Research Paper

Assessment of Indonesia's Mineral Value-Added Policy: A Literature Review and Future Research Agenda

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Abstract

This study addresses a gap in Indonesia's mineral-downstream policy research by identifying the optimal policy scenario for enhancing the added value of primary metal mineral commodities. This research examines competitive and comparative advantages and economic impacts using system dynamics modeling. Initially, qualitative interviews are conducted to identify elements affecting domestic refining facilities' growth, followed by quantitative surveys and the Analytic Hierarchy Process (AHP) to prioritize factors fostering these advantages. Findings suggest that developing existing theories to fit Indonesia's specific context is crucial, and focus group discussions with key mining company decision makers are recommended to develop relevant indices. This method evaluates policy options to determine those offering the most significant economic advantage for each mineral type by analyzing unique characteristics and mapping them to suitable policies. Integrating competitive and comparative advantages into the mineral-added value policy context maximizes economic returns and provides practical recommendations for policymakers, addressing a critical gap in the literature.

Keywords: *Mineral; Downstream; Smelter; Indonesia; Competitive Advantage; Comparative Advantage; Economic Impact; System Dynamics*

INTRODUCTION

For over a decade, Indonesia has enforced a policy to increase the value of its mineral resources. Law Number 4 of 2009 on Mineral and Coal Mining mandates that all metallic minerals must undergo domestic processing and refining to meet the government's minimum product standards. Following exploration activities, this policy applies to all metallic minerals classified as metals under Government Regulations. The 2020 report from the Ministry of Energy and Mineral Resources indicates that from 2009 to 2021, this policy significantly impacted only the nickel industry regarding refining and processing facility development. The nickel's growth trajectory is considerably steeper than that of other metals, which either remained flat or showed minimal increase. The bars corresponding to other metals, such as bauxite, copper, and iron, are relatively small and show slight variation over the years, indicating a lack of similar progress in these sectors. In contrast, the growth in the smelter construction of other primary metals has largely stagnated or not increased over the past decade, as illustrated in Figure 1.

Indonesia has encountered difficulties in balancing its domestic value-added initiatives while maintaining the economic feasibility of various commodities. To address these challenges, the government extended the implementation timeline of these policies on three occasions. From 2014 to 2016, Government Regulation Number 1 of 2014 banned the export of unprocessed minerals, including nickel ore and bauxite, to force investment in domestic processing facilities. However, from 2017 to 2019, Government Regulation Number 1 of 2017 permitted the export of low-grade Ni ore and bauxite under the condition that companies demonstrated a commitment to building domestic smelters, which was intended to ensure the long-term sustainability of the mineral value-added initiative. The most recent extension, implemented through the Minister of Energy and Mineral Resources (MEMR) Regulation No. 11 of 2019, prolongs the export ban on

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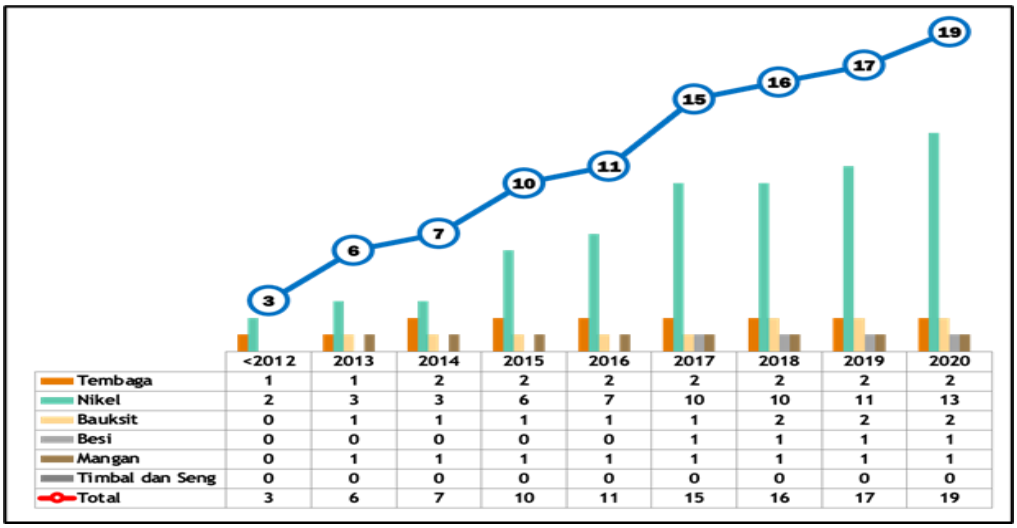
nickel ore from 2020 onwards. This regulation aimed to bolster the domestic processing industry and position Indonesia as a leading player in the global nickel market, particularly in light of the growing demand for nickel in electric vehicle battery production. These policy shifts reflect the government's persistent efforts to balance promoting domestic value-added policies with navigating the complexities of commodity market dynamics, where the need to attract foreign investment and maintain market competitiveness often conflicts with the broader economic goals of resource nationalism.



	<2012	2013	2014	2015	2016	2017	2018	2019	2020
Tembaga	1	1	2	2	2	2	2	2	2
Nikel	2	3	3	6	7	10	10	11	13
Bauksit	0	1	1	1	1	1	2	2	2
Besi	0	0	0	0	0	1	1	1	1
Mangan	0	1	1	1	1	1	1	1	1
Timbal dan Seng	0	0	0	0	0	0	0	0	0
Total	3	6	7	10	11	15	16	17	19

Figure 1. Development of refining and processing facilities (Ministry of Energy and Mineral Resources, 2021)

The extension of Indonesia's mineral value-added policy, which mandates domestic refining of all metallic minerals, has been partially due to delays in domestic smelter construction. By requiring all metallic minerals undergo domestic refinement, this policy overlooks the unique competitive and comparative advantages of different minerals. Consequently, mining operations may come to an end if exporting any unprocessed metal minerals is prohibited, particularly in cases when domestic production capacity is insufficient. This cessation will impact Indonesia's economy, including potential losses in state revenues, as evidenced by the smelter development trends shown in Figure 2.

