

Heterogeneous Difference-in-Differences Models for Evaluating Education Policies and Interventions: An Exemplary Study of Online Platforms in German Adult Education Centres

Cedefop Research Seminar, 13/10/26; Julian Hemmerich, Fabian Rüter



Deutsches Institut für
Erwachsenenbildung

Leibniz-Zentrum für
Lebenslanges Lernen



1. Challenges in evaluating educational policies and interventions
2. Investigation case: Increasing online course participation via platforms
3. Methodology: (Heterogenous) Difference-in-Differences models
4. Results & Discussion
5. Literature

1. **Challenges in evaluating educational policies and interventions**
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- As funding for experimental studies before implementation is rare, most educational policies and interventions can only be evaluated in retrospect without randomized control and intervention groups
 - Difference-in-Differences designs account for pre-existing differences in control and interventions groups, assuming parallel trends
- Differences between groups can cause the parallel trends assumption to fail
 - Designs including covariates as augmented inverse probability weighting models account for different development between groups caused by observables
- Interventions are sometimes implemented at different points in time for different groups
 - Heterogenous difference-in-differences designs account for staggered implementation

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- Market entry of big companies of the digital economy and their development of platforms such as LinkedIn Learning has led to a shift in the adult education landscape (Grotlüschen, 2018)
 - Accelerated by the Covid-pandemic, there has been a steep increase in online courses in Germany (Kohl & Denzl, 2021; Ortmanns et al. 2024), with platforms profiting from it (Coursera, 2022; Coursera 2024)
 - Three German federal public adult education center („Volkshochschulen“ – vhs) associations have implemented their own platforms („onlinevhs“), making courses of participating providers in the federal state available on a single website
 - One of the goals of the platforms is to increase online course participation (Klemm & Repka, 2021; Bayerischer Volkshochschulverband, 2021)
 - Theories and empirical analyses from organizational sociology and economics imply that platforms can indeed have a positive effect on sales/ participation (Deng et al., 2023; Kirchner, 2022; Li & Wang, 2025; Pan et al., 2024; Wang et al., 2018; Zhou et al, 2022)
- **Research question: Do public adult education platforms increase online course participation?**

The screenshot shows the homepage of the onlinevhs.bayern website. At the top, there is a dark blue navigation bar with links for 'Startseite', 'Über uns', and 'FAQ'. Below this is a white header area containing the 'vhs | onlinevhs.bayern' logo, a search bar with the text 'KI', and icons for 'Login', 'Merktzettel', and 'Warenkorb'. A horizontal menu with colored buttons for 'Politik - Gesellschaft - Umwelt', 'Gesundheit', 'Kultur - Gestalten', 'Sprachen', and 'Beruf' is positioned below the header. The main content area features a large banner with a blue keyboard background and a green circle containing the text 'Online-Kurse buchen!'. To the right of the banner is a small icon of a person. Below the banner, the text 'Bei dir zu Hause: deine vhs' is followed by 'Weiterbildung flexibel - modern - online' and a paragraph about interactive seminars. At the bottom, a section titled 'Demnächst startende Kurse' displays a row of course dates: '9 Sep', '9 Sep', '9 Sep', and '10 Sep'.

https://onlinevhs.bayern

Startseite Über uns FAQ

vhs | onlinevhs.bayern

KI

Login Merktzettel Warenkorb

Politik - Gesellschaft - Umwelt Gesundheit Kultur - Gestalten Sprachen Beruf

Online-Kurse buchen!

Bei dir zu Hause: deine vhs
Weiterbildung flexibel - modern - online

Interaktive Seminare, Vorträge und Kurse aus den Veranstaltungen der bayerischen Volkshochschulen. Buche jetzt dein Onlineerlebnis.

Demnächst startende Kurse

9 Sep 9 Sep 9 Sep 10 Sep



[Startseite](#) [Über uns](#) [FAQ](#)

 **onlinevhs.bayern**

Suchbegriff, Kurs, Kursnummer 

[Login](#) [Merkzettel](#) [Warenkorb](#)

[Politik - Gesellschaft - Umwelt](#) [Gesundheit](#) [Kultur - Gestalten](#) [Sprachen](#) [Beruf](#)

[/ Qualifikation für das Arbeitsleben – IT- Organisation/Management \(Beruf\)](#)
[/ Technische IT- / Medienanwendungen](#)

KI von A bis Z:
Künstliche Intelligenz verstehen und anwenden

Künstliche Intelligenz verändert die Art und Weise, wie Inhalte erstellt, präsentiert und optimiert werden. Doch wie lassen sich KI-Tools effizient nutzen? In diesem umfassenden Workshop werden verschiedene Anwendungen der Künstlichen Intelligenz praxisnah erklärt und direkt angewendet. Dazu gehört die Bilderstellung, Texterstellung, Präsentationen, Protokolle und optimales Prompting.

