ORIGINAL ARTICLE

OPEN ACCESS

Formal Credit and the Novelty of Firm Innovation Under Unregistered-firm Pressure: Evidence from Sub-Saharan Africa and Pakistan

Usman Majeed [1], **Abubakr Saeed** [2]

Authors' Affiliations:

[1]PhD Scholar, Department of Management Sciences, COMSATS University, Islamabad, Pakistan
[2]Professor, Department of Management Sciences, COMSATS University, Islamabad, Pakistan

Article History:

Submitted: July 27, 2026
Revised: September 22, 2026
Accepted: September 28, 2026
Published online: September 30, 2026

Corresponding author(s):

Usman Majeed
Email:FA24-PMS-009@isbstudent.comsats.edu.pk

Co-author(s)Email:

Abubakr Saeed
abubakr.saeed@comsats.edu.pk

A B S T R A C T

Purpose—Formal firms in developing economies face rivals that operate unregistered and avoid tax, licensing, and compliance obligations. Whether this pressure stimulates innovation remains contested, partly because prior studies often measure whether firms innovate rather than what they introduce. This study distinguishes innovation incidence from market novelty and examines how formal credit relationships relate to each margin.

Study Design/methodology/approach— Using World Bank Enterprise Survey data for 30,483 establishments in 45 Sub-Saharan African economies (2011–2025), the study estimates linear probability models with economy-by-survey-year and industry fixed effects. Product and process innovation are distinguished from market-novel product innovation. Additional comparisons examine Pakistan and South Asia and separate loan holders, firms reporting no credit need, and credit-constrained firms.

Findings— Perceived unregistered-firm pressure is positively associated with product-innovation incidence; the process-innovation association is weaker and does not survive the reporting-disposition control, but no association with conditional product novelty is detected. Firms holding formal credit are more likely to innovate and, among innovators, to introduce a product new to their market. The conditional-novelty association is substantially larger in Pakistan, although the Pakistani innovator sample is smaller and the two estimates are not formally compared. Firms reporting no need for credit resemble constrained firms rather than credit holders on innovation novelty. The initially observed financing moderation is not supported after decomposing credit-status categories and accounting for multiple testing.

Practical Implications— Innovation-support programmes should distinguish market-novel products from innovation incidence. Reported absence of credit demand may not reliably indicate sufficient financing, and policies for registered firms should consider regulatory cost asymmetries rather than assume that competitive pressure alone improves innovation quality.

Originality/Value— The study separates the incidence and novelty margins of innovation, tests the conventional credit-constraint classification using observed financing groups, and identifies which associations extend from Sub-Saharan Africa to Pakistan and South Asia.

Keywords: unregistered-firm pressure, innovation novelty, credit constraints, Enterprise Surveys, Sub-Saharan Africa, Pakistan

JEL Classification Codes: O17, O31, G21, G32

1 | INTRODUCTION

1.1 | Background and Context

Pressure from unregistered firms is a defining feature of business environments in developing economies, and whether it stimulates innovation among registered firms is contested. McCann and Bahl (2017) and Amin (2025) report positive associations with new product development and research spending. Wang and Wang (2024), and Avenyo et al. (2021) report adverse associations with new-to-market innovation in Eastern Europe and Central Asia, with product and process innovation in South Asia, including Pakistan, and with product innovation intensity in Sub-Saharan Africa. La Porta and Shleifer (2014) argue that unregistered firms are too unproductive to pose a serious threat.

There are two points about this body of literature that account for the lack of convergence. Firstly, most papers focus on the question of whether firms innovate, not what they bring out, so positive relationships with incidence and negative with novelty are compatible. Secondly, financing is measured inconsistently: realised borrowing, self-reported obstacles and constructed credit-constraint status are treated as interchangeable when they are not. A third source of divergence, which this study does not claim to resolve, is research design: these papers differ in setting, in how competitive exposure is measured and in estimator, and any of these can produce different estimates independently of the margin examined.

The gap is narrower than the observation that findings are mixed. Novelty-weighted outcomes have been studied by Wang and Wang (2024) and Avenyo et al. (2021), but they examine novelty instead of incidence and in different samples, so the comparison between margins is made across studies rather than within one. An unconditional new-to-market indicator is also zero both for a firm that imitated and for one that introduced nothing, so separating the margins requires conditioning on having innovated, which this literature has not done. Nor has the taxonomy treating firms that report no loan need as unconstrained (Kuntchev et al., 2013) been validated against their behaviour.

1.2 | Research Questions

The study therefore asks five questions. Is perceived pressure associated with whether registered firms innovate (**RQ1**), and, conditional on innovating, with whether the product is new to the market (**RQ2**)? Does holding formal credit relate differently to these two margins (**RQ3**)? Do firms reporting no loan need behave like credit holders or like constrained firms on novelty (**RQ4**)? And does the financing position moderate the association in RQ1, and which answers extend beyond Sub-Saharan Africa (**RQ5**)?

This study addresses both issues by placing innovation among the arsenal of strategic responses available to a registered firm confronted by rivals that operate outside the regulatory system. It disaggregates the incidence of innovation from the novelty of innovation, rigorously tests the disaggregation, and disaggregates the measures of financing rather than aggregating them. The context is Sub-Saharan Africa, the region with the largest unregistered sector in the world and the weakest access to formal credit, and the analysis is then extended to Pakistan and South Asia. Pakistan is the complementary comparison case because it reproduces both of these conditions outside the African institutional setting, combining a large unregistered sector with formal credit penetration among the lowest in South Asia (Bussolo & Sharma, 2023), and because it differs from the main setting on legal origin, financial contracting and banking concentration, so agreement between the two is informative precisely because they are not close substitutes. It is reported separately rather than

inside the pooled South Asian sample because India supplies 87% of that sample; the pooled estimates are retained as a deliberately unfavourable test of how far the findings travel.

A note about the terminology. The survey item underlying the primary independent variable asks respondents to rate the practices of competitors in the informal sector as an obstacle. This paper refers to the measure as unregistered-firm pressure rather than informal competition, as the item measures perceived pressure from a legally distinct source, rather than common competition for a product-market. Other research is mentioned using their original terms.

The contribution is threefold. First, the paper separates two margins the literature conflates and specifies which mechanism should operate on each, so that unregistered-firm pressure and formal credit may be predicted to affect different margins of firm behaviour. Second, it validates two instruments that Enterprise Survey research takes as given: the credit-constraint taxonomy and the perception-based obstacle items. Third, it clarifies which results apply to Pakistan and South Asia, and which do not.

2 | LITERATURE REVIEW

2.1 | Unregistered-firm Pressure and Innovation Incidence

Pressure from unregistered firms, unlike competitive rivalry, involves regulatory asymmetry. Informal firms tend to be smaller and less efficient than the registered firms, but they survive alongside them by avoiding taxes and regulation (Ulyssea, 2018). That cost difference is material: regulation that applies only after a certain size led to a quantitative difference in innovation (Aghion et al., 2023), and compliance imposes constraints that limit how regulated firms can react as unregulated vendors proliferate (Diestre & Barber IV, 2026). Since that cost difference is structural, prices cannot be used to close it.

Schumpeterian theory identifies the response. When the rival is a close substitute, the innovation premium is obtained by escaping that rival (Aghion et al., 2005). Firm evidence bears out this process: US manufacturers facing direct low-cost Chinese competition shifted into new product categories and technology classes rather than withdrawing (Xia et al., 2026), and those with more innovation output weathered the entrance better (Hombert & Matray, 2018). Which rival is a trigger depends on what managers pay attention to, not on industry categories (Li et al., 2026; Ocasio, 1997), so the stimulus is pressure as experienced by the firm. These studies are set in US manufacturing and pharmaceuticals, so what transfers is the mechanism and not the context: the rival holds a cost advantage the focal firm cannot neutralise through price, and the response is differentiation rather than exit. Scale does not transfer, so responses here should be smaller and more resource-dependent, which H4 tests.