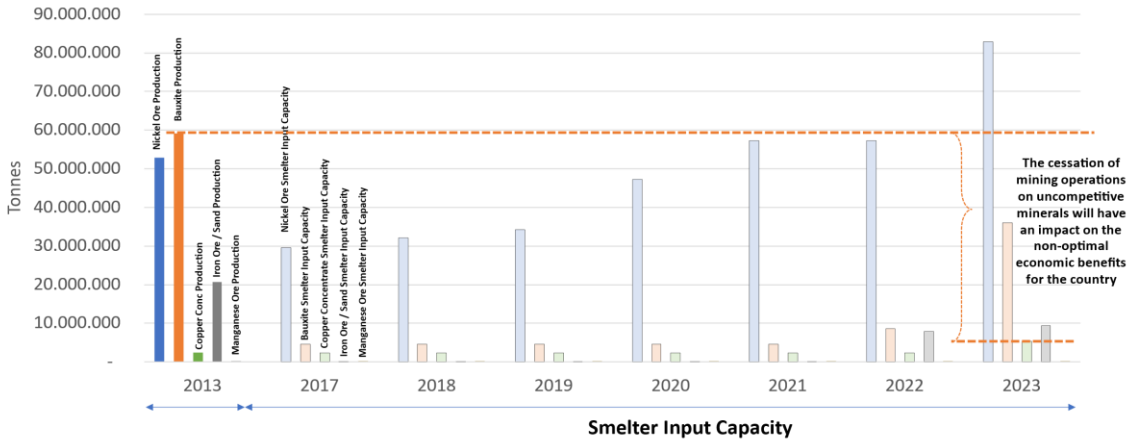


Figure 2. The development of mineral refining facilities and the impact of cessation of mining operations compared with the smelter input capacity

Despite Indonesia's abundant metal reserves and significant contribution to global production (Table 1), refining facilities have remained stagnant. Challenges in implementing the country's mineral value-added policy over the past decade have led to a reassessment of competitive and comparative advantages in policy formulation. Hanafi et al. (2019) applied Porter's diamond model and found that each mineral commodity in Indonesia has unique competitiveness factors, suggesting these should guide policy strategies. Similar insights are seen in studies on Romania's coal industry (Diana et al., 2015), China's coal sector (Wu et al., 2017), and Greece's aluminum products (Konsolas, 2018). Additionally, competitiveness studies in sectors like the UAE's business environment (Michael et al., 2019) and renewable energy (Fang et al., 2018) emphasize the role of a competitive advantage in shaping effective policies across industries and countries.

Table 1. Position of Indonesia's mineral commodities in the world (Ministry of Energy and Mineral Resources, 2021)

Mineral	World Reserve Ranking	World Production Rank
Nickel	1st in the world (23% of world reserve)	1st in the world (29% of world production)
Bauxite	6th in the world (4% of world reserve)	6th in the world (4% of world production)
Copper	7th in the world (3% of world reserve)	12th in the world (2% of world production)
Iron	- (Not in the top 17 of world reserve)	- (Not in the top 17 of world production)
Manganese	- (Not in the top 16 of world reserve)	- (Not in the top 16 of world production)

The concept of the comparative advantage is also suggested when formulating policies. For instance, Mamina et al. (2020) investigated Zimbabwe's potential to excel at mineral beneficiation and value addition by utilizing Balassa's Revealed Comparative Advantage. Their study found that Zimbabwe had a relative advantage in manufacturing specific mining-related commodities. Therefore, it is advised that Zimbabwe focuses on producing these identified products to enhance its economic value. Additionally, the principle of the comparative advantage has been extensively utilized in various sectoral analyses. These encompass examinations of Iran's leather industry (Shafaei et al., 2009), India's textile sector (Kathuria, 2018), Kazakhstan's broader industry (Madiyarova et al., 2018), overall tourism flows (Zhang & Jensen, 2007), tourism services in the EU-28 countries (Algieri et al., 2018), China's rare earth products (Shuai et al., 2022), the agri-food industry (Mizik, 2021), the metal industry in the Eurozone (Konstantakopoulou & Tsionas, 2019), and Romania's industrial sector (Marinescu & Constantin, 2010). However, studies on the comparative advantage of mineral mining in Indonesia remain scarce within the existing body of literature.

As a key player in global mineral mining, Indonesia needs a clear framework for its value-added policy that focuses on its competitive and comparative advantages. This research analyzes key factors influencing smelter development and aimed to create a context-specific framework for assessing economic impacts. This study offers guidance for policymakers in enhancing competitiveness while ensuring sustainable growth in the mining sector.

LITERATURE REVIEW

The literature review forms the theoretical foundation of an article, aiming to "revisit" what previous researchers have explored on a specific topic. This provides context and justification for the research objectives and hypotheses. A strong literature review does more than summarize relevant studies—it critically evaluates, reorganizes, and synthesizes existing work. Figure 3 illustrates the mapping of publication topics related to the competitive and comparative advantages. This mapping supports investment decisions in smelter development by highlighting economic benefits based on SLR findings.

Porter's diamond model, a widely recognized framework for evaluating national competitive advantage, identifies four main determinants: factor conditions, demand conditions, related and supporting industries, and firm strategy, structure, and rivalry—with external influences from government and chance. Despite its extensive use, the model has drawn criticism. Rugman snd D'Cruz, (1993) questioned its suitability for small, open economies like Canada, proposing a double diamond framework for such contexts. Cho et al. (2008) also refined the model by introducing the MASI approach to account for location-specific factors in international business.

The model has been applied in various sectors, including tourism (Algieri et al., 2018; Michael et al., 2019), the Iranian leather value chain (Shafaei et al., 2009), and the coal industries in China (Wu et al., 2017) and Romania (Diana et al., 2015). Fang et al. (2018) adapted it to assess the G20 countries' renewable energy competitiveness.

