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Friederike Hertweck Serife Yasar

The Impact of University Openings on Local Youth





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The Impact of University Openings on Local Youth

Abstract

This study investigates how the establishment of a new university affects the educational pathways for younger cohorts. By analyzing cohorts at various stages of their education, we show a notable shift towards higher education and a decline in completion rates for vocational training programs across all cohorts. This effect is observed even among adolescents in upper secondary school, despite the apparent pre-determination of their educational trajectory. However, the benefits are not distributed equally, with youth from academic households experiencing the most significant gains, which raises concerns about increasing educational inequalities due to new university establishments. Our results highlight the complex interplay between accessibility, social networks, and educational preferences, calling for policy interventions that balance the expansion of higher education access with efforts to mitigate increased stratification.

JEL-Codes: I2, R23

Keywords: Education expansion; educational choices; human capital; educational aspirations; university openings

November 2024

^{*} Friederike Hertweck, RWI; Serife Yasar, RWI, RUB, and RGS. – We thank Ronald Bachmann, Thomas Bauer, Barbara Boelmann, and participants of the 5th Forum Higher Education and the Labour Market (HELM) in Nuremberg as well as the 37th Annual Conference of the European Society for Population Economics (ESPE) in Rotterdam for valuable comments. Sarah Höne provided excellent research assistance. This work was funded by the Federal Ministry of Education and Research (BMBF) and Next Generation EU as part of the project "NLP in Education Research: Development of the German higher education market since the 1970s (Studi-BUCH)" under grant number 16DKWN139A. This paper uses data from the National Educational Panel Study. The NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi, Germany) in cooperation with a nationwide network (NEPS Network, 2023). – All correspondence to: Friederike Hertweck, RWI, Hohenzollernstraße 1–3, 45128 Essen, Germany, e-mail: Friederike.Hertweck@rwi-essen.de

1 Introduction

Expansion of higher education has long been a central policy tool for reducing inequality and increasing opportunities for local youth (e.g., Baron et al., 2018). While the presence of a nearby university can facilitate access to higher education, many teenagers may have already committed to specific educational tracks by the time a new university opens, potentially limiting the immediate impact on their educational choices. As a result, the effects of university openings on adolescents' outcomes may vary across cohorts, with any significant changes in regional educational attainment likely to emerge with a delay.

Several studies have explored the impact of university openings on the level of educational attainment within local populations. These studies indicate that university establishments lead to higher rates of university enrollment and graduation (Boelmann, 2024; Siegler, 2012), as well as an increased local supply of highly qualified professionals (Berlingieri et al., 2022; Charruau, 2022). Most of this literature focuses on specific age groups, such as individuals aged 16 to 28 years (Siegler, 2012) or those exactly 19 years old at the time of the university's establishment (Boelmann, 2024). Thus, these studies primarily examine the impact of university openings on higher education decisions, focusing on individuals who have already completed secondary schooling and, therefore, have already obtained a university entrance qualification. Consequently, there is lack of evidence that captures the broader spectrum of educational pathways or the potential influence of university openings on earlier educational choices.

This study fills this gap by examining the effects of university openings on the educational choices of adolescents who were already born, but have not completed their educational choices at the time the university was established. Unlike previous studies that focus exclusively on individuals who have already completed secondary schooling and made their school track decisions, this study investigates how the local availability of a university affects the broader range of educational pathways for younger cohorts. By considering adolescents at various stages of their educational trajectories, we capture the potential shifts in both academic and vocational educational choices, thus providing a more comprehensive understanding of how university openings shape local educational outcomes.

The empirical strategy uses individual-level data from the German National Educational Panel Study (NEPS), a representative survey that includes detailed information on individuals' educational backgrounds and the district-level location of their place of birth. This rich dataset allows for an in-depth analysis of a range of educational outcomes, including attainment of a university entrance qualification, participation in vocational training, and university graduation. To identify causal effects, we exploit the plausibly exogenous variation in the geographic and temporal distribution of university openings across districts in Germany between 1965 and 1989. This variation serves as a natural experiment to examine the impact of university openings on local educational attainment.

The results of this study demonstrate that the establishment of a university in a local district significantly affects the educational trajectories of adolescents. Specifically, the availability of a university increases the probability of university graduation by 36.5 % to 75.2 %, depending on the age at which students are exposed to the university opening. However, this positive effect on university graduation comes at the cost of a decrease in vocational training participation, which declines by 5.4 % to 18.4 %. While this shift away from vocational training is plausible – given that vocational and higher education are rather substitutes – it may be an unintended consequence, as vocational training is a critical pathway to skilled employment in many sectors. Additionally, we also estimate positive coefficients for the probability to graduate from secondary school with a university entrance qualification. Yet, these coefficients lack statistical significance.

Overall, our findings suggest a substantial shift in educational choices among local youth when a university is established, with a marked increase in university graduation rates and a corresponding decline in vocational training completion. This effect is observed across all age groups, from primary school students to those in upper secondary education at the time of the university's opening. Interestingly, the impact extends beyond those in early educational stages, with even adolescents already in upper secondary school at the time of the university opening showing an increased likelihood of pursuing higher education. This is surprising because school track decisions have already been made when students are in secondary education. However, this shift towards university enrolment comes at the expense of vocational training, with a corresponding reduction in the probability of completing vocational education. Our findings indicate that the establishment of a local university reshapes both the accessibility of higher education and the educational preferences of local youth. By reducing transaction costs and probably increasing access to support or counseling systems, the local university encourages a greater number of students to pursue university degrees over vocational training. However, a heterogeneity analysis reveals that this shift is not uniform across all social groups. The effects are most pronounced among female students and those from academic households, suggesting that while the introduction of a local university may improve overall access to higher education, the latter finding could also exacerbate existing inequalities. Overall, our results highlight the complex interplay between access, social networks, and educational choices.

While the institutional context of the 1960s to 1980s, characterized by political power dynamics determining the timing and location of university openings, provides a quasi-experimental setting for estimating the effect of universities on local youth, several key threats to identification remain in our analysis. First, districts that received new universities may have already been on different educational or economic trajectories prior to the university opening. Second, other contemporaneous policy changes, such as the introduction of financial aid and the expansion of technical colleges, could confound the effect of the university openings. Third, parental sorting may introduce bias if families relocate to districts with universities to access higher education opportunities. Finally, student mobility—where students from neighboring districts move to the treatment district for university access—could limit local enrollment, further underestimating the true impact. Overall, we believe that these factors likely lead to downward bias, resulting in an underestimation of the true effect of university openings on educational outcomes. We address these concerns in detail and conduct a series of robustness checks to validate the reliability of our findings.

Our paper contributes to the broad literature that analyzes the effects of the establishment of a new university. The first strand of this literature investigates the effects of a new university on local individuals. Siegler (2012) demonstrates a causal effect of university establishments in Germany during 1960-1979, indicating an 8 to 10 percentage point increase in the probability of graduation for local individuals. Similarly, Jardim (2020) for Brazil shows that the establishment of a university increases incentives to accumulate human capital, resulting in a 0.038 standard deviation increase in the test grades for the municipality. Frenette (2009) investigates Canadian university establishment effects, revealing a modest increase

of 1.3 percentage points in post-secondary participation. Furthermore, Elsayed and Shirshikova (2023) explore the large-scale construction of public universities in Egypt during the 1960s and 1970s, finding long-lasting positive effects on education and labor market outcomes, especially for females, with an increase of 11.7 percent in higher education attainment. Boelmann (2024) investigates the impact of university establishments on the gender gap in higher education. She shows that the availability of local universities contributed to the narrowing gender gap in higher education. Although not directly analyzing the establishment of new universities, the relationship between distance to university and positive educational outcomes is shown, among others, by Card (1993); Frenette (2004, 2009); Spiess and Wrohlich (2010); Gibbons and Vignoles (2012); Do (2004); Spiess and Wrohlich (2010); Weßling and Bechler (2019). We add to this literature by showing which school level students adjust their educational choices to the establishment of a new university.

