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The Covid-19 pandemic and international supply chains

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Abstract

The Covid-19 pandemic has caused major disruptions in international trade and has raised concerns about adverse effects on international supply chains. Using a unique establishment survey matched with administrative data from Germany, we provide novel evidence on how establishments have adjusted their supply chains in response to pandemic-induced disruptions. We find that establishments that experienced difficulties in obtaining intermediate inputs as a result of the pandemic are significantly more likely to change their network of suppliers than establishments without such problems, especially if disruptions affected imports from abroad. If an establishment experienced disruptions, it is also more likely to replace a distant with a closer supplier. However, these supply chain adjustments in response to the pandemic appear to be temporary.

Zusammenfassung

Die Covid-19 Pandemie hatte einen beträchtlichen Einbruch des internationalen Handels zur Folge, wodurch auch Fragen zur Zukunft internationaler Handelsketten aufgeworfen wurden. Anhand eines Betriebs-Surveys, welches mit administrativen Daten verbunden werden konnte, untersuchen wir, wie Betriebe in Deutschland ihre Lieferketten aufgrund von pandemiebedingten Störungen angepasst haben. Unseren Ergebnissen zu folge weisen Betriebe, bei denen es aufgrund der Pandemie zu Einschränkungen im Bezug von Vorleistungen oder Zwischenprodukten gekommen ist, im Vergleich zu Betrieben ohne solche Beeinträchtigungen eine signifikant höhere Wahrscheinlichkeit auf, einen oder mehrere Lieferanten ausgetauscht zu haben. Dies ist insbesondere dann der Fall, wenn es zu Problemen beim Bezug aus dem Ausland gekommen ist. Betriebe, die von solchen Einschränkungen betroffen sind, haben darüber hinaus eine höhere Wahrscheinlichkeit, weiter entfernte Lieferanten mit näher gelegenen ersetzt zu haben. Den Ergebnissen zufolge handelt es sich dabei jedoch um temporäre Anpassungen.

JEL classification

D22, F14

Keywords

Covid-19 pandemic, establishments, Germany, imports, intermediate inputs, supply chains

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1 Introduction

Germany's economy is deeply integrated in international supply chains. In this paper, we study how establishments in Germany have adjusted their supply chains in response to pandemic-induced difficulties in acquiring intermediate inputs. We show to what extent such difficulties are associated with replacing suppliers located in more distant regions with ones closer to (or at) home.

Recent studies have used information on firm-level input-output linkages to show that economic shocks are propagated along supply chains (Cavalho et al. 2021; Barrot/Sauvagnat 2016). In light of the disruption the Covid-19 pandemic caused to international trade, the question whether firms adjusted their supply chains in response by reducing exposure to international shocks and re-shoring production has received renewed attention.

Firm-to-firm relationships in global value chains (GVCs) are shown to be sticky, especially in periods of high uncertainty (see Martin et al. 2020). We provide evidence that German establishments switched suppliers in response to the pandemic, a time marked by high uncertainty. Moreover, experiencing problems with imports of intermediate goods is associated with a higher likelihood of switching to suppliers nearby.

Borin and Mancini (2019) provide a measure of the importance of GVCs as a share of all trade and show that it has been declining since the Great Recession. Our establishment-level study seems to point in a similar direction1. Antras (2020) however argues that the evidence in Borin and Mancini (2019) can be a reason for the decline in trade growth but cannot be seen as a sign for de-globalization. Indeed, we do not find evidence that the switches of suppliers were of a permanent nature.

2 Data

The empirical analysis is based on a combination of a unique establishment survey and administrative data. The survey *Establishments in the Covid-19 Crisis* contains representative information about how the pandemic has affected establishments in Germany. We use data from wave 16, which provides information on whether an establishment experienced difficulties in receiving intermediate inputs since March 2020 due to the pandemic. Establishments were also asked whether they changed one or more of their suppliers in 2020 as a result of the pandemic, whether the change involved replacing a more distant with a closer supplier and whether these changes were permanent.

