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Ten Years Hence: Business Angel Tax Credits, the Absent Employment Lift, and a Decade of Convergent Evidence

Kevin A. Schulte, Ph.D.

ORCID: https://orcid.org/0009-0005-1443-5368 · Correspondence: editor@undeterredpress.com · Version of record: undeterredpress.com/ten-years-hence

ABSTRACT

A 2016 doctoral dissertation employed a Campbell and Stanley dual-pair quasi-experimental design across matched state pairs to examine whether US state business angel tax credits produce the technology employment lift that constitutes their principal legislative intent. Across three independent treatment-control configurations (Kansas-Minnesota, LMM F = .026, p = .794; Wisconsin-Tennessee, F = .023, p = .879; and Wisconsin-Minnesota, p = .797), the null hypothesis of no employment effect was accepted at 95% confidence. Ten years later, the evidence base has grown decisively and convergently. Denes, Howell, Mezzanotti, Wang, and Xu (2023), publishing in the *Journal of Finance* across 31 US states using difference-in-differences methodology, confirm the null employment finding while identifying the mechanism: angel tax credits increase angel investment by approximately 18% but attract non-professional, inexperienced investors who provide capital without managerial support, producing crowding-out rather than net job creation. International evidence from the United Kingdom, Ireland, Germany, and Sweden sharpens the mechanism further: outcomes track the managerial engagement investors actually provide, and investor subsidies that attract inexperienced, unengaged investors produce the mal-investment signature predicted by Austrian Business Cycle Theory in 2016. Lerche (2025), in the *American Economic Review*, demonstrates that direct firm subsidies, bypassing the investor intermediary entirely, produce robust employment gains, completing the evidentiary picture. Meanwhile, the federal Angel Tax Credit Act has been introduced in Congress five times since 2014 without enactment, and over 30 states have collectively allocated more than $8.1 billion to these programs since 1989 (Denes et al., 2023), a decade of compounding null evidence notwithstanding. This article argues that the persistence is structural, not accidental.

Keywords: Angel tax credits, angel investor tax credits, investor tax credit, angel financing, entrepreneurship policy, entrepreneurial finance, government subsidy, technology employment, quasi-experimental design, difference-in-differences, inexperienced investors, crowding out, supply-side economics, Austrian Business Cycle Theory, mal-investment, policy persistence

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Introduction

In July 2024, Senator Christopher Murphy introduced the Angel Tax Credit Act (S.4809) in the United States Senate, the fifth time substantially identical legislation had been introduced since 2014, and the eighteenth month after the *Journal of Finance* published the most comprehensive study to date on the question of whether angel tax credits achieve their stated purpose, concluding that such credits produce no significant entrepreneurial or employment impact across 31 states (Denes et al., 2023). The legislative record is not an anomaly. It is a pattern, and patterns of this kind invite explanation.

The central question addressed by this article is one that ought to have a simple answer by now: do business angel tax credits create the technology employment that constitutes their primary legislative justification? The question was examined rigorously in a 2016 doctoral dissertation at Saint Louis University (Schulte, 2016), confirmed by the field's flagship finance journal seven years later (Denes et al., 2023), validated by independent international evidence from Germany, Ireland, and Sweden across a comparable time horizon, and yet the policy continues uninterrupted, expanding rather than contracting, at both the federal and state levels. Senator Murphy's 2024 bill, introduced eighteen months after the *Journal of Finance* null finding, has not advanced. The policy proceeds regardless.

This article serves three purposes. First, it establishes the retrospective convergence of evidence, placing the 2016 dissertation findings into explicit dialogue with a decade of subsequent scholarship in a way that neither the 2016 study nor any subsequent study has done in consolidated form. Second, it refines the mechanism beyond a simple null finding. The 2016 study concluded that the evidence was consistent with Austrian Business Cycle Theory's prediction of mal-investment; international evidence from Germany (Berger & Gottschalk, 2025) and Ireland now confirms the precise investor-level dynamics that produce the null, and Lerche's (2025) *American Economic Review* findings identify the policy instrument that actually achieves what angel tax credits claim to achieve. Third, the article uses that mechanism to explain why the policy persists despite the evidence, an explanation that is structural rather than epistemological.

A methodological observation merits early statement. The 2016 dissertation was completed and submitted to ProQuest in 2016, predating by three years the working paper literature that eventually produced Denes et al. (2023). The two studies are structurally independent: they employ different quasi-experimental frameworks, different treatment and control group configurations, different

dependent variable operationalizations, and draw on different analytical traditions. Their convergence on the same null finding is not a corroboration within a methodological tradition. It is an independent replication across methodological traditions. Under the triangulation framework articulated by Lawlor, Tilling, and Davey Smith (2016), which defines triangulation as the strengthening of causal inferences by integrating results from different approaches with different and largely unrelated sources of potential bias, this convergence constitutes a meaningfully stronger evidentiary claim than either study alone could advance. That is the evidentiary foundation on which this retrospective rests.

Carpentier and Suret's earlier work informed the 2016 dissertation directly: their 2007 study was part of the literature the dissertation engaged with and cited during its review of prior tax-incentive evaluations, a genuine scholarly debt this article records plainly. A further, more striking instance involves their subsequent work. In 2016, the same year the dissertation underlying this article was completed, Carpentier and Suret published a comprehensive international literature review, "The Effectiveness of Tax Incentives for Business Angels," as a chapter in the *Handbook of Research on Business Angels*. Working independently, using an entirely different method (systematic review of the global literature rather than primary quasi-experimental research) and reviewing an entirely different evidentiary base (international tax incentive programs broadly rather than US state angel tax credits specifically), Carpentier and Suret reached the same skeptical conclusion in the same calendar year: "there is very limited evidence that tax incentives for [business angels] are effective, with tax expenditures generally being higher than the tax revenues that are generated by the investments." They attribute the failure to poor program design, an explanation this article's later sections independently arrive at as well, through the Engagement Hypothesis developed below. Carpentier and Suret's 2016 chapter reflects no awareness of the dissertation, an unpublished document with no public circulation at the time; the reverse cannot be stated with equal certainty, since a working-paper or conference version of the chapter may have circulated in advance of formal publication and could plausibly have been among the literature reviewed. Even allowing for that uncertainty, the finding was reached through a different method, addressing a different evidentiary base, in the same calendar year the question was first rigorously posed in a US state context, a genuinely unusual coincidence of timing worth stating plainly rather than passing over.

The 2016 Study: Design and Findings

Research Context and Prior Literature

The research was conducted at Saint Louis University and completed in 2016, examining whether business angel tax credits (offered at the time by approximately 26 US states at rates ranging from 25% to 50% of the invested amount, with a modal credit rate of 35%) produce incrementally new technology jobs as their principal legislative intent specifies (Schulte, 2016). The policy premise is straightforward on its face: by reducing the effective cost of capital to early-stage investors, the state creates an incentive that expands the supply of angel investment, which flows to early-stage technology firms, which hire technology workers, which generate the tax revenues that justify the

foregone tax revenue represented by the credit. Each link in that chain is a testable proposition. The 2016 study tested the terminal link, the employment outcome, which prior evaluations had systematically avoided.

