



Advancing Fair Competition Principles in Indonesia AI Economy Through Regulatory Sandbox Governance

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Abstract. The advancement of artificial intelligence (AI) has redefined Indonesia's economic landscape, particularly in digital economy sector. These changes introduce not only new opportunities for efficiency and innovation but also emerging risks of algorithmic dominance and unequal market power. As AI-driven business models increasingly rely on control over data, computing infrastructure, and large-scale machine-learning capabilities, competitive advantages become disproportionately concentrated among a small group of dominant digital firms. In response, this research aims to analyze how AI-driven business models undermine fair competition principles in Indonesia and to assess the adequacy of existing legal instruments especially competition law, in addressing emerging forms of AI-enabled anti-competitive conduct. The study finds that Indonesia's regulatory framework remains insufficient, as current laws do not effectively govern algorithmic pricing, facilitate oversight of tacit collusion, or mitigate exclusionary practices enabled by AI, thereby limiting the enforcement capabilities of institutions such as KPPU. Therefore, it emphasizes the urgent need to establish a hybrid regulatory model, combining traditional legislation with a regulatory sandbox for balancing innovation with market fairness. By enabling supervised AI experimentation and proactive regulatory learning, a sandbox -based model strengthens oversight capacity, mitigates risks of AI-driven monopolistic practices, and advances fair competition in Indonesia's rapidly expanding AI economy.

Keyword: Artificial Intelligence Economy, Fair Competition Principles, Regulatory Sandbox, Algorithmic Collusion, Digital Economy Indonesia

1 Introduction

Artificial intelligence (AI) has rapidly revolutionized both the global and national economies, emerging as a core infrastructure of the contemporary digital economy. Across countries at varying levels of development, AI has been increasingly integrated into key sectors such as e-commerce, financial technology, transportation, and manufacturing. AI-driven technology drives innovations in automation, data analytics, and digitally mediated consumer engagement [1]. This transformation is most visible in the expansion of platform-based [2] and sharing-economy business models [3], where firms deploy sophisticated algorithms and large-scale datasets to optimize pricing strategies, logistics coordination, and targeted market interactions. While these technological advancements have improved operational efficiency and broadened market access, they simultaneously generate complex regulatory challenges particularly in competition areas where AI-driven business practices intensify risks of market concentration, exclusionary conduct, and algorithmic collusion [4].

The growing reliance on algorithmic pricing, automated recommendation systems, and data-driven decision-making has fundamentally altered how competitive conduct manifests in digital markets [5]. Unlike conventional forms of anti-competitive behavior, AI-enabled practices often operate without explicit agreements or direct human coordination and are subsequently difficult to detect and sanction under traditional competition law doctrines [6]. This phenomenon is evident in the emergence of tacit algorithmic collusion [7], self-preferencing mechanisms [8], exclusionary design, and gatekeeping behavior exercised by dominant digital platforms. Moreover, the opacity and adaptive nature of AI systems further complicate regulatory scrutiny, as anti-competitive effects may arise dynamically and incrementally rather than through clearly identifiable conduct or intent.

In Indonesia, the rapid diffusion of AI-driven business models has outpaced the evolution of the legal and regulatory framework governing market competition. Existing competition law, particularly Law No. 5 of 1999 on the Prohibition of Monopolistic Practices and Unfair Business Competition, remains focused on conventional forms of market dominance, price-fixing, and monopolistic behavior, and does not explicitly address algorithmic decision-making, data concentration, or AI-enabled exclusionary practices [9]. Despite the publication of National AI Strategy 2020-2045, there remains no legally enforceable instrument that governs algorithmic conduct in competition cases. As a result, enforcement authorities face structural limitations in identifying, assessing, and remedying AI-driven anti-competitive conduct, often relying on case-by-case interpretations that generate regulatory uncertainty and inconsistent outcomes [10]. This regulatory gap has become increasingly evident in recent cases involving predatory flash sales by TikTok Shop and Shopee, payment system restrictions imposed through Google Play, and algorithmic surge pricing mechanisms employed by ride-hailing platforms [11] where AI systems have not only obscured anti-competitive behavior but have also structurally reinforced barriers to market entry, thus risk reinforcing “winner-takes-all” dynamics in digital markets [12], where economic value and market power accumulate disproportionately among a small group of dominant firms.

