Driving Growth in Village Industries: Exploring Effective Financing Facilities for Micro and Small Enterprises

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Abstract. The challenge of financing for micro and small manufacturing enterprises is a global issue but needs local solutions, as the industry characteristics and financing facilities are different among countries and even within countries. In the post-pandemic period, recovering micro and small industries in rural areas is very important. This study departs from a contextual question: which type of financing facilities effectively drive the growth of micro and small industries in villages? The study objectives are (1) to group and map regions based on the intensity of micro and small industry sectors in villages and (2) to identify the types of funding facilities linked to the intensity of micro and small industry in villages. This exploratory, secondary, and quantitative research acquires official data from BPS-Statistics Indonesia. Data analytics using the Knime Analytics Platform reveals that the higher intensity of micro and small enterprises is positively associated with the intensity of small community business financing, microcredit, the role of village and small industry cooperatives, and the function of rural banks. They all require government support in financing, such as grants, soft loans, and credit guarantees. The study suggests the need for continuous government support, particularly for many micro-enterprises.

Keywords: Data Analytics, Data Mining, Financing, Indonesia, SMEs

1 Introduction

The World Bank reported that small and medium enterprises (SMEs) face external funding problems in developing and developed countries [1]. The report points out that difficult financing can hinder the ability of established small companies to invest and grow and the ability of new companies to establish operations, which can reduce overall economic activity and employment growth. The development and growth of small firms are vital, especially for rural areas. For many developing countries, agriculture is the primary economic sector in rural areas (villages). However, due to changes in land use, agricultural areas often decrease, affecting the number of employment opportunities. In this situation, the role of micro and small industries is critical because the industry sector could absorb many jobs.

The challenge of financing for micro and small enterprises is a global issue but requires local solutions, as the characteristics of MSEs and financing services differ among and even within countries. A survey among small and medium-sized enter-

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prises (SMEs) in Canada found that credit constraints have a negative impact on investment and employment growth [2]. Furthermore, a survey among SMEs in Vietnam confirmed that smaller enterprises have less access to credit and a less expensive cost of financing from microfinance than commercial banks [3]. The challenge faced by Asian SMEs to access credit was discussed, and solutions were proposed, such as the development of credit information infrastructures, credit-rating techniques, and a sustainable credit guarantee scheme [4]. A review paper about SMEs in Kenya revealed that the availability and accessibility of business financing play an essential role in driving business growth [5]. A survey study among small, medium, and micro enterprises in South Africa confirmed that the success of SMEs is positively and significantly related to financial support from both the private and public sectors [6]. Overall, these studies confirm the challenge for SMEs to access financing and solutions essential for SMEs' growth.

In Indonesia, the number of micro enterprises in the manufacturing industry in 2021 is 3,956,083 firms with 7,304,554 workers, and small enterprises 206,605 firms with 1,804,743 workers while large and medium enterprises 31,876 firms with 6,287,159 workers [7]. The firm size is defined by the number of employees, in which small manufacturing has 5-19 employees, and micro manufacturing has 1-4 employees. Micro and small manufacturing enterprises share 99% of manufacturing firms with 59% of workers. Therefore, facilitation and financing services are critical to support their growth.

A survey study in Indonesia reported that government expenditure and investment contribute positively and significantly to the growth of small and medium-sized enterprises (SMEs), but not significantly to the growth of micro enterprises [8]. It implies that micro enterprises are still facing challenges for growth, and government spending should be more focused on micro enterprises. A secondary data study found that government credit guarantees were positively associated with the growth of micro, small, and medium-sized enterprises at the industrial unit level, and this influence strengthened in the year following the year of loan [9]. A qualitative study among micro enterprises in Jakarta revealed that most micro enterprises do not use official institutions' funds but loan sharks [10]. A study taking the rural bank's perspective reported the importance of rural banks in maintaining and increasing banking efficiency levels to increase their ability to provide loans to micro and small enterprises [11].