The prior program evaluation literature had, with remarkable consistency, deflected from job creation as the primary dependent variable into tangential cost-benefit proxies: the level of funds invested in program-approved companies, taxes collected as a multiple of taxes distributed, the number of angel groups formed in the state, and entrepreneurs per capita. These evaluations were conducted primarily by compensated program evaluators (organizations and consultants whose continued employment depended on producing findings favorable to the programs they assessed) and suffered from a near-universal absence of control groups, adequate sample sizes, and appropriate longitudinal design. The absence of control groups is not a minor methodological limitation; it renders causal attribution analytically impossible. Without a counterfactual, a comparison of what would have happened to technology employment in the absence of the credit, any employment growth near the credit period can be claimed as program success. The 2016 study characterized this evaluative dynamic as "Shoot Anything That Flies; Claim Anything That Falls": a pattern in which any positive economic outcome occurring within temporal proximity of the credit period is claimed as program success regardless of whether a credible causal connection to the credit can be established.

Theoretical Framework

The 2016 study was grounded in two complementary theoretical frameworks positioned as competing predictions against which the empirical evidence would adjudicate. Supply-side economic theory (Laffer, 1981) posits that reducing the effective cost of capital to investors stimulates investment in early-stage firms, expanding productive capacity and creating new employment, the mechanism underlying the legislative rationale for angel tax credits. Angel tax credits are, in this sense, a direct descendant of the broader supply-side tradition that shaped federal tax policy from the 1980s onward: a targeted, narrower instrument applying the same underlying logic, that reducing the tax burden on a specific class of economic actor will unlock enough additional activity to justify the foregone revenue, to a single investor class rather than to the tax code as a whole. The prediction of this framework, applied to the angel tax credit context, is that credits should produce measurably positive technology employment outcomes relative to states without such credits.

Austrian Business Cycle Theory (Garrison, 2004; Engelhardt, 2012), however, provides the cautionary counterargument: that subsidized capital expansion without quality filtering distorts markets by attracting marginal entrepreneurs and investors during the credit period, investors and firms that would not have entered the market absent the subsidy, and that may lack the capability to deploy capital productively. This phenomenon, referred to as mal-investment, results in firms that achieve temporary employment growth but are predestined for failure as the underlying economics reassert themselves. Greenwald and Stiglitz (1987) established the theoretical basis for understanding how information asymmetries distort capital allocation in early-stage firm financing, a dynamic that angel tax credits may exacerbate rather than resolve by subsidizing investors irrespective of their informational quality or engagement capacity. The Austrian framework's prediction went beyond

simple failure: it anticipated a characteristic fingerprint of short-term employment growth without long-term sustainability, elevated firm failure rates, and capital directed to economically marginal uses. The 2016 study positioned these frameworks as competing predictions; the evidence, as documented below, adjudicated decisively in favor of the Austrian account.

A methodological caveat is owed here regarding the scope of this framework. Austrian Business Cycle Theory, in its classical Mises-Hayek formulation, is a macroeconomic theory concerned with central bank credit expansion, interest-rate distortion, and malinvestment across an economy's aggregate capital structure. In its original domain, it is not a theory of targeted, microeconomic subsidy programs directed at a narrow investor class. Its application here extends the theory's core insight, that capital insulated from market discipline tends toward misallocation, to a considerably narrower context than the theory was originally built to address. This extension is defensible, and the empirical record documented throughout this article is consistent with it, but it should be stated plainly rather than left for a reader to discover unstated. Notably, the same predicted mechanism does not require Austrian theory to derive. Mainstream information economics, specifically the adverse selection and credit rationing framework of Stiglitz and Weiss (1981) and the extension in Greenwald and Stiglitz (1987) already discussed above, predicts an equivalent outcome through an entirely conventional, non-heterodox route: subsidized capital, allocated without a market-based screening mechanism, will tend to flow disproportionately toward less-informed or lower-quality participants because the subsidy removes the price signal that would otherwise perform that screening function. Stiglitz was awarded the Nobel Memorial Prize in Economic Sciences in 2001 specifically for this body of work on markets with asymmetric information, placing this second theoretical route about as far from heterodox economics as the discipline allows. That two theoretically independent, and at times explicitly rival, traditions (one heterodox, one squarely mainstream and Nobel-recognized) converge on the same prediction is a form of theoretical triangulation analogous to the empirical triangulation this article documents throughout, and it means the argument's validity does not rest on acceptance of Austrian macroeconomics specifically.

Research Design

The research employed a longitudinal pretest-posttest with control group quasi-experimental design, what Campbell and Stanley (1963) describe as one of the strongest available designs for controlling internal validity threats including history, maturation, testing, instrumentation, regression to the mean, and selection-maturation interaction. The design's strength derives from the pretest-posttest structure, which allows the researcher to establish baseline equivalence between treatment and control groups before the treatment is administered, and from the inclusion of matched control groups, which provides the counterfactual necessary for causal attribution.

Two treatment states were selected based on the enactment of angel tax credit legislation with a clearly identifiable effective date. Kansas enacted a 50% angel tax credit effective January 1, 2005. Wisconsin enacted a 25% credit concurrently. These states were selected because their credit

enactment dates were sufficiently recent at the time of study to permit adequate post-treatment observation periods while remaining sufficiently historical to allow full-arc observation, including through the 2007-2009 recession.

Control states were selected through a systematic Pearson correlation analysis of pre-treatment technology employment levels across all states without angel tax credits during the pre-treatment period of 2002 through 2004. States without state income taxes were eliminated from consideration (Alaska, Florida, Nevada, South Dakota, Texas, Washington, and Wyoming), as the structural difference in tax environment would confound comparison. Minnesota was selected as Kansas's control state ($r = .92$, $p < .05$) and Tennessee was selected as Wisconsin's control state ($r = .98$, $p < .05$). All four states, Kansas, Minnesota, Wisconsin, and Tennessee, are located in the central United States with natural amenities rankings in the bottom 50th percentile as classified by the USDA Economic Research Service, minimizing the well-documented spatial amenity effects on technology employment that could confound a cross-regional comparison (Haltiwanger, Jarmin, & Miranda, 2010). The outcome variable was technology employment as reported by the Bureau of Labor Statistics Occupational Employment Statistics survey, operationalized at the state level across the full study period. Study periods were 2002 through 2010 for the Kansas-Minnesota pairing and 2002 through 2014 for the Wisconsin-Tennessee pairing, providing sufficient time series to capture the median 30-month gestation period for technology firms, normal year-over-year firm death rate deviations, and the complete arc of the 2007-2009 recession and recovery.

Covariate Handling and Microeconomic Shock Correction

The original causal model included Gross State Product and population as covariates to control for economic cycling and the well-established relationship between population and employment levels documented by Fisher (1981), Greenwood (1985), and Trendle (2009). A Pearson correlation analysis of the covariate structure revealed near-perfect multicollinearity between Gross State Product and population ($r = .98$) for both pairings, necessitating removal of Gross State Product from the model. Population was retained as the sole covariate, consistent with the extensive literature establishing population as a strong independent predictor of employment growth and the established methodological principle that collinear predictors in a regression model produce unstable coefficient estimates that obscure rather than illuminate the relationship of interest.

A significant microeconomic event in Kansas required explicit addressing before analysis could proceed. In early 2005, Sprint consummated its merger with Nextel Communications. Sprint's world headquarters in Overland Park, Kansas employed approximately 16,000 STEM workers at the time of the merger. The subsequent merger integration process and progressive headquarters relocation to Reston, Virginia resulted in an estimated loss of approximately 3,150 technology jobs in Kansas by observation period six, approximately 5% of total STEM employment in the state, attributable to corporate merger mechanics rather than to any treatment or control condition. This event constitutes precisely the type of history threat that Campbell and Stanley (1963) identify as a primary internal validity risk in quasi-experimental designs. Regression imputation at sig.05 was conducted to correct this historical invalidity, producing the corrected employment trajectory equation $Y = 55{,}375 + 958X$

+ ε, where X represents the 15 study periods and Y is technology employment. The corrected dataset was visualized using sixth-order polynomial trend curves for all four states, revealing clear cyclical patterns and long-term positive trends consistent with national technology employment trajectories across subjects, without the artificial depression introduced by the Sprint-Nextel event.

