Building Opportunity:
The Long-Term Effects of Post-WWII Federal Educational Transfers

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Abstract

This paper studies the long-run effects of physical capital investments on universities and the geography of science. After World War II, the federal government transferred surplus military laboratories, classrooms, and housing worth $770 million (1947 dollars) to over half of all U.S. colleges and universities. Exploiting quasi-random variation from wartime military siting and logistical constraints on surplus reallocation, we find that recipient institutions experienced substantially higher survival rates, 15–20% enrollment gains, and a persistent 20% rise in STEM publications over six decades. Research quality increased far more than quantity: citations per capita rose 22% while publications per capita rose only 2%, suggesting that improved infrastructure attracted higher-impact researchers rather than simply scaling up existing programs. Scientific production effects persist through 2010, long after enrollment convergence and the depreciation of the original structures.

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1 Introduction

The United States spends over $700 billion annually on higher education (National Center for Education Statistics, 2023), and a growing share of federal science policy is channeled through universities. Yet governments have remarkably little causal evidence on a basic question: does investing in the physical infrastructure of universities improve their research output, and if so, for how long? The question matters because scientific production is geographically concentrated and that concentration is persistent (Goldin and Katz, 1999; Macleod and Urquiola, 2021). If physical capital investments can permanently shift the research trajectory of a university, then infrastructure spending is a policy lever for reshaping the geography of innovation. If the effects are transitory, then the billions spent on campus construction may expand access to education without altering the long-run distribution of knowledge creation.

Answering this question has proved difficult because capital investments in universities are endogenous: institutions that produce more research attract more funding, better faculty, and higher-quality students, making it hard to separate cause from effect. The existing literature has studied shocks to R&D funding (Gross and Sampat, 2023; Kantor and Whalley, 2019), the displacement and destruction of human capital (Waldinger, 2016; Borjas and Doran, 2012), and technology transfer programs (Bianchi and Giorcelli, 2020; Giorcelli, 2019). But physical infrastructure, the most basic and expensive input to the university production function, has received almost no causal attention.

This paper exploits one of the largest natural experiments in the history of American higher education. Between 1944 and 1947, the U.S. federal government transferred surplus military property (classrooms, laboratories, dormitories, and housing) to 939 colleges and universities, representing 54% of all institutions in the country. The estimated value of these transfers was approximately $770 million in 1947 dollars, equivalent to 54% of G.I. Bill expenditures and 65% of total institutional spending at the time. Despite its scale, this episode has received almost no attention in the economics literature.

Our identification strategy exploits two institutional features of the postwar demobilization. First, wartime military installations were sited for strategic and tactical reasons largely unrelated to local educational conditions. In 1941, for example, the Army Air Force assigned 110 of 130 evaluation points for potential base sites to flying weather, terrain, and proximity to training ranges (Shaw, 2004). Second, the transfer of surplus property to universities was logistically constrained: structures could only be moved

within a "feasible distance" of the recipient institution (Hollis, 1949), and only 57% of institutional applications were approved. The combination of quasi-random military siting and distance-based eligibility constraints generates variation in the probability and intensity of receiving surplus property that is plausibly independent of prewar institutional characteristics. Consistent with this claim, we find no systematic differences between treated and untreated counties across a wide range of 1940 demographic, economic, and educational characteristics.

To trace the effects of these transfers over six decades, we construct a novel institution-level panel spanning 1928–2010 by digitizing archival records from two Record Groups at the National Archives and linking them to historical enrollment data and modern bibliometric records from OpenAlex. The resulting balanced panel tracks 712 four-year institutions at nine benchmark years over eight decades, combining newly digitized treatment data with measures of enrollment, STEM publications, and citations in physics, biology, chemistry, and medicine.

Our results are striking. Recipient universities had substantially higher survival rates: at 15 years, the survival advantage was 8 percentage points for facility-transfer recipients and 21 percentage points for housing-transfer recipients. Treated institutions experienced a 15–20% increase in enrollment that persisted for roughly two decades before eventually fading. Most importantly, treated universities produced approximately 20% more STEM publications, and these gains *persisted through 2010*, long after enrollment convergence and the depreciation of the original structures.

A decomposition of research effects into quantity and quality yields perhaps the paper's most interesting finding. Treated institutions produced only about 2% more publications per capita (per enrolled student), but 22% more citations per capita. The infrastructure transfers thus raised research *quality* far more than research *quantity*. This pattern is consistent with a mechanism in which improved physical infrastructure (better laboratories, modern facilities, adequate housing) enabled treated institutions to attract and retain more productive researchers. The surplus transfers, in this interpretation, did not simply scale up existing research programs; they shifted the composition of faculty toward higher-impact scholars, with lasting consequences for institutional research trajectories.

We further decompose the effects by transfer type and intensity. Both facility transfers (classrooms and laboratories) and housing transfers generate positive effects on research output, with the largest gains among institutions receiving both types. The finding that housing transfers, which had no direct connection to research infrastructure,

also improved scientific production points to important complementarities between residential and research capacity. On the intensive margin, housing allocation elasticities for scientific output range from 0.4 to 0.6, while facility allocation elasticities are 0.06–0.09. The larger housing elasticities suggest that for many institutions, residential capacity was the binding constraint on growth.

The divergent persistence of enrollment and research effects is central to the paper's contribution. That enrollment advantages faded over several decades is unsurprising: as building costs normalized and other funding sources expanded, non-recipient institutions could close the physical capital gap. But the persistence of research advantages through 2010, six decades after the initial transfers, implies that temporary infrastructure investments set institutions on permanently higher research trajectories. Once an institution attracted better faculty, built a departmental reputation, and established research networks, these advantages proved self-reinforcing even after the original physical capital advantage had dissipated. The geography of American science, our results suggest, is not immutable, but it may require only a one-time push to permanently alter.

These findings advance our understanding of three interconnected questions. First, a growing literature studies the determinants of scientific production and the geography of innovation (Waldinger, 2016; Bianchi and Giorcelli, 2020; Andrews, 2023; Gross and Sampat, 2023; Andrews and Whalley, 2022; Howard et al., 2024; Helper et al., 2025). This literature has emphasized the roles of R&D funding, human capital, and agglomeration, but the contribution of physical infrastructure has been difficult to isolate. We provide the first causal evidence that a one-time shock to university physical capital can generate six decades of persistent research gains, and we show that these gains operate primarily through research quality rather than quantity, pointing to a faculty recruitment channel that connects physical capital to long-run institutional trajectories.

Second, we contribute to the literature on the long-run effects of WWII-era federal investments (Herbst, 2017; Garin and Rothbaum, 2025; Mitrunen, 2025; Ferrie et al., 2025). Within this literature, we study a distinct *educational* channel: the reallocation of military infrastructure to universities. Our findings complement work on the G.I. Bill (Bound and Turner, 2002; Stanley, 2003; Abramitzky et al., 2025; Althoff and Szerman, 2025), which documents the demand side of the postwar education expansion, by providing evidence on the supply-side counterpart. Where the G.I. Bill literature traces effects through individual veteran outcomes, we trace them through institutional capacity and knowledge production.

Third, and perhaps most directly relevant for policy, our findings speak to the design

of modern place-based innovation initiatives. The CHIPS and Science Act, the National Science Foundation's Regional Innovation Engines program, and similar efforts seek to broaden participation in the innovation economy by investing in universities outside traditional research hubs. A key premise of these programs is that strategic investments can create lasting research capacity where none existed before. Our evidence provides historical support for this premise, while also highlighting that the returns to infrastructure investments may operate less through the direct provision of research space than through the ability to attract and retain high-quality faculty.

The paper proceeds as follows. Section 2 describes the historical setting. Section 3 presents the data construction. Section 4 develops the empirical strategy. Section 5 reports the main university-level results. Section 6 extends the analysis to spillovers on local firms and individuals. Section 7 concludes.

2 Historical Setting

2.1 Universities, Innovation, and the Crisis of Physical Capacity

American universities are central to the nation's innovation system. They train the scientists and engineers who staff private-sector R&D laboratories, produce the basic research on which applied innovation builds, and anchor the regional economies in which they are embedded (Goldin and Katz, 1999; Andrews, 2023; Howard et al., 2024). Yet the physical infrastructure of these institutions, which determines how many students can be trained and how much research can be conducted, has received little attention as a determinant of innovation capacity. The postwar period offers an unusually clear window into the role of physical capital, because a sudden and massive demand shock collided with binding supply constraints.

The Servicemen's Readjustment Act of 1944 (the G.I. Bill) provided up to four years of tuition and living stipends to returning veterans. Out of approximately 16 million WWII veterans, about 2.2 million received some form of postsecondary education through the program. By 1947, of the 2.3 million students enrolled in higher education institutions, 1.15 million, over half, were veterans. From 1946 to 1949, colleges faced a tidal wave of applications from both veterans and non-veterans, driven by the G.I. Bill and the latent demand for college education that had accumulated during the war years (1941–1945).

But colleges lacked the physical infrastructure to accommodate this surge. Class-

rooms were overcrowded, laboratory space was scarce, and dormitories were full. According to Hollis (1949), the rapid expansion in enrollment, combined with high building costs and shortages of labor and materials in the postwar economy, meant that the urgent need for additional space could not be met through ordinary construction channels. Every institution wanted more enrollment, but most did not have adequate infrastructure to support it. The constraint on higher education expansion, and by extension, on the postwar expansion of America's innovation capacity, was not demand but supply: physical capital.

2.2 Three Federal Transfer Programs

Congress responded with a series of programs that repurposed surplus military infrastructure for educational use. During the war, the federal government had constructed large numbers of temporary and prefabricated structures at military installations for military personnel and war production workers. Wartime construction technology had advanced the development of two broad types of relocatable real property: prefabricated structures (portable and demountable buildings) and temporary construction (structures that could be torn down and reassembled under standard instructions). According to the Federal Public Housing Authority (1946), trailers traveled across the country to supply temporary shelter, while demountable units were moved from one locality to another either in entirety (for example, via barges down rivers) or taken apart in panels and shipped by freight to be reassembled at their destinations. Three programs directed these assets to colleges and universities.

The **Surplus Property Act of 1944** (Public Law 457, 78th Congress) authorized the disposal of surplus government property, with public institutions given priority over private buyers (Cook, 1948). The War Assets Administration oversaw the transfer of surplus real property (buildings, land, and equipment) from decommissioned installations. The *1947 Directory of Surplus Real Property* documents over 2,700 surplus sites available for disposal nationwide. The majority of surplus came from Army troop training centers, Army and Navy airfields, and ordnance plants (Gilbert, 1950).

