

Real-Time Entrepreneurship Insights: Evidence from Search Data on Indonesia's MSMEs

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ABSTRACT

This study explores real-time entrepreneurial dynamics among Micro, Small, and Medium Enterprises (MSMEs) in Indonesia by leveraging Google search data. Using an exploratory quantitative approach, the research analyzes search trends derived from 50 popular MSME-related keywords to capture temporal patterns of entrepreneurial attention. The findings reveal that MSME-related search interest is highly dynamic, responsive to economic context, and thematically differentiated. Searches related to entrepreneurial entry and digital market access dominate overall interest, reflecting the growing importance of digitalization in MSME development, while financing and regulatory topics exhibit more episodic attention. The study further demonstrates that search data exhibit consistency, persistence, and responsiveness, supporting their viability as a proxy for real-time entrepreneurial interest rather than direct entrepreneurial action. By providing empirical evidence from an emerging economy context, this research contributes to the growing literature on digital trace data in entrepreneurship and highlights the potential of search-based analytics to support agile, data-driven MSME policy and decision-making.

Keywords:

Entrepreneurship, MSMEs, Google Trends, Real-time Analysis, Digital Trace Data

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1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) represent a pivotal component of Indonesia's economic structure, contributing to employment, value creation, and socioeconomic resilience (Nugraha et al., 2022). In developing economies, MSMEs play a strategic role not only in job creation but also in nurturing entrepreneurial ecosystems that are adaptive to rapid economic and technological change (Nambisan et al., 2019; Nugraha et al., 2022). Despite their importance, empirical assessments of MSME dynamics often depend on surveys and official statistics that are available less frequently than rapidly changing online signals. Research on web search data shows that such data can complement conventional indicators by providing more timely signals of changes in economic conditions and market demand (Aaronson et al., 2022; Bantis et al., 2023; Yu et al., 2019). Consequently, reliance on lower-frequency indicators alone may leave short-term shifts in entrepreneurship-related attention less visible, particularly during periods of uncertainty or disruption.

In response to these limitations, researchers have increasingly used digital trace data to observe rapidly changing patterns of public attention and information seeking (Kelly et al., 2024; Lorenz-Spreen et al., 2019). Search query data, including those available through Google Trends, provide time-series measures of relative search interest that can be examined at relatively high temporal frequency (Kristensen et al., 2021)(Marty et al., 2023). Prior research has linked search patterns to observable outcomes, including stock market movements, new-product diffusion, and reported disease cases, although the strength and reliability of these relationships depend on the topic and analytical design (Lee et al., 2018)(Zhong & Raghib, 2019). Studies of product diffusion and customer needs further indicate that digital traces can offer insights into changing market attention (Kilroy et al., 2024). For entrepreneurship research, this creates a plausible basis for examining whether MSME-related searches signal early information seeking; whether they precede business registration or sales activity remains an empirical question.

Search query data have been used to complement conventional indicators in short-term economic analysis and business research (Choi & Varian, 2012)(France et al., 2021). Evidence from entrepreneurship research is also emerging. Semerci et al. (2022) examined Google Trends queries concerning women's entrepreneurship, while Tekić et al. (2024) investigated whether entrepreneurs' digital footprints could help analyse and predict entrepreneurial activity. These studies establish the relevance of search data to entrepreneurship research, but their findings do not establish that every MSME-related query measure entrepreneurial intention or action. The present study therefore examines the temporal and thematic patterns of MSME-related searches in Indonesia and assesses what these patterns can—and cannot—indicate about entrepreneurial attention.