Most establishments in the sample grant permission to link the survey data to administrative records from the *Establishment History Panel (BHP)*, which contains annual information on the population of establishments in Germany. From the BHP, we use the pre-pandemic share of skilled

[1] Borin and Mancini (2019) define their measure of GVC prevalence as the share of exports of a country which cross at least two borders. In our data, we see imports of intermediate goods and services without further knowledge whether they crossed one or more borders.

workers, as observed on 30 June 2019. Finally, we add a measure of establishment quality to control for unobserved heterogeneity, the so-called CHK effects (Card et al. 2013), which correspond to the estimated establishment fixed effects from an AKM-style wage decomposition (Abowd et al. 1999).

Our analysis is based on 912 establishments that report receiving intermediate inputs and can be linked to the BHP.[2] According to this sample, 63.6 percent of establishments experienced difficulties in obtaining intermediate inputs and 15.2 percent changed one or more of their suppliers. Descriptive statistics can be found in Table A 1 in the Supplementary Material as well as a description of the datasets.

3 Estimation strategy

We estimate the following logit model to assess the changes that establishments made to their supply chains in response to pandemic-induced difficulties in obtaining intermediate inputs:

$$Pr(y_i = 1|D_i, \boldsymbol{x_i}) = e^{\left(\beta_0+\beta_1 D_i^{Germany}+\beta_2 D_i^{Abroad}+\boldsymbol{\gamma' x_i}\right)} \Big/ \left[1 + e^{\left(\beta_0+\beta_1 D_i^{Germany}+\beta_2 D_i^{Abroad}+\boldsymbol{\gamma' x_i}\right)}\right] \quad (1)$$

In the first specification, the dependent variable, y_i, is an indicator that takes the value 1 if an establishment replaced one or more of its suppliers. The main explanatory variable, D_i, indicates whether an establishment experienced difficulties in obtaining intermediate inputs from either within Germany, $D_i^{Germany}$, or abroad, D_i^{Abroad} (the reference category consists of establishments without such problems).[3] Positive coefficient estimates of β_1 and β_2 would provide evidence in favour of the hypothesis that disruptions caused by the pandemic led establishments to adjust their supply chains. Vector $\boldsymbol{x_i}$ contains dummy variables for nine sectors, four establishment size categories, two regions (East, West), as well as the share of skilled workers and the CHK establishment effect as a measure of unobserved establishment heterogeneity.

To assess the nature of changes made to an establishment's supply chains, we estimate two additional specifications using only data on establishments that changed their suppliers. First, we define a dependent variable that takes the value 1 for changes in which a more distant supplier is replaced by a less distant one and 0 otherwise. These changes refer to cases in which a supplier from outside the EU is replaced with a supplier in the EU or in Germany or if a supplier from the EU is exchanged for a supplier within Germany. Second, we assess the expected duration of adjustments by distinguishing between changes reported to be permanent as opposed to temporary adjustments.[4]

[2] The sample increases to 1,000 establishments without data from the BHP. Table A 4 shows similar results for the larger sample.

[3] To ensure a unique assignment, we include establishments that report disruptions in Germany and abroad in the category *Abroad*.

[4] Establishment that report temporary and permanent adjustments are assigned to the category *Permanent*.

4 Results

Table 1 shows the average marginal effects of pandemic-induced difficulties in obtaining intermediate inputs on the probability of an establishment changing its supply chains. According to the bivariate relationship in column 1, establishments that experienced difficulties with imports are significantly more likely to have made a change than establishments without such problems. In the case of difficulties with suppliers within Germany, there is a statistically significant difference of almost 10 percentage points. This difference increases to approximately 28 percentage points for establishments that experience difficulties in obtaining intermediate inputs from abroad. Compared to an average probability of reporting a change in one's suppliers of 15.2 percent, these differences are economically large[5].

