

From Discouraged Borrowers to Measuring Credit Gaps: A Methodology Based on Enterprise Surveys

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Motivation

*Credit markets are frequently characterized by information asymmetries between borrowers and lenders - leading to **moral hazard** (Holmstrom and Tirole, 1997) or **adverse selection** (Stiglitz and Weiss, 1981)*

*The result is credit rationing and an **inefficient allocation of resources***

***To mitigate these market failures**, Public Development Banks devote a substantial amount of funds - e.g. in 2021, SME financing provided by EIB Group accounted for €45bn of the total committed lending volume of €94.9bn*

***Quantifying** the extent to which companies are unable to obtain the finance they need is therefore of first-order importance*

Measuring credit gaps is an empirical issue.

- **macroeconomic approach** also defined as the gap between the credit-to-GDP ratio and its long-term trend (Drehmann and Tsatsaronis, 2014); macroprudential contexts, i.e. setting countercyclical capital buffers
 - Methodologies: one-sided Hodrick-Prescott filter, bandpass methods, the Kalman filter and structural approaches such as vector error correction modelling
- **methodologies based on firm-level data** pursue a bottom-up approach to credit constraints.
 - literature exploits surveys, as balance sheet data represent equilibrium outcomes and are not designed to measure excess demand
 - Some surveys identify potential customers that would like to have obtained credit but either were rejected or decided not to apply for a credit line despite needing it (i.e. discouraged borrowers)

This paper: proposes a methodology to identify the set of firms that are creditworthy, yet rationed AND estimates their financing needs

- Provides a **bottom-up estimate of credit gaps**, focusing on non-listed firms operating primarily in emerging markets
- Enterprise Survey provides us with an estimate of the share of **firms needing a loan** broken down into applicants and discouraged firms
- It derives an estimate of the **volume of additional credit** that would be required to **meet discouraged firms' needs** while taking into account their creditworthiness

Main results

- In the 35 economies we examine, we document a credit gap of USD 306bn or 8.4% of GDP, with significant variation across countries and regions
- SMEs account for 73% of the overall credit gap - USD 225bn or 6.2% of GDP
- Eliminating the credit gap brings stock to 29-30% of GDP - still well below the euro area average of 41%
- IFC et al. (2017) estimate a credit gap of 19% of GDP. This study derives benchmark credit intensities from companies in advanced economies. In contrast, this paper compares firms in the same, local operating environment.

Data

- Firm-level data: 2018-2020 Enterprise Surveys (EIB, EBRD, WBG)
- 23,815 firms, representative sample of an economy's formal, non-agricultural private sector
- 35 economies in Central Eastern Europe (CEE), Central Asia (CA), Europe's Southern and Eastern Neighbourhood (SN & EN), Western Balkans (WB) and Turkey (TUR)
- Face-to-face interviews with business owners and top managers and are designed to represent the business environment as experienced by firms
- The samples are stratified by size, sector, and geography. Large firms are over-sampled to allow for inference at a reasonable sample size

Key definitions

We draw on a detailed set of widely used questions (Popov and Udell, 2012; Gorodnichenko and Schnitzer, 2013) measuring a firm's ability to access finance

- **Accepted (Rejected) firms:** firms that applied for a loan and had their application accepted (rejected)
- **Discouraged firms:** firms that need a loan but did not apply for it (Freel et al. 2012; Kon and Storey, 2013) because “Interest rates are not favorable”; “Collateral requirements are too high”; “Size of loan and maturity are insufficient”; or “Did not think it would be approved”

Discouraged firms are of particular interest, as creditworthy firms that decide not to apply for desired external financing face a financing gap.

Breakdown of firms needing credit

	Need	Applied	<i>Rejected</i>	Discouraged
	[% of firms]	[% of firms]	[% of firms]	[% of firms]
CA	36.6	14.3	2.4	22.3
CEE	32.5	19.4	1.1	13.1
EN	57.6	21.4	2.6	36.2
SN	29.8	6.7	0.7	23.1
TUR	60.5	23.5	0.9	37.0
WB	37.8	26.8	0.6	10.9
TOTAL	38.2	16.0	1.2	22.2

- $credit_{i,t}$: stock of credit to non-financial corporations (IMF FSI, IMF FAS, NCBs and ECB for CEE).

$$credit\ flow_{i,t} = st_i\ credit_{i,t-1} + (1 - st_i)\frac{credit_{i,t-1}}{maturity_i^{lt}} + \Delta credit_{i,t,t-1} \quad (1)$$