Results

Between-subjects Linear Mixed Model analyses conducted at 95% confidence produced definitive results across all three independent treatment-control configurations. For the Kansas-Minnesota pairing controlling for population, the test of the treatment effect produced F = .026 (p = .794): insufficient evidence to reject the null hypothesis of no employment effect. For the Wisconsin-Tennessee pairing, the equivalent analysis produced F = .023 (p = .879): again insufficient to reject the null. The dual-pair design's central methodological strength, the ability to interchange treatment and control subjects to verify findings and guard against Type I error, was exercised by pairing Wisconsin with Minnesota (r = .90, p = .036), producing p = .797: a third independent null. Three structurally independent configurations, each arriving at the same conclusion.

MANOVA analyses confirmed that the level of tax credit (25% in Wisconsin versus 50% in Kansas) had no significant differential effect on technology employment outcomes (H02 accepted, sig.05). A narrow exception warrants precise characterization: during the 2007-2009 recession period only, Kansas's 50% credit showed marginal evidence of technology job retention at sig.10, not job creation, not at the pre-specified significance threshold, and contingent on legislators' ability to anticipate recessions with sufficient lead time to design a credit response before the recession arrives, which the study deemed analytically implausible as a basis for policy design. The preponderance of evidence across all configurations, all outcome variables, and the pre-specified significance threshold obligated accepting both null hypotheses.

Key Finding, 2016 Dissertation. Across three independent quasi-experimental configurations, Kansas vs. Minnesota, Wisconsin vs. Tennessee, and Wisconsin vs. Minnesota, business angel tax credits showed no statistically significant effect on technology employment at 95% confidence. The null was not a borderline finding: the p-values ranged from .794 to .879, far exceeding the .05 threshold for rejection. The evidence was consistent with the Austrian Business Cycle Theory prediction of mal-investment.

The Mechanism Proposed

The 2016 study concluded that the evidence was consistent with Austrian Business Cycle Theory's prediction of mal-investment: angel tax credits appeared to expand the supply of investment capital without ensuring the quality of either the capital or the investor, potentially drawing in marginal investors during the credit period who provided capital without the hands-on managerial involvement that characterizes high-quality angel investment and that the empirical angel investment literature identifies as the primary value-creation mechanism beyond the capital itself. The mechanism was asserted theoretically in 2016 on the basis of the BCT framework and the pattern of the null findings;

the international literature would take a decade to provide the firm-level and investor-level empirical confirmation necessary to elevate it from theoretical interpretation to empirically confirmed mechanism. That confirmation is documented in the sections below.

A Decade of Policy Persistence: 2016–2026

The Federal Legislative Record

The federal legislative record on angel tax credits since 2016 is straightforward to characterize: uninterrupted introduction, uninterrupted failure to enact. The Angel Tax Credit Act has been introduced in Congress five times since 2014, with the most recent introduction occurring in July 2024 as S.4809, sponsored by Senator Christopher Murphy in the 118th Congress (Murphy, 2024). Each introduction has died in committee without a floor vote. The 2024 version carries a GovTrack-assessed probability of enactment of 0%. The bill's text is materially identical across all five versions: a credit against federal income tax for qualified equity investments in early-stage companies, with no engagement requirement, no active management condition, and no mechanism distinguishing between capital deployed with managerial involvement and capital deployed as a pure financial transaction.

The timing of the 2024 introduction is analytically notable. Senator Murphy introduced S.4809 in July 2024, eighteen months after Denes, Howell, Mezzanotti, Wang, and Xu published their definitive null finding in the *Journal of Finance* in November 2023 across 31 states. There is no evidence that the Denes et al. (2023) findings were reviewed, considered, or incorporated into the legislative record surrounding the 2024 introduction. The evidence base and the legislative activity exist in non-communicating parallel tracks. This is not an accusation of willful ignorance; it is an observation about the structural relationship between academic evidence and the organized legislative advocacy process, a point to which the article returns in the discussion of political economy below.

The State Legislative Record

At the state level, the decade from 2016 to 2026 presents a picture of broad continuation with isolated exits driven by budget mechanics rather than evidence review. Massachusetts repealed its angel tax credit in November 2024 under Chapter 238 of the 2024 Acts, citing program restructuring. Virginia's Joint Legislative Audit and Review Commission (JLARC) explicitly recommended in June 2022 that the General Assembly "consider eliminating the angel investment tax credit," citing research showing the credit had little impact on startup growth and was used disproportionately by inexperienced investors; Virginia's credit is set to expire after 2025. Iowa's Angel Investor Tax Credit was repealed effective July 1, 2025, following its third state-mandated evaluation in December 2024, though the repeal's stated rationale centered on program cost and utilization rather than an explicit finding of no employment effect. South Carolina's 35% credit lapsed December 31, 2025, when the legislature declined to renew it upon sunset. Minnesota's credit did not operate in 2018 or 2020 due to appropriations cap exhaustion, a mechanical interruption rather than a policy reversal. Meanwhile, Kentucky maintains a 40% credit, Maryland maintains a 50% biotechnology credit and a 33% broad-spectrum credit, and Wisconsin, one of the two original treatment states in the 2016 dissertation,

continues its 25% Qualified New Business Venture program without modification. More than 30 states are actively operating programs. No state has cited the Denes et al. (2023) *Journal of Finance* finding or the Schulte (2016) dissertation specifically as grounds for program elimination, though Virginia's JLARC cited its own independently commissioned research to the same effect. Of the four exits that have occurred or are scheduled, Virginia's is the clearest documented instance of a state's own research body citing evidence of program ineffectiveness as explicit grounds for a recommendation to eliminate; Massachusetts, Iowa, and South Carolina's exits were driven by legislative restructuring, cost/utilization concerns, and sunset clause mechanics respectively, without citing the academic evidence base.

The aggregate fiscal exposure across active state programs is estimated at approximately $2 billion annually in foregone tax revenues, based on available state budget disclosures and the range of credit rates and investment caps established by active programs. This is a substantial, ongoing fiscal commitment to a policy instrument whose primary stated purpose, technology job creation, has been examined rigorously in multiple independent studies across multiple methodological frameworks and found in each case to be unachieved.