In Indonesia's mining sector, research remains limited. Hanafi et al. (2017) conducted a literature review on Indonesia's competitive advantage and later applied Porter's model to assess the competitiveness of domestic mining upgrades (Hanafi et al., 2018) and smelter industries for nickel, copper, aluminium, and iron (Hanafi et al., 2019). Their studies emphasize targeted policies to enhance sector competitiveness, underscoring the need for commodity-specific strategies. Such tailored approaches could provide insights into smelter investments and help develop a competitive and sustainable mining sector in Indonesia.

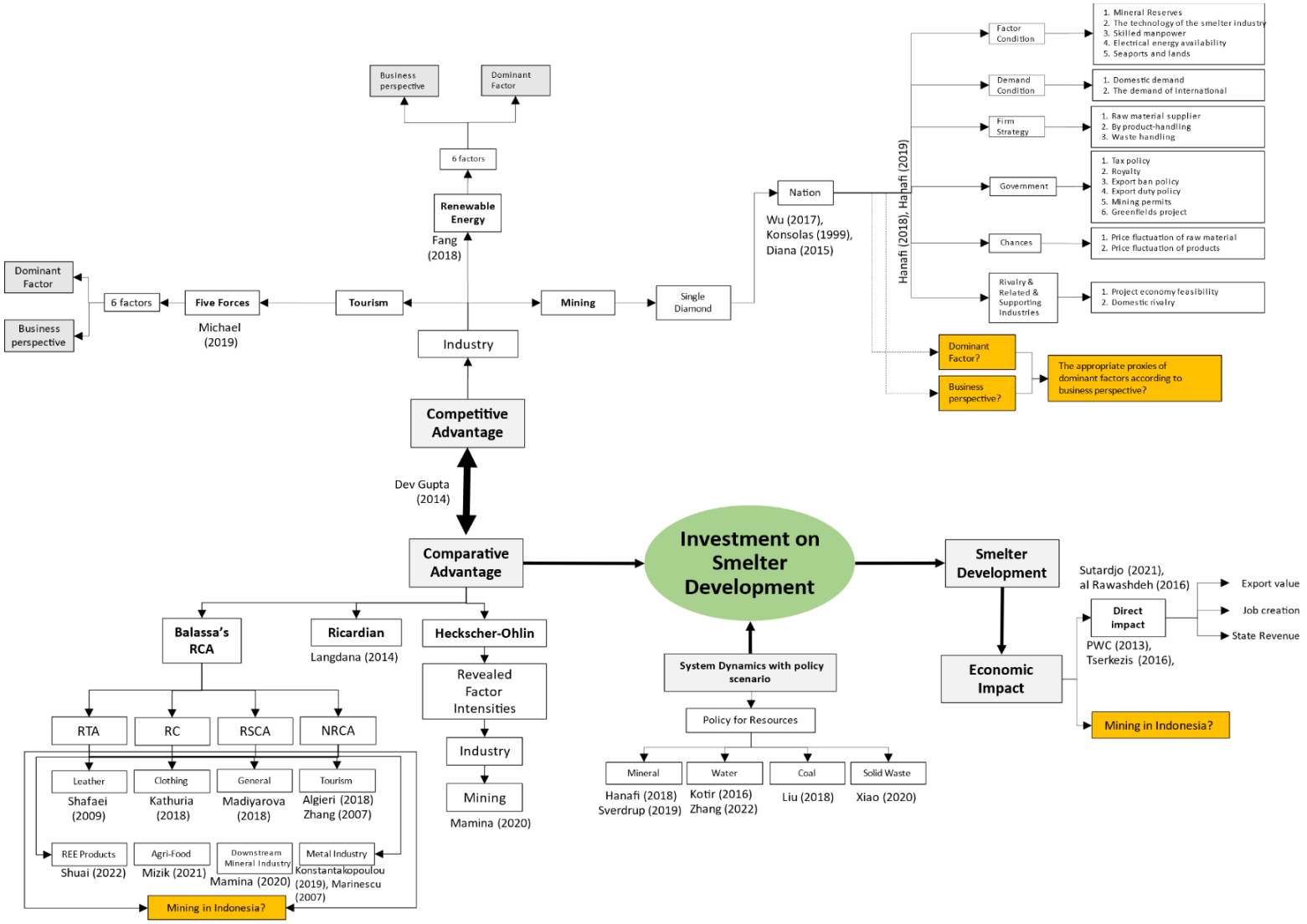


Figure 3. The mapping of topics related to competitive and comparative advantage for smelter development investment and economic benefit

Economic Impact Literature Review

Economic impact assessments often vary in scope and execution, with guidelines lacking the necessary details for consistent and comprehensive analysis. PwC (2013) defined economic impact as the effect of business activity on the economy within a particular area, considering factors such as exports, investments, profits, intangibles, and payroll. This definition emphasizes the need for a broad and holistic economic impact analysis approach.

Tserkezis and Tsakanikas (2016) studied mining on the Greek island of Milos and found that its total economic impact comprises direct, indirect, and induced effects on gross value added, GDP, employment, and tax revenues. This research highlights how immediate mining impacts create ripple impacts across the economy. Similarly, Al Rawashdeh et al. (2016) examined mining's impact in Jordanian local areas, focusing on socioeconomic indicators like unemployment, the Human Development Index, poverty, education, health, and environmental factors. Their findings highlight the importance of considering broader social and environmental implications when conducting economic assessments.

In Indonesia, Tui and Adachi (2021) analyzed the economic impact of the country's mining export ban using 2010 input-output data across 13 mining-related sectors. They found that exclusion of certain ores from the ban warranted reconsideration, reflecting the complex policy-economic dynamics. Additionally, they projected that metals would play a crucial role in Indonesia's long-term economic growth, emphasizing the strategic importance of mining for Indonesia.

A systematic literature review found that while some studies use input-output methods to assess indirect impacts on specific sectors, including mining, there is a notable gap in research on direct impact indicators like state revenue, job creation, and export value, especially in the context of Indonesia's mining and smelter development. This gap signals the need for further research to provide a more comprehensive understanding of mining's economic impact on the country.

To address this gap, future research should focus on developing a more nuanced framework tailored to Indonesia's mining sector. This framework should account for both the economic and social and environmental implications of mining activities. Moreover, it should consider Indonesia's unique resource endowments, regulatory environment, and development priorities.

