Endurance of chance? A longitudinal study of the U.S. land-grant universities born of luck, serendipity, or both (1862-2024)

Abstract

Research summary: Why do some chance events create enduring organizational imprints while others dissipate? I distinguish between luck (passive receipt of resources without organizational agency) and serendipity (unexpected benefits emerging through organizational action and preparedness), arguing that founding-period chance events vary in their relative composition of luck versus serendipity, creating imprints with varying durability and adaptability. Analyzing 29 U.S. universities from 1862 to 2024 using archival data, contemporary rankings, and enrollment records, I find that all land-grant universities—whether designated through luck, serendipity, or both—excel in agriculture and mechanical arts (A&M) compared to counterfactual peers, consistent with the Morrill Acts' mandates. Yet, universities whose designations involved greater serendipity maintain A&M excellence more persistently than those driven predominantly by luck. Further, serendipity-dominant universities expanded beyond their original A&M mandates more successfully than luck-dominant ones. This study contributes to imprinting theory by revealing how organizational agency during founding shapes imprint durability and adaptability. It also advances luck and serendipity research by showing how varying compositions of chance events create distinct paths that resist change, providing one answer to why organizations exhibit persistent heterogeneity.

KEYWORDS:

imprinting, serendipity, luck, firm heterogeneity

1| INTRODUCTION

Strategy research has paid increasing attention to the systematic consequences of chance events rather than treating them as merely noise or unexplained variance (e.g., Andriani & Cattani, 2016; Cattani, 2006; Denrell, Fang, & Liu, 2014). For example, in 1894, brothers John Harvey and Will Keith Kellogg accidentally left cooked wheat dough sitting overnight at their Battle Creek Sanitarium; the fermented dough produced thin flakes when rolled, launching what became the Kellogg Company and creating the ready-to-eat cereal industry that has persisted for decades (Carson, 1957). Similarly, the coincidental introduction between Microsoft and IBM facilitated by Bill Gates' mother serving on a board with IBM's CEO enabled Microsoft's decades-long dominance (Manes & Andrews, 1994). Yet not all chance-driven beginnings endure or bring lasting advantages. For instance, Pets.com—a famous firm selling pet supplies online—received lucky venture capital windfalls totaling over $80 million but collapsed after only 268 days as a publicly traded company (Merlo,

2009). Likewise, Polaroid, whose founder Edwin Land unexpectedly conceived instant photography in 1943 when his daughter asked "Why can't I see the picture now?", became trapped by the very success of its high-margin instant film business model and failed to adapt to digital photography despite allocating 42% of its R&D budget to digital imaging by 1989, ultimately filing for bankruptcy in 2001 (Tripsas & Gavetti, 2000). How and why do the effects of some chance events endure while others fade?

Drawing on the emerging literature on chance events (Busch, Cattani, Fang, & Rindova, 2024; Garud, Gehman, & Giuliani, 2018; Liu & de Rond, 2016) and imprinting theory (Marquis & Tilcsik, 2013; Simsek, Fox, & Heavey, 2015), I argue that founding-era luck and serendipity both create persistent organizational imprints yet differ in durability and adaptability. Luck—passive receipt of favorable circumstances without organizational agency—produces less enduring advantages because organizations cannot replicate the conditions or extract systematic lessons (Denrell *et al.*, 2014; Denrell, Fang, & Winter, 2003). Serendipity involves unexpected discoveries through purposeful action where organizations recognize and exploit unforeseen opportunities (Busch, 2024; Dew, 2009; Garud *et al.*, 2018), creating more durable advantages because organizations develop capabilities alongside resources, understand success mechanisms, and recombine these capabilities in new domains (Cattani, 2006; Cattani & Malerba, 2021). While luck-driven organizations are constrained by their existing strengths, serendipity-driven ones can better adapt their historical advantages to new domains (Andriani & Cattani, 2016; Garud *et al.*, 2018).

I develop hypotheses based on the U.S. universities that acquired the land-grant status under the Morrill Acts of 1862 and 1890 through luck and/or serendipity (Andrews, 2023). This context is well-suited for studying the long-term impact of historical chance on organizations and their competitive advantages. First, as I detail below and summarize briefly in Table 1, land-grant designations for 14 universities and 15 counterfactuals in my sample occurred through processes involving significant luck and/or serendipity—chance elements difficult to observe systematically in publicly traded firms or survey data (Busch, 2024; Busch *et al.*, 2024). Second, universities feature well-defined academic departments, enabling precise assessment of competitive advantages across domains—a level of granularity unavailable without detailed segment-level

profitability data from business firms. Third, universities represent consequential organizations serving as engines of economic growth and innovation that transform industries and society (Owen-Smith, 2018).

Drawing on extensive archival sources (university catalogues, registries, yearbooks, and historical archives), contemporary rankings (U.S. News & World Report), enrollment data (IPEDS), and regional economic indicators (U.S. Census Bureau and Bureau of Economic Analysis), I examine 29 universities from 1862—when the first Morrill Act was signed into law—to 2024, the latest year for which data are available. I find that land-grant universities exhibit greater excellence in agriculture and mechanical arts (A&M; mechanical arts now referring to engineering), consistent with the Morrill Acts' founding mandates. Moreover, excellence in A&M subjects is more lasting for serendipity-driven land-grant universities than for luck-driven ones. Furthermore, luck-driven universities became constrained by their A&M strengths, developing non-A&M disciplines more slowly and with lower rankings. In contrast, serendipity-driven universities maintained A&M excellence while successfully expanding into other academic disciplines with greater success.

This study makes several contributions to strategic management and organization theory. First, it advances imprinting theory by bringing back founding-era organizational agency in understanding durability and adaptability of imprints. While prior research establishes that founding conditions create persistent imprints and typically theorizes history as mainly structural constraints (Marquis & Qiao, 2025; Marquis & Tilcsik, 2013; Simsek *et al.*, 2015), I show that the type of chance event with varying levels of agency shapes how lasting imprints are and whether it enables or constrains long-term adaptation. Serendipity-driven imprints, forged through organizational action and preparedness, prove more durable in their core domains and more flexible in enabling expansion beyond original mandates, while luck-driven imprints paradoxically fade in their core strengths while simultaneously constraining diversification. Second, this study contributes to emerging literature on luck and serendipity (Busch, 2024; Cattani, 2006; Denrell *et al.*, 2014) by providing among the first large-scale empirical test distinguishing their long-term organizational consequences. This addresses a fundamental puzzle in strategic management: why organizations differ and maintain these differences over time (Rumelt, Schendel, & Teece, 1994). While existing perspectives attribute persistent

heterogeneity to industry structure (Porter, 2008), firm resources and capabilities (Knott, 2003; Wibbens, 2019), or nonmarket environments (Hannan & Freeman, 1977; Lounsbury, 2001), these explanations face a conundrum—if heterogeneity stems from identifiable factors, organizations should imitate successful peers and erode differences (Lieberman & Asaba, 2006). My historical contingency perspective reveals that chance events, particularly their agentic versus passive nature, create organizational differences that resist learning and imitation not because mechanisms are unknowable, but because historical circumstances cannot be recreated.

2| THEORY AND HYPOTHESES

2.1|Theoretical background

Luck versus serendipity. Prior work has provided evidence on the systematic consequences of chance events (e.g., Andriani & Cattani, 2016; Cattani, 2006; Denrell *et al.*, 2014), suggesting it useful to distinguish between luck and serendipity as distinct yet related phenomena, with differing implications for organizational agency and adaptation (Busch *et al.*, 2024). Luck represents passive receipt of favorable circumstances—purely exogenous events or resource windfalls that influence organizational trajectories without deliberate action or preparation (Liu & de Rond, 2016; Parnell, Dent, O'Regan, & Hughes, 2012). Serendipity, by contrast, embodies a more agentically constituted form of chance characterized by "prepared discovery" where organizational actors recognize, interpret, and act upon unforeseen opportunities (Busch, 2024; Dew, 2009; Garud *et al.*, 2018). This conceptual distinction manifests empirically in organizational contexts: Levi Strauss's fortuitous 1853 arrival in San Francisco during the Gold Rush exemplifies pure luck in timing and geography, while 3M's Post-it Notes discovery illustrates serendipity—Spencer Silver's 1968 "failed" adhesive represented unexpected contingency, yet the outcome required six years of persistent advocacy, Art Fry's prepared recognition of bookmark applications, and 3M's organizational culture encouraging exploration of non-obvious uses (Balzano, 2022; Dew, 2009). Importantly, competitive dynamics may produce hybrid cases combining both elements: when multiple parties are involved, if neither demonstrates agency, outcomes reflect pure luck; if both exhibit agency, serendipity dominates; but when one party exercises agency while another does not, the result combines serendipity and luck.

Importantly, there has been increasing recognition that chance events during organizational founding can create durable effects (Denrell *et al.*, 2014). Prior work has shown that chance events can fundamentally shape organizational capabilities and competitive positioning in ways that endure for decades. For instance, Cattani (2005, 2006) provided evidence that Corning's accumulated glass-working capabilities developed without anticipating subsequent telecommunications applications such that historically contingent capability configurations prove valuable when unexpected opportunities emerge. Similarly, Pfizer's blockbuster drug Viagra originated from a serendipitous discovery when an observant nurse reported unexpected side effects during cardiovascular trials in 1989, yet the company's organizational capability to recognize this signal, redirect research resources, and navigate FDA approval transformed a chance observation into a pharmaceutical category generating billions in revenue decades later (de Rond & Thietart, 2007; Garud *et al.*, 2018). While these examples suggest that certain historical contingencies create competitive advantages that resist erosion, imprinting theory provides a useful framework to understand how and why some chance events produce lasting organizational effects while others dissipate.

Imprinting. According to Marquis and Tilcsik (2013), three essential features characterize imprinting: temporally restricted *sensitive periods* of high environmental susceptibility, powerful stamps or *imprints* where the entity reflects environmental elements at that time, and *persistence* despite subsequent environmental changes (Simsek *et al.*, 2015). Founding represents the quintessential sensitive period when organizations exhibit heightened susceptibility to environmental influence (Kimberly, 1979). However, existing imprinting research suffers from two important limitations for understanding how different types of chance events at founding—luck, serendipity, or their combination—create varying organizational trajectories. First, organizational agency has received less attention as the literature treats founding conditions primarily as structural constraints rather than examining how organizational actors actively select, interpret, and transform environmental elements during sensitive periods (Simsek *et al.*, 2015). Second, post-imprinting processes remain under-theorized, typically characterized through broad concepts like inertia (Hannan & Freeman, 1984), institutionalization (Zucker, 1977), and traditionalizing forces (Stinchcombe, 1965) without specifying

how imprinted characteristics evolve, adapt, or get reconfigured for new purposes over organizational lifecycles (Marquis & Tilcsik, 2013; Simsek *et al.*, 2015).