These findings are robust to the inclusion of control variables. The estimated effects decrease only slightly when we control for an establishment's number of employees, its economic sector, or location (column 2). Results remain similar when we add the CHK effects as measures of unobserved establishment-level heterogeneity and the share of skilled employees (column 3). A concern may be that the large positive effect associated with disruptions abroad is due to comparing establishments whose supply chains extend abroad with establishments that only acquire intermediate inputs from within Germany, so that even after controlling for confounding factors these establishments might still remain sufficiently different. However, we show in Table A 4 that the results are robust to restricting the sample to establishments that purchase intermediate inputs abroad. Moreover, the results are not driven by a single sector, as shown in Table A 6. When we estimate the model separately by sector, we find that experiencing difficulties abroad has a significant effect in each case, but that it is largest for establishments from the manufacturing sector (Table A 7).

[5] We neither have information on the size of the supplier network nor on the number or share of changes in suppliers.

Table 1: Probability of changing a supplier

Average marginal effects

	(1)	(2)	(3)
Difficulties (Germany)	0.0987*** (0.0306)	0.1004*** (0.0311)	0.1029*** (0.0320)
Difficulties (Abroad)	0.2777*** (0.0405)	0.2645*** (0.0412)	0.2600*** (0.0406)
Control variables (survey)	**No**	**Yes**	**Yes**
Control variables (administrative)	**No**	**No**	**Yes**
Observations	**912**	**912**	**912**

Note: Unit of observation is establishment. Sampling weights are used. Robust standard errors are shown in parentheses. ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Survey control variables include dummies for sectors, employment size categories and East Germany. Administrative control variables include the share of skilled employees and the establishment fixed effects from an AKM-style wage decomposition. Complete results are in Table A 2 and Table A 3.

Source: IAB Survey „Establishments in the Covid-19 Crisis, IAB Establishment History Panel © IAB

We further assess the adjustments to supply chains using the sample of establishments that report to have changed one or more suppliers. Panel A of Table 2 shows the average marginal effects for whether the change involves replacing a supplier that is located further away with one closer by. Based on the bivariate relationship in column 1, having experienced disruptions abroad significantly increases the probability of replacing a more distant with a less distant supplier by approximately 42 percentage points. While this effect decreases slightly, it remains statistically significant at the 10 percent level once the full set of control variables is introduced. No significant effects are found for establishments with difficulties involving suppliers from within Germany.

Panel B addresses the question whether adjustments in supply chains were permanent or temporary. Regardless of whether control variables are included in the estimation, we find no evidence that pandemic-induced disruptions make it more likely that establishments changed their network of suppliers permanently. By contrast, establishments who experienced disruptions in Germany or abroad and who changed one or more of their suppliers have a significantly lower probability of making a permanent adjustment compared to establishments that changed their suppliers but did not experience disruptions in their supply chains. These results suggest that establishments that were exposed to disruptions used changes in their supply network as a short- to medium-term response to cope with pandemic-induced difficulties. Establishments without disruptions are more likely to make a permanent change, which might represent long-term plans that are independent of the pandemic.

Table 2: Probability of different types of changes

Average marginal effects

	(1)	(2)	(3)
	Panel A: Probability of replacing a more with a less distant supplier		
Difficulties (Germany)	0.2230 (0.2301)	0.2607 (0.2162)	0.2124 (0.2358)
Difficulties (Abroad)	0.4198** (0.2002)	0.3982** (0.1943)	0.3686* (0.2079)
	Panel B: Probability permanently changing a supplier		
Difficulties (Germany)	-0.2753** (0.1338)	-0.3232** (0.1581)	-0.3178** (0.1305)
Difficulties (Abroad)	-0.2017*** (0.0772)	-0.1944*** (0.0666)	-0.2042*** (0.0636)
Control variables (survey)	**No**	**Yes**	**Yes**
Control variables (administrative)	**No**	**No**	**Yes**
Observations	**912**	**912**	**912**

Note: Unit of observation is establishment. Sampling weights are used. Robust standard errors are shown in parentheses. ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Survey control variables include dummies for sectors, employment size categories and East Germany. Administrative control variables include the share of skilled employees and the establishment fixed effects from an AKM-style wage decomposition. Complete results are in Table A 8 and Table A 9 (Panel A) and in Table A 10 and Table A 11 (Panel B).