Threat need not drive adaptation. Threatened firms might retreat to routine (Mazzei et al., 2025; Staw et al., 1981) and attention need not translate into action (Eklund et al., 2025). These reasons are more relevant for the nature of the attempt than for the decision to attempt; this distinction is elaborated below. For the incidence of innovation, this escape logic predicts a positive association.

H1. *Perceived unregistered-firm pressure is positively associated with the incidence of product and process innovation.*

2.2 | Financing Conditions and Innovation

Innovation is paid for before it pays, and its value is hard for outsiders to assess or to pledge as collateral, so external finance is scarce and costly for firms that innovate. Financial constraints reduce innovation in emerging economies (Gorodnichenko & Schnitzer, 2013), credit supply shapes innovative activity (Amore et al., 2013), access to external finance is associated with innovation among developing-economy firms (Ayyagari et al., 2011) and banking deregulation that expands credit supply raises patenting (Chava et al., 2013).

H2. *Firms holding a formal credit relationship are more likely to innovate.*

2.3 | Incidence versus Novelty

What a firm introduces matters as much as whether it innovates. A product new to the firm's market requires larger and riskier outlays with uncertain demand, whereas a product new only to the firm usually imitates what rivals already sell. The two categories partition product innovators, and the difference between them is the information available at commitment: for an incremental product, a rival has demonstrated feasibility and demand is observable beforehand, whereas for a market-novel product neither is. Market novelty in this sense concerns the scope of the market in which the product is new, not technological radicalness, a distinction Garcia and Calantone (2002) show is often blurred. If finance constrains the scale rather than the occurrence of innovative effort, its association should be concentrated on the ambitious margin. Consistent with this, the support that maintains common innovation in times of financial crisis does not apply to radical progress (Brancati et al., 2026), although that evidence concerns technological ambition rather than market scope, and credit constraints are linked to less new-to-market innovation (Wang & Wang, 2024).

One constant objection is that debt suits riskier innovation poorly: across countries, credit-market development represses innovation in high-tech, finance-intensive sectors (Hsu et al., 2014). That applies to frontier technology where equity markets are advanced. Where equity finance is largely absent, bank credit serves as the main outside funder of any undertaking bigger than the owner's own capital, including ambitious ones.

H3a. *Conditional on innovating, firms holding a formal credit relationship are more likely to have introduced a market-novel product.*

Pressure should produce a different effect. It creates urgency to respond without providing resources to take a bold action, and threatened companies gravitate to more predictable, less risky responses (Mazzei et al., 2025). Pressure therefore can increase the frequency of an innovation without altering its content. Because the threat-rigidity argument points towards imitation while the urgency argument leaves composition unchanged, the hypothesis is stated as a null rather than as a signed prediction.

H3b. *Conditional on innovating, perceived unregistered-firm pressure is unrelated to whether the product is market-novel.*

2.4 | Reported absence of credit demand: sufficiency or suppressed demand?

The conventional approach to classification is to treat a firm that reports no loan needs as unconstrained (Kuntchev et al., 2013), given that reporting no demand can be taken to indicate sufficient finance. Two lines of evidence challenge this. First, demand for external finance is a function of innovative opportunity: financing constraints on innovation are driven by innovative capability, and not by internal cash flows (Hottenrott & Peters, 2012), hence a firm with no high-quality projects reports no need. Second, firms that would use credit may not apply because they expect rejection or unacceptable terms (Kon & Storey, 2003), a systematic self-selection (Han et al., 2009) that is far more prevalent where lending conditions are poor (Brown et al., 2011). The no-need group comprises roughly half of Enterprise Survey respondents (Islam & Meza, 2023),and prior informality leads firms to avoid formal credit rather than optimize over it (Wenwen, 2026).

The competing readings make opposite predictions. If reported absence of demand reflects sufficiency, innovators in the no-need group should resemble credit holders in the novelty of what they introduce; if it reflects absent opportunity or suppressed demand, they should resemble constrained firms. The test discriminates the sufficiency account from the other two but cannot separate them from each other. Because this comparison emerged during the analysis rather than being specified in advance, it is reported as a discriminating test rather than as a hypothesis.

2.5 | Financing as a Contingency

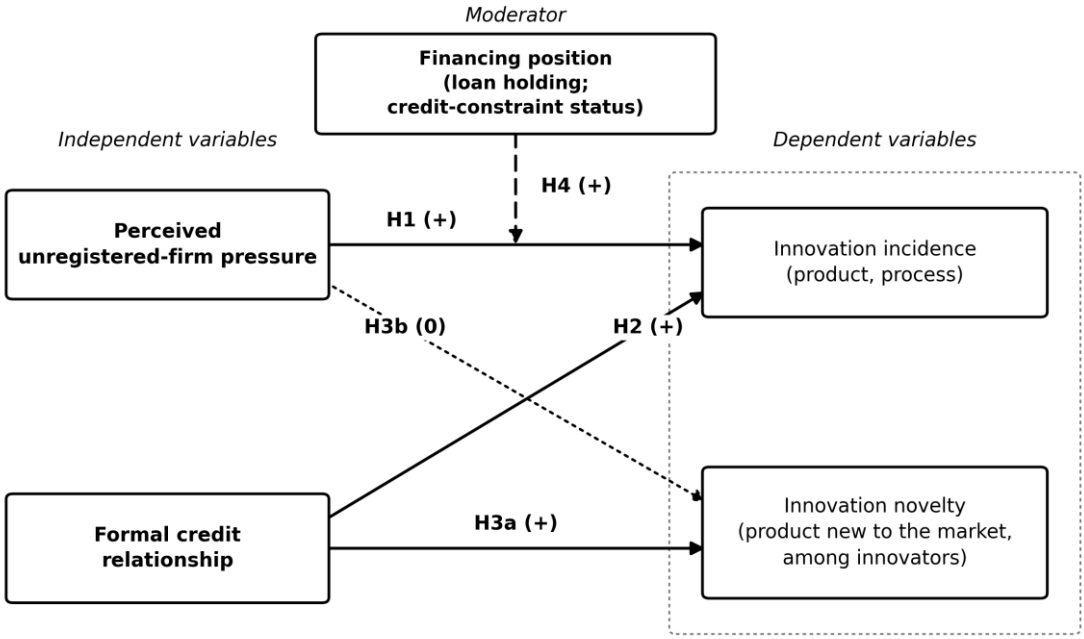
If differentiation is how registered firms escape low-cost rivals, firms able to finance it should respond more strongly. Resources influence competitive behaviour: Firms with more cash gain share in their rival's market from increased rivalry, to a greater degree when the rival is financially constrained (Fresard, 2010). The innovation effects of low-cost competition also depend on resources (Autor et al., 2020), and internal slack buffers South Asian firms from unregistered-sector pressure (Abbas et al., 2022).

However, two issues arise when testing the hypothesis. First, credit-constraint status (Kuntchev et al., 2013) is more proximate to the theory than realised borrowing (Linn & Weagley, 2024), but credit-constraint status aggregates credit users and the "no need" group mentioned above. Second, the pressure of unregistered firms itself increases the likelihood of credit constraint, especially in Sub-Saharan Africa (Distinguin et al., 2016; Kouakou, 2026).