I argue that when founding circumstances involve greater organizational agency—as in serendipitous discoveries requiring prepared recognition and active transformation—the resulting imprints exhibit both greater persistence and greater adaptability. First, agency strengthens imprint durability through enhanced path-dependent processes—organizations that actively pursued founding opportunities continue investing in related structures and routines, generating stronger learning effects as accumulated expertise makes existing approaches increasingly efficient, complementarity effects as organizations build interdependent capabilities around initial choices, and coordination effects as organizational members develop shared understandings of how we do things here rooted in founding narratives emphasizing organizational achievement (Sydow, Schreyögg, & Koch, 2009, 2020). Second, agency also facilitates adaptation by enabling organizations to understand why certain practices exist and became institutionalized. For instance, prior work has shown that ethnic banks adapted relationship-banking capabilities developed for local markets to serve immigrant communities in new geographic contexts (Li, Hernandez, & Gwon, 2019). Organizations that actively shaped their founding circumstances, rather than passively receiving them, develop tacit knowledge about the logic connecting practices to outcomes, enabling deliberate reconfiguration when environmental conditions shift.

Imprinting of chance and persistent organizational heterogeneity. Integrating the emerging literature on chance events with imprinting theory provides a new explanation for a fundamental puzzle in strategic management: why organizations differ and maintain these differences over time (Rumelt *et al.*, 1994). Prior work has provided explanations from the perspectives of industry (McGahan & Porter, 1997; Rumelt, 1991), firm, business segments (Schmalensee, 1985), and strategic leaders (Crossland & Hambrick, 2007). I argue that chance events at organizational founding—whether passive luck, active serendipity, or hybrid combinations—create initial resource and capability differences during sensitive periods when organizations exhibit heightened environmental susceptibility. These initial differences become imprinted into organizational structures, routines, and cultures (Marquis & Tilcsik, 2013; Simsek *et al.*, 2015). Subsequently, self-reinforcing mechanisms amplify initial differences over time, transforming ephemeral founding

circumstances into escalating divergence (Sydow *et al.*, 2009, 2020). This framework addresses the imitation conundrum that has long puzzled strategy scholars: if heterogeneity stems from identifiable factors, why cannot less successful firms imitate more successful ones (Lieberman & Asaba, 2006)? When competitive advantages originate in unique historical contingencies that become imprinted and path-dependently reinforced, they resist both observation and replication because success sources involve complex interactions between historically specific founding conditions, accumulated path-dependent learning, and organizationally embedded routines whose causal connections to performance remain ambiguous even to the organizations themselves.

2.2|Luck and serendipity in becoming land-grant universities in the U.S.

The American land-grant university system presents a useful context for examining how chance events shape institutional development, with both the 1862 and 1890 Morrill Acts introducing significant contingent elements in their implementation. The first act, signed by President Lincoln during the Civil War, granted each state 30,000 acres of federal land per congressional representative to establish colleges teaching "agriculture and the mechanic arts, without excluding scientific and classical studies" (Morill Act of 1862: Section 4). The second Morrill Act of 1890 specifically addressed Southern segregation by requiring states to either provide equitable education for Black students or establish separate institutions, leading to the creation of many Historically Black Colleges and Universities (HBCUs). Despite their systematic intent, implementation varied dramatically across states due to local political dynamics, economic factors, and fortuitous circumstances (Andrews, 2023; Cross, 1999; Williams, 1991). Table 1 presents 14 land-grant institutions and their 15 counterfactual peers to examine luck, serendipity, or their combination. Classification follows the competitive dynamics between parties: cases where neither the eventual designee nor its competitors were active pursuing the status reflect luck; cases where all parties actively competed reflect serendipity; cases where only one party actively pursued while the other(s) remained passive reflect hybrid combinations of luck and serendipity.

=======Insert Table 1 about here=======

Luck-driven land-grant universities and their counterfactuals. Luck-driven outcomes emerged when established universities initially received land-grant designations but willingly lost them to institutions that demonstrated minimal agency in securing the status. These cases represent passive receipt of favorable circumstances beyond the beneficiary's control. The University of New Hampshire exemplifies this pattern. In 1866, New Hampshire established its land-grant institution in partnership with Dartmouth College rather than creating a separate school, with Dartmouth controlling the land-grant fund proceeds while the agricultural college used its facilities and faculty. When the national Grange movement campaigned against "classical colleges" holding land-grant funds, Dartmouth relinquished the designation in response to external pressure, allowing the New Hampshire College to separate and eventually relocate to Durham in 1892 as an independent institution. Neither Dartmouth nor the agricultural college exercised meaningful agency in this transfer—the outcome stemmed from external political forces rather than competitive advocacy or institutional mobilization (Johnson, 1956; Sorber, 2018). Similarly, Virginia State University received land-grant status in 1920 without actively seeking it. After Virginia's 1902 constitution mandated racial segregation, the university's liberal arts program was eliminated by state authorities who opposed classical education for Black citizens, forcing reorientation toward industrial training. This externally imposed transformation inadvertently made the institution eligible to receive Black land-grant funding when it transferred from Hampton Institute—a decision imposed through changing segregationist policies rather than institutional agency (Betts, 2013; Davis, 2014; Dean, 2023).

Serendipity-driven land-grant universities and their counterfactuals. Serendipity-driven outcomes occurred when chance circumstances unexpectedly chose a winner among actively competing candidates. Auburn University represents a paradigmatic serendipity case involving institutional desperation, political advocacy, and fortuitous timing. By 1871, the East Alabama Male College faced imminent closure due to chronic funding shortages, leading its board to desperately offer the campus to the state for the land-grant college. Meanwhile, the University of Alabama and Tuscaloosa had the strongest claim, making convincing arguments with powerful advocates throughout the state and in the legislature, but Union General Croxton's March 1865 burning of the campus during the Civil War—a chance event entirely beyond institutional

control—fundamentally weakened its position. The February 1872 selection process proved highly contingent: when debate finally began on February 13, Representative William Murrah unexpectedly submitted a minority report favoring Auburn over the committee's initial recommendation, triggering days of deliberations with multiple drafts before the Auburn bill passed on February 24. Auburn's success emerged from its board's active lobbying, the Methodist Conference's timely approval, Murrah's tactical minority report, and Alabama's war damage eliminating the frontrunner (Bishop, 2018; Cox, 2016; Rogers, 2016). Oregon State University followed a similar pattern when Corvallis College faculty member William Moreland, serving as legislative clerk, actively lobbied alongside Representative C.B. Bellinger, who had narrowly won a contested election. Just as a bill designating Willamette University was about to become law, Bellinger successfully moved to strike Willamette's name and insert Corvallis College on October 27, 1868, with the highly contentious legislative action drawing vocal criticism from prominent farmer John Minto (Lyman, 1903; Robbins, 2016).

Luck- and serendipity-driven land-grant universities and their counterfactuals. When one party actively pursuing the designation while another remained passive or withdrew, the outcomes reflected hybrid combinations of luck and serendipity. Yale University's loss of land-grant status to the University of Connecticut (UConn) illustrates this pattern. The Connecticut State Grange organized sustained opposition to Yale's land-grant designation, documenting that Yale had graduated only seven agricultural students in 24 years at costs the Grange considered exorbitant while maintaining high admission standards, classical curriculum, and no university farm. J.H. Hale's influential 1886 Grange report catalyzed the "Yale-Storrs Controversy," making Storrs Agricultural School—founded in 1881 and struggling—the focus of Grange advocacy. Yale demonstrated agency by suing for damages after the 1893 transfer and winning $154,604 in compensation, but UConn itself exhibited minimal agency as the Grange movement acted as external allies rather than institutional stakeholders (Sorber, 2018; Stemmons, 1931). Similarly, the University of Kentucky's separation from Transylvania University combined elements of both chance types. John Bryan Bowman founded the Agricultural and Mechanical College as a department within the religiously controlled Kentucky University (formerly Transylvania) in 1865 but concerns about federal funding supporting church-affiliated

institutions created tensions. When Bowman's financial management grew problematic and he refused to cooperate with ordered audits, a legislative investigating committee documented irregularities in January 1878, leading to the A&M College's severance as an independent state-run institution on March 13, 1878. The newly founded University of Kentucky demonstrated no agency in this outcome, while Transylvania had exercised agency through Bowman's leadership before losing control (Kiesel, 2003; Sorber, 2018).

2.3 | Disciplinary advantages of land-grant universities due to chance

Land-grant designation through the Morrill Acts of 1862 and 1890 constituted a resource windfall—substantial financial endowments, land assets, and federal support explicitly earmarked for agriculture and mechanical arts education—whose effects, I argue, prove remarkably durable despite originating in chance circumstances (Williams, 1991). This durability emerges through three interconnected mechanisms. First, the Morrill Acts created immediate resource allocation asymmetries favoring agriculture and engineering disciplines. Federal land-grant funds could mainly support A&M subjects, creating initial funding imbalances from inception (Edmond, 1978). Universities that received land-grant status faced intense scrutiny regarding fulfillment of this mandate, as evidenced by the transfers away from Yale, Brown, Dartmouth, and the University of North Carolina when these institutions failed to demonstrate adequate commitment to practical agricultural education (e.g., Johnson, 1956; Kinnear, 1972; Sorber, 2018; Stemmons, 1931; Wallenstein, 2021). This accountability pressure—the threat that designations could be redirected elsewhere—compelled land-grant universities to concentrate resources in A&M disciplines, creating distinctive resource bundles that non-land-grant institutions could not replicate. Second, these initial resource advantages triggered path-dependent processes whereby early investments in specialized facilities, faculty expertise, and agricultural experiment stations created cumulative advantages that became self-reinforcing over time (Arthur, 1989; Sydow *et al.*, 2009). For example, developing competitive agricultural research programs required decades of accumulated expertise, not merely capital infusions. Universities with existing A&M capabilities could more efficiently expand them than competitors could build from scratch. As land-grant universities built reputations in these disciplines, they attracted students and faculty particularly interested in agriculture and engineering, creating positive feedback loops that further concentrated specialized human capital. These institutions also forged

stronger relationships with agricultural producers, engineering firms, and government agencies, developing co-specialized assets and complementary capabilities spanning research, teaching, extension services, and industry partnerships that proved difficult for non-land-grant institutions to replicate (Kantor & Whalley, 2018).

These mechanisms transformed the chance event of land-grant designation into enduring competitive advantages in A&M disciplines. Initial resource windfalls—whether obtained through luck, serendipity, or their combination—created focal points for organizational attention and resource allocation. Path-dependent accumulation of specialized assets, expertise, and relationships made these focal points increasingly difficult to dislodge. Complementarities between various funding sources and institutional missions created integrated systems resisting unbundling. Over the years, these self-reinforcing processes should produce observable excellence in agriculture and mechanical arts among land-grant universities compared to institutions that did not receive this designation, regardless of whether the initial designation stemmed from luck, serendipity, or hybrid processes. Taking these together, I hypothesize that:

> **Hypothesis H1.** Land-grant universities demonstrate greater excellence in A&M disciplines compared to their counterfactual universities.