By contrast, several jurisdictions have developed more comprehensive and forward-looking regulatory responses to address the competitive risks associated with AI-driven business models. The United States adopts a predominantly market-driven approach that relies on ex post antitrust enforcement through case-by-case litigation and agency action [13], while the European Union advances a preventive, risk-based ex ante regulatory model [14], most notably through the EU Artificial Intelligence Act, which classifies AI systems according to risk levels, introduces market surveillance mechanisms, and is increasingly complemented by regulatory sandbox arrangements. Australia, meanwhile, employs a hybrid model that combines market flexibility with institutional intervention, particularly through competition and consumer protection oversight by the Australian Competition and Consumer Commission (ACCC), alongside policy experimentation and adaptive regulatory tools. Against this background, this paper argues that the integration of a regulatory sandbox governance model within Indonesia’s competition law framework offers a viable pathway to address AI-driven competition risks. Accordingly, the study examines how AI-driven business models reshape market structures and generate new competition concerns in Indonesia, and how a regulatory sandbox can function as a regulatory lever to advance fair competition while supporting responsible AI innovation.

2 Method

This study employ a normative legal research method supported by a conceptual approach to examine the adequacy of Indonesia’s competition law framework in responding to AI-driven market conduct. The normative analysis focuses on Law No. 5 of 1999 on the Prohibition of Monopolistic Practices and Unfair Business Competition, assessing its capacity to address emerging AI-enabled practices. The conceptual approach is used to identify, define, and refine key legal concepts relevant to AI governance and competition law, including market dominance, barriers to entry, tacit collusion, self-preferencing, and relevant market definition. Through this approach, the study examines how technological characteristics of AI, such as machine learning capabilities, large-scale data utilization, and algorithmic coordination, challenge and extend conventional competition law doctrines, thereby providing a theoretical foundation for developing more adaptive and technology-responsive regulatory instruments.

In addition, a comparative legal approach is employed to analyze regulatory responses to AI-driven competition issues in selected jurisdictions, namely the United States, the European Union, and Australia, with the objective of identifying best practices applicable to Indonesia’s regulatory scopes. The United States represents a market-driven model that relies primarily on ex post antitrust enforcement, whereas the European Union adopts a regulation-driven and preventive ex ante framework through instruments such as the EU Artificial Intelligence Act and the Digital Markets Act (DMA), increasingly complemented by regulatory sandbox mechanisms. Australia reflects a pragmatic hybrid model that combines risk-based regulation, co-regulation with industry actors, and institutional oversight suited to a rapidly evolving digital ecosystem. These comparative models inform the assessment of regulatory gaps in Indonesia and support the argument for integrating conventional statutory regulation with flexible governance tools such as a regulatory sandbox. The analysis is based on secondary legal materials, including statutes, regulatory guidelines, policy documents, competition cases, and peer-reviewed academic literature, supplemented by

documented enforcement cases and policy developments as contextual evidence rather than empirical econometric data.

3 Result And Discussion

3.1 Progress of AI-Driven Business in Indonesia

Indonesia has established itself as one of Southeast Asia's most dynamic digital economies. The influence of artificial intelligence has progressively shaping business paradigms, market approaches, and consumer interactions. E-commerce, recognized as one of the rapidly expanding sectors, is projected to attain a market valuation of USD 90 billion by 2025 [15] and depends significantly on AI-powered innovations such as AI-driven recommendation algorithms, customer behavior predictions, and dynamic pricing models to enhance user experience and business efficiency. Within the e-commerce sector, artificial intelligence has redefined business-consumer interactions by enabling real-time personalization, precision-targeted advertising, and algorithmically driven promotional mechanisms such as flash sales [16]. Leading platforms including Tokopedia, Shopee, Lazada, and Bukalapak employ machine learning technologies to refine product recommendation systems, implement dynamic pricing and bundling strategies, tailor advertising content to individual user preferences, streamline logistics processes, and enhance fraud detection capabilities [17]. A prominent example is TikTok Shop, which has introduced a "shoppertainment" model that seamlessly integrates interactive video content with in-app purchasing, facilitating rapid user engagement and achieving significant market expansion, with gross merchandise value in Indonesia surpassing USD 8 billion by the end of 2024.