The second strand of this literature analyzes the economic effects of newly established universities. Ferhat (2022) reveals that new universities in the 1990s in France resulted in an 8 percentage point increase in employment probability and a 5 percent wage increase. The study by Berlingieri et al. (2022) on the establishment of technical colleges in the 1980s and 1990s in Germany shows a 13 percent increase in the student population and high-skilled workers within a decade, with variations based on local labor market conditions. Valero and Van Reenen (2019) associate a 10 percent increase in universities per capita with a 0.4 percent higher future GDP per capita. The literature also affirms highly localized spillovers in patenting (Aghion et al., 2009; Andersson et al., 2009; Jaffe, 1989; Jaffe et al., 1993), technological innovation (Acs et al., 1992; Anselin et al., 1997; Audretsch and Feldman, 1996; Jaffe, 1989), business start-ups (Abramovsky et al., 2007; Audretsch et al., 2005; Bania et al., 1993; Woodward et al., 2006), and employment growth (Hausman, 2022). Charruau (2022) finds that university creation is correlated with human capital gains and the growth of skilled employment. In Egypt, Elsayed and Shirshikova (2023) document positive impacts on the labor market, particularly for females, with a 12.8 percent higher participation in the labor force and 11.7 percent higher paid employment.

This study provides valuable insights into the educational and economic impacts of university expansion, a key area for policymakers aiming to improve access to higher education and enhance local human capital. By demonstrating that the opening of universities significantly increases university graduation rates, this research underscores the potential of higher education expansion to foster upward social mobility and economic development. However, it also highlights the trade-off between increased university enrollment and decreased participation in vocational training, pointing to the need for balanced educational policies that support both academic and vocational pathways. As governments worldwide continue to invest in higher education infrastructure, the study's findings offer important implications for designing policies that not only improve access to universities but also ensure a diverse, skilled workforce. Additionally, policy interventions should consider ways to address inequalities in educational outcomes, ensuring that all students, regardless of their parental background, have equal opportunities to benefit from university openings.

The remainder of this paper is organized as follows. Section 2 describes the higher education expansion in Germany and outlines our empirical approach including potential threats to identification. Section 3 introduces the data. The findings are presented in Section 4, followed by the discussion of the underlying channels in Section 5. Finally, Section 6 concludes.

2 Empirical Setting

We aim to identify whether university openings affect educational choices at various stages of schooling. To do so, the empirical analysis must account for the nonrandom spatial distribution of universities: In an ideal experiment, a large set of universities would be randomly established over a large set of comparable districts, enabling causal inference regarding their impact on local individuals. Because such a controlled experiment is impractical, we approximate this condition by leveraging the establishment of universities in a quasi-experimental framework.

2.1 Higher education expansion in Germany

The Sputnik shock in 1957 prompted Western nations to prioritize academic education, especially in science, technology, engineering, and mathematics (STEM). In several Western countries, new universities were established. Consequently, the establishment of new universities in Germany starting in this era was not only a response to domestic educational needs but also part of a broader effort to enhance scientific and technological capabilities in the face of international competition. Additionally, the decentralization of academic institutions aimed to extend access to higher education beyond traditional urban centers, fostering regional development and addressing demographic shifts characterized by an increasing number of young people pursuing a university education.

The expansion of universities in Germany after the Sputnik shock occurred in three phases, each driven by different regional and political factors. From 1965 to the early 1970s occurred the first phase, which was characterized by the opening of new universities in regions that had been historically underrepresented in higher education. These institutions were primarily established in the two states of Bavaria and North Rhine-Westphalia, two large German states with the majority of inhabitants being employed in the agricultural or production sector (IT.NRW, 2021; BMWSTI, 2018). Decentralizing higher education was the aim of these new universities, making it more accessible to a wider range of students from the industrial and agricultural sectors (e.g., Ruhr University Bochum, 2024; University Konstanz, 2024; Heinrich-Heine-University Düsseldorf, 2024; University Augsburg, 2024).

The second phase, occurring in the early 1970s, was marked by the merger of various existing higher education institutions, such as pedagogical schools and technical colleges, into newly established universities. This process was largely driven by the local desire to get their 'own' university and to unify existing higher education institutions under the broader, more prestigious university framework. The consolidation allowed for the integration of a wider range of academic disciplines and the expansion of academic programs. While these newly formed universities were not entirely "new" in the conventional sense, they represented a significant elevation of existing institutions, transforming them into comprehensive universities with greater research capabilities and a broader academic scope (e.g., University Kassel, 2024; University Siegen, 2024; University Paderborn, 2024; Blickfeld Wuppertal, 2024).

The third phase, from 1974 to 1990, saw the development of universities from single advanced schools, often focused on pedagogy or teacher training, into fullyfledged academic institutions. This phase marked a further decentralization of higher education, as smaller, specialized institutions in regional areas were transformed into universities with a broader range of disciplines. These new universities were intended to cater the growing demand for higher education, particularly in fields like social sciences, engineering, and humanities. Establishing these universities in rather smaller cities helped to regionalize the academic landscape and provided greater educational opportunities outside of Germany's traditional academic centers (e.g., NDR, 2024; University Osnabrück, 2024; University Lübeck, 2024; Leuphana University Lüneburg, 2024).

Overall, the university expansion was closely tied to both political and economic changes in Germany, including the need to train a highly skilled workforce for the country's post-war economic recovery and growth. Yet, unlike expansion periods in other countries in the 1970s (e.g., Carneiro et al., 2023), Germany lacked a national regional educational development plan. Führ and Furck (1998) summarize in the *Handbook on German Educational History* that the selection of the *exact* district where a university was established was not guided by explicit plans developed to foster local educational development in particular areas. Instead, Führ and Furck (1998) state that the "location of new universities was decided by political power balances rather than regional and educational planning reasons" (p. 434). This suggests that factors such as political leverage and influence within certain districts played a more decisive role than educational policy. Since the timing and distribution of new universities across districts did not directly align with local educational needs or development strategies, we argue that their distribution is plausibly exogenous.

2.2 Empirical strategy

We estimate the effect of universities on local youth by exploiting the random timing and location of university openings in a quasi-experimental design. The relationship of interest is the effect of a university on the educational choices of a person i born in district r before the university opened in year t. To do so, we employ a two-way fixed-effects setting in the spirit of Borusyak et al. (2024) and estimate

$$Y_{ir, t>0} = \tau_{r, t<0} D_{irt} + \phi_r + \phi_{t<0} + u_{irt}$$
(1)

in which a set of realized educational outcomes $Y_{ir, t>0}$ are regressed on the treatment indicator (D_{irt}) as well as on fixed effects for districts (ϕ_r) and birth cohorts $(\phi_{t<0})$. The treatment indicator D_{irt} equals 1 if a university was established in district rwhen the individual i was 21 years old or younger at the time when a university was established in their home district. In turn, the treatment indicator is set to 0 if no university was established in district r or if individual i was already at least 22 years old when the university was established. An age threshold of 22 is chosen because at this age, the vast majority of people has already made their educational choices. It is constructed from the completion of 13 years of formal schooling (starting at age 6) leading to the university entrance qualification, plus up to 20 months of mandatory military or civil service.¹

Note that t is the year of the university opening. For our empirical identification, it is important that the establishment of a university took place *after* an individual was born in t < 0 but *before* all educational choices of that individual were realized in t > 0. Thus, $\tau_{r, t<0}$ is the effect of university openings on educational choices, identified by individuals who were between 1 and 21 years of age when the university was established in their home district.

We focus on three binary outcome variables that capture key educational choices. The first outcome is the probability of an individual graduating from an academic high school, which grants access to a university entrance qualification that serves as a prerequisite for attending university. The second outcome measures the likelihood of completing vocational education, reflecting an alternative educational pathway. Finally, the third outcome represents the probability of an individual graduating from university, representing the completion of higher education. Overall, the three outcomes measure realized academic success (and thereby choices) across different educational tracks.

As we are interested in understanding how university openings shape educational choices at various stages of schooling, we estimate Equation 1 separately for distinct age cohorts that refer to school levels in the German educational system. Specifically, we classify individuals into four groups based on their age at the time of the university opening. These are *preschool* (age 1 to 5), *primary school* (age 6 to 9), *lower secondary school* (age 10 to 15), and *upper secondary school* (age 16 to 19). In addition, we conduct separate estimations of Equation 1 for each individual age rather than relying on predefined school levels. This approach helps mitigate concerns about the potentially arbitrary nature of age categories, which, while linked to the school system, may inadvertently affect outcomes.