2.4 | The persistence of disciplinary advantages of land-grant universities due to chance

While resource windfalls create initial advantages, the durability of these advantages depends critically on the process through which they were obtained. I argue that serendipity-driven land-grant universities maintain A&M excellence more persistently than luck-driven ones because active founding processes create self-reinforcing organizational capabilities, deeper commitments, and more coherent complementarities for endurance. This differential persistence stems from these three interconnected mechanisms activated more powerfully by agency than by passive receipt.

First, active founding builds procedural knowledge and capabilities through learning-by-doing that passive recipients are less likely to develop. When Oregon State faculty member William Moreland lobbied the legislature and Representative C.B. Bellinger successfully struck Willamette's name to insert Corvallis College (now Oregon State), they developed tacit knowledge about stakeholder needs, political navigation,

and agricultural program design through solving actual organizational problems under uncertainty (Zollo & Winter, 2002). This procedural knowledge—knowing how to build and sustain A&M excellence and why particular approaches succeed—differs fundamentally from declarative knowledge about what land-grant status entails. Auburn University's board of trustees, desperately competing against the University of Alabama's superior political position, developed resource mobilization capabilities, coalition management skills, and stakeholder engagement routines that became embedded in organizational memory and applied to subsequent challenges in building agricultural research capacity and extension networks (Bishop, 2018; Cox, 2016; Rogers, 2016). In contrast, the University of New Hampshire, passively receiving status when Dartmouth withdrew, acquired the designation without developing underlying capacity for recognizing and exploiting agricultural opportunities. However, such capacity proves path-dependent and cumulative—prior domain knowledge determines future learning ability—creating advantages that deepen rather than erode over time (Cohen & Levinthal, 1990).

Second, earned status through competitive processes forges stronger organizational commitments to excellence in founding domains. When Kansas State's Manhattan delegation competed fiercely with Lawrence for land-grant designation, ultimately succeeding when Amos Adams Lawrence's philanthropic intervention redirected the state university to Lawrence, the competitive struggle created achievement narratives that became central to their operations (Howes, 1962; Olson, 2012). These "we fought and won" narratives might differ categorically from "circumstances granted us this" narratives in motivational power and durability. Moreover, earned legitimacy creates accountability structures absent in granted status. Universities that actively secured land-grant designation through demonstrating capability face ongoing pressure to validate their selection by maintaining A&M excellence—a legitimacy debt that functions as a self-reinforcing commitment mechanism (Sydow *et al.*, 2020). Clemson University, where Benjamin Tillman actively championed the institution's founding and served as lifetime trustee, developed organizational narratives of earned agricultural leadership that successive generations honored through continued excellence across 130 years (Cox, 2009; Reel, 2014).

Third, complementarities might be stronger when activated through deliberate agency rather than haphazard processes. Universities that actively built A&M programs through competitive founding deliberately designed complementary systems where agricultural research programs complemented practical education curricula, experiment stations complemented extension services, industry partnerships complemented applied research, and faculty expertise complemented student training (Cross, 1999; Marcus, 2015). These intentionally designed complementarities exhibit stronger interdependence than accidentally assembled elements because active design ensures elements genuinely reinforce each other rather than merely coexisting. Auburn University, having developed resource mobilization and political navigation capabilities during its founding competition, could systematically apply these capabilities to securing agricultural research funding, expanding experiment station networks, and deepening industry partnerships—applications that reinforced initial A&M advantages across changing technological and market conditions over 150 years (Bishop, 2018; Cox, 2016; Rogers, 2016).

Over the years, these compounding advantages—stronger learning processes, deeper commitments, and more powerful complementarities—create persistence differentials between serendipity-driven and luck-driven universities. Therefore, I hypothesize that:

> **Hypothesis H2.** The greater the serendipity (relative to luck) in obtaining land-grant status, the more persistently universities demonstrate excellence in A&M disciplines.

2.5 | The differential effects of luck and serendipity on organizational adaptation

While resource windfalls create advantages, they can simultaneously constrain organizations through competency traps, particularly when acquired passively without organizational agency (Barnett & Hansen, 1996). This paradox—that windfalls both enable and constrain—underpins the divergent developmental trajectories of luck-driven versus serendipity-driven land-grant universities. I argue that the key distinction lies not in the resource windfall itself but in how it was obtained, which shapes organizations' subsequent capacity to adapt these resources beyond their original mandates.

Luck-driven land-grant universities face three interconnected constraints limiting expansion beyond A&M disciplines. First, passive receipt creates path dependencies through specialized asset accumulation

without corresponding capability development. Universities that received land-grant status without competitive effort developed experimental farms, engineering laboratories, and specialized faculty expertise in A&M fields, yet lacked the ability to sense opportunities, seize them, and reconfigure resources—that emerge from actively navigating competitive processes (Eisenhardt & Martin, 2000; Teece, Pisano, & Shuen, 1997). These specialized investments represent substantial opportunity costs: resources concentrated in A&M become unavailable for other disciplines, creating switching costs that deepen over time as A&M investment is increasingly attractive relative to exploring new domains (Ghemawat & Ricart Costa, 1993). Second, passive receipt fosters cognitive lock-in whereby administrators perceive their institutions as fundamentally defined by A&M missions rather than viewing land-grant status as a platform enabling broader excellence. Without having actively shaped their founding circumstances, luck-driven universities lack the organizational narratives and mental models that would legitimize disciplinary exploration beyond original mandates. Third, external stakeholder pressures reinforce A&M focus. Luck-driven institutions develop dense networks with agricultural producers, engineering firms, and government agencies whose complementary investments and political influence create pressures to maintain traditional land-grant disciplines (Kantor & Whalley, 2018; Marcus, 2015). Having passively received status, these universities possess limited political capital to redefine stakeholder relationships or resist external demands for A&M fidelity.

In contrast, serendipity-driven land-grant universities are better able to expand beyond A&M disciplines through capabilities forged during competitive founding processes. The very act of actively securing land-grant status—whether through political lobbying (as Oregon State's faculty member William Moreland demonstrated), navigating contentious legislative processes (as Auburn's board accomplished during the extended 1872 deliberations), or mobilizing stakeholder coalitions (as Benjamin Tillman orchestrated for Clemson)—builds capabilities transferable to subsequent challenges (Eisenhardt & Martin, 2000; Teece *et al.*, 1997). These universities are better at recognizing, assimilating, and applying knowledge from diverse fields, which proves crucial for expanding beyond narrow founding mandates. Critically, serendipity-driven institutions possess deeper understanding of why their structures and practices exist because they actively created them rather than passively inheriting them. Universities that earned land-grant

status through agency can thus reconfigure A&M-focused capabilities (rigorous applied research, industry engagement, practical education) for other professional and scientific disciplines.

Serendipity-driven universities also develop broader organizational capabilities managing disciplinary diversity. Having succeeded through competitive processes requiring innovation and adaptability during founding, these institutions internalize entrepreneurialism and strategic flexibility as core organizational characteristics that subsequently become imprinted and self-reinforcing (Marquis & Tilcsik, 2013; Sydow *et al.*, 2020). They view land-grant status as a resource enabling broader academic excellence rather than a constraint limiting them to specific mandates. Furthermore, serendipity-driven institutions develop superior stakeholder management capabilities through the political navigation required to secure land-grant status. Auburn's success in overcoming the University of Alabama's powerful advocates throughout the state and in the legislature through Representative Murrah's tactical minority report, or Clemson's navigation of almost a year of bitter public debate and Supreme Court challenges, exemplifies political capabilities that subsequently enable these universities to maintain legitimacy with traditional agricultural constituencies while simultaneously cultivating relationships in new academic domains (Thelin, 2004; Williams, 1991). These capabilities allow pursuit of disciplinary diversification while preserving land-grant identity and stakeholder support. Hence, I hypothesize that:

> **Hypothesis H3.** The greater the serendipity (relative to luck) in obtaining land-grant status, the more successfully universities expand beyond A&M into other academic disciplines.

3| METHOD

3.1|Data and sample

I drew my sample from several data sources that are summarized in Table 2.

=======Insert Table 2 about here=======

I collected information on universities from a variety of sources to test my hypotheses. Consistent with the theory above, I focus on land-grant universities and their counterfactuals in this natural-experimental setting. First, three research assistants (RAs) and I independently checked university catalogues, registries, yearbooks, and historical archives as well as various websites to obtain the founding year for each department

and the historical enrollment data of all universities included in this sample since their founding years. The three RAs and I then cross-checked this information. More recent enrollment data are corroborated with those from the Integrated Postsecondary Education Data System (IPEDS). Second, land-grant universities by chance—luck, serendipity, or both—and their counterfactual institutions are listed in Table 1, and a total of 14 land-grant universities can be considered as having gained their status through luck and/or serendipity, while the remaining 15 universities did not benefit from such chance events. Third, founding dates and presidents of different universities came from schools' websites and Google Search, and again the three RAs and I cross-validated this information. I also hand-coded whether the focal university is privately endowed and a member of the Association of American Universities (AAU) from university websites and the AAU website. Furthermore, I obtained the rankings of disciplines of different universities from the U.S. News & World Report, which is the most authoritative source for U.S. universities (Bastedo & Bowman, 2009; Sauder, 2008), to better understand discipline developments of these universities. The U.S. News & World Report has published detailed rankings of different academic disciplines for graduate schools since 1994. These rankings include classical liberal arts (English, music, fine arts, mathematics, and physics), sciences (biology, chemistry, economics, geology, history, psychology, political science, sociology, and computer science), and professional schools (business, education, engineering, law, medical research and primary care, and public affairs and policy). I did not use undergraduate program rankings, which are mostly incomplete regarding different subjects—for example, these rankings only concern practical programs such as business and engineering. I collected data from published books by the U.S. News & World Report (America's Best Graduate Schools) from 1996 to 2024, except for agriculture that is not included. For agricultural rankings, I used U.S. News & World Report's Best Global Universities, which began in 2014. Moreover, I collected state-level gross state product per capita and population from the U.S. Census Bureau's decennial censuses and the Bureau of Economic Analysis. The final longitudinal sample consists of 29 universities from 1862 or the first year when the university recruited students—whichever is later—to 2024 and 4,482 firm-year observations, with missing values and limited time coverage for rankings.

3.2 | Variables

Dependent variables. I coded whether a department was established (1 = yes, 0 = no) in the following fields, respectively: agriculture, mechanical arts (i.e., engineering), business, law, medicine, education, policy, economics, sociology, political science, and psychology. I focused on these disciplines because all universities had classical liberal arts (e.g., English, music, fine arts, mathematics, and physics) and humanities (e.g., history), which had become templates for American universities before the Civil War (Lucas, 1994; Thelin, 2004). The first two categories represent A&M subjects, while the remaining disciplines do not. The second set of dependent variables pertains to rankings in U.S. News & World Report. In the early years of publication, the rankings typically included 25 to 50 schools per discipline, and this scope later expanded to over 100 in some fields (e.g., business and law). For universities not listed in the rankings, I assigned the next sequential rank as an approximation. For instance, if 100 schools were ranked in business, all unranked schools were assigned a rank of 101.