H4. *The association between perceived unregistered-firm pressure and innovation is stronger for firms in better financing positions (see Figure 1).*

Figure 1

Conceptual Framework



Note. Solid arrows denote hypothesised positive associations. The dashed arrow denotes the hypothesized moderation (H4): a stronger financing position, measured by loan holding and by credit-constraint status, strengthens the association in H1. As in any moderation model, each financing measure also enters the H4 specifications as a main effect. The dotted arrow marks H3b, which predicts no association (0) between pressure and novelty among innovators. All models include firm controls and economy-by-year and industry fixed effects.

3 | METHODOLOGY & DESIGN

3.1 | Data and Sample

The data are the World Bank Enterprise Surveys, from the July 2026 releases of the Indicators Database (Global Methodology) and the Standardized Raw Database. The estimation sample comprises 30,483 establishments in 45 Sub-Saharan African economies across 80 economy-survey-year cells between 2011 and 2025, covering 53 two-digit industries. Establishments with fewer than five permanent full-time employees are excluded, and firms must report all core analysis variables. Restricting the main analysis to one institutional region is deliberate, since a pooled global average can mask regional differences and breadth of coverage does not establish generality (Levinthal & Rosenkopf, 2026). Pakistan (2,072 firms, 2013 and 2022 rounds) and South Asia (32,417 firms, six economies) are analysed separately.

Samples differ across models, and no values are imputed. From the core 30,483, the 51 establishments not answering the market-novelty item, all product innovators, leave 30,432; 56 more rated fewer than eight obstacle items, leaving 30,427 where that index is used; credit-constraint status cannot be assigned to 426 firms, leaving the 30,057 of Table 5; and the conditional-novelty models use the 10,037 innovators answering the novelty item, of whom 9,855 have an assigned status. Sampling weights are not applied, since the strata are defined on size, sector, and region, which the fixed effects and controls already absorb (Solon et al., 2015).

3.2 | Measures

Product and process innovation are binary indicators of whether the establishment introduced new or significantly improved products or processes during the preceding three years. Market-novel innovation equals

one if the new product was also new to the main market, and zero otherwise, including non-innovators. Incremental innovation equals one for product innovators whose product was not market-novel. Conditional novelty, used to test H3, is defined only for the 10,037 product innovators answering the novelty item. Perceived unregistered-firm pressure is the reported severity, on a 0-4 scale, of practices of competitors in the informal sector as an obstacle.

Two financing measures are kept distinct. The first is holding a loan or line of credit. The second is credit-constraint status following Kuntchev et al. (2013): firms are unconstrained if they hold a loan or overdraft or reported no need for a loan, and constrained if they applied and were rejected or needed credit but did not apply. The second measure is the broader of the two because it also counts overdrafts, which is why 38.3% hold credit under it while 22.1% hold a loan or line of credit. This accounts for 98.6% of the sample, with 63.8% categorised as unconstrained, of whom 38.3 percentage points have credit and 25.5 do not have any need. Since these two groups are distinctly different, every single model employing the measure in question is presented in its pooled and decomposed forms. The general obstacle index, which is the average of fifteen other obstacle variables on the same scale, represents the respondent's predisposition towards considering conditions difficult and is constructed by excluding the pressure variable itself as well as the access-to-finance variable that is mechanically associated with the credit measure, and is set to missing for firms rating fewer than eight items. Controls are log employment, log firm age, percentage foreign and state ownership, and majority female ownership.

3.3 | Estimation

Equation (1) tests H1 and H2 separately for each outcome k (product, process, market-novel, and incremental innovation), for firm i in economy-survey-year cell c and two-digit industry j:

$$Y^{k}_{icj} = \beta_1 Pressure_{icj} + \beta_2 Credit_{icj} + \gamma' X_{icj} + \delta c + \theta_j + \varepsilon_{icj} \quad (1)$$

where X contains log employment, log firm age, foreign and state ownership shares and majority female ownership, and δ and θ are cell and industry fixed effects, so identification comes from comparisons among firms surveyed in the same economy and year. H1 predicts $\beta_1 > 0$ and H2 predicts $\beta_2 > 0$. Equation (2) tests H3 on product innovators only, where Novel equals one if the product was new to the main market:

$$Novel_{icj} = \lambda_1 Pressure_{icj} + \lambda_2 Credit_{icj} + \gamma' X_i c_j + \delta_c + \theta_j + u_{icj} \quad (2)$$

H3a predicts $\lambda_2 > 0$ and H3b predicts $\lambda_1 = 0$. The discriminating test replaces Credit with indicators for holding credit and for reporting no need, with constrained firms being the reference. Because Equation (2) conditions on an outcome of the model, it is open to selection bias (Heckman, 1979). Two considerations speak to its likely direction: test (a) of Table 4 compares the same coefficients on the full sample and agrees, and the direction of bias is plausibly conservative for the credit result, since credit draws in marginal innovators, who should be less likely to have introduced a market-novel product. Sharp bounds (Lee, 2005) would formalize this. Equation (3) tests H4:

$$Y^{k}_{icj} = \beta_1 Pressure_{icj} + \beta_2 M_{icj} + \beta_3 (Pressure_i c_j \times M_{icj}) + \gamma' X_{ij} + \delta_c + \theta_j + \varepsilon_{icj} \quad (3)$$

where M is the measure of financing (loan possession, pooled credit-unconstrained status, credit possession, or reporting no need) and asterisks indicate variables centred within economy-survey-year cells, such that the interaction effect is the slope difference within the cell and not between the cells (Giesselmann & Schmidt-Catran, 2022). H4 predicts $\beta_3 > 0$. All regressions represent linear probability models using OLS

estimation, due to the direct interpretability of interaction terms on the probability scale (Hoetker, 2007). Logit and probit are not used because in a nonlinear model the interaction effect is a cross-partial derivative rather than the coefficient on the product term, so its magnitude, sign and significance vary across observations and the reported coefficient is not a valid test of it (Ai & Norton, 2003; Greene, 2010; Karaca-Mandic et al., 2012); since H4 is tested entirely through interactions, this governs. Their coefficients are also scaled by the residual variance and so are not comparable across models or groups (Zelner, 2009). Firm-level fixed effects are not possible owing to repeated cross-sectional surveys with a three-year recall period.

Standard errors are clustered by economy (45 clusters). Industry clustering is used for Pakistan and South Asia because Pakistan has only two survey rounds, so economy-survey-year clustering would leave two clusters, far below the range in which cluster-robust inference is reliable (Colin Cameron & Miller, 2015); the two-digit industry yields 42. Jackknife (CR3) standard errors, restricted wild-cluster bootstrap p-values with Webb weights and 9,999 replications (Colin Cameron & Miller, 2015), and Oster (2019) coefficient-stability bounds are available on request. Holm-adjusted p-values are applied to the moderation family, which searches across four financing measures and four outcomes, but not to the main effects, which correspond to hypotheses stated in advance and are each tested once. Because innovation refers to the preceding three years whereas financing is observed at the survey date, all estimates are conditional associations rather than causal effects.

4 | RESULTS AND ANALYSIS

4.1 | Descriptive Statistics

Table 1 reports descriptive statistics. Product innovation is reported by 33.1% of establishments and process innovation by 29.2%; 21.4% introduced a market-novel product, and 11.6% innovated only incrementally. Among product innovators answering the novelty item, 64.9% describe the product as new to their main market. Perceived pressure averages 1.71 on the 0-4 scale. Across the full survey file, Sub-Saharan Africa averages 1.70, high but below Latin America at 1.94. What distinguishes Sub-Saharan Africa is the combination of high perceived pressure with very low formal credit use, at 22.1%.