The estimator in Equation 1 allows our treatment effect, $\tau_{r, t<0}$, to vary by district (r) and birth year of the individuals (t > 0). Yet, we are interested in obtaining an *average* treatment effect for each specific age group that experienced a university opening, i.e., $\overline{\tau}$. To obtain the average effect, the estimator proposed by

¹Military service was mandatory in Germany for males starting at age 18, with its exact duration varying throughout the analysis period. In general, military service lasted up to 18 months during the relevant time period, while alternative civil service could extend to 20 months (Haberhauer and Maneval, 2000).

Borusyak et al. (2024) proceeds in three steps: First, it uses the control group as well as not-yet-treated cohorts born in treatment districts to estimate the fixed effects ϕ_r and $\phi_{t<0}$. Second, for each treated observation, the imputed treatment effect is computed as $\hat{\tau}_{ir, t<0} = Y_{ir, t>0} - \hat{\phi}_r - \hat{\phi}_t$. Finally, the treatment effect is obtained by taking an unweighted average of the individual imputed treatment effects, $\hat{\tau}_{ir, t>0}$, to get $\overline{\tau}$. In the following, we use the unweighted average as our baseline result.²

Standard errors are clustered at the district level. For computing these errors, we assume homogeneous treatment effects across all treated individuals, with deviations from this average used to calculate the standard errors (excluding each unit's own cluster). To mitigate overfitting, we use the largest feasible average treatment effect for this computation. While this represents a conservative approach, it is likely the most appropriate given the potential heterogeneity in the true treatment effects.

2.3 Threats to identification

Our analysis has four potential threats to identification. These are pre-existing trends, simultaneous policy changes, parental sorting, and student mobility. These factors may rather downward bias our estimates, leading to an underestimation of the true effect of university openings on educational outcomes. We explain all threats in more detail in the following.

Pre-existing trends. A key assumption to interpret our estimates as causal is the parallel trends assumption, which posits that, in the absence of the university opening, individuals in the treatment and control districts would have followed the same educational trajectories over time. The presence of pre-existing differences in educational or economic trends between districts with new universities could bias the estimates. For example, the districts in which a university ultimately opened may have already experienced faster improvements in their inhabitants' educational outcomes or benefited from regional reforms (e.g., increased local investment, higher income levels, or other policy changes) that could independently affect educational attainment. If university openings coincide with other regional reforms, observed changes in educational outcomes may be driven by these factors rather than the opening of the university itself. Given the lack of a centralized regional planning authority and the politically-driven nature of university locations, we argue that

 $^{^{2}}$ We also run the standard two-way fixed regressions, which lead to biased results in our setting due to the staggered opening of universities. Please see the results and a discussion in Appendix B.2.

adolescents in districts with university openings would have followed the same educational trajectories as those in districts without such openings, had the latter not received a university. Although we cannot visually assess parallel pre-trends as in standard event studies due to varying timing of the university openings, we conduct placebo regressions as a robustness check to test for any pre-existing trends in Section 4.2 and show that the parallel trends assumption appears to be satisfied.

Simultaneous policy changes. The opening of universities may coincide with other regional policy changes or educational reforms, complicating the identification of the university's role as the sole driver of any observed shifts in educational outcomes. Notably, the establishment of new universities in the 1970s and 1980s coincided with two significant educational policy reforms: the simultaneous opening of specific colleges in higher education (Fachhochschulen (FH), nowadays known as Universities of Applied Sciences) in the 1970s and the introduction of financial aid for students in 1971 (Bock, 1973). The establishment of these colleges aimed to broaden access to higher education, particularly in rural areas. They often emerged from traditional engineering or pedagogical schools and differ from traditional universities mainly through their more practical orientation. In districts where these colleges were established but no university was opened, students may have opted for more academically oriented school tracks or pursued higher education (at one of these colleges) rather than pursuing vocational training. This could lead to an underestimation of the true effect of university openings, as the opening of additional higher education institutions may have affected educational choices towards more higher education although these are considered as untreated districts.

Similarly, the introduction of financial aid in 1971 (provided as a full subsidy to students) reduced the financial barriers to attending university, particularly for students from lower-income households. While this policy affected students nationwide, its impact was likely more pronounced in districts without a nearby university, where the reduction in transaction costs made higher education more accessible. As a result, the presence of financial aid may lead to a downward bias in the estimated effect of university openings on university graduation rates, also underestimating the true causal effect.

Parental sorting into districts. Parents choose where to raise their offspring and may be influenced by factors such as access to educational and labor market opportunities. By restricting our treatment analysis to individuals born in the district where the university was established, we mitigate bias stemming from parental selection into treatment, wherein families relocate to districts hosting universities to gain access to higher education opportunities (Tiebout, 1956). Using districts at birth differs from the prevailing practice in the literature on educational expansion, which typically examines the district of residence at the time of high school completion (Kamhöfer et al., 2019), the place of residence at the time of childhood (Siegler, 2012) or lower secondary school (Ferhat, 2022), or the student's home district before graduating from high school (Frenette, 2006). By focusing on the district of residency at birth before the university was opened as in Boelmann (2024), this paper's approach offers a more robust framework for assessing the impact of university establishment on educational choices across age groups.

Student mobility. A further potential threat to identification arises from student mobility, particularly when students from districts without a university move to districts with new university establishments. If students from neighboring or untreated districts relocate to the treatment district to pursue higher education, they may occupy available university spots, thereby limiting access for local students. This could result in local adolescents being unable to fully capitalize on the newly available educational opportunities, as they may be unable to enroll in the university despite its proximity. Consequently, the impact of university openings on local educational choices could be underestimated, as the true effect may be diluted by the inflow of students from other regions.

3 Data

We utilize two different datasets to estimate whether adolescents adjust their educational choices in response to the establishment of a new university. These datasets cover detailed information on university establishments in Germany and data on the educational trajectories of people born since the 1950s.

Establishment of universities. Data on the establishment of universities in Germany has been sourced from annual student guides to higher education, which have been consistently published by the Federal Employment Agency since 1971. These guides contain detailed information for students in upper secondary school to assist them with their decisions on whether, what, and where to study. All information on study options (and thereby new openings of universities) have been extracted and provided by Hertweck et al. (2024). We further enhanced the dataset with publicly available historical data on each university in Germany, typically accessible through the institutions' websites. Table 8 in Appendix C provides a summary of all 25 universities that were established in Germany between 1965 and 1989. Figure 1 illustrates the spatial distribution of newly established universities.



Figure 1: Spatial distribution of the newly established universities

Note: This figure illustrates the spatial distribution of the newly established universities. Blueshaded districts already hosted a university in 1965, while yellow-shaded districts represent those we classify as districts that experienced the opening of a university between 1965 and 1989. Please refer to Table 8 in Appendix C for more details on each university.

Previous studies on the expansion of German education have primarily utilized data from partially incomplete statistical yearbooks (Boelmann, 2024) and information from the current list of universities (*Hochschulkompass* as in Siegler (2012)). However, these data sources often lack a few years (as in Boelmann (2024)), omit data on universities that are no longer operational (as observed in Siegler (2012)) or fail to distinguish between the year a university is officially founded and the first year of teaching, which may be several years later if a completely new campus is constructed. Our dataset surpasses these existing sources and their downsides by relying on official study guides provided by the Federal Employment Agency enriched by the universities' historical data.

Educational choices. Data on educational choices come from the German National Panel Study (NEPS).³ The NEPS is a representative multi-sequence study designed to research educational trajectories over the life course. It contains details on, for instance, the birth year and district, parental education, and a variety of educational choices and transitions. For our analysis, we use data from the Starting Cohort 6 (NEPS SC6), which contains data on adults who were sampled and retrospectively surveyed about their educational trajectories between 2007 and 2010.⁴

We restrict our sample to individuals who were born between 1950 and 1986 in a district in Western Germany that did not have a university prior to 1965. This selection procedure yields a sample of 7,884 individuals for the main analysis. Table 1 presents the summary statistics, delineating the means and standard deviations separately for individuals residing in districts that experienced the establishment of a new university (Columns 2 to 6) and those residing in districts without such a new establishment or who were already above 22 years of age when the university was opened in their home district (Columns 7 to 11).