Source: IAB Survey „Establishments in the Covid-19 Crisis, IAB Establishment History Panel © IAB

5 Conclusion

We provide novel evidence on how establishments in Germany responded to disruptions to their supply chains that arose as a result of the Covid-19 pandemic. We show that experiencing difficulties in receiving intermediate inputs makes it more likely that establishments adjusted their network of suppliers, especially if the disruptions affected inputs from abroad. Conditional on changing suppliers, establishments are more likely to replace a distant with a closer supplier if disruptions affect imports from abroad. We are, however, hesitant to interpret these findings as evidence in favour of the hypothesis that the Covid-19 pandemic has contributed to a lasting reduction in the relevance of global supply chains. Rather, our findings suggest that establishments intend these adjustments to be temporary, which makes a return to the initial levels of international supply networks appear likely.

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Appendix

Data

Establishments in the Covid-19 Crisis. The survey was initiated by the Institute for Employment Research (IAB) and its first wave administered in August 2020. It has since been carried out every 3 to 4 weeks. Its purpose is to collect up-to-date information that allows drawing conclusions about how establishments in Germany are affected by the Covid-19 pandemic. Each wave of the survey contains approximately 2,000 establishments which are representative of the population of private-sector establishments with at least one employee subject to social security contributions. To account for non-random sampling, weights are provided to ensure that valid population estimates can be computed. The survey is based on a rotating panel design according to which establishments may be contacted repeatedly for up to seven times. This paper uses data from wave 16, which was carried out between 2 and 8 August 2021.

The survey is carried out in the form of computer-assisted telephone interviews (CATI). It consists of a set of so-called panel questions, which are included in (almost) all waves, and topic-specific questions. Examples of panel questions are the impact of the pandemic on an establishment in general, an establishment's liquidity, the use of short-time work, or whether an establishment has recently hired or laid off workers. The data also includes a unique establishment identifier which allows linking the survey data to administrative records for those establishments that agreed to the linkage. Further information on the survey can be found in Backhaus et al. (2021) and Bellmann et al. (2021).

Establishment History Panel (BHP). The BHP dataset contains information about the population of establishments in Germany from 1975 (West Germany) and 1992 (East Germany) onwards. It is constructed once per year (data refers to 30 June) based on notifications made by employers to the social security systems and is therefore highly reliable. In addition to information about the location and the sector that an establishment belongs to, the BHP also provides detailed information about the structure of employment. Among other things, it contains the total number of employees, the number of employees by sex, age, qualification, and full-time status, among other variables. Further information on the BHP data can be found in Ganzer et al. (2021).

The Card-Heining-Kline (CHK) effects. The BHP can be further supplemented by a measure of unobserved establishment heterogeneity, the so-called CHK effects (Card et al. 2013). Based on an AKM-style (Abowd et al. 1999) wage decomposition, these effects correspond to the estimated establishment fixed effects. Further information on the CHK effects can be found in Bellman et al. (2020).

Tables

Table A1: Summary statistics

	Mean	Standard deviation
Difficulties in obtaining intermediate goods		
no difficulties	0.36	0.45
from within Germany	0.29	0.44
from abroad	0.34	0.50
Change in supplier		
overall	0.15	0.41
from a distant to a closer supplier (conditional on changing)	0.58	0.49
permanent (conditional on changing)	0.79	0.36
Survey control variables		
Establishment Size		
1-9 employees	0.21	0.40
10 to 49 employees	0.36	0.48
50 to 249 employees	0.35	0.48
250 or more employees	0.08	0.27
Sector		
Agriculture	0.03	0.16
Manufacturing	0.28	0.45
Construction	0.08	0.28
Retail and maintenance	0.23	0.42
Transportation	0.02	0.15
Hospitality and tourism	0.05	0.22
Information and communication	0.03	0.16
Other services	0.15	0.36
Health care and education	0.12	0.33
Region		
West Germany	0.83	0.38
East Germany	0.17	0.38
Administrative control variables		
Share of skilled employees	0.83	0.17
CHK effects	0.38	0.35
Observations	912	

Note: Sampling weights are used.