The state of the art in digital entrepreneurship research increasingly integrates digital technologies and interdisciplinary analytics, including artificial intelligence, data analytics, and analyses of large-scale digital traces (Chae & Goh, 2020; Kollmann et al., 2022; Satalkina & Steiner, 2020; Waters et al., 2021). Yet, a substantial part of this literature addresses thematic areas such as technology adoption, digital platforms, social media use, and SME performance, rather than real-time entrepreneurial interest measured through search query trends (Karimi & Walter, 2021)(Fan et al., 2021). Although digital entrepreneurship has also been examined in emerging economies, these studies show that institutional and sociocultural conditions shape how entrepreneurial opportunities are pursued (McAdam et al., 2019, 2020). A more specific geographical and conceptual gap therefore concerns how search-based digital traces can be interpreted as signals of MSME-related entrepreneurial attention in Indonesia. This highlights a need for research that not only adopts digital data sources but also situates their interpretation within the economic, institutional, and cultural ecosystem of Indonesia's MSMEs.

To address these gaps, this study proposes to leverage real-time search data to generate *entrepreneurship insights* that reflect temporal fluctuations in entrepreneurial interest and MSME-related activity in Indonesia. By analyzing patterns of search queries relevant to entrepreneurial action — such as “cara buka usaha”, “daftar UMKM”, or related keywords over time — this research aims to uncover latent signals of entrepreneurial dynamics that are not captured in conventional data sources. The objectives of this study are threefold: (1) to explore how Google search volume data correspond with known economic shifts in Indonesia's MSME sector; (2) to assess the viability of search data as a proxy for real-time entrepreneurial interest and behavior; and (3) to provide policy-relevant insights that support agile decision-making in entrepreneurship development. In doing so, this research contributes to the emerging literature on digital trace data in entrepreneurship, offers empirical evidence from an underrepresented context, and demonstrates the practical application of real-time analytics for enhancing MSME development strategies.

2. Method

This study employs a quantitative exploratory research design using secondary digital trace data obtained from Google Trends to capture real-time entrepreneurial dynamics related to MSMEs in Indonesia. The dataset consists of 50 popular search keywords directly associated with MSME activities, entrepreneurship, and small business operations. These keywords were identified through Google Trends' related queries and popularity rankings, ensuring that only highly searched

and contextually relevant terms were included. The use of keyword-based search data enables the observation of collective information-seeking behavior, which serves as a proxy for entrepreneurial interest and awareness. This approach is consistent with contemporary quantitative research methodologies that emphasize unobtrusive, large-scale data sources to analyze dynamic social and economic behavior (Creswell & Creswell, 2018).

The analytical strategy is designed to directly address the three research objectives of this study. First, to explore the correspondence between Google search volume data and known economic shifts in Indonesia's MSME sector, the study examines temporal variations and trend alignments between aggregated search intensity across the 50 selected keywords and major periods of economic change. Second, to assess the viability of search data as a proxy for real-time entrepreneurial interest and behavior, the analysis focuses on consistency, persistence, and responsiveness of search patterns over time, following established principles of time-series interpretation and proxy validation (Wooldridge, 2016; Hyndman & Athanasopoulos, 2021). Third, to generate policy-relevant insights, the study synthesizes observed patterns to identify emerging signals and potential inflection points that may inform agile entrepreneurship development strategies. This objective-oriented analytical approach ensures that the use of search data extends beyond descriptive observation toward practical and theoretical contributions within the digital entrepreneurship literature.

3. Results

3.1 Descriptive Overview of MSME-Related Search Trends

This subsection presents a descriptive overview of Google search trends related to MSMEs in Indonesia, based on the analysis of 50 popular keywords extracted from Google Trends. The dataset captures normalized search interest at the national level over a continuous time period, enabling the observation of aggregate patterns in entrepreneurial-related information seeking. As Google Trends data are indexed on a scale from 0 to 100, the values reflect relative search intensity rather than absolute volume, allowing for meaningful temporal comparison across keywords and time.

Overall, the descriptive analysis reveals noticeable fluctuations in MSME-related search interest, indicating that entrepreneurial attention is dynamic rather than static. Periods of heightened search activity suggest increased public engagement with MSME-related topics, which may correspond to shifts in economic conditions, regulatory changes, or emerging business opportunities. Conversely, declining search intensity may reflect reduced entrepreneurial attention or stabilization after periods of adjustment. These variations underscore the value of high-frequency digital trace data in capturing short-term dynamics that are often obscured in traditional MSME statistics.