The Political Economy of Persistence

The 2016 dissertation identified the structural reason for this persistence, and a decade of subsequent observation has confirmed it without meaningful exception. The pattern is a specific instance of the concentrated-benefits, diffuse-costs dynamic that Olson (1965) identified as a general feature of collective action problems in democratic policymaking: benefits flowing to a small, organized, highly motivated group will persist against a diffuse public cost even when the underlying policy is demonstrably ineffective, because the organized group has every incentive to mobilize and the dispersed public bears too small an individual cost to justify mobilizing against it. The beneficiary coalition for angel tax credit programs is concentrated, organized, and financially incentivized to defend the programs regardless of the evidence. Angel investors receive the subsidy directly and have clear financial motivation to maintain it. Compensated program evaluators, the consultancies and quasi-governmental organizations hired by state agencies to assess program effectiveness, have continued employment interests that are fundamentally misaligned with producing credible null findings. Minnesota's 2014 evaluation, conducted by a private consultancy retained by the state Department of Revenue, relied on self-reported investor and business surveys with no control group, and reported high investor-claimed additionality rates that no quasi-experimental or difference-in-differences design would be positioned to corroborate. Iowa's Department of Revenue conducted three such evaluations between 2014 and 2024 using comparable self-report methodology, none employing a control group or counterfactual design capable of isolating a causal employment effect, exactly the "Shoot Anything That Flies" pattern the 2016 dissertation identified, now documented across two additional states and a full additional decade. State agency administrators overseeing angel tax credit programs have institutional interests in program continuation, as program elimination

would reduce their agencies' mandates and budgets. Paid legislative advocates representing the Angel Capital Association and state-level equivalents deploy professional resources in legislative contexts from which academic researchers are structurally absent.

The opposing coalition, the general public whose forgone tax revenues finance the subsidy, is diffuse, unorganized, and without the focused motivation to engage with arcane tax credit policy that might break the advocacy asymmetry. The academic evidence base, regardless of its quality or the prestige of its publication venue, has no organized political vehicle through which it reaches legislative deliberation. The result is a political equilibrium in which the organized coalition consistently prevails over the diffuse public interest, and in which academic evidence, including now a null finding in the *Journal of Finance*, one of the most prestigious finance journals in the world, has failed to penetrate legislative deliberation in nearly every documented case. Virginia's JLARC is the one clear exception: its own research body cited evidence explicitly, and the legislature allowed the credit's expiration to proceed rather than extending it, though whether that inaction constitutes deliberate evidence-based policy change or simple legislative inertia on a low-salience sunset provision remains difficult to establish with certainty from the public record. This is a political economy problem, not a policy evaluation problem, and it will not be resolved by stronger evidence alone.

Converging US Evidence: 2019–2025

Denes, Howell, Mezzanotti, Wang, and Xu (2023)

In 2023, Denes, Howell, Mezzanotti, Wang, and Xu published "Investor Tax Credits and Entrepreneurship: Evidence from U.S. States" in the *Journal of Finance* (78[5], 2621–2671), representing the most comprehensive examination of the angel tax credit question to date in the published academic literature. Using a staggered difference-in-differences framework, a panel regression approach that exploits variation in the timing of angel tax credit enactment across states to identify the causal effect of credit introduction, across 31 US states and multiple decades of data, the study examined the full range of entrepreneurial outcomes that angel tax credits are asserted to produce: employment growth, startup formation rates, successful exits, and patenting activity.

The central findings are clear. Angel tax credits increase angel investment by approximately 18%, the credits demonstrably move capital, as their proponents claim. But that capital movement produces "no significant impact on entrepreneurial activity" across all outcome variables examined (Denes et al., 2023, p. 2621). The null effects are described as "economically small and statistically insignificant" across all specifications, subsamples, and robustness checks, language that leaves no room for the interpretive hedging that sometimes characterizes null findings in the empirical literature. The quality of angel-backed firms measurably deteriorates after credits are introduced, consistent with the adverse-selection prediction: the credits attract capital, but the marginal capital attracted is deployed into lower-quality investments. This is the crowding-out dynamic rather than the additionality dynamic that legislative supporters assume.

The Denes et al. (2023) finding on firm quality deterioration is particularly significant. It moves the evidentiary record beyond a simple null and into a mechanistic account: the credits actively degrade the quality of the investment population rather than simply failing to produce employment, suggesting that the marginal investor attracted by the credit is systematically less capable of identifying and supporting high-quality early-stage firms than the inframarginal investor who would have invested in the absence of the credit. This adverse selection at the investor level is what the 2016 dissertation's Austrian BCT framing predicted theoretically, and what the subsequent international literature confirms at the firm and investor levels empirically.

Methodological Triangulation

The methodological designs of the 2016 study and Denes et al. (2023) are structurally independent in the precise sense required by the triangulation framework articulated by Lawlor, Tilling, and Davey Smith (2016). The 2016 study employed a Campbell and Stanley dual-pair quasi-experimental design with matched control states and pre-specified control pairings established through correlation analysis conducted on pre-treatment data before any examination of outcomes, a design that requires the researcher to commit to the control group structure prior to observing the result, thereby preventing the post-hoc selection bias that contaminates many observational comparisons. Denes et al. (2023) used a staggered difference-in-differences panel regression across 31 states, a design that draws on the large-N panel regression tradition and identifies effects through variation in treatment timing across a much larger state sample than is practical in a dual-pair matched design.

These approaches share no structural assumptions. They draw on different analytical traditions, the small-N matched-pair tradition descended from Campbell and Stanley's (1963) quasi-experimental framework, and the large-N econometric panel tradition descended from the difference-in-differences literature. They have different potential sources of bias: the matched-pair design is vulnerable to incorrect control group selection, while the staggered DiD design is vulnerable to treatment timing endogeneity and parallel trends assumption violations. Their convergence on the same null finding, across independent data sources, independent analytical frameworks, and independent research teams, constitutes exactly the type of triangulated causal inference that Lawlor et al. (2016) identify as stronger than corroboration within a single methodological tradition.

A third, independent line of evidence approaches the question from a different direction entirely. Harrison, Bock, and Gregson (2020), publishing in the *Journal of Business Venturing Insights*, employ neither a quasi-experimental design nor a panel regression but a large-scale simulation of angel investment portfolio returns under real-world constraints of investment timing, termination, and reinvestment. Their conclusion, reached through a methodology structurally unrelated to either the 2016 study's matched-pair design or the Denes et al. (2023) panel regression, is that the impact of tax credits on angel investment returns is disproportionate relative to the policy rationale typically offered for their existence, and that several "stylised facts" commonly invoked to justify angel investment policy are not consistently supported by the underlying research base. This is a returns-and-risk finding rather than an employment-outcome finding, arrived at through simulation rather

than causal inference on observed data. Its relevance here is structural: a third methodological tradition, addressing a related but distinct outcome variable, independently arrives at skepticism toward the policy rationale for angel investment tax incentives.

Addressing the Countervailing Evidence: Tuomi and Boxer (2015)

Not all evidence outside the peer-reviewed literature points toward the null finding, and a complete account of the evidence base requires addressing the strongest countervailing study directly rather than omitting it. Tuomi and Boxer (2015) conducted case studies of Wisconsin's and Maryland's angel tax credit programs, Wisconsin being one of the two treatment states in the 2016 dissertation itself, and concluded that both programs "can result in a substantial boost in leveraged capital, local employment, and earnings," with generated revenue exceeding the credit outlay. This finding is notable enough that Denes et al. (2023) cite it directly in their own literature review, characterizing it as "suggestive evidence," a deliberately hedged term from authors who are not otherwise given to hedging.

The methodology explains the discrepancy. Tuomi and Boxer used RIMS II, a regional input-output economic modeling system maintained by the U.S. Bureau of Economic Analysis, the same general category of tool as the REMI model employed in Minnesota's 2014 evaluation, discussed above. Input-output modeling estimates economic impact by applying assumed spending multipliers to observed investment flows; it does not establish a causal counterfactual through a control group or a natural experiment, and it will tend to find positive impact nearly by construction, since it is modeling where money moves rather than testing whether the credit caused an outcome that would not otherwise have occurred. This is a materially different and less rigorous evidentiary standard than the quasi-experimental design underlying the 2016 dissertation or the difference-in-differences framework underlying Denes et al. (2023), both of which are built specifically to establish causal attribution rather than to model assumed economic multipliers. The Tuomi and Boxer finding is real, and Wisconsin's own case deserves acknowledgment rather than omission, but it is evidence of a different, weaker kind than the evidence the null finding rests on, and the two are not in genuine methodological competition.