A comparison of these groups reveals similar characteristics in terms of gender distribution and parental educational attainment: 51 to 53 % of the respondents are female, and 13 to 14 % of the respondents in the sample have an academic background (as defined as having at least one parent who graduated from university). Regarding their educational outcomes, 44 to 46 % of individuals obtained a university entrance qualification, 67 to 69 % completed vocational training after secondary school, and 16 to 17 % graduated from university at some point during their life.

The statistically significant differences in birth years are the result of the treatment definition and the sampling methodology employed in the NEPS SC6 study. While NEPS SC6 is representative of the German population as a whole, it does not achieve full representativeness at the district-birth year cell level. For further information about the sampling procedure, see Aust et al. (2011). Despite this limitation, both treatment and control districts reflect Germany's overall demographic structure, as the the nationwide decline in birth rates after 1970 (Destatis, 2024).

³Researchers who work with data from the NEPS must include the following statement and reference: This paper uses data from the National Educational Panel Study (Blossfeld and Roßbach, 2019). The NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi, Germany) in cooperation with a nationwide network. This paper uses wave 13 of NEPS SC6 (NEPS Network, 2023).

⁴The NEPS officially started in 2010. The adult survey 2007/08 was conducted by the Institute for Employment Research (IAB) as a study called "Working and Learning in a Changing World" (ALWA). After ALWA, data collection of the adult survey continued as part of the NEPS. Please refer to NEPS Network (2023) for more details.

Figure 2: Timeline of birth years, university establishments, and educational choices



Note: This figure illustrates the time period covered in our analysis. The NEPS birth cohorts range from 1950 to 1986, while the openings of universities took place between 1965 and 1989. Our analysis focuses on realized educational choices between 1970 and 2010.

Table 1: Summary Statistics

		Treatment			Control			t-	Test			
	Ν	Mean	SD	Min	Max	Ν	Mean	SD	Min	Max	Diff	p-value
Birth year	1,169	1961.08	6.63	1950	1986	6,715	1965.60	9.80	1950	1986	4.53	0.00
Female	1,169	0.53	0.50	0	1	6,715	0.51	0.50	0	1	-0.02	0.28
Academic background	1,092	0.14	0.35	0	1	6,375	0.13	0.34	0	1	-0.01	0.33
High School graduation	1,169	0.46	0.50	0	1	6,715	0.44	0.50	0	1	-0.02	0.27
Vocational Training	1,169	0.69	0.46	0	1	6,715	0.67	0.47	0	1	-0.01	0.34
University graduation	1,169	0.17	0.38	0	1	6,715	0.16	0.36	0	1	-0.02	0.14

Note: Summary statistics for the individuals in the treatment and control group as defined in Section 2. The summary statistics cover the number of observations (N) as well as the mean and the standard deviation (SD) of the respective variables. Having an academic background is defined as having at least one parent that graduated from university; yet information on parental educational attainment is not available for all respondents. Source: Own calculations based on NEPS SC6.

4 Results

4.1 Baseline results

This paper investigates the impact of university openings on the educational attainment of local youth who were already born but still attending school at the time the university was established. The analysis concentrates on three outcomes that capture realized academic success (and thereby choices) across different educational pathways: the probability of graduating from university, the likelihood of pursuing vocational training, and the probability of obtaining a university entrance qualification after attending an academic track in secondary school.

Table 2 provides the regression results of the three different outcomes in Panels A to C across the four age groups in Columns 1 to 4. The results indicate a positive and statistically significant effect of university openings on the local youth's probability

of graduating from university (Panel C). This effect is observed across all school levels and ranges from 6 to 13 percentage points. For instance, among children attending preschool when the university opens (Column 1), a coefficient of 0.128implies that the establishment of a university during this early educational stage increases the probability of university graduation by 12.8 percentage points, relative to individuals who did not experience a university opening in their district. Due to the overall low levels of university graduation in our sample (see Table 1), a coefficient of 0.128 corresponds to an increase in university graduation rates of 75.2 %. These magnitudes are consistent with findings from previous studies on the effect of university expansion in Germany (e.g., Boelmann, 2024). Overall, the estimates suggest that the presence of a local university strongly increases the likelihood of an individual obtaining a university degree, thus positively influencing the educational attainment of the local youth, likely by improving access to and reducing the barriers to university education. Interestingly, even adolescents who were already in upper secondary school at the time of the university opening are affected. This finding will be discussed in greater detail in Section 5, where we explore the underlying mechanisms driving these effects.

As is evident from Panel B in Table 2, the opening of a university is found to have a negative effect on the probability of pursuing vocational training ranging from 4 to 14 percentage points across school levels. Given the generally high levels of completing vocational training in our sample (see Table 1), this represents a decrease in vocational training by 5.4 to 18.4 %. These results suggest that the availability of university education reduces the demand for alternative educational pathways, such as vocational programs, in the local population. The negative association with vocational training is consistent across all school levels, although it is important to note that the results for vocational training are less robust in terms of statistical significance. This could be attributable to the conservative estimation approach used to calculate standard errors, which may have attenuated the precision of the estimates. In the German context, where vocational training and university education are distinct educational pathways, these results highlight the shift in educational choices induced by the opening of a local university. The findings suggest that local universities not only provide more opportunities for higher education but also alter local youth's preferences, steering them away from vocational tracks in favor of university enrollment.

When examining the impact of a university opening on the probability of completing an academic high school (and thus receiving a university entrance qualification), as shown in Panel A, we find no statistically significant effects across any school level. Nevertheless, the coefficients point in the expected direction: they are positive and sizable, ranging from 9 to 17.2 percentage points, which corresponds to an increase of 20 to 38.2 %. While the lack of statistical significance is not unexpected for youth in lower or upper secondary school, it is somewhat surprising for preschool and primary school children, as their educational track decisions have not yet been made at the time of the university's establishment. Given this, we would have anticipated a shift towards attending more academic track schools among the youngest age cohorts. The absence of statistical significance may, however, be attributable to the conservative approach used in the calculation of standard errors, as well as to the broader trend of increasing academic track schools across Germany during the period under study. This issue will be further explored in the discussion of underlying mechanisms in Section 5.

4.2 Robustness

Overall, the evidence presented in Table 2 suggests that university openings significantly affect the educational choices of the local adolescents, with a clear shift towards university education over vocational training. To strengthen the causal interpretation of our results, we conduct three robustness checks that address potential threats to identification, including the possibility of pre-existing trends and the spillover effects on students in neighboring districts. Additionally, we relax the assumption of fixed age categories and present results for an alternative definition of age groups.

Pre-existing trends. To assess the potential impact of pre-existing trends on our results, we conduct placebo regressions using a sample of districts that did not experience a university opening until 1990. For this exercise, we randomly assign a *placebo* university opening to approximately 10 % of these districts and compare the local youth's educational outcomes with those of the remaining districts, using the same regression framework as outlined in Equation 1. We then perform 1,000 iterations, generating 1,000 *placebo coefficients* for each outcome and age group. The distribution of these coefficients is presented in Figures 5, 6, and 7 of Appendix A. The results in Figure 5 indicate that pre-existing trends are largely absent, with the exception of a small, positive coefficient for the probability of university graduation

	School level at university establishment year:					
	Preschool	Primary	Lower	Upper		
		school	secondary	secondary		
	(1)	(2)	(3)	(4)		
Panel A: High sche	ool graduation					
Local university	0.102	0.112	0.172	0.090		
	(0.097)	(0.091)	(0.114)	(0.121)		
Panel B: Vocationa	al training					
Local university	-0.137**	-0.036	-0.124**	-0.099		
	(0.054)	(0.054)	(0.054)	(0.069)		
Panel C: Universit	y graduation					
Local university	0.128***	0.062^{*}	0.128^{***}	0.117^{**}		
	(0.049)	(0.036)	(0.036)	(0.046)		
Additional controls	3:					
District FE	yes	yes	yes	yes		
Birth year FE	yes	yes	yes	yes		
Observations	6,933	6,941	7,007	6,945		

Table 2: Baseline by school level attendance at university establishment year

Note: Columns 1 to 4 provide the regression results on estimating Equation 1 separately for different age groups that correspond to the four school levels in the Germany school system. Robust standard errors (in parentheses) are clustered on the level of districts. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

among adolescents in lower secondary school at the time of the university's opening. This suggests a slight upward bias in the estimated effect, although the magnitude is modest. Similarly, for the probability of completing vocational training, slight pre-existing trends are evident across all school levels (Figure 6) leading to an overestimation of the true effect of university openings on the probability of completing vocational training. Figure 7 shows no pre-existing trends for the probability of obtaining a university entrance qualification.

