Heterogeneous Effects of Theory-Based Entrepreneurship Training

Opening a Research Program

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The research program. Theory-based entrepreneurship training works, on average. Camuffo et al. (2020, 2024) and Agarwal et al. (2025) establish this across eight RCTs and multiple countries. The natural next question is: *for whom does it work, and why?* This paper opens a systematic investigation into heterogeneous treatment effects (HTE) in theory-based training.

The gap. Camuffo, Gambardella & Jannace (2025, CEPR DP20300) provide the empirical starting point: using the same pooled RCT dataset (8 RCTs), they detect significant HTE along a vector of basic demographic covariates (gender, work experience, education, months operational, RCT location). The evidence that heterogeneity *exists* is clear. What remains unknown is *why* that is, which cognitive and behavioral traits of entrepreneurs, and which structural features of their ventures, generate differential responses to the same training. McKenzie, Woodruff et al. (*VoxDevLit*, 2025) identify this as the primary open question in the field: "There is a lot of heterogeneity in both samples and results, so there is less guidance on which groups benefit most." No paper has yet addressed this systematically for theory-based training.

The framework. I organize heterogeneous effects into three theoretically motivated categories, each with a distinct rationale and empirical basis in adjacent literatures:

Category	Key variables	Rationale and evidence
Person-level	Ambiguity aversion, illusion of control, learning orientation, prior experience, education	Drexler, Fischer & Schoar (2014, *AEJ Applied*) show cognitive sophistication moderates training response. Karlan & Valdivia (2011, *ReStat*) find heterogeneity by human capital and diligence. Camuffo et al. (2026, *Strategy Science*): PhDs show "expertise trap" (confidence without quality gains).
Venture-level	BM development stage, sector, idea scope, team composition	Novelli & Spina (2024, *SMJ*): effectiveness varies with BM development stage. Gambardella & Messinese (2025, *Org Science*): theory-based outperforms under lower uncertainty.
Dosage/Amount	Attendance, sessions completed, mentor engagement	ITT vs. TOT gaps in Karlan & Valdivia (2011): actual exposure drives heterogeneous effects beyond assignment.

These categories are not arbitrary: they map onto whether the entrepreneur is *ready to learn* (person), whether the venture *needs* theory-based reasoning (venture), and whether the training was *received* at all (dosage).

First step: exploration. The starting point is an exploratory analysis using the `GenericML` package (Chernozhukov, Demirer, Duflo & Fernandez-Val, *Econometrica* 2025) and Random Forest with a Zi vector of 40+ cognitive, behavioral, and venture-level covariates from the baseline survey, organized by category (available for 5 of the 8 RCTs). Where Camuffo, Gambardella & Jannace (2025) used demographics to establish *that* HTE exists, this paper uses mechanism-level variables to establish *why*. Variable importance estimates from GenericML identify which moderators drive heterogeneity within each category; pre-specified interaction regressions then provide confirmatory estimates.

Contributions. This paper reframes the heterogeneity question from "does X moderate the effect?" to "what categories of moderators matter, and what is the mechanism?" It provides the first systematic, theory-grounded account of HTE in theory-based entrepreneurship training, directly answers the open question documented by McKenzie et al. (2025), and lays the groundwork for designing next-generation experiments with heterogeneity built in from the start.