- st_i proportion of loans with maturity ≤ 1 (e.g. around 30% of loans) - Enterprise Survey
- $maturity_i^{lt}$ avg. maturity of long-term ($> 1y$) loans - Enterprise Survey
- $\Delta credit_{i,t,t-1}$: credit growth between two consecutive years
- *Macro-financial fundamentals*: GDP per capita, output gap, political instability/absence of violence dimension, capital adequacy ratio of the banking system, the loan-to-deposit ratio, the ratio of non-performing loans to gross loans and the return on assets (IMF WEO, FSI, WGB WGI, NCBs).

Methodology & Results: step by step

Allocating credit to discouraged firms: Scoring model

Provide an assessment of the creditworthiness of discouraged firms (Ferrando and Mulier, 2022). Sequential screening mechanism determining $P(\text{rejected}_i | \text{applied}_i = 1)$ - probability for firm i of seeing its loan application rejected conditional on having applied for a loan

- t_0 : the financial institution sets its own risk appetite, determining PD^* - the probability of default level above which a bank rejects loan applications
- t_1 : firm i decides to apply for a loan.
- t_2 : a bank assesses firm i riskiness via the measurement of firm i probability of default PD_i
- t_3 : firm i loan application is rejected or accepted

$$P(\text{rejected}_i | \text{applied}_i) = P(PD_i \geq PD^* | \text{applied}_i) \quad (2)$$

Allocating credit to discouraged firms: Scoring model

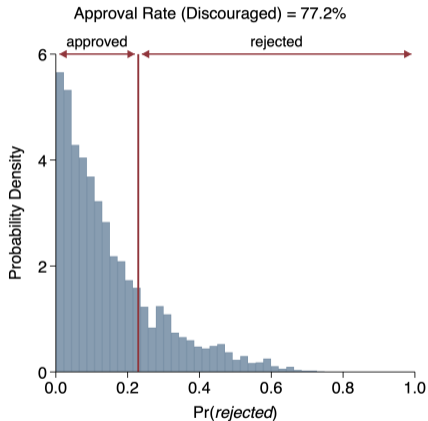
- Large set of candidate predictors - pre-select 51 potential regressors
- Narrow down and select the predictors using the LASSO (Tibshirani, 1996) - In line with Abadie and Kasy (2019) we apply a 5-fold cross-validation method. Similar results with AIC, BIC and 10-CV
- LASSO selected 18 predictors augmented by country and sector fixed effects
- Discouraged firms have on avg. a higher model-implied probability of rejection (15.3%) than firms with an approved loan application (6.7%)
- This suggests that based on observables discouraged firms are less creditworthy than successful loan applicants

Allocating credit to discouraged firms: Rejection threshold

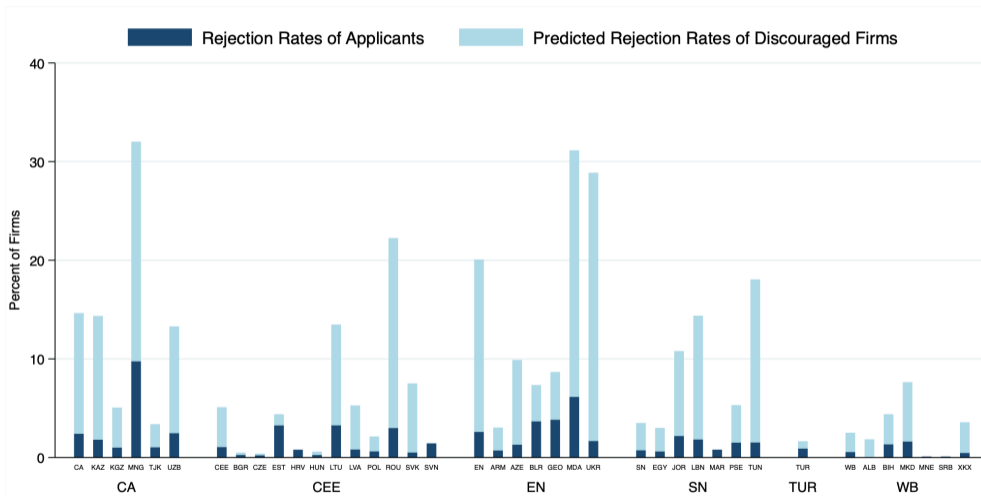
- Threshold probability \tilde{p} follows from the percentile of the rejection probability distribution that replicates the observed rejection rate in the sample of applicants.