Independent variables. As described in Table 1, if the designated university and their counterfactual(s) both exhibited little agency, then the land-grant status was mainly driven by *luck* (1 = yes, 0 = no). If one of the parties actively pursued the land-grant status, then it was the case with both *luck and serendipity* (1 = yes, 0 = no). If all parties actively pursued the land-grant status, then the case was mainly driven by serendipity (1 = yes, 0 = no). The remaining universities are coded as baseline for comparison. For example, luck = 1 for Ohio State and 0 for Miami University and Ohio University, luck and serendipity = 1 for the University of Connecticut and 0 for Yale, and serendipity = 1 for North Dakota State University and 0 for the University of North Dakota.

Control variables. I first controlled for university presidents' discipline background that corresponds to the coding of disciplines described above, based on which organizational leaders make decisions according to the existing literature (Crossland & Hambrick, 2007; Hambrick & Mason, 1984). I then controlled for university characteristics and state-level economic indicators, which are important for university development (e.g., Bramwell & Wolfe, 2008; Dennis, 2001). These included *university age*, whether the university is an *AAU member* (1 = yes, 0 = no), and whether it is *privately endowed* (1 = yes, 0 = no) as public and private universities

reflect different governance modes (Lucas, 1994; Thelin, 2004). University size and resources also correlate with founding dates and rankings (Hofstadter & Smith, 1961), and thus I controlled for *enrollment* (logarithm of matriculated students). At the state level, I controlled for *gross state product* (GSP) *per capita* (in logarithm) and *population* (in logarithm) as local economy might be also critical to university development (Andrews, 2023; Dennis, 2001).

3.3 | Estimation

I transformed the first set of dependent variables into hazard rates—specifically, the instantaneous probability that a university established a given discipline, conditional on that discipline not having previously existed. This coding strategy aligns with my theoretical interest in predicting the speed at which universities adopted related academic fields. To estimate these hazard rates, I employed the Cox proportional hazards model, which is robust to assumptions about the underlying distribution of event times. This model assumes that the current hazard rate is proportional to a baseline hazard. I tested this proportionality assumption using the partial residual approach (Schoenfeld, 1982) and found that it holds (with results reported in one row of Table 4). Since I am interested in new establishment, I employed the single-event Cox proportional hazard model, and after a university established a discipline, the remaining years of observations would be dropped. The second set of dependent variables consists of rank-ordered outcomes. Accordingly, I used a random-effects ordered probit model for estimation. Fixed-effects estimation was not feasible due to the incidental parameters problem: the presence of numerous parameters compromises the consistency of the estimator (Lancaster, 2000). The random-effects specification is preferred over the pooled estimator, as it better accounts for university-specific unobserved heterogeneity. Finally, based on the natural experiments detailed in Table 1, I included a series of dummy variables to capture university-pair fixed effects, thereby enhancing the comparability of institutions within matched pairs. For example, North Dakota State University and University of North Dakota share the same university-pair dummy.

3.4 | Results

=======Insert Table 3 about here=======

Table 3 presents the summary statistics and correlation matrix. None of the correlation coefficients among the independent variables exceeds the commonly used threshold of 0.7, and the variance inflation factors (VIFs) for all regressions remain below 10, suggesting that multicollinearity is not a major concern. To further assess multicollinearity, I followed Kalnin's (2018) diagnostic approach. Specifically, for pairs of variables with absolute correlation coefficients greater than 0.3, I examined whether (1) they exhibit regression coefficients with signs opposite to their zero-order correlation with the dependent variable, and (2) positively (negatively) correlated variables display regression coefficients with opposite (same) signs. No such instances were observed. Accordingly, I conclude that multicollinearity does not threaten the validity of my estimation results. Tables 4 and 5 present the regression results.

=======Insert Tables 4 and 5 about here=======

Hypothesis 1 argues that land-grant universities that obtained this status by chance developed A&M subjects more quickly and excel in them as well. Columns 1 and 2 of Table 4 show that historical luck (β = 0.189, p = 0.008 for agriculture and β = 0.567, p = 0.042 for mechanic arts), the combination of luck and serendipity (β = 0.561, p = 0.046 for agriculture and β = 1.332, p = 0.015 for mechanic arts), and serendipity (β = 1.452, p = 0.034 for agriculture and β = 3.025, p = 0.000 for mechanic arts) during the land-grant assignment are positively related to the speed of establishing these A&M disciplines. All else being equal, land-grant universities due to chance were at least 17.3% (= $1/e^{0.189}$) and 43.3% (= $1/e^{0.567}$) more quickly to establish agricultural and mechanic arts disciplines. Among universities that eventually established A&M subjects, the average time to establish agriculture was 20.68 years, and for mechanic arts, 52.28 years. Accordingly, land-grant universities that obtained their status by chance adopted agriculture approximately 6 to 16 years earlier, and mechanic arts approximately 27 to 49 years earlier.

Columns 1 and 2 of Table 5 show that luck (β = –79.470, p = 0.000 for agriculture and β = –15.400, p = 0.071 for mechanic arts), luck and serendipity (β = –75.897, p = 0.002 for agriculture and β = –28.387, p = 0.039 for mechanic arts), and serendipity (β = –128.700, p = 0.011 for agriculture and β = –49.982, p = 0.022 for mechanic arts) are more highly ranked in these disciplines, as greater values mean lower ranked. All else being equal, luck-, serendipity-, or both driven universities rank approximately 37 to 50 places higher than

their counterparts in agriculture and 4 to 13 places higher in mechanic arts/engineering. These effects are substantial given the scope of the rankings: approximately 400 global universities were ranked in agriculture (around 50 are from the U.S.), and between 50 and 100 in engineering in the U.S. Therefore, Hypothesis 1 is supported.

Hypothesis 2 states that more serendipity-driven land-grant universities exhibit more lasting advantages in A&M subjects than their more luck-driven counterparts. Columns 1 and 2 of Table 5 show that serendipity-driven land-grant universities rank more highly agriculture ($p = 0.066$) and mechanic arts ($p = 0.010$) than their luck-driven counterparts by the U.S. News since 1994 to 2024. This suggests that more than a century after the original Morill Acts (1862 and 1890), land-grant universities driven more by serendipity exhibit a stronger and more enduring advantage in A&M disciplines than their counterparts driven more by luck. Hence, Hypothesis 2 is supported.

Hypothesis 3 suggests that compared with their serendipity-driven counterparts, luck-driven land-grant universities have more limited development of other fields beyond A&M disciplines. Columns 3 to 11 of Table 4 show that luck-driven land-grant universities are more slowly in establishing departments or schools of than their serendipity-driven counterparts in terms of: business ($p = 0.074$), law ($p = 0.044$), medicine ($p = 0.019$), education ($p = 0.014$), policy ($p = 0.036$), economics ($p = 0.038$), sociology ($p = 0.026$), political science ($p = 0.068$), and psychology ($p = 0.057$). Similarly, Columns 3 to 11 of Table 5 show that luck-driven land-grant universities ranked less highly in departments or schools than their serendipity counterparts with respect to business ($p = 0.020$), law ($p = 0.040$), medicine ($p = 0.083$), education ($p = 0.079$), policy ($p = 0.032$), economics ($p = 0.094$), sociology ($p = 0.025$), political science ($p = 0.052$), and psychology ($p = 0.049$). Thus, Hypothesis 3 is supported.

Land-grant status→student enrollment (path dependent)→discipline development. Student enrollment in A&M programs provides a crucial pathway through which land-grant advantages persist across generations, reflecting a type of organizational capabilities that serendipity-driven universities develop more powerfully than luck-driven ones. Universities with superior procedural knowledge about agricultural education, stronger embedded relationships with farming communities, and deeper commitment to land-

grant missions attract more students seeking practical agricultural and mechanical training. These students, upon graduation, populate state extension services, agricultural industries, and engineering firms, creating alumni networks that subsequently channel future students back to their alma maters, establishing self-reinforcing feedback loops where enrollment begets capability development, which attracts further enrollment (Arthur, 1989). Testing whether chance events created persistent A&M advantages thus requires examining both initial enrollment levels following land-grant designation and the path-dependent dynamics through which enrollment advantages self-reinforce over time.

I first examined whether the universities in my sample enrolled more students initially following land-grant designation, then tested whether enrollment exhibits path-dependent persistence, and finally assessed whether this enrollment mediates the relationship between founding circumstances and long-term disciplinary excellence. Prior methodological work establishes that path dependence can be tested by regressing dependent variables on lagged counterparts, with coefficients reflecting self-reinforcement levels (Jung, 2014; Marquis & Qiao, 2025). However, including lagged dependent variables creates endogeneity concerns or a dynamic panel data bias (Nickell, 1981). To address this, I employ the generalized method of moments (GMM) estimator, which extends two-stage least squares instrumental variable approaches to accommodate heteroskedasticity and autocorrelation while using deeper lags of the dependent variable and control variables as instruments that satisfy orthogonality conditions (Hansen, 1982; Hansen & Singleton, 1982). This three-stage procedure first differences equations to eliminate fixed effects, then instruments endogenous variables using their lagged levels, and finally estimates coefficients using moment conditions that account for complex error structures, thereby providing consistent estimates of path-dependent processes (Arellano & Bond, 1991; Blundell & Bond, 1998).

Table 6 presents the results. Column 1 demonstrates that land-grant universities designated through luck ($\beta = 0.836$, $p = 0.085$), combined luck and serendipity ($\beta = 0.567$, $p = 0.068$), and serendipity ($\beta = 0.293$, $p = 0.074$) enrolled significantly more students than their counterfactual peers following designation. This pattern reflects the Morrill Acts' explicit mission to democratize higher education for agricultural and industrial classes, making land-grant institutions more accessible through lower tuition, practical curricula, and

geographic positioning closer to farming communities than classical liberal arts colleges (Edmond, 1978; Williams, 1991). Auburn University, for instance, dramatically expanded enrollment after securing land-grant status by offering practical agricultural and mechanical education to Alabama farmers' sons who could not afford or access the University of Alabama's classical curriculum. Similarly, Kansas State University attracted students from farming families across Kansas through its explicit agricultural focus and lower admission requirements compared to the University of Kansas's liberal arts orientation (Howes, 1962; Olson, 2012).