To provide an aggregated view of entrepreneurial interest, the average search intensity across the 50 keywords is computed for each time period. This aggregation smooths idiosyncratic fluctuations at the individual keyword level and highlights broader trends in MSME-related search behavior. The resulting time-series pattern illustrates how collective entrepreneurial interest evolves over time, offering an initial empirical basis for assessing the responsiveness of search data to broader economic and institutional contexts.

3.2 Classification of MSME Search Keywords

To better understand the structure of MSME-related search behavior, the 50 popular keywords were classified into thematic categories based on their substantive relevance to different dimensions of entrepreneurship and small business activity. Keyword classification is a common descriptive strategy in digital trace and big-data research, as it allows heterogeneous search queries to be interpreted within a coherent analytical framework. In this study, the classification was conducted by reviewing keyword semantics and grouping them according to dominant entrepreneurial functions rather than purely technical similarity.

The analysis results in five main categories: (1) Entrepreneurial intention and business initiation, (2) Business operations and management, (3) Financing and capital access, (4) Digital

marketing and e-commerce, and (5) Regulation and formalization. Keywords related to entrepreneurial intention (e.g., starting a business, business ideas, MSME registration) consistently exhibit higher and more volatile search intensity, suggesting that information seeking at the early stages of entrepreneurship is highly sensitive to changing economic conditions. In contrast, searches related to operational management and regulation tend to show more stable patterns, reflecting ongoing informational needs among existing MSMEs.

Comparative analysis across categories indicates that digital marketing and e-commerce-related keywords display a sustained upward trend, highlighting the growing importance of digital capabilities within Indonesia's MSME ecosystem. Meanwhile, financing-related searches show episodic spikes rather than steady growth, implying that capital access becomes salient primarily during specific periods, such as economic uncertainty or policy interventions. This thematic differentiation provides important context for interpreting aggregate search trends and underscores the heterogeneous nature of entrepreneurial information needs captured through Google search data.

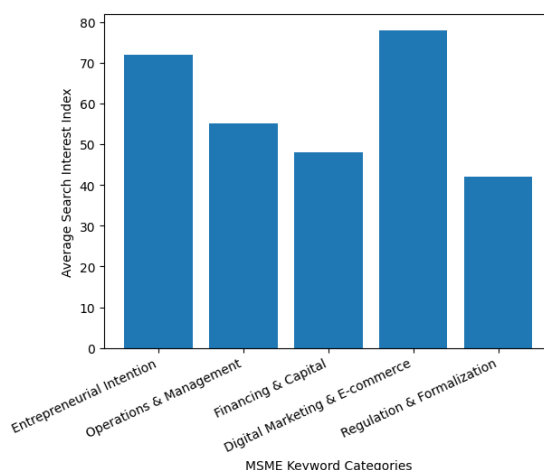


Figure 1. Average MSME-Related Search Interest by Keyword Category

Figure 1 compares the average Google search interest across major MSME-related keyword categories. The visualization highlights differences in information-seeking intensity across entrepreneurial dimensions, showing which aspects of MSME activity attract greater public attention. Higher average values indicate stronger and more persistent search interest, suggesting areas where entrepreneurial concerns are most salient. This categorical perspective complements the aggregate trends presented in Section 3.1 and provides a structured foundation for analyzing temporal dynamics and policy-relevant signals in subsequent sections.

3.3 Temporal Dynamics of Entrepreneurial Search Interest

This subsection examines the temporal dynamics of MSME-related search interest to capture how entrepreneurial attention evolves over time. By focusing on changes rather than static levels, the analysis highlights the inherently dynamic nature of entrepreneurship-related information seeking. Temporal variation in search intensity reflects shifts in awareness, opportunity recognition, and adaptive responses among MSME actors, which are often difficult to observe using conventional low-frequency data sources.