The advancement of AI has also profoundly reshaped Indonesia's financial services ecosystem. Digital wallets and payment platforms such as OVO, GoPay, DANA, and ShopeePay increasingly rely on AI-driven systems to automate credit scoring, enhance fraud detection, and offer personalized lending services, thereby accelerating financial inclusion, particularly for micro, small, and medium-sized enterprises (MSMEs). In parallel, the logistics sector has experienced significant efficiency gains through the deployment of AI technologies across supply chains and distribution networks. Companies such as J&T Express, SiCepat, and GoSend (Gojek) utilize predictive analytics and route-optimization algorithms to shorten delivery times and reduce operational costs, enabling e-commerce vendors in remote and underserved regions to access nationwide markets [18]. These AI-powered logistics networks play a critical role in supporting Indonesia's geographical inclusivity, especially in archipelagic and rural areas.

Another significant development in Indonesia's artificial intelligence landscape is the accelerating consolidation driven by platform mergers and super-app integration strategies. The formation of the GoTo Group through the merger of Gojek and Tokopedia has produced an integrated digital ecosystem encompassing ride-hailing, e-commerce, payments, and logistics, all supported by proprietary AI systems [19]. This consolidation was further intensified by Tokopedia's acquisition by TikTok in 2025, while Grab has simultaneously expanded into overlapping sectors through aggressive bundling and algorithmic customization strategies. In the same year, merger discussions between Grab and GoTo signaled the potential emergence of the region's most powerful digital conglomerate [20]. These developments raise substantial competition concerns, particularly regarding market dominance, gatekeeping behavior, and AI-enabled exclusion, as highlighted by the Indonesian Competition Commission (KPPU). In the absence of an adequate regulatory framework, the expanding dominance of AI-driven super-apps increasingly threatens to restrict market access for independent vendors while diminishing consumer choice through opaque recommendation and ranking mechanisms. At the same time, the growing reliance on proprietary algorithms and closed data ecosystems raises entry barriers for local startups, informal merchants, and businesses operating in rural and peripheral markets.

3.2 Market Inequality and Competition Challenges

Artificial intelligence has emerged as a pivotal driver of Indonesia's economic transformation, generating significant benefits across multiple sectors and throughout all stages of the supply chain. However, the expansion of AI-enabled business models has simultaneously introduced structural challenges for Indonesia's competition law regime. Unlike traditional markets, where market dominance is typically assessed through pricing behavior or output restrictions, AI-driven platforms derive competitive advantage from large-scale data aggregation, algorithmic

optimization, and self-reinforcing network effects [21]. These characteristics enable dominant digital platforms to entrench market power and create substantial barriers to entry for smaller firms and new market participants. As a result, conventional legal frameworks, particularly Law No. 5 of 1999 face increasing difficulty in addressing technologically mediated forms of exclusion, concentration, and algorithmic dominance that define Indonesia's AI-driven digital economy [22].

One of the primary competition concerns in the AI-driven economy is data monopolization, whereby dominant platforms accumulate vast volumes of personal, transactional, and behavioral data that are subsequently leveraged to develop predictive models for pricing, targeting, and customer retention. This data advantage often drives a process of 'platformization,' [23] in which access to critical datasets and digital infrastructure becomes increasingly concentrated and inaccessible to smaller competitors, resulting in an uneven competitive landscape. A notable example is Google's dominance over the Android ecosystem and the Google Play billing system, which has attracted regulatory scrutiny across multiple jurisdictions, including Indonesia, following complaints by application developers regarding discriminatory commission structures and restricted payment options [24]. In such cases, competitive harm arises not primarily from pricing levels, but from the strategic use of platform control to limit ecosystem access, foreclose competition, and suppress potential rivals.