By conducting thorough and context-specific economic assessments, policymakers and industry stakeholders can make more informed decisions about resource allocation and policy design to ensure sustainable economic growth. Such assessments can also help identify challenges and opportunities, enabling proactive strategies to mitigate risks and maximize benefits for local communities and the broader economy.

Research gap

The interrelationships among the topics across all 27 search strings in Table 2 were analyzed using the VOSviewer application, following a methodology adapted from (Bakker, 2010). The results were categorized into network, overlay, and density visualization. These visualizations helped identify connections between research topics and assess the originality of the studies .

The network visualization (Figure 4) revealed 20 clusters. A different color and varying distances between clusters represent each cluster. The color of an item corresponds to its cluster, while the lines between items represent links (van Eck & Waltman, 2021). An item's weight is reflected in the size of its label and circle; a higher weight corresponds to more prominent labels and circles. The distance between the two journals in the visualization approximately signifies the relatedness of the journals concerning co-citation links.

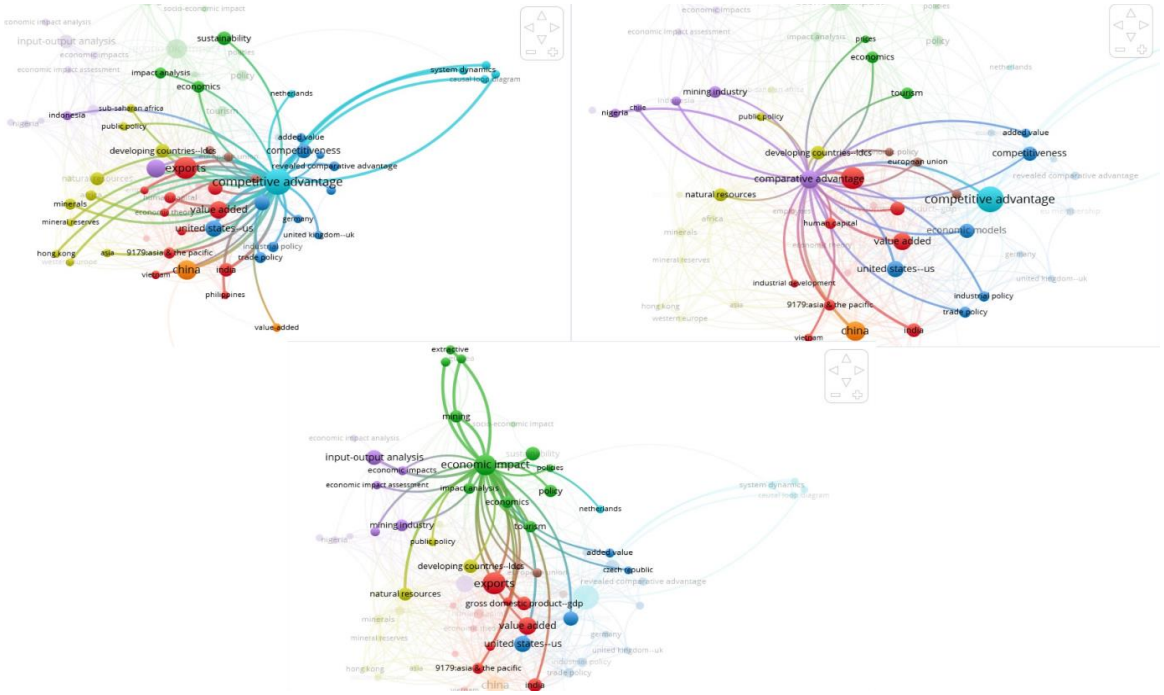


Figure 4. Network Visualization Analysis of VOSviewer by Selecting the Keywords “Competitive Advantage” (top-left), "Comparative Advantage" (top-right), and "Economic Impact" (bottom-center)

Data visualized in Figure 4 reveal insightful patterns. It is observed that specifically selecting "competitive advantage" in the network highlights its association with "Indonesia" and "comparative advantage" but shows no direct connections to "mining," "economic impact," or "policies." A similar pattern emerges when "comparative advantage" is selected, showing links with "Indonesia" and "competitive advantage," yet lacking connections to "mining," "economic impact," or "policies." On the other hand, when "economic impact" is chosen, it is connected with "Indonesia," "mining," and "policies," but not with topics related to "competitive advantage" or "comparative advantage".

These observations suggest that this study represents a pioneering effort in analyzing the interconnections between "Competitive Advantage," "Comparative Advantage," and "Economic Impact," with a focus on mining, specifically mineral value-added policy. The lack of direct links between these topics in the existing literature, as indicated by the network visualization, underscores our research’s novelty and unique contribution in collectively examining these themes.

The overlay visualization feature in VOSviewer, which is based on the average publication year, provides further insights into the temporal distribution of research topics. Figure 5 illustrates that the study reveals a concentration of articles between 2015 and 2018 for the search terms “competitive advantage,” “mining,” and “Indonesia.” Publications pertaining to “comparative advantage” and “economic repercussions” often have an average publication year prior to 2015, as opposed to those above. This indicates that more recent research has focused on the intersection of the competitive advantage, mining, and Indonesia. However, there appears to be a gap in newer studies that integrate both competitive and comparative advantages in the context of Indonesia’s mineral-added value policy. Addressing this gap could significantly enhance our understanding of how such policies can yield optimal economic benefits.