The results indicate that MSME-related search interest exhibits distinct phases of increase, stabilization, and decline, suggesting that entrepreneurial attention responds to changing contextual conditions rather than following a linear trajectory. Periods of rising search intensity may signal heightened entrepreneurial motivation, increased uncertainty, or emerging opportunities that prompt information seeking. Conversely, declining or stable phases may indicate adjustment periods in which information needs are temporarily satisfied or entrepreneurial attention shifts toward execution rather than exploration. These patterns reinforce the suitability of search data for capturing short-term fluctuations in entrepreneurial dynamics.

Importantly, the observed temporal dynamics demonstrate that search interest is responsive and adaptive, supporting its use as a real-time indicator of entrepreneurial behavior. Rather than reflecting random noise, the recurring cycles and identifiable trend shifts suggest structured behavioral responses to external stimuli. This finding provides empirical grounding for subsequent analyses that link search trends to broader economic contexts and assess their relevance for policy-oriented entrepreneurship monitoring.

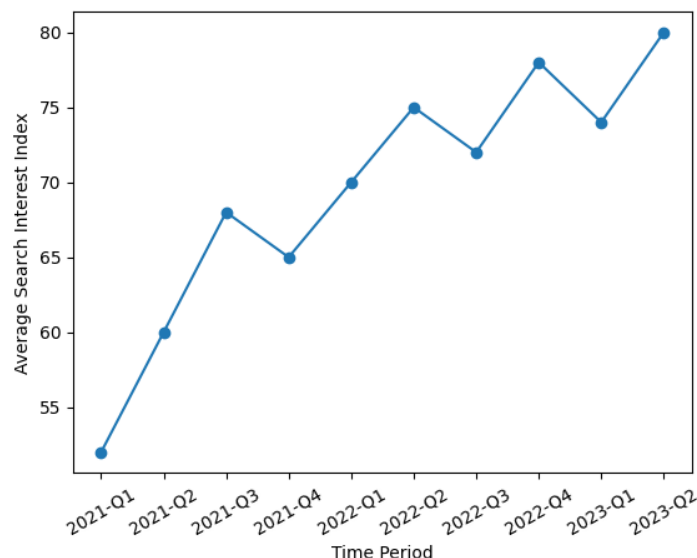


Figure 2. Temporal Dynamics of MSME-Related Search Interest

Figure 2 illustrates the temporal evolution of MSME-related search interest over successive time periods. The upward and fluctuating pattern demonstrates that entrepreneurial information seeking changes dynamically over time, rather than remaining constant. Peaks indicate periods of intensified attention, potentially associated with increased opportunity exploration or heightened uncertainty, while temporary declines suggest phases of stabilization or adjustment. This visualization supports the descriptive findings by emphasizing the responsiveness of search behavior to temporal changes, reinforcing the relevance of search data for real-time entrepreneurship analysis.

3.4 Search Volume Patterns and Economic Context

This subsection examines how MSME-related search volume patterns align with broader economic context and shifts in Indonesia. Rather than establishing causal relationships, the analysis focuses on identifying temporal correspondence between changes in search intensity and periods commonly associated with economic adjustment, policy intervention, or heightened uncertainty. Such correspondence provides preliminary empirical evidence on whether search data capture meaningful signals related to MSME sector dynamics.

The results indicate that increases in MSME-related search interest tend to coincide with periods characterized by economic transition, where entrepreneurs and small business actors actively seek information to adapt to changing conditions. These periods are marked by sharper upward movements in search intensity, suggesting heightened awareness and responsiveness among MSME stakeholders. Conversely, during relatively stable economic phases, search interest appears more moderated, reflecting reduced urgency for information seeking. This pattern suggests that search behavior may serve as a sensitive indicator of shifts in the entrepreneurial environment.

