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The Effects of Product Differentiation and Process Innovation on Credit Rationing

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ABSTRACT

Informational credit rationing is a disequilibrium phenomenon in credit markets, in which price mechanisms fail to allocate credit efficiently due to informational frictions. It is commonly argued that innovative firms are particularly susceptible to credit rationing because innovation may exacerbate information asymmetries between firms and lenders. However, this argument often overlooks the improvements in internal information and management required to undertake such activities, which can influence the net change in information available to lenders. These improvements can enhance transparency and reduce agency problems, potentially offsetting the initial informational disadvantages. Using data from the World Bank Enterprise Surveys for medium and large formal firms and proxy indicators such as product differentiation and process improvement, this study estimates the average effect of innovation-related activities on access to credit. The results reveal statistically significant reductions in the probability of experiencing credit rationing, with marginal effects ranging from 11.8 to 19.7 percentage points. These findings are robust across model specifications and suggest that product differentiation, while initially increasing informational frictions, ultimately improves firms' credit profiles.

JEL classification: D82, L25, Q31

Keywords: credit rationing, credit markets, innovation, product differentiation, agency problems

1 INTRODUCTION

Credit rationing is a central phenomenon in credit markets, characterized by the failure of standard pricing mechanisms to balance credit supply and demand. This issue has been, and continues to be, extensively studied. There is consensus that the imbalance is primarily driven by informational frictions (Drakos and Giannakopoulos, 2011; Steijvers and Voordeckers, 2009). Given the relevance of informational frictions, it is often argued that credit rationing is particularly prevalent among innovative firms because innovation would deepen information asymmetries between them and lenders.

There is some consensus in the literature that credit rationing tends to negatively affect innovation (Canepa and Stoneman, 2008; Savignac, 2008). However, the effects of innovation on credit rationing are less clear. This note explores the empirical relationship between innovation-related activities and credit rationing, focusing on product differentiation and production process improvements. Exploring this relationship is challenging given dual causality. To address this, two instrumental variables were used, one that emphasizes the bonuses received mainly by the manager, and the other that reflects the knowledge of production targets throughout the firm.

This study estimates a non-linear probability model, specifically addressing endogeneity concerns and unobservable heterogeneity affecting the relationship between observed innovation-related activities and empirical measures of credit rationing. Using two alternative proxy metrics of innovation-related activities (product differentiation and process improvement or innovation), it found that these activities reduce the marginal probability of experiencing credit rationing among medium and large-sized firms. Understanding the relationship between innovation and credit constraints is vital for policymakers aiming to support business growth. The study shows that firms engaged in product differentiation and process innovation observe a reduction in the marginal probability of experiencing credit rationing, driven by internal improvements in transparency and organization. The result resembles that in Gong-Bing et al. (2022), who find that these benefits are especially pronounced for firms with limited market power, high supplier concentration, and greater financial constraints.

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CONCEPTUAL FRAMEWORK

The literature on the relationship between product differentiation, process innovation, and credit restrictions is sparse. Most studies emphasize the increased information asymmetries, risks, and uncertainties associated with innovative activities, which can negatively impact credit access and increase the likelihood of credit rationing. There is limited research on the potential positive effects of product differentiation and innovation on credit access, particularly regarding improved informational transparency and better control of internal agency problems within firms. These factors are essential for effective product differentiation and innovation. The following section explores various elements of the relationships between product differentiation and innovation and credit access, especially credit rationing, leading to the formulation of the study's main hypothesis: firms engaging in product differentiation and process innovation are likely to experience a net reduction in their marginal probability of experiencing credit rationing.

2.1 Credit Rationing

Credit rationing is a crucial concept in credit markets. It refers to a situation where lenders limit the supply of credit to borrowers who are willing and able to pay the prevailing interest rate. This phenomenon indicates a disequilibrium where the standard price mechanism fails to balance credit supply and demand. The seminal work by Stiglitz and Weiss (1981) provides a comprehensive theoretical framework explaining that credit rationing occurs due to information asymmetries between borrowers and lenders. They argue that in the presence of imperfect information, increasing interest rates may lead to adverse selection and moral hazard. Adverse selection occurs when higher interest rates attract riskier borrowers who are willing to accept the cost because either they have projects with a higher variance of returns or they do not intend to

repay. This leads to a deterioration in the average quality of loan applicants. Moral hazard arises after a loan is granted, where borrowers may undertake riskier projects than initially agreed upon, as they bear less of the downside risk. Anticipating this behavior, lenders may ration credit to limit potential losses. Consequently, lenders may prefer to ration credit rather than increasing interest rates, as higher rates can exacerbate adverse selection and moral hazard, ultimately reducing their expected returns.

Several factors can contribute to the prevalence of credit rationing in credit markets. The lack of transparent and reliable information about borrowers increases uncertainty for lenders, which is particularly relevant for smaller firms, startups, and those with less established track records (Berger and Udell, 1998). Restrictions on the availability of collateral also play a significant role, as collateral can mitigate the negative effects of information asymmetries. Thus, firms lacking sufficient collateral are more likely to experience credit rationing (Steijvers and Voordeckers, 2009). Additionally, regulatory requirements and capital adequacy norms can limit the lending capacity of financial institutions, leading to increased credit rationing (Bernanke and Lown, 1991). Támola, Fernández-Díez, and Joachín (2024) have explored the distinction between internal and external factors and their contribution to credit rationing, finding that external variables have a larger association with credit rationing than internal variables; furthermore, within the latter group, the quality and truthfulness of information provided by firms present statistically significant associations with credit rationing.

Reducing information asymmetries is crucial for mitigating credit rationing. While innovations themselves may temporarily increase information asymmetries, the underlying organizational adjustments required to deliver those innovations can result in meaningful improvements in internal organization, including improvements in information systems.[1] These internal changes may end up more than compensating for potential increases in information asymmetries associated with product differentiation and innovation. For instance, implementing innovative processes often requires upgrading information management, which can reduce informational opacity (Cohen and Klepper, 1996a, 1996b). In addition, improved internal controls and incentive mechanisms align interests within the firm, reducing moral hazard concerns for lenders (Panda and Leepsa, 2017).

1 The potential increase in information asymmetries between the firm and lenders due to innovations is likely to be temporary as, over time, they learn their economic and financial implications. The case of a process of continued innovation can be different, as the information sets must be continually updated.

2.2 Product Differentiation, Innovation, and Firm Organization

Product differentiation refers to the process by which firms try to distinguish their products from those of competitors. It can be seen as a strategy to reduce the price elasticity of demand for their products and gain some degree of pricing power facing a downward-sloping demand (Caves and Williamson, 1985). Two important cases are horizontal and vertical differentiation. In horizontal product differentiation, there are minor differences in the intrinsic attributes of a product in terms of quality or performance, and the modifications are targeted to preferences such as colors or flavors (e.g., assorted flavors for coffee or different clothing designs). In vertical differentiation, products or services differ in quality or significant characteristics in a way that is commonly agreed by consumers. Examples are budget and premium versions of a given product (e.g., smartphones, cars), where intrinsic characteristics such as speed, capacity, and durability distinguish one product from others within a given category.

Innovation, on the other hand, refers to a process that results in the introduction of a significantly different product, process, or idea. In some cases, it can be the result of a cumulative combination of multiple vertical differentiators or a truly novel product, service, or process that may qualify for legal protection such as a patent. The purpose of innovation is to gain a competitive advantage and some degree of pricing power, although innovation often involves more fundamental changes than product differentiation (Dutta, 1990).[2]

In addition to product differentiation or innovation, firms also try to develop improvements or innovations in production processes, such as new or significantly improved production or delivery methods. Both types of improvements or innovations aim to increase the firm's price-cost margin, with product innovation operating through price while process innovation affects costs (Cohen and Klepper, 1996a, 1996b). Process innovation focuses on changes in the way that products or services are created, produced, or delivered rather than changes to the products or services themselves and can involve reducing costs and/or increasing productivity by adopting modern technologies, workflows, and supply chain improvements, among other strategies.

Although innovation and product differentiation are similar in their motivation to gain a competitive advantage and some degree of pricing power, innovation can be characterized as a fundamental discontinuity or radical alteration in products and production technologies (Dutta, 1990) and, as such, generally carries a higher level of risk and uncertainty compared to product differentiation. Given this distinction, it can be argued that product differentiation is likely to be more prevalent and more commonly pursued by small and medium enterprises than product innovation (although this is likely to vary depending on firm and market characteristics).

2 Digital calculators were an innovation relative to mechanical calculators such as slide rules. Smartphones innovated over first- and second-generation cellular phones. Flip phones and foldable phones can be seen as vertical differentiations for second-generation cellular phones and current smartphones, respectively.

The effectiveness and success of product differentiation and process improvement or innovation are, to a considerable extent, the result of internal organizational practices. *Cozzarin* (2017) reviews multiple studies presenting evidence that improved internal organization (i.e., selection and hiring, training, performance appraisals, incentives, commitment, and other management elements) is associated with higher levels of innovation. Thus, organizational innovation, understood as the implementation of new methods of organization in the workplace, has been shown to contribute to product and process innovations (Anzola-Román et al., 2018; Bataineh et al., 2023; Lee, and Jung 2024). Furthermore, better internal organization is associated with improved capabilities for innovation (Capriati and Divella, 2020).

These elements point to an often neglected but important aspect of firms more invested in product differentiation and innovative ideas. To achieve these outcomes, firms must improve their internal organization, which requires improving their information systems and solving internal agency problems. These firms would be, in general, more informationally transparent than those not invested in such activities. This should reduce the information asymmetries from the standpoint of potential lenders.

A central insight from the economics of organization is that performance improvements typically require complementary bundles of organizational practices, not isolated tweaks (Milgrom and Roberts, 1990). Product differentiation and innovation therefore tend to go together with internal upgrading: more formalized routines and processes, stronger measurement and monitoring, better managerial accounting and management information systems, and improved internal controls. These changes can raise the reliability and standardization of internal information and reduce scope for hidden actions. Evidence on ISO 9000 certification is consistent with this formalization and process discipline channel. ISO 9000 is linked to innovation-related performance primarily through process innovation, consistent with certification being associated with more formalized and coordinated operating processes (Terziovski and Guerrero, 2014).

The lending literature also indicates that lenders price and contract on the borrower's internal information/control environment. Disclosed internal control weaknesses are associated with higher loan spreads and more restrictive nonprice terms, consistent with lenders treating internal-control quality as relevant for monitoring costs and expected losses from hidden actions (Kim, Song, and Zhang, 2011). Internal control weakness reports also affect the structure of debt contracts by altering the contracting mix (e.g., the reliance on covenant-based terms versus alternative protections such as collateral) as well as pricing, which is consistent with reporting quality affecting how lenders design contracts (Costello and Wittenberg-Moerman, 2011).

Finally, internal information quality is not only a financing input; it is also correlated with innovative output. Higher internal information quality is associated with more patents and patent citations, and innovation outcomes improve following remediation of internal control problems (Huang, Lao, and McPhee, 2020).

Furthermore, Gong-Bing et al. (2022) highlight that firms facing greater financial constraints, possessing limited market power, and operating within highly concentrated supplier environments can enhance their long-term access to commercial credit by engaging in product differentiation and process innovation. These innovative efforts inherently promote greater transparency and improved internal organization, which in turn foster more meaningful and sustainable access to commercial credit.

2.3 Innovation, Differentiation, and Credit Rationing

There is abundant literature on innovation and credit rationing, which covers both directions of the relationship. A general result is that credit rationing hinders innovation (Banerjee and Moll, 2010; Brown et al., 2012; Mancusi and Vezzulli, 2014; Yu and Fu, 2021). There is also literature focusing on credit access for innovative firms, which includes credit rationing. Piga and Atzeni (2007) discuss the arguments for more difficult access to credit among firms with more research and development (R&D), which revolve, in part, around information and uncertainty. The central argument is that the more intensive the R&D and innovation processes, the more likely it is that problems of moral hazard and adverse selection will interfere with the credit evaluation process. In addition to this, these more innovative firms may be seen as riskier by external investors, which may affect their ability to obtain credit given the differences in expected returns and risk tolerance for external financiers. Furthermore, more innovative firms may be more difficult to evaluate, increasing uncertainty about potential outcomes and adding an additional hurdle to obtaining external financing.