Public Law 269 (December 28, 1945) created the Veterans' Re-use Housing Program (VEHP), administered by the National Housing Agency. Under this program, surplus military housing, including temporary family dwellings and dormitories, was dismantled at military sites and re-erected on college campuses to house returning veterans and their families.

Public Law 697 (August 8, 1946) established the Veterans' Educational Facilities Program (VEFP), administered by the Federal Works Agency. This program transferred surplus military structures for instructional and research use, including classrooms, laboratories, and administrative buildings. In addition, many Army and Navy facilities that were currently unused and declared surplus were transferred to these programs and made available to universities (Office of War Mobilization and Reconversion, 1946).

Together, these three programs transferred surplus to 939 institutions of higher education, representing 54% of all colleges and universities in the country. The fiscal magnitude was substantial. According to Russell (1951), the costs of disassembly, transport, and re-erection alone totaled approximately $274 million. Combining this with the estimated fair value of property transferred under VEFP (Hollis, 1949), we estimate total program expenditures of approximately $770 million in 1947 dollars. To put this figure in perspective, it was equivalent to roughly 54% of total federal expenditure on the education portion of the G.I. Bill, 5.5 times total monetary transfers from the federal government to higher education institutions, and 65% of aggregate institutional spending in higher education at the time. By any measure, this was one of the largest federal investments in the physical infrastructure of American universities.

Historical evidence suggests that public institutions received more assistance than private ones. The VEFP operated a priorities system in which "state governments and their instrumentalities" (including public colleges and universities) were given precedence over nonprofit private institutions (Cook, 1948). Even under VEHP, which had no formal priorities system, a contemporary survey of 300 colleges found that 30% of large private institutions and many smaller private colleges received no housing transfers, while almost all public universities received at least some federal housing (Hettinger, 1946).

2.3 Why Allocation Was Quasi-Random

Two features of the surplus transfer process are central to our empirical strategy.

Military siting was driven by strategic, not educational, considerations. The surplus real property originated primarily from military bases and ordnance plants, which were located away from crowded city centers for strategic reasons. The Army Air Force's 1941 site selection criteria allocated 110 of 130 evaluation points to flying weather, terrain suitability, proximity to ranges and ground forces, cost, and strategic and tactical considerations, with only 20 points assigned to availability of local housing (Shaw, 2004). After the attacks on Pearl Harbor in December 1941, base construction accelerated

further and site selection boards operated under severe time constraints, prioritizing operational requirements such as climate, soil quality, preparation costs, and degree of air congestion. The spatial distribution of surplus military property was therefore largely orthogonal to prewar educational conditions.

Surplus transfers were logistically constrained. Although prefabrication technology made moving buildings across the country a possibility, distance was a significant barrier. Under VEFP, only 57% of institutional applications were approved for transfers of real property; the remainder received only personal property (equipment and supplies), because "the cost of moving and warehousing personal property is relatively low as compared to the cost of demolition, transportation and re-erection of buildings" (Russell, 1951). Ex post calculations from the program estimate that disassembly and transportation costs accounted for approximately one quarter of total transfer costs, making it necessary for suitable surplus property to be within "a feasible distance of the institutions" before a transfer could proceed (Hollis, 1949). The Federal Public Housing Authority (1946) similarly noted that transfers would only be cost-effective if "the distance moved is not excessive." Several universities, including Miami, Nebraska, and Wisconsin, took over facilities from nearby military airfields, using them on site (Hollis, 1949).

The interaction of these two features generates our identifying variation. Conditional on the quasi-random spatial distribution of military installations, proximity-driven eligibility constraints determined which institutions received surplus property and how much they received. Section 4 presents formal balance tests confirming that treated and untreated institutions are similar on observable prewar characteristics.

3 Data

We construct an institution-level panel spanning 1928 to 2010 by combining newly digitized archival records on surplus transfers, historical enrollment statistics, and modern bibliometric data. This section describes each component.

3.1 Surplus Property Transfers

We digitize administrative records on federal surplus allocations to institutions of higher education from two record groups at the National Archives and Records Administration (NARA).

Housing transfers. From the *Management Directory of Veterans Re-use Housing Projects* (June 15, 1947), we extract the recipient institution, city, state, housing type (temporary family dwellings or dormitories), number of units allocated, number completed, and federal funds disbursed.[1]

Facility transfers. From records of the Veterans Educational Facilities Program, we recover the recipient institution, state, total dollar amount approved, and square footage of facilities transferred.[2]

Surplus property geography. We also digitize the *1947 Directory of Surplus Real Property*, which reports the name, location, wartime use, acreage, estimated cost, classification, and disposition status for each surplus site. These data characterize the broader spatial distribution of military surplus and allow us to construct distance-based measures of institutional exposure to surplus property.

3.2 Enrollment Panel

We build an enrollment panel from four historical sources. Prewar enrollment comes from the *Biennial Survey of Education* (1928–1940), which reports institution-level enrollment for the universe of U.S. colleges and universities at two-year intervals. For the early postwar period, we use *Fall Enrollment in Higher Education Institutions* (1947–1967), annual institution-level reports from the Office of Education. From the late 1960s onward, we draw on the *Higher Education General Information Survey* (HEGIS, 1968–1983) and its successor, the *Integrated Postsecondary Education Data System* (IPEDS, 1984–2010).

Linking these sources across eight decades requires careful matching of institution names, accounting for mergers, closures, and name changes.[3] The resulting panel observes the universe of U.S. institutions at nine benchmark years (1932, 1940, 1947, 1957, 1970, 1980, 1990, 2000, and 2010). Our main estimation sample restricts attention to the 712 four-year institutions that are continuously observed over the full period, yielding a balanced panel.

[1] Record Group 207: General Records of the Department of Housing and Urban Development, Library Collection of Agency Issuances, 1934–79, Boxes 2–4.

[2] Record Group 162: General Records of the Federal Works Agency, Information Records, Records Concerning the Bureau of Community Facilities, 1945–47, Box 10.

[3] We describe the matching procedure and report match rates in a data appendix, available upon request.

3.3 Scientific Production

We measure research output using institution-level bibliometric data from OpenAlex (Priem et al., 2022). For each institution in the panel, we collect metadata on all publications authored by researchers with contemporaneous U.S. affiliations in physics, biology, chemistry, and medicine, fields that account for the majority of scientific output at U.S. universities over the sample period. For each institution–decade cell, we construct total publications, total citations, publications per enrolled student, and citations per enrolled student. This decomposition allows us to distinguish between research *scale* (total output, which mechanically covaries with institutional size) and research *quality* (per-capita output, which captures the productivity and impact of research conditional on size).

3.4 Descriptive Statistics

Table 1 reports summary statistics for the balanced panel at the 1940 baseline. The median institution enrolled approximately 700 students; the distribution is highly right-skewed, with a handful of large public universities enrolling over 30,000. Average STEM publication counts are low in the 1930s baseline, reflecting the early stage of American research universities, but grow substantially over the sample period.

Table 2 reports the composition of treatment across Census regions. In the full sample, 46% of institutions received no surplus transfers, 14.5% received housing only, 16.1% received facilities only, and 23.5% received both. Treatment rates were highest in the South (62.4% treated) and West (71.2%) and lowest in the Northeast (36.2%), reflecting the geographic distribution of military installations.

Figures 1 and 2 map the geographic distribution of treated institutions by intensity and type, respectively. Treatment is spread across the country, with notable concentrations in the South, Midwest, and West, consistent with the location of wartime military bases in these regions.

4 Empirical Strategy

4.1 Estimating Equations

Our main specification is a dynamic difference-in-differences design that traces the evolution of outcomes at treated versus untreated institutions over time:

$$\log(\text{Outcome}_{it}) \;=\; \alpha_i + \nu_t + \sum_{\tau=-10}^{70} \beta_\tau \left(\text{Treated}_i \times \mathbf{1}\{\text{Years After Treatment}_{it} = \tau\}\right) + \varepsilon_{it} \tag{1}$$

where $\log(\text{Outcome}_{it})$ denotes enrollment, publications, or citations at institution i in year t; α_i and ν_t are institution and year fixed effects; and $\text{Years After Treatment}_{it}$ measures calendar time relative to the base year 1940. The coefficients $\{\beta_\tau\}$ trace the dynamic treatment effect. Under the identifying assumption that treated and untreated institutions would have evolved similarly absent the transfers, the pre-treatment coefficients $\{\beta_\tau : \tau < 0\}$ should be zero, and post-treatment coefficients capture causal effects. Standard errors are clustered at the institution level throughout.

We estimate three variants of this specification. The *extensive-margin* specification defines Treated_i as a binary indicator for any surplus receipt. The *by-type* specification replaces this with separate indicators for housing-only, facility-only, and combined transfers, allowing effects to differ across program types. The *intensive-margin* specification replaces the binary indicator with continuous measures of treatment intensity (log square footage of facility allocations or log number of housing units) and restricts the sample to recipients of the relevant program type.

To examine institutional survival, we estimate Kaplan–Meier survival functions separately for facility-transfer and housing-transfer recipients versus non-recipients, with differences tested by the log-rank statistic.

4.2 Identifying Assumption and Balance Tests

The key identifying assumption is that the spatial distribution of military surplus, conditional on its quasi-random siting during the war and the logistical constraints on postwar reallocation, is uncorrelated with the determinants of university trajectories. This assumption would be violated if, for example, military installations were disproportionately located near stronger or weaker universities, or if institutions with better prewar trajectories were more successful in obtaining surplus allocations.

We assess this assumption in Figure 3, which reports standardized differences in 1940

county characteristics between treated and untreated counties, separately for any treatment, VEFP facility transfers, and VEHP housing transfers. The outcomes include population, educational attainment (proportion with college education, some college, high school, or less), log population, racial composition, employment, and age–sex composition. Across all three treatment definitions and all outcomes, the estimated differences are small in magnitude and statistically indistinguishable from zero. We find no evidence that treatment assignment was correlated with observable prewar county characteristics.

4.3 Threats to Identification

The main concern for the university-level estimates is selection on unobservable institutional quality: institutions that successfully obtained surplus property may have been more entrepreneurial or better-managed, and these unobserved traits, rather than the physical capital itself, could drive the observed gains. Several features of the setting mitigate this concern. First, the logistical constraints on surplus transfers meant that geographic proximity to a military installation, not institutional initiative, was the primary determinant of receipt. Second, only 57% of institutional applications were approved, and the binding constraint was transportation feasibility rather than application quality. Third, the balance tests in Figure 3 show no prewar differences between treated and untreated counties on a wide range of observable characteristics, which is consistent with, though does not prove, the absence of selection on unobservables. Finally, the absence of differential pre-trends in the event-study estimates (Figures 4–6) provides further support: treated and untreated institutions were on parallel trajectories prior to the surplus transfers.