Before estimating the GMM models, several specification and validity checks were conducted to ensure the appropriateness of the estimator. First, I verified the presence of endogeneity and dynamic persistence in student enrollment—key conditions for using a dynamic panel GMM approach—by performing the Arellano and Bond (1991) test for serial correlation. The results indicated significant first-order autocorrelation or AR(1) ($p = 0.000$) but no second-order autocorrelation or AR(2) ($p = 0.259$), satisfying the requirement that the differenced error terms are not serially correlated. Second, we conducted the Hansen's J-test of overidentifying restrictions to evaluate the joint validity of the instruments (Hansen, 1982; Hansen & Singleton, 1982). The statistic ($p = 0.306$) suggests that the instruments are valid and uncorrelated with the error term. Third, to assess instrument strength, I examined the first-stage F-statistics and the Kleibergen–Paap rk Wald F-statistics for weak instrument diagnostics in GMM or instrumental variable settings, both of which exceeded the conventional threshold of 10, indicating that the instruments are not weak. Fourth, I confirmed the absence of instrument proliferation—a common issue in system GMM—by applying the instrument-collapsing option and maintaining the instrument count below the number of groups (Roodman, 2009). Finally, all models were estimated using robust two-step system GMM with Windmeijer (2005) corrected standard errors to address finite-sample bias. Column 2 (with the differencing scheme dropping all time-invariant variables from the regression) reveals that student enrollment exhibits strong path dependence ($\beta = 0.913$, $p = 0.000$), indicating that enrollment advantages self-reinforce over time through reputation effects, alumni networks, and accumulated educational capacity. Tables 4 and 5 demonstrate that higher enrollment is related to both faster discipline establishment and superior rankings, supporting enrollment's mediating role between founding circumstances and long-term excellence.

To directly test Hypothesis 2 on whether serendipity creates more lasting A&M advantages than luck, I conducted subsample analyses comparing path dependence strength across three groups: luck-driven land-grant universities and their counterfactuals ($\beta = 0.878$, $p = 0.000$), hybrid luck-and-serendipity cases and their counterfactuals ($\beta = 0.917$, $p = 0.000$), and serendipity-driven universities and their counterfactuals ($\beta = 0.935$, $p = 0.000$). The GMM estimates reveal that lagged enrollment coefficients are highest for serendipity-driven universities, suggesting stronger self-reinforcement mechanisms. To test this pattern more rigorously, I interacted time-invariant founding circumstance indicators (luck, luck-plus-serendipity, serendipity) with lagged enrollment. Wald tests of interactions show that serendipity's interaction with lagged enrollment exceeds luck's interaction ($p = 0.065$) and the hybrid case's interaction ($p = 0.089$), providing evidence that serendipity activates stronger path-dependent processes. These results provide further evidence for Hypothesis 2.

=======Insert Table 6 about here=======

Alternative survival analysis models. I also employed a parametric approach for survival analysis, utilizing a range of distributions (exponential, Gompertz, loglogistic, Weibull, lognormal, and generalized gamma) to model the data. To determine the most suitable distribution, I compared the fit of each model using Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). These exploratory analyses revealed that the exponential distribution provided the best fit for my data, as evidenced by the lowest AIC and BIC values among the parametric models considered. The results are shown in Table 7, which are consistent with those reported in Table 4 and supportive of my hypotheses.

=======Insert Table 7 about here=======

4| DISCUSSION

I examine how different types of chance events shape long-term organizational development, distinguishing between luck (passive receipt of resources) and serendipity (unexpected benefits from organizational agency). Land-grant universities designated through luck, serendipity, or both excel in agriculture and mechanical arts compared to counterfactual peers, yet serendipity-driven universities maintain this excellence more persistently than luck-driven ones. Moreover, luck-driven universities became more constrained by their

A&M specialization, developing non-A&M disciplines less successfully than serendipity-driven universities, which expanded beyond their original mandates while maintaining agricultural and engineering strengths.

4.1 | Theoretical implications

Bringing organizational agency back to imprinting. This study advances imprinting theory by revealing a paradox: organizational agency during founding simultaneously enhances both imprint durability and adaptive capacity, challenging conventional interpretations that treat imprinting as structural determinism constraining organizational evolution (Marquis & Tilcsik, 2013; Simsek *et al.*, 2015). I theorize and show that instead greater organizational agency during founding creates *stronger* imprints that prove more persistent. Interestingly, this same agency also enhances adaption. The resolution to this paradox lies in recognizing that agency creates different types of imprints: serendipity-driven founding inscribes procedural knowledge about why practices succeed alongside structural commitments to what practices are, enabling organizations to understand logics behind the imprints and adapt imprinted capabilities to new domains. Luck-driven founding, lacking this procedural dimension, creates brittle imprints resistant to reconfiguration. This extends recent work by Becker (2025), Goyal (2025) and Marquis and Qiao (2025) by specifying agency as a critical moderator determining whether founding conditions create adaptive capabilities or rigid constraints, thereby enriching our understanding of organizational dynamics within imprinting frameworks.

Luck versus serendipity. This study advances the emerging literature on chance by highlighting that rather than being opposing forces, agency and chance interact complexly, with their combination determining whether historical contingencies create durable advantages or ephemeral perturbations. My findings reveal three surprising patterns. First, chance events create lasting organizational effects rather than temporary noise, challenging implicit assumption that sustained excellence must reflect systematic capabilities rather than fortune (Henderson, Raynor, & Ahmed, 2012) and contradicting the treatment of lucky windfalls as transient anomalies (Bebchuk, Grinstein, & Peyer, 2010). The 160-year persistence of competitive advantages demonstrates that certain historical contingencies fundamentally alter organizational trajectories through self-reinforcing mechanisms that resist erosion. Second, not all chance proves equally enduring: serendipity-driven advantages persist more strongly than luck-driven ones because agency activates stronger path dependence

that deepens over time. Third, passive luck creates constraints as well as advantages while agentic serendipity enables both domain persistence and adaptive expansion.

Persistent heterogeneity among organizations. These insights together further help address a fundamental puzzle in strategic management: why organizations differ and maintain these differences over time despite competitive pressures that should erode heterogeneity (Rumelt *et al.*, 1994). Prior work has provided rich evidence on how industry (McGahan & Porter, 1997; Rumelt, 1991), firm, business segments (Schmalensee, 1985), and strategic leaders (Crossland & Hambrick, 2007) shape performance variation among firms, yet the origins and persistence mechanisms of these differences remain theoretically underdeveloped. My historical contingency perspective provides one resolution by demonstrating that chance events during organizational founding create initial capability differences that become imprinted and subsequently amplified through path-dependent processes, generating persistent heterogeneity resistant to competitive equilibration. This challenges the assumption that superior performance stems primarily from deliberate strategic choices (Snow & Hrebiniak, 1980), revealing instead that organizational heterogeneity emerges from complex interactions between chance events and organizational responses whose unique historical configurations cannot be reconstructed or imitated. The critical insight is that heterogeneity persists not because success factors are unidentifiable but because they originate in historically specific circumstances involving chance elements whose effects become locked-in through self-reinforcing mechanisms (Arthur, 1989; Sydow *et al.*, 2009, 2020), creating competitive advantages that resist internal comprehension and/or external replication across generations.

4.2 | Practical implications

My study has several practical implications. First, it suggests that policymakers should carefully consider how resource allocation mechanisms influence institutional development trajectories. The recent actions of the Trump administration to redirect billions in federal funding away from Ivy-League and other institutions could inadvertently create opportunities for these universities to develop specialized excellence in long-ignored disciplines that dispense with governmental funding. While such resource reallocations may initially appear disruptive, my findings suggest that universities receiving unexpected windfalls can be constrained.

This might have some implications for strategy as resourcefulness is not always or monotonically good (George, 2005; Williams, Zhao, Sonenshein, Ucbasaran, & George, 2021).

For business strategists, this study implies that firms must pay close attention to the origins of their resource base—particularly when windfalls or regulatory designations play a role. Capabilities forged through historical contingency may be more deeply embedded than those built through deliberate strategy, and firms should audit their legacies for such assets. Understanding whether core strengths stem from serendipitous adaptation or passive luck may help guide future investments, especially in diversification, innovation, and organizational renewal.

The paper also offers insight into how firms might respond to windfalls—such as a sudden influx of government contracts, regulatory advantages, or funding injections. There has been debate about the utility of resource windfalls. Yet, as this study shows, some institutions converted chance-based designations into enduring capabilities. For business firms, this suggests that resource windfalls should be treated not as static blessings or curses but as strategic inflection points—moments where organizational attention, capability building, and internal alignment are especially consequential for long-term trajectory.

4.3|Limitations and future research

Some limitations might point out future research directions. First, the historical nature of this study presents inherent challenges related to measuring and identifying various long-term mechanisms. This limitation is shared with much work on path dependence, imprinting, and institutional legacies (e.g., Vergne & Durand, 2010). Future research may build on this study by incorporating more granular, longitudinal, or comparative process-tracing designs to clarify how specific events become embedded in organizational routines and identities, in addition to the student enrollment measure.

Second, while higher education is a good context in which to build my theory because of such factors as the clear missions of universities and well-documented organizational structures, it is necessary to extend my study to business firms to allay concerns of the unique way of operationalizing luck and serendipity. Corporate environments often involve more fluid boundaries, stronger market competition, and shorter planning horizons. Testing the relevance of historical chance and windfalls in such settings—especially in

relation to government contracts, regulatory awards, or unexpected market access—could further validate and refine the framework presented here.

4.4 | Conclusion

Despite these caveats, this study is among the first to offer an imprinting perspective on the lasting effects of different types of chance events. I hope future research will continue this line of inquiry and further explore how chance elements—both past and present—shape different types of organizations in varied and temporally distinct ways.

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TABLE 1 Luck versus serendipity in determining land-grant status