Source: IAB Survey „Establishments in the Covid-19 Crisis, IAB Establishment History Panel © IAB

Table A2: Probability of changing a supplier

Estimated coefficients from logit regression

	(1)	(2)	(3)
Difficulties (Germany)	1.6212*** (0.4593)	1.6777*** (0.4882)	1.6083*** (0.4970)
Difficulties (Abroad)	2.7320*** (0.4206)	2.7819*** (0.4749)	2.7581*** (0.4712)
Establishment Size (reference category: 1-9 employees)			
10 to 49 employees	- (.)	0.0569 (0.3205)	-0.0081 (0.3365)
50 to 249 employees	- (.)	0.6617** (0.3144)	0.5255 (0.3577)
250 or more employees	- (.)	0.6090 (0.4637)	0.4402 (0.5076)
Sector (reference category: Agriculture)			
Manufacturing	- (.)	0.8980 (0.8808)	0.7987 (0.9198)
Construction	- (.)	0.5804 (0.9382)	0.4557 (0.9750)
Retail and maintenance	- (.)	0.5826 (0.8893)	0.5118 (0.9188)
Transportation	- (.)	0.4835 (1.0560)	0.3529 (1.0831)
Hospitality and tourism	- (.)	0.1399 (0.9833)	0.1360 (0.9881)
Information and communication	- (.)	1.1974 (0.9755)	1.0376 (1.0173)
Other services	- (.)	0.0413 (0.9581)	-0.0439 (1.0045)
Health care and education	- (.)	1.8351*** (0.8988)	1.7870* (0.9287)
Region (reference category: West Germany)			
East Germany	- (.)	0.4973 (0.8773)	0.6076 (0.3583)
Share of skilled employees	- (.)	- (.)	0.1913 (0.6786)
CHK effects	- (.)	- (.)	0.4083 (0.4561)
Constant	-3.5531 (0.3778)	-4.4937 (0.8773)	-4.6493 (0.9455)
Pseudo R^2	**0.1350**	**0.1826**	**0.1850**
Observations	**912**	**912**	**912**

Note: Unit of observation is establishment. Sampling weights are used. Robust standard errors are shown in parentheses. ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level.

Source: IAB Survey „Establishments in the Covid-19 Crisis, IAB Establishment History Panel © IAB

Table A3: Probability of changing a supplier

Average marginal effects

	(1)	(2)	(3)
Difficulties (Germany)	0.0987*** (0.0306)	0.1004*** (0.0311)	0.1029*** (0.0320)
Difficulties (Abroad)	0.2777*** (0.0405)	0.2645*** (0.0412)	0.2600*** (0.0406)
Establishment Size (reference category: 1-9 employees)			
10 to 49 employees	- (.)	0.006 (0.0339)	-0.0008 (0.0356)
50 to 249 employees	- (.)	0.081** (0.0393)	0.0631 (0.0443)
250 or more employees	- (.)	0.0737 (0.061)	0.0519 (0.0637)
Sector (reference category: Agriculture)			
Manufacturing	- (.)	0.0884 (0.0712)	0.0799 (0.0772)
Construction	- (.)	0.0518 (0.0766)	0.0411 (0.0816)
Retail and maintenance	- (.)	0.052 (0.0695)	0.0469 (0.0748)
Transportation	- (.)	0.0418 (0.0897)	0.0308 (0.0926)
Hospitality and tourism	- (.)	0.0108 (0.0742)	0.011 (0.0786)
Information and communication	- (.)	0.1283 (0.0943)	0.111 (0.0987)
Other services	- (.)	0.0031 (0.0707)	-0.0034 (0.0773)
Health care and education	- (.)	0.2285*** (0.061)	0.2272** (0.09)
Region (reference category: West Germany)			
East Germany	- (.)	0.058 (0.0444)	0.0717 (0.0459)
Share of skilled employees	- (.)	- (.)	0.0206 (0.0732)
CHK effects	- (.)	- (.)	0.044 (0.0489)
Observations	**912**	**912**	**912**

Note: Unit of observation is establishment. Sampling weights are used. Robust standard errors are shown in parentheses. ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level.

