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The impact of work-related training on earnings during the COVID-19 pandemic[1]

Wpływ szkoleń zawodowych na zarobki podczas pandemii COVID-19

Słowa kluczowe: szkolenia zawodowe, pracownicy, zarobki, metoda DID, pandemia COVID-19.

Streszczenie: Celem niniejszego artykułu jest analiza wpływu szkoleń zawodowych na wysokość zarobków w Polsce, zarówno przed, jak i w trakcie pandemii COVID-19. Przy użyciu danych z Badania Aktywności Ekonomicznej Ludności (BAEL) z lat 2018–2020 oraz metody różnic w różnicach (DID) oszacowano wpływ szkoleń zawodowych na wysokość miesięcznych zarobków netto w dwóch perspektywach czasowych: 3 i 12 miesięcy po szkoleniu. W celu redukcji obciążenia selekcyjnego do modelu włączono szereg cech indywidualnych respondentów, w tym ich udział w szkoleniach niezwiązanych z pracą. Wyniki analizy wskazują, że szkolenia nie miały przeciętnie wpływu na miesięczne zarobki netto respondentów, zarówno przed pandemią (2018–2019), jak i w pierwszym roku jej trwania (2020).

Key words: work-related training, employees, earnings, DID method, COVID-19 pandemic.

Abstract: In this paper, we investigate the earnings effects of work-related training before and during the COVID-19 pandemic in Poland. We use the difference-in-differences (DID) method and data from the Polish Labour Force Survey (LFS) for the years 2018–2020 to estimate the impact of work-related training on net monthly earnings from two perspectives: 3 and 12 months after the training. To further reduce selection bias, we control for several individual characteristics, including participation in non-work-related training. We find that, on average, training did not have any significant impact on net monthly earnings either before (2018–2019) or during the first year of the pandemic (2020).

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Introduction

The structure of demand for labour is constantly changing due to the implementation of various innovations, especially technological, in production processes. In this dynamic environment, training programmes play a key role in equipping individuals with the new knowledge and skills needed at work to become more productive, or at least maintain current productivity. From a theoretical point of view, attending work-related training, which is a form of investment in human capital, should, in a perfectly competitive labour market, translate into higher wages (Becker, 1962). However, in a world of imperfect competition, there may be no wage effect (Acemoglu, 1997). It seems that work-related training may have been especially useful during the COVID-19 pandemic, when pandemic-related restrictions forced companies worldwide to shift to remote or hybrid work. One could have expected participation in training to help workers adapt smoothly to this change in work organisation and avoid a decline in productivity and earnings.

Although the wage effects of training have been analysed in a number of studies to date, to the best of our knowledge, none of them refer to the period of the COVID-19 pandemic. Moreover, the results of previous studies are inconclusive – some of them evidence a positive impact of training on wages, while others show no wage effect. In this article, we attempt to investigate the earnings effects of training during the COVID-19 pandemic in Poland. We also examine the differential effects of training participation across individuals' and workplace characteristics. Our analysis relies on the difference-in-differences (DID) method and data from the Polish Labour Force Survey (LFS) for the period 2018–2020. We estimate the impact of work-related training on monthly earnings before COVID-19 (2018–2019) and during the first year of the pandemic (2020) from two perspectives: 3 and 12 months after the training.

The remaining sections of the paper are organised as follows: Section 2 provides a comprehensive review of the relevant literature, highlighting the existing knowledge gaps. In Sections 3 and 4, we describe the data and method used. Our results are presented in Section 5. The study concludes in Section 6 with a discussion of the implications and limitations of our findings.

Review of empirical literature

The empirical literature on the wage effects of work-related training is relatively wide and diverse, in the sense that several identification strategies were used, and the results are not conclusive.