$$\tilde{p} = F_p^{-1}(1 - \overline{rejected}) \quad (3)$$

- Discouraged firms with a predicted rejection probability below this threshold obtain credit.
- With $\tilde{p} = 22.9\%$, 22.8% of discouraged firms are denied credit and 77.2% would obtain it



Observed and estimated rejection rates



From Firm-Level Data to Country-Level Aggregates

Aggregate credit gap in country i :

$$\text{credit gap}_i = \sum_{j \in \text{discouraged}} w_{ij} 1(\widehat{\text{approved}}_{ij}) \widehat{\text{volume}}_{ij} \quad (4)$$

- w_{ij} : survey weight of firm j in country i
- $1(\widehat{\text{approved}}_{ij}) = 1$ if and only if the probability of rejection $<$ threshold probability, i.e. $\widehat{p}_{ij} < \tilde{p}$
- $\widehat{\text{volume}}_{ij}$: desired loan volume of the discouraged firms. Approximated with same volume of credit per worker as successful applicants.

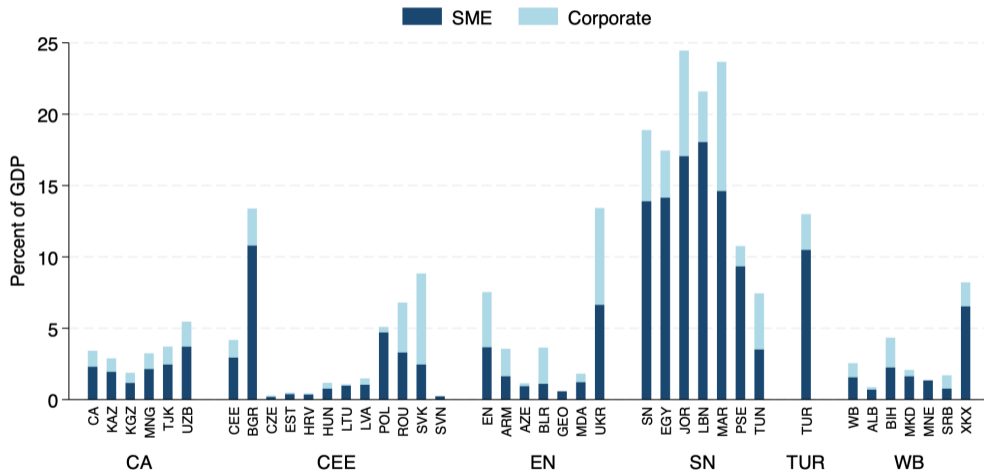
$$\text{credit gap}_i = \text{credit flow}_i \frac{\sum_{j \in \text{discouraged}} w_{ij} 1(\widehat{\text{approved}}_{ij}) \text{emp}_{ij}}{\sum_{k \in \text{applied}} w_{ik} 1(\text{approved}_{ik}) \text{emp}_{ik}} \quad (5)$$

- emp_{ij} (emp_{ik}): full-time equivalent employment of firm j (k) in country i

Results

- Our baseline results suggest an aggregate credit gap of USD 306bn or 8.4% of GDP
- SN largest credit gap at USD 103bn or 18.9% of GDP; smaller in other regions: 7.5% in EN and 2.5% in WB.
- SMEs account for 73% of the overall credit gap - USD 225bn or 6.2% of GDP
- Eliminating the credit gap brings stock to 29-30% of GDP - still well below the euro area average
- IFC et al. (2017) estimates credit gap of 19% of GDP. Use credit intensity of MSMEs in ten advanced benchmark economies to derive potential demand by MSMEs in emerging and developing countries. But these levels of credit can only be sustained in economies characterized by the strong institutions and high levels of physical and human capital.
- We draw on the credit intensity of successful applicants to derive the potential demand of bankable discouraged firms located in the same country. By construction, these firms face the same operating environment as the benchmark firms.