Lerche (2025): The Mechanism Clincher

Lerche (2025), publishing in the *American Economic Review* (115[8], 2781–2818), examined the employment effects of direct investment tax credits applied to German manufacturing firms, credits flowing directly to the firm rather than to an investor intermediary. The results are dramatically and instructively different from the angel tax credit literature. A 7.6% reduction in effective capital cost produced a 12% increase in employment and a 17.7% increase in capital stock among directly-subsidized firms, with positive local labor market spillovers of approximately one additional manufacturing job per directly-created job, an employment multiplier effect that the angel tax credit literature has searched for and consistently failed to find.

The Lerche (2025) finding is critical not because it contradicts the angel tax credit literature but because it completes it. The failure documented across the angel tax credit evidence base is not a failure of tax incentives as a policy instrument per se; Lerche (2025) establishes that direct firm-level

tax incentives can produce robust employment effects. The failure is with the specific structural configuration of investor-subsidy programs that interpose an investor intermediary between the subsidy and the productive use of capital. When the credit reaches the firm directly, the employment creation mechanism is engaged. When the credit reaches an investor who may or may not deploy it productively, who may or may not provide the managerial engagement that creates employment-generating value, and who faces no requirement to do so, the mechanism fails. The 2016 dissertation's Austrian BCT framing, that the credit expands capital supply without ensuring productive deployment, is what the Lerche contrast demonstrates, now with quantified precision. Direct subsidy: 12% employment gain. Investor subsidy: null.

The International Lens: Convergence and Mechanism Confirmation

The United Kingdom: An Apparent Contradiction, Methodologically Undermined

The United Kingdom's Enterprise Investment Scheme (EIS) and Seed Enterprise Investment Scheme (SEIS) represent the largest angel investment incentive programs outside the United States, and they occupy a complex position in the international evidence base. HMRC-commissioned evaluations in 2018 and 2022, conducted by Ipsos and Kantar Public with London Economics, reported positive outcomes for SEIS-backed firms: approximately 12% employment growth and 23% turnover growth relative to control group firms over comparable periods (HMRC, 2022). EIS evaluations showed similarly favorable outcomes. On the surface, these findings appear to contradict the US null literature, and program advocates have cited them accordingly.

Three structural factors critically undermine this apparent contradiction, however. First, the evaluations were commissioned and funded by HMRC, the government department whose programs are being evaluated, reproducing the same compensated-evaluator dynamic identified in the 2016 dissertation as a systematic source of favorable bias in angel tax credit program evaluation. This does not render the findings false, but it subjects them to the same credibility discount that the 2016 dissertation applied to state-agency-commissioned evaluations in the United States, for identical structural reasons. Second, the EIS and SEIS involve significant self-selection bias: firms are selected for EIS and SEIS investment by sophisticated investors who are actively engaged with the investee company, making the control group comparison inherently contaminated; non-EIS firms are structurally different from EIS firms before the investment occurs, not merely different because of it.

Third, and most fundamentally, the UK schemes do not contain the statutory engagement requirement that has sometimes been attributed to them, including in the original version of this article (see the Correction Notice below). HMRC guidance treats an investor who is an employee, partner, or paid director of the company, or who holds more than 30% of its share capital or voting power, as “connected” with the company and generally ineligible for relief (HM Revenue and Customs, 2025). A narrow exception allows an investor who was unconnected when the shares were issued to become a paid director afterward. Active involvement is therefore permitted, but no provision of the scheme requires it. The UK findings cannot be read as evidence that a statutory engagement

requirement works. What they can support, subject to the two credibility discounts above, is a narrower observation: the UK schemes draw heavily on sophisticated angels who choose to engage with investee firms, and the favorable reported outcomes, to whatever extent they are real, coincide with engagement that arises from investor selection rather than from statute. That pattern is consistent with the investor-level mechanism documented in Germany and Sweden, but it is weaker evidence than a comparison involving mandated engagement would provide, and no such comparison yet exists in the international evidence base.

Ireland: The Mal-Investment Signature in the Data

Ireland's Employment Investment Incentive Scheme (EIIS) provides a more analytically revealing case than the UK programs, because its findings are more complex than a simple positive or negative verdict. Lynch, Mac an Bhaird, and O'Reilly (2026) examined 1,254 firms, 627 EIIS recipients and 627 matched controls, using propensity score matching combined with a staggered difference-in-differences design over the five years following investment. EIIS-backed firms showed employment gains (rising to approximately 7% by year five, roughly 1.3 additional workers per firm) and revenue gains (approximately 3% by year five) relative to matched controls; on the surface, the credits appear to stimulate economic activity. But two further findings, examined together, produce the Austrian BCT fingerprint with unusual clarity: EIIS-backed firms showed no statistically significant improvement in profitability relative to controls, and they were 3 to 4 percentage points less likely than control firms to remain active over the observation period.

This combination (employment and revenue growth without profitability improvement, accompanied by elevated firm failure rates) is the textbook signature of mal-investment as defined in the Austrian Business Cycle literature (Engelhardt, 2012; Garrison, 2004). Capital is being directed to firms that grow in observable, legislatively-countable dimensions, employment and revenue, while becoming economically less viable as ongoing business concerns. The employment gains that legislative supporters cite as program success are, in the Irish data, a precursor to firm failure rather than evidence of sustainable job creation. The Austrian BCT prediction from 2016 anticipated exactly this outcome: that angel tax credits may produce a short-term increase in employment levels that is not sustainable, because the credit enables firms to start and sustain operations toward a predestined economic reckoning that the underlying economics, unimproved by the capital infusion and absent managerial engagement, make inevitable. The Irish evidence did more than confirm the null; it illustrated the mechanism generating it, with a temporal dimension that the cross-sectional US evidence cannot provide.

Germany: The Mechanism Confirmed at the Investor Level

Germany's INVEST grant program provides direct subsidies to angel investors, the closest structural analog to US state angel tax credits available in the international literature, and its evaluation by Berger and Gottschalk (2025) represents the most direct international confirmation of the 2016 dissertation's proposed mechanism. Publishing in the *Journal of Business Venturing* (40[1], 106456),

Berger and Gottschalk (2025) examined INVEST at the investor level using German administrative data, allowing observation of the characteristics and behaviors of the investors attracted by the grant alongside the outcomes of the firms they fund.

Their findings are precise and mechanistically illuminating. The INVEST grant attracts new investors who enter the angel investment market specifically because of the subsidy, investors who, by the administrative data, would not have invested in early-stage firms absent the credit. These grant-attracted investors are inexperienced: they provide capital but little to no managerial support, mentorship, or strategic guidance to the firms they fund. A parallel finding from Virginia's JLARC (2022), examining a US state program directly rather than a German grant, quantifies precisely this dynamic: only 6% of Virginia's angel tax credit investors had prior entrepreneurial experience, compared with 55% of angel investors generally, confirming the same inexperienced-investor selection effect in a US institutional context rather than only a German one. At the firm level, positive outcomes occur in the data only when these inexperienced, grant-attracted investors syndicate with experienced angel investors who do provide active managerial support. Without syndication with experienced investors, the grant-attracted investors are economically inert in terms of firm outcomes, they provide cash, but not capability, and firms funded exclusively by grant-attracted investors perform no better than unfunded control firms.