5 Results

5.1 Institutional Survival

We begin with the most fundamental margin of institutional success: whether surplus transfers helped universities survive. Many small colleges in the postwar period faced existential financial pressures, and the infusion of federal surplus infrastructure could plausibly have helped some avoid closure.

Figure 7 presents Kaplan–Meier survival estimates separately for facility-transfer and housing-transfer recipients. The results are striking. At the five-year horizon, facility-transfer recipients had a 92% survival probability, compared to 87% for non-recipients

(log-rank $\chi^2(1) = 9.59$, $p < 0.01$). Housing-transfer recipients fared even better: 98% versus 87%. By 15 years after the program, these gaps had widened substantially: 83% versus 75% for facility recipients, and 96% versus 75% for housing recipients (log-rank $\chi^2(1) = 55.54$, $p < 0.001$). Federal surplus transfers substantially reduced the probability of institutional closure, with the largest effects from housing transfers, likely because housing was the binding constraint on many institutions' ability to accommodate the postwar enrollment surge.

5.2 Enrollment Expansion

Figure 4 (Panel a) presents event-study estimates of the effect of any surplus receipt on log enrollment. Raw trends in Appendix Figure A8 confirm that treated and untreated institutions followed similar trajectories before the war, then diverged sharply in the postwar period. The event-study estimates show a clear pattern: no differential trend in the prewar period, followed by a sharp increase in enrollment at treated institutions beginning in the late 1940s. Treated universities experienced approximately 15–20% higher enrollment relative to untreated institutions, with effects peaking in the 1950s and 1960s and gradually attenuating over subsequent decades.

Figure 5 (Panel a) decomposes these effects by transfer type. All three categories (housing only, facility only, and combined) generate positive enrollment effects. The largest and most persistent effects accrue to institutions receiving both types of surplus, consistent with complementarities between residential and instructional capacity. On the intensive margin (Figure 6, Panel a), a 10% increase in housing transfer units is associated with a 0.75% increase in enrollment, a modest but economically meaningful elasticity. Appendix Figure A11 shows that enrollment effects are concentrated among public universities, consistent with the historical evidence that public institutions were prioritized under the surplus allocation system.

5.3 Scientific Production

The effects on knowledge production are large and persistent. Figure 4 (Panels b–c) shows that treated universities produced approximately 20% more STEM publications and received substantially more citations, with effects emerging in the 1950s and growing monotonically through the end of the sample. Pre-trends are flat for both outcomes. The publication and citation results are notably larger and more persistent than the enrollment effects, suggesting that surplus transfers had a disproportionate impact on

the research function of universities.

Figure 5 (Panels b–c) reveals that all three transfer types generated positive research effects, including housing-only transfers. This finding is important because housing transfers had no direct connection to research infrastructure. Their positive effect on scientific output implies that the constraint on research capacity was not only laboratory space but also the broader institutional capacity to support researchers and their families. Institutions that received both housing and facility transfers experienced the largest and most persistent gains.

5.4 Research Quality versus Quantity

The total publication and citation results combine two distinct channels: treated institutions may produce more research because they are *larger* (a scale effect), or because their researchers are more *productive* (a quality effect). To distinguish these channels, we examine per-capita measures: publications and citations per enrolled student.

Figure 8 presents the results, which reveal a sharp divergence. Publications per capita increased by only about 2%, a small effect that is not consistently statistically significant. Citations per capita, by contrast, rose by approximately 22%, a large and persistent effect. The infrastructure transfers thus raised research *impact* far more than research *throughput*.

This pattern points to a specific mechanism: surplus infrastructure enabled treated institutions to compete more effectively for high-quality faculty. Better laboratories, modern classrooms, and adequate housing made these institutions more attractive to established researchers, who brought their own research programs, external funding, and graduate students. The result was not simply more papers, but more impactful scholarship. Interestingly, Waldinger (2016) finds that physical capital destruction (Allied bombing of German university departments) had only short-run effects on scientific output, while human capital losses (dismissals of scientists) were far more persistent. Our results are complementary: the surplus transfers operated primarily through the *recruitment* of higher-quality faculty rather than through the direct use of the physical structures themselves, consistent with human capital being the deeper determinant of long-run research capacity (Macleod and Urquiola, 2021).

5.5 Intensive-Margin Effects

Figure 6 reports elasticities from specifications that relate log outcomes to the log intensity of surplus received, restricting to recipients of each program type. The results reveal a consistent hierarchy: housing allocation elasticities are substantially larger than facility allocation elasticities for all three outcomes. For scientific publications, housing elasticities range from 0.4 to 0.6, while facility elasticities range from 0.06 to 0.09. The pattern for citations is similar.

The larger housing elasticities are perhaps surprising, given that housing has no direct connection to research infrastructure. One interpretation is that housing was the binding constraint for many institutions: additional dormitory and family housing capacity allowed institutions to admit more students, employ more researchers, and grow in ways that had cascading effects on research output. An alternative interpretation is that institutions with larger housing deficits had more room to grow on all dimensions, and the housing elasticity partly captures this differential growth potential.

5.6 Long-Run Persistence

A central finding of the paper is the divergent persistence of enrollment and research effects. Figure 9 extends the analysis through 2010 and reveals that enrollment advantages had largely faded by the end of the sample period, consistent with non-treated institutions eventually closing the physical capacity gap through their own construction programs. Research advantages, by contrast, persisted through 2010: treated institutions continued to produce significantly more publications and receive substantially more citations than their untreated counterparts, even six decades after the original transfers.

This persistence is difficult to explain through physical capital alone, as the surplus structures had long since depreciated or been replaced. We interpret the persistent research advantage as reflecting the self-reinforcing dynamics of institutional reputation and faculty quality. Once surplus infrastructure enabled treated institutions to attract stronger faculty and establish productive research departments, these advantages compounded over time through hiring networks, doctoral training, and funding success, a dynamic consistent with the "virtuous circles" described by Macleod and Urquiola (2021). The implication is that a one-time infrastructure investment can permanently shift an institution's position in the research hierarchy, even after the physical capital itself is gone.

6 Beyond the University: Spillovers to Firms and Individuals

The preceding results establish that surplus transfers permanently raised university research output and temporarily expanded enrollment. A natural next question is whether these institutional gains remained confined to campuses or spilled over to the surrounding economy. We outline below the research designs we plan to implement for two ongoing extensions: spillovers to local firms and innovation, and spillovers to individuals in treated communities. We have not yet estimated these models; this section describes our planned approach and the identifying variation we intend to exploit.

6.1 Spillovers to Firms and Local Innovation

Universities affect local economies through multiple channels: they supply human capital to nearby firms, generate knowledge spillovers through faculty consulting and technology transfer, and anchor agglomeration economies that attract innovative enterprises (Kantor and Whalley, 2019; Andrews, 2023). Recent evidence from Helper et al. (2025) shows that postwar federal national laboratories, sited mostly outside existing innovation hubs, generated lasting boosts in patenting by nearby inventors and broad-based local economic gains. Whether surplus-induced university research gains transmitted through similar channels is an open empirical question.

We plan to investigate these spillovers along three dimensions: county-level patenting activity using USPTO patent counts, the composition of local employment toward human-capital-intensive industries, and new firm formation in technology-intensive sectors. For patenting, we will estimate a county-level dynamic difference-in-differences specification that mirrors the university-level event study:

$$\log(\text{Patents}_{ct}) = \alpha_c + \nu_t + \sum_{\tau} \beta_\tau \left(\text{Treated}_c \times \mathbf{1}\{t = \tau\}\right) + X_c^{1940} \cdot \gamma_t + \varepsilon_{ct} \qquad (2)$$

where $\log(\text{Patents}_{ct})$ denotes the log number of patents filed by inventors in county c in period t; α_c and ν_t are county and period fixed effects; Treated_c indicates whether county c contained a university that received surplus property; and X_c^{1940} is a vector of prewar county characteristics interacted with period indicators to absorb differential trends correlated with baseline observables. The identifying assumption parallels the university-level design: conditional on the quasi-random location of military surplus and county fixed effects, treated and untreated counties would have followed parallel patenting trajectories absent the transfers.

6.2 Spillovers to Individuals

A complementary question is whether surplus-induced university growth improved educational attainment and labor market outcomes for individuals in surrounding communities. Understanding these spillovers is central to evaluating the equity and efficiency of place-based higher education investments: if gains extend to nearby children and families who never attend the recipient institution, the social returns are substantially larger than those captured by the university alone.

We plan to pursue two empirical strategies, following Bailey et al. (2024). The county-by-birth-cohort design will compare outcomes for cohorts born in treated versus untreated counties, before and after the surplus transfers:

$$Y_{cb} = \lambda_c + \alpha_b + \delta_{s(c)b} + \beta \cdot (\text{Treated}_c \times \text{Post}_b) + X_c^{1940} \cdot b + \varepsilon_{cb} \tag{3}$$

where Y_{cb} denotes average educational or labor market outcomes for individuals born in county c in birth cohort b; λ_c, α_b, and $\delta_{s(c)b}$ are county, cohort, and state-by-cohort fixed effects; Treated_c indicates whether county c received surplus property; Post_b indicates cohorts that turned 18 on or after 1947; and X_c^{1940} is a vector of prewar county characteristics interacted with birth cohort. We will augment this with an individual-level specification that adds household controls (gender, race, parental education, income, 1940 urban residence):

$$Y_{icb} = \lambda_c + \alpha_b + \beta \cdot (\text{Post}_b \times \text{Treat}_c) + X_c^{1940} \cdot b + H_i'\theta + \varepsilon_{icb} \tag{4}$$

The central identification challenge for the individual-level estimates will be separating the supply-side effects of surplus infrastructure from the demand-side effects of the G.I. Bill. We plan to address this in two ways. First, surplus transfers generated *geographically localized* variation, determined by proximity to military installations, that is distinct from the *nationally uniform* G.I. Bill. Second, the analysis will focus on birth cohorts that turned 18 on or after 1947, individuals who were generally too young to have served in WWII and directly benefited from veteran education benefits (Bound and Turner, 2002).

Results from both the firm-level and individual-level analyses are forthcoming.

