estimates of actual developments using establishment-level data.

2.2 Germany's Vocational Education and Training System

The dual system of vocational education and training in Germany combines occupation-specific on-the-job training in an establishment with theoretical education in public vocational part-time schools (cf. Hippach-Schneider/Krause/Woll 2007, for a short description). On the training market, establishments post vacancies, young applicants apply for a position, and ultimately establishments and applicants conclude contracts for conducting the training. During the practical work, the trainees carry out productive tasks in their training establishment for which they receive a remuneration.

The vocational education and training system is strongly regulated by the Vocational Training Act and the Vocational Training Curricula for a given occupation. These define the conditions under which an establishment is eligible to train, the duration of training, the remuneration, and minimum standards for training. Although vocational education and training has a clear focus on a specific occupation, the skills acquired are transferable to a certain degree (Winkelmann 1996, Harhoff/Kane 1997, Fitzenberger/Lickleder/Zwiener 2015). In Germany, about 300 different training occupations exist and training usually takes two to three years, depending on the occupation trained and individual performance. Training years start in August or September in the majority of sectors and professions. Access to training in a certain profession does usually not require a specific school-leaving certificate by law. The dual system of vocational education and training plays an important role for skill formation in Germany and it is often seen as a successful way to tackle youth unemployment (Eichhorst et al. 2015).

2.3 Data, Sample Selection, and Variable Definitions

We exploit the IAB Establishment Panel, a key database for the analyses of labour demand in Germany (cf. Ellguth/Kohaut/Möller 2014). The IAB Establishment Panel is a multi-topic survey of

nearly 16,000 establishments[2] per year that has been repeated annually since 1993 for western Germany and since 1996 for eastern Germany. The sample is stratified by federal state, economic sector and establishment size and randomly drawn from the Establishment File of the Federal Employment Agency (BA), which contains the universe of German establishments with at least one employee subject to social insurance contributions. In addition to annually repeated core questions, such as on the vocational education and training, the survey also includes changing focus topics. The impact of the Covid-19 pandemic was one of these focus topics in the 2020 survey wave.

We restrict our analysis to the years 2013 to 2020 to make sure that the Great Recession does not confound our estimates. The 2020 wave of the IAB Establishment Panel was surveyed from July to Mid-November 2020, i.e. after the first lockdown in Germany, which ended in May 2020, and before the second (partial) lockdown, which began in November 2020. The survey responses thus capture the state after the first lockdown.

For our analysis, we select all "training establishments" from the IAB Establishment Panel. We define an establishment as training establishment if it either trains at least one trainee on June 30 of the current year (irrespective of how long the training has lasted already), trained at least one trainee on June 30 of the previous year, has concluded at least one new training contract in the current year, has offered at least one training position in the current year but could not fill it, or has graduates having completed training in the current year. Our goal is to include establishments even if they have stopped training, to make sure that we also capture possible effects at the extensive margin and thus to avoid sample selection issues.

In addition, we restrict our estimation sample to establishments that participated in the 2020 wave of the survey and answered the question on the extent to which they were economically affected by the Covid-19 pandemic. We use this information to define their treatment status (see next section). Ultimately, we select 7,516 training establishments out of all 16,604 establishments of the 2020 wave into our estimation sample. For these training establishments, we also select all observations from the 2013 to 2019 waves, for estimating outcomes in pre-treatment years (see Section 3.2 for details).

We analyse four outcome variables. Our first outcome is the fraction of successful graduates in the current year who continue their careers in the training establishment (or in another establishment of the same company, if the training establishment is part of a multi-establishment company) among all successful graduates of that year. We refer to this outcome as the take-over rate. The second and third outcomes refer to trainees who are currently trained at the establishment.[3] As second outcome, we consider an indicator variable for whether a training establishment trains at least one trainee in the current year. As third outcome, we consider an indicator variable for whether a training establishment trains less trainees (including zero trainees) in the current than in the previous year, provided that at least one trainee was trained in the previous year. As fourth outcome, we consider an indicator variable for whether a training establishment has concluded new training contracts for the next training year. We refer to these outcomes as the likelihood to

[2] Establishments are defined as economically and regionally separate operational units. Several different establishments may belong to the same company.

[3] In each wave, the IAB Establishment Panel asks for the total number of trainees (irrespective of how long the training has lasted already) at the establishment on June 30 of both the current and the previous year.

train at least one trainee in the current year, the likelihood to train less trainees in the current than in the previous year, and the likelihood to train new trainees in the next training year, respectively.

As control variables, we take into account indicator variables for an establishment's federal state, industry sector, size (measured in the previous year; i.e. before the pandemic), and survey participation; see Section 3.2 for details. We describe our main treatment variable, the economic affectedness by the pandemic, in the next section.

2.4 Affectedness by the Covid-19 Pandemic

The Covid-19 pandemic affected establishments in Germany to quite varying degrees. More than one third of all establishments reported that they did not suffer negative economic effects due to the pandemic, when surveyed in 2020, while 11 percent reported to have experienced very strong negative effects (panel (A) of Table 1). Overall, almost each second establishment faced medium strong, strong, or very strong negative economic effects, showing the dramatic impact of the pandemic on large parts of the economy.

Negative effects tend to be slightly weaker for training establishments (panel (B) of Table 1), suggesting that training establishments are somewhat positively selected. The overall pattern, however, is similar to that in the general population of establishments. Almost 39 percent of the training establishments reported that they were not negatively affected by the pandemic in 2020 in economic terms, while 17 percent reported that they were only very weakly or weakly negatively affected. In contrast, 23 percent of the training establishments faced medium strong and more than one out of five training establishments struggled with strong to very strong negative economic effects because of the pandemic in 2020.

Having established that large fractions of establishments were either substantially negatively affected by the pandemic in 2020 or not at all, we now turn to characterizing which establishments were more likely to be affected than others in a regression framework. We do this by estimating linear probability models of experiencing medium strong, strong, or very strong negative economic effects due to the pandemic. As explanatory variables, we include the location of the establishment (East/West), the establishment size in the previous year (three categories), and the industry (nine categories). Table 2 presents the ordinary least squares estimates for all establishments in column (1) and for training establishments in column (2).

Table 1: Negative economic affectedness by the Covid-19 pandemic after the first lockdown in 2020
Fraction, in percent

Strength of negative economic affectedness					
none	very weak	weak	medium strong	strong	very strong
(A) All establishments; N = 16,604					
35.6	3.8	11.1	23.7	14.9	10.9
(B) Training establishments; N = 7,516					
38.5	4.8	12.5	23.2	13.0	8.0

Notes: This table shows the fraction of establishments that experienced a certain degree of negative economic effects due to the Covid-19 pandemic in 2020. Panel (A) shows results for all establishment surveyed in the 2020 wave of the IAB Establishment Panel. Panel (B) shows results for the subset of training establishments as defined in Section 2.3. All fractions are weighted by the cross-sectional weighting factor.