This is the mal-investment mechanism stated at the theoretical level in the 2016 dissertation and now confirmed in German firm-level administrative data with a precision that theory alone cannot achieve. Angel tax credits and angel investor grants attract the wrong type of investor at the margin, not an insufficient amount of investment capital, but a systematically less capable investor. The credits are structurally incapable of distinguishing between a sophisticated, hands-on angel investor whose involvement creates employment-generating value beyond the capital itself, and a wealthy individual seeking a tax benefit who happens to satisfy the formal accreditation criteria. In the German context, the administrative data reveal this distinction directly. In the US context, where no engagement requirement exists and where the accreditation standard is purely financial, the same dynamic operates but is invisible to program evaluators measuring only aggregate investment levels.

The Germany Within-Country Natural Experiment

Germany provides the most analytically clean natural experiment available in the international literature: within a single national context, with the same institutional environment, same legal framework, and same macroeconomic conditions, investor subsidies (INVEST grant, Berger & Gottschalk, 2025) produce null firm-level outcomes except through syndication with experienced investors, while direct firm subsidies (Lerche, 2025, *American Economic Review*) produce robust employment gains of 12%. The investor intermediary is the structural failure point. When the subsidy bypasses the intermediary and reaches the firm directly, employment creation follows. When the subsidy reaches the intermediary without an engagement requirement, the employment creation mechanism is severed. The within-country comparison eliminates virtually every alternative explanation, including national culture, legal systems, financial market development, and

macroeconomic conditions, that might otherwise account for cross-national differences. The investor intermediary structure is what differs, and the investor intermediary structure is what explains the outcomes.

Sweden: An Independent Confirmation of the Employment Null

Sweden's investor tax deduction, introduced in December 2013, was formally evaluated by Tillväxtanalys (the Swedish Agency for Growth Policy Analysis) in a February 2023 report using a difference-in-differences matching design considerably more rigorous than most state-level US evaluations discussed above. The study compared firms receiving investment from individuals claiming the tax deduction against firms receiving investment from non-eligible institutional sources, including venture capital funds, pension funds, and other institutional investors, matched on pre-investment size, growth trajectory, fixed assets, and industry using Coarsened Exact Matching. This is an independent country, an independent research team with no connection to the US or German literature, and a matching methodology distinct from both the 2016 dissertation's quasi-experimental design and the Denes et al. (2023) staggered difference-in-differences panel.

On the employment outcome specifically, the Swedish evaluation finds no statistically significant difference between beneficiary and non-beneficiary firms in the years following investment. This is a direct, independent confirmation of the employment null first documented in the 2016 dissertation and subsequently confirmed by Denes et al. (2023), now replicated in a fourth national context, using yet another distinct methodology, by researchers with no prior exposure to either study.

The Swedish data goes further than a simple null, however, and the additional finding strengthens rather than merely replicates the existing evidence. Beneficiary firms significantly underperformed matched non-beneficiary firms on both turnover (24% lower) and value added (approximately 20-24% lower, depending on the year since investment), worse than the counterfactual, not merely equal to it. Tillväxtanalys's own investor-characteristics analysis confirms the same inexperienced-investor mechanism documented in Germany and Virginia: targeted investors display low industry and managerial experience relative to the broader population of identified Swedish business angels, and the report's authors explicitly align this finding with Denes et al.'s survey evidence that investors induced by the tax incentive are disproportionately inexperienced and lack entrepreneurial background. A fourth country, a fourth methodology, and the same mechanism.

One divergence from the US evidence deserves acknowledgment rather than omission. Denes et al. (2023) find that US angel tax credits increase angel investment activity by approximately 18%; the Swedish evaluation finds no clear evidence of an increase in either the amount or incidence of external equity financing following the reform, even among high-growth, young, and intangible-asset-intensive firms specifically targeted by the policy's design. Whether this divergence reflects differences in program design, the Swedish scheme, unlike most US state credits, restricts eligibility to external investors at the expansion stage and specifically excludes insiders at that stage, or differences in

underlying investor market structure is not established by the available evidence and should not be asserted beyond what the data shows. What is established, independently and robustly, is the employment null and the inexperienced-investor mechanism.

Table 1. Cross-National Evidence Summary: Angel Tax Credit and Related Investment Incentive Programs

Country	Program	Subsidy goes to	Engagement requirement	Evaluation and method	Key findings
United States	State angel tax credits (30+ states)	Investor	No	Schulte (2016), dual-pair quasi-experimental design; Denes et al. (2023), staggered difference-in-differences, 31 states	Angel investment up about 18%; no significant effect on employment or other entrepreneurial outcomes; quality of funded firms declines
United Kingdom	EIS and SEIS	Investor	No (involvement permitted, not required; connected investors generally excluded)	HMRC-commissioned evaluations (2018, 2022), control-group comparison	SEIS firms: about 12% employment and 23% turnover growth versus controls; evaluator independence and investor self-selection limit the comparison
Ireland	EIIS	Investor	No	Lynch, Mac an Bhaird, & O'Reilly (2026), propensity score matching with staggered difference-in-differences, 1,254 firms	Employment up about 7% and revenue up about 3% by year five; no significant profitability gain; 3 to 4 percentage points lower survival
Germany	INVEST grant	Investor	No	Berger & Gottschalk (2025), investor-level administrative data	Attracts inexperienced investors; positive firm outcomes only when they syndicate with experienced angels
Germany	Direct investment tax credit (manufacturing)	Firm	Not applicable	Lerche (2025), *American Economic Review*	7.6% lower capital cost produced 12% more employment, 17.7% more capital stock, and local job spillovers
Sweden	Investor tax deduction (2013)	Investor	No	Tillväxtanalys (Reshid et al., 2023), difference-in-differences with coarsened exact matching	No significant employment difference; turnover 24% lower and value added about 20–24% lower than matched firms; no clear increase in external equity

Note. Engagement requirement refers to a statutory obligation for the subsidized investor to provide active managerial involvement in the investee firm. EIS = Enterprise Investment Scheme. SEIS = Seed Enterprise Investment Scheme. EIIS = Employment Investment Incentive Scheme.

Toward a Unified Mechanism: The Engagement Hypothesis

A decade of evidence, examined in the preceding sections, permits a statement of mechanism that is more precise and more actionable than the theoretical Austrian BCT framing available in 2016, while remaining consistent with that framing and with the cross-national and cross-methodological evidence base. The failure of US state angel tax credit programs is not a function of tax credits as a policy instrument; Lerche (2025) demonstrates that direct firm-level tax credits produce robust employment effects. Nor is it a function of angel investors as a class of economic actors; the Berger and Gottschalk (2025) German data confirm that experienced investors with active involvement create firm-level

value, and the UK evidence, though methodologically compromised, is consistent with that finding. The failure is with the specific structural combination of investor-subsidy-without-engagement-requirement that characterizes all active US state programs and the German INVEST grant.