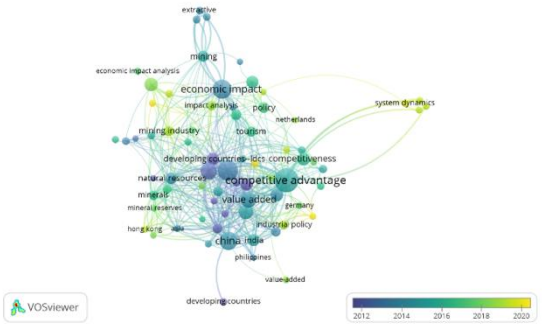


Figure 5. Overlay Visualization Analysis of VOSviewer

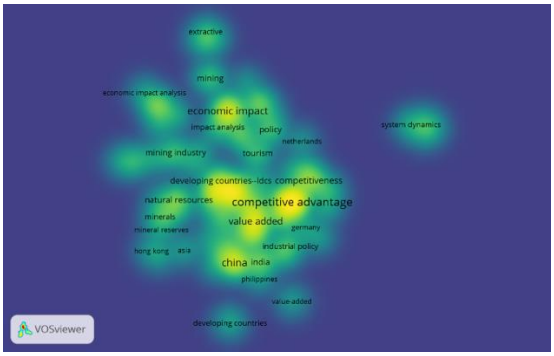


Figure 6. Density visualization analysis of VOSviewer

In the density visualization generated using VOSviewer, the density of items in a specific location is represented by color, where the default color scheme ranges from blue to yellow. Areas with a high concentration of heavier weighted items are closer to yellow, whereas regions with fewer and lighter weighted items are closer to blue (van Eck & Waltman, 2021). The density visualization in Figure 6 reveals that the string “competitive advantage” has a bright yellow color and heavier weight than others, and its location is near “value-added," suggesting a high density of publications that link “competitive advantage” with “value-added." In contrast, the string “minerals," "mining industry," or “economic impact” is relatively far from “competitive advantage," suggesting that fewer publications discuss the relationship between competitive advantage and minerals, mining, or economic impact. Subsequently, the string “system dynamics" has the farthest distance from “the competitive advantage," indicating limited publications related to these two topics. Notably, the string “comparative advantage” is barely visible unless zoomed in, indicating a small point size and fewer publications discussing this topic.

The current literature on mineral value-added policies in Indonesia reveals a significant research gap, particularly in terms of integrating competitive and comparative advantage frameworks within the mining context and their economic impact. While there is substantial research on these topics individually, there is a noticeable lack of studies that explore their interplay, especially in relation to Indonesia’s unique resource landscape. This gap suggests a need for more focused research that examines how these concepts can be combined to optimize policy decisions, enhance economic benefits and address the specific challenges faced by the Indonesian mining sector. Such research will contribute valuable insights into developing more effective and targeted mineral policies that align with the country's economic goals.

RESEARCH METHOD

The research methods should enable readers to reproduce the analysis. Provide sufficient details to allow the work to be reproduced. A reference should indicate methods already published; only relevant modifications should be described. Figures are sequentially numbered, commencing at 1, with the figure title and number below the figure, as shown in Figure 1.

In order to formulate a comprehensive conceptual framework for an effective mineral value-added policy in Indonesia, the first crucial step entails conducting a systematic literature review (SLR) to gain an in-depth understanding of existing research. The SLR method systematically gathers pertinent publications and documents meeting predetermined criteria and addressing formulated research questions. By employing rigorous procedures throughout the searching, identification, appraisal, synthesis, analysis, and summarization stages, the SLR method ensures minimal bias and yields reliable findings and conclusions (Linnenluecke et al., 2020). These findings serve as valuable guidance for decision-makers and scientific practitioners alike (Mengist et al.,

2020).

Within the SLR process, a thorough exploration of prior theoretical knowledge drawn from competitive advantage, comparative advantage, and economic impact is undertaken. Following the completion of the SLR, research gaps are pinpointed utilizing the VOSviewer software. Subsequently, a conceptual framework is proposed based on the analysis of SLR outcomes and identified research gaps, thereby offering pertinent insights for shaping the research agenda concerning mineral value-added policy in Indonesia.

The initial phase of implementing the SLR method involves delineating search sequences, a method detailed by Bakker (2010). This process entails categorizing keywords into distinct groups, which are then amalgamated to construct a comprehensive array of search strings, as depicted in Table 2.

Table 2. List of Search Strings Category (adopted from Bakker (2010))

No.	Category A	Category B	Category C
1	Competitive Advantage	Mineral	Nation
2	Comparative Advantage	Value Added	Indonesia
3	Economic Impact	Refinery / Smelter	Smelter

In this study, we have organized keywords into three categories: Category A (3 keywords), Category B (3 keywords), and Category C (3 keywords), resulting in 27 search strings (3 x 3 x 3). For instance, the search string 'A1B1C1' represents the combination of keywords: the competitive advantage AND mineral AND nation. All 27 search strings are then executed across Scopus, ScienceDirect, and Proquest databases to acquire literature with explicit relevance.

The results from Scopus, ScienceDirect, and ProQuest were initially filtered manually by reading abstracts to eliminate less relevant studies, yielding 32, 23, and 10 results, respectively. Subsequently, a more in-depth body skim reading was conducted to identify the most relevant papers, resulting in 8, 1, and 4 results for Scopus, ScienceDirect, and ProQuest, respectively. In addition to these, snowballing was employed, including 30 focus papers that met the study criteria. These focus papers were identified through the thorough and comprehensive reading of the initially selected papers, following the methodology outlined by Bakker (2010).

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FINDINGS AND DISCUSSION

Result

Mineral mining activities consist of two main phases: exploration, which produces data on mineral resources and reserves, and operation production, which produces ore. Indonesia's current mineral-added value policy mandates domestic refinement for all metallic minerals, disregarding competitive and comparative advantages. There is a chance that mining activities may stop because of this policy, which includes an export prohibition on all unprocessed metal minerals, which might affect Indonesia's economy. The policy of mineral-added value, molded by policy scenarios,

determines the trajectory of mineral ore operations going forward. Therefore, future research may aim to find an appropriate policy scenario to increase the added value of the main metal mineral commodities in Indonesia. This is achieved by addressing the following research questions:

1. What key factors determine the competitiveness of Indonesia's added value in the mineral sector?
2. What crucial factors determine the comparative advantage that attracts investment in the downstream minerals industry?
3. How do nickel, bauxite, copper, iron, and manganese compare regarding competitiveness and comparative advantage in the mineral sector?
4. How can a value-added policy in the mineral sector be tailored to maximize economic benefits for commodities with different competitive and comparative advantages?