Source: IAB Establishment Panel, own calculations. © IAB

Strikingly, the location and the size of the establishment played no or only a minor role for the affectedness by the Covid-19 pandemic once the industry is controlled for. This is true for establishments in general and training establishments in particular. One explanation for these patterns is that the pandemic constitutes an unanticipated random shock that hit establishments of different size classes and at different locations within industry sectors in a quite similar way. However, contact limitations or supply bottlenecks during the lockdown affected industry sectors in quite different ways. The results in Table 2 support this hypothesis by showing clear differences in affectedness across industries. For instance, establishments in the hospitality and transport and storage sectors were most likely to be moderately strongly to very strongly negatively affected by the Covid-19 pandemic, conditional on location and size. Training establishments in the hospitality sector were 73.1 pp and training establishments in the transport and storage sector were 43.1 pp more likely to be negatively affected than training establishments in the agriculture, forestry and mining sectors (the reference category), conditional on location and size. In contrast, agriculture, forestry and mining as well as construction were the least negatively affected industries, with no statistically significant differences in affectedness between them.

Table 2: Which establishments where heavily affected by the Covid-19 pandemic after the first lockdown in 2020?

Difference in conditional likelihood to experience negative economic effects in 2020, relative to respective reference category, in percentage points

	(1) All establishments	(2) Training establishments
Location (reference: West)		
East	-0.025 (0.012)	-0.038 (0.020)
Establishment size (reference: 1 to 19)		
20 to 249	-0.026 (0.012)	-0.016 (0.020)
250 and more	0.018 (0.022)	0.036 (0.027)
Industry (reference: agriculture/forestry/mining)		
Manufacturing	0.267 (0.033)	0.363 (0.044)
Construction	-0.035 (0.035)	0.070 (0.048)
Wholesale/retail/maintenance	0.231 (0.033)	0.310 (0.045)
Transportation/storage	0.280 (0.043)	0.431 (0.071)
Hospitality	0.591 (0.033)	0.731 (0.051)
Information/communication	0.201 (0.047)	0.317 (0.073)
Other services	0.150 (0.032)	0.245 (0.045)
Educ./health./social services	0.183 (0.032)	0.279 (0.043)
Intercept	0.311 (0.029)	0.188 (0.038)
Observations	16,604	7,516

Notes: This table shows ordinary least squares coefficient estimates of a linear probability model of experiencing medium strong to very strong negative economic effects due to the Covid-19 pandemic in 2020. Column (1) shows estimates for all establishments surveyed in the 2020 wave of the IAB Establishment Panel. Column (2) shows estimates for the subset of training establishments as defined in Section 2.3. Estimates are weighted by the cross-sectional weighting factor. Robust standard errors are in parentheses.

Source: IAB Establishment Panel, own calculations. © IAB

3 Effects of the Covid-19 Pandemic on Vocational Education and Training

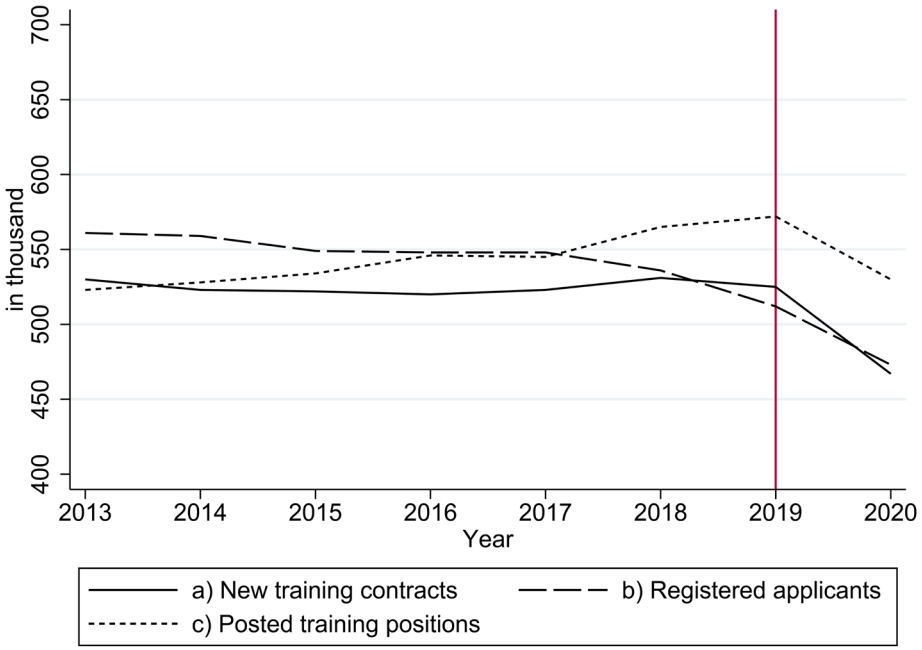
3.1 Preliminary Descriptive Evidence

Official statistics show that the training market in Germany experienced severe losses in 2020. Compared to 2019, the number of new training contracts fell by 57,600, or 11 percent, to 467,500 contracts, which is a new low in Germany (Figure 1). The largest decline of 13.9 percent was registered in industry and commerce (Federal Institute for Vocational Education and Training (BIBB) 2020). The number of posted training positions registered by the establishments at the BA shows a similar trend. While the number of posted positions increased slightly in previous years, a significant and sudden decline of 7.3 percent occurred between 2019 and 2020, from 572,000 to 530,300 positions in September. The number of applicants for a training position registered at the vocational guidance service was declining between 2019 and 2020, too, yet at a similar rate as already between 2018 and 2019 (we will come back to this point in Section 4).

Furthermore, the IAB Establishment Panel 2020 provides information on the personnel policy measures that establishments intended to implement in response to the Covid-19 pandemic in the area of vocational education and training. 9 percent of the training establishments that were medium strongly to very strongly negatively affected by the pandemic in economic terms stated that they intended to retain less of their graduates. Among the other training establishments, this share was only 1.5 percent. In addition, 19 percent of the affected training establishments intended to forego the planned filling of vacant training positions. By contrast, only 4 percent of the other training establishments intended to do so.

However, simply relying on time-series comparison and intended personnel policy measures reported by establishments might yield a biased picture of the causal effects of the pandemic on vocational training. For instance, the BIBB assumes that at least a part of the decline in the number of newly concluded training contracts between 2019 and 2020 has taken place independent of the pandemic (Oeynhausen et al. 2020). Next, we describe our approach to identify the causal effects of the pandemic.

Figure 1: Newly concluded training contracts, registered applicants for vocational training positions and posted vocational training positions, 2013 to 2020, September



Source: a) Federal Institute for Vocational Education and Training (BIBB) (2020), b) and c) Federal Employment Agency (BA) (2020), own illustration.

3.2 Method

Our estimation strategy to identify the causal effects of the Covid-19 pandemic on vocational education and training is to contrast trends in training outcomes of establishments more negatively affected (the "treated") and less negatively affected (the "controls") by the pandemic. We implement this strategy by applying a classical difference-in-differences approach.