Material
Voraussetzung ist ein Zoom-Account und eine E-Mail-Adresse

Gebühr **125,00 €**
In den Warenkorb 

Kursnummer: 252-1453

Start **Ende**
 Fr. 06.02.2026  Fr. 06.02.2026
09:00 Uhr 16:30 Uhr

1 Termin 

Dozent*in:
Robin Weniger

Veranstalter:
vhs Marktheidenfeld 



 **onlinevhs.bayern**

[Startseite](#) [Über uns](#) [FAQ](#) [Impressum](#) [AGB](#) [Datenschutzerklärung](#) [Barrierefreiheitserklärung](#)

← ↻ https://onlinevhs.bayern/warenkorb#/cart/payment-options

vhs

onlinevhs.bayern

Suchbegriff, Kurs, Kursnummer

🔍

Login

Merktzettel

Warenkorb

1

Warenkorb

🛒 Übersicht

👤 Persönliche Daten

💳 Zahlungs-
optionen

🔍 Prüfen &
Buchten

👤

Zahlung via Lastschrift

Zahlung per Lastschriftverfahren

Neue Bankdaten verwenden:

IBAN *

IBAN eingeben

BIC

BIC (wird automatisch aus IBAN ermittelt)

Bank

Bankinstitut (wird automatisch aus IBAN ermittelt)

☐ Hiermit ermächtige ich den Anbieter widerruflich, die von mir zu entrichtenden Entgelte von meinem Konto mittels SEPA-Lastschrift einzuziehen. Zugleich weise ich mein Kreditinstitut an, die von dem Anbieter auf mein Konto gezogenen Lastschriften einzulösen. *

Die mit * markierten Felder müssen ausgefüllt werden.

Zurück

Kurse

Weiter

Folgende Kurse befinden sich im Warenkorb:

Nummer	Titel	Teilnehmende	Beginn	Gebühren
Volkshochschule				
252-1453 vhs	KI von A bis Z: ➤ Zu den Details	− 1 +	06.02.2026 09:00 Uhr	125,00 € 🗑

10

www.die-bonn.de

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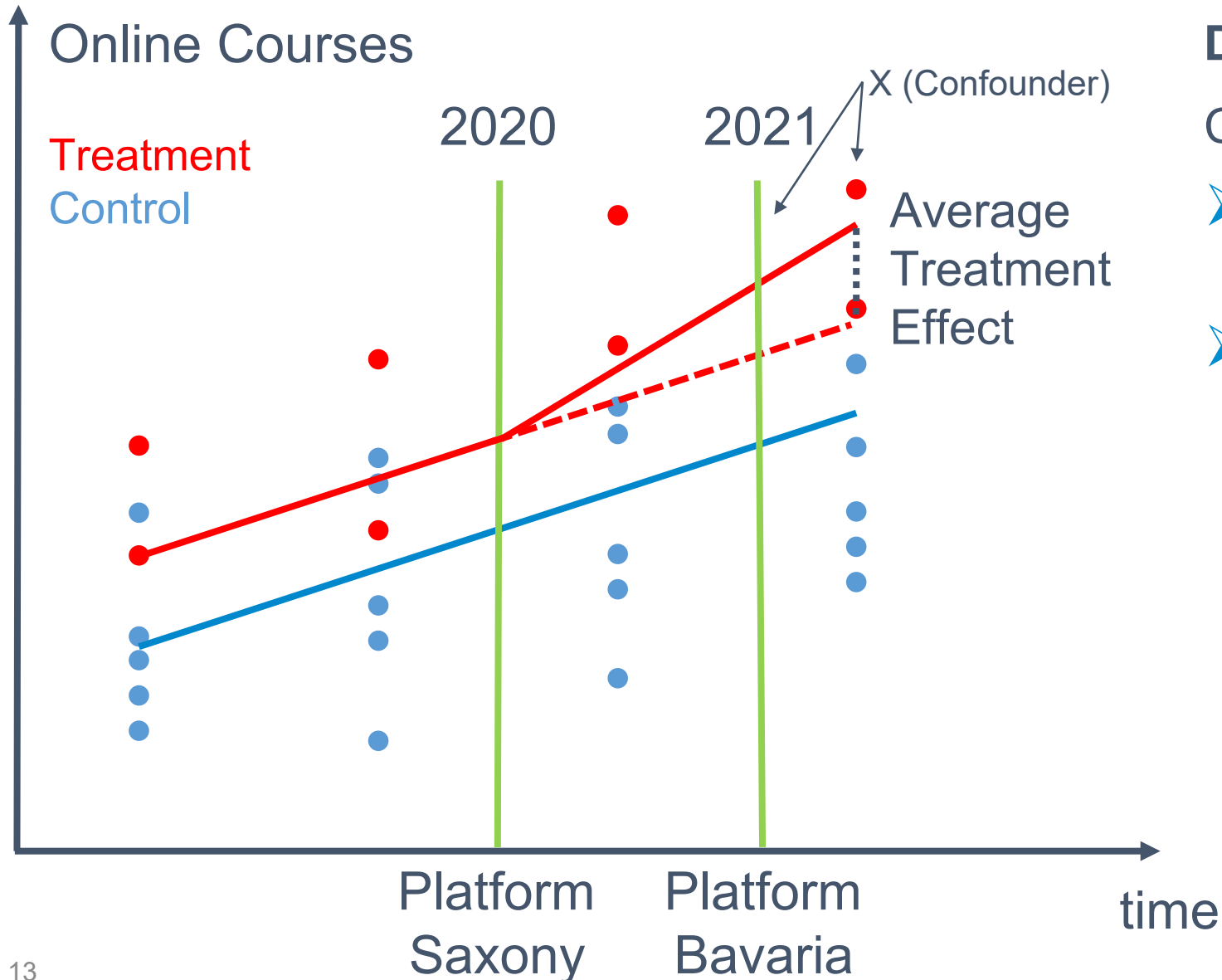
Items vhs statistics (years 2020-2024)