Although most studies on financing for micro and small manufacturing enterprises used case studies, such as [10], [11] or survey methods, such as [8], this study implements data mining for official statistics to obtain more general findings. The question is which type of financing facilities effectively drive the growth of micro and small manufacturing enterprises in villages. The objectives of this paper are (1) to group and map regions based on the intensity of micro and small industry in villages and (2) to identify the financial facility associated with the intensity of micro and small industry sectors in villages. The term village refers to the smallest government administrative, mostly in rural areas.

The following method section presents the analysis tool, data source, and research framework. Then this paper will analyze the results and have discussions. The last section draws conclusions and recommendations.

2 Method

This study belongs to exploratory, secondary, and quantitative research. The source of secondary data is the official statistics published by BPS-Statistics Indonesia. The data mining process was performed by adopting and adapting the Cross Reference Industrial Standard Process for Data Mining (CRISP-DM). The CRISP-DM comprises six phases: Business understanding, Data Understanding, Data Preparation, Modeling, Evaluation, and Deployment [12]. The business understanding phase was adapted by defining the data mining objective of this study to group regions based on MSE's industrial sector. The data understanding phase was performed by understanding the official statistics and their characteristics.

Furthermore, the data preparation was conducted by formatting the data and calculating some ratios. Modeling and evaluation phases refer to clustering analysis. Furthermore, the deployment phase refers to using the clustering model on another dataset for other locations (provinces) or time (years). This step was not implemented as this study focused on one-year data.

Modeling in the data mining process is often contradicted by the traditional statistical hypothesis-based modeling technique. The data mining process seeks patterns in the data, but hypothesis testing is not the goal [13]. Data miners choose models by experiment rather than based on statistical theories and assumptions [14]. The primary analytical technique in this study was clustering to group regions. As the number of objects (regions) is not big, some traditional clustering algorithms were selected: k-means, k-medoids, and hierarchical clustering. The appropriateness of the cluster model was evaluated through the goodness-of-fit measure, which is the silhouette coefficient. Data mining was performed using the Knime Analytics Platform, an open-source data science software. Furthermore, graphs were created using Tableau, an interactive data visualization software.

2.1 Secondary data

The study object is micro and small enterprises (MSEs) in the manufacturing industry (named micro and small industries/MSIs) in villages among regencies in Indonesia. MSIs engage in production activities, excluding other economic activities, such as selling and service. A village is the lowest government administration structure. The administration is structured from the central government to provinces to regencies/municipalities, districts, and villages. This study focuses on MSIs in Java Island. Java consists of four provinces, a special region of the capital city, Jakarta, and a special region of Yogyakarta. Jakarta was excluded from the analysis because there are no rural villages. Yogyakarta was also excluded because the data were less updated and had a different classification of the industrial sector than the other four provinces. The four provinces: East Java, Central Java, West Java, and Banten, contain 80 regen-

cies and 22 municipalities. Municipalities were excluded from the analysis, so the analysis focused on rural villages. The data were gathered from the website of BPS-Statistics Indonesia. Data were extracted from the four published reports "Villages Potential Statistics 2021" for each province (East Java, Central Java, West Java and Banten), released in the second half of 2022. Table 1 presents the number of regencies, villages and MSEs for each province and Indonesia. This study covers 80 regencies with 23,062 villages. The four provinces cover 56% of MSEs in Indonesia. This figure is reasonable because economic activity is currently concentrated in Java. Most MSEs in the four provinces are micro enterprises, with 93% compared to 7% of small enterprises.

Table 1. Number of regencies, villages, and MSEs

Province	Regency	Village	MEs (Micro)	SEs (Small)	MSEs
East Java	29	8,086	681,442	80,573	762,015
Central Java	29	8,237	808,293	47,195	855,488
West Java	18	5,455	592,791	29,434	622,225
Banten	4	1,284	100,260	3,568	103,828
Total	80	23,062	2,182,786	160,770	2,343,556
Indonesia	416	84,096	3,956,083	206,605	4,162,688
% Sample	19%	27%	55%	78%	56%

2.2 Research framework

A research framework was developed to investigate funding facilities for MSIs (see Fig. 1). Three financing measures were selected: credit type, cooperative type, and bank type.