7 Conclusion

One-time federal transfers of surplus military infrastructure to American universities generated research gains that persisted for six decades, long after the original structures had depreciated and enrollment advantages had faded. The key insight is *how* physical capital produced lasting effects: not by directly enabling more research, but by attracting better researchers. Surplus transfers raised citation impact (+22%) far more than publication volume (+2%), and the effects were driven by the recruitment of senior, higher-impact faculty. Physical capital was the catalyst; human capital was the mechanism.

This distinction matters for policy. Programs like the CHIPS and Science Act seek to create lasting research capacity outside traditional innovation hubs. Our evidence suggests this is possible, but that the returns to university infrastructure operate through a channel that standard cost-benefit analyses tend to miss. The relevant depreciation rate is not the building's lifespan but the institutional reputation it helped create. And the binding constraint on university growth may not be laboratories or equipment, but the complementary inputs, including housing, that allow institutions to attract and retain the people who do the research.

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Figures and Tables

Table 1: Summary Statistics: Balanced Panel at 1940 Baseline

	Obs	Mean	SD	Min	Max
Panel A: Institutional Characteristics					
Age (years since founding)	712	72.7	35.5	10	304
Public institution	712	0.323	0.468	0	1
Total enrollment	712	1,504	3,136	22	36,126
Male enrollment	712	920	2,138	0	24,998
Female enrollment	712	584	1,193	0	13,429
Total expenditures ($000s)	692	571	1,304	7	12,331
Panel B: Research Output (1930s Decade)					
STEM publications	712	7.3	32.6	0	338
STEM citations	712	191.6	1,051.1	0	12,799

Notes: Summary statistics for the balanced panel of 712 four-year institutions observed continuously from 1932 to 2010. Enrollment and expenditures are measured in 1940. Publications and citations are aggregated over the 1930–1939 decade using data from OpenAlex (Priem et al., 2022), restricted to physics, biology, chemistry, and medicine.

Table 2: Treatment Composition by Census Region

	Obs	Non-treated	Housing only	Facility only	Both
Full sample	1,731	0.459	0.145	0.161	0.235
Northeast	409	0.638	0.105	0.149	0.108
Midwest	545	0.475	0.140	0.156	0.229
South	569	0.376	0.171	0.153	0.300
West	208	0.288	0.173	0.222	0.317

Notes: Share of institutions in each treatment category by Census region. The sample includes all institutions observed in the panel, including those outside the balanced panel. Housing refers to VEHP transfers; facility refers to VEFP transfers; "Both" indicates receipt of transfers from both programs.

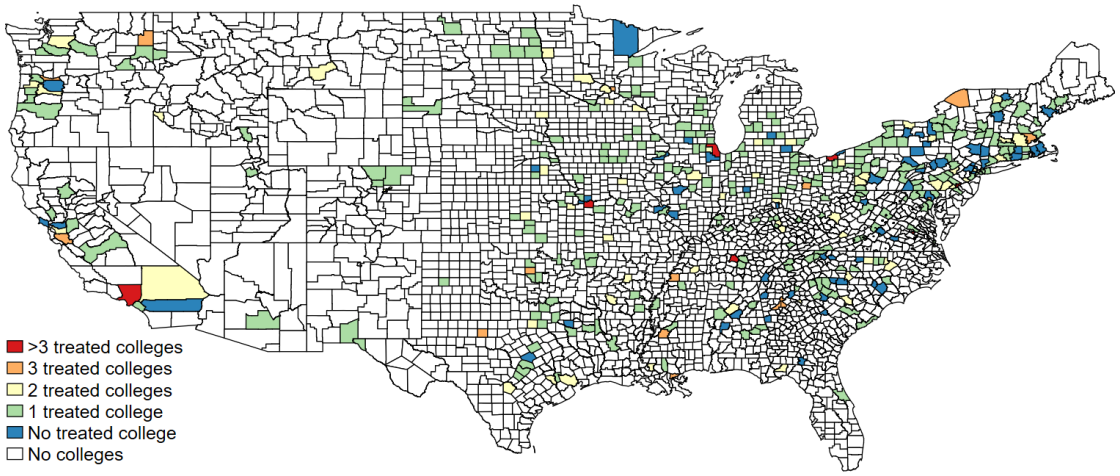


Figure 1: Treated Colleges by Treatment Intensity

Notes: Counties are shaded by the number of colleges that received surplus military property. White counties contain no colleges. Data are from authors' digitization of NARA Record Groups 162 and 207.

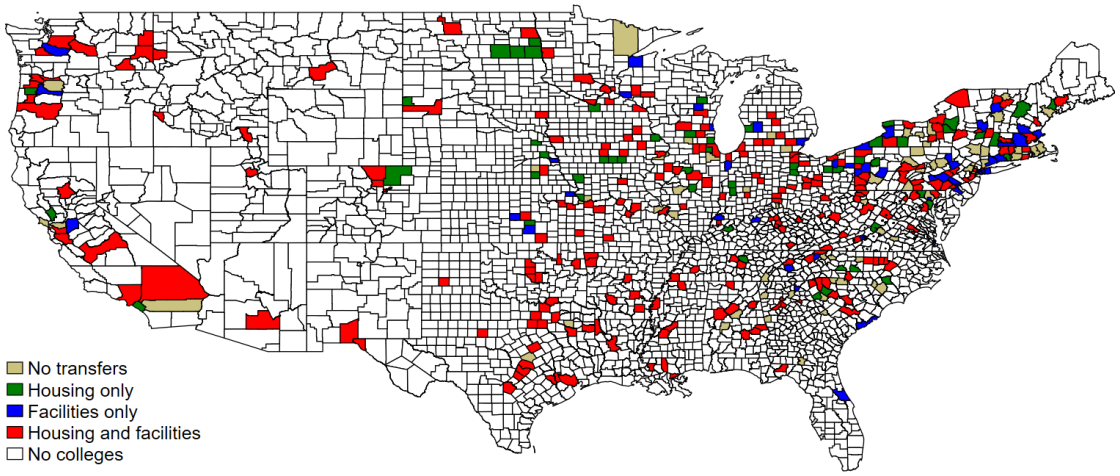
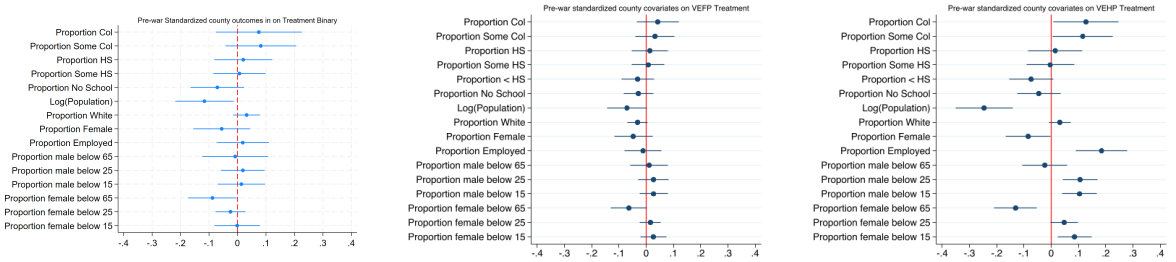


Figure 2: Treated Colleges by Type of Transfer

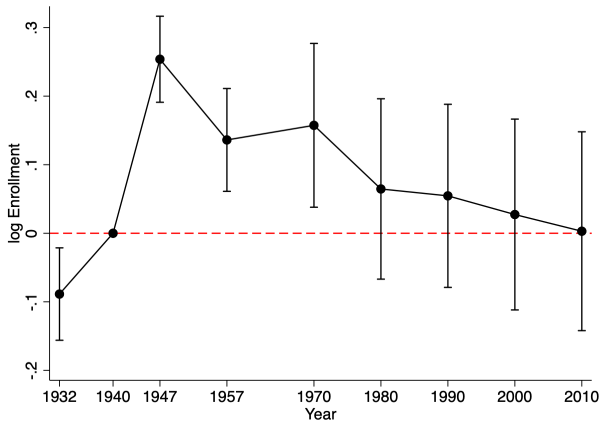
Notes: Counties are shaded by the type of surplus transfer received: housing only (VEHP, green), facility only (VEFP, blue), both programs (red), or no transfers (tan). White counties contain no colleges.



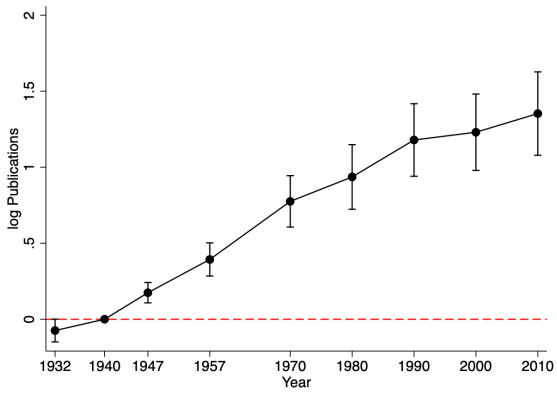
(a) Any Program (b) VEFP Facility Transfers (c) VEHP Housing Transfers

Figure 3: Prewar Balance: 1940 County Characteristics by Treatment Status

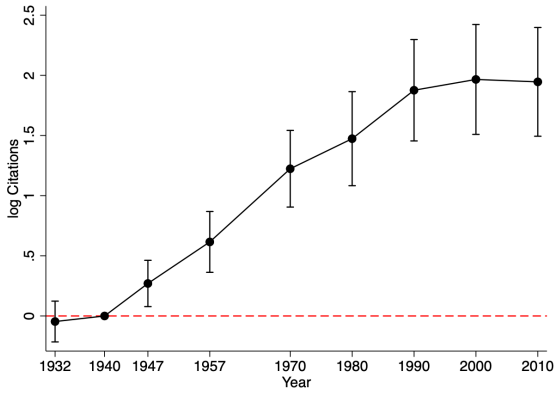
Notes: Standardized differences in 1940 county characteristics between treated and untreated counties for three treatment definitions. Each point is the coefficient from a bivariate regression of the standardized county outcome on the treatment indicator; horizontal lines are 95% confidence intervals. County data from Haines (2005).