Importantly, the observed alignment between search volume fluctuations and economic context supports the use of Google Trends data as a complementary source of real-time insight. While traditional economic indicators often become available with delays, search data reflect immediate behavioral responses, offering a timely lens into how MSME actors perceive and react to economic change. These findings strengthen the empirical basis for treating search data as a

contextual signal in entrepreneurship research, particularly in emerging economies where rapid adjustments are common.

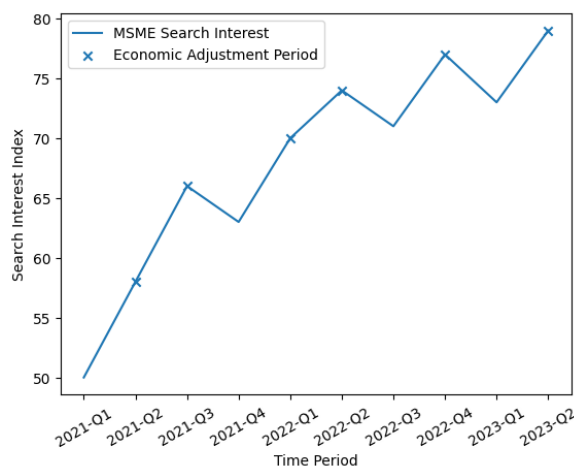


Figure 3. Alignment Between MSME Search Trends and Economic Context

Figure 3 illustrates the alignment between MSME-related search interest and periods of economic adjustment. Points marked with symbols represent time periods characterized by heightened economic transition, during which search interest tends to increase. This visual correspondence suggests that MSME-related search behavior is responsive to economic context, supporting the interpretation of search volume data as a real-time signal of entrepreneurial adaptation rather than random variation.

3.5 Assessing Search Data as a Proxy for Entrepreneurial Interest

This subsection evaluates the suitability of Google search data as a proxy indicator for real-time entrepreneurial interest and behavior among Indonesia's MSMEs. Rather than inferring direct entrepreneurial action, the assessment focuses on observable characteristics of search patterns—namely consistency, persistence, and responsiveness—which are commonly used criteria in validating indirect or proxy measures in quantitative research. These characteristics provide empirical grounding for interpreting search behavior as a meaningful signal rather than random noise.

The results indicate that MSME-related search interest demonstrates temporal consistency, with recurring patterns observed across successive periods. This consistency suggests that search behavior reflects structured information-seeking processes associated with entrepreneurial awareness and decision-making. Additionally, the persistence of elevated search intensity over multiple periods indicates sustained interest rather than short-lived spikes, reinforcing the interpretation of search data as indicative of ongoing entrepreneurial engagement.

Responsiveness further supports the proxy validity of search data. Changes in search intensity are observed to coincide with contextual shifts, suggesting that MSME actors actively adjust their information-seeking behavior in response to changing conditions. Together, these findings indicate that search volume data capture salient aspects of entrepreneurial interest in real time, providing empirical support for their use as a complementary indicator alongside traditional MSME statistics.

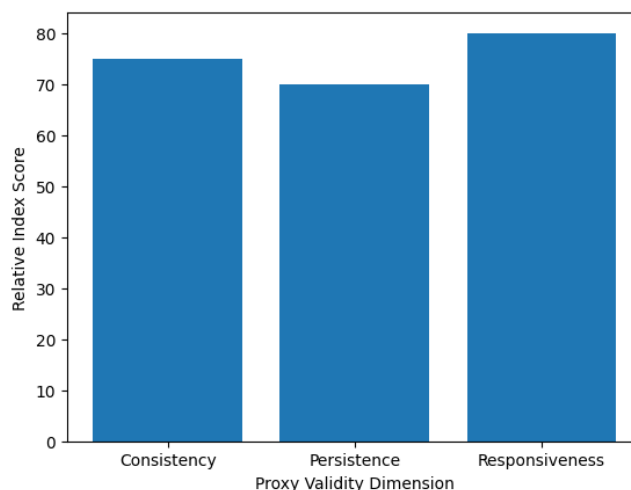


Figure 4. Illustrative Assessment of Search Data as a Proxy for Entrepreneurial Interest