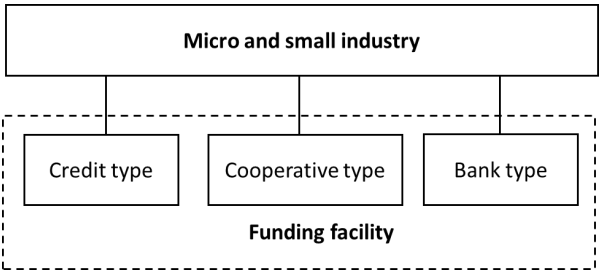

Fig. 1. Research framework

Most villages have MSEs producing food and beverages; the average food sector is 74% and beverage 67%. It means that both sectors are less likely to differentiate between villages. A preliminary clustering analysis was performed and indicated that both sectors were not significantly differentiated clusters. Therefore, both sectors are

excluded from the analysis. Based on the official data, four variables and related indicators were selected as follows.

MSI sectors	:	Apparel and textile, Furniture and wood products, Metal products, other non-metal products
Credit types	:	Microcredit program, Small enterprises credit program, Small community business financing
Cooperative types	:	Village and small industry cooperatives, Savings and loan cooperatives, other cooperatives
Bank types	:	Government Banks, Private Banks, Rural Banks

3 Result and Discussion

Based on the characteristics of the data, the analysis technique belongs to unsupervised learning. The clustering technique was used to group regencies. The unit of analysis is the number of villages in each regency.

3.1 Grouping of regions based on industrial sector

Cluster analysis was performed to group regencies based on the four industrial sectors. As the number of objects is 80 regencies, which is not a big number, three simple clustering algorithms were explored: k-means, k-medoids, and hierarchical clustering. The feasible number of clusters was two or three. Table 2 summarizes the results. The goodness of the clustering algorithm was examined through silhouette coefficients with a range of -1 to +1. The biggest mean score of the silhouette coefficient is 0.345 for n=2 both in k-means and k-medoids. Therefore, clustering was performed using the result of k-means/k-medoids with two clusters.

Table 2. Comparison of clustering algorithms

Algorithm	Attribute	n=2	n=3
k-means	number of regencies	34,46	25, 24, 31
	Mean silhouette coefficient	0.35	0.27
k-medoids	number of regencies	34,46	25, 18,37
	Mean silhouette coefficient	0.35	0.26
Hierarchical Clustering	number of regencies	42, 38	22, 20, 38
	Mean silhouette coefficient	0.28	0.25

Independent group t-tests confirmed that four industrial sectors significantly (p-value < 0.001) differentiated both clusters. Box-and-whisker plots for both clusters shown in Fig. 2 prove the difference between both clusters. The first cluster has higher normalized scores for all four industrial sectors, thus assigned as a 'high' cluster, and the second as 'low'.

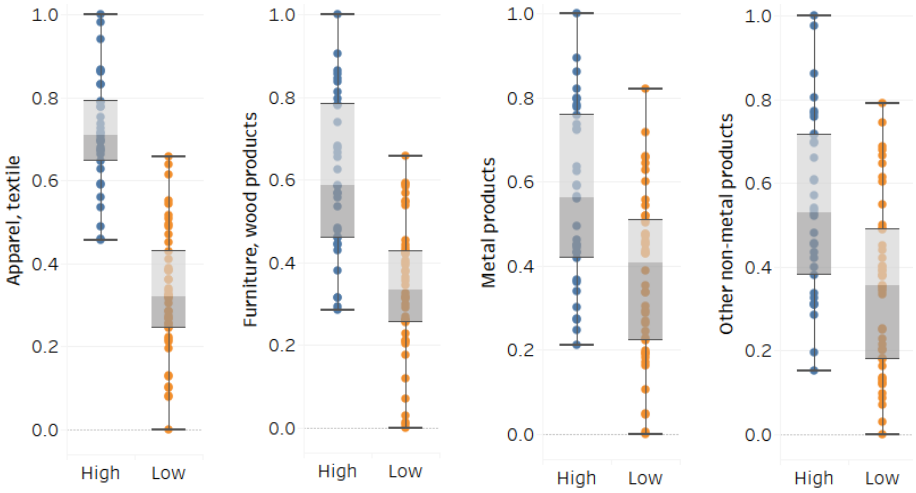

Fig. 2. Box-and-whisker plots

The number of regencies in each cluster is 34 for the high cluster and 46 for the low cluster, as shown in Table 3 and Table 4. The cluster's center for k-medoids is one of the objects, while the center for k-means is just a calculated number. Based on the k-medoids, the first cluster center is Banyumas, for the high cluster, in Central Java Province, and the second is Cirebon, for the low cluster, in West Java Province.