The studies based on the ordinary least squares (OLS) method provide mixed evidence. Konings et al. (2015) show that training correlates with a 1–1.7% increase in the wages of workers in Belgium. Similarly, Arulampalam et al. (2010) find a positive correlation of training with wages ranging from 1% to 9% for workers in ten European countries. However, some other studies using OLS failed to find

significant wage effects of training. For instance Gorlitz (2011), who based his analysis on WeLL Data for Germany and Switzerland, finds no significant effects of training, and Hinerasky et al. (2014) obtained a similar result for workers in Germany. An obvious limitation of studies using OLS is that their results may be biased due to the endogeneity of participation in training, and thus they may be regarded as unreliable.

Some studies used the fixed effects (FE) or difference-in-differences (DID) method to reduce the selection bias. The results of these studies show, on average, lower wage effects of training compared to the OLS estimates. These methods allow for the elimination of the bias that comes from the unobserved heterogeneity, which does not vary over time. Most of the studies using FE and DID find the wage effect of training close to 1% (Ci et al., 2015; Travkin & Sharunina, 2016; Ruhose et al., 2019; Gaulke, 2021; Denzel et al., 2022). Mendez and Sepulveda (2015), who used FE, find a wage premium of 2% for the US and 0.7% for the UK, and they note that there is a difference in the effects between employer-provided training in the private sector (2%) and in the public sector (6%) in the United States. On the other hand, studies by Luchinskaya & Dickinson (2019) for the UK, Burger et al. (2022) for Slovenia, and Albert et al. (2010) for six European countries, where the FE and DID methods were used, find no wage effects of training.

The wage effects of training are also analysed with the use of various combined methods, such as the fixed effects model combined with instrumental variables (FE-IV) or difference in differences-propensity score matching (DID-PSM). The studies that use these methods find either low or no effects of training. For instance Icardi (2015), using the DID method, finds positive wage effects for Germany and England, but after using the DID-PSM method the positive effects disappear. Brunello et al. (2012) analyse the impact of training on wages in Italy using the OLS, FE, IV, and FE-IV methods, but find no significant effects. Similarly, Nguyen et al. (2021), who use the OLS and FE-IV methods for Vietnam, find no wage effects except for young workers.

The randomised control trial (RCT), which is regarded as the gold standard for causal inference, was used in a few studies, and all of them conclude that training has no impact on wages (Gorlitz & Tamm, 2016; Ibarrarán et al., 2019; Hidalgo et al., 2014; Schwerdt et al., 2012).

Finally, two meta-analyses synthesise the research findings on the wage effects of training programmes. Haelermans et al. (2012), who conducted a meta-analysis based on 71 estimates from 36 articles, find that, on average, the wage effect of work-related training amounts to 2.6% per course after correcting for the publication bias. Similarly, Kluve et al. (2019) conducted a quantitative review of 113 impact evaluations of youth employment programmes worldwide, focusing on randomised experiments and other causal inference methods that control the selection on unobservables. They conclude that the impact of training on earnings amounts to 4% on average.

For Poland, there have been only two studies that attempted to identify the wage effect of training. Liwiński (2017), who analysed the effects of training received by individuals with higher education in the period 2001–2013, finds that, on average, training has no impact on earnings, although he identified a small positive wage premium for participants of training that is long (more than 20 hours) or conducted in the form of a workshop. Icardi (2021) estimated the unconditional quantile regression (UQR) on the basis of the PIAAC 2012 data that covered 14 European countries, including Poland. She finds a positive effect of training on wages in Poland for those below the 10th decile in the wage distribution.

Overall, the empirical literature provides mixed evidence. While some studies suggest that training may have a positive effect on earnings, particularly for low-wage earners or when the training is conducted in a specific form or over an extended period, others find no significant impact. One potential explanation of these discrepancies is that training may not solely enhance human capital, but rather help to offset emerging deficits (Muehler et al., 2007).

Data

The data used in this study come from the Polish Labour Force Survey (LFS) for the years 2018–2020. The LFS provides comprehensive information on respondents' labour market situation, including their employment status, earnings, and participation in training. Our analysis covered both the pre-pandemic period (2018–2019) and the first pandemic year (2020) to see whether COVID-19 mattered for the wage effects of training.