The empirical evidence for the incidence of innovation on credit access is more diverse in terms of results. Piga and Atzeni (2007) find different results for firms with various levels of R&D (low-R&D firms are less likely to obtain credit). Freel (2007) also finds mixed evidence of credit rationing when considering innovation in small firms. Lee et al. (2015) find that credit rationing tends to be more pronounced for innovative firms but less affected by worsening general credit conditions after a financial crisis relative to non-innovative firms. Dalla Pellegrina (2017) examines the relationship between innovation and credit rationing for small Italian firms conditional on lender size, showing that, after correcting for endogeneity, there is no difference in credit rationing between innovative and non-innovative firms considering small and large banks. Thus, overall, empirical evidence does not clearly support the notion that credit rationing is more severe for innovative firms.

This discrepancy between theoretical predictions and empirical evidence can be seen as an indication of an incomplete argument relating innovation to credit rationing. This study considers that the standard arguments fail to account for the improved management and organization required to improve processes and products to attain lower production costs and/or command higher prices. These improvements, particularly in terms of information transparency and

internal control mechanisms, are likely to reduce information asymmetries and mitigate agency problems, thus having the potential to reduce the probability of experiencing credit rationing.[3]

The argument highlighted here is that differentiation and innovation require directed efforts involving incentive structures and internal screening and monitoring. Honig-Haftel and Martin (1993) explore the relationship between patent output and employee reward systems. After controlling for various firm characteristics and exploring several types of incentives, they find that patent output depends on internal incentive systems. Kerssens-van Drongelen and Jan Bilderbeek (1999) find evidence that introducing quantitative and qualitative targets (which intrinsically require developing a concomitant monitoring system) influences innovative activities. Dvir and Lechler (2004) find equivalent results.

This study finds that most of these arguments apply to product differentiation and, for the most part, to process innovation as well. Product differentiation also requires improving the firm's internal organization. Although arguably to a lesser extent than for innovation, these efforts still involve aligning internal incentives and improving screening and monitoring. Furthermore, since product differentiation involves a less radical change (compared to innovation), external creditors are likely to better understand them, reducing information asymmetries and uncertainty. It is important to note the opposing forces in relation to credit rationing in these situations. In both cases, the improved internal organization is likely to result in less credit rationing. Also in both cases, the price-cost ratios are likely to improve, contributing to easier access to external financing. The differences that may emerge are in creditors' understanding of the resulting efforts and the degree of improvement required in internal organization. Thus, whether firms engaging in product differentiation or process innovation are less likely to experience credit rationing than those pursuing more radical changes (product innovations) is a matter of empirical investigation.

Therefore, our hypothesis is that firms engaging in product differentiation or process innovation are less affected by credit rationing than those not engaging in these activities due to their improved internal information systems, better resolution of agency problems, improved observability, and potentially better price-cost ratios. The increased informational transparency associated to those internal improvements becomes relevant from the perspective of public financing programs directed toward innovative firms and/or to promote differentiation and innovation. Lending intended to promote differentiation and innovation generates larger informational and systemic externalities.

3 These relationships are likely to vary conditional on internal and external characteristics (e.g., sector, firm size, regulatory and institutional conditions, etc.)

3

DATA AND VARIABLES

3.1 Data Sources

The data used in our estimations come from two sources. For country-level data, the source is the World Bank's World Development Indicators, while for firm-level data and business environment data, it is the World Bank's Enterprise Surveys (ES). The ES cover firms with more than five employees in non-agricultural formal private sectors.[4] Starting in 2023, the ES began collecting information about several management practices for medium and large firms starting in 2018.[5] Hence, the sample consists of 29,868 medium and large firms from 87 countries, covering the period from 2018 to 2023.

3.2 Product Differentiation

The ES ask questions to gather information about the introduction of new or improved products or services. Specifically, this study first used question H.1, which aims to identify either the introduction of a new product or service or the improvement of a product or service already provided by the firm. It then asks two additional questions to clarify the nature of such products or services. Question H.2 classifies the introduction or improvement as new to the market or only new to the firm, an important distinction that would point to a higher level of differentiation,

4 ES defines firm size as follows: small: 5-19 workers: medium: 20-99 workers, large: 100+ workers.

5 Some of the answers provided were: "same product, new flavor," "improved quality and performance," "updated models," and "better taste".

with potential implications for our empirical model. Question H.3 asks respondents to provide a detailed description of the product or service under consideration.

After examining the answers to these questions, we noticed that the products or services under consideration are, for the most part, relatively simple improvements or variations of existing ones. That is, question H.1 identifies mostly product differentiations of varying degrees rather than meaningful innovations, and H.2 helps distinguish when these differentiations are also meaningful at the market level (not merely for the firm). Using this information, we create two dichotomic variables. The first one, *NIPSE*, identifies firms that have introduced a new or improved product or service, irrespective of whether the novelty or improvement is also new in the main market of operation. The second one, *NIPSM*, identifies the subset of firms with new or improved products or services that are also new to their main market.

3.3 New or Improved Production Processes

The price-cost ratio can also be improved by targeting the cost side of the equation. Improving or introducing new production processes could also correlate with improved information management and moderation of agency problems. Question H.5 of module H of the ES specifically addresses this point, gathering information about the introduction of new or improved processes which includes methods of production, logistics, distribution, or supporting activities. For this question, we cannot identify the processes that are completely new in relation to the processes implemented by other firms in an analogous way to the case of products or services, therefore we do not introduce this distinction. Thus, with this information we create a new dichotomic variable, *NIPRO*, which identifies firms with new or improved processes.

3.4 Dependent Variable (Credit Rationing)

The relationships of interest relate to the probability of being credit rationed. Thus, central to the analysis is the process of classifying firms into the alternative statuses of credit rationing. For this, we followed the strategy in Islam and Rodriguez (2023). The classification starts by categorizing firms into three groups based on their access to finance as fully credit constrained, partially credit constrained, or credit unconstrained. A firm is classified as fully credit constrained if it lacks access to external finance and either did not apply for a loan for reasons other than need or applied for a loan and was rejected, even though it has access to equity financing for investments.[6] The partially credit-constrained status pertains to firms that applied for a loan and had the application partially approved, applied for a loan and faced rejection while having

6 External finance includes borrowing for investment or working capital, from banks, and other financial institutions (microfinance institutions, credit cooperatives, credit unions, or finance companies). It also considers trade credit (purchases on credit from suppliers and advances from customers) and other external sources.

access to external sources of finance, or that possessed external finance but did not apply for a loan for reasons other than lack of need. Finally, credit-unconstrained firms are those that either applied for a loan and had it fully approved or did not apply for a loan due to lack of need. Based on those three categories, we created a dichotomous variable to classify a firm as either credit constrained or not, *CCD*, which takes the value of 1 if a firm is either fully or partially credit constrained, and 0 otherwise.

3.5 Control Variables

We control for several additional variables. These include number of employees, sales, duration of operation as a formally registered firm, an indicator variable for firms that were formally registered since inception, variables indicating the firm's legal status (sole proprietorship, partnership, shareholding company, or other business structure), and dummy variables indicating the sector of operation and exporting status. We also control for gender characteristics of the top manager and full-time workers), the presence of internationally recognized quality certifications, inflation rate variability in the country of operation, and regional dummies.

3.6 Instrumental Variables

There are endogeneity concerns generated by simultaneity in the specification to estimate the relationship between product differentiation and innovation on the probability of being credit rationed. This study employs alternative strategies to account for this endogeneity concern, which require finding valid instrumental variables, that is, instruments that satisfy the relevance and exogeneity conditions. In anticipation of the discussion in the next subsection, the variables are a score measuring the degree of knowledge of production targets within the organization and a categorization about the structure of managers' performance bonuses.

4

EMPIRICAL APPROACH

To identify the causal effect of product differentiation and process improvement (or innovation) on credit rationing, we must account for potential endogeneity and unobserved common factors that may jointly determine both outcomes. Since the data consists of repeated cross-sections rather than firm-level panel data, firms are not tracked over time. Therefore, unobserved firm-specific heterogeneity cannot be modeled as a random effect. Instead, we allow for unobserved heterogeneity at the country level using a multilevel structure.

We estimate a multilevel bivariate probit model with instrumental variables. This framework allows (i) the endogenous innovation decision to be jointly determined with credit rationing and (ii) correlation between unobserved determinants of both outcomes.

(1)

$$\pi_{ict}^{*} = X'_{ict}\,\beta_1^{\pi} + R'_{ct-1}\,\beta_2^{\pi} + I_{ict}\,\beta_3^{\pi} + S'_{ict}\beta_4^{\pi} + A'_{ct}\,\beta_5^{\pi} + \lambda_c^{\pi} + \lambda_t^{\pi} + u_{ict}$$

$$\pi_{ict} = 1[\pi^{*}_{ict} > 0]$$

$$u_{ict} \sim_{iid} N(0,1) \text{ independent of } x_{ict}$$

$$\lambda_c^{\pi} \sim_{iid} N(0, \sigma^2_{\lambda,\pi}) \text{ independent of } x_{ict} \text{ and } Z'_{ict}$$

(2)

$$I^{*}_{ict} = X'_{ict}\,\beta_1^{I} + R'_{ct-1}\,\beta_2^{I} + Z'_{ict}\,\beta_3^{I} + S'_{ict}\,\beta_4^{I} + A_{ct}'\,\beta_5^{I} + \lambda_c^{I} + \lambda_t^{I} + v_{ict}$$

$$I_{ict} = 1[I^{*}_{ict} > 0]$$

$$v_{ict} \sim_{iid} N(0,1) \text{independent of } x_{ict} \text{ and } Z'_{ict}$$

$$\lambda_c^{I} \sim_{iid} N(0,\sigma^2_{\lambda,I}) \text{ independent of } x_{ict} \text{ and } Z'_{ict}$$

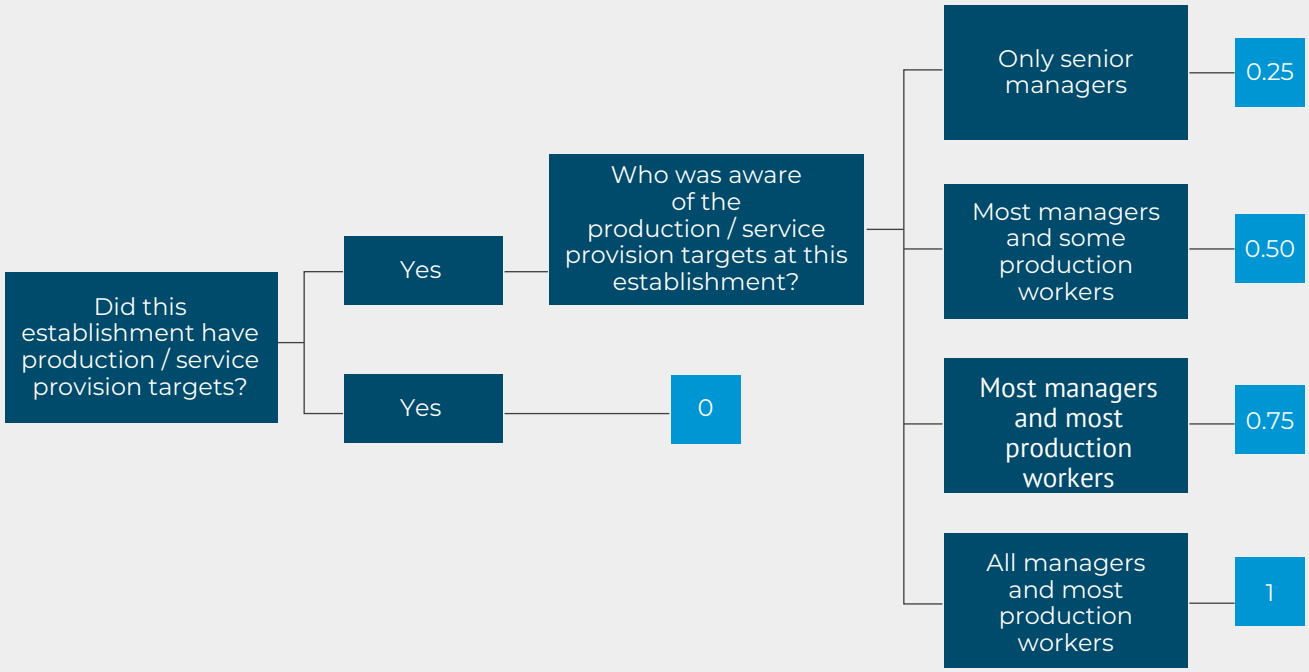
Equation (1) is a probit equation for credit rationing, where $\pi^*_{ict} = 1$ if the firm i is credit rationed and $\pi^*_{ict} = 0$ otherwise. X'_{ict} represents firm-level variables, $R'_{ct\text{-}1}$ is a vector of lagged country-level variables, I_{ict} is the endogenous regressor (later this will be alternatively product differentiation or improved process), S'_{ict} is a vector of sector-specific variables (e.g., exporting, manufacturing), A'_{ct} is a vector of firm-reported external conditions (e.g. court weakness, informal competition), λ_c is a country-level random intercept and λ_t are year fixed effects capturing common macro shocks. u_{ict} is an idiosyncratic error term corresponding to the credit rationing model. I_{ict} refers to an instrumented variable on a vector of instruments Z'_{ict}. All variables X'_{ict} , $R'_{ct\text{-}1}$, S'_{ict} and A'_{ct} are assumed to be exogenous. On the other hand, I'_{ict} is allowed to be endogenous. This is because it can be correlated with unobserved firm characteristics (other than product differentiation, process improvement, or innovation). For example, the firm's motivation could increase or decrease the degree of product differentiation or process improvement and be affected to a greater or lesser extent by credit rationing. These problems are mitigated, to some extent, by the inclusion of a rich set of firm and country characteristics, but still some other factors may not be captured by the included covariates.