Source: IAB Survey „Establishments in the Covid-19 Crisis, IAB Establishment History Panel © IAB

Table A4: Probability of changing a supplier – all available observations

Average marginal effects

	(1)	(2)
Difficulties (Germany)	0.098** (0.0.039)	0.092** (0.039)
Difficulties (Abroad)	0.2467 *** (0.042)	0.241*** (0.525)
Control variables (survey)	**No**	**Yes**
Control variables (administrative)	**No**	**No**
Observations	**1,000**	**1,000**

Note: Unit of observation is establishment. Sampling weights are used. Robust standard errors are shown in parentheses. ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Survey control variables include dummies for sectors, employment size categories and East Germany. Administrative control variables include the share of skilled employees and the establishment fixed effects from an AKM-style wage decomposition.

Source: IAB Survey „Establishments in the Covid-19 Crisis, IAB Establishment History Panel © IAB

Table A5: Probability of changing a supplier – only establishments that receive intermediate inputs from abroad

Average marginal effects

	(1)	(2)	(3)
Difficulties (Germany)	0.006 (0.038)	0.013 (0.039)	0.012 (0.038)
Difficulties (Abroad)	0.265*** (0.0389)	0.284*** (0.048)	0.291*** (0.046)
Control variables (survey)	**No**	**Yes**	**Yes**
Control variables (administrative)	**No**	**No**	**Yes**
Observations	**503**	**503**	**503**

Note: Unit of observation is establishment. Sampling weights are used. Robust standard errors are shown in parentheses. ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Survey control variables include dummies for sectors, employment size categories and East Germany. Administrative control variables include the share of skilled employees and the establishment fixed effects from an AKM-style wage decomposition.

Source: IAB Survey „Establishments in the Covid-19 Crisis, IAB Establishment History Panel © IAB

Table A6: Probability of changing a supplier – excluding individual sectors

Average marginal effects

	Excluded sector				
	Agriculture	**Manufacturing**	**Construction**	**Retail and maintenance**	**Transportation**
Difficulties (Germany)	0.103*** (0.0332)	0.0986*** (0.035)	0.1061*** (0.0363)	0.1242*** (0.0342)	0.1064*** (0.0332)
Difficulties (Abroad)	0.2638*** (0.0412)	0.2556*** (0.0451)	0.2586*** (0.0413)	0.2762*** (0.0468)	0.2563*** (0.0407)
Control variables (survey)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Control variables (administrative)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Observations	**889**	**657**	**836**	**698**	**891**
	Excluded sector				
	Hospitality and tourism	**Information and communication**	**Other Services**	**Health care and educatin**	
Difficulties (Germany)	0.108*** (0.0333)	0.1056*** (0.0329)	0.0997*** (0.0346)	0.0752** (0.0322)	
Difficulties (Abroad)	0.2773*** (0.0427)	0.2468*** (0.0415)	0.2854*** (0.046)	0.2289*** (0.0425)	
Control variables (survey)	**Yes**	**Yes**	**Yes**	**Yes**	
Control variables (administrative)	**Yes**	**Yes**	**Yes**	**Yes**	
Observations	**865**	**887**	**773**	**800**	

Note: Unit of observation is establishment. Sampling weights are used. Robust standard errors are shown in parentheses. ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Survey control variables include dummies for sectors, employment size categories and East Germany. Administrative control variables include the share of skilled employees and the establishment fixed effects from an AKM-style wage decomposition. Each column shows the estimation results when observations from the corresponding sector are excluded.

Source: IAB Survey „Establishments in the Covid-19 Crisis, IAB Establishment History Panel © IAB

Table A7: Probability of changing a supplier – by sector

Average marginal effects

	Manufacturing	Retail and maintenance	Services
Difficulties (Germany)	0.2338 (0.1561)	0.0511 (0.1461)	0.1468** (0.0583)
Difficulties (Abroad)	0.4253*** (0.1356)	0.2307** (0.1054)	0.2611*** (0.0561)
Control variables (survey)	**Yes**	**Yes**	**Yes**
Control variables (administrative)	**Yes**	**Yes**	**Yes**
Observations	**255**	**214**	**323**