This article proposes that the accumulated evidence supports what may be termed the Engagement Hypothesis: angel tax credits and investor subsidies produce employment lift only when the subsidized investor provides active managerial engagement with the investee firm. Where that engagement is absent, the subsidy attracts capital without capability at the margin, funding firms that grow in employment without becoming economically viable, and ultimately generating firm failure rates that erase the temporary employment gains that program advocates count as evidence of success. None of the investor-subsidy programs examined here requires engagement by statute; they differ in how much engagement their investor populations supply on their own. The Engagement Hypothesis explains not just the null but the broader cross-national pattern: the UK schemes, which exclude connected insiders and draw heavily on self-selected, typically engaged angels, report positive outcomes in evaluations of limited credibility; Ireland produces employment growth without profitability improvement and with elevated failure rates; Germany INVEST produces inexperienced investors and null outcomes except where grant-attracted investors syndicate with experienced angels; Sweden and the US state credits, both of which attract disproportionately inexperienced investors, produce null employment findings. The variable that tracks outcomes across these cases is the engagement the investor actually provides, and the outcome variable changes accordingly.

The Lerche (2025) direct-firm-subsidy findings complete the logical structure of the Engagement Hypothesis. When the investor intermediary is removed entirely and the subsidy reaches the firm directly, the employment creation mechanism is recovered in full, a 12% employment gain, a positive capital stock effect, and positive local spillovers. The intermediary is where the mechanism breaks. The subsidy is not the problem. The instrument that channels the subsidy through an investor who faces no requirement to add value beyond the capital transfer is the problem. This is a structurally precise and policy-actionable diagnosis, which the Austrian BCT framing of 2016 correctly anticipated at the theoretical level but could not demonstrate empirically until the decade's evidence accumulated. The pattern is not confined to Lerche's German data. Fazio, Guzman, and Stern (2020) find that state-level R&D tax credits, another direct-to-firm instrument that bypasses any investor intermediary, increase both the quantity and quality of entrepreneurship in the United States specifically, and a broader meta-analysis by Blandinières and Steinbrenner (2021) finds R&D tax incentives effective on average across a wider international sample, with effectiveness varying by design feature in a manner consistent with the Engagement Hypothesis's emphasis on structural design over instrument category. Direct-to-firm credits, examined independently across at least three separate studies and two countries, consistently outperform investor-intermediary subsidies. The pattern is not an artifact of any single dataset.

The Engagement Hypothesis also explains why the null is not universal, without requiring the evidence to be internally inconsistent. To the extent the UK results are real, they reflect the kind of investor the schemes attract, not a legal obligation the schemes impose. When program advocates cite

UK evidence to defend US state angel tax credits, they are comparing programs that share a label but differ in the engagement their investors bring. The Engagement Hypothesis makes this confusion analytically visible: the relevant policy variable is not whether a subsidy flows through an investor, but whether the investor who receives it supplies the managerial involvement that creates value beyond the capital. No existing program secures that involvement by statute, which is why a statutory engagement requirement, proposed below, remains an untested design rather than a proven one.

Policy Implications and Recommendations

Direct Firm Subsidies as the Evidence-Supported Alternative

The Lerche (2025) *American Economic Review* findings establish a clear and evidence-supported alternative to investor-subsidy programs. Direct investment tax credits to early-stage technology firms, credits that flow to the firm itself, reducing its effective capital cost and enabling capital investment that would otherwise be deterred by the cost of capital, produce the employment outcomes that investor-subsidy programs have consistently failed to produce. The Lerche finding is not an isolated result: a 7.6% reduction in effective capital cost produces a 12% employment gain and a 17.7% capital stock increase, with spillover effects that amplify the aggregate economic impact. The employment multiplier is demonstrably positive for direct firm credits; it is demonstrably null for investor subsidies.

State legislatures currently appropriating funds to angel tax credit programs should consider the reallocation of those appropriations to direct firm investment credits, particularly for technology and innovation-sector companies meeting qualifying criteria established by the legislature. The evidentiary basis for this reallocation is not just that investor subsidies fail, but that a structurally analogous instrument with a different routing achieves the outcomes the investor subsidy claims to achieve. This is a more compelling policy argument than a pure null finding, because it eliminates the counterargument that tax credits as a class have been demonstrated to fail. They have not. A specific structural variant has been demonstrated to fail. A different structural variant has been demonstrated to succeed. The reallocation decision has clear evidential support.

Engagement Requirements as a Minimum Structural Reform

For states that choose to retain investor-subsidy programs, whether for political economy reasons, for established program infrastructure reasons, or on the view that the direct-firm-subsidy alternative requires legislative action that is not currently achievable, engagement requirements represent the minimum necessary structural reform to make the mechanism theoretically capable of producing employment outcomes. No existing program offers a ready template: the UK schemes permit, but do not require, investor involvement, and generally exclude investors who are employees of the investee firm. A US state credit that conditioned the credit on documented engagement, such as a board seat or a defined advisory role maintained for the credit's holding period, would be, in real terms, a different

policy instrument than the current engagement-free investor subsidies, and one for which the investor-level evidence from Germany and Sweden provides a basis for more optimistic outcome expectations.

The political economy challenge of engagement requirements is not trivial: requiring active investor participation narrows the pool of investors who can claim the credit to those genuinely engaged with early-stage firms, which reduces the total subsidy delivered to the current beneficiary coalition and will predictably generate organized opposition from investors currently receiving the credit for passive financial transactions. This is a policy design challenge with a clear structural logic, however, and the evidence base provides the analytical foundation for legislators willing to prioritize employment outcomes over the breadth of the beneficiary coalition.

Program Evaluation Reform

The compensated-evaluator problem identified in the 2016 dissertation remains unresolved a decade later. Program evaluations commissioned and funded by the administering agency are structurally incapable of producing credible null findings: the evaluating organization's continued employment in the evaluation relationship depends on findings that support program continuation, creating a systematic incentive for favorable framing, outcome variable selection, and methodological choices that maximize the probability of finding positive effects. This dynamic has been documented in the 2016 dissertation, observed consistently in the prior literature review, and is reproduced in the same form in the UK HMRC-commissioned EIS evaluations that appear to contradict the US null findings. A second, distinct bias compounds the first, operating even where no direct financial conflict of interest exists. The administering agency itself has typically already disbursed substantial public funds under the program by the time an evaluation is commissioned, and Arkes and Blumer's (1985) classic account of the sunk cost effect predicts that decision-makers facing a prior investment will tend to inflate their estimate of that investment's success rather than confront the possibility that it was wasted. This is a psychological bias distinct from the evaluator's financial self-interest: an agency administrator with no personal stake in the evaluator's future contracts may still resist a null finding simply because accepting it would require acknowledging that years of the agency's own prior spending decisions produced nothing. The two biases point in the same direction and are difficult to disentangle empirically, but they are analytically distinct, and program evaluation reform proposals that address only the financial conflict of interest, for instance, by requiring evaluators with no ongoing contractual relationship to the agency, would leave the sunk cost dynamic fully intact, since it operates at the level of the commissioning agency rather than the evaluator.

Independent evaluation, conducted by organizations with no financial relationship to the administering agency and no ongoing program involvement, with technology job creation as the primary dependent variable should be a statutory requirement for any continuation of angel tax credit funding. The current practice of allowing administering agencies to select, fund, and direct evaluators is structurally indistinguishable from allowing the regulated industry to select its own regulators: it is a conflict of interest embedded so deeply in program practice that it has become invisible to the

legislators who appropriate the evaluation funding. Requiring independent evaluation would not guarantee null findings, it would guarantee that the findings, whatever they are, are credible enough to inform policy decisions. The current practice guarantees that they are not.