To capture this potential correlation between unobserved factors affecting product differentiation and process improvement or innovation, equation (2) is added to the model. This is a probit equation where the observed outcome is equal to 1 when there is product differentiation and 0 if not. Process improvement or innovation may depend on the same covariates X'_{ict} but may also depend on exogenous variables Z'_{ict} ("instruments") that do not have a direct effect on π^*_{ict}. For Z'_{ict} we use two different indicator variables. The first one refers to the presence of firm production or service provision targets (see Figure 1), while the second captures the firm's practices in relation to the implementation of performance bonuses for managers (Figure 2).

The intuition behind the use of these instruments to improve information management (targets) and agency problems through bonuses correlates with the introduction of new processes or products, as well as innovative products at the market level (Dvir and Lechler, 2004; Kerssens-van Drongelen and Bilderbeek, 1999). As mentioned, management and organizational improvement is necessary to improve processes and products to reduce production costs and/or charge higher prices. Arguably, these instrumental variables are not correlated with credit rationing, since they are internal practices that are inherent to profit maximizing behavior, which is always present regardless of the level of demand for external financing.[7]

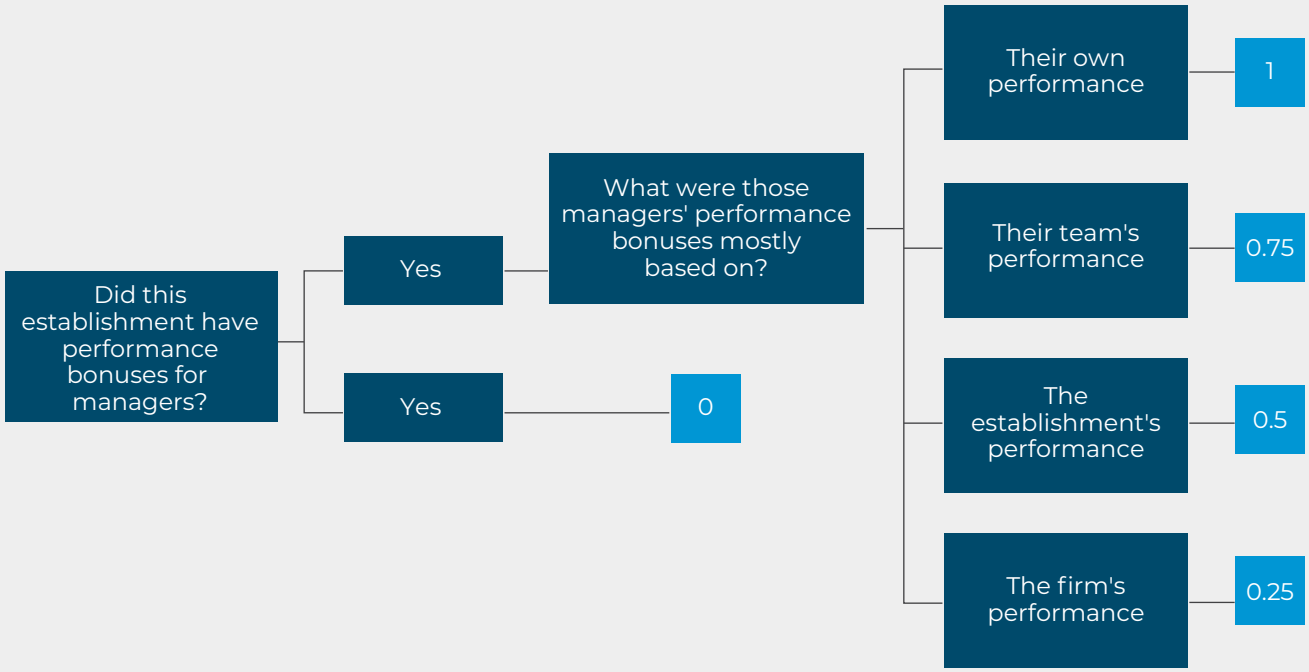
7 Shareholders usually introduce production targets and performance bonuses in order to increase production and/or reduce costs; when banks observe these, they are more confident that firms are not allocating resources to high-risk projects.

Figure 1. Construction of Score Variable for the Presence of Production or Service Provision Targets



Source: Authors' elaboration based on ES Indicators and Bloom et al. (2019).

Figure 2. Construction of Score Variable for Performance Bonus Structure



Source: Authors' elaboration based on ES Indicators and Bloom et al. (2019).

In this case, the errors u_{ict} and v_{ict} follows a bivariate standard normal distribution with unit variance ${\sigma_{u_{ict}}}^2$ and ${\sigma_{v_{ict}}}^2$ and covariance ρ_u, ρ_v. Furthermore, the non-observable term ${\lambda_c}^{\pi}$ and ${\lambda_c}^{I}$ follows a normal distribution with mean 0 and ${\sigma_\lambda}^2$ independent of all error terms and all covariates. In this case, the two stages are estimated simultaneously. The model is estimated by maximum likelihood, using the generalized structural equation model estimation routine in Stata. The likelihood contributions are a product of normal probabilities and densities, mixed with the density of the country-specific effects. Mixing (i.e., probit) is performed using Mean-variance adaptive Gauss-Hermite quadrature.

5

EMPIRICAL EVIDENCE

This section presents empirical results. The variables of interest in their relationship with credit rationing are as follows:

- ***NIPSE:*** Identifies firms that have introduced new or improved products or services in the previous three years. This can be interpreted as a proxy for product differentiation.

- ***NIPSM:*** Identifies firms that have introduced new or improved products or services in the previous three years that are also new to the main market where the firm operates. This can also be interpreted as a stronger measure of product differentiation.

- ***NIPRO:*** Identifies firms that have introduced new or improved processes in the previous three years. It proxies process improvement and, to some degree, process innovation.

5.1 Product Differentiation and Credit Rationing

We begin our analysis by exploring the impact of product differentiation, as measured by the variable *NIPSE*, on the probability of experiencing credit rationing. To address the non-linear nature of the problem and potential endogeneity issues, we employ a multilevel bivariate probit model (MBPM). This model accounts for unobserved heterogeneity, and measurement error and does not assume a joint normal distribution of error terms, providing a more flexible and robust estimation.

Endogeneity may arise due to omitted variable bias, measurement error, or simultaneity between product differentiation and credit rationing. To test for endogeneity, we performed a Hausman test comparing the standard Probit model with the MBPM. The test yields a Hausman statistic of 2.745, exceeding the critical value of 1.96, which leads us to reject the null hypothesis of exogeneity. This indicates that endogeneity is present and must be addressed to obtain consistent estimates.

To correct for endogeneity, we instrument the *NIPSE* variable using two instruments: (i) a score measuring the degree of knowledge of production targets within the organization and (ii) a categorization of the structure of managers' performance bonuses. These instruments are theoretically sound, as they influence the likelihood of product differentiation but are plausibly exogenous to the credit rationing outcome. The F-test for the relevance of the instruments in the first-stage regression yields a highly significant χ^2 statistic of 820.01 ($p < 0.0001$), indicating that the instruments are strong predictors of NIPSE. The Amemiya-Lee-Newey (ALN) test for overidentifying restrictions produces a χ^2 statistic of 4.18 with a p-value of 0.1239, failing to reject the null hypothesis that the instruments are exogenous.

The MBPM estimation results are presented in the first two columns of Table A1. The coefficient for NIPSE is negative and statistically significant, indicating that product differentiation reduces the probability of being credit rationed. The estimated average marginal effect is –12.4 percent, suggesting that firms introducing new or improved products or services in the previous three years' experience a 12.4 percentage point reduction in the likelihood of credit rationing.

5.2 Market-level Differentiation

We extend the analysis to consider firms that introduced new or improved products or services that are also new to their main market (*NIPSM*). This represents a more substantial form of product differentiation, potentially leading to greater improvements in the price-cost ratio and affecting the credit risk profile. The Hausman test again indicates endogeneity for *NIPSM* (Annex I). We use the same instruments as before, which are validated through a significant first-stage F-test confirms the instruments' predictive power for *NIPSM*, while the ALN test fails to reject the null hypothesis of instrument exogeneity.

Columns 3-4 of Table A1 show the MBPM estimation results for *NIPSM*. The coefficient of interest is negative and statistically significant, with an average marginal effect of –11.8 percent. This indicates that firms introducing market-level new products or services experience an 11.8 percentage point reduction in the probability of credit rationing. The magnitude is comparable to the effect observed for *NIPSE*, suggesting that both forms of product differentiation result in a similar net change in the probability of experiencing credit rationing.

5.3 Process Improvement and Innovation and Credit Rationing

Columns 5 and 6 in Table A.1 show the MBPM estimation results for the relationship between process improvement and innovation (*NIPRO*) and credit rationing. Process innovations aim to enhance efficiency and reduce costs, potentially improving the firm's financial health and creditworthiness. The rationale in this case is that these improvements and innovations will have a similar effect on the probability of experiencing credit rationing as in the previous cases, but the effects could be larger as cost-reduction and efficiency-increasing processes are arguably better understood by creditors.

As in the previous cases, we tested for endogeneity and the validity of the proposed instruments. The Hausman test confirms endogeneity concerns for *NIPRO* (Annex I). Using the same instruments, we find that they are relevant predictors of *NIPRO* (as indicated by a significant first-stage F-test), while the ALN test fails to reject the null hypothesis of instrument exogeneity. As shown in Table A1, the coefficient of interest is negative and statistically significant, with an average marginal effect of –17.7 percent. This suggests that firms implementing new or improved processes in the previous three years' experience a 17.7 percentage point reduction in the likelihood of credit rationing. The effect is more substantial than those observed for the product differentiation variables, indicating that process improvements may have a stronger impact on credit access.

5.4 Robustness Checks

We explored three strategies to test the robustness of our empirical results. First, we examined the stability of the direction of the effects using alternative estimation methods. We applied the following models: linear probability model, probit, probit IV, and recursive bivariate probit. As shown in Tables A.2 to A.4, for all four estimation methods and for the three variables of interest, the estimated coefficients of interest remained negative and statistically significant. Moreover, as each method improved over the previous one in terms of functional form and treatment of endogeneity problems, the absolute value of the estimated coefficient increased. This indicates two things: first, the lack of treatment of endogeneity mainly generated a downward bias in the estimated effect of innovation on credit rationing; second, that although the coefficient increases, the signs and significance do not change. We interpret these results as confirming the direction of the net effects, and the effective resolution of endogeneity issues.

Second, we further explored the model across different subsamples to reveal whether the observed effects are consistent across various segments of the data. In this case, we randomly split the original sample in two and re-estimated the MBPM for each subsample. As shown in Table A5, the coefficient of interest is quantitatively similar, although there is a general decrease in statistical significance, which is expected given the sizeable reduction in sample size.