Table 3. Regencies in the high cluster

Province	Region	Code	Province	Region	Code
East Java Province	Pacitan	PCT	Central Java Province	Cilacap	CLP
	Trenggalek	TRK		Banyumas	PWT
	Tulungagung	TLG		Purbalingga	PBG
	Blitar	BLT		Banjarnegara	BNR
	Malang	MLG		Kebumen	KBM
	Jember	JMR		Wonosobo	WSB
	Banyuwangi	BYW		Magelang	MKD
	Madiun	MAD		Klaten	KLN
				Sukoharjo	SKH
West Java Province	Cianjur	CJR		Karanganyar	KRG
	Bandung	BDG		Sragen	SGN
	Tasikmalaya	TSM		Kudus	KDS
	Ciamis	CMS		Jepara	JPA
	Bandung Barat	BBR		Demak	DMK
	Pangandaran	PDR		Semarang	SMG
				Temanggung	TMG
Banten Province	Tangerang	TGR		Batang	BTG
				Pekalongan	PKL
				Pemalang	PML

Table 4. Regencies in the low cluster

Province	Region	Code	Province	Region	Code
East Java Province	Ponorogo	PNG	Central Java Province	Purworejo	PWR
	Kediri	KDR		Boyolali	BYL
	Lumajang	LMJ		Wonogiri	WNG
	Bondowoso	BDW		Grobogan	PWD
	Situbondo	SIT		Blora	BLA
	Probolinggo	PBL		Rembang	RBG
	Pasuruan	PSR		Pati	PTI
	Sidoarjo	SDA		Kendal	KDL
	Mojokerto	MJK		Tegal	TGL
	Jombang	JBG		Brebes	BBS
	Nganjuk	NJK			
	Magetan	MGT	West Java Province	Bogor	BGR
	Ngawi	NGW		Sukabumi	SKB
	Bojonegoro	BJN		Garut	GRT
	Tuban	TBN		Kuningan	KNG
	Lamongan	LMG		Cirebon	CBN
	Gresik	GSK		Majalengka	MJL
	Bangkalan	BKL		Sumedang	SMD
	Sampang	SPG		Indramayu	IDM
	Pamekasan	PMK		Subang	SNG
	Sumenep	SMP		Purwakarta	PWK
				Karawang	KWG
Banten Province	Pandeglang	PDG		Bekasi	BKS
	Lebak	LBK			
	Serang	SRG			

Fig.3 exhibits the distribution of regencies for high and low clusters. Regencies belonging to higher-intensity industrial sectors (high cluster) seem to be located in the south rather than in the north. Central Java appears to have more regencies in the high than low cluster.

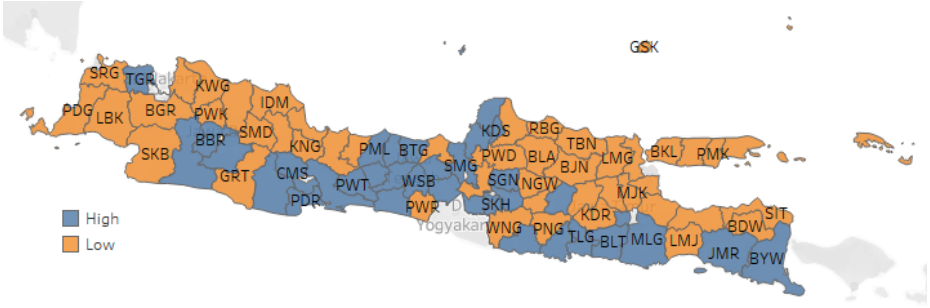

Fig. 3. Cluster map

3.2 Association of MSEs and funding facility

An independent group t-test was performed to investigate which financing facility for MSEs differentiates both clusters. To obtain findings with a stronger relationship, the cut-off points of p-value to classify significance were determined as $p < 0.005$ instead of the common $p < 0.05$ (see Table 5).