The LFS data identify the respondent's participation in training within the previous four weeks. For the purpose of this analysis, training was defined as any form of organised learning that occurred under the supervision of a teacher, lecturer, or instructor, and was conducted by an employer, a labour office, or any other organisation. Examples of training include courses, lectures, seminars, conferences, and private lessons. It should be noted, however, that the database does not provide information on whether the respondent had completed the training by the time of the survey. The earliest the training could have ended was four weeks before the interview. However, the latest possible completion date was difficult to determine, as there have been extreme cases where the declared length of the training exceeded two years, with no upper limit. On the one hand, it is clear that effects can only be expected for individuals who have completed training, which is an argument for excluding from our sample those who participated in long training courses. On the other hand, the longer the training, the larger the impact we can expect on productivity. Fortunately, short training – that is, lasting for up to one week – prevails (76%) in our sample. Taking all the arguments into account, our analysis covers all cases of training, including those that remain incomplete, thereby potentially leading to an underestimation of the wage effects.

The Polish LFS is based on a quarterly rotating sample, and each respondent is subject to four observations according to the 2-(2)-2 rule, meaning that they are interviewed in two consecutive quarters, and then, after a two-quarter break, they are interviewed again in two consecutive quarters. Using this property of the LFS, we merged individual records into quarterly and yearly panels. The quarterly panel was constructed by merging respondents' records coming from the interviews conducted in two consecutive quarters, that is, at time t_0 and $t_1 = t_0 + 1$ quarter, while the yearly panel includes information from two interviews conducted four quarters apart, that is, at time t_0 and $t_1 = t_0 + 4$ quarters.

In our sample, we included all respondents for whom the first observation in the panel (at time) was in the 2nd, 3rd, or 4th quarter of 2018–2020. We excluded those observed in the first quarter from our analysis, because the Polish labour market was affected by the pandemic-related restrictions only in quarters 2–4 of 2020,[2] and we wanted to compare the results for 2020 with those for the same quarters of 2018 and 2019. Thus, our analysis focuses on the short-term (3-month) and medium-term (12-month) wage effects of training that was attended before (2018–2019) or during (2020) the COVID-19 pandemic.

Our sample covers individuals aged from 18 to 64 who were employed at time t_0 and t_1 in the panel. Importantly, respondents who did not report their earnings at either t_0 or t_1 are excluded from the sample. This exclusion applies primarily to the self-employed, since they are not required to report their incomes in the LFS. Thus, our analysis focuses on the earnings effects of training that may come from changes in the hourly wage and/or working time, conditional on working for at least one hour at time t_0 and t_1.

In Table 1, we present for each quarter of 2018–2020 the fractions of individuals in our sample who participated in training within the previous four weeks. Importantly, we distinguish between two major types of training in the table, i.e., work-related and non-work-related. We focus on the former in this paper, although the latter is also important as a potential control variable that represents individuals' willingness to learn. We can see that on average 6–6.5% of employees attended work-related training in the years 2018–2020, while participation in non-work-related training was lower and gradually decreasing (from 4% in 2018 to 3% in 2020). In 2018 and 2019, we can observe a seasonality in the incidence of the work-related and non-work-related training, with substantially smaller fractions of participants in the second quarter of each year. However, this pattern changed in 2020 as a result of the pandemic-related restrictions. The participation rates in both types of training decreased sharply in the second quarter of 2020, but they recovered in the third

[2] The first case of COVID-19 infection in Poland was reported on 4 March 2020, and the national government took several measures to slow the spread of the virus. This included a shift to remote teaching at schools and universities on 12 March 2020, and other restrictions related to work organization implemented later in March and April 2020. Thus, we may roughly assume that the Polish labour market was affected by the COVID-19 pandemic starting from the 2nd quarter of 2020.

