Tax Windfall or White Elephant? The Intensive-Margin Innovation Response of U.S. Pharmaceutical Firms to the 2017 Corporate Tax Reform

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A central question for the U.S. medical innovation system is whether broad-based fiscal policies—rather than targeted "push" or "pull" instruments—meaningfully affect the *rate and direction* of biomedical innovation. Existing work has mostly evaluated policy tools that explicitly condition support on R&D activity or outputs (e.g., R&D tax credits, public funding, exclusivity extensions, or prizes), or that are tightly targeted to pharmaceuticals. Much less is known about the innovation consequences of large, *untargeted* corporate tax changes that alter firms' after-tax cash flows regardless of how funds are used. This gap matters for ongoing policy debates about the relative efficiency of broad tax cuts versus more tailored, market-expanding or risk-sharing instruments for stimulating socially valuable pharmaceutical innovation—an issue squarely aligned with this conference's focus on how public policies shape the level and direction of innovation in the U.S. medical innovation system.

We study the 2017 U.S. Tax Cuts and Jobs Act (TCJA), which reduced the federal corporate tax rate from 35% to 21% and generated a large, plausibly exogenous increase in after-tax cash flow for tax-paying corporations. Building directly on our prior paper (Trujillo et al., 2025, under review), we first take as given that aggregate pharmaceutical R&D spending among publicly traded firms did *not* increase in response to the TCJA. Using non-parametric and difference-in-differences (DiD) designs, that paper finds no statistically or economically meaningful rise in total R&D expenditures, even several years post-reform, despite sizable tax windfalls. Instead, we document stable R&D trajectories, modest revenue growth, and suggestive shifts toward M&A activity. In this sequel, we ask a different question: **even if total R&D spending did not expand, did the TCJA change *how* pharmaceutical firms innovate—across stages, timing, and quality—at the intensive margin?**

To answer this, we move from aggregate R&D inputs to a suite of upstream, midstream, and downstream *innovation outcomes* at the firm-therapeutic area level. Specifically, we examine: (i) patent applications and approvals (upstream knowledge production); (ii) clinical development dynamics, including trial initiations and time to Phase III completion (midstream development intensity); (iii) regulatory approvals (downstream product output); and (iv) innovation quality, proxied by forward citations to patents associated with TCJA-era R&D. Our outcomes thus speak not only to the *rate* of innovation but to its *composition* and *quality*, responding to the conference's interest in measures and methods for assessing medical innovation.

Our empirical strategy to assess causality exploits multiple dimensions of quasi-experimental variation in exposure to the TCJA. First, we implement a baseline DiD design comparing U.S.

pharmaceutical firms to a control group of European peers over 2012–2024. The identifying assumption is that, absent the TCJA, innovation trajectories for U.S. and European firms would have followed parallel trends conditional on observed covariates. We probe this assumption using rich pre-trend diagnostics and placebo reforms. Second, within the set of U.S. firms, we exploit *heterogeneity in effective exposure to the tax cut* along several dimensions that sharpen identification and help distinguish liquidity from other mechanisms:

1. **Pre-reform tax burden and tax liability.** Firms with positive, sizable pre-TCJA tax liabilities (and thus large expected rate reductions) receive a larger "tax windfall" than firms with low or zero effective tax rates. We use pre-reform effective tax rates, deferred tax liabilities, and realized changes in cash tax payments to construct firm-specific tax shock measures.
2. **Firm stage and profitability.** We explicitly contrast *mature, profitable firms* with ongoing operating profits and clear tax liabilities to *pre-commercial or early-stage* firms that were not yet meaningfully tax-paying at the time of the reform. The former experience direct balance sheet relief; the latter are exposed indirectly, primarily via changes in financing conditions and market liquidity. This stage-based heterogeneity allows us to test whether intensive-margin responses are concentrated among firms for whom the TCJA created a concrete tax windfall versus those whose innovation budgets continued to depend mainly on external capital markets.
3. **Internal liquidity and leverage.** We interact the tax shock with firm level liquidity (cash holdings, net leverage, and interest coverage) to test whether the reform relaxed binding financial constraints, in line with theories of liquidity-driven R&D.
4. **U.S. exposure and therapeutic horizon.** We further interact exposure with measures of U.S. revenue share and therapeutic portfolio composition (e.g., oncology vs. neurodegenerative vs. rare disease) to examine whether short-cycle, more cash-flow-sensitive projects respond more than long-horizon discovery efforts.