As benchmark, we regress outcome y of training establishment j in period t = [2013,2020] on an intercept $\bar{y}$, an indicator variable taking on unity if the establishment experienced medium strong, strong, or very strong negative economic effects because of the pandemic in 2020, $1(treat_j = 1)[treat_j]$, indicator variables for the post-treatment year, $1(year = 2020)[post_t]$, and the pre-treatment years, $1(year < 2019)[\overline{pre}_t]$, leaving out 2019 as the reference year, interaction terms between the treatment and year indicators, control variables X (see Section 2.3) with coefficient vector β, and an error term u. The model's main coefficients of interest are α, π, γ, ρ and δ; see regression equation (1). We cluster standard errors at the industry-year level.

$$\begin{aligned} y_{jt} = \bar{y} + treat_j\,\alpha + \overline{pre}_t\,\pi + post_t\,\gamma + \\ +\left(\overline{pre}_t * treat_j\right)\rho + \\ +\left(post_t * treat_j\right)\delta + \\ \beta X_{jt} + u_{jt} \end{aligned} \tag{1}$$

We are most interested in estimating δ. This estimate provides a measure of how the change of a given outcome between 2020 (after the start of the pandemic) and 2019 (before the pandemic) differs between treated and control establishments. If outcomes of treated and control

establishments would have developed at the same rate in the absence of the pandemic, δ captures the causal effect of the pandemic.

By providing evidence on the validity of this identifying assumption, estimates of ρ are of interest, too. This "placebo" test measures whether trends in outcomes diverged between establishments that will be more or less negatively affected by the pandemic already in the years before the pandemic. Additionally, estimates of α, π and γ measure how outcomes differ between treated and control establishments in 2019, how outcomes of control establishments differ between 2019 and their average over the 2013 to 2018 pre-treatment period, and how outcomes of control establishments differ between 2019 and 2020, respectively. In Section 3.3, we show that both levels and changes in outcomes are very similar between treated and controls in the years prior to the pandemic and that the control group behaved quite stable before versus after the start of the pandemic, suggesting the identifying assumption to hold. We provide further evidence for its validity in Section 3.4, including proofing robustness of our results to addressing possible pre-trends in alternative ways.

Finally, we should note that estimating pre-trends is somewhat challenging with our survey data because we have to observe all establishments in 2020 to define their treatment status. Luckily, the IAB Establishment Panel has a considerable panel dimension: Almost one third of training establishments participated in the survey in each year of our sample period 2013-2020. However, another third participated in 2020 only. Unfortunately, the panel dimension is not large enough to estimate coefficients for pre-treatment years with sufficient precision in the strongly balanced panel. We therefore use all observations of sampled training establishments available for this task. To rule out systematic selectivity in survey participation biasing our estimates, we add indicator variables for the combination of years a given establishment participated in the survey to the control variables. Reassuringly, we find no evidence for selective sample participation to bias our estimates (see Section 3.4).

3.3 Results

In this section, we present ordinary least squares estimates of the four training outcomes described in Section 2.3: the take-over rate of recent graduates, the likelihood to train at least one trainee in the current year, the likelihood to train less trainees in the current than in the previous year, and the likelihood to train new trainees in the next training year. In Figure 2 and Table 3, we present the key estimates of all of our outcomes derived from regression equation (1).

Effects on recent graduates

In column (1) of Table 3, we show the estimates of regression equation (1) for the take-over rate of recent graduates as outcome. The estimates of the treatment effect (δ) (to the right of the vertical line) and the placebo test (ρ) (to the left of the vertical line) are also depicted in panel (A) of Figure 2.

Reassuringly, the placebo estimate is close to and statistically indistinguishable from zero. This suggests that average take-over rates of treated and control establishments have evolved at a similar rate before the pandemic. In 2020, however, the average take-over rate has declined significantly more for treated establishments than for control establishments, relative to 2019. The benchmark specification shows a reduction in the average take-over rate due to the pandemic by

9.6 pp. This effect is sizeable given that the average take-over rate was 74 percent in 2019 (before the pandemic).

Table 3 further shows estimates of α, γ and π. Although not an issue for identification per se, it is reassuring that all of these estimates are quite close to zero and not statistically significantly different from zero at the five-percent level. This suggests that treatment and control establishments did not differ in their training behaviour before the pandemic and that the control group behaved quite stable before versus after the start of the pandemic. This is not only true for the take-over rate but also for the other outcomes that we will consider next (see Table 3, columns (2) to (4); only the estimate of γ in column (4) is significant at the five-percent level). Overall, these patterns suggest that our estimates indeed capture the effects of the pandemic and not some other differential developments between treated and control establishments.

Effects on training in the current year

In 2019 (before the pandemic), the likelihood that a training establishment trains at least one trainee was 76 percent. The estimate of the pandemic's effect on this likelihood is negative (minus 3.8 pp, see column (2) of Table 3 or panel (B) of Figure 2) yet relatively small and statistically insignificant. Again, the placebo effect is estimated to be both economically and statistically insignificant. We therefore find no evidence that the Covid-19 pandemic had a significant effect on the extensive margin of training in 2020 in the benchmark model.

Table 3: Difference-in-Differences Estimates of Different Outcomes – Benchmark Estimates

Change in difference of a given outcome variable between establishments more and less negatively affected by pandemic relative to difference in 2019, in percentage points

	(1)	(2)	(3)	(4)
	Take-over rate	**Trains this year**	**Less trainees**	**New trainees**
$Treat_j$ x $post_t$ (δ)	-0.096 (0.0347)	-0.038 (0.0441)	0.077 (0.0387)	-0.067 (0.0259)
$Treat_j$ x $\overline{pre}_t$(ρ) [Placebo]	0.005 (0.0286)	0.014 (0.0441)	0.013 (0.0362)	-0.004 (0.0217)
$Treat_j$ (α)	0.01 (0.0234)	0.018 (0.0419)	-0.018 (0.0332)	-0.012 (0.0203
$Post_t$ (γ)	0.018 (0.0255)	0.017 (0.0322)	-0.029 (0.0267)	-0.037 (0.0177)
$\overline{Pre}_t$ (π)	-0.016 (0.022)	0.027 (0.0266)	-0.022 (0.0182)	0.011 (0.0179)
Observations	15,986	29,715	25,223	29,484
Location	Y	Y	Y	Y
Size	Y	Y	Y	Y
Industry	Y	Y	Y	Y
Survey participation	Y	Y	Y	Y
Constant	Y	Y	Y	Y

Notes: This table shows ordinary least squares coefficient estimates of regression equation (1). The outcomes are the take-over rate of recent graduates in column (1), the likelihood to train at least one trainee in the current year in column (2), the likelihood to train less trainees in the current than in the previous year in column (3), and the likelihood to train new trainees in the next training year in column (4). *Treat* is an indicator variable for establishment *j* experiencing medium strong to very strong negative economic effects of the Covid-19 pandemic. *Post* is an indicator variable for the year 2020, the treatment year, $\overline{pre}$ is an indicator variable for years 2013 to 2018, the placebo years, and 2019 is the reference year. Each regression includes indicator variables for federal state, establishment size in the previous year (6 categories), industry (16 categories), and survey participation as controls. All regressions are weighted by the cross sectional weighting factor. Robust standard errors clustered at the industry–year level are in parentheses.