Finally, we examined the sensitivity of the results to the definition of credit rationing. As in Támola, Fernández-Díez, and Joachín (2024), we adopted a stricter definition of credit rationing (fully credit constrained), assigning a value of 1 if the firm is fully credit constrained and 0 otherwise. As shown in Table A6, the main results for the MBPM are qualitatively the same as with our baseline definition of credit rationing (CCD), although there are some relatively minor differences in some estimated coefficients. This is to be expected, given the change in definition of the dependent variable. Overall, the results appear to be robust to alternative estimation methods, samples, and definitions of the dependent variable.

6

DISCUSSION AND CONCLUSIONS

Credit rationing is a disequilibrium phenomenon affecting credit markets, characterized by the failure of price mechanisms to adequately balance supply and demand, typically due to informational frictions. These frictions—primarily information asymmetry between lenders and borrowers—lead to adverse selection and moral hazard. Adverse selection arises when lenders cannot accurately assess borrowers' risk, while moral hazard emerges when borrowers, once financed, have incentives to deviate from the agreed terms. These issues are compounded by internal agency problems within firms, particularly between owners and managers, which further obscure the firm's risk profile and financial behavior.

Innovative firms face more credit constraints initially, as launching a new product or process introduces new and unfamiliar elements into a firm's operations. These changes act like informational shocks, making it harder for lenders to assess the firms' risk without previous historical data or benchmarks. As a result, information asymmetries increase, making it more difficult for banks to evaluate the firm's creditworthiness. However, this study empirically tests and confirms a more nuanced hypothesis: while innovation-related activities—such as product differentiation, production process improvements, and process innovation—may initially increase information asymmetries, they also compel firms to strengthen their internal information systems and management practices. These internal improvements enhance transparency and reduce agency problems, ultimately improving the firm's credit profile. The empirical results validate this hypothesis, showing that the net effect of engaging in innovation is a statistically significant reduction in the probability of experiencing credit rationing. Thus, innovation not only contributes to productivity and competitiveness (Aghion and Howitt, 1992; Griliches, 1991;

Romer, 1990) but also fosters better financial access by mitigating the very frictions that typically justify credit constraints.

Quantitative estimates from structural models show that product differentiation is associated with an 11.8 to 12.4 percent reduction in the likelihood of credit rationing, while process improvements and innovations are linked to a 17.7 percent reduction. These results reflect the experience of firms that have already undertaken innovation efforts, highlighting how such activities can influence access to external finance. Although innovation may introduce elements that are harder for lenders to evaluate—potentially increasing information asymmetries—firms that successfully implement innovation often undergo internal transformations that enhance transparency and governance. These organizational improvements, including better data systems and managerial oversight, appear to offset the risks typically associated with innovation. This paper contributes to the literature by showing that firms engaged in product or process innovation are less likely to face credit constraints, suggesting that the internal capabilities developed through innovation play a key role in improving financial access.

This justifies public financial support for the generation of innovative product ideas, understood as product differentiation and innovation or process improvement, for companies with highly restricted access to credit. According to the findings of this document, differentiation and innovation improve a firm's credit profile through the development of internal systems, such as financial reporting, governance, and transparency. This improvement reduces agency problems (misalignment between managers and lenders) and makes the firm more transparent to financial institutions.

However, it is important to specify that even though innovative companies become easier to finance over time, the social benefits of financing them remain high, as other banks and institutions also benefit from the improved information generated by the initial lender's involvement in the firm. This is called informational externalities: the first lender bears the cost of getting to know the firm, but other lenders benefit without paying. Public support for innovation-related financing is fully justified, not only because of initial credit constraints, but also because of the positive effects it has on the financial system.

Finally, even though there is literature supporting the relationship between firms' internal organization and greater access to credit, further research on the effects of innovation through product differentiation and process innovation on companies' access to and long-term sustainability of credit is needed. This paper seeks to contribute to the conversation by demonstrating its effect on reducing credit rationing, but delving deeper into the effects on credit access and sustainability is essential for policymakers.

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APPENDIX

Table A1. Marginal Effects for Multilevel Bivariate Probit Model (MBPM)

VARIABLES	NIPSE		NIPSM		NIPRO	
	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*
(log) Number of employees	-0.0364973	0.0281263	-0.0201023	0.0296366	-0.0231145	0.0274103
(log) Number of employees squared	0.002884	-0.0053856	0.001406	-0.0055322	0.0022338	-0.0052254
(log) Value of sales	0.0371168	-0.0146719	0.0245313	-0.0167897	0.0318421	-0.0140924
(log) Values of sales squared	-0.001043	0.0004966	-0.0006837	0.0005554	-0.0008186	0.0004895
(log) Years formally registered	0.0049603	-0.0189918	0.0034242	-0.0192177	0.0001134	-0.0191529
Partnership as legal status (1 = yes, 0 = no)	0.0392688	-0.0045918	0.026731	-0.0067872	0.0291296	-0.0047387
Public or private shareholding company, as legal status (1 = yes, 0 = no)	0.0005539	-0.0095297	0.0009866	-0.0093463	-0.00247	-0.0118471
Other, as legal status (1 = yes, 0 = no)	0.1491238	0.1538174	0.1307784	0.1519316	0.1085428	0.1534725
Courts (0 = no obstacle,..., 4 = very severe obstacle)	-0.0135045	0.038683	-0.0065181	0.0398011	-0.0054205	0.0390553
Informal competition (1 = yes, 0 = no)	0.0274821	0.0519652	0.0190659	0.0506799	0.0255481	0.0526496
Export sector (1 = yes, 0 = no)	0.0681761	-0.01338	0.0530504	-0.0160476	0.0430126	-0.0124526
Manufacturing sector (1 = yes, 0 = no)	-0.0020957	0.0292769	0.0053175	0.0301147	-0.0038226	0.0281605
Inflation rate variability	-0.0015211	0.0039724	-0.0004987	0.0041513	0.0023184	0.0048607
Female as a top manager (1 = yes, 0 = no)	0.0115856	0.0313477	0.0109236	0.0311366	0.0146267	0.0321833
Proportion of permanent full-time workers that are female	0.0003511	0.0003542	0.0002872	0.0003433	-0.0001146	0.0002879
Internationally rec. quality certification (1 = yes, 0 = no)	0.0265451	-0.008202	0.0238024	-0.0091119	0.0388897	-0.0036031
Year of survey = 2019	-0.16416	-0.0049428	-0.1076208	0.003897	-0.1097264	-0.003864
Year of survey = 2020	-0.0408614	-0.1060379	-0.0008599	-0.0986619	0.0126597	-0.098095
Year of survey = 2021	0.0662993	-0.1613289	0.0399338	-0.1587908	0.0051574	-0.1633661
Year of survey = 2022	-0.3808784	0.1173348	-0.2648365	0.1356693	-0.2556517	0.1188228
Year of survey = 2023	-0.2664747	-0.0410262	-0.1974783	-0.0303884	-0.1662332	-0.0370868
Latin America and the Caribbean	0.1475201	0.0271757	0.1317154	0.0217617	0.1408109	0.0352518
Asia	-0.0031963	0.0245464	0.0195485	0.0275476	-0.0217202	0.020975
Africa	-0.093952	0.125763	-0.0522746	0.132817	-0.0916775	0.1180107
Score on knowledge of production/service provision targets	0.1685119		0.1270849		0.1383017	
Score on basis of managers' performance bonuses	0.0526472		0.0524917		0.0384164	
New product or service (1 = yes, 0 = no)		-0.1237602				
New product to market (1 = yes, 0 = no)				-0.1176818		
New process innovation dummy (1 = yes, 0 = no)						-0.1767784

*** p<0.01

** p<0.05

* p<0.1

Table A2: Estimation Results for the Effects of Product Differentiation on Credit Rationing

	5-S1	5-S2	4-S1	4-S2	3	2	1
	GSEM		Recursive Bi-Probit		IV Probit	Probit	OLS
VARIABLES	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 2 *Credit Constrained Dummy*	*Credit Constrained Dummy*	*Credit Constrained Dummy*
(log) Number of employees	-0.147*	0.108	-0.133*	0.0977	0.1000	0.105	0.0201
	(0.0817)	(0.0818)	(0.0738)	(0.0742)	(0.0746)	(0.0737)	(0.0200)
(log) Number of employees squared	0.0116	-0.0207**	0.0105	-0.0187**	-0.0190**	-0.0194**	-0.00456**
	(0.00873)	(0.00886)	(0.00790)	(0.00802)	(0.00806)	(0.00794)	(0.00211)
(log) Value of sales	0.149***	-0.0563*	0.135***	-0.0510*	-0.0554*	-0.0670**	-0.0162*
	(0.0350)	(0.0326)	(0.0313)	(0.0298)	(0.0301)	(0.0294)	(0.00919)
(log) Values of sales squared	-0.00420***	0.00191**	-0.00380***	0.00173**	0.00185**	0.00215***	0.000558**
	(0.000934)	(0.000868)	(0.000834)	(0.000795)	(0.000803)	(0.000781)	(0.000244)
(log) Years formally registered	0.0200	-0.0729***	0.0181	-0.0660***	-0.0669***	-0.0684***	-0.0185***
	(0.0135)	(0.0135)	(0.0122)	(0.0122)	(0.0123)	(0.0122)	(0.00346)
Partnership as legal status (1 = yes, 0 = no)	0.158***	-0.0176	0.143***	-0.0160	-0.0200	-0.0301	-0.0102
	(0.0297)	(0.0262)	(0.0265)	(0.0238)	(0.0241)	(0.0232)	(0.00731)
Public or private shareholding company, as legal status (1 = yes, 0 = no)	0.00223	-0.0366	0.00202	-0.0331	-0.0328	-0.0307	-0.0113
	(0.0330)	(0.0278)	(0.0299)	(0.0251)	(0.0252)	(0.0249)	(0.00812)
Other, as legal status (1 = yes, 0 = no)	0.600***	0.590***	0.544***	0.535***	0.524***	0.483***	0.136***
	(0.115)	(0.122)	(0.102)	(0.106)	(0.108)	(0.106)	(0.0353)
Courts (0 = no obstacle,..., 4 = very severe obstacle)	-0.0543***	0.148***	-0.0492***	0.134***	0.137***	0.140***	0.0444***
	(0.00910)	(0.00893)	(0.00824)	(0.00801)	(0.00798)	(0.00754)	(0.00242)
Informal competition (1 = yes, 0 = no)	0.111***	0.199***	0.100***	0.181***	0.179***	0.172***	0.0549***
	(0.0217)	(0.0226)	(0.0193)	(0.0185)	(0.0189)	(0.0183)	(0.00570)
Export sector (1 = yes, 0 = no)	0.274***	-0.0513**	0.248***	-0.0465**	-0.0536**	-0.0738***	-0.0187***
	(0.0247)	(0.0252)	(0.0204)	(0.0234)	(0.0243)	(0.0217)	(0.00583)
Manufacturing sector (1 = yes, 0 = no)	-0.00843	0.112***	-0.00764	0.102***	0.103***	0.104***	0.0298***
	(0.0204)	(0.0199)	(0.0185)	(0.0178)	(0.0179)	(0.0180)	(0.00526)
Inflation rate variability	-0.00612**	0.0152***	-0.00554**	0.0138***	0.0141***	0.0144***	0.00167***
	(0.00259)	(0.00399)	(0.00233)	(0.00361)	(0.00364)	(0.00326)	(0.000431)
Female as a top manager (1 = yes, 0 = no)	0.0466*	0.120***	0.0422*	0.109***	0.109***	0.105***	0.0304***
	(0.0276)	(0.0280)	(0.0248)	(0.0249)	(0.0251)	(0.0248)	(0.00735)
Proportion of permanent full-time workers that are female	0.00141***	0.00136***	0.00128***	0.00123***	0.00121***	0.00111***	0.000305***
	(0.000356)	(0.000357)	(0.000321)	(0.000315)	(0.000319)	(0.000313)	(9.26e-05)
Internationally rec. quality certification (1 = yes, 0 = no)	0.107***	-0.0315	0.0967***	-0.0285	-0.0319	-0.0415**	-0.0111**
	(0.0219)	(0.0216)	(0.0194)	(0.0197)	(0.0201)	(0.0194)	(0.00546)