(a) Log Enrollment



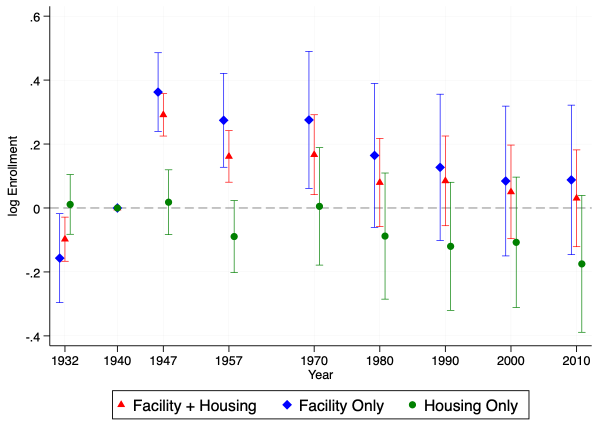
(b) Log STEM Publications



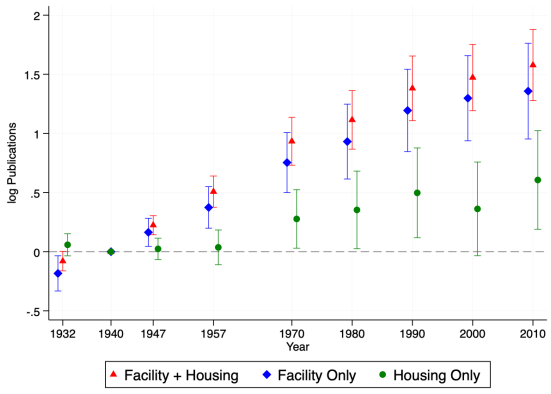
(c) Log STEM Citations

Figure 4: Effects of Surplus Transfers on University Outcomes: Extensive Margin

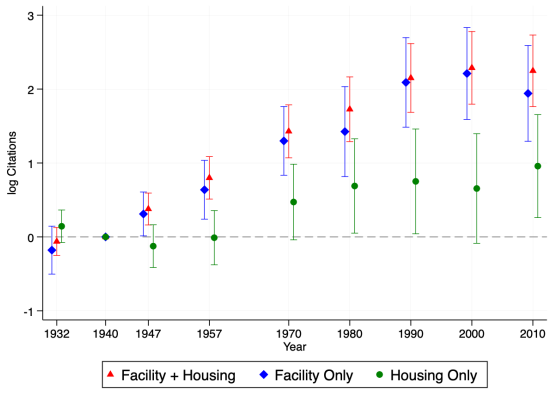
Notes: Event-study estimates from Equation (1). Treated_i is a binary indicator for any surplus receipt. Outcomes are in logs; the omitted baseline is 1940. Dashed vertical lines mark the war years and the onset of surplus transfers. Bars are 95% confidence intervals from standard errors clustered at the institution level. $N = 712$ institutions observed at 9 time points.



(a) Log Enrollment



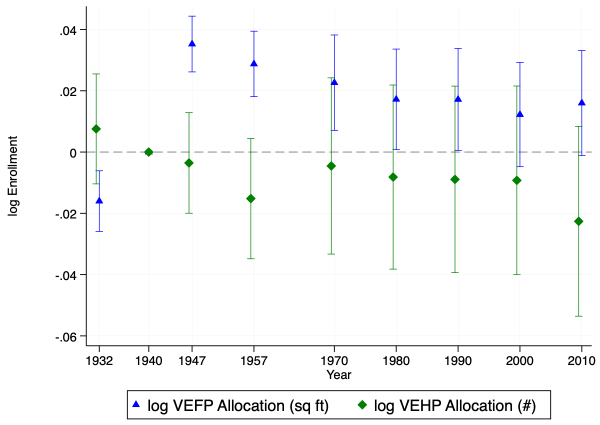
(b) Log STEM Publications



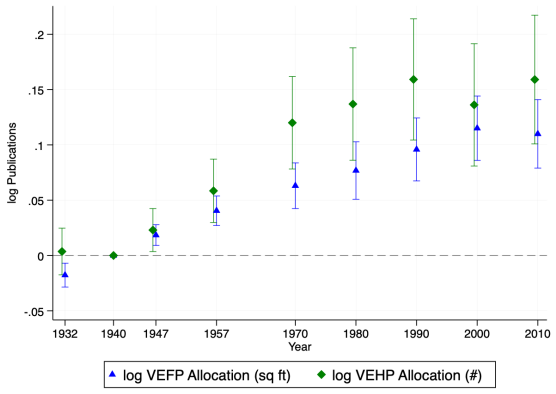
(c) Log STEM Citations

Figure 5: Effects by Type of Surplus Transfer

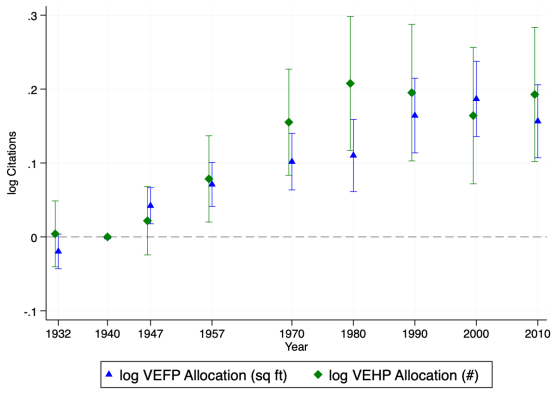
Notes: Event-study estimates with separate treatment indicators for institutions receiving both housing and facilities (VEFP+VEHP, red), facilities only (VEFP, blue), and housing only (VEHP, green). Other details as in Figure 4.



(a) Log Enrollment



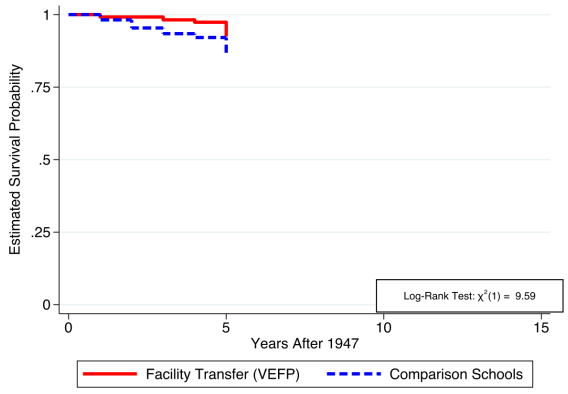
(b) Log STEM Publications



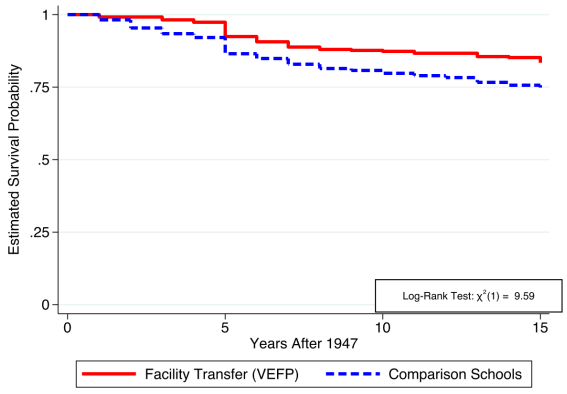
(c) Log STEM Citations

Figure 6: Intensive-Margin Effects: Elasticities with Respect to Transfer Size

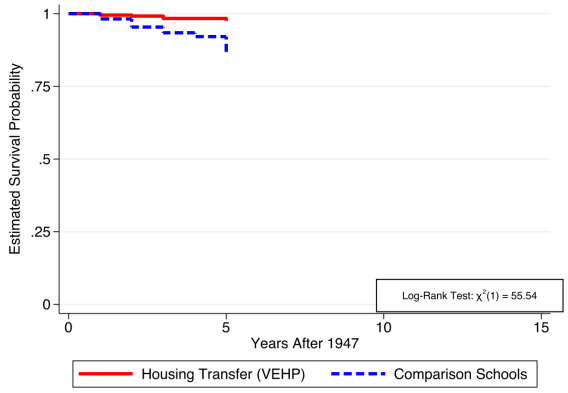
Notes: Event-study estimates from intensive-margin specifications relating log outcomes to log VEFP allocation (square feet, blue triangles) and log VEHP allocation (housing units, green circles). Each specification restricts to recipients of the relevant program. Other details as in Figure 4.



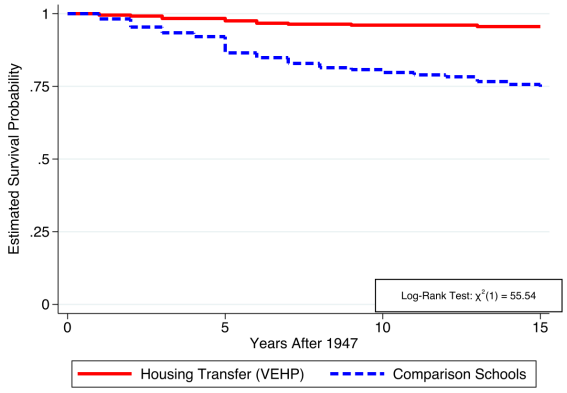
(a) Facility Transfers (VEFP), 5 Years



(b) Facility Transfers (VEFP), 15 Years



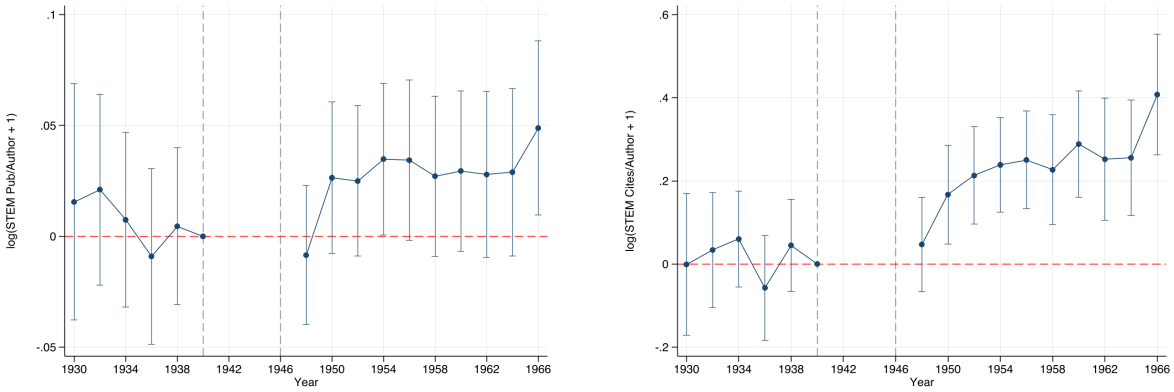
(c) Housing Transfers (VEHP), 5 Years



(d) Housing Transfers (VEHP), 15 Years

Figure 7: Kaplan–Meier Survival Estimates: Treated vs. Comparison Institutions

Notes: Kaplan–Meier estimated survival probabilities for institutions that received surplus transfers (solid red) versus comparison institutions (dashed blue). The intervention year (1947) is normalized to zero. Panels (a)–(b) compare VEFP facility-transfer recipients to non-recipients; panels (c)–(d) compare VEHP housing-transfer recipients to non-recipients. Log-rank test statistics: VEFP $\chi^2(1) = 9.59$; VEHP $\chi^2(1) = 55.54$.