Neighboring districts. As described in Section 2, the distribution of new universities across districts is plausibly exogenous. However, potential bias may arise from individuals residing near district borders. Youth living close to the border of their home district might, in fact, be exposed to a university located just outside their district, especially in urban areas where universities are often situated within city boundaries, while surrounding districts may lack a university. Similarly, youth in

districts without a university could still be indirectly affected by the opening of a new university nearby. Therefore, defining treatment solely based on district borders may not accurately capture the real proximity to a newly established university.

To address this concern, we conduct a robustness check by refining our treatment definition and shifting from a *district-based* to a *distance-based* approach. Distances are measured as straight-line distances from the centroids of the districts. Specifically, we exclude individuals from the analysis if a university was located within a 30-kilometer radius of their birth district as of 1965. Districts with a university opening after 1965 within a 30-kilometer radius are classified as treated districts, i.e., as if they had experienced a university opening themselves. This 30-kilometer threshold is informed by existing research, which suggests that the effects of university openings are typically observed within this range.⁵

By restricting the sample to districts located more than 30 kilometers from universities that were established prior to 1965, we excluded nearly half of the original sample (see Table 3). The remaining individuals, who lived at least 30 kilometers away from any pre-1965 university, may have experienced the opening of a new university either in their home district or in a neighboring district during their childhood or adolescence (treated individuals) or did not experience the opening of a university nearby (control group). The results in Table 3 follow a similar pattern to those from the district-based treatment definition and show comparable magnitudes, except for preschool children, for which the coefficient is much smaller in magnitude.

Although the results are generally consistent (but partly lack statistical significance, most likely due to power issues), we do not consider the distance-based definition of treatment districts to be superior to the baseline approach. The 30-kilometer threshold is inherently arbitrary, whereas district boundaries provide more meaningful geographic units in our context, particularly given issues related to accessibility. Car ownership was limited among students until the late 1980s, and public transportation frequently terminated at district borders, limiting mobility between districts (Haefeli, 1998). Therefore, we cannot assume that students from all neighboring districts could easily access a newly established university on a regular commuting basis.

⁵Spiess and Wrohlich (2010) report that the average distance to a higher education institution in Germany is 22 kilometers, while Frenette (2009) finds that individuals residing within a 40kilometer radius of a university experience a 73 % increase in the probability of enrolling in college. Given these findings, we select a 30-kilometer threshold as an approximate midpoint between the observed distances in the literature, with the exact midpoint being 31 kilometers.

	Outcome: University graduation					
	Preschool Primary Lower Upper					
		school	secondary	secondary		
	(1)	(2)	(3)	(4)		
Panel A: District-	based definition	of treatment di	stricts (Baseline)		
Local university	0.128^{***}	0.062*	0.128***	0.117**		
	(0.049)	(0.036)	(0.036)	(0.046)		
Observations	6,933	6,941	7,007	6,945		
Panel B: Distance	-based definitio	n of treatment d	istricts			
Local university	0.084	0.083	0.106^{**}	0.094^{**}		
	(0.062)	(0.062)	(0.046)	(0.047)		
Observations	3,752	3,768	3,878	3,751		
Additional control	s:					
District FE	yes	yes	yes	yes		
Birth year FE	yes	yes	yes	yes		

Table 3: Robustness: District- vs. distance-based treatment definition

Note: This table compares the results from the district-based definition of treatment districts as in Table 2 with the distance-based definition that serves as a robustness check. Robust standard errors (in parentheses) are clustered on the level of districts. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

Alternative definition of age groups. The age categories used in the preceding analysis are based on the age of local adolescents at the time the university was established in their district. However, this categorization does not account for variations in school entry age or grade retention, and thus may be considered somewhat arbitrary. To address this limitation, we conduct a final robustness check by relaxing on these age groups and estimating separate regressions of Equation 1 for all individuals who were 21 years old at the time of the university opening and progressing down to those who were just born (age 1). Specifically, individuals are considered as being treated if they were at least a years old when the university was established in their district, where a ranges from 20 down to 1. As in the previous specifications, the control group consists of individuals born in districts that did not experience a university opening until 1990, as well as individuals aged 22 or older at the time the university was established in their home district. The results, including the coefficients and corresponding 95 % confidence intervals for each outcome variable, are presented in Figure 3.

The results in Figure 3 reveal that the establishment of universities significantly increases university graduation rates across almost all age groups while simultaneously reducing the probability of pursuing vocational training. Along with the findings in Table 2, Figure 3 shows a small time lag of two to three years, indicating that the impact of university openings on local youth is observed primarily when they are in the early stages of upper secondary schooling or even younger.

Standard TWFE estimator. When dealing with staggered treatment adoption, the estimator proposed by Borusyak et al. (2024) and implemented in Equation 1 is usually preferred over the classic two-way fixed effects (TWFE) approach because the latter can lead to biased estimates in the presence of such staggered treatments. In staggered adoption settings, where different units receive the treatment at different times, TWFE may suffer from compositional bias, as it assumes a constant treatment effect across all units, including those treated at different times, likely leading to misleading estimates, particularly when the timing of treatment affects the outcome in a non-linear or heterogeneous way. The Borusyak estimator, on the other hand, corrects for this by accounting for the varying timing of treatment, providing more robust and consistent estimates of treatment effects in such contexts. This makes it a better choice for settings with staggered treatment adoption, as it mitigates the biases that arise from the assumption of uniform treatment timing inherent in the TWFE approach (Goodman-Bacon, 2021; Borusyak et al., 2024).



Figure 3: Baseline results by age at university establishment year

Note: This figure presents the results from Equation 1, estimated separately for each age group. Panels A to C depict the impact of university establishments on the probability of high school graduation, pursuing vocational training, and university graduation, respectively. The 95 % confidence intervals are displayed for each estimate. The horizontal axis represents the age groups, corresponding to a that ranges from 20 down to 1. It is important to note that, due to the aggregation from 21 down to 1, the sample size increases from 20 down to 1. Due to the small sample sizes, it is not possible to run the regressions separately for adolescents who were 21 years of age when the university was established.

Despite the limitations associated with the TWFE approach, we run them as a simple robustness check. Specifically, we include an indicator variable that takes a value of 1 for individuals who were under 19 years old at the time a university was established in their birth district. The control groups are consistent with those used in our baseline regression in Equation 1, as outlined in Section 2. Again, we conduct separate regressions for each school level to further explore the effects. Our results in Table 7 in Appendix B.2 suggest that the TWFE estimator in the context of university establishments is upwardly biased. The coefficient magnitudes are implausibly large, with the TWFE estimator indicating that the establishment of a university increases the probability of graduating from university for youth in upper secondary school by nearly 50 percentage points. In contrast, our baseline results following Borusyak et al. (2024) suggest a modest effect of only 11.7 percentage points.

4.3 Heterogeneity

In this section, we explore heterogeneity in the estimated effects across two groups that have historically been underrepresented in higher education: female students and students from non-academic backgrounds. For the purpose of this analysis, students from non-academic backgrounds are defined as those whose parents have not completed a higher education degree. Table 4 presents the regression results from estimating Equation 1, with Panel B focusing exclusively on female students and Panel C providing the results for a subsample regression focusing on individuals from non-academic backgrounds. Panel A, for comparison, reports the baseline results as presented in Table 2. In Table 4, we concentrate on the most advanced educational choice, i.e., graduating from university. The results for the other outcomes of interest – completing vocational training and obtaining a university entrance qualification – are in Tables 5 and 6 in Appendix B, respectively. This stratified analysis allows for a deeper understanding of how the effects may vary across different demographic and socioeconomic groups, shedding light on potential disparities in educational outcomes.