Another increasingly growing concern is algorithmic exclusion [25], whereby recommendation systems, search rankings, and matching algorithms systematically deprioritize or marginalize competing sellers and service providers. In both global and Indonesia, ride-hailing platforms such as Uber, Grab, and Gojek have faced public criticism [26] and regulatory scrutiny over the use of algorithmic surge pricing and opaque driver-allocation systems, which are alleged to disadvantage independent drivers and competing logistics providers. Similarly, TikTok Shop's bundling strategies and Shopee's algorithm-driven flash sale mechanisms have been criticized for disproportionately favoring large or affiliated sellers at the expense of small and informal merchants [27], many of whom rely heavily on platform access for their livelihoods. Although such algorithmic practices may not conform neatly to traditional legal definitions of collusion or abuse of dominance, their cumulative effects on market access, competitive neutrality, and economic opportunity are substantial [28].

Additionally, AI facilitates cross-market leverage by dominant digital platforms through gatekeeping behavior [29], raising concerns related to the essential facilities doctrine [30]. This phenomenon is particularly evident in Indonesia's increasingly consolidated platform economy, where super-apps such as GoTo and Grab extend their dominance from core markets such as ride-hailing or digital payments, into adjacent sectors including e-commerce, insurance, and digital finance. While service integration may enhance consumer convenience, it often consolidates otherwise unrelated offerings in ways that restrict consumer choice and distort competition. In many cases, such integration marginalizes independent service providers without explicit exclusionary conduct, thereby complicating legal assessment under conventional competition law standards. These effects are further amplified by the use of AI systems, which automate and optimize bundling, ranking, and access decisions in real time, reinforcing gatekeeping power and entrenching cross-market dominance.

Furthermore, the competitive harm generated by AI-driven practices are often inconspicuous to both end users and regulatory authorities. Unlike traditional cartel behavior, which typically involves explicit intent and communication among competitors, algorithmic systems may produce collusive-like outcomes without any direct human coordination, this phenomenon commonly described as *tacit algorithmic collusion* [31]. Indonesian regulators, including the KPPU, have expressed concern over this lack of algorithmic transparency, particularly in cases involving price discrimination and platform self-preferencing. However, existing competition law continues to rely on evidentiary standards centered on intent or agreement, requirements that are exceedingly difficult to satisfy when pricing, ranking, or content prioritization decisions are determined autonomously by adaptive, self-learning algorithms [32].

These developments underscore the growing incompatibility between traditional competition law frameworks and the operational realities of digital and AI-driven markets. Indonesia, like many jurisdictions, currently lacks legal instruments specifically designed to address algorithmic harms arising from AI-enabled business practices. In particular, there are no explicit regulatory guidelines governing data portability, interoperability, or algorithmic transparency. Existing laws such as Law No. 5 of 1999 prohibit conduct including price-fixing, predatory pricing, and monopolistic behavior, yet do not explicitly encompass AI-related competition risks. Similarly, Law No. 11 of

2008 on Electronic Information and Transactions, as amended by Law No. 1 of 2024, introduces the concept of "electronic agents" but remains insufficiently aligned with the complexity of contemporary AI-driven business models, leaving ambiguity regarding accountability for algorithmic decision-making. Law No. 27 of 2022 on Personal Data Protection emphasizes the protection of personal data but does not adequately address broader issues of AI business governance or competitive effects. Although technical instruments such as Government Regulation

No. 71 of 2019 on Electronic System and Transaction Management and the Ministry of Communication and Informatics Regulation No. 3 of 2021 establish general standards for electronic systems, including AI, they lack specific provisions on competition-related impacts. Likewise, the National Artificial Intelligence Strategy 2020–2045 recognizes the importance of AI governance but stops short of offering concrete, enforceable mechanisms to ensure legal certainty and safeguard fair competition.