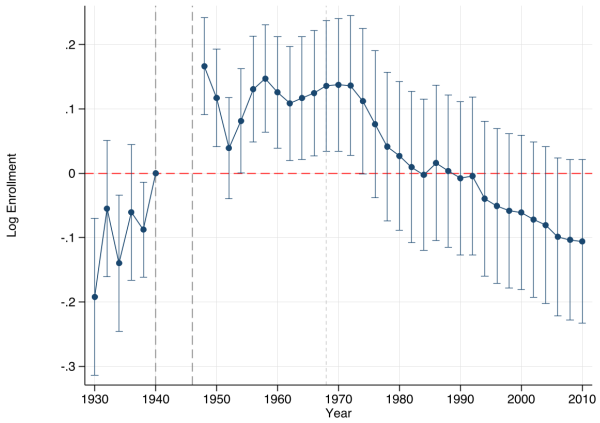


(a) STEM Publications per Capita

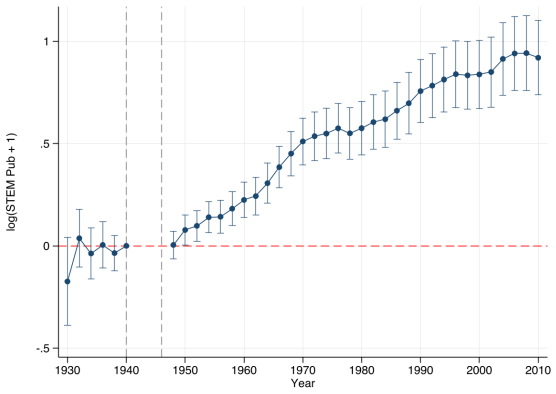
(b) STEM Citations per Capita

Figure 8: Research Quality vs. Quantity: Per-Capita Effects

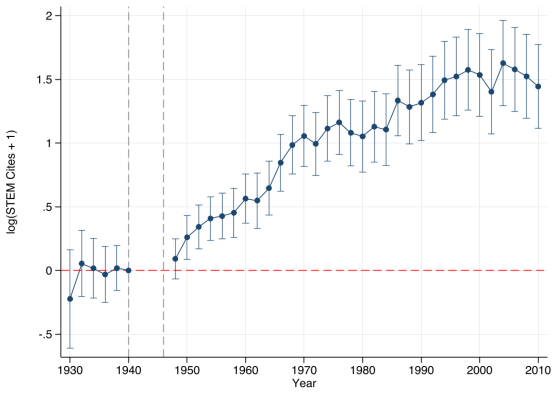
Notes: Event-study estimates from Equation (1) with per-capita outcomes (publications or citations divided by enrollment). Treated_i is a binary indicator for any surplus receipt. The modest effect on publications per capita (panel a) combined with the large effect on citations per capita (panel b) implies that surplus transfers raised research *quality* rather than *quantity*. Other details as in Figure 4.



(a) Log Enrollment



(b) Log STEM Publications



(c) Log STEM Citations

Figure 9: Long-Run Effects Through 2010

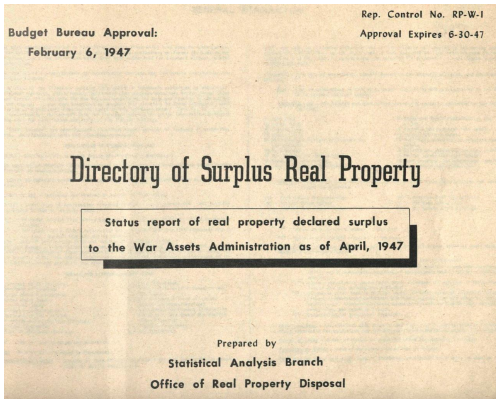
Notes: Event-study estimates extending the panel through 2010 using HEGIS and IPEDS enrollment data and OpenAlex bibliometric data. Enrollment gains (panel a) fade over time as untreated institutions close the physical capacity gap. Scientific production effects (panels b–c) persist through 2010, six decades after the original transfers. Other details as in Figure 4.

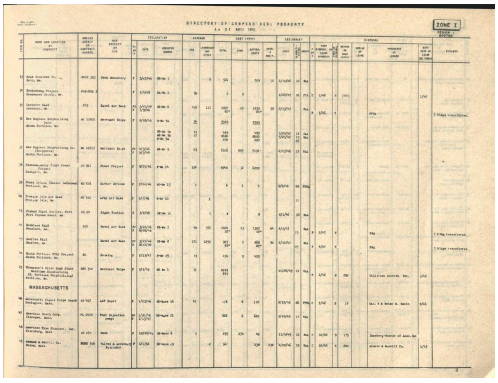
Appendix: Archival Data Sources



Figure A1: Data Collection at the National Archives (NARA), College Park, MD

Notes: Photograph of the authors' archival research at NARA. Records were obtained from Record Group 162 (General Records of the Federal Works Agency) and Record Group 207 (General Records of the Department of Housing and Urban Development).





Zone I
Region I Boston

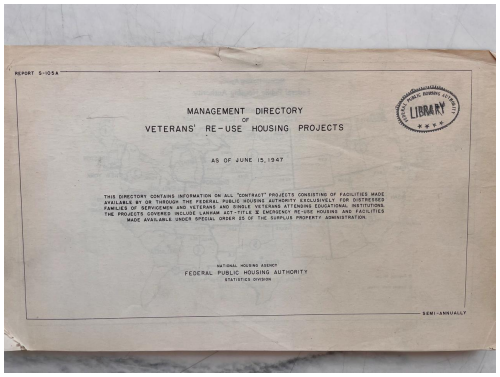
Directory of Surplus Real Property as of April 1947

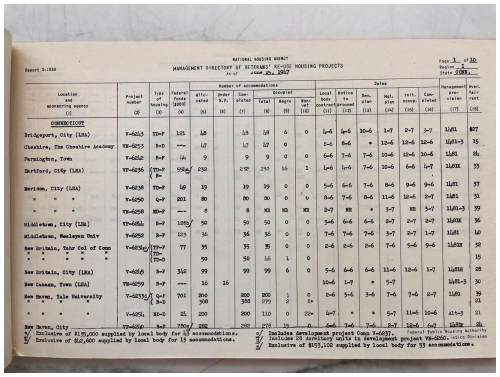
		Location				Declaration			Acreage		Cost ($000)				Assignment			Disposal					
Item No.	Name	City	State	Owning Agency or Contract	War Product or Use	Pr or F	Date	Register Number	Fee	Leasehold	Total	Land	Better-ments	Rack. &	Date	Classifi-cation	Agency	F or C	Date Disp	Type of	Returns on	Period	Purchaser or Leasee
18	New Haven AAP (Cant	East Haven	Conn.	JD 193	Troop Housing	F	6/2/45	WH-Conn 2	30		10	10			9/5/45	06	FPHA	C	4/46	S	7		Salvatore Esposito
19	Pataganset Finianing (	Niantic	Conn.	PL 1106	Absorbent Gauze	Pr	12/7/45	HR-Conn 10	5		337				3/25/46	12	WAA	C	4/46	S	272		Pataganset Finishing Co. Inc
20	Portland Housing Proj	Portland	Conn.	2	Housing	F	5/9/45	RH-Conn 1	18		11	11			6/26/46	06	FPHA	C	4/46	S	8		Various
21	Royal Typewriter Co.	Hartford	Conn.	PL 2384	Bomb Fuses	F	4/11/46	FR-Conn 19	3		373	35	338		4/16/46	12	WAA	C	1/46	S	325		Hartford Empire Co.

- Name, City, State, War Product of Use, Acreage, Cost($000), Classification, Purchaser or Leasee

Figure A2: Directory of Surplus Real Property, 1947

Notes: Cover page and sample entries from the *Directory of Surplus Real Property* (War Assets Administration, 1947). Top left: cover page. Top right: original document pages. Bottom: digitized sample showing fields recorded for each surplus site, including name, city, state, war product of use, acreage, cost ($000), classification, and purchaser or leasee.



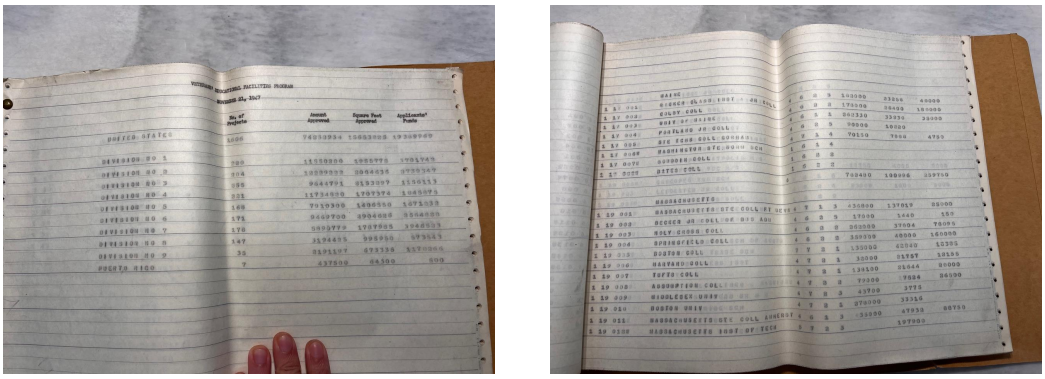


State	Location and sponsoring agency	Project number	Type of housing	Federal funds ($000)	Allocated	Under N.P.	Completed	Occupied - Total	Occupied - Negro	Occupied - Non-Vet	Local Body Contract	Notice to proced	Dev. Plan	Mgt. plan	Init. Occup.	Completed	Management provision	Aver. fair rent
OHIO	New Conoord, Muskingum College	V-33354	Tr-F	20	30		30	29	0	1	3-6	3-6	5-6	5-6	4-6	5-6	1481-1	23
OHIO	New Conoord, Muskingum College	V-33422	B-F	136	18		18	6	0	1	5-6	6-6	10-6	10-6	2-7	2-7	1481	32
OHIO	New Conoord, Muskingum College	V-33422	B-D		112		112	110	0	42*								11
OHIO	Oberlin, Oberlin College	V-33357	Tr-F	31	50		50	48	0	0	2-6	2-6	4-6	4-6	3-6	6-6	1481-1	24
OHIO	Oberlin, Oberlin College	V-33423	TD-D	203	202		202	184	8	13	6-6	6-6	6-6	6-6	NR	1-7	1481	15
OHIO	Oxford, Miami University	VP-33351	Tr-F	141c	215	19	196	195	0	0	12-5	11-5	*	5-6	NR		1481-2	30
OHIO	Oxford, Miami University	V-33421	B-D	318	440		440	483	0	0	5-6	6-6	7-6	10-6	NR	3-7	1481	13

- Name, City, State, Type of housing, Federal funds ($000), Allocated, Completed, Occupied

Figure A3: Management Directory of Veterans' Re-use Housing Projects (VEHP), 1947

Notes: Cover page and sample entries from the *Management Directory of Veterans Re-use Housing Projects* (Federal Public Housing Authority, June 15, 1947). Top left: cover page. Top right: original document pages for Connecticut. Bottom: digitized sample showing fields recorded for each institution, including name, city, state, type of housing, federal funds ($000), units allocated, completed, and occupied.