Note: Unit of observation is establishment. Sampling weights are used. Robust standard errors are shown in parentheses. ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level. Survey control variables include dummies for sectors, employment size categories and East Germany. Administrative control variables include the share of skilled employees and the establishment fixed effects from an AKM-style wage decomposition. The results in the column “Service” include establishments from the following sectors: Hospitality and tourism, Information and communication, Other services as well as Health care and education

Source: IAB Survey „Establishments in the Covid-19 Crisis, IAB Establishment History Panel © IAB

Table A8: Probability of replacing a more with a less distant supplier

Estimated coefficients from logit regression

	(1)	(2)	(3)
Difficulties (Germany)	1.0005 (0.1441)	1.2714 (1.1718)	1.0251 (1.2173)
Difficulties (Abroad)	1.8122* (1.0609)	1.9262* (1.1027)	1.7704 (1.0991)
Establishment Size (reference category: 1-9 employees)			
10 to 49 employees	- (.)	-1.6934*** (0.6339)	-1.6195** (0.7326)
50 to 249 employees	- (.)	-0.3043 (0.6647)	-0.2509 (0.8481)
250 or more employees	- (.)	0.2623 (0.7959)	0.3124 (1.1356)
Sector (reference category: Agriculture)			
Manufacturing	- (.)	- (.)	- (.)
Construction	- (.)	0.2203 (0.8601)	0.3685 (0.8513)
Retail and maintenance	- (.)	-0.4456 (0.7743)	-0.4046 (0.9317)
Transportation	- (.)	- (.)	- (.)
Hospitality and tourism	- (.)	- (.)	- (.)
Information and communication	- (.)	0.3500 (0.9990)	0.5286 (1.0346)
Other services	- (.)	- (.)	- (.)
Health care and education	- (.)	-0.1240 (0.8780)	-0.0611 (0.7877)
Region (reference category: West Germany)			
East Germany	- (.)	-0.1202 (0.5950)	0.2777 (0.8097)
Share of skilled employees	- (.)	- (.)	1.4610 (2.7740)
CHK effects	- (.)	- (.)	0.0933 (1.7167)
Constant	-1.1378 (1.0000)	-0.4642 (0.2447)	-1.6420 (2.6395)
Pseudo R^2	**0.0407**	**0.1353**	**0.1409**
Observations	**153**	**153**	**153**

Note: Unit of observation is establishment. Sampling weights are used. Robust standard errors are shown in parentheses. ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level.

Source: IAB Survey „Establishments in the Covid-19 Crisis, IAB Establishment History Panel © IAB

Table A9: Probability of replacing a more with a less distant supplier

Average marginal effects

	(1)	(2)	(3)
Difficulties (Germany)	0.2230 (0.2301)	0.2607 (0.2162)	0.2124 (0.2358)
Difficulties (Abroad)	0.4198** (0.2002)	0.3982** (0.1943)	0.3686* (0.2079)
Establishment Size (reference category: 1-9 employees)			
10 to 49 employees	- (.)	-0.3737*** (0.1243)	-0.3567** (0.1442)
50 to 249 employees	- (.)	-0.0586 (0.126)	-0.0482 (0.161)
250 or more employees	- (.)	0.0446 (0.1346)	0.0531 (0.1913)
Sector (reference category: Agriculture)			
Manufacturing	- (.)	- (.)	- (.)
Construction	- (.)	0.0414 (0.1605)	0.0683 (0.1558)
Retail and maintenance	- (.)	-0.0887 (0.1559)	-0.8 (0.1881)
Transportation	- (.)	- (.)	- (.)
Hospitality and tourism	- (.)	- (.)	- (.)
Information and communication	- (.)	0.0649 (0.1798)	0.0961 (0.1795)
Other services	- (.)	- (.)	- (.)
Health care and education	- (.)	-0.0241 (0.1719)	-0.0118 (0.1524)
Region (reference category: West Germany)			
East Germany	- (.)	-0.0239 (0.1186)	-0.0553 (0.1643)
Share of skilled employees	- (.)	- (.)	0.2865 (0.5385)
CHK effects	- (.)	- (.)	0.0183 (0.3355)
Observations	**153**	**153**	**153**

Note: Unit of observation is establishment. Sampling weights are used. Robust standard errors are shown in parentheses. ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level.