The results from the analysis of the effect of university openings on the educational choices of females (Panel B) indicate that the establishment of a university significantly increases the probability of female students graduating from university, with estimated effects ranging from 8 to 22 percentage points. These findings align with those of Boelmann (2024), who demonstrated that the expansion of higher education through university openings substantially narrowed the gender gap in university graduation rates. Specifically, her analysis found that female students benefited disproportionately from the proximity of a university, with university openings contributing to a reduction of the local gender gap in graduation rates by approximately 72 %. In addition, our results suggest that this increased participation in higher education comes at the expense of participation in vocational training. As shown in Table 5 in Appendix B, female teenagers are 18 to 25 percentage points less likely to pursue vocational training if a university is accessible within their home district.

The results differ when examining adolescents from non-academic households (Panel C). The magnitudes of the coefficients in Table 4 are notably smaller than those observed in the baseline results in Panel A, suggesting that the effects in the baseline model are primarily driven by students from *academic* households. Furthermore, we find no significant effects on either the likelihood of completing vocational training or the probability of obtaining a university entrance qualification (see Tables 5 and 6 in Appendix B). These findings suggest that the presence of a local university does not significantly influence the educational choices of students from non-academic backgrounds, implying that their educational preferences are largely unaffected by the proximity of higher education institutions.

	Outcome: University graduation School level at university establishment year:							
	Preschool Primary Lower		Upper					
		school	secondary	secondary				
	(1)	(2)	(3)	(4)				
Panel A: Baseline	results							
Local university	0.128^{***}	0.062^{*}	0.128^{***}	0.117^{**}				
-	(0.049)	(0.036)	(0.036)	(0.046)				
Observations	6,933	6,941	7,007	6,945				
Panel B: Subsample: Female adolescents								
Local university	0.223***	0.082**	0.118**	0.162^{***}				
v	(0.067)	(0.034)	(0.048)	(0.047)				
Observations	3,534	3,542	3,582	3,539				
Panel C: Subsampl	le: Non-acader	nic Background						
Local university	0.042	0.042	0.085***	0.072				
v	(0.039)	(0.039)	(0.032)	(0.047)				
Observations	5,710	5,728	5,775	5,724				
Additional controls	3:							
District FE	yes	yes	yes	yes				
Birth year FE	yes	yes	yes	yes				

Table 4:	Heterogeneity	bv	family	background	and	gender
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Note: Columns 1 to 4 provide the regression results on estimating Equation 1 separately on a subsample of female respondents (panel B) and those from non-academic backgrounds (panel C). Panel A provides the baseline results as in Table 2. Robust standard errors (in parentheses) are clustered on the level of districts. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

5 Channels

Our findings indicate a significant shift in the educational preferences of local youth following the establishment of a university. Specifically, we observe a notable increase in university graduation rates, accompanied by a corresponding decline in the completion of vocational training. This shift is consistent with predictions from rational choice and human capital theory, which suggest that, given the higher returns associated with a university degree and the improved future employment prospects, the shift from vocational to higher education is both plausible and expected. Interestingly, the effect is observed across all age groups, suggesting that the opening of a local university affected the educational choices of the local youth irrespective of their previous educational choices (such as school track decisions). In fact, the results indicate that the presence of the university even affected teenagers already enrolled in upper secondary education. This implies that the impact of the university is rapidly integrated into the local population with little delay. Such a quick adjustment is consistent with Cowan and Zinovyeva (2013), who find that universities typically begin to influence regional innovation within three to five years.

Our findings indicate that the opening of local universities had a notably stronger impact on females, while its effects on children from non-academic households were either minimal or negligible. This differential impact could stem from several factors, including enhanced access to higher education, reduced informational barriers, and changes in educational aspirations. In the following, we examine these potential channels in more detail to better understand the underlying drivers of our results.

5.1 Access to higher education and transaction costs

The establishment of a local university directly affects the accessibility of higher education for local youth, particularly by reducing geographical barriers and associated transaction costs. Prior to the university's opening, adolescents in the area may have faced substantial costs in terms of time, money, and effort when traveling to universities in distant cities. These transaction costs, including travel expenses and the challenges of living away from home, may have deterred many potential university students as shown in various studies that determine the link between distance to college and educational attainment (Card, 1993; Frenette, 2004, 2009; Spiess and Wrohlich, 2010; Gibbons and Vignoles, 2012; Do, 2004; Spiess and Wrohlich, 2010; Weßling and Bechler, 2019). This is particularly true for students from lower-income or rural backgrounds, for whom the proximity of a university in their home district likely made the prospect of higher education more realistic and appealing.

Our results in the preceding section show that the effect of a local university is particularly pronounced for females, who exhibit much higher increases in university graduation rates than males. This could be due to a variety of factors, including the traditionally higher burden of mobility costs for young women, as well as gendered social norms that may have previously restricted female access to distant universities (Boelmann, 2024). By reducing these barriers, the presence of a university makes university education more accessible, especially for females who might otherwise have been deterred by the geographical separation. These findings underscore the importance of location in facilitating higher education access, particularly in regions where transportation options are limited, and where moving away from home may not have been an option for many adolescents. However, access to higher education and the reduction of transaction cost can not be the only lever through which the effect works because, as the analysis of the heterogeneity by family background shows, those students who had academically trained parents benefited the most from the opening.

5.2 Information frictions

In addition to reducing transaction costs, the establishment of a local university likely influenced local youth through informational and social channels. The availability of a nearby university may provide students with more immediate access to information about higher education opportunities, as well as the social support necessary to navigate the university application process (Do, 2004). This could include direct institutional support, such as guidance counselors and preparatory programs, which may have been introduced to local schools alongside the university opening. These resources help mitigate information frictions and provide the necessary guidance for students to pursue university education.

Notably, the presence of a local university creates new educational dynamics within the community, where peers, older siblings, or neighbors may have played an important role in encouraging younger students to pursue higher education. While one might expect informational frictions to cause a lag in the effects on students already in upper secondary school at the time of the university's establishment, our results show sizable effects even for these adolescents, suggesting that local universities quickly became a viable option for students already in later stages of their education. This may reflect anticipation effects, where younger students and their families anticipated the university's opening and began planning their educational paths accordingly.

The opening of a local university may have also prompted changes in institutional practices, with local schools adapting to better prepare students for university enrollment. For example, the introduction of annually updated student guides in 1971, distributed to all upper secondary students in Germany, institutionalized career counseling.⁶ Schools located near newly established universities may have been more motivated to incorporate these resources and enhance their career services. This combination of peer influence, social networks, and institutional changes likely accelerated the shift toward university education, even among students already enrolled in secondary education when the university was founded.

5.3 Educational aspirations

Our results in Table 4 show that children from non-academic households are less likely to graduate from university - although the opening of a local university reduces transaction costs and information frictions. Educational aspirations likely play a role in explaining these results: Since the 1950s, the number of children attending academic track high schools has steadily increased, reflecting a broader societal shift towards higher educational attainment (Wolter, 2014). As more children were sent to academic tracks, there was a growing recognition, especially within more educated families, that higher education would provide their offspring with better opportunities for securing well-paying jobs and achieving upward social mobility. These rising educational aspirations may have contributed to a greater propensity for students from academic households to pursue university degrees when they became more accessible through the opening of local universities.

Interestingly, the general increase in educational aspirations over time may also explain why we do not observe strong effects on the probability of completing an academic track in upper secondary school. As educational expectations rose across the entire population, even in districts without newly established universities, students were increasingly likely to pursue academic tracks, making the marginal effect of a local university opening less pronounced at the high school level. This suggests that while access to higher education plays a critical role in shaping post-secondary decisions, broader shifts in societal educational aspirations might have reduced the relative impact of university openings on earlier stages of the educational trajectory. Instead, the effects of university openings may have been masked by broader trends in the school system, notably the nationwide increase in the availability of secondary schools offering academic tracks. By the time students obtain a university entrance qualification, they have already been filtered by social factors throughout their educational journey (Schindler and Lörz, 2012).