Land-grant university (italicized) and its counterfactual	Mini-vignette and context (very brief to conform to the page limitations) **Concusion and type of chance**	Sources (links in blue to preserve length):
• *North Dakota State University* (founded in 1890) • University of North Dakota (founded in 1883)	• Officials drew lots to determine where to place the institution when the two competing colleges—what became North Dakota State University (NDSU) and the University of North Dakota (UND)—and their towns could not reach agreement. • Representatives from Fargo County ended up pulling straws to figure out which county would house the new North Dakota college. • North Dakota State University won the land grant by one vote. **NDSU and UND competed for the land grant and the outcome was decided by a draw. The land-grant status was driven by serendipity.**	• Andrews (2023); Geiger (1958) • The first session of the legislative assembly of the State of North Dakota • The second session of the legislative assembly of the State of North Dakota
• *Kansas State University* (founded in 1863) • University of Kansas (founded in 1865)	• In 1863, Manhattan and Lawrence fiercely competed to host the state's premier institutions. The Manhattan Delegation helped the Blue Mont College secured the land-grant designation (later becoming Kansas State University), while Lawrence won the state university (University of Kansas) by a single legislative vote, largely due to Amos Adams Lawrence's substantial $10,000 donation and land gift that redirected the state university. **Kansas State University and the University of Kansas competed for the land grant and the outcome was decided by a sudden event to break the impasse. The land-grant status was driven by serendipity.**	• Brown (1963); Howes (1962); Olson (2012) • Kansas State official website • A related description
• *Oregon State University* (founded in 1856) • Willamette University (founded in1842)	• Just as a bill designating Willamette University as Oregon's land-grant institution was about to become law—promoted by people such as prominent farmer John Minto, Representative Charles Byron Bellinger of Benton County, who won a contested election and then successfully moved to strike Willamette's name and insert Corvallis College (later Oregon State University) instead. • Corvallis College faculty member William Moreland, who also served as legislative clerk, actively lobbied for the land-grant designation alongside Senator Bellinger. The legislative action proved highly contentious, with prominent farmer John Minto emerging as a vocal critic of the Corvallis selection. The combination of Moreland's strategic positioning within the legislature, Bellinger's contested election victory giving him the platform to make the substitution motion, and the timing of the intervention just before the Willamette bill's passage created the conditions for Corvallis's success. **Williamette Univeristy and Oregon State University (e.g., their faculty) competed for the land grant and the outcome was decided by a series of chance events: the election of Charles Byron Bellinger, opposition of John Minto, and contentious decision. The land-grant status was driven by serendipity.**	• Lyman (1903); Robbins (2016, 2017) • Oregon Encyclopedia • Oregon State University archives
• *Auburn University* (founded in 1856) • University of Alabama (founded in 1831)	• The selection faced time pressure as the Morrill Act was quickly nearing expiration; the state then moved fast. • By 1871 the faculty had informed the board of trustees that lack of funds prevented the school from continuing operations, and board of trustees decided to offer the school to the state for the land-grant college. • The University of Alabama and its town Tuscaloosa competed and had the strongest claim, making "the most convincing argument" with "powerful advocates throughout the state and in the legislature." Yet, its suffered from destruction during the Civil War, when Union General Croxton followed orders to burn the campus in March 1865, dramatically altering the institution's trajectory via a chance wartime event. • On February 13, 1872, when debate finally began, Representative William Murrah unexpectedly submitted a minority report favoring Auburn instead, arguing Auburn offered "larger and more valuable" buildings and proper Methodist relinquishment. The committee deliberated "for days" with "several drafts" read and voted on, finally passing the Auburn bill on February 24, 1872. Even after passage, "debate and controversy continued for months," underscoring the decision's precarious, chance-driven nature shaped by: Methodist Conference timing, the minority report tactical maneuver, subjective building valuations, legislative fatigue from months of unproductive debate, and Alabama's war damage eliminating the frontrunner. **Auburn University (e.g., their faculty) and the University of Alabama competed for the land grant and the outcome was decided by a series of chance events. The land-grant status was driven by serendipity.**	• Bishop (2018); Cox (2016); Rogers (2016) • The Auburn University Digital Library • Aubrun University On the Lawn
• *Clemson University* (founded in 1889) • University of South Carolina (founded in 1801)	• Thomas Green Clemson's 1888 bequest mandated an agricultural college with $80,000 and 814 acres, governed by seven lifetime trustees whom he personally named—including Benjamin Ryan Tillman, the agrarian reformer and Farmers' Association leader. Tillman had championed a separate agricultural college since 1885 against conservative opposition and seized upon Clemson's death to politically mobilize support, canvassing the state and urging the legislature to accept the bequest despite fierce opposition from South Carolina College and Governor Richardson. • The bequest faced a Supreme Court challenge in Lee v. Simpson brought by Clemson's son-in-law Gideon Lee contesting the will. After "almost a year of bitter public debate" between Tillman's agrarian reformers and conservatives who wanted funds to strengthen South Carolina College's existing agricultural program, the legislature passed the Clemson College bill in December 1888. Governor John P. Richardson reluctantly signed the Act of Acceptance in November 1889, formally establishing the college. • Personal bequest, political championing by Tillman (acting as a trustee and political entrepreneur), and favorable legal ruling enabled the transfer of Morrill Act and Hatch Act funds from South Carolina College to Clemson. **Both Clemson University and the University of South Carolina fought for th land grant, and these chancy legal and poltical circumstances made Clemson Univeristy the winner. The land-grant status was driven by serendipity.**	• Cox (2009); Reel (2014) • South Caroline Encyclopedia • Clemson University website
• *Virginia Tech* (founded in 1851 as the Olin and Preston Institute) • University of Virginia (founded in 1819)	• Twenty-four schools across Virginia claimed Morrill Act funds during 1870-1872 legislative sessions. Established institutions including the University of Virginia and Virginia Military Institute competed for the designation. Preston and Olin Institute, a small struggling Methodist school in Blacksburg facing financial difficulty, entered late as a contender when trustees offered to reorganize as the agricultural and mechanical college in exchange for land-grant funds, supported by Montgomery County's pledge of $20,000. • The campus of the University of Virginia (UVA) was damaged during the Civil War, making Virginia Tech's establishment a product of both political debate and historical contingency. **Virginia Tech and UVA actually pursued the land grant, and Virginia Tech obtained the land grant mostly due to serendipity.**	• Kinnear (1972); McDowell (2001); Wallenstein (2021) • Virginia Tech special collections • Duncan Lyle Kinner's Archive
• *University of New Hampshire* (founded in 1866) • Dartmouth College (founded in 1769)	• In 1866, New Hampshire partnered its land-grant school with Dartmouth College rather than creating a separate institution. Dartmouth controlled the land-grant fund proceeds ($80,000 from 150,000 acres) while the New Hampshire College of Agriculture and Mechanic Arts used Dartmouth's facilities and faculty—a financially prudent arrangement. The relationship was "amiable if occasionally strained," with agricultural students maintaining separate identity (lower admission standards, distinct organizations, balcony seating in chapel) while Dartmouth benefited from state funding. • The national Grange movement campaigned against "classical colleges" holding land-grant funds, criticizing institutions like Dartmouth for prioritizing literary education over practical agricultural training. Under this external pressure, Dartmouth relinquished the land-grant designation, allowing the New Hampshire College to separate and eventually relocate to Durham in 1892 as an independent institution (later University of New Hampshire, UNH). **UNH's land-grant status emerged passively from Dartmouth's voluntary withdrawal rather than from competitive advocacy or stakeholder mobilization by the agricultural college itself. So, this was driven by luck (both parties exhibited little agency).**	• Johnson (1956); Sorber (2018) • The University of New Hampshire website • New Hampshire College: The State School in Hanover
• *Ohio State University* (founded in 1870)	• Initially, Ohio's existing public universities—Ohio University and Miami University—competed vigorously to secure land-grant status. • Newly elected Republican Governor Rutherford B. Hayes intervened decisively, advocating for a completely new institution near the state legislature in Columbus rather than dividing funds among existing schools.	• Goerler (2011); Knight and Commons (1891)

• Miami University (founded in 1809) • Ohio University (founded in 1804)	• Hayes viewed this as an opportunity to create something innovative rather than reinforcing established institutions. His successful advocacy resulted in the 1870 founding of Ohio Agricultural and Mechanical College (later Ohio State University). • **Ohio University and Miami University could have become land-grant universities but Governor Hayes intervened. As Ohio State University had little agency, the land-grant status was driven mainly by luck.**	
• *Virginia State University* (founded in 1882) • Hampton University (founded in 1868)	• Federal land-grant funding was previously allocated to Hampton Institute from 1872 to 1920. • After White leaders instituted segregation in Virginia's 1902 constitution, the liberal arts program at Virginia Normal and Collegiate Institute (now Virginia State University, VSU) was eliminated: Southern White leaders generally opposed classical liberal education for Black citizens, preferring industrial and agricultural training that would not challenge the racial hierarchy. Virginia State University was forced to refocus on normal and industrial education. • The 1902 forced reorientation toward "normal and industrial" education inadvertently made Virginia Normal eligible to receive Black land-grant funding. In 1920, the land-grant designation transferred from Hampton Institute to Virginia Normal and Industrial Institute—a decision imposed by state authorities rather than pursued by VSU itself. The institution exhibited no agency in securing this status; it was a consequence of externally mandated curricular changes driven by segregationist policies. • **Neither Hampton or VSU possessed agency in this situation. So, the land grant was driven by luck.**	• Betts (2013); Davis (2014); Dean (2023) • Virginia State University history webpage • Hampton University report • The History of Virginia State University • Hampton University Britannica page
• *Mississippi State University* (founded in 1878) • University of Mississippi (founded in 1848)	• The state legislature accepted the terms of the Morrill Act by decreeing that two-fifths to the University of Mississippi and three-fifths to establish Alcorn University—the nation's first Black land-grant college (and the university remains a historically Black college and university, now known as Alcorn State University). • The University of Mississippi's agriculture department and the resulting program failed to interest students and closed after four years. It abandoned the land grant. Local chapters of the Grange were determined to establish a land-grant school for Whites in Mississippi and lobbied the legislature to create the Agricultural and Mechanical College of the State of Mississippi (now Mississippi State University). • **While Mississippi State did not have agency as it did not exist, the University of Mississippi relinquished the status (and not to exercise agency). Hence, it was driven by luck.**	• Ballard (2008); Mississippi Encyclopedia (2025); Sansing (1999)
• *North Carolina State University* (founded in 1887) • University of North Carolina at Chapel Hill (founded in 1789)	• University of North Carolina at Chapel Hill (UNC Chapel Hill) received the designation in 1866 but interpreted the Morrill Act's phrase "branches of learning as are related to agriculture" to mean they could teach chemistry and biology as subjects "related" to agriculture without teaching actual agriculture. The university continued prioritizing classical liberal arts, maintaining that Latin and Greek were required, which the university president Battle later wrongly claimed the Morrill Act mandated. • President Battle (1912: 377) of the UNC Chapel Hill said: "What was the effect of the legislation in regard to the University? The loss of $7,500 a year was a serious matter but it had its compensations. (a) It relieved us of the charge that we were defrauding the farmers and mechanics, thereby creating much odium against us. (b) It enabled us to avoid the scandal of having a low standard of admission, which was necessary for those intending to pursue the "branches of learning relating to agriculture and mechanic arts." Our critics used this to support the charge that we did not have a true University. (c) It enabled us to develop the institution along the lines of the most approved universities–Harvard, Yale, Columbia, Princeton, without being embarrassed by the constant demand to build stables and workshops, buy prize cattle and modern machinery. (d) It relieved us of the almost impossible task of governing in harmony bodies of students of diverse training, modes of work, aims in life." • Agricultural interests, led by the North Carolina Grange, documented that the University of North Carolina had diverted land-grant funds away from practical education, enrolled virtually no agricultural students between 1868-1885, and failed to develop meaningful agricultural research. • In response, state legislator Augustus Leazar sponsored the 1887 bill that established the North Carolina College of Agriculture and Mechanic Arts (now North Carolina State University, NCSU) in Raleigh. • **NCSU did not exercise agency via founders, whereas UNC Chapel Hill forwent its agency. It was a case of luck.**	• Battle (1912); Marcus (2015); McCarthy (2002); Sorber (2018) • Brick Layers: An Atlas of New Perspectives on NC State's Campus History • Teaching note on The 1862 Land-Grant Colleges
• *University of Connecticut* (founded in 1881) • Yale University (founded in 1701)	• Yale University's Sheffield Scientific School became Connecticut's first land-grant institution in 1863. • The Connecticut State Grange criticized Yale's (1) high admission standards (Latin and trigonometry), (2) lack of a university farm, (3) "classical college" approach (e.g., teaching farmers French and German), and (4) Poor return on investment (only 7 agricultural graduates in 24 years at $25,700 per student or $725,000 today) • J.H. Hale's influential 1886 Grange report catalyzed the "Yale-Storrs Controversy". • Storrs Agricultural School, founded in 1881, was struggling but became the focus of Grange advocacy. • The 1887 Hatch Act created a temporary compromise by splitting agricultural experiment station funding. • Connecticut legislature officially transferred land-grant status to Storrs in 1893. • Yale sued for damages, winning $154,604 in compensation (in 1896). • The court ruled that land grants belonged to states, not institutions, allowing Connecticut to reassign the designation. To the University of Connecticut **While there was little agency for UConn (grangers are allies not main owners), Yale also demonstrated agency. This was a combination of luck and serendipity.**	• Sorber (2018); Stemmons (1931) • The Yale-Storrs Controversy • UConn Today • When Yale was a farming school
• *University of Rhode Island* (founded in 1892) • Brown University (founded in 1764)	• Brown University initially received Rhode Island's land-grant designation in 1863 but struggled to develop effective agricultural education. The university relied on a reluctant natural history museum curator to deliver agricultural lectures and field trips, while the state's scholarship allocation system favored urban students rather than developing farmers. • When the 1887 Hatch Act permitted funding agricultural experiment stations separate from existing colleges, the Rhode Island General Assembly established a competing agricultural school at Kingston. • Brown fought to retain its land-grant status through multiple legal challenges. After initially offering to relinquish its designation in 1890, Brown reversed course when the Second Morrill Act promised increased funding. The state legislature formally transferred the land-grant status to the Rhode Island College for Agricultural and Mechanical Arts (now University of Rhode Island, URI) in 1892, prompting Brown to sue unsuccessfully all the way to the U.S. Supreme Court, Ih refused to hear the case. Brown finally conceded In 1894, agreeing to repay $50,000 from land sales in exchange for $40,000 compensation for educating earlier scholars. **While URI did not have agency in this case, Brown exhibited some agency but failed. Thus, this was a combination of luck and serendipity.**	• Sorber (2018); Sullivan (2024); Tolman (1894) • University of Rhode Island history webpage • Legal case Brown v. RICA&M
• *University of Kentucky* (founded in 1865) • Transylvania University (founded in 1780)	• In 1865, John Bryan Bowman founded the Agricultural and Mechanical College as a department within the religiously controlled Kentucky University (formerly Transylvania University) to serve as Kentucky's land-grant institution. Concerns quickly emerged about federal land-grant funding supporting a church-affiliated institution, creating tension between denominational governance and state control requirements. Also, there was strong disagreement between Bowman and other leadership in regards to what should be taught at the college. • By 1877, Bowman's regency became increasingly arbitrary and financial management grew problematic—he refused to cooperate with ordered audits, leading to his suspension. A legislative investigating committee examined the books in January 1878, documenting irregularities. On March 13, 1878, the legislature severed the A&M College from Kentucky University, establishing it as an independent state-run institution (later University of Kentucky). The Board of Curators abolished Bowman's regency and ordered him to vacate the premises, ending the church's control over land-grant funds. **While the newly founded University of Kentucky did not have agency, Transylvania University had. Thus, it was a combination of luck and serendipity.**	• Kiesel (2003); McVey (1949); Sorber (2018) • John Bryan Bowman • The University of Kentucky website • The University of Kentucky history