	5-S1	5-S2	4-S1	4-S2	3	2	1
	GSEM		Recursive Bi-Probit		IV Probit	Probit	OLS
VARIABLES	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 2 *Credit Constrained Dummy*	*Credit Constrained Dummy*	*Credit Constrained Dummy*
Year of survey = 2019	-0.518***	-0.0180	-0.469***	-0.0163	-0.00277	0.0356	0.00732
	(0.0481)	(0.0511)	(0.0404)	(0.0460)	(0.0478)	(0.0437)	(0.0135)
Year of survey = 2020	-0.123***	-0.444***	-0.111***	-0.402***	-0.401***	-0.393***	-0.0927***
	(0.0471)	(0.0542)	(0.0425)	(0.0462)	(0.0466)	(0.0473)	(0.0136)
Year of survey = 2021	0.197***	-0.765***	0.179***	-0.693***	-0.707***	-0.725***	-0.119***
	(0.0547)	(0.0751)	(0.0490)	(0.0681)	(0.0681)	(0.0682)	(0.0138)
Year of survey = 2022	-1.563***	0.389***	-1.416***	0.352***	0.386***	0.469***	0.162***
	(0.0804)	(0.0626)	(0.0524)	(0.0638)	(0.0675)	(0.0506)	(0.0161)
Year of survey = 2023	-0.909***	-0.156***	-0.824***	-0.141***	-0.120**	-0.0603	-0.0160
	(0.0560)	(0.0592)	(0.0415)	(0.0507)	(0.0545)	(0.0440)	(0.0137)
Latin America and the Caribbean	0.532***	0.108**	0.482***	0.0978**	0.0852*	0.0493	-0.00219
	(0.0485)	(0.0512)	(0.0408)	(0.0450)	(0.0467)	(0.0430)	(0.0125)
Asia	-0.0127	0.0978***	-0.0115	0.0886***	0.0900***	0.0924***	0.0174**
	(0.0285)	(0.0293)	(0.0258)	(0.0265)	(0.0266)	(0.0263)	(0.00740)
Africa	-0.412***	0.456***	-0.373***	0.413***	0.426***	0.455***	0.124***
	(0.0358)	(0.0321)	(0.0293)	(0.0328)	(0.0334)	(0.0295)	(0.00867)
Score on knowledge of production/service provision targets	0.678***		0.614***				
	(0.0350)		(0.0237)				
Score on basis of managers' performance bonuses	0.212***		0.192***				
	(0.0258)		(0.0223)				
η	0.468***	0.468***					
	(0.0941)	(0.0941)					
New product or service (1 = yes, 0 = no)		-0.475***		-0.430***	-0.354***	-0.134***	-0.0301***
		(0.126)		(0.0987)	(0.123)	(0.0212)	(0.00547)
var(η)		1					
		(0)					
Constant	-1.679***	-0.484	-1.521***	-0.439	-0.440	-0.432	0.311***
	(0.347)	(0.327)	(0.309)	(0.295)	(0.297)	(0.296)	(0.0884)
Observations	29,868	29,868	29,868	29,868	29,868	29,868	29,868
R-squared							0.086

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A3: Estimation Results for the Effects of Product Differentiation New in the Main Market on Credit Rationing

	5-S1	5-S2	4-S1	4-S2	3	2	1
	GSEM		Recursive Bi-Probit		IV Probit	Probit	OLS
VARIABLES	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 2 *Credit Constrained Dummy*	*Credit Constrained Dummy*	*Credit Constrained Dummy*
(log) Number of employees	-0.0981	0.113	-0.0894	0.103	0.103	0.106	0.0206
	(0.0876)	(0.0815)	(0.0797)	(0.0742)	(0.0747)	(0.0737)	(0.0200)
(log) Number of employees squared	0.00686	-0.0211**	0.00625	-0.0192**	-0.0193**	-0.0194**	-0.00461**
	(0.00934)	(0.00883)	(0.00850)	(0.00802)	(0.00807)	(0.00795)	(0.00211)
(log) Value of sales	0.120***	-0.0640**	0.109***	-0.0583**	-0.0564*	-0.0696**	-0.0168*
	(0.0384)	(0.0322)	(0.0347)	(0.0296)	(0.0300)	(0.0294)	(0.00920)
(log) Values of sales squared	-0.00334***	0.00212**	-0.00304***	0.00193**	0.00188**	0.00223***	0.000576**
	(0.00102)	(0.000859)	(0.000925)	(0.000791)	(0.000801)	(0.000782)	(0.000244)
(log) Years formally registered	0.0167	-0.0733***	0.0152	-0.0667***	-0.0667***	-0.0686***	-0.0186***
	(0.0145)	(0.0135)	(0.0132)	(0.0122)	(0.0123)	(0.0121)	(0.00346)
Partnership as legal status (1 = yes, 0 = no)	0.130***	-0.0259	0.119***	-0.0236	-0.0223	-0.0329	-0.0109
	(0.0328)	(0.0258)	(0.0296)	(0.0236)	(0.0240)	(0.0232)	(0.00731)
Public or private shareholding company, as legal status (1 = yes, 0 = no)	0.00482	-0.0356	0.00439	-0.0325	-0.0332	-0.0305	-0.0112
	(0.0366)	(0.0276)	(0.0333)	(0.0251)	(0.0253)	(0.0249)	(0.00812)
Other, as legal status (1 = yes, 0 = no)	0.638***	0.579***	0.582***	0.528***	0.541***	0.477***	0.135***
	(0.116)	(0.123)	(0.103)	(0.107)	(0.110)	(0.106)	(0.0353)
Courts (0 = no obstacle,..., 4 = very severe obstacle)	-0.0318***	0.152***	-0.0290***	0.138***	0.138***	0.141***	0.0447***
	(0.00977)	(0.00942)	(0.00896)	(0.00784)	(0.00785)	(0.00753)	(0.00242)
Informal competition (1 = yes, 0 = no)	0.0931***	0.193***	0.0848***	0.176***	0.178***	0.170***	0.0544***
	(0.0233)	(0.0224)	(0.0210)	(0.0184)	(0.0188)	(0.0183)	(0.00570)
Export sector (1 = yes, 0 = no)	0.259***	-0.0612**	0.236***	-0.0557**	-0.0515**	-0.0776***	-0.0196***
	(0.0260)	(0.0246)	(0.0218)	(0.0232)	(0.0246)	(0.0217)	(0.00583)
Manufacturing sector (1 = yes, 0 = no)	0.0260	0.115***	0.0236	0.105***	0.105***	0.104***	0.0300***
	(0.0221)	(0.0201)	(0.0202)	(0.0178)	(0.0180)	(0.0180)	(0.00527)
Inflation rate variability	-0.00243	0.0158***	-0.00222	0.0144***	0.0146***	0.0146***	0.00171***
	(0.00262)	(0.00398)	(0.00239)	(0.00360)	(0.00363)	(0.00325)	(0.000432)
Female as a top manager (1 = yes, 0 = no)	0.0533*	0.119***	0.0486*	0.108***	0.109***	0.105***	0.0303***
	(0.0297)	(0.0279)	(0.0269)	(0.0249)	(0.0251)	(0.0248)	(0.00735)
Proportion of permanent full-time workers that are female	0.00140***	0.00131***	0.00128***	0.00119***	0.00122***	0.00109***	0.000300***
	(0.000385)	(0.000355)	(0.000349)	(0.000315)	(0.000320)	(0.000313)	(9.26e-05)
Internationally rec. quality certification (1 = yes, 0 = no)	0.116***	-0.0347	0.106***	-0.0316	-0.0296	-0.0428**	-0.0114**
	(0.0236)	(0.0214)	(0.0209)	(0.0198)	(0.0203)	(0.0194)	(0.00547)
Year of survey = 2019	-0.393***	0.0143	-0.358***	0.0130	0.00701	0.0458	0.00981
	(0.0495)	(0.0487)	(0.0432)	(0.0445)	(0.0463)	(0.0437)	(0.0135)

	5-S1	5-S2	4-S1	4-S2	3	2	1
	GSEM		Recursive Bi-Probit		IV Probit	Probit	OLS
VARIABLES	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 2 *Credit Constrained Dummy*	*Credit Constrained Dummy*	*Credit Constrained Dummy*
Year of survey = 2020	-0.00284	-0.417***	-0.00259	-0.380***	-0.381***	-0.384***	-0.0915***
	(0.0493)	(0.0525)	(0.0449)	(0.0462)	(0.0465)	(0.0472)	(0.0136)
Year of survey = 2021	0.129**	-0.776***	0.117**	-0.707***	-0.711***	-0.729***	-0.120***
	(0.0567)	(0.0757)	(0.0514)	(0.0678)	(0.0679)	(0.0681)	(0.0138)
Year of survey = 2022	-1.391***	0.447***	-1.267***	0.407***	0.397***	0.488***	0.167***
	(0.0830)	(0.0572)	(0.0576)	(0.0593)	(0.0644)	(0.0504)	(0.0161)
Year of survey = 2023	-0.835***	-0.116**	-0.761***	-0.105**	-0.116**	-0.0473	-0.0127
	(0.0586)	(0.0556)	(0.0452)	(0.0486)	(0.0531)	(0.0439)	(0.0137)
Latin America and the Caribbean	0.552***	0.0868*	0.502***	0.0791*	0.0853*	0.0419	-0.00401
	(0.0530)	(0.0501)	(0.0448)	(0.0445)	(0.0466)	(0.0430)	(0.0125)
Asia	0.0939***	0.109***	0.0856***	0.0994***	0.101***	0.0951***	0.0181**
	(0.0310)	(0.0296)	(0.0282)	(0.0265)	(0.0268)	(0.0263)	(0.00740)
Africa	-0.290***	0.477***	-0.264***	0.435***	0.432***	0.460***	0.126***
	(0.0370)	(0.0326)	(0.0321)	(0.0311)	(0.0319)	(0.0294)	(0.00863)
Score on knowledge of production/service provision targets	0.620***		0.565***				
	(0.0376)		(0.0257)				
Score on basis of managers' performance bonuses	0.256***		0.233***				
	(0.0285)		(0.0242)				
η	0.453***	0.453***					
	(0.105)	(0.105)					
New product or service (1 = yes, 0 = no)		-0.449***		-0.409***	-0.465***	-0.116***	-0.0247***
		(0.141)		(0.113)	(0.159)	(0.0245)	(0.00598)
var(η)		1					
		(0)					
Constant	-2.058***	-0.503	-1.874***	-0.458	-0.470	-0.434	0.310***
	(0.383)	(0.326)	(0.340)	(0.296)	(0.298)	(0.296)	(0.0885)
Observations	29,868	29,868	29,868	29,868	29,868	29,868	29,868
R-squared							0.086

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A4: Estimation Results for the Effects of Process Improvement and Innovation on Credit Rationing