Table 1

Descriptive Statistics

Variable	*N*	*M*	*SD*	Min	Max
Product innovation	30,483	0.331	0.471	0	1
Process innovation	30,483	0.292	0.455	0	1
Market-novel innovation	30,432	0.214	0.410	0	1
Incremental innovation only	30,432	0.116	0.320	0	1
Conditional novelty (innovators)	10,037	0.649	0.477	0	1
Unregistered-firm pressure (0-4)	30,483	1.708	1.337	0	4
Loan or line of credit	30,483	0.221	0.415	0	1
Credit unconstrained (pooled)	30,057	0.638	0.481	0	1
holds a loan or overdraft	30,057	0.383	0.486	0	1
reports no need for a loan	30,057	0.255	0.436	0	1
General obstacle index (0-4)	30,427	1.398	0.762	0	4

Log employment	30,483	2.907	1.176	1.61	10.31
Log firm age	30,483	2.624	0.732	0	5.40
Foreign ownership (%)	30,483	9.92	27.19	0	100
State ownership (%)	30,483	0.48	4.45	0	99
Majority female ownership	30,483	0.118	0.323	0	1

Note. Estimation sample: 45 economies, 80 economy-survey-year cells, 2011-2025. The two credit-unconstrained subcategories are mutually exclusive and sum to the pooled measure. "Loan or line of credit" is the measure used in Tables 3, 4 and 6; "holds loan or overdraft" is the Kuntchev et al. (2013) component. Statistics are unweighted, and differences in *N* reflect item non-response.

Table 2 reports pairwise correlations. The pressure measure correlates only weakly with the innovation outcomes and negatively with firm size, so smaller firms report more exposure. Market-novel and incremental innovation correlate negatively with each other by construction, since they partition product innovators, which is the arithmetic reason a formal test is required for H3.

Table 2

Pairwise Correlations

Variable	1	2	3	4	5	6	7
1. Product innovation	1.000						
2. Process innovation	.502	1.000					
3. Market-novel innovation	.744	.420	1.000				
4. Incremental only	.516	.197	-.189	1.000			
5. Unregistered-firm pressure	.048	.020	.031	.031	1.000		
6. Loan or line of credit	.100	.086	.092	.031	.028	1.000	
7. Log employment	.080	.064	.079	.017	-.115	.205	1.000

Note. Pearson correlations; those between two binary variables are phi coefficients. N = 30,432. At this sample size, correlations above .015 in absolute value are significant at the 1% level.

4.2 | Pressure, Credit and Innovation Incidence

Table 3 reports the main models. Perceived pressure is positively associated with all four outcomes. A one-point increase on the severity scale is associated with a 1.46 percentage-point higher probability of product innovation and a 0.77-point higher probability of process innovation. Across the interquartile range of the measure, this amounts to roughly 4.4 percentage points of product innovation, about 13% of the sample mean. H1 is supported, with the qualification set out below. The process result is materially weaker: it is insignificant in seven of the nine size, sector and period subsamples, and it disappears under the reporting-disposition control. This is consistent with prior evidence that the short Enterprise Survey module measures process innovation with more error than product innovation (Cirera & Muzi, 2020), so the process result is reported as not established rather than as evidence against a relationship.

Credit shows much larger associations. Firms holding a loan or line of credit are 9.9 percentage points more likely to report product innovation and 8.1 points more likely to report process innovation, against sample means of 33.1% and 29.2%. In relative terms, these are associations of roughly 30% and 28% of the base rate, against 4% per severity point for pressure. H2 is supported.

Table 3

Unregistered-Firm Pressure, Credit, and Innovation Outcomes

Predictor	Product	Process	Market-novel	Incremental only
Unregistered-firm pressure	.0146***	.0077*	.0084*	.0061**
	(.0038)	(.0035)	(.0032)	(.0019)
Loan or line of credit	.0992***	.0807***	.0764***	.0236***
	(.0081)	(.0074)	(.0063)	(.0050)
Observations	30,483	30,483	30,432	30,432
Fixed effects and controls	Yes	Yes	Yes	Yes

Note. Linear probability models with economy-by-survey-year and industry fixed effects and the full control set. Standard errors clustered by economy in parentheses. The market-novel and incremental outcomes are defined only for the 30,432 establishments answering the novelty item, whereas the first two columns use all 30,483, the 51 in the difference being all product innovators; the .0008 gap between the product coefficient and the sum of its components is therefore a difference of sample, not of arithmetic. *$p < .05$. **$p < .01$. ***$p < .001$.

4.3 | Incidence or composition? Testing H3

The market-novel and incremental coefficients in Table 3 are not two findings. They partition product innovation and sum to it (.0764 plus .0236 against .0992, the small difference arising from the 51 establishments noted under Table 3), so a larger coefficient on the more common outcome reflects unequal base rates rather than a difference in association. Table 4 therefore reports two tests. The first uses the difference between the two indicators as the dependent variable, yielding the difference of the two coefficients with correct inference. The second restricts the sample to product innovators and asks whether the innovation was market-novel, holding the decision to innovate fixed.

The results separate the two predictors sharply. Credit is associated with a 5.3 percentage-point larger coefficient for market-novel than incremental innovation, and conditional on innovating, financed firms are 3.1 points more likely to have introduced a market-novel product against a conditional base rate of 64.9%. Pressure shows neither: the difference between its coefficients is .0023 and conditional on innovating it is unrelated to novelty, with a 95% confidence interval from −1.10 to 0.80 percentage points, so the interval excludes associations larger than about one point in either direction, while zero is not established. H3a is supported; H3b is not rejected, as no association has been detected within that interval. Pressure is associated with whether firms innovate; credit is additionally associated with what they introduce (see Figure 2).

This is the study's central result and the most robust estimate reported. It survives jackknife and bootstrap inference, the reporting-disposition control discussed below, and an Oster (2019) stability test in which unobservable selection would need to be 8.1 times as important as the full observable control set to eliminate it.

The margin distinction reconciles part, but not all, of the conflicting published evidence. Wang and Wang (2024) and Avenyo et al. (2021) report adverse associations using novelty-weighted and intensity-weighted outcomes, while McCann and Bahl (2017) and Amin (2025) report positive associations for incidence measures. If pressure raises the probability of innovating without raising the probability that what is introduced is novel, a novelty-weighted outcome loads on the margin where the association is zero and an incidence outcome loads where it is positive. The two literatures may be measuring different margins of the same

behaviour. The account is partial, since Abbas et al. (2022) report adverse associations for incidence measures in South Asia, where our own estimate is also negative in sign.

Table 4

Testing Whether the Associations Differ by Novelty

Test	Predictor	Estimate	SE	95% CI	*p*	*N*
(a) Market-novel minus incremental	Pressure	.0023	.0036	[−.0050, .0096]	.522	30,432
(a) Market-novel minus incremental	Loan or credit line	.0529	.0080	[.0368, .0690]	<.001	30,432
(b) Conditional novelty (innovators)	Pressure	-.0015	.0047	[−.0110, .0080]	.745	10,037
(b) Conditional novelty (innovators)	Loan or credit line	.0305	.0093	[.0118, .0492]	.002	10,037
(c) Conditional novelty by credit group	Holds credit vs. constrained	.0377	.0135	[.0105, .0649]	.008	9,855
(c) Conditional novelty by credit group	No need vs constrained	-.0086	.0186	[−.0461, .0289]	.647	9,855
(c) Conditional novelty by credit group	Holds credit vs. no need	.0463	.0109	[.0243, .0683]	<.001	9,855

Note. Test (a) regresses the difference between the market-novel and incremental indicators on the Table 3 specification. Test (b) restricts the sample to product innovators answering the novelty item; the outcome is whether the product was new to the main market (mean .649). Test (c) replaces the credit indicator in (b) with the credit-constraint categories, with constrained firms being the reference. All use the full control set and fixed effects, clustered by economy (45 clusters); intervals use $t(44)$. *p < .05. **p < .01. ***p < .001.