Table 5. Funding facility and MSEs clusters

Funding facility	Mean		t-test	
	High Cluster	Low Cluster	p-value	sig. $p \leq 0.005$
Small community business financing	0.53	0.36	0.000	sig.
Microcredit	0.77	0.56	0.002	sig.
Small enterprises credit	0.54	0.48	0.173	not sig.
Village and Small Industry Cooperative	0.50	0.35	0.001	sig.
Savings and Loan Cooperative	0.33	0.30	0.581	not sig.
Other Cooperatives	0.24	0.34	0.164	not sig.
Rural Bank	0.53	0.34	0.001	sig.
Government Bank	0.44	0.31	0.020	not sig.
Private Bank	0.41	0.35	0.262	not sig.

The finding about credit types reveals that a cluster of regencies with a higher intensity of MSEs in villages is likely to have a higher intensity of small community business financing (Kredit Usaha Bersama) and microcredit (Kredit Usaha Kecil). The former financing is a government grant to a group of individuals to start or develop a collective business. Microcredit is also a government-subsidized financing/loan program with low interest for micro enterprises without having to provide collateral. The positive association might indicate that both financing programs initiated by the government effectively support the development of micro and small enterprises. The finding strengthens prior case studies about the effectiveness of that financing supports such as [15], [16].

Furthermore, the significant cooperative type is a village and small industry cooperative. A village unit cooperative is an economic and social organization for developing various rural community economic activities organized by the community and for the community itself. Village unit cooperatives serve their members in various supports, such as savings and loans, consumption, production, marketing, and services. This type of cooperative also receives the government's support more than saving-loan cooperatives and other cooperatives. This finding also supports prior case studies about the effectiveness of this village cooperative, such as [17].

The finding about bank types in villages indicates that the intensity of rural banks (Bank Perkreditan Rakyat) is associated with the intensity of MSEs in villages. The finding is consistent with a previous study linking rural banks, MSEs, and poverty

reduction [18]. Rural banks compete with private and government banks in some regions, which expand their financing to micro and small enterprises in villages [19]. Rural banks offer advantages over commercial banks, such as easy credit guarantee, customer trust focus, and faster credit fund disbursement. These might support SMEs' growth.

4 Conclusions

This paper has explored the intensity of micro and small enterprises based on the industrial sector in villages among the regencies of Indonesia and its association with financing facilities. The result revealed that a higher intensity of micro and small enterprises is positively associated with the availability of small community business financing, microcredit, the role of village and small industry cooperatives, and the function of rural banks. They all require government support in financing, such as grants, soft loans, and credit guarantees (collateral). These findings suggest that the central and local governments facilitated funding for the SMES in villages to recover more quickly.

This study contributes by providing generalizations and supporting previous studies, based on case studies or surveys, on financing facilities for micro and small industry. The conclusion is limited to the availability and characteristics of the official statistics. In addition, the characteristics of micro and small industries outside Java may differ from those revealed in this study. Further study is suggested to reach a broader generalization for Indonesia.

References

[1] F. Abraham and S. L. Schmukler, "Addressing the SME Finance Problem: Research & Policy Briefs," 2017.

[2] S. Cao and D. Leung, "Credit constraints and productivity of SMEs: Evidence from Canada," *Econ. Model.*, vol. 88, pp. 163–180, 2020, doi: 10.1016/j.econmod.2019.09.018.

[3] N. Nguyen, C. Gan, and B. Hu, "An empirical analysis of credit accessibility of small and medium-sized enterprises in Vietnam," *Banks Bank Syst.*, vol. 10, no. 1, pp. 34–46, 2015.

[4] N. Yoshino and F. T. Hesary, "The Roles of SMEs in Asia and Their Difficulty in Assessing Finance," *ADBI Work. Pap.*, vol. 1, no. 911, pp. 1–52, 2018, [Online]. Available: https://www.adb.org/sites/default/files/publication/474576/adbi-wp911.pdf.