⁶Please refer to Bock (1973) for an example of such a student guide and a detailed discussion of the content of these books in Hertweck et al. (2024).

6 Conclusion

This paper investigates the causal impact of university openings on local educational outcomes in Germany, using individual-level data from the German National Educational Panel Study (NEPS). By exploiting the exogenous variation in the timing and location of university openings across districts, the study isolates the effects of universities on local youth, focusing on key educational outcomes such as university graduation, vocational training participation, and obtaining a university entrance qualification by completing upper secondary schooling.

The results suggest a substantial shift in educational preferences when a university is established, with a notable increase in university graduation rates and a corresponding decline in vocational training completion. Interestingly, this shift extends beyond those in the early stages of their educational pathways, with even students in upper secondary education at the time of the university opening being more likely to pursue higher education. This highlights the significant impact of local university openings on educational choices, even when key school track decisions have already been made. Notably, while local universities can be thought of improving access to higher education for everyone living nearby, the results show that the effects are more pronounced among female students and those from academic households, suggesting that they may have mixed effects on existing inequalities. This finding underscores the complex interplay between access to education, social networks, and educational choices.

From a policy perspective, these findings have important implications. When governments establish new universities, they aim to both stimulate the local economy and increase local human capital. Previous research has highlighted the economic benefits of university openings, showing improvements in the local economy and innovation within a few years of establishment (Cowan and Zinovyeva, 2013). The educational effects identified in this study align with the broader economic impacts, suggesting that university openings can effectively achieve their intended outcomes in a relatively short timeframe. Our results suggest that expanding access to universities, while beneficial for higher education attainment, could inadvertently reduce the incentives for pursuing vocational qualifications, potentially impacting the skilled labor force and labor shortage in some occupations in the long term. Overall, policy interventions should therefore carefully consider how to mitigate the potential for increased educational stratification, while expanding opportunities for higher education access. Future research could build on this study by exploring the longer-term effects of university openings on labor market outcomes, such as employment rates and earnings. Additionally, examining the heterogeneous effects of university openings across different demographic groups – such as more detailed information on parental socioeconomic status or rural versus urban areas – could provide deeper insights into the distributional impacts of educational policy.

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A Additional Figures

A.1 Distribution of birth years in treatment and control group

Figure 4 displays the distribution of birth years for individuals in treatment and control districts in the sample as described in Section 3. Treatment districts are those that experienced a university opening between 1965 and 1989, control districts are those without a university opening. Figure 4 shows that the distributions overlap but are statistically from each other, as also described in Table 1. Only a few observations are available for treatment districts after the mid 1970s. While the NEPS SC6 is considered to be representative for Germany, it lacks sufficient observations for district-birth year cells (Aust et al., 2011).



Figure 4: Birth Years

Note: The figure illustrates the distribution of birth years in our sample for treatment and control districts. The red-bordered bars represent districts without university openings, while the bluebordered bars depict districts that experienced a university opening between 1965 and 1989.

A.2 Placebo regressions

In the following, we present the results of the placebo regressions as described in Section 4.2. Each of the following Figures 5, 6, and 7 presents the distributions of coefficients across 1,000 iterations, where districts with university openings are selected randomly and assigned a random establishment year. Panel A always displays the coefficient distribution for preschool children, Panel B for primary school children, Panel C for lower secondary school students, and Panel D for upper secondary school students in the placebo establishment year. The red line always represents the estimated coefficient from the baseline specification, as shown in Table 2. In the absence of any pre-trends, the distribution of coefficients should have a mean of zero.





Note: This figure illustrates the distribution of coefficients across 1,000 iterations, where districts with university openings are selected randomly and assigned a random establishment year. Panel A displays the coefficient distribution for preschool children, Panel B for primary school children, Panel C for lower secondary school students, and Panel D for upper secondary school students in the placebo establishment year. The red line represents the estimated coefficient from the baseline specification, as shown in Panel C of Table 2.



Figure 6: Outcome: Probability to complete vocational training (placebo regression)

Note: This figure illustrates the distribution of coefficients across 1,000 iterations, where districts with university openings are selected randomly and assigned a random establishment year. Panel A displays the coefficient distribution for preschool children, Panel B for primary school children, Panel C for lower secondary school students, and Panel D for upper secondary school students in the placebo establishment year. The red line represents the estimated coefficient from the baseline specification, as shown in Panel B of Table 2.

Figure 7: Outcome: Probability to obtain a university entrance qualification (placebo regression)



Note: This figure illustrates the distribution of coefficients across 1,000 iterations, where districts with university openings are selected randomly and assigned a random establishment year. Panel A displays the coefficient distribution for preschool children, Panel B for primary school children, Panel C for lower secondary school students, and Panel D for upper secondary school students in the placebo establishment year. The red line represents the estimated coefficient from the baseline specification, as shown in Panel A of Table 2.

B Additional Tables

B.1 Heterogeneity analysis

	Outco	me: Completion	n of vocational tr	aining			
	D b D D C D C D C D C D C D C D C D C D						
	Preschool	Primary	Lower	Upper			
	<i>.</i> .	school	secondary	secondary			
	(1)	(2)	(3)	(4)			
Panel A: Baseline	e results						
Local university	-0.137**	-0.036	-0.124**	-0.099			
	(0.054)	(0.054)	(0.054)	(0.069)			
Observations	6,933	6,941	7,007	6,945			
Panel B: Subsamp	ole: Female ado	lescents					
Local university	-0.115	0.004	-0.182***	-0.246***			
	(0.089)	(0.090)	(0.047)	(0.068)			
Observations	3,534	3,542	3,582	3,539			
Den al C. Caleran		Dr. l					
Panel C: Subsamp	ne: Non-acaaen		0.000	0.005			
Local university	-0.036	0.017	-0.062	-0.025			
	(0.055)	(0.056)	(0.062)	(0.071)			
Observations	5,710	5,728	5,775	5,724			
Additional control	ls:						
District FE	yes	ves	yes	ves			
Birth year FE	yes	yes	yes	yes			

Table 5: Heterogeneity by family background and gender

Note: Columns 1 to 4 provide the regression results on estimating Equation 1 separately on a subsample of female respondents (panel B) and those from non-academic backgrounds (panel C). Panel A provides the baseline results as in Table 2. Robust standard errors (in parentheses) are clustered on the level of districts. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

	Outcome: Obtaining a university entrance qualification School level at university establishment year:					
	Preschool	Primary school	aary Lower Up ool secondary secon			
	(1)	(2)	(3)	(4)		
Panel A: Baseline	results					
Local university	0.102	0.112	0.172	0.090		
	(0.097)	(0.091)	(0.114)	(0.121)		
Observations	6,933	6,941	7,007	6,945		
Panel B: Subsample	e: Female add	olescents				
Local university	0.104	0.120^{**}	0.174	0.294^{***}		
	(0.085)	(0.059)	(0.129)	(0.093)		
Observations	$3,\!534$	$3,\!542$	$3,\!582$	$3,\!539$		
Panel C: Subsample	e: Non-acader	nic Background				
Local university	0.056	0.070	0.090	-0.009		
	(0.096)	(0.107)	(0.114)	(0.111)		
Observations	5,710	5,728	5,775	5,724		
Additional controls	:					
District FE	yes	yes	yes	yes		
Birth year FE	yes	yes	yes	yes		

Table 6: Heterogeneity by family background and gender

Note: Columns 1 to 4 provide the regression results on estimating Equation 1 separately on a subsample of female respondents (panel B) and those from non-academic backgrounds (panel C). Panel A provides the baseline results as in Table 2. Robust standard errors (in parentheses) are clustered on the level of districts. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

B.2 Two-way fixed effects estimator

Table 7 presents the results from the standard two-way fixed effects (TWFE) estimator for Equation 1. The regression includes fixed effects for both districts and birth years, as well as an indicator variable for individuals who were under 19 years old at the time of the university's establishment in their birth district. As in previous analyses, we conduct separate regressions for each school level.