TABLE 2 Data sources and variable measurements

Category	Variable	Data source	Variable measurement
Dependent variable	Discipline year of setup	• University catalogues, registries, yearbooks, and historical archives: Willamette, Oregon State, U South Carolina (part), U Connecticut, Yale, U New Hampshire, Miami University, U Rhode Island, Hampton, U Kentucky, Mississippi State, UNC Chapel Hill, Dartmouth, U Kansas, Virginia State • University websites for all departments	Whether a department was established (=1 if yes, 0 = no) • Agriculture • Mechanic arts/engineering (including computer science) • Business • Law • Medicine • Education • Policy • Economics • Sociology • Political science • Psychology
	Ranks of specific disciplines	America's Best Graduate Schools from the U.S. News & World Report for all rankings except for agriculture U.S. News & World Report's Best Global Universities Ranking for agriculture rankings	US News ranks of: • Agriculture • Engineering • Computer science • Business • Law • Medicine • Education • Policy • Economics • Sociology • Political science • Psychology
Independent variables	Chance elements	Sources are in Table 1	• Luck (=1 if yes, 0 = no) • Luck and serendipity (=1 if yes, 0 = no) • Serendipity (=1 if yes, 0 = no)
Control variables	Leadership	President's background	A&M background (=1 if yes, 0 = no)
	University age	University websites	Age of the university
	Membership in AAU	University websites, AAU website and Google search	Whether the focal university is an AAU member (=1 if yes, 0 = no)
	Privately endowed	University websites and Google search	Whether the focal university is a privately endowed university (=1 if yes, 0 = no)
	Enrollment	• University catalogues, registries, yearbooks, and historical archives: Willamette, Oregon State, U South Carolina (part), U Connecticut, Yale, U New Hampshire, Miami University, U Rhode Island, Hampton, U Kentucky, Mississippi State, UNC Chapel Hill, Dartmouth, U Kansas, Virginia State • University websites: Auburn, Virginia Tech, U Alabama, U Virginia, U South Carolina (part), Ohio University, Brown, Transylvania, U Mississippi, North Carolina State, North Dakota State, U North Dakota, Clemson, Kansas State, Ohio State • Integrated Postsecondary Education Data System (IPEDS) for 2001 and after	Logarithm of student enrollment + 1 (as some universities in the U.S. South did not enroll students, such as the University of Alabama)
	GSP per capita	U.S. Census Bureau and BEA. North Dakota was admitted to the Union in 1889, but the University of North Dakota already existed. I used the most adjacent 1890 values for the years 1884 to 1888.	Logarithm of GSP
	Population size		Logarithm of population size

TABLE 3 Summary statistics and correlation matrix

Variable	No. Obs.	Mean	Std. dev.	1	2	3	4	5	6	7	8	9
1. Ranking - agriculture	319	239.621	126.864	1								
2. Ranking - mechanic arts	580	49.629	16.335	-0.023	1							
3. Ranking - business	580	46.945	19.951	-0.219	0.563	1						
4. Ranking - law	580	114.840	72.952	-0.419	0.199	0.476	1					
5. Ranking - medicine	580	44.366	16.086	-0.258	0.682	0.764	0.419	1				
6. Randing - education	580	59.862	31.834	0.329	0.392	0.312	0.392	0.224	1			
7. Ranking - public policy	540	48.780	22.226	0.166	0.426	0.382	0.413	0.431	0.459	1		
8. Ranking - economics	580	33.771	13.099	-0.206	0.795	0.496	0.276	0.694	0.296	0.375	1	
9. Ranking - sociology	580	30.260	9.280	-0.053	0.628	0.562	0.367	0.677	0.418	0.482	0.774	1
10. Ranking - political science	580	31.069	11.328	-0.160	0.684	0.642	0.460	0.737	0.399	0.487	0.847	0.884
11. Ranking - psychology	580	52.431	28.049	-0.089	0.513	0.612	0.435	0.816	0.255	0.439	0.511	0.556
12. Luck	4,482	0.163	0.370	0.046	-0.064	0.067	0.161	0.093	-0.039	0.096	0.032	-0.019
13. Luck and serendipity	4,482	0.097	0.296	0.066	0.143	0.143	-0.275	0.157	-0.158	-0.136	0.102	0.117
14. Serendipity	4,482	0.199	0.399	-0.195	0.214	0.294	0.496	0.239	0.125	0.342	0.152	0.176
15. Presidents with an A&M background	4,482	0.210	0.407	-0.104	0.141	0.277	0.261	0.289	0.146	0.280	0.286	0.280
16. University age	4,482	104.638	62.358	0.151	-0.212	-0.545	-0.305	-0.555	0.310	-0.159	-0.339	-0.262
17. AAU membership	4,482	0.251	0.434	-0.105	-0.402	-0.707	-0.413	-0.649	-0.241	-0.495	-0.400	-0.479
18. Privately endowed	4,482	0.145	0.353	0.157	-0.303	-0.427	0.059	-0.488	0.351	-0.082	-0.394	-0.149
19. Number of students (logged)	4,482	7.847	1.892	-0.415	0.194	0.215	-0.260	0.307	-0.308	-0.073	0.303	0.043
20. GSP per capita (logged)	4,482	2.111	1.008	-0.013	0.180	-0.156	-0.145	0.041	0.220	-0.181	0.215	0.191
21. Population (logged)	4,482	14.518	0.923	-0.111	-0.116	-0.183	-0.347	-0.053	-0.425	-0.238	0.041	-0.223

Variance	10	11	12	13	14	15	16	17	18	19	20	21
10. Ranking - political science	1											
11. Ranking - psychology	0.586	1										
12. Luck	-0.048	0.080	1									
13. Luck and serendipity	0.110	0.095	-0.145	1								
14. Serendipity	0.165	0.279	-0.005	-0.163	1							
15. Presidents with an A&M background	0.266	0.287	0.075	0.169	0.226	1						
16. University age	-0.322	-0.460	-0.222	-0.167	-0.238	-0.240	1					
17. AAU membership	-0.448	-0.688	-0.044	-0.190	-0.288	-0.248	0.383	1				
18. Privately endowed	-0.234	-0.406	-0.182	-0.135	-0.205	-0.192	0.560	0.475	1			
19. Number of students (logged)	0.072	0.196	0.061	0.065	0.008	-0.008	0.573	0.111	-0.070	1		
20. GSP per capita (logged)	0.160	-0.036	-0.023	0.028	-0.014	-0.062	0.451	0.057	0.022	0.365	1	
21. Population (logged)	-0.227	-0.067	0.132	-0.067	-0.072	-0.076	0.355	-0.040	-0.252	0.542	0.236	1

TABLE 4 Single-event cox proportional hazard model of discipline development of 29 American universities (1862–2024)