3.3 Comparative Approach: AI Regulation and Competition Law in United States, European Union, and Australia

As AI continues to reshape economic structures and digital markets, several jurisdictions have begun to recalibrate their competition and regulatory frameworks to address emerging risks of power concentration, algorithmic coordination, and platform-based exclusion. Indonesia, however, still lacks a systematic regulatory framework that explicitly governs the application of AI within competition law, particularly in relation to algorithmic collusion, data monopolization, and gatekeeping conduct by dominant digital platforms. Law No. 5 of 1999 remains anchored in an industrial-era conception of markets, relying primarily on indicators such as price-fixing, output restriction, and market share concentration. While these tools remain relevant, they are increasingly ill-suited to addressing AI-driven conduct that may generate exclusionary or collusive effects without explicit agreements or human intent, such as dynamic pricing, personalized recommendations, and automated bundling [33]. As a result, enforcement authorities face significant interpretive and evidentiary challenges when assessing algorithmically mediated market power.

In contrast, the United States, the European Union, and Australia have adopted divergent regulatory models reflecting different legal traditions and policy priorities. The United States represents a predominantly market-driven and ex post enforcement model, where AI-related competition risks are addressed through existing antitrust statutes, notably the Sherman Act, Clayton Act, and Federal Trade Commission Act. Regulatory intervention largely occurs through case-by-case litigation and agency enforcement by institutions such as the Federal Trade Commission (FTC) and the Department of Justice (DOJ) [34]. Although this approach maintains regulatory flexibility and reduces the risk of overburdening innovation, its dependence on establishing intent, explicit agreement, or demonstrable consumer harm significantly limits its capacity to address tacit algorithmic collusion, data-driven market foreclosure, and opaque self-preferencing practices. Moreover, the absence of a comprehensive federal AI statute further restricts the ability of regulators to exercise proactive and systematic oversight over AI-enabled market conduct [35].

In comparison, the European Union has embraced a regulation-driven and preventive ex ante approach that closely integrates AI governance with competition policy. Central to this framework is the EU Artificial Intelligence Act, which adopts a risk-based classification of AI systems and imposes stringent obligations on high-risk applications, including requirements on transparency, human oversight, data governance, and accountability [36]. This regime operates in tandem with existing competition instruments such as the DMA and the General Data Protection Regulation (GDPR) which directly address gatekeeping behavior, data asymmetries, and platform self-preferencing. The EU framework is valued for its preventive capacity to address competitive risks ex ante; however, its extensive regulatory architecture and compliance costs risk creating rigidity and imposing uneven burdens on smaller enterprises and nascent innovators [37].

Australia adopts a pragmatic hybrid regulatory model that combines market-based flexibility with targeted institutional intervention [38]. Competition oversight is primarily exercised by the ACCC, which has undertaken extensive digital platform inquiries and promotes a risk-based, adaptive approach to AI governance [39]. Rather than introducing a comprehensive, binding AI statute, Australia emphasizes co-regulatory arrangements, sector-specific guidelines, and regulatory experimentation, including the exploration of sandbox mechanisms and enhanced monitoring of algorithmic practices. This approach enables regulatory responsiveness to rapid technological change while preserving enforcement discretion; however, its reliance on soft-law instruments and incremental reform may constrain legal certainty and limit enforceability in cases involving entrenched digital dominance.

3.4 Regulatory Sandbox as an Urgent Governance Response for AI-Driven Competition Risks in Indonesia

Indonesia’s AI-driven markets are expanding faster than the legal and evidentiary capacities of conventional competition enforcement. The regulatory gap is not the absence of prohibitions since Law No. 5/1999 already prohibits cartel conduct, predatory pricing, and abuse of dominance, but the absence of operational tools that allow regulators to (i) observe algorithmic decision-making, (ii) generate admissible evidence of AI-enabled harms, and (iii) calibrate remedies before exclusionary structures become irreversible. This design logic is highly responsive to AI markets where dominance is expressed through data concentration, ranking/routing rules, and automated experimentation rather than through stable price/output restraints.