	5-S1	5-S2	4-S1	4-S2	3	2	1
	GSEM		Recursive Bi-Probit		IV Probit	Probit	OLS
VARIABLES	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 2 *Credit Constrained Dummy*	*Credit Constrained Dummy*	*Credit Constrained Dummy*
(log) Number of employees	-0.123	0.112	-0.104	0.0946	0.0992	0.104	0.0201
	(0.0940)	(0.0874)	(0.0793)	(0.0739)	(0.0747)	(0.0738)	(0.0200)
(log) Number of employees squared	0.0119	-0.0213**	0.0100	-0.0180**	-0.0187**	-0.0192**	-0.00455**
	(0.01000)	(0.00946)	(0.00844)	(0.00799)	(0.00808)	(0.00795)	(0.00211)
(log) Value of sales	0.169***	-0.0575*	0.143***	-0.0486	-0.0577*	-0.0714**	-0.0176*
	(0.0419)	(0.0347)	(0.0348)	(0.0296)	(0.0302)	(0.0295)	(0.00922)
(log) Values of sales squared	-0.00434***	0.00200**	-0.00367***	0.00169**	0.00193**	0.00227***	0.000594**
	(0.00111)	(0.000924)	(0.000925)	(0.000789)	(0.000804)	(0.000783)	(0.000244)
(log) Years formally registered	0.000602	-0.0781***	0.000509	-0.0661***	-0.0672***	-0.0676***	-0.0182***
	(0.0158)	(0.0145)	(0.0133)	(0.0121)	(0.0122)	(0.0122)	(0.00347)
Partnership as legal status (1 = yes, 0 = no)	0.155***	-0.0193	0.131***	-0.0164	-0.0236	-0.0332	-0.0110
	(0.0360)	(0.0277)	(0.0300)	(0.0235)	(0.0239)	(0.0232)	(0.00733)
Public or private shareholding company, as legal status (1 = yes, 0 = no)	-0.0131	-0.0483	-0.0111	-0.0409	-0.0388	-0.0334	-0.0120
	(0.0402)	(0.0298)	(0.0340)	(0.0251)	(0.0254)	(0.0249)	(0.00813)
Other, as legal status (1 = yes, 0 = no)	0.576***	0.626***	0.487***	0.529***	0.511***	0.468***	0.131***
	(0.126)	(0.130)	(0.105)	(0.105)	(0.108)	(0.106)	(0.0354)
Courts (0 = no obstacle,..., 4 = very severe obstacle)	-0.0288***	0.159***	-0.0243***	0.135***	0.139***	0.141***	0.0446***
	(0.0105)	(0.0100)	(0.00896)	(0.00787)	(0.00785)	(0.00755)	(0.00242)
Informal competition (1 = yes, 0 = no)	0.136***	0.215***	0.115***	0.182***	0.179***	0.170***	0.0545***
	(0.0256)	(0.0242)	(0.0211)	(0.0183)	(0.0189)	(0.0183)	(0.00571)
Export sector (1 = yes, 0 = no)	0.228***	-0.0508*	0.193***	-0.0430*	-0.0554**	-0.0744***	-0.0188***
	(0.0277)	(0.0260)	(0.0219)	(0.0225)	(0.0236)	(0.0217)	(0.00584)
Manufacturing sector (1 = yes, 0 = no)	-0.0203	0.115***	-0.0171	0.0972***	0.100***	0.102***	0.0293***
	(0.0240)	(0.0212)	(0.0202)	(0.0178)	(0.0180)	(0.0181)	(0.00527)
Inflation rate variability	0.0123***	0.0198***	0.0104***	0.0168***	0.0165***	0.0153***	0.00183***
	(0.00290)	(0.00436)	(0.00241)	(0.00357)	(0.00369)	(0.00326)	(0.000432)
Female as a top manager (1 = yes, 0 = no)	0.0776**	0.131***	0.0656**	0.111***	0.110***	0.106***	0.0306***
	(0.0323)	(0.0300)	(0.0270)	(0.0248)	(0.0252)	(0.0248)	(0.00735)
Proportion of permanent full-time workers that are female	-0.000608	0.00117***	-0.000514	0.000993***	0.00102***	0.00103***	0.000286***
	(0.000422)	(0.000370)	(0.000356)	(0.000312)	(0.000315)	(0.000314)	(9.27e-05)
Internationally rec. quality certification (1 = yes, 0 = no)	0.206***	-0.0147	0.174***	-0.0125	-0.0227	-0.0392**	-0.0105*
	(0.0265)	(0.0236)	(0.0209)	(0.0201)	(0.0210)	(0.0194)	(0.00548)

	5-S1	5-S2	4-S1	4-S2	3	2	1
	GSEM		Recursive Bi-Probit		IV Probit	Probit	OLS
VARIABLES	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 2 *Credit Constrained Dummy*	*Credit Constrained Dummy*	*Credit Constrained Dummy*
Year of survey = 2019	-0.450***	-0.0151	-0.381***	-0.0127	0.00910	0.0435	0.00910
	(0.0545)	(0.0523)	(0.0438)	(0.0441)	(0.0461)	(0.0437)	(0.0135)
Year of survey = 2020	0.0462	-0.433***	0.0390	-0.366***	-0.375***	-0.384***	-0.0915***
	(0.0542)	(0.0555)	(0.0458)	(0.0461)	(0.0466)	(0.0472)	(0.0136)
Year of survey = 2021	0.0189	-0.832***	0.0160	-0.703***	-0.729***	-0.736***	-0.122***
	(0.0618)	(0.0813)	(0.0522)	(0.0672)	(0.0677)	(0.0684)	(0.0139)
Year of survey = 2022	-1.490***	0.422***	-1.260***	0.357***	0.413***	0.486***	0.166***
	(0.0914)	(0.0606)	(0.0593)	(0.0571)	(0.0614)	(0.0504)	(0.0161)
Year of survey = 2023	-0.745***	-0.150***	-0.630***	-0.127***	-0.0958*	-0.0453	-0.0123
	(0.0607)	(0.0570)	(0.0453)	(0.0460)	(0.0498)	(0.0439)	(0.0137)
Latin America and the Caribbean	0.600***	0.147***	0.507***	0.124***	0.0953**	0.0499	-0.00210
	(0.0559)	(0.0552)	(0.0431)	(0.0446)	(0.0479)	(0.0431)	(0.0126)
Asia	-0.112***	0.0888***	-0.0949***	0.0751***	0.0835***	0.0939***	0.0182**
	(0.0342)	(0.0312)	(0.0285)	(0.0267)	(0.0272)	(0.0264)	(0.00742)
Africa	-0.554***	0.458***	-0.468***	0.387***	0.418***	0.458***	0.126***
	(0.0450)	(0.0343)	(0.0328)	(0.0336)	(0.0353)	(0.0295)	(0.00870)
Score on knowledge of production/service provision targets	0.734***		0.620***				
	(0.0409)		(0.0259)				
Score on basis of managers' performance bonuses	0.204***		0.172***				
	(0.0302)		(0.0244)				
η	0.632***	0.632***					
	(0.0903)	(0.0903)					
New product or service (1 = yes, 0 = no)		-0.721***		-0.609***	-0.432***	-0.127***	-0.0256***
		(0.146)		(0.0988)	(0.152)	(0.0247)	(0.00600)
var(η)		1					
		(0)					
Constant	-2.523***	-0.548	-2.133***	-0.463	-0.450	-0.409	0.319***
	(0.418)	(0.350)	(0.342)	(0.295)	(0.298)	(0.296)	(0.0887)
Observations	29,784	29,784	29,784	29,784	29,784	29,784	29,784
R-squared							0.086

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A5: Robustness Checks

VARIABLES	Original sample		65%		35%		Original sample		65%		35%		Original sample		65%		35%	
	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2
	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*
(log) Number of employees	0.108	-0.147*	0.137	-0.197**	0.0871	0.0134	0.113	-0.0981	0.00631	-0.150	0.287**	-0.0144	0.112	-0.123	0.126	-0.151	0.0920	-0.0720
	(0.0818)	(0.0817)	(0.0931)	(0.0915)	(0.168)	(0.175)	(0.0815)	(0.0876)	(0.106)	(0.114)	(0.129)	(0.138)	(0.0874)	(0.0940)	(0.110)	(0.119)	(0.144)	(0.151)
(log) Number of employees squared	-0.0207**	0.0116	-0.0225**	0.0174*	-0.0215	-0.00664	-0.0211**	0.00686	-0.0111	0.0116	-0.0375***	-0.000978	-0.0213**	0.0119	-0.0215*	0.0160	-0.0215	0.00460
	(0.00886)	(0.00873)	(0.0101)	(0.00978)	(0.0182)	(0.0187)	(0.00883)	(0.00934)	(0.0114)	(0.0122)	(0.0140)	(0.0148)	(0.00946)	(0.01000)	(0.0118)	(0.0127)	(0.0156)	(0.0161)
(log) Value of sales	-0.0563*	0.149***	-0.0271	0.131***	-0.123*	0.198***	-0.0640**	0.120***	-0.0411	0.170***	-0.0936*	0.0549	-0.0575*	0.169***	-0.0931**	0.144***	0.00586	0.211***
	(0.0326)	(0.0350)	(0.0368)	(0.0388)	(0.0667)	(0.0756)	(0.0322)	(0.0384)	(0.0421)	(0.0518)	(0.0508)	(0.0580)	(0.0347)	(0.0419)	(0.0432)	(0.0524)	(0.0580)	(0.0690)
(log) Values of sales squared	0.00191**	-0.00420***	0.00106	-0.00380***	0.00395**	-0.00526***	0.00212**	-0.00334***	0.00156	-0.00487***	0.00277**	-0.00132	0.00200**	-0.00434***	0.00288**	-0.00381***	0.000425	-0.00526***
	(0.000868)	(0.000934)	(0.000985)	(0.00103)	(0.00177)	(0.00200)	(0.000859)	(0.00102)	(0.00112)	(0.00139)	(0.00136)	(0.00154)	(0.000924)	(0.00111)	(0.00115)	(0.00139)	(0.00154)	(0.00182)
(log) Years formally registered	-0.0729***	0.0200	-0.0498***	0.0240	-0.133***	0.00732	-0.0733***	0.0167	-0.0687***	0.0186	-0.0826***	0.0143	-0.0781***	0.000602	-0.0619***	-0.00269	-0.107***	0.00693
	(0.0135)	(0.0135)	(0.0150)	(0.0150)	(0.0291)	(0.0293)	(0.0135)	(0.0145)	(0.0175)	(0.0190)	(0.0212)	(0.0225)	(0.0145)	(0.0158)	(0.0182)	(0.0200)	(0.0241)	(0.0254)
Partnership as legal status (1 = yes, 0 = no)	-0.0176	0.158***	-0.00473	0.175***	-0.0586	0.113*	-0.0259	0.130***	-0.0289	0.0846**	-0.0260	0.210***	-0.0193	0.155***	-0.0433	0.147***	0.0227	0.166***
	(0.0262)	(0.0297)	(0.0291)	(0.0330)	(0.0539)	(0.0623)	(0.0258)	(0.0328)	(0.0334)	(0.0422)	(0.0408)	(0.0526)	(0.0277)	(0.0360)	(0.0347)	(0.0457)	(0.0459)	(0.0577)
Public or private shareholding company, as legal status (1 = yes, 0 = no)	-0.0366	0.00223	-0.0309	0.0365	-0.0605	-0.0995	-0.0356	0.00482	-0.0641*	-0.0546	0.00525	0.104*	-0.0483	-0.0131	-0.0815**	-0.0316	0.00935	0.0193
	(0.0278)	(0.0330)	(0.0311)	(0.0371)	(0.0592)	(0.0709)	(0.0276)	(0.0366)	(0.0363)	(0.0477)	(0.0433)	(0.0578)	(0.0298)	(0.0402)	(0.0378)	(0.0510)	(0.0483)	(0.0645)
Other, as legal status (1 = yes, 0 = no)	0.590***	0.600***	0.486***	0.582***	0.822***	0.650**	0.579***	0.638***	0.729***	0.652***	0.314	0.596***	0.626***	0.576***	0.653***	0.540***	0.552**	0.636***
	(0.122)	(0.115)	(0.128)	(0.124)	(0.263)	(0.260)	(0.123)	(0.116)	(0.157)	(0.147)	(0.209)	(0.197)	(0.130)	(0.126)	(0.159)	(0.157)	(0.222)	(0.210)
Courts (0 = no obstacle,..., 4 = very severe obstacle)	0.148***	-0.0543***	0.152***	-0.0521***	0.136***	-0.0615***	0.152***	-0.0318***	0.152***	-0.0243*	0.154***	-0.0447***	0.159***	-0.0288***	0.161***	-0.0295**	0.156***	-0.0269
	(0.00893)	(0.00910)	(0.00952)	(0.0101)	(0.0184)	(0.0196)	(0.00942)	(0.00977)	(0.0123)	(0.0127)	(0.0148)	(0.0155)	(0.0100)	(0.0105)	(0.0125)	(0.0133)	(0.0166)	(0.0171)
Informal competition (1 = yes, 0 = no)	0.199***	0.111***	0.146***	0.0641***	0.350***	0.234***	0.193***	0.0931***	0.223***	0.0857***	0.145***	0.105***	0.215***	0.136***	0.236***	0.168***	0.176***	0.0777*
	(0.0226)	(0.0217)	(0.0228)	(0.0239)	(0.0522)	(0.0489)	(0.0224)	(0.0233)	(0.0297)	(0.0304)	(0.0341)	(0.0366)	(0.0242)	(0.0256)	(0.0309)	(0.0327)	(0.0385)	(0.0409)
Export sector (1 = yes, 0 = no)	-0.0513**	0.274***	-0.0878***	0.225***	0.0551	0.411***	-0.0612**	0.259***	-0.0612*	0.306***	-0.0545	0.183***	-0.0508*	0.228***	-0.0569*	0.249***	-0.0438	0.189***
	(0.0252)	(0.0247)	(0.0266)	(0.0252)	(0.0558)	(0.0587)	(0.0246)	(0.0260)	(0.0328)	(0.0356)	(0.0375)	(0.0385)	(0.0260)	(0.0277)	(0.0327)	(0.0354)	(0.0425)	(0.0441)
Manufacturing sector (1 = yes, 0 = no)	0.112***	-0.00843	0.0924***	-0.0133	0.164***	-0.00285	0.115***	0.0260	0.141***	0.0314	0.0753**	0.0201	0.115***	-0.0203	0.122***	-0.0184	0.0983***	-0.0233
	(0.0199)	(0.0204)	(0.0221)	(0.0228)	(0.0422)	(0.0437)	(0.0201)	(0.0221)	(0.0265)	(0.0289)	(0.0309)	(0.0346)	(0.0212)	(0.0240)	(0.0268)	(0.0303)	(0.0345)	(0.0388)
Inflation rate variability	0.0152***	-0.00612**	0.00971**	-0.00524*	0.0278***	-0.00793	0.0158***	-0.00243	0.0180***	-0.00103	0.0134**	-0.00425	0.0198***	0.0123***	0.0157***	0.0140***	0.0277***	0.00895*
	(0.00399)	(0.00259)	(0.00451)	(0.00296)	(0.00833)	(0.00535)	(0.00398)	(0.00262)	(0.00514)	(0.00346)	(0.00639)	(0.00404)	(0.00436)	(0.00290)	(0.00544)	(0.00368)	(0.00739)	(0.00465)