Table 1. Fractions of employees who participated in training, by types of training (yearly panel)

		2018					2019					2020				
		Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total
		as % of working individuals														
Work-related training		7.16	6.61	5.07	7.04	6.49	6.50	7.01	4.07	6.63	6.11	7.36	3.61	6.68	7.01	6.13
Purpose	Acquisition of job competencies	1.19	1.44	1.21	1.80	1.40	1.47	1.48	0.88	1.30	1.30	1.18	0.89	1.24	1.05	1.09
	Improvement of job competencies	5.29	5.00	3.69	4.95	4.76	4.70	5.17	2.99	4.94	4.48	5.71	2.61	5.09	5.75	4.75
Initiator	Employer	5.32	5.26	3.55	5.59	4.95	4.96	5.08	2.70	4.94	4.47	4.94	2.66	4.91	5.54	4.46
	Employee	1.28	1.19	1.31	1.31	1.27	1.35	1.71	1.23	1.39	1.42	1.95	0.83	1.54	1.19	1.40
Funding source	Employee	1.01	0.90	1.41	1.03	1.08	1.16	1.39	0.78	1.20	1.14	1.03	0.22	1.06	0.91	0.80
	Employer	5.59	5.55	3.45	5.87	5.14	5.15	5.39	3.14	5.14	4.75	5.86	3.27	5.38	5.82	5.06
Length	Less than one week	4.52	4.88	3.00	4.85	4.32	4.58	4.63	2.75	4.99	4.27	4.84	2.05	4.20	5.12	4.01
	Between one week and one month	0.68	0.42	0.62	0.85	0.64	0.60	0.67	0.29	0.48	0.52	0.98	0.67	0.71	0.56	0.74
	More than one month	0.98	0.93	0.69	0.88	0.88	0.86	1.17	0.54	0.62	0.81	1.03	0.39	1.01	0.56	0.76
Non-work-related training		4.93	3.91	2.72	4.03	3.94	3.87	3.73	3.09	3.41	3.55	4.73	1.33	3.31	2.03	2.93
Number of observations		3,366	3,117	2,901	2,826	12,210	2,662	2,225	2,039	2,083	9,009	1,944	1,802	1,691	1,426	6,863

quarter of 2020, reaching even higher levels than those in the third quarter of 2018 and 2019. The onset of the second wave of the COVID-19 pandemic in the fourth quarter of 2020 did not affect the rate of participation in work-related training, but it seems to have discouraged employees from non-work-related training.

Additionally, Table 1 presents more specific information on participation in work-related training by purpose, initiator, funding source, and length. The data indicate that most training is relatively short (lasting for up to one week), is initiated and funded by the employer, and aims to improve employees' competencies. Importantly, the restrictions related to the first wave of the COVID-19 pandemic had a roughly equal negative impact on participation in all the above-mentioned types of training, regardless of their characteristics. Moreover, the composition of training participants by socio-economic characteristics (gender, age, marital status, education level) also remained unchanged compared to the pre-pandemic period.[3] Thus, it seems that although training participation decreased as a result of the pandemic, it had little effect on the structure of training events or their participants.

Method

As the baseline for our analysis we estimated the following Mincer-type earnings equation using the ordinary least squares (OLS) method:

$$\ln(w_{1i}) = \beta_0 + T_i\beta_1 + X_i\beta_2 + \varepsilon_i \quad (1)$$

where: $\ln(w_{1i})$ is the natural logarithm of net monthly earnings from the main job at time t_1, that is one year after the training; T_i is a binary variable taking the value of 1 if the respondent participated in training within the four weeks before t_0, and 0 otherwise; X_i denotes a vector of control variables, and ε_i is the random error.

The full list of control variables included: participation in non-work related training, gender, marital status, education level, job tenure, work experience, town size, and region (voivodeships).

Obviously, the coefficient β_1 in equation (1) may only be regarded as a naive estimator of the training effect as it measures the correlation between training participation and earnings conditional on the other covariates rather than the causal effect. Therefore, in the second step of our analysis, we employed the difference-in-differences (DID) method to obtain a more reliable estimate. In this approach, our estimator of the earnings effect is the difference between the growth rates of monthly earnings in the group of individuals who participated in a training event (treatment group) and the group of non-participants (control group). By using this method, we eliminate the part of selection bias that comes from unobservable individuals' characteristics that are time-invariant. However, the DID estimator may still be biased if confounding factors change over time. To implement the DID method, we estimated the following equation:

[3] This is evidenced by results available from authors.

$$\ln(w_{1i}) - \ln(w_{0i}) = \gamma_0 + T_i\gamma_1 + X_i\gamma_2 + \tau_i \quad (2)$$

where the growth rate of monthly earnings in the period $t_0 - t_1$ was regressed on the same set of control variables as in equation (1), while τ_i is the random error. Using this method, we attempted to explore the effects at two time perspectives: 3 and 12 months after the training.