From a doctrinal perspective, conventional competition law faces structural difficulties in addressing AI-driven markets because the primary competitive levers are increasingly opaque, adaptive, and scalable. Algorithmic opacity undermines detectability, as neither regulators nor market participants can readily identify the causal mechanisms shaping market outcomes. The adaptive nature of AI systems further challenges intent- or agreement-based legal tests, since self-learning algorithms may independently converge on collusive-like behavior without explicit coordination. At the same time, the scale at which AI operates magnifies potential harm, as minor adjustments in algorithms or data inputs can instantaneously affect millions of transactions. These characteristics produce a widening evidentiary gap that although the resulting market effects may resemble collusion or foreclosure, the traditional proof structure remains difficult to satisfy because decision-making is embedded within models, data pipelines, and platform governance rules rather than observable conduct. This dynamic is reflected in recent Indonesian cases involving platform billing restrictions, algorithmic steering toward affiliated logistics services, surge pricing controversies, flash-sale mechanisms, and concentration in fintech markets, where competitive harm manifests primarily as structural market foreclosure rather than as classical price-fixing conduct.

From the perspective of Richard Posner’s *Economic Analysis of Law* (EAL), regulation should be understood as an institutional choice aimed at minimizing total social costs, rather than maximizing doctrinal consistency or formal legal completeness. Applied to AI-driven markets, the central policy question is not whether competition law should intervene, but which governance approach minimizes the combined costs of enforcement, compliance, and regulatory error in an environment characterized by algorithmic opacity and rapid technological change. Based on EAL Theory, the total social costs (TSC) could be designed as follows:

$$Total\ Social\ Cost\ (TSC) = Enforcement\ Cost\ (EC) + Compliance\ Cost\ (CC) + Expected\ Error\ Cost\ (Err) \tag{1}$$

Expected error cost reflects two types of error, which can be stylized as:

$$Err = P(I) \times H(I) + P(II) \times H(II) \tag{2}$$

Type I error reflects the over-enforcement or false positive situation that blocks pro-competitive AI system, while Type II error reflects the under-enforcement or false negative situation such as allowing tacit algorithmic collusion, foreclosure, or gatekeeping. A sandbox is economically attractive when it reduces expected error costs more than it increases enforcement/compliance costs. In AI markets, Type II error harms (H(II)) are plausibly large because algorithmic markets exhibit self-reinforcing network effects and path dependence: once foreclosure or lock-in occurs, restoring competition is costly and sometimes infeasible. Conversely, purely rigid ex ante prohibitions risk large Type I costs by deterring beneficial innovation. In this scheme, sandbox offers an adaptive and balanced regulatory framework that introduces structured oversight and evidence generation while preserving experimentation under constraints, consistent with the template’s emphasis that traditional laws may be too slow or rigid for AI’s pace and that supervised experimentation enables adaptive interventions.

The efficiency logic of the sandbox can be further operationalized through a simple net-benefit test for regulatory intervention. Regulatory oversight is justified when the expected harm avoided by intervention exceeds the combined enforcement and compliance costs. In AI competition contexts, the expected harm avoided is greatest in high-impact systems, such as algorithmic pricing, ranking, and cross-market bundling, particularly when deployed by firms with significant market power. The sandbox therefore functions not merely as an innovation-friendly tool, but as an efficient instrument that concentrates regulatory resources where marginal benefits are highest, while applying proportional obligations to keep compliance costs manageable. This proportionality is especially important for MSMEs, whose participation in AI markets may otherwise be discouraged by regulatory uncertainty and

disproportionate compliance burdens, a concern explicitly acknowledged in the ICOSEND design framework. Regulatory intervention is justified when:

$$\text{Expected Harm Avoided (EHA)} > (EC+CC) \quad (3)$$

This condition is most likely to hold in AI systems with high scale, opacity, and market leverage, precisely where sandbox oversight is prioritized. A purely ex post antitrust model, as reflected in market-driven enforcement systems, may reduce enforcement costs in the short term but significantly increases expected error costs when algorithmic conduct is opaque, adaptive, and difficult to reconstruct after harm has occurred. Conversely, blanket ex ante prohibitions may reduce the risk of under-enforcement but at the expense of inflated compliance costs and heightened Type I errors, particularly in rapidly evolving technological environments. The sandbox's comparative advantage lies in its capacity to minimize error costs through regulatory learning including pre-sandbox competitive impact assessments, real-time monitoring, and third-party auditing mechanisms.