4.4 | Testing H4 and validating the credit-constraint measure

With loan holding as the moderator, the interaction is essentially zero for every outcome (product .0002, p = .980). With pooled credit-constraint status, it is positive and nominally significant for product innovation (.0086, p = .022) and market-novel innovation (.0093, p = .009), and these estimates are robust to alternative centring, stricter fixed effects and alternative clustering. On these rows, H4 would receive partial support. Two checks overturn that reading.

Decomposition is the first check. For product innovation, the interaction with holding credit is .0036 (p = .450) and with reporting no need is .0114 (p = .017), so that the composite effect is based on the sample with the least clearly defined financing situation. Excluding this sample leads to a reduced interaction of .0018 (p = .725) with 22,393 firms. The second check is multiplicity, since the minimum p-value for sixteen moderation tests adjusted for Holm correction is .145.

This point is brought out in Table 5, where the three groups are profiled based on attributes that are observed rather than assessed. While those without any need for loans fall in the middle with respect to size and age, with respect to innovation, they are virtually alike with those who are constrained (.311 versus .306) but clearly lower than credit holders (.363). They also report the lowest obstacle index and the lowest perceived pressure, which is what one would expect of firms with limited growth ambition rather than firms whose financing needs are comfortably met. This is the pattern Islam and Meza (2023) warn about and Wenwen

(2026) documents directly. Placing these firms in the unconstrained category assigns roughly a quarter of the sample to a group they do not behaviourally resemble.

The discriminating test set out in the literature review bears directly on the outcome that matters most here. Test (c) of Table 4 re-estimates the conditional-novelty model with the credit-constraint categories entered separately. Among innovators, credit holders are 3.8 percentage points more likely than constrained firms to have introduced a market-novel product ($p = .008$), whereas no-need firms are indistinguishable from constrained firms (-0.9 points, $p = .647$); the gap between the two groups that the standard classification pools together is 4.6 points ($p < .001$). The estimate survives jackknife and wild-cluster bootstrap inference ($p = .010$ and .005), and the obstacle control (.0372, $p = .010$), and its Oster delta is 4.7. It replicates in Pakistan, where credit holders exceed constrained innovators by 24.4 points ($p = .008$) while no-need firms do not (7.0 points, $p = .354$), a gap of 17.4 points between the two pooled groups ($p = .007$). On the ambitious margin, the no-need group behaves as the absent-opportunity and suppressed-demand accounts predict, not as the sufficiency account does (Hottenrott & Peters, 2012; Kon & Storey, 2003), although the data cannot separate those two accounts, which imply the same pattern, so both remain candidate explanations rather than findings. The result also sharpens H3a: the novelty premium attaches to holding credit, not to the mere absence of a reported constraint.

Pooled unconstrained status, similar to Distinguin et al. (2016) and , goes down with perceived pressure (-.0162, $p = .009$), almost exclusively because of the no-need group (-.0243, $p < .001$), the credit-holding component rising by .0081 so that the two components sum to the pooled coefficient, and actual borrowing increases slightly (.0094, $p = .007$). The construct behaves contrary to its largest constituent part. The moderator, thus, is endogenous to the variable being moderated.

H4, therefore, is not supported since no moderation effect is found when the measure is decomposed, and multiplicities are taken into consideration. It should be noted that this is not an absence but a lack of detection. Having 45 clusters in the sample, the study has 80% power to detect a slope difference of 1.03 percentage points per severity point, which comes down to 4.1 points on the entire scale; smaller differences would remain undetected.

Table 5

Profile of the Three Financing Groups on Recorded Characteristics

Characteristic	Constrained	Reports no need	Holds credit
N	10,882	7,664	11,511
Log employment	2.551	2.927	3.232
Log firm age	2.503	2.622	2.740
Exporter (share)	.109	.160	.219
Began operations unregistered (share)	.284	.203	.189
Product innovation	.306	.311	.363
Market-novel innovation	.189	.196	.247
General obstacle index	1.466	1.238	1.442
Unregistered-firm pressure	1.835	1.499	1.728

Note. Unconditional group means. The standard Kuntchev et al. (2013) classification assigns both the no-need and holds-credit groups to the unconstrained category. Shares and innovation entries are proportions on a 0–1 scale, not percentages; the obstacle index and pressure measure are means on their 0–4 scales.

4.5 | Bounding the Reporting-disposition Problem

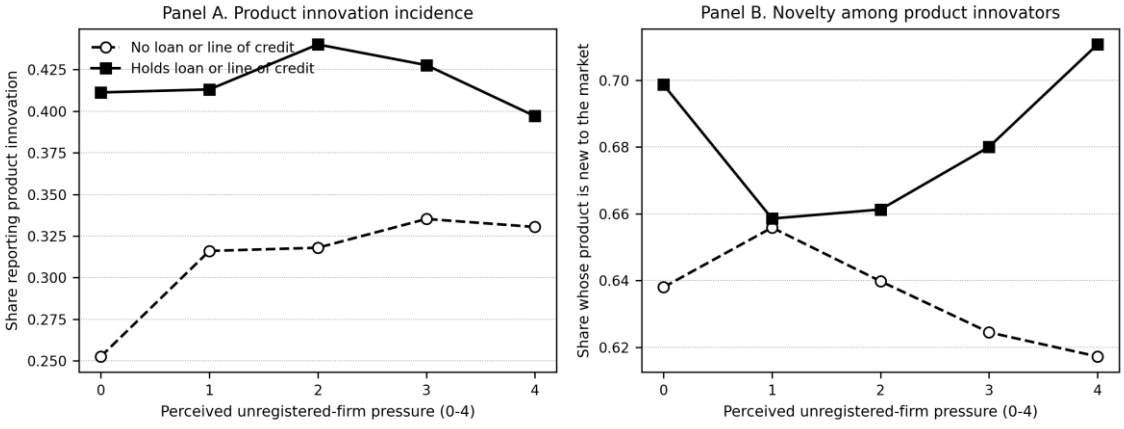
The main predictor is a perception elicited on the same severity scale, in the same instrument, as fifteen unrelated obstacle items and as the innovation outcomes. A firm that rates everything as severe will record a high value on the pressure item for reasons unrelated to unregistered rivals . Adding the general obstacle index reduces the pressure coefficient for product innovation by about 45%, to .0082 (p = .039), and for incremental innovation to .0050 (p = .043), but reduces it to statistical zero for process (-.0001, p = .986) and market-novel innovation (.0031, p = .340).

The obvious objection is that this control does too much, since a firm genuinely operating in a hostile environment will rate many obstacles highly for good reason. Two further tests assess the objection. The first supports the control: replacing the index with the firm deviation from its economy-year-industry cell mean, which contains no shared environmental variation, leaves the coefficient where the full control put it (.0086, p = .029; .0089, p = .027 with a leave-one-out cell mean), so the work is done by firm-level disposition rather than local environment. The second undercuts it: standardized, that deviation predicts holding credit (.092), firm size (.093) and exporting (.085) as strongly as it predicts product innovation (.079), so it is not purely a way of answering questions.

The defensible object is therefore an interval rather than a point. The association between perceived pressure and product innovation lies between about 0.8 and 1.5 percentage points per severity point, the upper bound treating none of the shared variation as method artefact and the lower bound treating all of it as artefact. Neither assumption is correct, but both ends of the interval are positive and statistically significant. H1 is therefore supported for product innovation, whereas for process and market-novel innovation the lower bound is not distinguishable from zero. Two considerations limit the consequences: interaction terms cannot be artefacts of common method variance, which attenuates rather than generates them (Siemsen et al., 2010), and the central result of this study does not involve the perception measure at all, since credit is recorded from the financing module and its association with conditional novelty is unchanged by the obstacle control (.0283, p = .007).