Source: IAB Establishment Panel, own calculations © IAB.

However, we find some evidence that after the first lockdown in 2020 the pandemic led to a reduction in the number of current trainees (conditional on training). As can be seen from column (3) of Table 3 or panel (C) of Figure 2, the placebo test shows no significant effects before the start of the pandemic. The estimate of the treatment effect, in turn, shows an increase of 7.7 pp in the likelihood of training establishments to reduce the number of their current trainees because of the pandemic. This effect is statistically different from zero at the five percent level. In Section 4, we discuss that this effect is likely to be driven by premature terminations of already existing training contracts and not by a reduction in the number of new trainees.

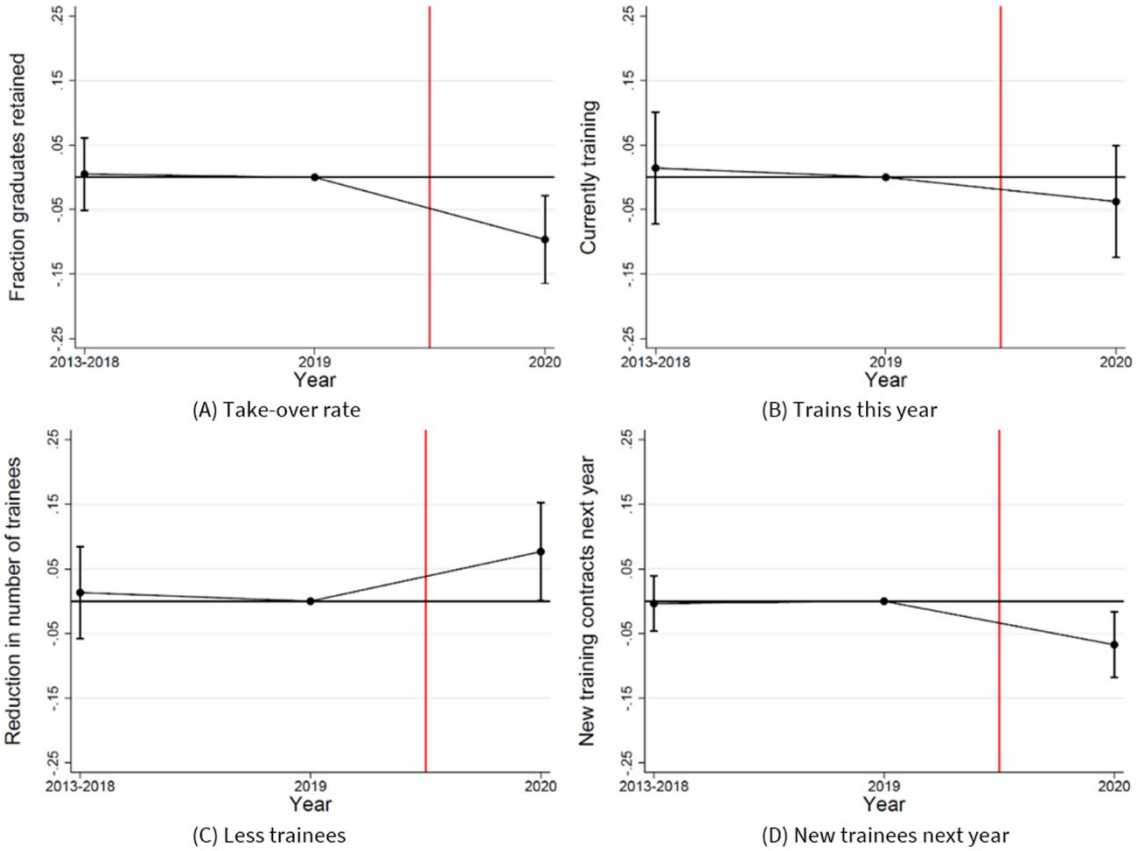
Effects on new training contracts for the next training year

As final outcome, we consider the likelihood that a training establishment has concluded new training contracts for the next training year, which was the case for 42 percent of training establishments in the 2019 survey (before the pandemic). According to the benchmark specification, the Covid-19 pandemic reduced the probability to conclude new training contracts for the next training year by 6.7 pp, ceteris paribus (column (4) of Table 3 or panel (D) of Figure 2). Reassuringly, the placebo estimate shows no significant effect at the five-percent level.

To sum up, our benchmark estimates show that the Covid-19 pandemic led to significant reductions in both current and new trainees after the first lockdown in 2020. We find no evidence, however, that establishments immediately stopped training completely. Moreover, establishments reduced the take-over of recent graduates in 2020 because of the pandemic, on average.

Figure 2: Difference-in-Differences Estimates – Different Outcome Variables

Change in difference of a given outcome variable between establishments more and less negatively affected by pandemic relative to difference in 2019, in percentage points



Notes: The panels of the figure show ordinary least squares estimates of coefficients ρ (placebo test – left to the vertical solid line) and δ (treatment effect – right to the vertical solid line) from regression equation (1). The outcomes are the take-over rate of recent graduates in panel (A), the likelihood to train at least one trainee in the current year in panel (B), the likelihood to train less trainees in the current than in the previous year in panel (C), and the likelihood to train new trainees in the next training year in panel (D). As controls, we include indicator variables for federal state, establishment size in the previous year (6 categories), industry (16 categories), and survey participation. All regressions are weighted by the cross sectional weighting factor. The 5% confidence intervals rely on robust standard errors clustered at the industry–year level.

Source: IAB Establishment Panel, own calculations © IAB.

Effect heterogeneity

Next, we explore if the effects of the pandemic vary across subgroups. We show the estimates of the treatment and placebo effects based on regression equation (1) for all of our four outcomes in Table 4 for the following subgroups: In panel (A), we report again the benchmark estimates from Table 3 for convenience. In panel (B), we split the sample by the location of the training establishment into East and West. In panel (C), finally, we estimate the effects separately in three groups of industry sectors. The first group comprises establishments operating in industries that

are, on average, least affected by the Covid-19 pandemic in 2020, namely agriculture, construction, social, health, and other services. The second group consists of establishments in manufacturing, retail, trade, maintenance, and information and therefore sectors that are more affected by the pandemic than those in the first group are. The third group contains establishments in the most negatively affected sectors transport and hospitality.

The sample split by location reveals some interesting patterns of effect heterogeneity. According to the estimates in panel (B), training establishments located in the East did not reduce take-over of graduates in 2020 due to the pandemic. The reduction in take-overs was solely driven by establishments in the West. Establishments in the West, in turn, were far less likely to reduce current or new trainees than those in the East.