Credit gaps by country and region



Robustness: Proportional allocation

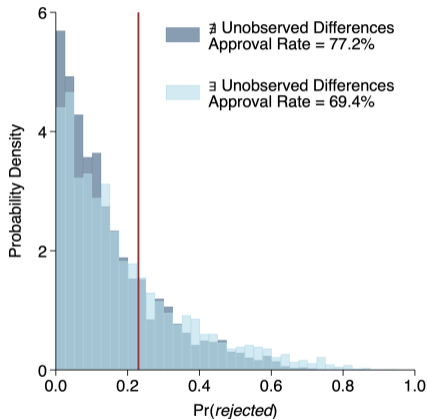
- Allocating credit based on a rejection threshold that corresponds to a threshold probability of default mimics the behaviour of banks. Rejection threshold may be considered arbitrary
- No need to allocate credit to individual firms. We can allocate credit in proportion to the approval probability instead.

$$\text{credit gap}_i = \text{credit flow}_i \frac{\sum_{j \in \text{discouraged}} w_{ij} P(\widehat{\text{approved}}_{ij}) \text{emp}_{ij}}{\sum_{k \in \text{applied}} w_{ik} 1(\text{approved}_{ik}) \text{emp}_{ik}} \quad (6)$$

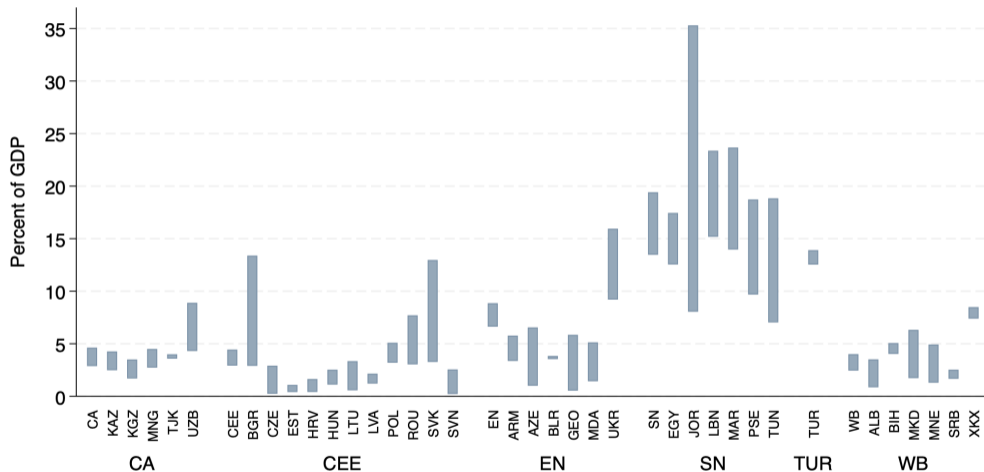
- Proportional allocation yields a marginally larger total credit gap of 8.7% of GDP or USD 316bn, compared to a baseline of 8.4% or USD 306bn
- At the country level, difference biggest in Jordan. Firms that are fully rationed under the baseline how have some of their needs met.

Robustness: Unobserved differences between applicants and discouraged firms

- Applicants and discouraged firms may differ in ways that are unobservable to the econometrician.
- Maintain $\tilde{p} = 22.9\%$, but assume that true rejection probabilities are 25% higher than model probabilities
- Approval rate declines from 77.2% to 69.4%.
Limited probability mass close to the threshold
- Credit gap declines from 8.4% of GDP to 8% of GDP. Decline rather uniform across countries