Figure 2

Innovation Incidence and Novelty by Perceived Pressure and Credit Status



Note. Unconditional shares, without fixed effects or controls. Panel A plots the share reporting product innovation. Panel B restricts to product innovators and plots the share whose product was new to the main market. Panel A rests on all 30,483 establishments, of which 6,732 hold a loan or line of credit, and 23,751 do not, and Panel B on the 10,037 innovators answering the novelty item, of which 2,816 hold one and 7,221 do not. Neither axis begins at zero.

4.6 | Evidence for Pakistan and South Asia

Pakistan combines a large unregistered sector with formal credit use among the lowest in the region (Bussolo & Sharma, 2023), and the phenomenon is well documented there: Miraj et al. (2021) report that 47% of Pakistani formal firms face unregistered rivals and 83% treat this as an obstacle, with severity driven principally by regulatory burden, taxation and licensing rather than by rival characteristics. Table 6 estimates the same models on Pakistan alone and on pooled South Asia, clustering by industry since two survey years cannot support economy-year clustering.

Three results follow. H2 replicates everywhere. Moreover, the composition result is replicated for Pakistan in an unusually strong fashion: Among the 312 Pakistani product innovators responding to the novelty item, those who possess formal credit are 25.2 percentage points more likely to have launched a market-novel product, against 3.1 points in Africa, though the two estimates are not formally compared. Neither result appears in pooled South Asia, which is effectively an Indian sample supplying 87% of observations. The Pakistan evidence also bears on the measurement result: whereas the pressure coefficients in Pakistan are higher than those in Africa, they are reduced to .0069 (p = .332) for product innovation and .0163 (p = .062) for process innovation when the index of obstacles is included, thus making the relationship between pressure less robust in Pakistan than in Africa, where the product-innovation lower bound survives.

Comparisons across the three samples are descriptive: a coefficient significant in one and not in another is not evidence that the two differ, since the difference between a significant and a non-significant estimate is not itself significant (Gelman & Stern, 2006).

The straightforward statement would be that credit innovation linkage is generally true for all three contexts, composition is supported for Africa and replicated in Pakistan but not for India, and perception-driven pressure linkage is bounded wherever it has been studied. This is an example of bounded generalization suggested by Levinthal and Rosenkopf (2026) to replace universal claims made on the basis of broad country coverage (see Table 7).

Table 6

Pakistan and South Asia

Sample	Outcome	Mean	Pressure	SE	*p*	Loan or credit	SE	*p*	*N*
Pakistan	Product innovation	.151	.0225	.0085	.010	.1342	.0575	.023	2,072
Pakistan	Process innovation	.168	.0257	.0088	.005	.2390	.0588	<.001	2,072
Pakistan	Market-novel	.092	.0173	.0087	.053	.1550	.0474	.002	2,071
Pakistan	Conditional novelty	.612	.0144	.0372	.700	.2523	.0563	<.001	312
South Asia	Product innovation	.174	-.0021	.0021	.320	.0562	.0070	<.001	32,417

South Asia	Process innovation	.222	.0031	.0021	.137	.0596	.0062	<.001	32,417
South Asia	Market-novel	.105	-.0001	.0018	.954	.0228	.0047	<.001	32,382
South Asia	Conditional novelty	.605	.0105	.0078	.186	.0128	.0139	.363	5,611

Note. Pakistan: 2013 and 2022 rounds, survey-year and industry fixed effects. South Asia: Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka, economy-by-year and industry fixed effects. Both use the full control set and cluster by two-digit industry, with 42 and 49 clusters respectively in the incidence and market-novelty models and 35 and 44 in the conditional-novelty models, where industries with no innovators drop out. Standard errors are reported so that the precision of the Pakistani estimates, in particular the 312-firm conditional-novelty estimate, can be assessed. *p < .05. **p < .01. ***p < .001.

Table 7

Summary of Hypotheses and Findings

	Hypothesis	Key estimate	Verdict
H1	Pressure is positively associated with innovation incidence	.0146 (p < .001) product; bounded between .0082 (p = .039) and .0146	Supported for product innovation; not established for process
H2	Formal credit relationship is associated with more innovation	.0992 (p < .001) product	Supported
H3a	Conditional on innovating, credit is associated with market novelty	.0305 (p = .002); .2523 (p < .001) in Pakistan	Supported
H3b	Conditional on innovating, pressure is unrelated to market novelty	-.0015 (p = .745), 95% CI [−.0110, .0080]	Not rejected; no association detected, and associations above about one percentage point are inconsistent with the data
Test	No-need innovators resemble credit holders on novelty (sufficiency account)	.0463 (p < .001) credit holders vs no need; .1741 (p = .007) in Pakistan	Rejected: no-need firms match constrained firms
H4	Credit strengthens the association in H1	.0036 (p = .450) for credit holders; smallest Holm p = .145	Not supported (non-detection)

Note. Estimates are from the Sub-Saharan African sample unless stated otherwise. Full results are reported in Tables 3 to 6. "Not established" means the data do not support the association, not that it is absent.

5 | DISCUSSION

5.1 | Research Implications

Regarding theory, the findings move the escape hypothesis (Aghion et al., 2005) to the incidence dimension and the financing constraint to the novelty dimension. Treating innovation as a single outcome hide this. Also, the different weighting of novelty makes other literature look contradictory.

Four factors plausibly account for the larger Pakistani estimate. The first is statistical: with 312 innovators, the estimate is imprecise, and one attaining significance in a small sample is, in expectation, larger than the quantity it estimates (Gelman & Carlin, 2014). Second, credit penetration in Pakistan is low even by regional standards (Bussolo & Sharma, 2023), so holders are more strongly selected and the gap widens without the mechanism being stronger. Third, non-bank substitutes are thinner than in Africa, where supplier credit, rotating savings, and donor schemes fund expansion without appearing in the loan variable. Fourth,

Pakistani innovation rates are roughly half the African ones, so novel launches are rarer and relatively larger commitments. These are candidate accounts rather than tested findings.

In terms of policy for Pakistan, there are three implications to be made. First, the association with credit is concentrated on the novelty margin rather than on whether firms innovate at all; hence, the enterprise programmes that have their performance assessed by the number of firms that engage in innovation would actually consider the imitation of others a success; indicators should be specified on novelty. Second, credit demand is not a reliable signal of credit need, since firms reporting no need behave like constrained firms, so schemes designed around observed demand rely on an indicator that does not track the behaviour assumed of it, though the data cannot establish whether such firms lack projects or have withdrawn from applying. Third, tightening enforcement against unregistered rivals should not be expected to raise innovation quality. Miraj et al. (2021) show that perceived pressure in Pakistan is driven by the compliance costs borne by the formal firm rather than by rival characteristics, which suggests that reducing the cost of remaining formal is a candidate lever requiring direct evaluation.

For researchers using the Enterprise Surveys, both measurement results are inexpensive to replicate and rarely reported. The general obstacle control and the decomposition of the credit-constraint classification each changed a conclusion in this study, and reporting both should become routine.

5.2 | Limitations and future research

The design is observational. Financing is observed at the survey date while innovation refers to the preceding three years, so reverse causality is possible, and the conditional-novelty result is as consistent with ambitious innovators borrowing as with borrowers innovating ambitiously. The main sample is Sub-Saharan African, and not all findings extend, as the Indian evidence shows. The Pakistani samples are small, particularly the 312 innovators underlying the conditional-novelty estimate, which should be treated as an encouraging replication rather than as independently decisive. The innovation measures are self-reported and drawn from the short Enterprise Survey module, which Cirera and Muzi (2020) show over-reports innovation relative to standalone surveys. The surveys are repeated cross-sections, so within-firm change cannot be observed. The conditional-novelty models also condition on an outcome, and estimates are unweighted.