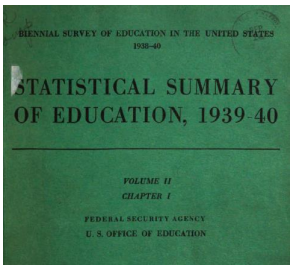


state	institution	amount_approved	sq_ft_approved	applicants_funds
alabama	ste a & m inst	57429	10200	2300
alabama	ste tchs coll florence	31098	5000	5461
alabama	ste tchs coll jacksonville	27733	4000	1460
alabama	ste tchs coll livingston	46721	10000	2300
alabama	ste tchs coll montgomery	46668	12600	9153
alabama	troy ste tchs coll	53243	11600	7231
alabama	tuskegee inst	83837	20000	4329

- Institution name, State, Amount approved, Square foot approved, Applicant Funds

Figure A4: Veterans' Educational Facilities Program (VEFP) Records

Notes: Original ledger pages and digitized sample from the Veterans' Educational Facilities Program records. Left: summary page showing total amounts approved, square footage, and applicant funds by division. Right: institution-level detail pages. Bottom: digitized sample showing fields recorded for each institution, including institution name, state, amount approved, square footage approved, and applicant funds.





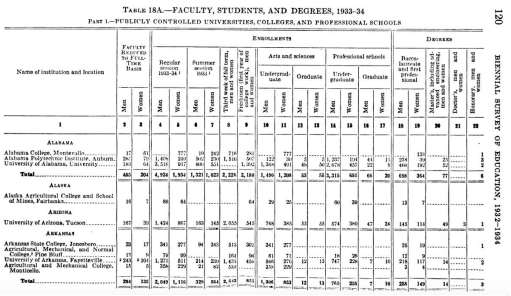


TABLE 18A.—FACULTY, STUDENTS, AND DEGREES, 1933-34

PART 1.—PUBLICLY CONTROLLED UNIVERSITIES, COLLEGES, AND PROFESSIONAL SCHOOLS

Name of institution and location	Faculty Reduced to Full-time Basis		Enrollments												Degrees			
			Regular session 1933-34 †		Summer session 1934 †		Third week of fall term, men and women ‡	Fourth week of fall term, men and women ‡	Arts and sciences				Professional schools					
									Undergraduate		Graduate		Undergraduate		Graduate			
	Men	Women	Men	Women	Men	Women			Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ALABAMA																		
Alabama College, Montevallo	17	61	377	1,078	16	392	376	294	777	1,078	122	392	6	376	111	41	224	130
Alabama Polytechnic Institute, Auburn	261	25	1,676	299	242	54	1,516	347	1,516	347	122	54	2,297	299	111	41	224	70
University of Alabama, University	181	64	2,141	402	831	.....	1,352	.....	1,352	402	401	64	56	2,676	455	222	466	192
Total	459	304	4,194	1,784	1,089	446	3,244	641	3,645	1,827	645	510	2,359	3,351	677	304	914	392
ALASKA																		
Alaska Agricultural College and School of Mines, Fairbanks	10	7	86	64	.....	.....	.....	.....	29	35	.....	.....	99	39	.....	.....	13	7
ARIZONA																		
University of Arizona, Tucson	167	39	1,424	867	193	342	2,955	545	768	340	53	55	574	390	47	28	145	114
ARKANSAS																		
Arkansas State College, Jonesboro	22	17	341	277	99	242	814	361	341	277	.....	.....	.....	.....	.....	.....	55	19
Agricultural, Mechanical, and Normal College, Pine Bluff	17	8	79	66	.....	.....	161	66	61	71	.....	.....	18	28	.....	.....	12	9
University of Arkansas, Fayetteville	1 265	1 203	1,221	811	214	220	1,475	434	866	270	12	13	747	228	7	10	218	117
Agricultural and Mechanical College, Monticello	15	5	226	279	81	80	350	.....	370	226	.....	.....	.....	.....	.....	.....	3	6
Total	294	150	2,049	1,110	320	342	2,510	861	1,306	823	12	13	765	256	7	10	288	149

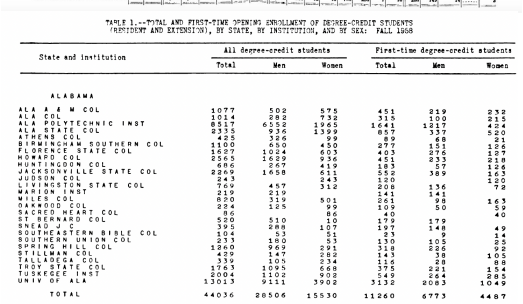


TABLE 1.--TOTAL AND FIRST-TIME OPENING ENROLLMENT OF DEGREE-CREDIT STUDENTS (RESIDENT AND EXTENSION), BY STATE, BY INSTITUTION, AND BY SEX: FALL 1966

State and institution	All degree-credit students			First-time degree-credit students		
	Total	Men	Women	Total	Men	Women
ALABAMA						
ALA A & M COL	1077	502	575	451	219	232
ALA COL	1014	282	732	315	100	215
ALA POLYTECHNIC INST	8517	6552	1965	1641	1217	424
ALA STATE COL	2335	936	1399	857	337	520
ATHENS COL	425	326	99	89	68	21
BIRMINGHAM SOUTHERN COL	1100	650	450	277	151	126
FLORENCE STATE COL	1627	1024	603	403	276	127
HOWARD COL	2565	1629	936	451	233	218
HUNTINGDON COL	686	267	419	183	57	126
JACKSONVILLE STATE COL	2247	1658	611	552	389	163
JUDSON COL	363		243	120		120
LIVINGSTON STATE COL	749	457	312	208	136	72
MARION INST	219	219		141	141	
MILES COL	830	329	501	261	98	163
OAKWOOD COL	234	125	95	109	50	59
SACRED HEART COL	86		86	46		46
ST BERNARD COL	520	510	10	179		
SNEAD J C	395	288	107	197	179	
SOUTHEASTERN BIBLE COL	104	53	51	33	148	42
SOUTHERN UNION COL	233	180	53	130	9	24
SPRING HILL COL	1260	969	291	318	105	213
STILLMAN COL	429	147	282	143	226	92
TALLADEGA COL	339	105	234	116	38	105
TROY STATE COL	1763	1095	668	375	221	88
TUSKEGEE INST	2004	1102	902	548	264	154
UNIV OF ALA	13013	9111	3902	5132	2083	3049
TOTAL	44036	28506	15530	11260	6773	4487

- State
- Institution name
- Total Enrollment

Figure A5: Historical Enrollment Data Sources

Notes: Sample pages from the historical enrollment sources used to construct the institution-level panel. Top left: cover of the *Biennial Survey of Education, Statistical Summary, 1939–40* (Federal Security Agency, Office of Education). Top right: sample page from the Biennial Survey showing institution-level faculty, enrollment, and degrees for publicly controlled universities. Bottom left: cover of *Opening Fall Enrollment, Higher Education 1966*. Bottom right: sample page showing institution-level enrollment by sex. Variables extracted include state, institution name, and total enrollment.

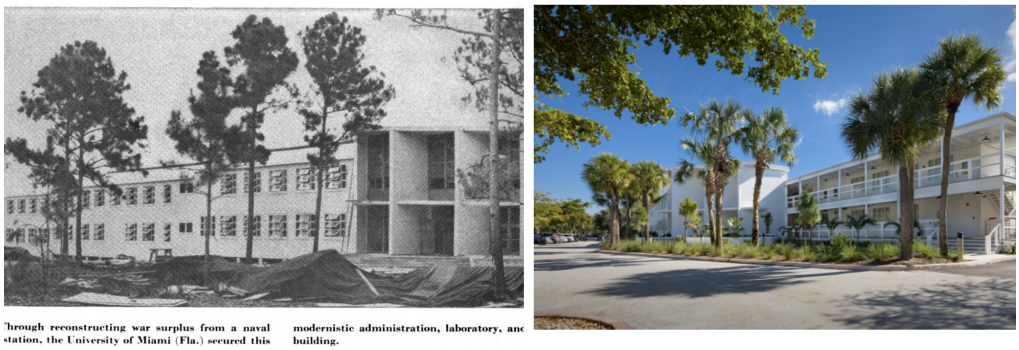


Figure A6: Example of Surplus Transfer: Naval Air Station to the University of Miami

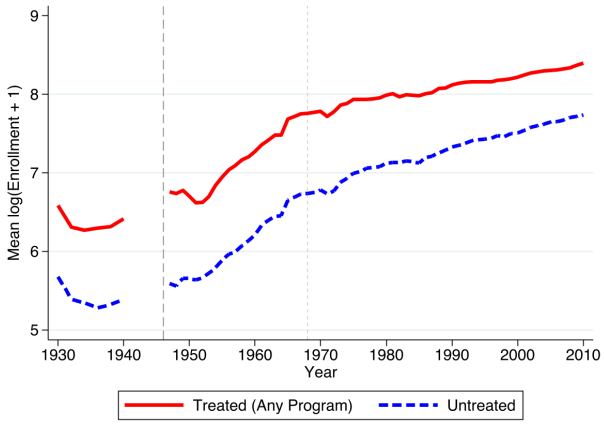
Notes: Left: Original naval air station buildings transferred to the University of Miami. Right: The same site as the University of Miami Administration Building (R. J. Heisenbottle Architects, P.A., 2023). Source: Hollis (1949), Federal Security Agency, Office of Education.