Designing an AI competition regulatory sandbox for Indonesia requires an architecture that treats sandbox governance not as a generic innovation instrument, but as a competition-specific regulatory mechanism. The sandbox's primary objective is to establish a controlled testing environment for AI applications in business practices while safeguarding fair competition, data transparency, and market integrity. This objective is inherently distinct from conventional innovation sandboxes, as it focuses on assessing whether AI systems generate or amplify market dominance, collusion-like outcomes, exclusionary conduct, or discriminatory access. The sandbox therefore functions as an evidentiary and learning mechanism, enabling regulators to observe algorithmic behavior in real market conditions before competitive harm becomes entrenched. Institutionally, this mandate can be grounded in the KPPU authority under Law No. 5 of 1999 and operationalized through a dedicated KPPU regulation or guideline that defines participation triggers, audit and monitoring powers, and the legal status of sandbox outputs, including their admissibility as evidence or their role in establishing compliance presumptions and remedial commitments. In the longer term, legislative reform may be required to explicitly recognize algorithmic conduct, data-driven market power, and supervised testing as integral elements of competition law enforcement in digital markets.

The governance structure of the sandbox must reflect the cross-sectoral nature of AI-driven competition risks. Sandbox governance should involve regulators, participants, and observers, with KPPU acting as the lead authority to ensure that competition integrity remains the central organizing principle. Effective implementation further requires structured coordination with digital governance authorities, personal data protection enforcement bodies, and sectoral regulators such as the Financial Services Authority (OJK) for fintech or transport authorities for ride-hailing and logistics platforms. This coordinated approach reduces regulatory fragmentation and lowers enforcement costs by pooling technical expertise and data access. Independent technical auditors, including accredited universities or specialized audit institutions, play a critical role in supporting model testing, reproducibility checks, and monitoring integrity, while public interest observers from academia, civil society, and SME associations enhance legitimacy and ensure that sandbox design remains responsive to broader public interests and the needs of smaller market participants.

The scope of sandbox testing should be defined by the intersection of high-risk AI use cases and competition law concerns. Priority use cases include algorithmic pricing, recommendation and ranking systems, logistics optimization, advertising auctions, and fintech credit scoring, each of which presents distinct risks of abuse of dominance, algorithmic collusion, self-preferencing, predatory pricing, or data monopolization. In the Indonesian AI-driven market, a phased approach to scope definition is appropriate. Initial testing should focus on high-impact and high-prevalence systems, such as surge pricing mechanisms, platform ranking and recommendation algorithms, and enforcement of platform rules related to billing or payment systems, which have already generated significant competition concerns. Subsequent phases may expand to advertising technologies, logistics steering practices, and fintech applications where competitive exclusion intersects with discrimination and access barriers.

Eligibility for sandbox participation should be determined by the potential impact of AI systems on market behavior, with priority given to high-risk and high-impact deployments. Participation should be mandatory for AI systems operated by dominant firms or digital gatekeepers with significant influence over market access, while remaining voluntary and incentivized for SMEs and startups to avoid disproportionate regulatory burdens. Systems that dynamically set prices, rank or suppress sellers, allocate orders or drivers, or bundle services across markets warrant particular attention due to their capacity to reshape market structures at scale. At the same time, all participants must demonstrate minimum technical readiness by committing to documentation, monitoring, and audit requirements, with simplified compliance pathways and regulatory assistance provided to SMEs to prevent sandbox participation from becoming an exclusionary barrier. Regulatory requirements within the sandbox must ensure both

accountability and feasibility. Participants are required to provide comprehensive documentation on AI system architecture, objectives, data sources, and training inputs, alongside a pre-sandbox competition impact assessment that articulates potential harm, affected markets, and mitigation strategies. Ongoing obligations include the submission of monitoring plans with defined indicators and alert thresholds, as well as the provision of explainability and audit interfaces that enable regulators and auditors to reconstruct and evaluate key algorithmic decisions. These requirements are designed not to expose proprietary information unnecessarily, but to generate sufficient evidence for competition assessment and enforcement.