The single most important direction for researchers using these surveys is to link responses to administrative records, so that the explanatory variables are measured independently of the respondent who reports the outcomes; both measurement problems documented here are problems of self-report and neither can be solved by any adjustment internal to the survey. Further research should measure financing and competitive exposure based on factors other than the self-rated severity of the problem. Such an analysis could be done, for example, by matching firms from survey data with administrative credit records. The incidence-novelty distinction can be applied in the analysis of results like the proportion of innovative sales. Another research idea is an empirical study focused on Pakistan which combines different survey waves into one pooled dataset.

6 | CONCLUSION

This research distinguishes between two issues that tend to be conflated in the existing literature: innovation per se, and its product. Firms perceiving stronger pressure from unregistered rivals exhibit higher

innovation, yet conditional on their innovating, no association with market novelty is detected: the estimate is −0.15 percentage points, 95% CI [−1.10, 0.80], so the study does not establish that no relationship exists. Firms with formal credit exhibit greater innovation, and conditional on their innovating, much greater novel innovation; in Pakistan, the difference is as large as 25 percentage points on 312 innovators. Firms with no credit needs, which the standard classification treats as unconstrained, are like constrained firms in both Africa and Pakistan, and the widely reported financing contingency rests on that pooling.

.

Acknowledgment: The authors would like to express their sincere thanks to the editor and the anonymous reviewers for their helpful comments and suggestions.

Author Contributions: Majeed, U.; Data curation: Majeed, U.; Formal analysis: Majeed, U.; Investigation: Majeed, U.; Methodology: Majeed, U. and Saeed, A.; Software: Majeed, U.; Supervision: Saeed, A.; Validation: Majeed, U. and Saeed, A.; Writing – original draft: Majeed, U.; Writing – review & editing: Majeed, U. Both authors approved the final version of the manuscript for publication.

Declaration of Conflicting Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Licenses and Copyright: This is an open-access article, free of all copyright, and fulfills the DOAJ definition of open access. This work is licensed under a "Creative Commons Attribution 4.0 International License". This permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Funding: The author(s) received no financial support for the research, authorship, and/or publication of this article.

Data Availability Statement: This study uses the World Bank Enterprise Surveys (Indicators Database, Global Methodology, and Standardized Raw Database, July 2026 releases). The underlying survey data are available through the World Bank Enterprise Surveys platform, subject to the applicable access conditions.

Plagiarism Statement: This article was screened using Turnitin. No plagiarism was detected. The Overall Similarity Index (SI) and Single Source Similarity are within the Higher Education Commission (HEC) prescribed thresholds (Overall SI <19%; Single Source <5%).

Artificial Intelligence (AI) Statement: This article was screened using Turnitin's AI writing detection tool to identify AI-generated and AI-paraphrased content. The AI-generated content is within the journal's prescribed threshold and complies with the HEC Anti-Plagiarism and AI Policy.

Disclaimer/Publisher's Note: The statements, opinions, and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher "AGASR" and/or the editor(s). The Publisher AGASR and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.

REFERENCE

Abbas, S., Adapa, S., Sheridan, A., & Azeem, M. M. (2022). Informal competition and firm level innovation in South Asia: The moderating role of innovation time off and R&D intensity. Technological Forecasting and Social Change, 181, 121751. https://doi.org/10.1016/j.techfore.2022.121751

Aghion, P., Bergeaud, A., & Van Reenen, J. (2023). The impact of regulation on innovation. *American Economic Review*, *113*(11), 2894-2936. https://doi.org/10.1257/aer.20210107

Aghion, P., Bloom, N., Blundell, R., Griffith, R., & Howitt, P. (2005). Competition and innovation: An inverted-U relationship. *The Quarterly journal of economics*, *120*(2), 701-728. https://doi.org/10.1093/qje/120.2.701

Ai, C., & Norton, E. C. (2003). Interaction terms in logit and probit models. *Economics letters*, *80*(1), 123-129. https://doi.org/10.1016/S0165-1765(03)00032-6

Amin, M. (2025). How does competition from informal firms impact research and development by formal manufacturing small and medium enterprises in the developing and emerging economies? *Kyklos*, *78*(1), 45-73. https://doi.org/10.1111/kykl.12410

Amore, M. D., Schneider, C., & Žaldokas, A. (2013). Credit supply and corporate innovation. *Journal of financial economics*, *109*(3), 835-855. https://doi.org/10.1016/j.jfineco.2013.04.006

Autor, D., Dorn, D., Hanson, G. H., Pisano, G., & Shu, P. (2020). Foreign competition and domestic innovation: Evidence from US patents. *American Economic Review: Insights*, *2*(3), 357-374. https://doi.org/10.1257/aeri.20180481

Avenyo, E. K., Konte, M., & Mohnen, P. (2021). Product innovation and informal market competition in sub-Saharan Africa: Firm-level evidence. *Journal of Evolutionary Economics*, *31*(2), 605-637. https://doi.org/10.1007/s00191-020-00688-2

Ayyagari, M., Demirgüç-Kunt, A., & Maksimovic, V. (2011). Firm innovation in emerging markets: The role of finance, governance, and competition. *Journal of financial and quantitative analysis*, *46*(6), 1545-1580. https://doi.org/10.1017/S0022109011000378

Brancati, E., Minetti, R., & Zhu, S. C. (2026). Financial shocks and firm innovation in supply chain networks. *Management science*, *72*(6), 4715-4736. https://doi.org/10.1287/mnsc.2023.03601

Brown, M., Ongena, S., Popov, A., & Yeşin, P. (2011). Who needs credit and who gets credit in Eastern Europe? *Economic Policy*, *26*(65), 93-130. https://doi.org/10.1111/j.1468-0327.2010.00259.x

Bussolo, M., & Sharma, S. (2023). *Hidden potential: rethinking informality in South Asia*. World Bank Publications.

Chang, S.-J., Van Witteloostuijn, A., & Eden, L. (2019). Common method variance in international business research. In *Research methods in international business* (pp. 385-398). Springer. https://doi.org/10.1007/978-3-030-22113-3_20

Chava, S., Oettl, A., Subramanian, A., & Subramanian, K. V. (2013). Banking deregulation and innovation. *Journal of financial economics*, *109*(3), 759-774. https://doi.org/10.1016/j.jfineco.2013.03.015

Cirera, X., & Muzi, S. (2020). Measuring innovation using firm-level surveys: Evidence from developing countries☆. *Research policy*, *49*(3), 103912. https://doi.org/10.1016/j.respol.2019.103912

Colin Cameron, A., & Miller, D. L. (2015). A practitioner's guide to cluster-robust inference. *Journal of human resources*, *50*(2), 317-372. https://doi.org/10.3368/jhr.50.2.317

Diestre, L., & Barber IV, B. (2026). Regulated versus unregulated competition: How drug shortages boost illegal pharmacy sales. *Strategic management journal*, *47*(7), 1811-1839. https://doi.org/10.1002/smj.70078

Distinguin, I., Rugemintwari, C., & Tacneng, R. (2016). Can informal firms hurt registered SMEs' access to credit? *World Development*, *84*, 18-40. https://doi.org/10.1016/j.worlddev.2016.04.006

Eklund, J., Raj, M., & Eggers, J. (2025). Attention focus and new opportunities: The moderating role of managerial attention to alternative issues. *Organization science*, *36*(1), 21-39. https://doi.org/10.1287/orsc.2021.15861