Concerning the sample split by industry, estimates of the effects of the pandemic on the average take-over rate are negative across all three groups of sectors considered (panel (C), column (1) of Table 4). With minus 6.5 pp, the effect is estimated to be weakest in manufacturing, retail, trade, maintenance, and information and strongest in the transport and hospitality sectors, with minus 13.7 pp. For the latter group, the estimated effects on both the likelihood to train at least one trainee in the current year and the likelihood to train fewer trainees in the current than in the previous year are quite interesting. Although not statistically significant, these estimates point towards an increase, or at least not a decrease, in the training of current trainees in 2020 because of the pandemic in this group, instead of a decrease as in the other two groups. Panel (C), column (3), further makes it clear that reductions in the number of current trainees mainly took place in manufacturing, retail, trade, maintenance, and information. Reductions of new trainees, finally, can be observed across all of the three groups of sectors, with estimates ranging from minus 7.1 to minus 16.2 pp (panel (C), column (4) of Table 4). This effect is strongest for establishments in the transport and hospitality sectors.

Table 4: Difference-in-Differences Estimates of Different Outcomes – by subgroups

Change in difference of a given outcome variable between establishments more and less negatively affected by pandemic relative to difference in 2019, in percentage points

	(1)	(2)	(3)	(4)
	Take-over rate	**Trains this year**	**Less trainees**	**New trainees next year**
Panel (A): All				
$Treat_j$ x $post_t(\delta)$	-0.096 (0.0347)	-0.038 (0.0441)	0.077 (0.0387)	-0.067 (0.0259)
$Treat_j$ x $\overline{pre}_t(\rho)$ [Placebo]	0.005 (0.0286)	0.014 (0.0441)	0.013 (0.0362)	-0.004 (0.0217)
Panel (B): Location				
East				
$Treat_j$ x $post_t(\delta)$	-0.001 (0.0607)	-0.058 (0.0344)	0.14 (0.0479)	-0.134 (0.0389)
$Treat_j$ x $\overline{pre}_t(\rho)$ [Placebo]	-0.005 (0.0599)	0.027 (0.0348)	0.043 (0.0481)	-0.054 (0.0413)
West				
$Treat_j$ x $post_t(\delta)$	-0.115 (0.0377)	-0.033 (0.0542)	0.064 (0.0439)	-0.052 (0.0305)

	(1)	(2)	(3)	(4)
	Take-over rate	**Trains this year**	**Less trainees**	**New trainees next year**
$Treat_j$ x $\overline{pre}_t(\rho)$ [Placebo]	0.005 (0.0314)	0.01 (0.0545)	0.009 (0.043)	0.009 (0.0255)
Panel (C): Industry				
Agricult./constr./social/health/other services				
$Treat_j$ x $post_t(\delta)$	-0.091 (0.0343)	-0.048 (0.0687)	0.06 (0.0646)	-0.071 (0.0404)
$Treat_j$ x $\overline{pre}_t(\rho)$ [Placebo]	0.008 (0.0314)	-0.008 (0.0692)	0.022 (0.0618)	-0.026 (0.0327)
Manufac./retail/trade/maintenance/information				
$Treat_j$ x $post_t(\delta)$	-0.065 (0.0619)	-0.028 (0.0313)	0.101 (0.0251)	-0.063 (0.0552)
$Treat_j$ x $\overline{pre}_t(\rho)$ [Placebo]	-0.021 (0.0613)	0.041 (0.0323)	0.01 (0.0334)	0.004 (0.0477)
Transport/hospitality				
$Treat_j$ x $post_t(\delta)$	-0.137 (0.0798)	0.06 (0.0485)	-0.049 (0.1278)	-0.162 (0.0683)
$Treat_j$ x $\overline{pre}_t(\rho)$ [Placebo]	0.081 (0.0525)	0.004 (0.0417)	-0.01 (0.1151)	-0.059 (0.0533)
$Treat_j$	Y	Y	Y	Y
$Post_t$	Y	Y	Y	Y
$\overline{Pre}_t$	Y	Y	Y	Y
Control variables	Y	Y	Y	Y
Constant	Y	Y	Y	Y

Notes: This table shows ordinary least squares estimates of regression equation (1) for different outcome variables and for different subgroups of training establishments. Panel (A) reports benchmark estimates pooling all observations (see also Table 3). Panel (B) reports estimates by whether the establishment is located in the East or the West of Germany. Panel (C) reports estimates by industry sector (3 categories, grouped in ascending order of sectors' affectedness in 2020: agriculture/construction/social/health/other services, manufacturing/retail/trade/maintenance/information and transport/hospitality). *Treat* is an indicator variable for establishment j experiencing medium strong to very strong negative economic effects of the Covid-19 pandemic. *Post* is an indicator variable for the year 2020, the treatment year, $\overline{pre}$ is an indicator variable for years 2013 to 2018, the placebo years, and 2019 is the reference year. Each regression includes indicator variables for federal state, establishment size in the previous year (6 categories), industry (16 categories), and survey participation as controls. All regressions are weighted by the cross sectional weighting factor. Robust standard errors clustered at the industry–year level are in parentheses.

Source: IAB Establishment Panel, own calculations © IAB

3.4 Robustness Checks

Pre-trends

Until now, we have pooled pre-treatment years to be able to estimate pre-trends more precisely, yet at the expense of reduced flexibility in the functional form. Additionally, we have applied the trend-correction procedure by Dustmann et al. (2021), illustrated in the Appendix. In Table 5, we present two variants of these "trend-corrected" estimates. Panel (B) contains the trend-corrected estimates of the treatment effect based on regression equation (2) (see Appendix). Panel (C) contains the trend-corrected estimates but additionally allows time-trends to vary by industry sector. For convenience, panel (A) shows once again the benchmark estimates. Results for each of our four outcome variables are shown in columns (1) to (4).

Overall, the results are quite robust, no matter how we account for possible pre-trends. Both the estimates of the likelihood to train at least one trainee in the current year (column (2)) and the likelihood to train new trainees in the next training year (column (4)) hardly vary across specifications. For the take-over rate (column (1)) and the likelihood to train less trainees (column (3)), the trend-adjusted estimates increase somewhat in absolute terms relative to the benchmark estimates (panel (A) vs panels (B) or (C)), from minus 9.6 pp to minus 11 pp and from 7.7 pp to 8.1 pp, respectively. These patterns suggest that potential pre-trends would, if at all, lead us to somewhat underestimate the negative effects of the pandemic.