These sources of variation are combined in a family of event-study and distributed-lag models that allow for dynamic treatment effects and delayed responses along the innovation pipeline. Concretely, we estimate firm- and firm-by-therapeutic-area-level regressions with high-dimensional fixed effects, treatment indicators based on tax-shock exposure, and interactions capturing the profit-stage split and other heterogeneities. We complement the baseline U.S.-Europe DiD with *within-U.S.* triple-difference designs that contrast high- vs. low-exposure firms before and after the TCJA, within therapeutic areas and global market trends. This layered strategy is designed to: (i) tighten identification relative to standard before/after designs; (ii) explicitly address concerns about violations of parallel trends due to concurrent macroeconomic shocks (most notably changes in interest rates and capital market conditions); and (iii) separate direct tax-liability channels from more diffuse financing-environment channels that might differentially affect pre-commercial firms.

Data come from firm level financial statements (S&P Compustat), private capital data (PitchBook), patent applications and grants, and clinical and regulatory development histories from Cortellis and ClinicalTrials.gov, spanning 2012–2024. We link patents and trials to firms and therapeutic areas, and we track subsequent forward citations and regulatory outcomes to capture both the timing and quality of innovation.

Preliminary results suggest a highly nuanced, but overall limited, intensive-margin innovation response to the TCJA. We find:

1. **Upstream patents.** Modest and short-lived increases in patent applications among U.S. firms relative to European peers, with effects that become statistically significant only once we condition on realized liquidity gains. These effects are concentrated among mid-sized and large tax-paying firms; pre-commercial firms and those with minimal pre-reform tax liabilities show no discernible response.
2. **Midstream development.** Some evidence of accelerated Phase III execution—shorter time to completion and higher throughput of trials—for firms with both (a) large tax windfalls and (b) high U.S. revenue exposure in shorter-cycle therapeutic areas (e.g., certain oncology indications). Magnitudes, however, are modest relative to baseline durations.
3. **Downstream approvals and quality.** To date, we detect no robust reallocation toward long-horizon discovery projects or substantial shifts in the quality distribution of innovation, as measured by forward citation intensity of patents tied to TCJA-era R&D. Estimated effects on regulatory approvals are small and statistically fragile.

Taken together with our previous null finding on total R&D spending, these results paint a consistent picture: **a large, untargeted corporate tax cut generated limited productivity gains for the U.S. medical innovation system and primarily reinforced the position of incumbent, profitable firms.** The TCJA appears to have marginally accelerated some late-stage development among well-capitalized firms, without expanding overall R&D or meaningfully redirecting innovation toward longer-horizon or higher-social-value projects. Pre-commercial and financially constrained firms—whose innovation trajectories depend more on external capital markets and interest rates—show little evidence of a TCJA-driven shift, underscoring the importance of considering firm stage when evaluating broad fiscal reforms.

Our contribution is threefold. First, we provide one of the first intensive-margin causal evaluations of a major, broad-based corporate tax reform on biomedical innovation, complementing existing work on targeted R&D incentives. Second, methodologically, we develop an identification strategy that combines cross-country DiD, multiple sources of firm level exposure, and stage-specific heterogeneity, with explicit attention to parallel trend threats from concurrent macro-financial shocks. Third, our findings inform the policy debate on the design of the U.S. medical innovation system: they suggest that broad tax windfalls are a relatively blunt instrument for stimulating socially valuable biomedical innovation compared to more precisely targeted push or pull policies.