VARIABLES	Original sample		65%		35%		Original sample		65%		35%		Original sample		65%		35%	
	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2
	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*
Female as a top manager (1 = yes, 0 = no)	0.120***	0.0466*	0.108***	0.0235	0.155***	0.0998*	0.119***	0.0533*	0.159***	0.0762**	0.0533	0.0157	0.131***	0.0776**	0.114***	0.0870**	0.159***	0.0702
	(0.0280)	(0.0276)	(0.0309)	(0.0309)	(0.0590)	(0.0592)	(0.0279)	(0.0297)	(0.0366)	(0.0386)	(0.0438)	(0.0472)	(0.0300)	(0.0323)	(0.0377)	(0.0412)	(0.0492)	(0.0518)
Proportion of permanent full-time workers that are female	0.00136***	0.00141***	0.00166***	0.00138***	0.000538	0.00150**	0.00131***	0.00140***	0.000986**	0.000753	0.00171***	0.00243***	0.00117***	-0.000608	0.00141***	-0.000462	0.000714	-0.000977
	(0.000357)	(0.000356)	(0.000390)	(0.000399)	(0.000725)	(0.000755)	(0.000355)	(0.000385)	(0.000457)	(0.000504)	(0.000569)	(0.000606)	(0.000370)	(0.000422)	(0.000466)	(0.000534)	(0.000604)	(0.000683)
Internationally rec. quality certification (1 = yes, 0 = no)	-0.0315	0.107***	-0.0377	0.105***	-0.0240	0.116**	-0.0347	0.116***	-0.00262	0.140***	-0.0843**	0.0766**	-0.0147	0.206***	0.00243	0.246***	-0.0456	0.135***
	(0.0216)	(0.0219)	(0.0239)	(0.0240)	(0.0451)	(0.0472)	(0.0214)	(0.0236)	(0.0284)	(0.0312)	(0.0332)	(0.0365)	(0.0236)	(0.0265)	(0.0300)	(0.0338)	(0.0377)	(0.0421)
Year of survey = 2019	-0.0180	-0.518***	0.0319	-0.430***	-0.183	-0.760***	0.0143	-0.393***	-0.0171	-0.392***	0.0681	-0.400***	-0.0151	-0.450***	0.0438	-0.427***	-0.107	-0.490***
	(0.0511)	(0.0481)	(0.0530)	(0.0501)	(0.112)	(0.111)	(0.0487)	(0.0495)	(0.0635)	(0.0646)	(0.0764)	(0.0779)	(0.0523)	(0.0545)	(0.0651)	(0.0690)	(0.0887)	(0.0884)
Year of survey = 2020	-0.444***	-0.123***	-0.407***	-0.0893*	-0.559***	-0.222**	-0.417***	-0.00284	-0.503***	-0.0271	-0.282***	0.0398	-0.433***	0.0462	-0.369***	0.0746	-0.537***	-0.00782
	(0.0542)	(0.0471)	(0.0574)	(0.0526)	(0.115)	(0.102)	(0.0525)	(0.0493)	(0.0698)	(0.0641)	(0.0804)	(0.0781)	(0.0555)	(0.0542)	(0.0692)	(0.0692)	(0.0933)	(0.0864)
Year of survey = 2021	-0.765***	0.197***	-0.660***	0.137**	-1.015***	0.339***	-0.776***	0.129**	-0.755***	0.133*	-0.824***	0.120	-0.832***	0.0189	-0.755***	0.0264	-0.983***	0.00585
	(0.0751)	(0.0547)	(0.0819)	(0.0612)	(0.163)	(0.118)	(0.0757)	(0.0567)	(0.0958)	(0.0738)	(0.126)	(0.0894)	(0.0813)	(0.0618)	(0.0995)	(0.0784)	(0.143)	(0.0992)
Year of survey = 2022	0.389***	-1.563***	0.466***	-1.375***	0.153	-2.088***	0.447***	-1.391***	0.407***	-1.479***	0.508***	-1.271***	0.422***	-1.490***	0.455***	-1.522***	0.377***	-1.429***
	(0.0626)	(0.0804)	(0.0618)	(0.0653)	(0.140)	(0.197)	(0.0572)	(0.0830)	(0.0756)	(0.114)	(0.0883)	(0.121)	(0.0606)	(0.0914)	(0.0758)	(0.116)	(0.100)	(0.149)
Year of survey = 2023	-0.156***	-0.909***	-0.0488	-0.773***	-0.470***	-1.296***	-0.116**	-0.835***	-0.182**	-0.884***	-0.0115	-0.768***	-0.150***	-0.745***	-0.113	-0.743***	-0.204**	-0.745***
	(0.0592)	(0.0560)	(0.0536)	(0.0515)	(0.137)	(0.138)	(0.0556)	(0.0586)	(0.0749)	(0.0788)	(0.0837)	(0.0887)	(0.0570)	(0.0607)	(0.0706)	(0.0765)	(0.0970)	(0.0994)
Latin America and the Caribbean	0.108**	0.532***	0.0214	0.487***	0.312***	0.666***	0.0868*	0.552***	0.133**	0.614***	0.0189	0.459***	0.147***	0.600***	0.172**	0.668***	0.103	0.478***
	(0.0512)	(0.0485)	(0.0520)	(0.0501)	(0.111)	(0.110)	(0.0501)	(0.0530)	(0.0672)	(0.0708)	(0.0755)	(0.0807)	(0.0552)	(0.0559)	(0.0709)	(0.0717)	(0.0869)	(0.0884)
Asia	0.0978***	-0.0127	0.113***	0.0184	0.0327	-0.0959	0.109***	0.0939***	0.0997***	0.0811**	0.124***	0.121**	0.0888***	-0.112***	0.111***	-0.0913**	0.0486	-0.145***
	(0.0293)	(0.0285)	(0.0329)	(0.0318)	(0.0612)	(0.0621)	(0.0296)	(0.0310)	(0.0385)	(0.0406)	(0.0466)	(0.0485)	(0.0312)	(0.0342)	(0.0390)	(0.0429)	(0.0519)	(0.0560)
Africa	0.456***	-0.412***	0.463***	-0.362***	0.417***	-0.555***	0.477***	-0.290***	0.461***	-0.330***	0.500***	-0.229***	0.458***	-0.554***	0.437***	-0.591***	0.492***	-0.489***
	(0.0321)	(0.0358)	(0.0362)	(0.0363)	(0.0674)	(0.0817)	(0.0326)	(0.0370)	(0.0422)	(0.0494)	(0.0517)	(0.0564)	(0.0343)	(0.0450)	(0.0435)	(0.0580)	(0.0554)	(0.0703)
Score on knowledge of production/ service provision targets		0.678***		0.594***		0.907***		0.620***		0.634***		0.610***		0.734***		0.767***		0.671***
		(0.0350)		(0.0297)		(0.0791)		(0.0376)		(0.0510)		(0.0556)		(0.0409)		(0.0525)		(0.0650)
Score on basis of managers' performance bonuses		0.212***		0.186***		0.274***		0.256***		0.279***		0.215***		0.204***		0.218***		0.178***
		(0.0258)		(0.0277)		(0.0543)		(0.0285)		(0.0373)		(0.0442)		(0.0302)		(0.0383)		(0.0488)
η	0.468***	0.468***	0.00412	0.00412	0.972***	0.972***	0.453***	0.453***	0.582***	0.582***	0.148	0.148	0.632***	0.632***	0.668***	0.668***	0.532***	0.532***
	(0.0941)	(0.0941)	(1.491)	(1.491)	(0.151)	(0.151)	(0.105)	(0.105)	(0.126)	(0.126)	(0.381)	(0.381)	(0.0903)	(0.0903)	(0.109)	(0.109)	(0.170)	(0.170)
New product or service (1=Yes, 0=No)	-0.475***		-0.143***		-1.259***													
	(0.126)		(0.0338)		(0.268)													
var(η)		1		1		1		1		1		1		1		1		1
		(0)		(0)		(0)		(0)		(0)		(0)		(0)		(0)		(0)

VARIABLES	Original sample		65%		35%		Original sample		65%		35%		Original sample		65%		35%	
	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2
	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*
New product or service (1 = yes, 0 = no)							-0.449***		-0.667***		-0.104							
							(0.141)		(0.197)		(0.199)							
New process innovation dummy (1 = yes, 0 = no)													-0.721***		-0.793***		-0.549**	
													(0.146)		(0.180)		(0.252)	
Constant	-0.484	-1.679***	-0.945**	-1.360***	0.533	-2.578***	-0.503	-2.058***	-0.464	-2.351***	-0.619	-1.753***	-0.548	-2.523***	-0.349	-2.292***	-0.923	-2.896***
	(0.327)	(0.347)	(0.372)	(0.382)	(0.671)	(0.761)	(0.326)	(0.383)	(0.424)	(0.514)	(0.513)	(0.580)	(0.350)	(0.418)	(0.435)	(0.520)	(0.587)	(0.698)
Observations	29,868	29,868	19,414	19,414	10,454	10,454	29,868	29,868	19,414	19,414	10,454	10,454	29,784	29,784	19,360	19,360	10,424	10,424