To obtain an appropriate mineral-added value policy scenario in Indonesia, we propose the research agenda outlined in Figure 7 based on an extensive literature review. To attain this objective, we recommend that the government and stakeholders scrutinize competitive and comparative advantages and economic impacts from the perspective of business actors, specifically key decision makers in mining companies. We contend that input from business actors is essential for achieving this goal. The decision to construct or invest in smelters often stems from how these leaders perceive the interplay between the competitive and comparative advantages of various commodities. Therefore, a detailed exploration of this interaction is necessary to understand how it influences the enhancement of domestic added value. Acknowledging the varied influences on Indonesia's mineral competitiveness, we emphasize the importance of incorporating the perspectives of business actors. This approach aligns with but extends beyond Porter's theory of the national competitive advantage. This is further emphasized by prior research, which indicated different competitive characteristics for each commodity.

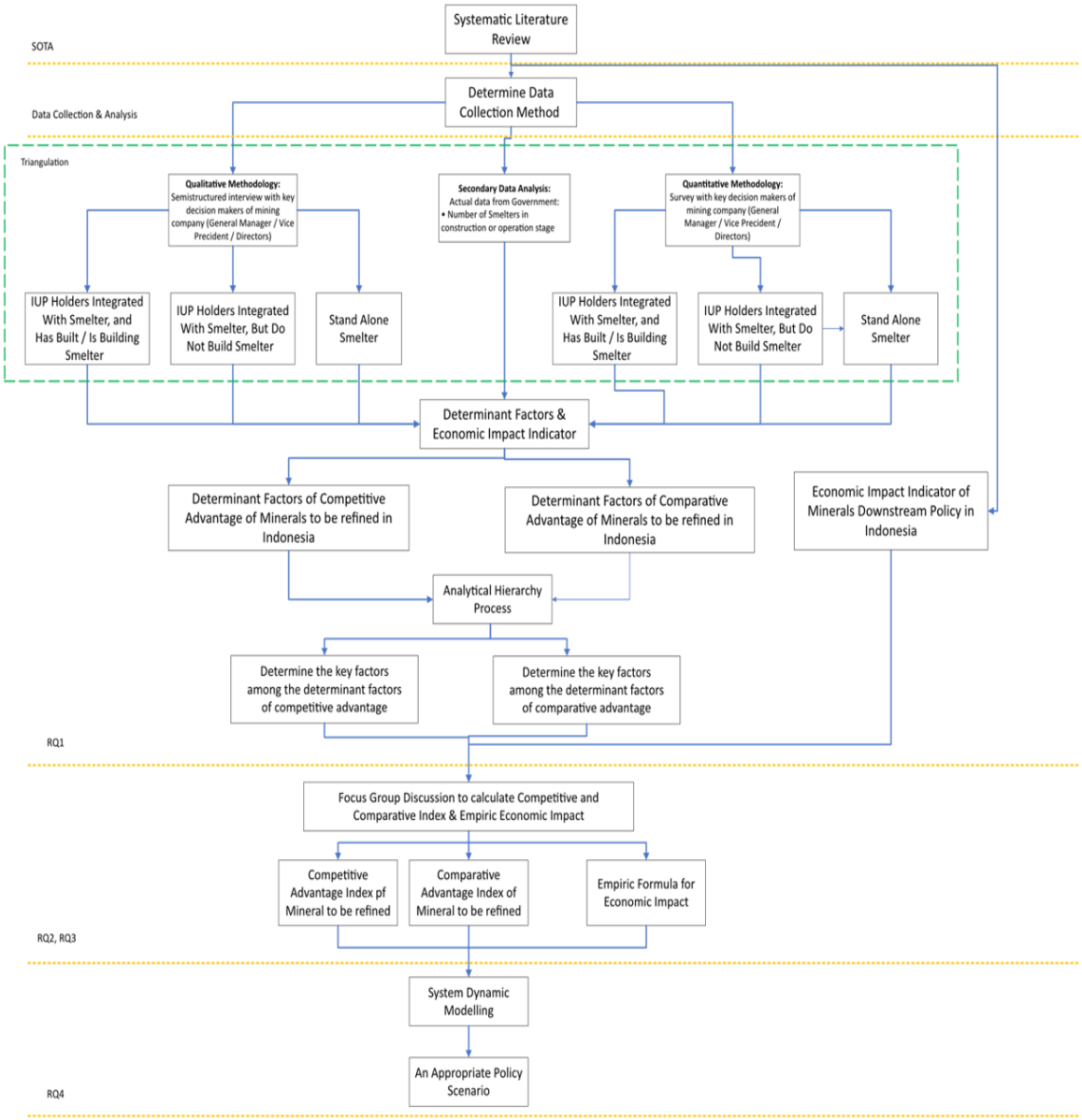

Figure 7. Conceptual framework of determinant factors of mineral to be refined domestically in Indonesia

To achieve this goal, a complex mixed-methods approach can be used to identify the determinant factors within the sub-factors of competitive advantage and comparative advantage determinants for minerals to be refined in Indonesia (Alam et al., 2020). This approach combines qualitative techniques, such as semi-structured interviews with key business actors from mining companies, supplemented by secondary analysis of actual data from the Government of Indonesia, and quantitative techniques by conducting surveys. The rationale and benefits of using this mixed-methods design, as demonstrated in a prior study by Hanafi et al. (2018), are summarized in Table 3.