Credit gap ranges



Conclusions & Implications

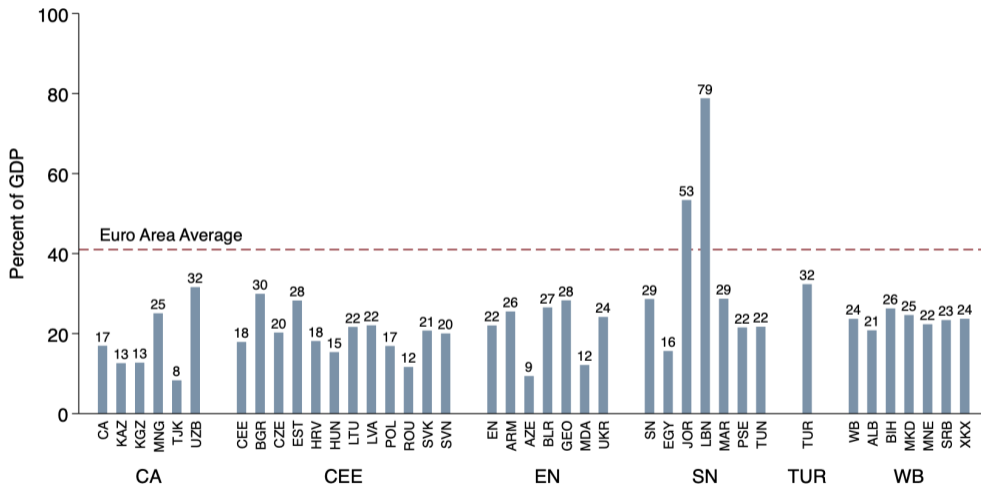
- Quantify credit gaps based on financing needs of firms that are discouraged from applying for a loan yet bankable
- Self-rationing rather inefficient given the high share of creditworthy discouraged firms (68%), consistent with Wernli and Dietrich (2022) for the Swiss market
- Eliminating the credit gap brings stock of NFCs credit to 29-30% of GDP - still below the euro area. Possible reasons: lower levels of economic and financial development (Beck et al., 2006; Love, 2003); limitations of the overall institutional framework (Demirgüç-Kunt and Maksimovic, 1998; Beck et al., 2005)
- Larger SMEs gaps call for funding support and an efficient interest rate pass-through
- Risk-sharing products to decrease banks' risk aversion and ease the collateral requirements
- Strengthening financial literacy (Cowling and Scip, 2022) and improving the information environment (Bertrand and Mazza, 2022) can increase the acceptability of assets and reduce firms' discouragement

ANNEX

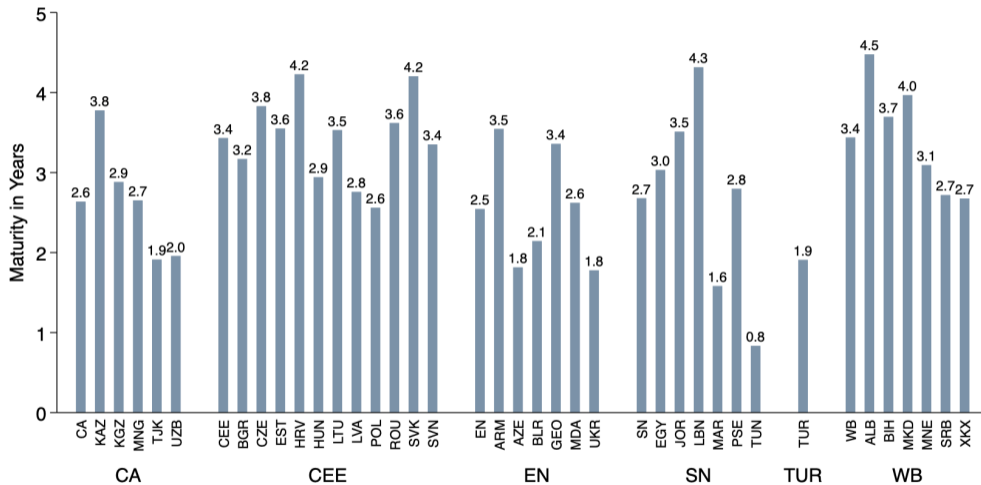
- **IFC (2017)**: estimate the financing gap for MSMEs across developing economies using a potential demand approach and match it with outstanding credit. Potential demand is derived by assuming that firms in developing countries desire the same debt-to-sales ratio as in ten advanced economies employed as benchmark. Data come from the Enterprise Survey. The study finds that the financing gap for MSMEs totals USD 5.2 trillion, or 19% of GDP on average for a large pool of emerging and developing economies.
- **Chakraborty and Mallick (2012)** find that on average credit-constrained small businesses desire 20% more debt, using the National Survey of Small Business Finances for 1988-1989 and 1993 in the US.
- **Singh et al. (2016)** obtain a financing gap corresponding to 60.2% of demand by women entrepreneurs in 2015 in Bangladesh drawing on field surveys with entrepreneurs, government organizations and financial institutions. The authors subtract potential demand for external finance from total finance channelled through formal sources.

- **Domeher et al. (2017)** use surveys to measure the SME financing gap in a low-income setting in Sub-Saharan Africa. Based on data on 1200 SMEs, they provide evidence for credit gaps that vary across sectors, with the agricultural sector being the most credit constrained. Furthermore, their findings reveal low demand among the respondents who had not applied for credit and suggest that interest rates are a major factor deterring participating in credit markets across all sectors.
- **Lopez-de Silanes et al. (2018)** quantify SME financing gaps for France, Germany, Poland, Netherlands, and Romania. The ECB SAFE survey is used to estimate the demand for credit. They find credit gaps to be the largest in Poland and the Netherlands, ranging from 5% to 14.7% and 6% to 16.3% of GDP, respectively.
- **Corrigan et al. (2020)** document a gap between acceptable credit demand and supply by estimating latent credit demand among potential Irish first time home-buyers, discounting for a prudent credit risk assessment. They exploit the Economic Sentiment Monitor Survey to estimate the levels of mortgage credit demand among Irish households, as well as the Irish Survey of Income and Living Conditions.