Monitoring and auditing constitute the core operational mechanisms of the sandbox and must be continuous rather than one-off, reflecting the adaptive nature of AI systems. Real-time monitoring enables regulators to track prices, rankings, allocations, and other market-relevant outputs, while periodic third-party audits provide independent verification through replication studies and bias testing. Data access must be proportionate and safeguarded through secure environments, strict confidentiality rules, and anonymization where feasible, with public transparency achieved through aggregated reporting rather than disclosure of source code or proprietary models. A minimum auditability standard should apply to all participants, requiring the maintenance of logs sufficient to explain why specific competitive outcomes occurred.

The sandbox operates through sequential phases of entry, testing, and exit. During the entry phase, regulators conduct eligibility screening, assess competition impact, classify risk, and establish monitoring protocols. The testing phase involves live deployment under safeguards, periodic audits, and ongoing regulatory engagement, with the possibility of remedial adjustments where risks emerge. Exit decisions are evidence-based and may result in full clearance with publication of findings and possible compliance recognition, conditional continuation subject to enforceable commitments, or suspension and escalation to formal enforcement where serious and persistent competitive harm is identified.

Crucially, sandbox output must be institutionally linked to enforcement and lawmaking. Audit logs and monitoring data generated through the sandbox should feed directly into KPPU's investigative processes, reducing reliance on intent-based evidence and enhancing enforcement effectiveness in algorithm-driven markets. Sectoral guidance derived from sandbox experience can clarify acceptable practices in areas such as algorithmic ranking, self-preferencing, and bundling, while recurring patterns of harm should inform legislative and regulatory reform addressing data monopolization, interoperability, and algorithmic transparency. Evaluation of sandbox outcomes must integrate competition metrics such as concentration, foreclosure, price dispersion, and switching costs with consumer and SME indicators, including choice diversity, visibility of smaller sellers, complaint rates, and dispute resolution outcomes. Together, these elements position the regulatory sandbox as an adaptive governance mechanism capable of advancing fair competition principles in Indonesia's AI-driven economy while preserving innovation and inclusivity.

4 Conclusion

This study has assessed the adequacy of Indonesia's competition law regime in responding to the structural transformations brought about by artificial intelligence in the digital economy. As AI systems increasingly mediate pricing, market access, visibility, and coordination, enforcement tools rooted in assumptions of transparency and human intent reveal fundamental limitations. Therefore, it can be concluded that:

1. Artificial intelligence reshapes competition by embedding market power in data concentration, algorithmic infrastructures, and self-reinforcing network effects rather than in observable pricing or output restrictions. Practices such as algorithmic pricing, recommendation-based market steering, cross-market leveraging by super-apps, and data-driven exclusion generate structural forms of dominance and gatekeeping that frequently escape traditional antitrust indicators. Within Indonesia's current legal framework, particularly Law No. 5 of 1999, these harms remain difficult to detect, attribute, and remedy due to the law's reliance on intent-based and conduct-focused doctrines. As a result, competition harm in AI-enabled markets increasingly manifests as systemic foreclosure and digital inequality rather than classical cartel behavior, exposing a regulatory gap that risks entrenching digital oligopolies, limiting innovation diffusion, and undermining the constitutional mandate of equitable and efficient economic governance under Article 33(4) of the 1945 Constitution.
2. In response to these challenges, a competition-oriented regulatory sandbox offers a context-sensitive and economically efficient regulatory solution. By enabling supervised experimentation, real-time monitoring, and structured evidence generation, the sandbox addresses the informational asymmetries that constrain

conventional enforcement in algorithm-driven markets. Grounded in economic analysis of law, particularly error-cost reasoning, the sandbox minimizes regulatory failure by reducing the risk of under-enforcement in high-impact AI systems while maintaining proportionality to avoid chilling innovation, especially for MSMEs and emerging digital actors. When institutionally anchored in the KPPU and supported by inter-agency coordination with digital and data protection authorities, the sandbox functions not as a substitute for competition law but as an adaptive complement that strengthens enforcement capacity, enhances legal certainty, and promotes a fair, transparent, and inclusive digital marketplace in Indonesia.

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