Pull Incentives in Multi-Market R&D Portfolios: Evidence from QIDP Designations

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Abstract

Targeted "pull" incentives are increasingly used to stimulate innovation in socially valuable but commercially fragile domains, yet most evidence treats policy as acting on coarse markets (e.g., therapeutic classes) and reports aggregate changes in innovative activity. This project studies what happens when the policy lever is granular and firms operate multi-market R&D portfolios. Using pathogen-specific Qualified Infectious Disease Product (QIDP) designations under the 2012 GAIN Act as localized payoff shocks, I build a firm–pathogen–year panel of systemic antibacterials (2000–2020) by combining global pipeline histories with regulatory-event records. I estimate staggered-adoption around each pathogen's first QIDP designation, and then decompose designation "news" into own versus rival and same-pathogen versus other-pathogen shocks. The first QIDP in a pathogen produces a persistent increase in firm participation in that pathogen. Cross-pathogen responses are asymmetric: rival QIDP designations in other pathogens reduce activity in the focal market, while own designations elsewhere do not induce systematic exit. The findings highlight a portfolio-reallocation channel of granular pull incentives, with implications for how narrowly policy should target incentives and how competition and firm constraints shape the distribution of innovative effort.

I. Motivation

Governments rely on pull incentives—extended exclusivity, priority review, transferable vouchers—to increase expected returns to R&D where private incentives are weak. A

large literature shows that expected market size and demand shifts shape innovation, and that demand-side instruments can redirect R&D across markets (Acemoglu and Linn 2004; Ridley et al. 2006; Seoane-Vazquez et al. 2008). A key design choice is granularity: regulators can define fine submarkets (e.g., pathogens, biomarkers, rare sub-indications) and apply localized pulls, rather than treating broad classes as the unit of policy.

When firms run multi-market R&D portfolios under financial and organizational constraints, a localized pull is not merely "more R&D" in the treated market. It can anchor activity in the treated node and reallocate effort away from other nodes, with the direction and magnitude shaped by competition and by firm constraints. Similar logic is relevant well beyond antibiotics whenever regulators create narrow eligibility criteria and firms choose among many related projects (e.g., expedited pathways, designation programs, or indication-specific exclusivities) (Hermosilla 2024; Sherman et al. 2013).

II. Setting and contribution

I study the QIDP program created by the Generating Antibiotic Incentives Now (GAIN) Act (2012). QIDP provides (i) additional exclusivity and (ii) expedited pathways (fast track / priority review) for drugs targeting a specified list of qualifying pathogens (Food and Drug Administration 2018; U.S. Food and Drug Administration 2017). Prior work evaluates GAIN mainly at the pipeline or class level (Kong and Zhao 2023; Majewska 2022). This project instead uses the pathogen-level timing of designations to characterize within- and cross-pathogen portfolio responses, separating own-firm and rival-firm designation news.

III. Data and sample

The core dataset is a firm–pathogen–year panel for systemic antibacterials from 2000–2020, built from Citeline Pharmaprojects development histories and regulatory-event fields. A firm is coded as active in a pathogen-year if it has at least one project in preclinical, clinical, or registration stages for that pathogen. QIDP designation events are aligned to calendar years and mapped to pathogen markets. The resulting panel contains roughly 2,808 firms and 1.24 million firm–pathogen–year observations (as in the current draft).

IV. Empirical framework

H1 (own-pathogen anchoring). Let T_m^* be the first year any product targeting pathogen m receives QIDP designation. I estimate a staggered-adoption DID with firm×pathogen fixed effects and year fixed effects:

$$Development_{imt} = \beta\,(Treat_m \times Post_{\{t>T_m^*\}}) + X'_{imt}\gamma + \alpha_{im} + \lambda_t + \varepsilon_{imt}, \qquad (1)$$

and complement it with event-study estimators for dynamic effects using the multi-period DID framework of Callaway and Sant'Anna (2021).

H2 (cross-pathogen reallocation and competition). I then estimate a specification that decomposes QIDP "news" into four lagged indicators (same vs other pathogen) × (own vs rival):

$$\begin{aligned} Development_{imt} = {} & \beta_1(Same \times Own)_{im,t-1} + \beta_2(Same \times Rival)_{im,t-1} \\ & + \beta_3(Other \times Own)_{im,t-1} + \beta_4(Other \times Rival)_{im,t} \\ & + X'_{imt}\gamma + \alpha_{im} + \lambda_t + \varepsilon_{imt}. \end{aligned} \qquad (2)$$

Heterogeneity analyses interact these shocks with (i) public vs private status (proxying financing capacity) and (ii) incumbent vs entrant status in the pathogen (proxying experience and sunk investments), drawing on portfolio and internal-capital-market perspectives (Acharya and Xu 2017; Ozbas and Scharfstein 2010; Scharfstein and Stein 2000).