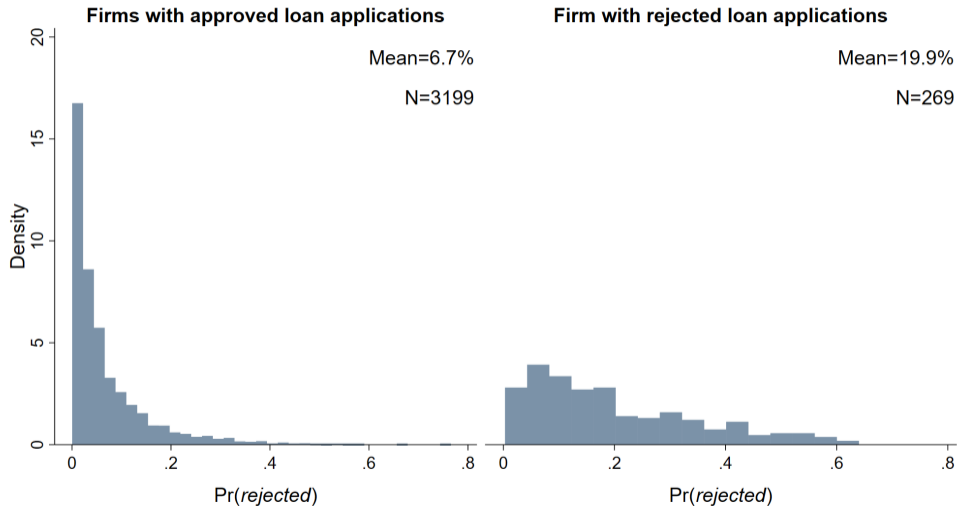
Credit to non-financial corporations



Average maturity



Step 1: Scoring model



Variable selection: different approaches

	5-CV	AIC	BIC	10-CV
Legal Status - Public	✓	✓	✗	✗
Legal Status - Other	✓	✓	✗	✓
Business Strategy	✓	✓	✗	✗
Supervisory Board	✓	✓	✗	✓
0-5 Years	✓	✓	✓	✓
Certificate	✓	✓	✓	✓
Website	✓	✓	✓	✓
Expected Total Sales Decrease	✓	✓	✓	✓
Owns Building	✓	✓	✓	✓
Invested: Fixed Assets	✓	✓	✓	✓
Leased: Fixed Assets	✓	✓	✓	✓
Bank Account	✓	✓	✗	✓
Overdraft Facility	✓	✓	✓	✓
Audited	✓	✓	✗	✓
Import License Application	✓	✓	✓	✓
Operating License Application	✓	✓	✓	✓
Small Firm	✓	✓	✓	✓
Exporter	✓	✓	✗	✓

Discouraged versus applicants

	Applicant		Discouraged	
	Mean	SD	Mean	SD
Legal Status - Public	0.07	0.26	0.06	0.23
Legal Status - Other	0.02	0.15	0.04	0.20
Business Strategy	0.50	0.50	0.39	0.49
Supervisory Board	0.37	0.48	0.32	0.47
0-5 Years	0.09	0.29	0.09	0.28
Certificate	0.34	0.47	0.19	0.39
Website	0.71	0.46	0.52	0.50
Expected Total Sales Decrease	0.16	0.36	0.20	0.40
Owns Building	0.73	0.44	0.68	0.47
Invested: Fixed Assets	0.59	0.49	0.25	0.43
Leased: Fixed Assets	0.31	0.46	0.12	0.33
Bank Account	0.95	0.22	0.88	0.33
Overdraft Facility	0.53	0.50	0.32	0.47
Audited	0.49	0.50	0.36	0.48
Import License Application	0.10	0.31	0.06	0.23
Operating License Application	0.16	0.37	0.10	0.30
Small Firm	0.34	0.47	0.54	0.50
Exporter	0.30	0.46	0.14	0.35

Baseline vs adjusted credit gaps