Source: IAB Survey „Establishments in the Covid-19 Crisis, IAB Establishment History Panel © IAB

Table A10: Probability of permanently changing a supplier

Estimated coefficients from logit regression

	(1)	(2)	(3)
Difficulties (Germany)	-2.9737** (1.2933)	-3.6400** (1.7753)	-4.3198** (1.9084)
Difficulties (Abroad)	-2.5889** (1.2058)	-2.8615* (1.6379)	-3.5770* (1.9087)
Establishment Size (reference category: 1-9 employees)			
10 to 49 employees	- (.)	-0.6464 (0.7881)	-1.0862 (0.7615)
50 to 249 employees	- (.)	-0.2240 (0.7228)	-0.8437 (0.8204)
250 or more employees	- (.)	1.3982 (1.1965)	0.6305 (1.3592)
Sector (reference category: Agriculture)			
Manufacturing	- (.)	- (.)	- (.)
Construction	- (.)	-1.0845 (1.5268)	-1.7481 (1.4205)
Retail and maintenance	- (.)	0.1651 (0.7788)	0.3665 (0.7651)
Transportation	- (.)	- (.)	- (.)
Hospitality and tourism	- (.)	- (.)	- (.)
Information and communication	- (.)	1.2103 (1.2737)	0.9129 (1.3279)
Other services	- (.)	- (.)	- (.)
Health care and education	- (.)	0.2953 (1.0919)	0.1214 (1.1981)
Region (reference category: West Germany)			
East Germany	- (.)	3.9169*** (1.4140)	5.2210*** (1.5522)
Share of skilled employees	- (.)	- (.)	-3.3265 (2.0394)
CHK effects	- (.)	- (.)	1.6710 (1.2222)
Constant	3.8384*** (1.1283)	4.0352** (1.7765)	7.2990** (3.0789)
Pseudo R^2	**0.0223**	**0.1667**	**0.2086**
Observations	**153**	**153**	**153**

Note: Unit of observation is establishment. Sampling weights are used. Robust standard errors are shown in parentheses. ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level.

Source: IAB Survey „Establishments in the Covid-19 Crisis, IAB Establishment History Panel © IAB

Table A11: Probability of permanently changing a supplier

Average marginal effects

	(1)	(2)	(3)
Difficulties (Germany)	-0.2753** (0.1338)	-0.3232** (0.1581)	-0.3178** (0.1305)
Difficulties (Abroad)	-0.2017*** (0.0772)	-0.1944*** (0.0666)	-0.2042*** (0.0636)
Establishment Size (reference category: 1-9 employees)			
10 to 49 employees	- (.)	-0.1006 (0.2688)	-0.1538 (0.107)
50 to 249 employees	- (.)	-0.0323 (0.104)	-0.1154 (0.1096)
250 or more employees	- (.)	0.132 (0.093)	0.06287 (0.123)
Sector (reference category: Agriculture)			
Manufacturing	- (.)	- (.)	- (.)
Construction	- (.)	-0.1893 (0.2688)	-0.2789 (0.2059)
Retail and maintenance	- (.)	0.0249 (0.1168)	0.0485 (0.1007)
Transportation	- (.)	- (.)	- (.)
Hospitality and tourism	- (.)	- (.)	- (.)
Information and communication	- (.)	0.1425 (0.1206)	.1079 (0.1366)
Other services	- (.)	- (.)	- (.)
Health care and education	- (.)	0.0433 (0.1537)	0.0168 (0.1632)
Region (reference category: West Germany)			
East Germany	- (.)	0.2958*** (0.0749)	0.3426*** (0.0702)
Share of skilled employees	- (.)	- (.)	-0.4696 (0.2959)
CHK effects	- (.)	- (.)	0.2359 (0.1655)
Observations	**153**	**153**	**153**

Note: Unit of observation is establishment. Sampling weights are used. Robust standard errors are shown in parentheses. ***/**/* indicate statistical significance at the 0.01/0.05/0.1 level.

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