Table 5: Difference-in-Differences Estimates of Different Outcomes – Robustness Regressions – Pre-Trends

Change in difference of a given outcome variable between establishments more and less negatively affected by pandemic relative to difference in 2019, in percentage points

	(1)	(2)	(3)	(4)
	Take-over rate	**Trains this year**	**Less trainees**	**New trainees**
$Treat_j$ x $post_t$				
(A) Benchmark	-0.096 (0.0347)	-0.038 (0.0441)	0.077 (0.0387)	-0.067 (0.0259)
(B) Pre-trend corrected	-0.11 (0.0345)	-0.037 (0.0439)	0.081 (0.0388)	-0.065 (0.0259)
(C) Pre-trend corrected, industry-specific trends	-0.11 (0.0332)	-0.037 (0.0433)	0.081 (0.0389)	-0.066 (0.0263)
$Treat_j$	Y	Y	Y	Y
$Post_t$	Y	Y	Y	Y
$\overline{Pre_t}$	Y	Y	Y	Y
Control variables	Y	Y	Y	Y
Constant	Y	Y	Y	Y

Notes: This table shows ordinary least squares coefficient estimates of regression equation (1) [(2) in the case of panels (B) and (C)]. The outcomes are the take-over rate of recent graduates in column (1), the likelihood to train at least one trainee in the current year in column (2), the likelihood to train less trainees in the current than in the previous year in column (3), and the likelihood to train new trainees in the next training year in column (4). *Treat* is an indicator variable for establishment *j* experiencing medium strong to very strong negative economic effects of the Covid-19 pandemic. *Post* is an indicator variable for the year 2020, the treatment year, $\overline{pre}$ is an indicator variable for years 2013 to 2018, the placebo years (in case of panels (B) and (C): indicator variables for each single year), and 2019 is the reference year. Each regression includes indicator variables for federal state, establishment size in the previous year (6 categories), industry (16 categories), and survey participation as controls. Regressions in panel (C) additionally control for industry-specific time trends. All regressions are weighted by the cross sectional weighting factor. Robust standard errors clustered at the industry–year level are in parentheses.

Source: IAB Establishment Panel, own calculations © IAB.

In Table 6, we present results of further robustness checks. Panels (A) to (D) contain the key estimates of the four training outcomes defined in Section 2.3. Within each panel, we show the estimates of the treatment and placebo effects from our benchmark regression equation (1) as well as the trend-corrected estimates of the treatment effect from regression equation (2). In column (1), we show again the estimates from our benchmark specification (see Table 3) for convenience.

Selectivity

The goal of the following three specifications is to test if our results are confounded by systematic intertemporal changes in selective sorting into treatment status unrelated to the pandemic. For this purpose, in column (2) we re-estimate the benchmark models but exclude all control variables. Reassuringly, the results do not change much when we exclude controls for all outcomes but the training of new trainees in panel (D). Not controlling for selection on observables appears to bias the estimates towards finding a weaker negative effect on the likelihood to train new trainees next training year (point estimates increase, in absolute terms, from minus 4.5 pp to minus 6.7 pp when we add controls).

In column (3), we add again the control variables, but this time we use information on industries (569 sectors) and regions (400 districts) from administrative data to control for sorting into

industries and regions in a more detailed way. In column (4), we return to the benchmark specification but use the fraction of school leavers with either no, a lower, or an intermediate secondary school-leaving certificate in an establishment's state (in the previous year) to control for differential changes in the local supply of applicants (these data come from the Federal Statistical Office and the Statistical Offices of the Federal States 2021). Reassuringly, our results are robust to including these alternative controls. As sole exception, we should highlight that the negative effect on the likelihood to train at least one trainee in the current year turns statistically significant at the five-percent level in column (3), panel (B).

Spill-overs

The goal of our final three robustness checks is to test if our results are sensitive to spill-overs of the effects of the pandemic to establishments in the control group. Theoretically, it might be the case that some establishments intensify training because they experienced positive economic effects by the pandemic, for instance. We tackle this question by estimating the benchmark models while dropping certain establishments from the treatment or the control groups, respectively.

In column (5) of Table 6, we show results from regressions where we drop establishments that are weakly negatively affected by the Covid-19 pandemic from the estimation sample. Including them among the control group might bias our estimates towards finding weaker or no negative effects on training because the training behaviour of these establishments might still react negatively to the pandemic even if they experienced only weak negative effects. In columns (6) and (7), finally, we exclude all establishments that might have possibly profited from the pandemic in economic terms. In column (6), we do this by excluding all establishments that have reported an increase in the demand for their products or services during the pandemic from the control group. In column (7), we restrict the estimation sample to establishments experiencing very weak or weak negative effects due to the pandemic in the control group and establishments experiencing strong to very strong negative effects in the treatment group (these latter results have to be interpreted with caution as the sample size declines by more than half, which reduces the precision of the estimates considerably). Overall, the results proof quite robust. Most importantly, there is no evidence that potential spill-overs or other confounding factors lead us to overestimate the negative effects of the pandemic in the benchmark specification.

Table 6: Difference-in-Differences Estimates of Different Outcomes – Robustness Regressions – Selectivity and Spill-overs

Change in difference of a given outcome variable between establishments more and less negatively affected by the pandemic relative to difference in 2019, in percentage points

	(1) Benchmark	(2) No control variables	(3) Detailed industries/ locations	(4) Local supply of applicants	(5) Alternative control group I	(6) Alternative control group II	(7) Alternative control group III
Panel (A): Take-over rate							
$Treat_j \times post_t$	-0.096	-0.093	-0.11	-0.096	-0.099	-0.089	-0.092
	(0.0347)	(0.0398)	(0.0373)	(0.0347)	(0.0438)	(0.0359)	(0.0595)
$Treat_j \times post_t$ [Trend-corrected]	-0.11	-0.105	-0.122	-0.109	-0.113	-0.103	-0.103
	(0.0345)	(0.0398)	(0.0373)	(0.0345	(0.0436)	(0.0359)	(0.0594)
$Treat_j \times \overline{pre}_t$ [Placebo]	0.005	0.000	-0.002	0.006	0.004	0.017	0.044
	(0.0286)	(0.0331)	(0.036)	(0.0284)	(0.036)	(0.0324)	(0.0589)
Panel (B): Trains this year							
$Treat_j \times post_t$	-0.038	-0.034	-0.063	-0.038	-0.037	-0.065	-0.099
	(0.0441)	(0.0503)	(0.0281)	(0.0441)	(0.0471)	(0.0532)	(0.0661)
$Treat_j \times post_t$ [Trend-corrected]	-0.037	-0.033	-0.067	-0.037	-0.034	-0.066	-0.109
	(0.0439)	(0.0503)	(0.0281)	(0.0439)	(0.0469)	(0.053)	(0.0658)
$Treat_j \times \overline{pre}_t$ [Placebo]	0.014	0.012	-0.001	0.014	0.015	-0.004	-0.04
	(0.0441)	(0.0503)	(0.0258)	(0.0441)	(0.0466)	(0.0521)	(0.0667)
Panel (C): Less trainees							
$Treat_j \times post_t$	0.077	0.077	0.082	0.076	0.076	0.077	0.124
	(0.0387)	(0.0386)	(0.0296)	(0.0387)	(0.046)	(0.0362)	(0.05)
$Treat_j \times post_t$ [Trend-corrected]	0.081	0.081	0.088	0.081	0.079	0.081	0.136
	(0.0388)	(0.0386)	(0.0296)	(0.0388)	(0.0461)	(0.0363)	(0.05)
$Treat_j \times \overline{pre}_t$ [Placebo]	0.013	0.013	-0.006	0.013	0.014	0.028	0.061
	(0.0362)	(0.0356)	(0.0279)	(0.0361)	(0.0405)	(0.0321)	(0.0533)
Panel (D): New trainees next year							
$Treat_j \times post_t$	-0.067	-0.045	-0.069	-0.067	-0.077	-0.074	-0.088
	(0.0259)	(0.0221)	(0.0318)	(0.0258)	(0.0282)	(0.0308)	(0.0544)
$Treat_j \times post_t$ [Trend-corrected]	-0.065	-0.042	-0.069	-0.065	-0.077	-0.071	-0.084
	(0.0259)	(0.0221)	(0.0318)	(0.0258)	(0.0283)	(0.0307)	(0.0544)
$Treat_j \times \overline{pre}_t$ [Placebo]	-0.004	-0.003	-0.021	-0.003	-0.018	-0.007	0.032
	(0.0217)	(0.0228)	(0.0311)	(0.0217)	(0.0224)	(0.0239)	(0.0406)
$Treat_j$	Y	Y	Y	Y	Y	Y	Y
$Post_t$	Y	Y	Y	Y	Y	Y	Y
$\overline{Pre}_t$	Y	Y	Y	Y	Y	Y	Y
Control variables	Y	N	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows ordinary least squares coefficient estimates of regression equation (1) [(2) in the case of rows 3 and 4 within each panel] for different outcome variables and different model specifications. Column (1) reports the benchmark estimates (see also Table 3). In the benchmark specification, *treat* is an indicator variable for establishment *j* experiencing medium strong to very strong negative economic effects of the Covid-19 pandemic, *post* is an indicator variable for the year 2020, the treatment year, $\overline{pre}$ is an indicator variable for years 2013 to 2018, the placebo years, 2019 is the reference year, and control variables comprise indicator variables for federal state, establishment size in the previous year (6 categories), industry (16 categories), and survey participation. Column (2) reproduces these estimates while excluding all control variables. Column (3) uses regional and industry information from administrative data to control for more detailed regions (400 districts) and industries (569 sectors) as in the benchmark specification. Column (4) returns to the benchmark specification but adds the fraction of school leavers with either no, a lower, or an intermediate secondary school-leaving certificate in an establishment's state in the previous year as control variable. Column (5) drops establishments weakly negatively affected by the Covid-19 pandemic from the sample. Column (6) excludes establishments reporting an increase in the demand for their products or services during the pandemic from the control group. Column (7) restricts the estimation sample to establishments experiencing very weak or weak negative effects due to the pandemic in the control group and establishments experiencing strong to very strong negative effects in the treatment group. All regressions are weighted by the cross sectional weighting factor. Robust standard errors clustered at the industry–year level are in parentheses.