To additionally reduce the selection bias, we included an independent variable representing the participation in non-work-related training in the model to control for innate personal abilities of individuals and their willingness to learn.

Results

Table 2 presents the earnings effects of work-related training that come from the estimation of equations (1) and (2) on the yearly and quarterly panel data. The OLS estimates evidence a strong, positive correlation of work-related training with earnings in the years 2018–2020, amounting to 12–13%. However, the DID estimates, based on both the yearly and quarterly panels, indicate that training had no impact on monthly earnings in the analysed period, with only one exception. We find a positive earnings effect on the basis of the quarterly panel for 2019, indicating that the earnings growth of training participants was 0.7 percentage points higher than that of non-participants. The other DID estimates are insignificant both for the pre-pandemic years (2018-2019) and for the first year of the pandemic (2020). Thus, it seems that training was not, on average, more useful, in terms of its impact on productivity, during the COVID-19 pandemic than before, as one could have expected.

The next step of our analysis was to check for a possible heterogeneity in the effects by training types. Therefore, in equations (1) and (2) we distinguished between different types of training events by their purpose, initiator, source of funding, and length. The estimation results are presented in Table 3. The DID estimates reveal positive earnings effects of some types of training in 2019 and 2020. First, we find positive effects of the training events attended in 2019, provided that their aim was to impart new competencies or that they were financed by employees. The effects of the former type were observed 3 and 12 months after the training event, while the latter had an impact on earnings only after 12 months. Secondly, in 2020 – that is, during the COVID-19 pandemic – three types of training events had a positive effect on monthly earnings. These were: training events initiated by employees, those financed by employees, and those lasting for more than 1 month. However, all these effects were identified only 3 months (but not 12 months) after the training.

Table 2. The earnings effects of participation in work-related training

	OLS yearly panel			DID yearly panel			DID quarterly panel		
	2018	2019	2020	2018	2019	2020	2018	2019	2020
Work-related training	0.121***	0.125***	0.136***	0.001	0.007	0.012	-0.001	0.007*	0.005
	(0.016)	(0.019)	(0.022)	(0.005)	(0.008)	(0.008)	(0.002)	(0.003)	(0.005)
Number of observations	8,844	6,347	4,919	8,071	5,809	4,247	9,598	8,111	5,343
R2	0.308	0.310	0.320	0.024	0.033	0.028	0.007	0.013	0.013

Notes: standard errors in parentheses; significance levels: * – 0.05, ** – 0.01, *** – 0.001.

Table 3. The earnings effects of participation in work-related training, by training characteristics