As noted by Goodman-Bacon (2021), the TWFE estimator in staggered treatment settings is biased, and the direction of the bias is not known in advance. In the context of university openings, we demonstrate in Table 7 that the TWFE estimator is upwardly biased. Specifically, the coefficient magnitudes produced by the TWFE estimator are implausibly large, suggesting that the establishment of a university increases the probability of graduating from university for youth in upper secondary school by nearly 50 percentage points. In contrast, the Borusyak estimator provides a more realistic and modest estimate, indicating an increase in the probability of university graduation of approximately 11.7 percentage points.

	Outcome: University graduation								
	School level at university establishment year:								
	Preschool	Primary	Lower	Upper					
		school	secondary	secondary					
	(1)	(2)	(3)	(4)					
Panel A: High sche	Panel A: High school graduation								
Local university	0.484^{***}	0.588^{***}	0.538^{***}	0.638^{***}					
	(0.090)	(0.119)	(0.146)	(0.093)					
adjust. R^2	0.0765	0.0758	0.0756	0.07589					
Panel B: Vocation	al training								
Local university	-0.295**	-0.216**	-0.178	-0.323**					
-	(0.124)	(0.091)	(0.151)	(0.145)					
adjust. R^2	0.0431	0.0434	0.0437	0.0430					
Panel C: Universit	y graduation								
Local university	0.434***	0.390***	0.202	0.487***					
v	(0.109)	(0.098)	(0.134)	(0.142)					
adjust. R^2	0.0284	0.0270	0.0255	0.0289					
Additional controls	5:								
District FE	yes	yes	yes	yes					
Birth year FE	yes	yes	yes	yes					
Observations	6,901	6,872	6,898	6,870					

Table 7: TWFE by school level attendance at university establishment year

Note: Columns 1 to 4 provide the regression results on estimating a classic two-way fixed effect strategy with district and birth year fixed effects separately for different school levels. These groups relate to the school level the individual attended when the university was established and are proxied via the individual's ages. Robust standard errors (in parentheses) are clustered on the level of districts. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

C University Establishments

The table below indicates the years when universities were established in Germany throughout the higher education expansion from 1965 to 1989. These openings are considered as openings as defined in this paper. Several cities already had a university prior to the higher education expansion. These are Würzburg, Braunschweig, Cologne, Clausthal, Göttingen, Heidelberg, Giessen, Hohenheim, Tübingen, Bonn, Darmstadt, Münster, Erlangen, Marburg, Munich, Hanover, Frankfurt, Hamburg, Freiburg, Nuremberg, Aachen, Karlsruhe, Kiel, Mannheim, Mainz, Saarbruecken, and Wilhelmshaven.

Please note that we do not consider two universities in our settings. These are the Universities of Witten-Herdecke and the University of Eichstätt. We exclude the University of Witten-Herdecke from our analysis because it launched a novel educational approach, funded substantially by a foundation, with just 27 students enrolling in its first year (University Witten/Herdecke, 2024). The University of Eichstätt emerged from the amalgamation of theology, pedagogy, and philosophy (Catholic University Eichstätt-Ingolstadt, 2024).

University	Teaching	Definition	History	Source
Bochum	1965	New Establish-	Teaching started in November 1965.	Ruhr University Bochum (2024)
Düsseldorf	1966	New Establish- ment	Teaching started in November 1966.	Heinrich-Heine-University Düsseldorf (2024)
Konstanz	1966	New Establish- ment	Teaching started in November 1966.	University Konstanz (2024)
Regensburg	1967	New Establish- ment	Teaching started in November 1967.	University Regensburg (2024)
Ulm	1967	New Establish- ment	Medical School was turned into a university in the year 1967. Teaching existed in the precursor institution.	University Ulm (2024)
Dortmund	1968	New Establish- ment	University opening in 1968.	Technical University Dortmund (2024)
Bielefeld	1969	New Establish- ment	Teaching started in November 1969.	University Bielefeld (2024)

 Table 8: History of University Establishments

University	Teaching	Definition	History	Source
Kaiserslautern	1970	New Establish- ment	Opening in 1970 jointly with Trier. The technical faculty was located in Kaiserslautern, the fac- ulty of the social sciences in Trier. Teaching started in 1970.	University Trier-Kaiserslautern (2024)
Augsburg	1970	New Establish- ment	The university was founded in 1970, marking the official beginning of teaching.	University Augsburg (2024)
Trier	1970	New Establish- ment	Reopening in November 1970 af- ter closing in the 15th century. Teaching started in 1970.	University Trier-Kaiserslautern (2024)
Bremen	1971	New Establish- ment	Teaching started in 1971.	University Bremen (2024)
Kassel	1971	Merger	Emerged as a merger of several predecessor institutions of higher education in 1971. 1971 is the of- ficial year of the merger. Teach- ing existed earlier in the predeces- sor institutions.	University Kassel (2024)
Paderborn	1972	Merger	Emerged as a merger of several predecessor institutions of higher education in 1971. 1972 is the of- ficial year of the merger. Teach- ing existed earlier in the predeces- sor institutions.	University Paderborn (2024)

University	Teaching	Definition	History	Source
Siegen	1972	Merger	Emerged as a merger of several predecessor institutions of higher education in 1972. 1972 is the of- ficial year of the merger. Teach- ing existed earlier in the predeces- sor institutions.	University Siegen (2024)
Wuppertal	1972	Merger	Emerged as a merger of several predecessor institutions of higher education in 1972. 1972 is the of- ficial year of the merger. Teach- ing existed earlier in the predeces- sor institutions.	Blickfeld Wuppertal (2024)
Bamberg	1972	Merger	Emerged as a merger of several predecessor institutions of higher education in 1972. 1972 is the of- ficial year of the merger. Teach- ing existed earlier in the predeces- sor institutions.	University Bamberg (2024)
Duisburg	1972	Merger	Emerged as a merger of several predecessor institutions of higher education in 1972. 1972 is the of- ficial year of the merger. Teach- ing existed earlier in the predeces- sor institutions.	University Duisburg-Essen (2024)

University	Teaching	Definition	History	Source
Essen	1972	Merger	Emerged as a merger of several	University Duisburg-Essen (2024)
			predecessor institutions of higher	
			education in 1972. 1972 is the of-	
			ficial year of the merger. Teach-	
			ing existed earlier in the predeces-	
			sor institutions.	
Oldenburg	1974	Rename	Was initially focused on pedagog-	NDR (2024)
			ical college and was renamed to	
			University in 1974. Teaching ex-	
			isted earlier in the predecessor in-	
			stitution. The university officially	
			began its teaching activities in	
			1974.	
Osnabrück	1974	Rename	Was initially focused on teacher	University Osnabrück (2024)
			training and was renamed to Uni-	
			versity in 1974. Teaching existed	
			earlier in the predecessor institu-	
			tion. The university officially be-	
			gan its teaching activities in 1974.	
Bayreuth	1975	Rename	Was initially focused on pedagogy	University Bayreuth (2024)
			and was renamed to University	
			in 1975. Teaching existed ear-	
			lier in the predecessor institution.	
			The university officially began its	
			teaching activities in 1975.	

University	Teaching	Definition	History	Source
Passau	1978	Rename	Was initially focused on philosophical-theological studies and was renamed to University in 1978. Teaching existed earlier in the predecessor institution. The university officially began its teaching activities in 1978.	University Passau (2024)
Lübeck	1985	Rename	Originally concentrated on medicine, it was rebranded as a University in 1985. Teaching existed in the predecessor institu- tion. We take the year of official renaming.	University Lübeck (2024)
Lüneburg	1989	Rename	Lüneburg University emerged from a former pedagogical college and engineering college in 1989. Teaching existed earlier in the predecessor institution. Granted university status officially in 1989.	Leuphana University Lüneburg (2024)
Hildesheim	1989	Rename	Hildesheim Pedagogical College turned into a university in 1989. Teaching existed earlier in the predecessor institution. Granted university status officially in 1989.	University Hildesheim (2024)

Note: This table summarizes the university opening histories and shows the year we define as treatment in our study.