Source: IAB Establishment Panel, own calculations © IAB

4 Discussion

The following points are important for interpreting our results. First, we find that the Covid-19 pandemic reduced the number of trainees trained in June, 2020. This reduction is likely to reflect mainly terminations of training contracts that have already existed before the start of the pandemic and not a decline of new trainees. This is because a training year typically starts in August/September the previous year. In principle, training can still start later, but according to the SIAB data (see Frodermann et al. 2021, for a description of the SIAB) in 93 percent of cases training starts March or earlier. Therefore, it appears plausible that this effect reflects mainly premature terminations of already existing training contracts.

Second, although we do not have individual-level data on applicants, trainees, or graduates at this point, we believe that the demand-side (i.e. establishments' decisions) is the main driver of our results, particularly at the early stage of the pandemic that we consider here, for at least three reasons: On the one hand, Figure 1 shows a decline in both the numbers of posted training positions and registered applicants for a training position after versus before the pandemic. The number of applicants was declining at a similar rate already since 2018 while the number of posted positions changed its slope and kinked downward when comparing the changes 2018 versus 2019 and 2019 versus 2020. The trajectory of new training contracts mirrors this kink quite closely, suggesting that establishments' decisions drive their decline in the first place.

On the other hand, lockdown-induced reductions in the number of applicants would tend to affect not only those training establishments that are directly affected by the pandemic but also all training establishments alike. Our difference-in-differences estimates would cancel out such effects.

Furthermore, next to the IAB Establishment Panel, the Institute for Employment Research (IAB) conducts a high-frequency survey among establishments to monitor recent developments on the German labour market during the pandemic, called "Establishments in the Covid-19 Crisis" (Backhaus et al. 2021). In the seventh wave of this survey conducted in December 2020, establishments that planned to offer fewer or no training positions for the training year 2021/22 because of the Covid-19 pandemic where asked for the reasons behind their decision. Almost all of these establishments reported that they plan to train less because of establishment-related reasons, like financial issues or insecurity about future business development. Additional reasons were much rarer, including problems during the recruiting process because of contact restrictions (36 percent) and expected lack of suitable applicants (28 percent). Restrictions on the side of the establishments therefore appear to be the main driver of the negative effect of the pandemic on the training of new trainees.

We should note, however, that it would be important to comprehend how the pandemic will affect the supply of potential trainees in the future. In another wave of the survey "Establishments in the Covid-19 Crisis" conducted in September 2021, the main reason for establishments to reduce the number of new training contracts was reported to be a lack of applicants while pandemic-related restrictions on the side of the establishments were reported to play only a minor role. This suggests that supply restrictions have gained in importance since the end of the lockdown measure in early spring 2021.

Third, in our analysis of effect heterogeneity, we find that the pandemic had a negative effect on take-overs of graduates in 2020 only for establishments located in the West. One explanation for this pattern is that training establishments in the East face far more severe problems of filling vacant training positions than those in the West already before the start of the pandemic (Leber/Schwengler 2021). Establishments in the East therefore appear to depend more on keeping their recent graduates, yet at the expense of a reduction in the number of new trainees.

Fourth, our heterogeneity analysis further reveals that in the transport and hospitality sectors the pandemic exerted negative effects on recent graduates as well as on new cohorts of trainees but left current trainees mainly unaffected. One potential explanation for this pattern is that affected establishments in these sectors were particularly dependent on the relatively cheap labour of trainees, especially during the lockdown. In the lockdown, contact restrictions were most problematic for hospitality and supply bottlenecks should have played a particular role for transport and logistics. It appears plausible that the effect of the pandemic on new trainees was then, in turn, particularly strong in these sectors.

Fifth, the German Government introduced the Bundesprogramm "Ausbildungsplätze sichern" (federal program for securing training places).[4] The program rewards small and medium sized establishments that are negatively affected by the Covid-19 pandemic with financial premia if they maintain or even expand vocational education and training as compared to their pre-crisis level. The program launched in August 2020 and might thus influence our findings. Unfortunately, with the data currently available it is not possible to evaluate its impact directly. However, in the IAB survey "Establishments in the Covid-19 Crisis" from December 2020, merely 1.8 percent of all establishments eligible for providing training reported that they have already received any kind of premia from the program. One important aspect of this low fraction is that only 43 percent of those establishments responded that they do know the program. Furthermore, only 44 percent of those who reported to know the program did know its eligibility criteria (which are also quite complex). Ultimately, given these knowledge gaps and low fraction of supported establishments at the time of our study we do not think that the program plays a significant role for our findings.