V. Baseline results

The first QIDP designation in a pathogen is followed by a persistent increase in firm participation in that pathogen. Table 1 reports estimates of Equation (1). Columns (1)–(3) progressively add firm-level and market-level controls; columns (4)–(6) introduce richer fixed-effects structures, culminating in firm×market fixed effects in column (6). Across all specifications, the coefficient on $Treat_m \times Post_{m,t}$ is positive, precisely estimated, and statistically significant at conventional levels, with point estimates ranging from 0.007 to 0.019. The sign and magnitude are remarkably stable as controls and fixed effects are added, indicating that the result is not an artifact of observable composition or simple time effects. Event-study profiles (Figure 1) show limited pre-trend differences and sustained post-designation effects, consistent with durable anchoring rather than

short-lived spikes.

Cross-pathogen responses are asymmetric (See Table 2). Within a pathogen, own-firm QIDP designation strongly increases continued participation, and rival designations in the same pathogen are associated with modest increases in participation (consistent with a feasibility/validation channel). Across pathogens, rival QIDP designations elsewhere are associated with large reductions in focal-pathogen participation, while own-firm designations elsewhere do not induce systematic exit on average.

Heterogeneity results show stronger cross-pathogen crowd-out and stronger within-pathogen anchoring among private firms and pathogen entrants than among public firms and incumbents, consistent with tighter portfolio constraints and higher sensitivity to competitive shocks.

VI. Robustness, identification checks, and planned extensions

Two concerns are especially relevant in this setting.

Reverse causality in first designation timing. Pathogens with rising R&D activity may obtain a first QIDP earlier because more firms are positioned to apply. In the full paper, I will (i) report pre-trend diagnostics in event time, (ii) conduct placebo timing tests, and (iii) model the hazard of first designation as a function of lagged pre-period pipeline measures to assess whether observables predict designation timing conditional on fixed effects and time trends.

Interference / SUTVA. Because incentives are localized and portfolios span many pathogens, treatment in one pathogen may affect outcomes in other pathogens. I keep the baseline H1 equation unchanged, but will add robustness checks that are explicitly spillover-aware: (i) re-estimating H1 with controls for other-pathogen QIDP "news" exposure (constructed as in H2) to show the own-pathogen estimate is not mechanically driven by contemporaneous cross-pathogen shocks; (ii) restricting the event-study sample to windows with limited concurrent QIDP activity in neighboring pathogens; and (iii) reporting exposure-response versions where the "treatment" intensity is the count of QIDP designations in other pathogens.

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Table 1: Impact of First QIDP Designation on Firm Opearting Status

VARIABLES	(1) No controls	(2) Firm controls	(3) All controls	(4) Market FE	(5) Firm FE	(6) Company×Market FE
Treated × Post	0.019***	0.019***	0.007***	0.009**	0.007***	0.009***
	(0.000)	(0.000)	(0.000)	(0.004)	(0.001)	(0.001)
Firm Size (log)		0.006***	0.006***	0.006***	-0.001	-0.001
		(0.000)	(0.000)	(0.002)	(0.001)	(0.001)
Existing Domains (log)		0.104***	0.104***	0.104***	0.099***	0.099***
		(0.000)	(0.000)	(0.022)	(0.002)	(0.003)
Novelty		0.007***	0.006***	0.006**	0.002***	0.003***
		(0.000)	(0.000)	(0.002)	(0.001)	(0.001)
Experience in Anti-Infective Market (log)		0.010***	0.008***	0.008	-0.018***	-0.018***
		(0.000)	(0.000)	(0.006)	(0.003)	(0.002)
Number of Firms (log)			0.011***	0.011	0.011***	0.011***
			(0.000)	(0.008)	(0.001)	(0.001)
Previous Failure (log)			0.559***	0.549***	0.517***	-0.087
			(0.007)	(0.047)	(0.093)	(0.090)
Constant	0.013***	-0.010***	-0.043***	-0.044	-0.038***	-0.039***
	(0.000)	(0.000)	(0.000)	(0.027)	(0.002)	(0.002)
Observations	1,238,328	1,238,328	1,238,328	1,238,328	1,238,328	1,238,328
R-squared	0.005	0.159	0.174	0.179	0.202	0.758
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Market FE				Yes		
Company FE					Yes	
Company×Market FE						Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: QIDP News Impact on Firm Operating Status

VARIABLES	(1) Firm is operating in the market (0/1)
Different Market × Other Granted (0/1)	-0.261***
	(0.005)
Different Market × Own Granted (0/1)	0.001
	(0.005)
Same Market × Other Granted (0/1)	0.009***
	(0.001)
Same Market × Own Granted (0/1)	0.315***
	(0.027)
Observations	1,238,328
R-squared	0.758
Company×Market FE	Yes
Year FE	Yes
Controls	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 1: Dynamic effects of first QIDP designation on firm development activity