Table 3. Reasons and Benefits for Using A Mixed Methods Design for the Study (adopted from Saunders et al. (2019))

Reason	Explanation
Initiation	This study employs a mixed-methods approach, combining qualitative methodology through exploratory research to identify the determinants of the competitive and comparative advantages of mineral commodities in Indonesia and quantitative methodology through explanatory research to gain a deeper understanding of the research problem, specifically whether the competitive and/or comparative advantage of a commodity can attract investors to Indonesia. This approach aids in developing research questions, interview questions, and questionnaire items, as well as the selection of samples, cases, and participants.
Facilitation	The use of a mixed method during the research may result in the discovery of new insights, which may necessitate the subsequent application of an alternative methodology for further exploration. Findings from previous studies have shown a discrepancy with reality. Therefore, an alternative strategy for formulating an effective mineral value-added policy in Indonesia involves identifying the dominant factors that contribute to the competitive advantage of smelter construction from a business perspective. This strategy entails a sophisticated mixed-method approach: initiating with quantitative techniques through questionnaires, followed by qualitative methods such as focus group discussions, and concluding with quantitative analysis using system dynamics. This approach adopts an abductive reasoning framework characterized by 'theory matching' or 'systematic combining.' The aim of this study is to either discover a new fitting framework or to expand upon existing theoretical models in this field.
Complementarity	The use of mixed methods enables the elaboration, improvement, clarification, confirmation, illustration, or linking of various meanings and findings. This methodology combines questionnaires, focus group discussions, and the application of system dynamics, along with an abductive approach (“theory matching” or “systematic combining”), aiming to discover new, fitting frameworks or expand upon existing theoretical models.
Interpretation	Qualitative analysis helps explain the emergence of certain relationships between variables from quantitative analysis. Employing a qualitative approach can aid in identifying factors that determine the competitive and comparative advantages of mineral commodities in Indonesia. Concurrently, a quantitative methodology can deepen the understanding of the research problem, particularly whether the competitive and/or comparative advantage of a commodity can encourage foreign investors to invest in Indonesia. The combination of these two methods may result in new insights to obtain an appropriate policy scenario to increase investment in smelter development.
Generalisability	Utilizing a mixed-method approach in the research may lead to the uncovering of fresh insights, potentially necessitating the subsequent application of an alternative method for further exploration. Previous

Reason	Explanation
	studies have revealed discrepancies with real-world scenarios. Thus, an alternative strategy for devising an effective mineral value-added policy in Indonesia involves identifying the predominant factors contributing to the competitive advantage of smelter construction from a business standpoint. This strategy employs a sophisticated mixed-methodology approach, commencing with quantitative techniques via questionnaires, proceeding to qualitative methods like focus group discussions, and concluding with quantitative analysis using system dynamics. This approach adopts an abductive reasoning framework characterized by 'theory matching' or 'systematic combining.' The objective is to either unearth a new suitable framework or enhance existing theoretical models utilized in this domain.
Diversity	The application of mixed methods enables the incorporation and reflection of a broader range of perspectives. Utilizing a mixed method approach provides insights from the viewpoints of business actors regarding the key elements that contribute to the comparative and competitive advantages in Indonesia's smelter construction sector.
Problem Solving	The mixed-methods approach is employed to identify the primary factors that contribute to the competitive advantage and comparative advantage of smelter construction in Indonesia from a business perspective. This approach addresses potential inaccuracies found in previous research, which may have arisen due to a discrepancy between their study and the actual real-world situation. By using mixed methods, the research seeks to provide a more comprehensive and accurate understanding of the factors influencing the competitiveness of smelter construction in Indonesia.
Focus	One approach might concentrate on a specific characteristic (for instance, quantitative methods on broader aspects), while the other approach might concentrate on a different characteristic (for instance, qualitative methods on finer details). By integrating qualitative and quantitative methodologies, this study endeavors to ascertain the factors impacting the competitive and comparative advantages of mineral commodities in Indonesia. Unlike prior studies that relied exclusively on deductive methodologies, often oversimplifying processes and neglecting industry nuances, this research employs both approaches to examine the research problem from a business standpoint. This method ensures a more comprehensive and precise understanding of the factors influencing the competitiveness of mineral commodities in Indonesia, considering both overarching and nuanced aspects.
Triangulation	Mixed methods may be used to combine data and determine whether the outcomes of one method mutually support the outcomes of the other method. A combination of qualitative methodology and quantitative methodology may help identify the determinants of the competitive and comparative advantages of mineral commodities in Indonesia. Combining these two

Reason	Explanation
	approaches may produce new insights into the ideal policy scenario for enhancing investment in smelter development.
Confidence	The choice of research method can significantly influence the outcomes of a study. Relying solely on one method may obscure the understanding of its impact on the results. It is advisable to use a combination of methods in an effort to counteract this "method effect," thereby enhancing the conclusions' validity. Previous studies have often produced results that do not align with the actual situation. To address this issue, an alternative approach for devising an effective mineral value-added policy in Indonesia involves identifying the key business factors that contribute to the competitiveness of smelter construction. Implementing a complex mixed method that combines quantitative methods through a questionnaire with qualitative methods through focus group discussions is expected to provide a more accurate and holistic understanding of the research problem.

For the research agenda, we recommend adopting an abductive approach as the strategy for theoretical development. This approach is effective for subjects that are well-documented in a general context but are less explored in a specific context. It allows researchers to develop existing theories or engage in "theory matching" or "systematic combining" to develop or expand existing theories. The objective is to comprehend a new phenomenon by formulating new hypotheses or propositions (Saunders et al., 2019). This process is illustrated in Figure 8.

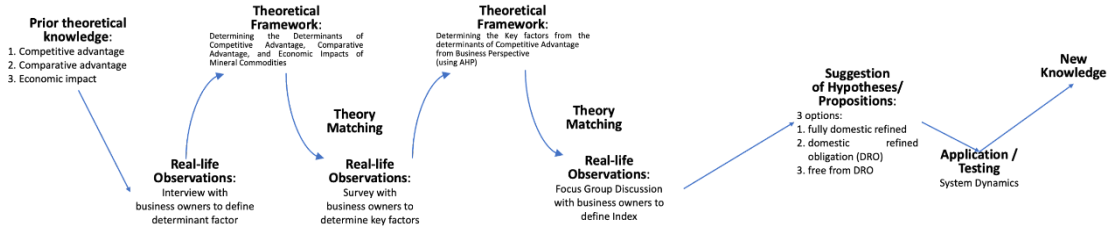

Figure 8. The Abductive Research Process and Implementation (adopted from Kovács & Spens (2005))