		OLS yearly panel			DID yearly panel			DID quarterly panel		
Work-related training characteristics		**2018**	**2019**	**2020**	**2018**	**2019**	**2020**	**2018**	**2019**	**2020**
Purpose	Acquisition of job competencies	0.079**	0.064	0.115*	0.010	0.037*	0.025	0.003	0.027***	-0.015
		(0.030)	(0.038)	(0.047)	(0.009)	(0.015)	(0.017)	(0.004)	(0.006)	(0.010)
	Improvement of job competencies	0.129***	0.142***	0.136***	0.002	-0.003	0.008	-0.003	0.000	0.009
		(0.018)	(0.022)	(0.024)	(0.006)	(0.008)	(0.008)	(0.003)	(0.004)	(0.005)
Initiator	Employer	0.126***	0.123***	0.138***	0.002	0.005	0.010	-0.002	0.006	-0.001
		(0.018)	(0.022)	(0.024)	(0.005)	(0.008)	(0.008)	(0.002)	(0.004)	(0.005)
	Employee	0.087**	0.116**	0.110*	0.009	0.019	0.009	0.000	0.010	0.027**
		(0.033)	(0.036)	(0.045)	(0.010)	(0.014)	(0.015)	(0.005)	(0.006)	(0.009)
Funding source	Employee (fully or partially)	0.048	0.056	0.190***	-0.011	0.033*	0.012	-0.002	0.014	0.026*
		(0.035)	(0.040)	(0.057)	(0.011)	(0.016)	(0.020)	(0.005)	(0.007)	(0.012)
	Employer	0.132***	0.136***	0.124***	0.006	0.002	0.010	-0.001	0.005	0.002
		(0.017)	(0.021)	(0.024)	(0.005)	(0.008)	(0.008)	(0.002)	(0.003)	(0.005)
Length	Less than one week	0.106***	0.130***	0.117***	0.006	-0.002	0.003	-0.003	0.003	-0.002
		(0.019)	(0.022)	(0.026)	(0.006)	(0.009)	(0.009)	(0.003)	(0.004)	(0.005)
	Between one week and one month	0.101*	0.057	0.135*	0.008	-0.000	0.037	-0.004	-0.000	-0.010
		(0.045)	(0.060)	(0.060)	(0.015)	(0.024)	(0.020)	(0.006)	(0.009)	(0.010)
	More than one month	0.108**	0.054	0.184**	-0.000	0.017	0.018	0.005	0.016	0.031*
		(0.040)	(0.047)	(0.060)	(0.012)	(0.019)	(0.020)	(0.006)	(0.009)	(0.014)

Notes: standard errors in parentheses; significance levels: * – 0.05, ** – 0.01, *** – 0.001.

Conclusions

This study aimed to investigate whether work-related training had an impact on monthly earnings in Poland in the first year of the COVID-19 pandemic (2020). Our analysis was based on the difference-in-differences (DID) method and panel data from the Polish Labour Force Survey (LFS) for the years 2018–2020.

We find that, on average, work-related training did not have any impact on earnings either before (2018–2019) or during (2020) the pandemic, except for a small though positive short-term effect in 2019. The identified lack of average effects is consistent with the results obtained in some of the recent studies covering the pre-pandemic period, both for Poland (Liwiński, 2017) and for other countries (Ibarrarán et al., 2019; Luchinskaya & Dickinson, 2019; Burger et al., 2022), although there are also some studies showing small positive training wage effects (Ruhose et al., 2019; Gaulke, 2021; Denzel et al., 2022). We now show that the earnings effects of training were not higher during the first year of the COVID-19 pandemic than before.

However, in the first year of the pandemic (2020) we observed positive effects for some types of training. In the short term (3 months), work-related training events have a positive impact on earnings provided they are initiated or financed by employees, or last for more than 1 month. In the longer term (12 months), we do not find such effects. Importantly, we did not find any effects for these types of training in the pre-pandemic period. This may be viewed as weak evidence that work-related training helped some employees adapt to remote work and, by this means, sustain their productivity.

There could be several reasons behind the absence of average earnings effects of work-related training. First of all, some training events may have no impact on work productivity (e.g., health and safety training) or the impact may be substantially delayed (e.g., language courses). Secondly, given the imperfect competition in the labour market, employers may not be willing to share the profit gains with their employees (Acemoglu, 1997). Another possible reason is that employees may have acquired the knowledge and skills needed to adjust to hybrid or remote work during the pandemic through informal instruction rather than formal training, or they may have used competencies they already possessed.

Our results are, of course, subject to certain limitations. One of them is a potential data measurement error due to self-reporting in the LFS, which may have affected, primarily, the information on individuals' earnings (misreporting or non-reporting), and on participation in work-related training. Secondly, our identification strategy rests on the assumption that the impact of individuals' unobservable characteristics on attending training and monthly earnings is constant over time. If this assumption does not hold, the selection bias, although substantially reduced by using the DID method, may still affect our estimates.

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