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A6: Robustness Checks

VARIABLES	Fully credit constrained						Fully and partially credit constrained					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2
	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*
(log) Number of employees	-0.233**	-0.155*	-0.213**	-0.0993	-0.247**	-0.134	0.108	-0.147*	0.113	-0.0981	0.112	-0.123
	(0.112)	(0.0853)	(0.107)	(0.0873)	(0.122)	(0.101)	(0.0818)	(0.0817)	(0.0815)	(0.0876)	(0.0874)	(0.0940)
(log) Number of employees squared	0.00885	0.0123	0.00754	0.00697	0.00969	0.0129	-0.0207**	0.0116	-0.0211**	0.00686	-0.0213**	0.0119
	(0.0121)	(0.00909)	(0.0116)	(0.00929)	(0.0132)	(0.0107)	(0.00886)	(0.00873)	(0.00883)	(0.00934)	(0.00946)	(0.01000)
(log) Value of sales	-0.0402	0.154***	-0.0532	0.117***	-0.0394	0.179***	-0.0563*	0.149***	-0.0640**	0.120***	-0.0575*	0.169***
	(0.0426)	(0.0370)	(0.0403)	(0.0383)	(0.0464)	(0.0460)	(0.0326)	(0.0350)	(0.0322)	(0.0384)	(0.0347)	(0.0419)
(log) Values of sales squared	0.00145	-0.00436***	0.00179*	-0.00328***	0.00151	-0.00462***	0.00191**	-0.00420***	0.00212**	-0.00334***	0.00200**	-0.00434***
	(0.00114)	(0.000988)	(0.00108)	(0.00102)	(0.00124)	(0.00122)	(0.000868)	(0.000934)	(0.000859)	(0.00102)	(0.000924)	(0.00111)
(log) Years formally registered	-0.0391**	0.0204	-0.0392**	0.0166	-0.0451**	0.000632	-0.0729***	0.0200	-0.0733***	0.0167	-0.0781***	0.000602
	(0.0177)	(0.0140)	(0.0169)	(0.0144)	(0.0193)	(0.0168)	(0.0135)	(0.0135)	(0.0135)	(0.0145)	(0.0145)	(0.0158)
Partnership as legal status (1 = yes, 0 = no)	-0.0311	0.164***	-0.0447	0.130***	-0.0327	0.163***	-0.0176	0.158***	-0.0259	0.130***	-0.0193	0.155***
	(0.0345)	(0.0315)	(0.0324)	(0.0329)	(0.0373)	(0.0392)	(0.0262)	(0.0297)	(0.0258)	(0.0328)	(0.0277)	(0.0360)
Public or private shareholding company, as legal status (1 = yes, 0 = no)	0.0157	0.00290	0.0163	0.00617	0.00411	-0.0112	-0.0366	0.00223	-0.0356	0.00482	-0.0483	-0.0131
	(0.0356)	(0.0343)	(0.0340)	(0.0363)	(0.0388)	(0.0427)	(0.0278)	(0.0330)	(0.0276)	(0.0366)	(0.0298)	(0.0402)
Other, as legal status (1 = yes, 0 = no)	0.955***	0.621***	0.880***	0.633***	1.053***	0.608***	0.590***	0.600***	0.579***	0.638***	0.626***	0.576***
	(0.151)	(0.122)	(0.147)	(0.118)	(0.169)	(0.138)	(0.122)	(0.115)	(0.123)	(0.116)	(0.130)	(0.126)
Courts (0 = no obstacle,..., 4 = very severe obstacle)	0.120***	-0.0564***	0.121***	-0.0324***	0.132***	-0.0312***	0.148***	-0.0543***	0.152***	-0.0318***	0.159***	-0.0288***
	(0.0112)	(0.00962)	(0.0113)	(0.00971)	(0.0130)	(0.0112)	(0.00893)	(0.00910)	(0.00942)	(0.00977)	(0.0100)	(0.0105)
Informal competition (1 = yes, 0 = no)	0.110***	0.115***	0.0961***	0.0927***	0.125***	0.146***	0.199***	0.111***	0.193***	0.0931***	0.215***	0.136***
	(0.0287)	(0.0231)	(0.0270)	(0.0235)	(0.0321)	(0.0289)	(0.0226)	(0.0217)	(0.0224)	(0.0233)	(0.0242)	(0.0256)
Export sector (1 = yes, 0 = no)	-0.105***	0.284***	-0.122***	0.257***	-0.109***	0.241***	-0.0513**	0.274***	-0.0612**	0.259***	-0.0508*	0.228***
	(0.0346)	(0.0281)	(0.0323)	(0.0275)	(0.0367)	(0.0327)	(0.0252)	(0.0247)	(0.0246)	(0.0260)	(0.0260)	(0.0277)
Manufacturing sector (1 = yes, 0 = no)	0.0492*	-0.00689	0.0501**	0.0274	0.0482*	-0.0182	0.112***	-0.00843	0.115***	0.0260	0.115***	-0.0203
	(0.0260)	(0.0212)	(0.0250)	(0.0220)	(0.0282)	(0.0255)	(0.0199)	(0.0204)	(0.0201)	(0.0221)	(0.0212)	(0.0240)
Inflation rate variability	0.0155***	-0.00620**	0.0156***	-0.00230	0.0217***	0.0136***	0.0152***	-0.00612**	0.0158***	-0.00243	0.0198***	0.0123***
	(0.00569)	(0.00269)	(0.00546)	(0.00260)	(0.00637)	(0.00323)	(0.00399)	(0.00259)	(0.00398)	(0.00262)	(0.00436)	(0.00290)
Female as a top manager (1 = yes, 0 = no)	0.0266	0.0443	0.0221	0.0499*	0.0310	0.0748**	0.120***	0.0466*	0.119***	0.0533*	0.131***	0.0776**
	(0.0371)	(0.0286)	(0.0354)	(0.0294)	(0.0404)	(0.0345)	(0.0280)	(0.0276)	(0.0279)	(0.0297)	(0.0300)	(0.0323)
Proportion of permanent full-time workers that are female	0.00165***	0.00142***	0.00146***	0.00138***	0.00145***	-0.000770*	0.00136***	0.00141***	0.00131***	0.00140***	0.00117***	-0.000608
	(0.000479)	(0.000371)	(0.000455)	(0.000382)	(0.000498)	(0.000460)	(0.000357)	(0.000356)	(0.000355)	(0.000385)	(0.000370)	(0.000422)
Internationally rec. quality certification (1 = yes, 0 = no)	-0.0220	0.110***	-0.0293	0.114***	0.00144	0.215***	-0.0315	0.107***	-0.0347	0.116***	-0.0147	0.206***
	(0.0293)	(0.0232)	(0.0279)	(0.0238)	(0.0336)	(0.0308)	(0.0216)	(0.0219)	(0.0214)	(0.0236)	(0.0236)	(0.0265)
Year of survey = 2019	-0.0705	-0.537***	-0.0138	-0.390***	-0.0742	-0.475***	-0.0180	-0.518***	0.0143	-0.393***	-0.0151	-0.450***
	(0.0684)	(0.0543)	(0.0612)	(0.0511)	(0.0724)	(0.0633)	(0.0511)	(0.0481)	(0.0487)	(0.0495)	(0.0523)	(0.0545)
Year of survey = 2020	-0.531***	-0.128***	-0.476***	-0.00233	-0.527***	0.0524	-0.444***	-0.123***	-0.417***	-0.00284	-0.433***	0.0462
	(0.0754)	(0.0492)	(0.0693)	(0.0490)	(0.0788)	(0.0579)	(0.0542)	(0.0471)	(0.0525)	(0.0493)	(0.0555)	(0.0542)
Year of survey = 2021	-0.648***	0.205***	-0.646***	0.127**	-0.717***	0.0210	-0.765***	0.197***	-0.776***	0.129**	-0.832***	0.0189

VARIABLES	Fully credit constrained						Fully and partially credit constrained					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2	5-S1	5-S2
	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Product Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New to Market Dummy*	Stage 2 *Credit Constrained Dummy*	Stage 1 *New Process Innovation Dummy*	Stage 2 *Credit Constrained Dummy*
	(0.105)	(0.0576)	(0.101)	(0.0566)	(0.115)	(0.0657)	(0.0751)	(0.0547)	(0.0757)	(0.0567)	(0.0813)	(0.0618)
Year of survey = 2022	-0.0309	-1.620***	0.0802	-1.377***	-0.0442	-1.578***	0.389***	-1.563***	0.447***	-1.391***	0.422***	-1.490***
	(0.0987)	(0.106)	(0.0815)	(0.0966)	(0.102)	(0.132)	(0.0626)	(0.0804)	(0.0572)	(0.0830)	(0.0606)	(0.0914)
Year of survey = 2023	-0.174**	-0.941***	-0.0923	-0.828***	-0.178**	-0.783***	-0.156***	-0.909***	-0.116**	-0.835***	-0.150***	-0.745***
	(0.0813)	(0.0689)	(0.0709)	(0.0654)	(0.0825)	(0.0770)	(0.0592)	(0.0560)	(0.0556)	(0.0586)	(0.0570)	(0.0607)
Latin America and the Caribbean	-0.260***	0.550***	-0.292***	0.547***	-0.230***	0.630***	0.108**	0.532***	0.0868*	0.552***	0.147***	0.600***
	(0.0737)	(0.0546)	(0.0692)	(0.0560)	(0.0818)	(0.0684)	(0.0512)	(0.0485)	(0.0501)	(0.0530)	(0.0552)	(0.0559)
Asia	0.208***	-0.0117	0.212***	0.0947***	0.203***	-0.116***	0.0978***	-0.0127	0.109***	0.0939***	0.0888***	-0.112***
	(0.0397)	(0.0296)	(0.0396)	(0.0311)	(0.0423)	(0.0371)	(0.0293)	(0.0285)	(0.0296)	(0.0310)	(0.0312)	(0.0342)
Africa	0.438***	-0.424***	0.455***	-0.285***	0.429***	-0.584***	0.456***	-0.412***	0.477***	-0.290***	0.458***	-0.554***
	(0.0423)	(0.0404)	(0.0415)	(0.0378)	(0.0462)	(0.0584)	(0.0321)	(0.0358)	(0.0326)	(0.0370)	(0.0343)	(0.0450)
Score on knowledge of production/service provision targets		0.711***		0.619***		0.791***		0.678***		0.620***		0.734***
		(0.0483)		(0.0475)		(0.0649)		(0.0350)		(0.0376)		(0.0409)
Score on basis of managers' performance bonuses		0.212***		0.249***		0.201***		0.212***		0.256***		0.204***
		(0.0269)		(0.0287)		(0.0326)		(0.0258)		(0.0285)		(0.0302)
η	0.562***	0.562***	0.433***	0.433***	0.763***	0.763***	0.468***	0.468***	0.453***	0.453***	0.632***	0.632***
	(0.129)	(0.129)	(0.152)	(0.152)	(0.150)	(0.150)	(0.0941)	(0.0941)	(0.105)	(0.105)	(0.0903)	(0.0903)
New Product or Service (1=Yes, 0=No)	-0.624***						-0.475***					
	(0.190)						(0.126)					
var(η)		1		1		1		1		1		1
		(0)		(0)		(0)		(0)		(0)		(0)
New product or service (1 = yes, 0 = no)			-0.451**						-0.449***			
			(0.200)						(0.141)			
New process innovation dummy (1 = yes, 0 = no)					-1.010***						-0.721***	
					(0.257)						(0.146)	
Constant	-0.399	-1.726***	-0.399	-2.016***	-0.490	-2.655***	-0.484	-1.679***	-0.503	-2.058***	-0.548	-2.523***
	(0.428)	(0.366)	(0.410)	(0.385)	(0.469)	(0.472)	(0.327)	(0.347)	(0.326)	(0.383)	(0.350)	(0.418)
Observations	**29,868**	**29,868**	**29,868**	**29,868**	**29,784**	**29,784**	**29,868**	**29,868**	**29,868**	**29,868**	**29,784**	**29,784**

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

ANNEX I: TESTS

NIPSE

Hausman Test for Endogeneity:

$$DWH = \frac{\hat{\beta}_{GSEM} - \hat{\beta}_{Probit}}{\sqrt{Var(\hat{\beta}_{GSEM}) - Var(\hat{\beta}_{Probit})}} \sim N(0,1)$$

$$H_0 = GSEM\ and\ Probit\ both\ consistent, but\ Probit\ is\ efficient.$$

$$H_1 = Only\ GSEM\ is\ consistent.$$

$$|DWH| = 2.745 > 1.96$$

F-Jointly Test for Relevance:

$$chi2\ (2) = 820.01$$

$$Prob > chi2 = 0.000$$

Amemiya-Lee-Newey (ALN) for Overidentifying Restrictions:

$$chi2\ (1) = 4.18$$

$$P - value = 0.1239$$

NIPSM

Hausman Test for Endogeneity:

$$|DWH| = 4.127 > 1.96$$

F-Jointly Test for Relevance:

$$chi2\ (2) = 637.15$$
$$Prob > \text{chi2} = 0.000$$

Amemiya-Lee-Newey (ALN) for Overidentifying Restrictions:

$$chi2\ (1) = 5.55$$
$$P - value = 0.0622$$

NIPRO

Hausman Test for Endogeneity:

$$|DWH| = 4.127 > 1.96$$

F-Jointly Test for Relevance:

$$chi2\ (2) = 683.21$$
$$Prob > chi2 = 0.000$$

Amemiya-Lee-Newey (ALN) for Overidentifying Restrictions:

$$chi\ 2\ (1) = 5.70$$
$$P - value = 0.0579$$