[5] C. G. Kamau, "Availability of Finance, Finance Costs, and Business Success in Kenya: Focus on the Small and Micro Enterprises," *EPRA Int. J. Econ. Bus. Manag. Stud.*, vol. 8, no. 8, pp. 26–30, 2021, doi: 10.36713/epra1013.

[6] E. C. Rungani and M. Potgieter, "The impact of financial support on the success of small, medium and micro enterprises in the Eastern Cape province," *Acta Commer.*, vol. 18, no. 1, pp. 1–12, 2018, doi: 10.4102/ac.v18i1.591.

[7] BPS-Statistics Indonesia, "Statistical Yearbook of Indonesia 2023," 2023. [Online].

Available: https://www.bps.go.id/publication/2020/04/29/e9011b3155d45d70823c141f/statistik-indonesia-2020.html.

[8] P. E. Prasetyo, "The Role of Government Expenditure and Investment for MSME Growth: Empirical Study in Indonesia," *J. Asian Financ. Econ. Bus.*, vol. 7, no. 10, pp. 471–480, 2020, doi: 10.13106/jafeb.2020.vol7.no10.471.

[9] B. K. Adhikary, K. Kutsuna, and S. Stephannie, "Does the government credit guarantee promote micro, small, and medium enterprises? Evidence from Indonesia," *J. Small Bus. Entrep.*, vol. 33, no. 3, pp. 323–348, 2021, doi: 10.1080/08276331.2019.1666338.

[10] R. Prijadi, P. Wulandari, P. M. Desiana, F. A. Pinagara, and M. Novita, "Financing needs of micro-enterprises along their evolution," *Int. J. Ethics Syst.*, vol. 36, no. 2, pp. 263–284, 2020, doi: 10.1108/IJOES-05-2018-0071.

[11] M. Anwar, S. R. Nidar, R. Komara, and L. Layyinaturrobaniyah, "Rural bank efficiency and loans for micro and small businesses: evidence from West Java Indonesia," *Int. J. Emerg. Mark.*, vol. 15, no. 3, pp. 587–610, 2020, doi: 10.1108/IJOEM-11-2017-0494.

[12] F. Martinez-Plumed *et al.*, "CRISP-DM Twenty Years Later: From Data Mining Processes to Data Science Trajectories," *IEEE Trans. Knowl. Data Eng.*, vol. 33, no. 8, pp. 3048–3061, 2019, doi: 10.1109/tkde.2019.2962680.

[13] M. Caka and Steve Tipton, "Data Mining," *City Tech Writer*, vol. 9, pp. 25–30, 2014.

[14] M. S. Brown, *Data Mining for Dummies*. John Wiley & Sons, 2014.

[15] A. P. Aldino, "Efektivitas Pelaksanaan Program Bantuan Sosial Pada Masyarakat Di Kota Palu (Studi Tentang Kelompok Usaha Bersama)," *Katalogis*, vol. 6, no. 8, pp. 1–8, 2018.

[16] V. W. Sujarweni and L. R. Utami, "Analisis Dampak Pembiayaan Dana Bergulir KUR (Kredit Usaha Rakyat) Terhadap Kinerja UMKM (Studi Kasus di Daerah Istimewa Yogyakarta)," *J. Bisnis dan Ekon. (JBE),* vol. 22, no. 1, pp. 11–25, 2017.

[17] E. Rufaidah, "Pemberdayaan Perekonomian Masyarakat Melalui Koperasi Unit Desa Berbasis Usaha Terbimbing," *Akad. J. Pemikir. Islam*, vol. 22, no. 2, p. 361, 2017, doi: 10.32332/akademika.v22i2.824.

[18] T. F. Rizkiyah and S. R. Nidar, "Apakah Peningkatan Kredit Bank Perkreditan Rakyat Dan Peran Umkm Dapat Menurunkan Tingkat Kemiskinan ?," *Image J. Ris. Manaj.*, vol. 11, no. 1, pp. 1–13, 2022, doi: 10.17509/image.v11i1.35000.

[19] S. Yuniarti, "Strategi Adaptif Bank Perkreditan Rakyat Menghadapi Ekspansi Kredit UMKM Bank Umum di Malang," *J. Keuang. dan Perbank.*, vol. 15, no. 3, pp. 437–445, 2011.