Fresard, L. (2010). Financial strength and product market behavior: The real effects of corporate cash holdings. *the Journal of Finance*, *65*(3), 1097-1122. https://doi.org/10.1111/j.1540-6261.2010.01562.x

Garcia, R., & Calantone, R. (2002). A critical look at technological innovation typology and

innovativeness terminology: a literature review. *Journal of Product Innovation Management: An international publication of the product development & management association*, *19*(2), 110-132. https://doi.org/10.1111/1540-5885.1920110

Gelman, A., & Carlin, J. (2014). Beyond power calculations: Assessing type S (sign) and type M (magnitude) errors. *Perspectives on psychological science*, *9*(6), 641-651. https://doi.org/10.1177/1745691614551642

Gelman, A., & Stern, H. (2006). The difference between "significant" and "not significant" is not itself statistically significant. *The American Statistician*, *60*(4), 328-331. https://doi.org/10.1198/000313006X152649

Giesselmann, M., & Schmidt-Catran, A. W. (2022). Interactions in fixed effects regression models. *Sociological Methods & Research*, *51*(3), 1100-1127. https://doi.org/10.1177/0049124120914934

Gorodnichenko, Y., & Schnitzer, M. (2013). Financial constraints and innovation: Why poor countries don't catch up. *Journal of the European Economic association*, *11*(5), 1115-1152. https://doi.org/10.1111/jeea.12033

Greene, W. (2010). Testing hypotheses about interaction terms in nonlinear models. *Economics letters*, *107*(2), 291-296. https://doi.org/10.1016/j.econlet.2010.02.014

Han, L., Fraser, S., & Storey, D. J. (2009). Are good or bad borrowers discouraged from applying for loans? Evidence from US small business credit markets. *Journal of Banking & Finance*, *33*(2), 415-424. https://doi.org/10.1016/j.jbankfin.2008.08.014

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica: Journal of the econometric society*, 153-161. https://doi.org/10.2307/1912352

Hoetker, G. (2007). The use of logit and probit models in strategic management research: Critical issues. *Strategic management journal*, *28*(4), 331-343. https://doi.org/10.1002/smj.582

Hombert, J., & Matray, A. (2018). Can innovation help US manufacturing firms escape import competition from China? *the Journal of Finance*, *73*(5), 2003-2039. https://doi.org/10.1111/jofi.12691

Hottenrott, H., & Peters, B. (2012). Innovative capability and financing constraints for innovation: more money, more innovation? *Review of Economics and Statistics*, *94*(4), 1126-1142. https://doi.org/10.1162/REST_a_00227

Hsu, P.-H., Tian, X., & Xu, Y. (2014). Financial development and innovation: Cross-country evidence. *Journal of financial economics*, *112*(1), 116-135. https://doi.org/10.1016/j.jfineco.2013.12.002

Islam, A. M., & Meza, J. R. (2023). *How prevalent are credit-constrained firms in the formal private sector?* (Policy Research Working Paper. World Bank, Issue.

Karaca-Mandic, P., Norton, E. C., & Dowd, B. (2012). Interaction terms in nonlinear models. *Health services research*, *47*(1pt1), 255-274. https://doi.org/10.1111/j.1475-6773.2011.01314.x

Kon, Y., & Storey, D. J. (2003). A theory of discouraged borrowers. *Small business economics*, *21*(1), 37-49. https://doi.org/10.1023/A:1024447603600

Kouakou, D. C. (2026). Managing credit constraints under competitive pressure from the informal sector. *Economics of Transition and Institutional Change*, *34*(3), 475-498. https://doi.org/10.1111/ecot.70029

Kuntchev, V., Ramalho, R., Rodríguez-Meza, J., & Yang, J. S. (2013). What have we learned from the enterprise surveys regarding access to credit by SMEs? *World Bank policy research working paper*(6670), 39.

La Porta, R., & Shleifer, A. (2014). Informality and development. *Journal of Economic Perspectives*, *28*(3), 109-126. https://doi.org/10.1257/jep.28.3.109

Lee, D. S. (2005). Training, wages, and sample selection: Estimating sharp bounds on treatment effects. In: National Bureau of Economic Research, Cambridge, Mass., USA.

Levinthal, D. A., & Rosenkopf, L. (2026). Mapping the landscape of research findings: Generalization across contexts in strategic management research. *Strategic management journal*, *47*(6), 1793-1808. https://doi.org/10.1002/smj.70071

Li, Y., Reis, S., & Khessina, O. M. (2026). When should firms watch for cross-industry competition? A demand-side perspective. *Strategic management journal*, *47*(3), 893-941. https://doi.org/10.1002/smj.70034

Linn, M., & Weagley, D. (2024). Uncovering financial constraints. *Journal of financial and quantitative analysis*, *59*(6), 2582-2617. https://doi.org/10.1017/S0022109023000650

Mazzei, M. J., DeBode, J., Gangloff, K. A., & Song, R. (2025). Old habits die hard: A review and assessment of the threat-rigidity literature. *Journal of management*, *51*(6), 2154-2181. https://doi.org/10.1177/01492063241286493

McCann, B. T., & Bahl, M. (2017). The influence of competition from informal firms on new product development. *Strategic management journal*, *38*(7), 1518-1535. https://doi.org/10.1002/smj.2585

Miraj, A., Naveed, S., & Nazuk, A. (2021). Determinants of Informal Competition faced by Formal Firms in Pakistan: An Empirical Evaluation from 2013 World Bank Enterprise Survey. *FWU Journal of Social Sciences*, *15*(2), 20. https://doi.org/10.51709/19951272/Summer-2/2

Ocasio, W. (1997). Towards an attention-based view of the firm. *Strategic management journal*, *18*(S1), 187-206.

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. *Journal of Business & Economic Statistics*, *37*(2), 187-204. https://doi.org/10.1080/07350015.2016.1227711

Siemsen, E., Roth, A., & Oliveira, P. (2010). Common method bias in regression models with linear, quadratic, and interaction effects. *Organizational research methods*, *13*(3), 456-476. https://doi.org/10.1177/1094428109351241

Solon, G., Haider, S. J., & Wooldridge, J. M. (2015). What are we weighting for? *Journal of human resources*, *50*(2), 301-316. https://doi.org/10.3368/jhr.50.2.301

Staw, B. M., Sandelands, L. E., & Dutton, J. E. (1981). Threat rigidity effects in organizational behavior: A multilevel analysis. *Administrative science quarterly*, 501-524. https://doi.org/10.2307/2392337

Ulyssea, G. (2018). Firms, informality, and development: Theory and evidence from Brazil. *American Economic Review*, *108*(8), 2015-2047. https://doi.org/10.1257/aer.20141745

Wang, K., & Wang, T. (2024). Competition from informal firms and new-to-market product innovation: A competitive rivalry framework. *Journal of Product Innovation Management*, *41*(4), 816-842. https://doi.org/10.1111/jpim.12712Digital

Wenwen, J. (2026). Choosing Not to Borrow: Imprinting Effects of Informality on Firms' Credit Self-rationing. *Borsa Istanbul Review*, *26*(2), 100785. https://doi.org/10.1016/j.bir.2026.100785

Xia, D., Cassiman, B., & Wehrheim, D. (2026). Escaping product market rivalry through innovation. *Management science*, *72*(9), 7921-7939. https://doi.org/10.1287/mnsc.2024.08304

Zelner, B. A. (2009). Using simulation to interpret results from logit, probit, and other nonlinear models. *Strategic management journal*, *30*(12), 1335-1348. https://doi.org/10.1002/smj.783