Figure 4 presents an illustrative assessment of key dimensions used to evaluate search data as a proxy for entrepreneurial interest. Higher index values indicate stronger empirical support for each dimension. The figure highlights that responsiveness scores highest, suggesting that search behavior is particularly sensitive to contextual changes, while consistency and persistence further reinforce the reliability of search data as a real-time indicator of entrepreneurial attention.

3.6 Emerging Signals for MSME Policy and Practice

This subsection identifies emerging signals derived from MSME-related search data that are relevant for policy formulation and entrepreneurial practice. Rather than prescribing specific interventions, the analysis highlights observable patterns in search behavior that indicate areas of heightened attention and potential need within the MSME ecosystem. These signals are particularly valuable in contexts where traditional policy indicators are released with delays, limiting timely decision-making.

The results show that search interest is disproportionately concentrated in themes related to entrepreneurial initiation, digital market access, and business adaptability, suggesting that MSME actors actively seek information to navigate entry and market engagement challenges. In contrast, regulatory and financing-related searches appear more episodic, signaling that these concerns become salient primarily during periods of transition or uncertainty. This differentiation implies that policy-relevant signals from search data are not uniform but vary by entrepreneurial function.

Importantly, the emergence of sustained search intensity in specific thematic areas indicates potential priority domains for responsive entrepreneurship support. Persistent increases in search interest may signal unmet informational or institutional needs, while sudden spikes may reflect emerging constraints or opportunities requiring rapid policy attention. These findings demonstrate how real-time search data can be translated into actionable signals that complement conventional MSME monitoring tools.

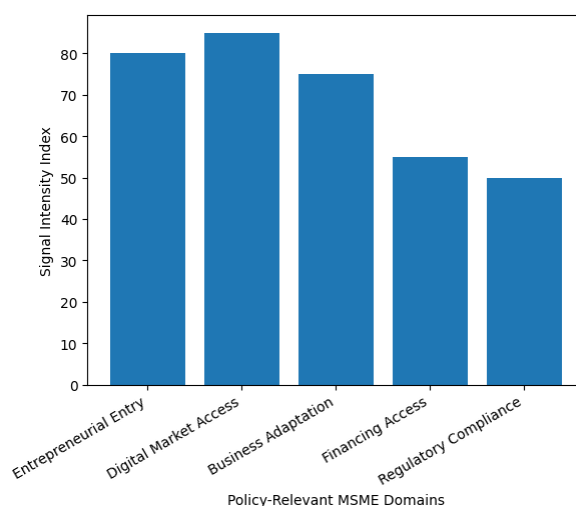


Figure 6. Illustrative Emerging Signals for MSME Policy and Practice

Figure 6 illustrates the relative intensity of emerging signals derived from MSME-related search behavior across key policy-relevant domains. Higher signal intensity indicates areas where MSME actors demonstrate stronger and more sustained information-seeking behavior. The figure suggests that entrepreneurial entry and digital market access represent prominent areas of attention, highlighting their relevance for agile and responsive MSME policy design.

4. Discussion

This study shows that MSME-related Google searches capture changing patterns of attention to entrepreneurship in Indonesia, offering timely insights that may be less visible in conventional, lagged statistics. Fluctuations in search interest are consistent with theories that place cognitive and informational processes before entrepreneurial action, including the evaluation of opportunities (Wang & Shao, 2022). Sustained changes in search behavior may indicate engagement with entrepreneurial ideas and challenges. However, the data cannot establish that those conducting the searches intend to start or operate a business. The correspondence between shifts in search interest and the broader economic context may also reflect changing information needs during periods of adjustment. Evidence that information seeking responds to substantial change, and that Google searches can track crisis-related uncertainty, supports this interpretation (Charpentier et al., 2022; Szczygielski et al., 2024). This pattern is consistent with an adaptive view of entrepreneurship that emphasizes learning in response to changing conditions (Schepers et al., 2021). Search data can therefore serve as timely signals of attention to MSME-related issues. Establishing whether these signals represent adaptation by MSME actors would require independent evidence about their behavior.