- Full sample of German public adult education centers
- Treatment: Dummy for platform (0/1)
- Outcome: participation in digital courses
- Control variables
- Year variable
- Analytical sample: $N = 5,696$ observations, $n = 831$ organisations
 - N (Never treated) = 4752, $n = 696$
 - N (Treated in 2020) = 104, $n = 15$
 - N (Treated in 2021) = 427, $n = 61$
 - N (Treated in 2024) = 413, $n=59$



ein Service des DIE

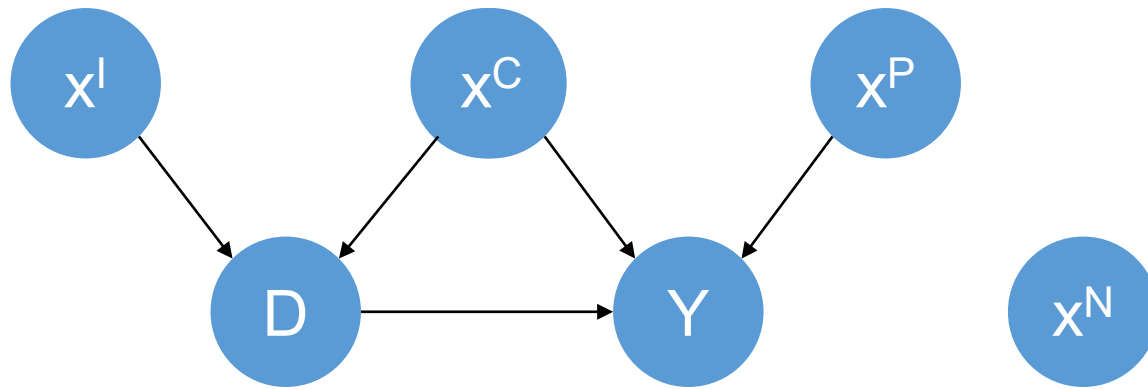
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Difference-In-Differences Modell

Challenges:

- Treatment is implemented across different points in time
- Treatment is selective/ non-random
 - Controlling observables causing different developments of online courses across groups
 - Doubly robust estimator via Augmented Inverse Probability Weighting (Callaway & Sant'Anna, 2021)



- D =Treatment (Plattform)
- Y =Outcome (Online-Belegungen)
- x^I =Instrument Variables
- x^C =Confounding Variables
- x^P =Precision Variables
- x^N =Null Variables

- x^I : legal entity, total number of courses, professionalisation, revenues & subsidies
- x^C : age/ gdp/ settlement structure type in the district, number of online courses
- x^P : -

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		Diff-in-Diff w/o Cov
Overall ATET		465.734** (179.096)
Chi²		17.16* (p = 0.029)
Treatment Groups	2020 (Saxony)	128.875 (334.067)
	2021 (Bavaria)	651.421* (248.984)
	2024 (Baden-Württemberg)	126.016 (194.547)

n = 831; N = 5,696 *p < .05. **p < .01. ***p < .001.

		Diff-in-Diff w/o Cov	Diff-in-Diff with Cov
Overall ATET		465.734** (179.096)	217.597 (172.783)
Chi²		17.16* (p = 0.029)	12.65 (0.124)
Treatment Groups	2020 (Saxony)	128.875 (334.067)	-94.769 (334.047)
	2021 (Bavaria)	651.421* (248.984)	317.643 (240.030)
	2024 (Baden-Württemberg)	126.016 (194.547)	200.921 (195.123)

n = 831; N = 5,696 *p < .05. **p < .01. ***p < .001.

→ While vhs with online platforms have increased online course participations, this effect was not caused by the platforms themselves, but by organisational and regional factors

Discussion

- Difference-in-Differences designs can be an effective way of analysing educational policies and interventions
- Heterogenous models account for staggered implementation settings
- Our results show the importance of including covariates leading to different developments between groups
 - While a difference-in-differences Model without covariates showed significant effects, these disappear when introducing covariates
 - The initial effect is actually caused by other factors than the platforms themselves, both on an organisational and regional level
 - The examined platforms reproduce existing disparities in online participation rather than reducing them

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Link to the study



Hemmerich, J., & Rüter, F. (2026). Do public education platforms increase online course participation? Evidence from a difference-in-differences study of German adult education centres. *Cogent Education*, 13(1), 2691342.

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