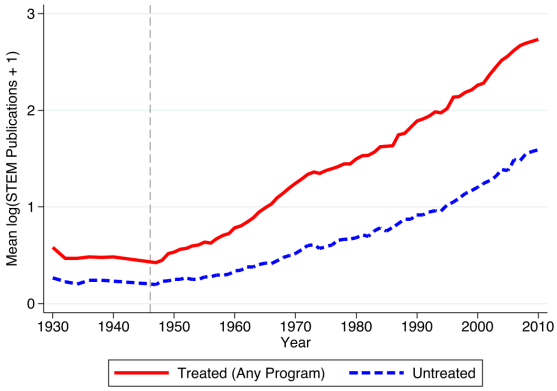
Figure A7: Example of Housing Transfer: War Surplus Housing at the University of Kentucky, Lexington

Notes: Aerial photograph of surplus military housing units deployed at the University of Kentucky campus to accommodate returning veterans and their families under the Veterans' Re-use Housing Program (VEHP).

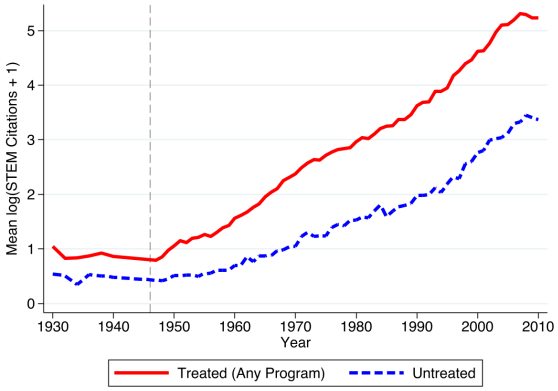
Appendix: Supplementary Results



(a) Log Enrollment



(b) Log STEM Publications



(c) Log STEM Citations

Figure A8: Raw Trends: Treated vs. Untreated Institutions

Notes: Raw mean log outcomes for treated institutions (those receiving any surplus transfer) and untreated institutions, plotted across all nine benchmark years. These unconditional trends motivate the event-study analysis in Section 5: treated and untreated institutions follow similar trajectories before the war, then diverge sharply in the postwar period for enrollment and persistently for research output.

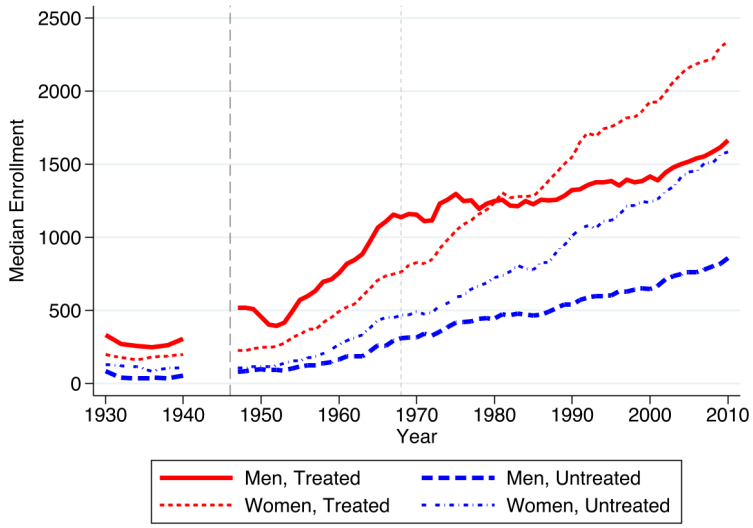


Figure A9: Raw Trends in Enrollment by Gender

Notes: Raw mean enrollment for men and women at treated versus untreated institutions across benchmark years. The postwar enrollment surge was initially driven by male veterans under the G.I. Bill; female enrollment grew more gradually.

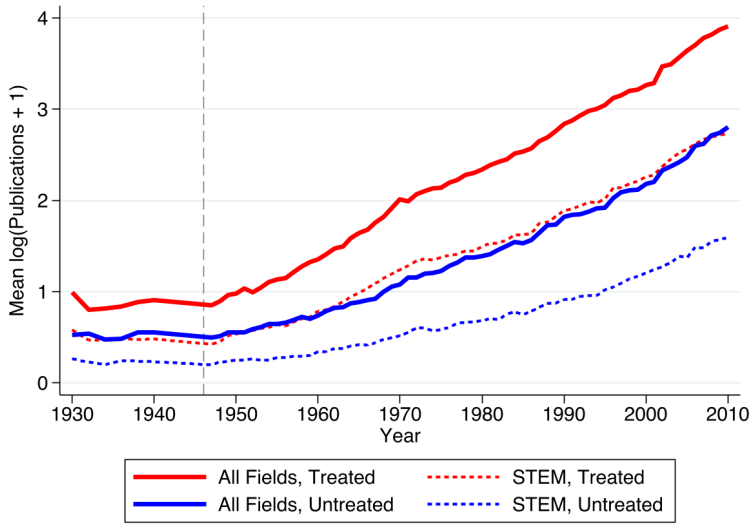


Figure A10: Raw Trends: All Publications vs. STEM Publications

Notes: Comparison of total publications and STEM publications (physics, biology, chemistry, and medicine) at treated versus untreated institutions. STEM fields account for the majority of the publication gap between treated and untreated institutions.

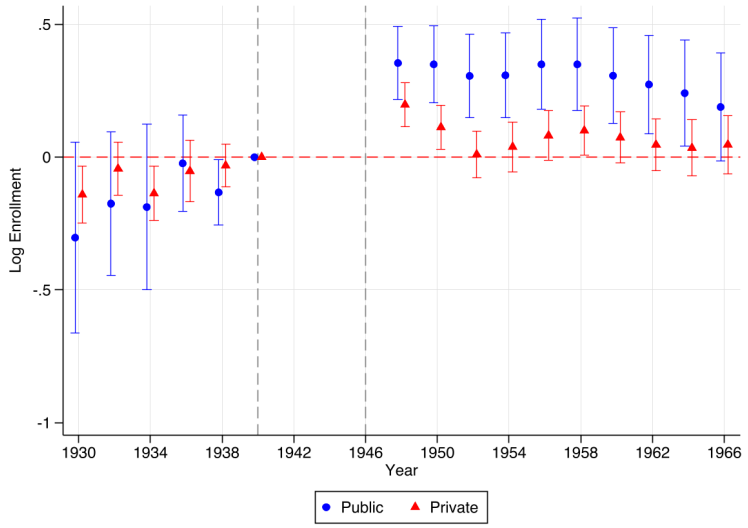
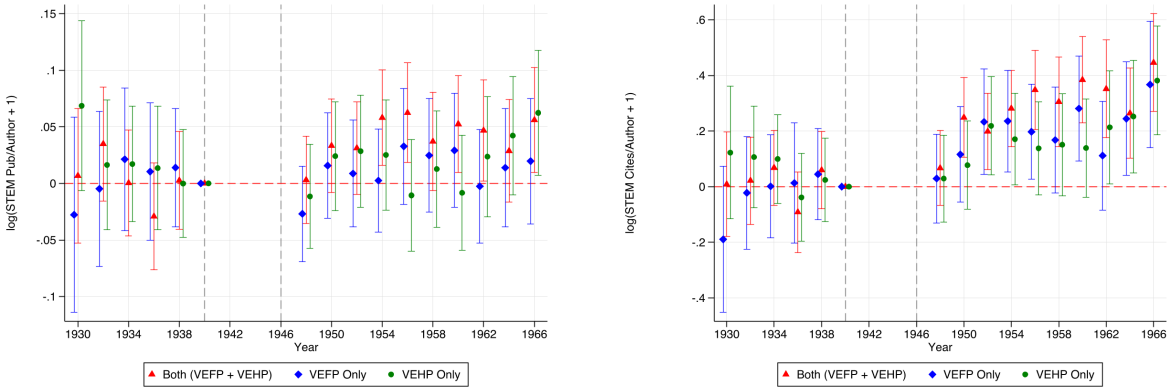


Figure A11: Heterogeneity: Public vs. Private Institutions

Notes: Event-study estimates from Equation (1) estimated separately for public and private institutions. Enrollment effects are concentrated among public universities, consistent with historical evidence that public institutions received more surplus transfers and were prioritized under the VEFP allocation system (Cook, 1948; Hettinger, 1946).

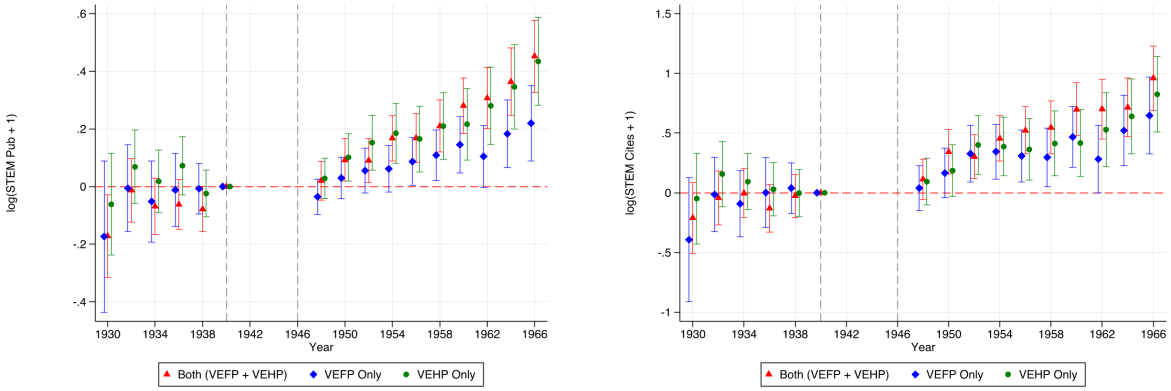


(a) STEM Publications per Capita

(b) STEM Citations per Capita

Figure A12: Research Quality by Type of Transfer: Per-Capita Effects

Notes: Per-capita event-study estimates decomposed by transfer type (both VEFP+VEHP, VEFP only, VEHP only). Institutions receiving both types of surplus exhibit the largest and most persistent gains in citations per capita, consistent with complementarities between housing and facility infrastructure in attracting higher-quality researchers.



(a) Log STEM Publications

(b) Log STEM Citations

Figure A13: Scientific Production by Type of Transfer: Total Output

Notes: Event-study estimates of total (not per-capita) STEM publications and citations, decomposed by transfer type. All three transfer categories generate persistent positive effects on research output, with the largest gains among institutions receiving both housing and facility transfers.