The Federal Proposal

The Angel Tax Credit Act in its current form (S.4809, 2024) should not be enacted. The proposed federal credit replicates the engagement-free investor-subsidy structure that both the 2016 study (Schulte, 2016) and Denes et al. (2023) have found to produce no employment effect, that the Irish data have found to produce a mal-investment signature, and that the German INVEST evidence (Berger & Gottschalk, 2025) has confirmed at the investor level. Introducing the same structural failure at the federal level would not resolve it; it would expand it from a state-by-state experiment, in which the distributed nature of the policy at least permits comparison across states, to a nationwide commitment from which no counterfactual remains available. If federal policymakers wish to create a federal investment incentive for early-stage technology firms, the Lerche (2025) evidence strongly supports a direct-firm credit structure over an investor-subsidy structure. That would be a different bill, bearing different evidence, and warranting a different legislative analysis than the one the five-time-introduced Angel Tax Credit Act currently receives.

Limitations

This retrospective is a synthesis of existing evidence rather than a new primary analysis, and that distinction bears on how its conclusions should be read. The Engagement Hypothesis rests most securely on the German within-country comparison, where institutional context, legal framework, and macroeconomic conditions are held constant between the INVEST grant and the Lerche (2025) direct-firm-subsidy evidence. The broader cross-national pattern, the United Kingdom, Ireland, Germany, Sweden, and the United States arrayed by the degree of investor engagement their programs attract, is consistent with the hypothesis but does not, on its own, establish it: none of these programs imposes a statutory engagement requirement, so engagement varies through investor selection rather than design, and these institutional contexts differ along many further dimensions, including investor market maturity, capital market depth, and the design of the underlying tax instruments, any of which could contribute to the observed differences in outcomes. The hypothesis should accordingly be read as a well-motivated candidate mechanism supported by one clean natural experiment and a broader suggestive pattern, not as a finding established with the same confidence as the null employment result itself.

Second, this article draws substantially on the author's own 2016 dissertation as its empirical anchor. While the convergence with independently authored studies documented throughout mitigates this concern, readers should weigh the dissertation's findings with the same scrutiny appropriate to any single-author, unpublished quasi-experimental study. Third, this article's claim of convergent evidence rests in part on a search for countervailing findings that, while reasonably extensive, was not a formal systematic review. Across several rounds spanning general academic search and Google Scholar results, roughly thirty sources, including peer-reviewed publications and other materials, were

examined specifically for research finding a positive employment effect from investor-intermediary angel tax credit programs. None was found; several pieces of further convergent evidence were found instead, and the one substantive countervailing study located, Tuomi and Boxer (2015), is addressed directly above. This search followed no fixed search-string protocol, drew on a single search tool rather than multiple academic databases, and involved no independent second reviewer, and it cannot rule out a contrary finding published in a smaller or more specialized venue. It is reported here as a data point supporting the convergence claim, not as proof of that claim's completeness. Finally, as a retrospective synthesis rather than a study built on newly collected data, this article's contribution is interpretive and integrative rather than estimative; the Engagement Hypothesis proposed here is offered as a target for future empirical testing, not as a conclusion equivalent in evidentiary weight to the triangulated null finding that motivates it.

Conclusion

In 2016, a doctoral dissertation at Saint Louis University concluded that business angel tax credits produce no measurable technology employment lift, a finding that was novel, methodologically rigorous, and politically inconvenient for the organized coalition defending an estimated $2 billion in annual state expenditure on a policy whose primary stated purpose was exactly the employment outcome the study found absent. The finding was grounded in a dual-pair quasi-experimental design, three independent treatment-control configurations, and a theoretical framework, Austrian Business Cycle Theory, that not only explained the null but predicted the dynamics that would later be confirmed in firm-level and investor-level data across three countries.

In 2023, a five-university research team published the same conclusion in the *Journal of Finance* across 31 states, using a structurally independent methodology, a dramatically larger sample, and a panel econometric framework that had no methodological overlap with the 2016 study. The convergence of two structurally independent designs on the same null constitutes, under the Lawlor et al. (2016) triangulation framework, a strengthened causal inference, stronger than either study could claim individually, and strong enough to warrant the adjective "established" rather than "suggestive."

In 2024, a US Senator introduced the federal version of the same policy for the fifth time. In 2025, Germany provided both the investor-level mechanism confirmation (Berger & Gottschalk, 2025) and the direct-firm-subsidy alternative (Lerche, 2025) that produces the employment outcomes the investor-subsidy model cannot. Ireland provided the temporal fingerprint of mal-investment, employment gains without profitability improvement, followed by elevated firm failure, confirming that the null in the US and German aggregate data is not an artifact of measurement timing but a reflection of a trajectory that angel-tax-credit-funded firms systematically follow toward economic failure.

Ten years hence, the evidence is substantially strengthened, internationally replicated, with its underlying mechanism now explained, and accompanied by a credible policy alternative with an empirically demonstrated employment effect. The persistence of the policy looks less like an open question about evidence quality and more like a problem of political economy. The organized

beneficiary coalition, angel investors, compensated evaluators, agency administrators, and professional advocates, has shown little sign of responding to academic evidence regardless of its quality, journal prestige, methodological rigor, or sample comprehensiveness. The coalition prevails not because it has better evidence, but because it has better organized political access.

What has changed in a decade is not the verdict, that was clear in 2016, but the analytical precision with which we can now identify the mechanism, name the structural failure, and point to the policy instrument that actually achieves what angel tax credits claim to achieve. The Engagement Hypothesis is testable and refutable: if a US state enacts an angel investor credit with a mandatory engagement requirement, such as a board seat or defined advisory role held for the credit's holding period, and that credit is evaluated independently with technology employment as the primary dependent variable and a credible control group, the hypothesis predicts a positive employment finding. That would be a meaningful policy experiment, and it would resolve the one remaining analytical uncertainty in the evidence base.

Until that experiment is conducted, the evidence before us is strong and consistent. Angel tax credits in their current engagement-free investor-subsidy form do not create the technology employment that constitutes their legislative purpose. They have not for a decade of compounding evidence from two countries, multiple methodological traditions, and multiple levels of analysis, from the state aggregate to the firm to the individual investor. The policy continues regardless. That is the most important finding of the retrospective: not that the evidence is strong, but that evidence of this quality has been demonstrably insufficient to break the political equilibrium that sustains the expenditure. Understanding that failure, structural, not epistemological, is prerequisite to any realistic path toward policy reform.

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The original version of this article, published August 1, 2026, stated that the UK Enterprise Investment Scheme requires investors to serve as directors, employees, or active participants in the investee firm as a condition of relief. That statement was incorrect. HMRC guidance generally excludes from relief investors who are employees, partners, or paid directors of the company, or who hold more than 30% of it, and permits, but does not require, an unconnected investor to become a paid director after investing (HM Revenue and Customs, 2025). The abstract, the UK section, the statement of the Engagement Hypothesis, the policy recommendations, the Limitations section, and the Conclusion have been revised accordingly. The Engagement Hypothesis is now stated in terms of the engagement investors actually provide, with a statutory engagement requirement presented as an untested design. This version also adds Table 1, which was omitted from the original, and a citation for the Irish EIIS evaluation (Lynch, Mac an Bhaird, & O'Reilly, 2026). The article's central finding, the null employment effect of US state angel tax credits, is unchanged.

AI DISCLOSURE — LEVEL 3 AI-primary drafting, with human direction throughout. The author verifies every claim and holds full intellectual responsibility for the result.

Kevin A. Schulte, Ph.D.
Founding Editor, Undeterred Press