Following the identification of determinant factors for competitive advantage and comparative advantage of minerals to be refined in Indonesia, the next step involves developing the Competitive Advantage Index and Comparative Advantage Index. This can be achieved through focus group discussions with key decision-makers at mining companies. Mineral mining consists of two main phases: exploration, which produces data on mineral resources and reserves, and operation production, which produces ore. The current mineral-added value policy in Indonesia mandates domestic refinement for all metallic minerals, disregarding competitive and comparative advantage. There is a chance that mining activities may stop as a result of this policy, which includes an export prohibition on all unprocessed metal minerals, which might affect Indonesia's economy (Sari et al., 2023). The policy of mineral-added value, which is molded by policy scenarios, determines the trajectory of mineral ore operations going forward. The findings of this research align with the broader literature on the socio-economic impacts of mining, as demonstrated by Al Al Rawashdeh et al. (2016) in their study of the Jordanian mining sector. They emphasized the significant socio-economic effects that mining policies can have on local communities, which often

extend beyond economic metrics to include social and environmental dimensions. Similarly, in the context of Indonesia's mineral value-added policy, the differential impact on various commodities, particularly the stagnation in smelter development for metals other than nickel, highlights the need for policies that not only drive economic growth but also address broader social implications, including community well-being and environmental sustainability. By engaging local communities and considering their perspectives, policymakers can develop more comprehensive and inclusive strategies that ensure the benefits of mineral development are equitably distributed.

The integration of competitive and comparative advantage frameworks into mineral policy, as discussed by Algieri et al. (2018), offers a valuable lens through which to assess and enhance the global competitiveness of Indonesia's mining sector. Their research on tourism competitiveness underscores the importance of adopting a multifaceted approach that considers various determinants of the competitive advantage. Applying this perspective to Indonesia's mineral sector suggests that a more nuanced understanding of the unique strengths and weaknesses of each commodity could inform more targeted policy interventions. For instance, while nickel has benefited from policies promoting domestic refining, other metals may require different strategies, such as fostering technological innovation or improving market access, to realize their full potential.

Furthermore, the comparison between Porter's Five Forces and the Resource-Based View (RBV), as explored by Asad (2012), highlights the importance of leveraging Indonesia's unique resource endowments to build sustainable competitive advantages. In the context of mineral policy, this means that Indonesia's vast mineral reserves should not only be seen as a source of raw materials but also as strategic assets that can be developed to create long-term economic value. By aligning mineral policies with the principles of RBV, Indonesia can focus on developing capabilities and resources that are difficult for competitors to replicate, thereby strengthening its position in the global mining industry and ensuring that the benefits of mineral extraction contribute to broader national development goals.

Furthermore, the use of system dynamics modeling is recommended to effectively determine the policy options for each mineral commodity, considering both competitive advantage and comparative advantage to maximize economic benefits. This method is essential for identifying policies that offer the greatest economic advantage for each type of mineral. Additionally, it is crucial to create a mapping of the most suitable policy options tailored to the unique characteristics of each mineral. This involves thoroughly analyzing which policies will yield the maximum economic return for each mineral commodity.

CONCLUSIONS

The research presented in this study highlights the critical need for a more nuanced and targeted approach to Indonesia's mineral value-added policy. Despite the introduction of Law Number 4 of 2009, which aims to increase the domestic processing of mineral commodities, the development of refining facilities has predominantly benefited the nickel industry, while other key metals have seen little to no progress. This uneven development underscores the importance of integrating competitive and comparative advantages into policy formulation. The findings suggest that each mineral commodity possesses unique competitive characteristics that should be carefully considered in designing policies intended to enhance industry competitiveness and attract investment in domestic refining capabilities.

By employing an SLR method and analyzing research gaps through VOSviewer software, this study contributes to the field by proposing a conceptual framework tailored to Indonesia's specific mineral sector dynamics. The review of 30 focus papers covering competitive advantage, comparative advantage, and economic impact provides a comprehensive foundation for future policy development. This framework is expected to guide policymakers in formulating more

effective mineral value-added policies that boost the domestic processing industry and leverage Indonesia's competitive strengths in the global mineral market. Consequently, this study advances the current state of knowledge by bridging gaps in the literature and offering practical insights for policy and decision-making processes in the Indonesian mining sector.

To devise an appropriate mineral-added value policy scenario for Indonesia, with an emphasis on domestic mineral refinement, we propose a research agenda that can be summarized as follows:

1. Examine the competitive advantage, comparative advantage, and economic impact from the business actors' view.
2. Identify determinant factors by implementing complex mixed qualitative and secondary analysis methods, followed by quantitative methods.
3. Use the abductive approach for theory development to understand the new phenomenon.
4. Develop the competitive and comparative advantage indexes by conducting focus group discussions with business actors.
5. Utilize system dynamics modeling to formulate the policy options for each mineral commodity.

Mapping the most appropriate policy options for each mineral characteristic, considering which policy can provide the most significant economic benefits for each mineral commodity.

LIMITATION & FURTHER RESEARCH

The findings indicate that while Indonesia's mineral value-added policy, particularly under Law Number 4 of 2009, has successfully stimulated growth in the nickel industry, it has failed to achieve similar results for other major metals such as bauxite, copper, and iron. This uneven development suggests that a one-size-fits-all policy approach may not be effective across different mineral commodities. To enhance the effectiveness of these policies, the government needs to adopt a more tailored approach that considers each mineral's unique competitive and comparative advantages. This could involve creating specific incentives for developing smelters for less-progressed metals, adjusting export restrictions, and fostering partnerships with private investors to stimulate growth in these sectors. Additionally, integrating a nuanced understanding of market dynamics and resource endowments into policy frameworks could help ensure that the benefits of domestic processing and refining are realized across a broader range of minerals, thereby contributing to a more balanced and sustainable economic development.

Incorporating perspectives from diverse stakeholders, including industry experts, government officials, and local communities, is essential for a holistic understanding of the impact of mineral value-added policies. Industry experts can offer insights into policy initiatives' technical and economic feasibility, while government officials can provide a context on regulatory challenges and national priorities. In addition, input from local communities is crucial because these groups often bear the direct social and environmental consequences of policy decisions. By engaging these stakeholders, policymakers can ensure that policies promote economic growth and industry competitiveness and address social equity and environmental sustainability, leading to more balanced and effective outcomes.

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