Discipline	Agriculture	Mechanic arts	Business	Law	Medicine	Education	Policy	Economics	Sociology	Political Science	Psychology
Column	1	2	3	4	5	6	7	8	9	10	11
Luck	0.189	0.567	-0.373	-0.614	-2.522	-0.454	-1.149	-3.216	-1.960	-0.911	-0.146
	(0.008)	(0.042)	(0.605)	(0.051)	(0.026)	(0.054)	(0.019)	(0.000)	(0.029)	(0.021)	(0.824)
Luck and serendipity	0.561	1.332	0.453	0.062	-1.324	0.011	-0.492	-1.867	-1.756	0.023	0.601
	(0.046)	(0.015)	(0.585)	(0.621)	(0.166)	(0.991)	(0.637)	(0.072)	(0.057)	(0.980)	(0.450)
Serendipity	1.452	3.025	0.408	1.223	1.133	0.043	2.400	1.263	1.079	0.368	2.343
	(0.034)	(0.000)	(0.544)	(0.030)	(0.012)	(0.048)	(0.037)	(0.082)	(0.009)	(0.060)	(0.057)
President with an A&M	0.989	-0.939	-0.340	-0.857	-0.306	-0.661	-0.326	-0.264	0.328	-0.956	-1.157
discipline background	(0.156)	(0.181)	(0.550)	(0.400)	(0.632)	(0.277)	(0.700)	(0.698)	(0.606)	(0.121)	(0.069)
University age	-0.024	-0.011	0.010	0.022	0.011	-0.001	-0.007	-0.017	-0.009	-0.005	-0.014
	(0.172)	(0.362)	(0.356)	(0.108)	(0.415)	(0.895)	(0.634)	(0.082)	(0.450)	(0.643)	(0.178)
AAU membership	-1.780	2.179	0.139	1.069	0.354	0.547	-0.296	3.763	0.760	1.243	-0.099
	(0.066)	(0.006)	(0.836)	(0.161)	(0.635)	(0.444)	(0.723)	(0.000)	(0.223)	(0.079)	(0.876)
Privately endowed	4.464	4.004	-3.118	-4.026	-1.760	1.046	1.768	-1.064	2.178	1.420	1.648
	(0.007)	(0.002)	(0.030)	(0.024)	(0.271)	(0.441)	(0.399)	(0.465)	(0.043)	(0.255)	(0.252)
Number of students (logged)	0.231	0.173	0.359	0.212	0.755	0.059	1.096	0.191	0.612	0.759	1.049
	(0.019)	(0.041)	(0.025)	(0.041)	(0.030)	(0.084)	(0.040)	(0.056)	(0.049)	(0.033)	(0.007)
GSP per capita (logged)	1.243	-0.006	-0.690	-1.101	-1.013	-1.143	3.664	-1.409	-0.443	-0.305	0.309
	(0.025)	(0.990)	(0.366)	(0.104)	(0.099)	(0.156)	(0.012)	(0.034)	(0.492)	(0.579)	(0.663)
Population (logged)	0.831	-0.074	-0.079	-0.296	-0.549	1.410	-0.641	-1.305	0.025	-0.492	-0.483
	(0.036)	(0.837)	(0.820)	(0.484)	(0.214)	(0.004)	(0.074)	(0.003)	(0.946)	(0.166)	(0.182)
Proportionality test—null: proportionality holds	$p = 0.263$	$p = 0.804$	$p = 0.796$	$p = 0.689$	$p = 0.187$	$p = 0.208$	$p = 0.992$	$p = 0.948$	$p = 0.695$	$p = 0.875$	$p = 0.169$
H3: Serendipity – luck (Wald test)	***p* = 0.029**	***p* = 0.043**	***p* = 0.074**	***p* = 0.044**	***p* = 0.019**	***p* = 0.014**	***p* = 0.036**	***p* = 0.038**	***p* = 0.026**	***p* = 0.068**	***p* = 0.057**
Number of observations	1,712	883	2,086	2,306	2,054	1,758	3,630	1,686	1,455	1,595	1,911
Adjusted R^2	0.148	0.201	0.095	0.146	0.189	0.125	0.203	0.237	0.179	0.185	0.124

Note: Standard errors are clustered at the university level and the corresponding p values are reported in parentheses.

TABLE 5 Random-effects ordered Probit model of discipline rankings of 29 American universities (1996–2024)

Discipline	Agriculture	Mechanic arts	Business	Law	Medicine	Education	Policy	Economics	Sociology	Political Science	Psychology
Column	1	2	3	4	5	6	7	8	9	10	11
Luck	-79.470	-15.400	0.077	63.582	15.055	8.748	9.719	2.972	7.066	1.801	14.808
	(0.000)	(0.071)	(0.992)	(0.024)	(0.000)	(0.163)	(0.476)	(0.052)	(0.013)	(0.676)	(0.013)
Luck and serendipity	-75.897	-28.387	-4.118	30.548	10.610	6.183	3.329	0.889	6.253	0.596	-10.933
	(0.002)	(0.039)	(0.068)	(0.259)	(0.000)	(0.317)	(0.802)	(0.877)	(0.282)	(0.912)	(0.062)
Serendipity	-128.700	-49.982	-9.752	-72.931	-7.983	-23.620	-16.070	-4.622	-6.883	-3.391	-28.629
	(0.011)	(0.022)	(0.081)	(0.037)	(0.002)	(0.002)	(0.034)	(0.031)	(0.014)	(0.043)	(0.000)
President with an A&M	-1.319	-0.975	-0.519	0.998	0.080	1.247	5.000	3.075	1.514	1.621	-0.928
discipline background	(0.934)	(0.445)	(0.478)	(0.576)	(0.929)	(0.581)	(0.000)	(0.001)	(0.005)	(0.006)	(0.648)
University age	1.535	0.125	0.046	-0.470	-0.203	0.326	-0.011	0.176	0.226	0.170	-0.285
	(0.000)	(0.022)	(0.555)	(0.031)	(0.000)	(0.000)	(0.934)	(0.003)	(0.000)	(0.001)	(0.000)
AAU membership	-26.925	-11.970	-27.160	-107.144	-19.600	-51.468	-39.602	-10.012	-14.941	-12.218	-44.042
	(0.205)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.015)	(0.000)	(0.002)	(0.000)
Privately endowed	-181.022	-18.897	-13.765	211.034	7.490	32.932	60.839	-20.129	-7.282	-16.789	19.135
	(0.000)	(0.021)	(0.305)	(0.000)	(0.148)	(0.009)	(0.008)	(0.022)	(0.377)	(0.033)	(0.110)
Number of students (logged)	-71.569	-23.974	-10.558	-24.928	-16.408	-28.618	-27.426	-18.553	-10.046	-13.537	-16.222
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
GSP per capita (logged)	-61.918	25.934	14.031	13.361	31.241	35.127	5.261	19.493	5.007	14.956	45.668
	(0.088)	(0.000)	(0.000)	(0.099)	(0.000)	(0.000)	(0.347)	(0.000)	(0.013)	(0.000)	(0.000)
Population (logged)	-30.381	-21.589	-14.091	26.306	-13.678	-26.255	2.831	-12.552	-3.818	-13.090	-13.228
	(0.001)	(0.000)	(0.001)	(0.038)	(0.000)	(0.000)	(0.701)	(0.000)	(0.151)	(0.000)	(0.001)
H2 and 3: Serendipity – luck (Wald test)	***p* = 0.066**	***p* = 0.010**	***p* = 0.020**	***p* = 0.040**	***p* = 0.083**	***p* = 0.079**	***p* = 0.032**	***p* = 0.094**	***p* = 0.025**	***p* = 0.052**	***p* = 0.049**
Number of observations	319	580	580	580	580	580	540	580	580	580	580
Adjusted R^2	0.275	0.495	0.353	0.109	0.525	0.409	0.291	0.586	0.550	0.660	0.293

Note: Standard errors are clustered at the university level and the corresponding p values are reported in parentheses.

TABLE 6 OLS (Column 1) and GMM estimation of student enrollment of 29 American universities (1862–2024)

Column	1	2	3	4	5	6
Luck	0.836					
	(0.039)					
Luck and serendipity	0.567					
	(0.068)					
Serendipity	0.293					
	(0.074)					
President with an A&M	1.695	-0.004	0.015	-0.003	0.001	0.002
discipline background	(0.069)	(0.741)	(0.355)	(0.913)	(0.955)	(0.900)
University age	0.016	0.003	0.005	0.002	0.003	0.003
	(0.370)	(0.000)	(0.000)	(0.095)	(0.000)	(0.000)
AAU membership	-0.575					
	(0.527)					
Privately endowed	1.621					
	(0.370)					
GSP per capita (logged)	1.184	-0.039	-0.054	-0.035	-0.038	-0.039
	(0.047)	(0.000)	(0.000)	(0.044)	(0.000)	(0.000)
Population (logged)	0.584	-0.015	-0.013	0.181	-0.028	-0.012
	(0.169)	(0.436)	(0.654)	(0.041)	(0.454)	(0.530)
Lagged student enrollment		0.913	0.878	0.917	0.935	0.909
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lagged student enrollment						0.013
× Luck						(0.015)
Lagged student enrollment						0.037
× Luck and serendipity						(0.019)
Lagged student enrollment						0.121
× Serendipity						(0.028)
intercept	-7.496	0.662	0.912	-1.902	0.842	0.624
	(0.246)	(0.010)	(0.024)	(0.102)	(0.108)	(0.015)
Number of observations	29	4,453	884	433	727	4,453

Note: Standard errors are clustered at the university level and the corresponding p values are reported in parentheses. Goodness of fit is not reported as these models are mean to correct for endogeneity. Time-invariant variables are dropped from the GMM estimations in Columns 2 to 6.

TABLE 7 Single-event survival analysis (exponential distribution) of discipline development of 29 American universities (1862–2024)

Discipline	**Agriculture**	**Mechanic arts**	**Business**	**Law**	**Medicine**	**Education**	**Policy**	**Economics**	**Sociology**	**Political Science**	**Psychology**
Column	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Luck	0.925	0.611	-0.749	-0.885	-2.933	0.492	-0.017	-1.463	-3.522	-0.608	-0.555
	(0.020)	(0.034)	(0.316)	(0.334)	(0.009)	(0.467)	(0.985)	(0.068)	(0.000)	(0.374)	(0.398)
Luck and serendipity	1.533	1.621	0.715	0.599	-2.025	0.399	1.095	-0.090	-2.434	-0.090	-0.107
	(0.055)	(0.036)	(0.397)	(0.587)	(0.039)	(0.685)	(0.286)	(0.920)	(0.023)	(0.921)	(0.895)
Serendipity	2.821	2.378	1.010	1.418	1.419	4.250	1.712	0.602	1.014	1.365	2.129
	(0.017)	(0.030)	(0.015)	(0.022)	(0.053)	(0.069)	(0.045)	(0.039)	(0.098)	(0.060)	(0.083)
H3: Serendipity – luck (Wald test)	***p* = 0.012**	***p* = 0.011**	***p* = 0.006**	***p* = 0.024**	***p* = 0.022**	***p* = 0.046**	***p* = 0.059**	***p* = 0.073**	***p* = 0.001**	***p* = 0.025**	***p* = 0.036**
Intercept	-12.350	-2.265	-10.418	-5.170	-5.763	-33.051	-11.835	2.548	-19.688	-6.440	-18.705
	(0.018)	(0.682)	(0.015)	(0.395)	(0.359)	(0.000)	(0.039)	(0.550)	(0.001)	(0.159)	(0.000)
Number of observations	1,712	883	2,086	2,306	2,054	1,758	3,630	1,686	1,455	1,595	1,911
Chi-squared	8.065	81.563	183.557	27.518	89.642	145.258	143.687	165.326	214.349	167.572	201.918

Note: Standard errors are clustered at the university level and the corresponding p values are reported in parentheses. Control variables are the same as those in Table 4, including president with an A&M discipline background (= 1 if yes), university age, AAU membership, privately endowed (= 1 if yes), number of students (logged), GSP per capita (logged), and Population (logged).