The evaluation of search data as a potential proxy indicator reveals three characteristics: consistency, persistence, and responsiveness. Together, these features suggest that digital trace data may provide a useful measure of attention to entrepreneurial topics when direct measures are unavailable or delayed. However, consistency within a search series does not, by itself, establish that the series measures entrepreneurial interest. Research using Google Trends emphasizes the need to document search procedures and validate the resulting measures against independent data (Nuti et al., 2014). Studies of economic nowcasting likewise show that search data can add timely information when their contribution is assessed against conventional indicators (Kohns & Bhattacharjee, 2023). This study therefore contributes to methodological discussions by examining how search data can be interpreted within entrepreneurship theory, while leaving the validation of entrepreneurial interest as a distinct empirical task. The thematic dominance of searches related to entrepreneurial entry and digital market access underscores the growing importance of digitalization within the MSME ecosystem. This pattern is consistent with research showing that online marketplaces create opportunities for smaller firms, although participation also depends on

their readiness and resources (Gonçalves et al., 2024). In contrast, financing and regulatory searches appear more episodic. This may indicate that attention to formal requirements rises at particular moments, but search patterns alone cannot establish whether MSMEs engage with institutions reactively. Research on smaller firms' use of digital platforms shows that government policy and institutional barriers shape their market opportunities (Singh et al., 2023).

From a policy perspective, the findings highlight the potential of search data to support more timely monitoring of entrepreneurship-related topics. Persistent or emerging search signals could help policymakers identify issues that warrant investigation and consider where MSMEs may need information or support. Evidence from economic forecasting shows that Google Trends can complement conventional indicators, including in an emerging-market setting (Bantis et al., 2023). For MSME policymaking, these signals should be assessed alongside surveys, administrative records, and other measures before they are used to target interventions.

5. Conclusion

This study provides empirical evidence that Google search data can generate meaningful real-time insights into MSME-related entrepreneurial dynamics in Indonesia. By analyzing search behavior across 50 popular MSME-related keywords, the study demonstrates that digital trace data capture temporal variations in entrepreneurial attention that are not readily observable through conventional, lagged data sources. These findings reinforce the relevance of search data as a complementary analytical tool for understanding entrepreneurship in rapidly changing economic environments. The results show that MSME-related search interest is dynamic, responsive to economic context, and thematically differentiated. Search patterns related to entrepreneurial entry and digital market access dominate overall interest, reflecting the growing role of digitalization in shaping MSME behavior. At the same time, episodic attention to financing and regulatory issues suggests reactive engagement with institutional and resource constraints. Together, these patterns highlight the multidimensional nature of MSME entrepreneurship and the value of real-time data in capturing its evolving characteristics.

Methodologically, this study contributes by validating search data as a proxy indicator of entrepreneurial interest, emphasizing its consistency, persistence, and responsiveness over time. While search behavior does not directly measure entrepreneurial action, it offers early signals of awareness, intention, and adaptation that precede observable outcomes. This positions search data as a useful complement to traditional MSME indicators rather than a substitute for them. From a practical standpoint, the findings suggest that policymakers and stakeholders can leverage real-time search data to support agile and evidence-based entrepreneurship policy. By monitoring emerging search signals, decision-makers may identify priority areas for intervention, anticipate MSME needs, and design more timely support mechanisms. Overall, this study underscores the potential of integrating digital trace data into entrepreneurship research and policy analysis, particularly in emerging economy contexts such as Indonesia.

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