Sixth, another policy intervention that might possibly influence our results is the new minimum wage for trainees in the dual system of vocational education and training that was introduced in 2020. All training contracts concluded on January 1, 2020 or thereafter are subject to a minimum remuneration of €515 per month. According to the IAB Establishment Panel, however, merely five percent of establishments offering new training positions for the training year 2019/20 (i.e. before the training minimum wage introduction) offered contracts remunerating less than this minimum. Moreover, we do not find that affectedness by the training minimum wage and affectedness by the Covid-19 pandemic are somehow associated. The fraction of offered training positions remunerating less than the minimum among all offered positions and the affectedness by the Covid-19 pandemic are not correlated significantly, no matter whether we look at the raw regression coefficient or add the control variables from our benchmark difference-in-differences model. We are therefore confident that the new training minimum wage plays no significant role for our findings.

[4] See this website for details of the program: https://www.bmbf.de/bmbf/de/bildung/berufliche-bildung/foerderinitiativen-und-program-ur-staerkung-der-berufsbildung/bundesprogramm-ausbildungsplaetze-sichern/bundesprogramm-ausbildungsplaetze-sichern.html.

5 Conclusion

In our study, we have estimated the short-run effects of the Covid-19 pandemic on vocational education and training in Germany after the first lockdown in 2020. While we did not find that the pandemic led affected establishments to stop training completely we found that it led to significant reductions in the number of both current and new trainees. Additionally, we found that the pandemic reduced the take-over rate in 2020.

Our findings suggest that the pandemic contributes to skills shortage in the near future. A declining number of new trainees intensifies the already difficult situation of lacking skills in the workforce, especially in occupations with already severe labour shortages. The training of workers can contribute substantially to reducing this shortage and to securing the supply of skilled workers.

For young workers, who were unfortunate to enter the labour market during the crisis, being dismissed from training or not taken over by their training establishment after graduation will potentially have long-lasting negative effects on their career development, particularly for less advantaged youth. Although analysing these effects explicitly has to be left to future research, the available evidence suggests that programs that foster on-the-job training and support the training-to-work transition during the Covid-19 pandemic, or crises in general, are advisable to avoid a “Corona cohort”.

Finally, the pandemic affects all countries worldwide and increasing skills shortage as well as negative career effects of entering the labour market in a recession are not specific to Germany, too. We therefore believe that our findings have broader implications for skill formation and individual career development during the Covid-19 pandemic in other industrialised countries and with other education systems.

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6 Appendix

Trend-correction procedure

In addition to our benchmark specification (regression equation (1)), we apply the trend-correction procedure of Dustmann et al. (2021) to account for potential biases from possible pre-trends. First, we regress outcome y of training establishment j in period t=[2013,2020] on an intercept $\tilde{y}$, an indicator variable taking on unity if the establishment experienced medium strong, strong, or very strong negative economic effects because of the pandemic in 2020, $1\left(treat_j = 1\right)$, indicator variables for each year, $1(year = t)$, except for 2019 (the reference year), interaction terms between the treatment and year indicators, control variables X with coefficient vector $\tilde{\beta}$, and an error term $\tilde{u}$. The models' main coefficients are $\tilde{\alpha}$, $\tilde{\gamma}$, and $\tilde{\delta}$; see regression equation (2).

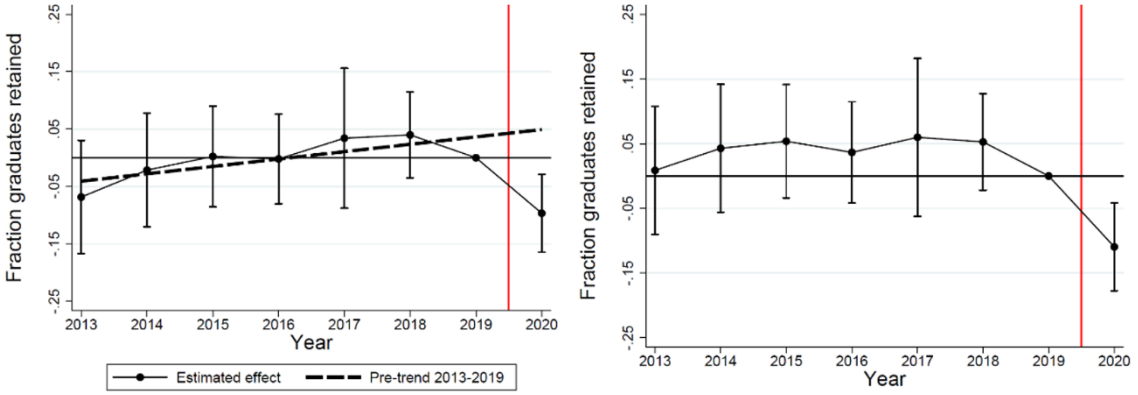
$$y_{jt} = \tilde{y} + 1\left(treat_j = 1\right)\tilde{\alpha} + \sum_{\tau=2013\neq2019}^{2020} 1(year = t)\tilde{\gamma}_\tau + \sum_{\tau=2013\neq2019}^{2020} [1(year = t) * 1(treat_j = 1)]\tilde{\delta}_\tau + \tilde{\beta}X_{jt} + \tilde{u}_{jt} \quad (2)$$

Second, we estimate regression equation (2) and use the estimates of $\tilde{\delta}_{\tau<2020}$to estimate a linear trend that we then extrapolate to 2020. Note that we do not involve any observations after the start of the pandemic in estimating the trend because this would eliminate parts of the effects of the pandemic. Finally, we "trend-correct" the original estimates of $\tilde{\delta}_\tau$ by taking their deviations from this trend line, again referencing against 2019.

In Figure 3, we illustrate this procedure using the case of the take-over rate as an example. In panel (A), we depict the original estimates of $\tilde{\delta}_\tau$ from regression equation (2). The graph in panel (A) further depicts the trend estimated using only pre-treatment years and then updated for 2020 (the dashed straight line). Although all estimates of $\tilde{\delta}_{\tau<2020}$ are statistically indistinguishable from zero, this line points towards a possibly weak yet positive pre-trend. Not addressing this potential pre-trend would lead the unadjusted estimates to *underestimate* the negative effect of the pandemic on take-overs. To be on the safe side, we therefore trend-correct the original estimates by taking their deviations from the linear trend. We show the trend-corrected estimates in panel (B) of Figure 3.

Figure 3: Difference-in-Differences Estimates – Fraction of Recent Graduates Retained

Change in difference of take-over rate between establishments more and less negatively affected by the pandemic relative to difference in 2019, in percentage points



(A) Without pre-trend correction (B) Pre-trend corrected

Notes: The figure shows ordinary least squares estimates of coefficients $\tilde{\delta}_\tau$ of regression equation (2) for the fraction of successful graduates in the current training year retained by their training establishment. The graph in panel (A) depicts the original estimates together with a linear trend estimated using only pre-treatment years and updated for 2020 (the dashed straight line). The graph in panel (B) depicts the deviations from this trend line. Control variables include federal state, establishment size in the previous year (6 categories), industry (16 categories) and survey participation. All regressions are weighted by the cross sectional weighting factor. The 5% confidence intervals rely on robust standard errors clustered at the industry–year level. Source: IAB Establishment Panel, own calculations © IAB.

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