Scripta Economica:
Journal of Economics, Management, and Accounting
Vol 2 No 2 November 2026, Hal 161-176
ISSN: 3110-0848 (Print) ISSN: 3109-970X (Electronic)
Open Access: https://scriptaintelektual.com/scripta-economica

Analysis of the Oligopolistic Market Structure in Indonesia's Telecommunications Industry

Saskia Ayu Wandira[1*], Sarpini[2]
[1-2] State Islamic University of Professor Kiai Haji Saifuddin Zuhri Purwokerto, Indonesia
Email: wndrrayuu@gmail.com[1]

Article Info :
Received:
22-10-2026
Revised:
27-10-2025
Accepted:
05-11-2026

Abstract

Indonesia's mobile telecommunications industry has undergone substantial consolidation, raising concerns about market concentration, entry barriers, and competitive conduct. This study analyzes the oligopolistic market structure following successive operator mergers and examines implications for competition and consumer welfare. A descriptive qualitative approach supported by quantitative analysis employed secondary data from corporate reports, regulatory documents, and telecommunications industry publications covering 2020–2025, supplemented by first-quarter 2026 observations. Market concentration was measured using the three-firm concentration ratio and Herfindahl–Hirschman Index (HHI), while entry barriers and strategic conduct were examined through documentary analysis. Subscriber-based HHI increased from 2,958 in the second quarter of 2021 to 3,727 in the first quarter of 2026, while revenue-based HHI reached approximately 3,905 in 2025. The Indosat–Hutchison and XL Axiata–Smartfren mergers increased HHI by approximately 408 and 345 points, respectively. Telkomsel retained the largest subscriber share at 48.77%, followed by Indosat Ooredoo Hutchison at 29.83% and XLSmart at 21.39%. Spectrum scarcity, infrastructure requirements, and capital intensity reinforced entry barriers. Operators increasingly prioritized revenue optimization and network development. The findings support stronger post-merger oversight, although available evidence cannot establish coordinated pricing or causal consumer welfare effects.

Keywords: *barriers to entry, market concentration, oligopoly, strategic conduct, telecommunications industry.*

©2026 Authors.. This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.
(https://creativecommons.org/licenses/by-nc/4.0/)

INTRODUCTION

The rapid expansion of digital connectivity has transformed mobile telecommunications into a strategic infrastructure sector supporting economic transactions, financial inclusion, public administration, education, and the development of digital services. Growing dependence on mobile broadband has intensified the economic significance of network availability, service affordability, technological investment, and effective market competition, particularly in emerging economies where mobile networks constitute a major channel of internet access. Research on telecommunications market concentration has established that the distribution of market power among operators is closely connected to broader questions of national competitiveness, although the relationship between concentration and economic performance requires consideration of market characteristics and institutional conditions (Bardey et al., 2022). The development of high-capacity telecommunications infrastructure has also increased the importance of investment sustainability, technological modernization, and gigabit connectivity in supporting digital transformation (Cave, 2023). Evidence concerning broadband investment and network coverage further indicates that infrastructure expansion cannot be understood solely through aggregate investment levels because its relationship with coverage varies across market conditions (Jung & Katz, 2023). Indonesia presents a particularly relevant setting following successive corporate consolidations, including the integration of Indosat Ooredoo and Hutchison 3 Indonesia in 2022 and the establishment of XLSmart through the merger of XL Axiata and Smartfren in 2025, which reduced the number of major mobile network operators to three. This transformation occurred alongside substantial infrastructure requirements, increasingly sophisticated mobile services, and continuing dependence on limited radio-frequency spectrum, creating conditions in which market concentration and competitive conduct require

simultaneous examination. The economic problem extends beyond the number of operating firms because consolidation may support investment efficiency and network integration while potentially reducing competitive pressure, limiting consumer choice, and strengthening the strategic advantages of established operators. Understanding Indonesia's telecommunications market structure consequently requires an analytical approach that connects ownership consolidation, concentration measurement, entry barriers, and operator behavior rather than treating technological expansion as sufficient evidence of effective competition.

Contemporary telecommunications research has developed several complementary approaches to examining the relationship between market structure, infrastructure investment, technological development, and competitive behavior. Studies addressing market structure and productive efficiency emphasize that the consequences of concentration depend on the interaction between competitive conditions, investment incentives, and the technical performance of telecommunications networks, challenging interpretations that automatically equate a smaller number of operators with either economic inefficiency or improved market performance (Elliott et al., 2025). Research on market entry provides a different analytical perspective by examining how the introduction of additional mobile competitors may influence incumbent behavior and competitive conditions, thereby emphasizing the importance of contestability beyond conventional concentration indicators (Čihák, 2025; Kim, 2026). A related body of literature considers telecommunications competition through the evolution of pricing arrangements, regulatory environments, and broader market dynamics, demonstrating the analytical relevance of pricing institutions and policy conditions when assessing the conduct of mobile network operators (Katz & Jung, 2025). Technological transformation represents another dimension of this discussion, particularly as the development of fifth-generation mobile networks introduces new competitive strategies involving service differentiation, infrastructure modernization, network capabilities, and the commercialization of advanced connectivity (Liu et al., 2024). The transition toward 5G also raises questions concerning operators' ability to translate technological investments into economically sustainable services, reinforcing the distinction between technological capability and commercial performance (Whalley & Curwen, 2024). Infrastructure-sharing research adds a further perspective by identifying the relevance of shared network resources to the costs and organization of broadband deployment, particularly where independent infrastructure duplication may impose substantial financial burdens (Kibinda et al., 2025). These research streams collectively establish that telecommunications competition operates through interdependent structural, technological, financial, and regulatory mechanisms, although their respective analytical emphases differ. The prevailing state of knowledge therefore supports an integrated interpretation of oligopolistic markets in which concentration, investment, pricing strategies, network development, and entry conditions must be examined as connected rather than independent characteristics.

Despite these developments, the existing literature reveals several limitations concerning the integrated assessment of telecommunications markets undergoing successive mergers and technological restructuring. Research focusing on market entry provides an important basis for understanding competitive responses, but evidence drawn from markets experiencing new entry cannot be transferred directly to an industry in which consolidation has reduced the number of established competitors (Čihák, 2025; Kim, 2026). Studies emphasizing investment and technical efficiency address essential dimensions of market performance, yet these dimensions do not independently establish whether post-merger concentration creates greater market power, more sustainable competition, or measurable consumer benefits (Elliott et al., 2025). A methodological limitation also arises from the measurement of telecommunications activity because subscriber counts, network performance, service revenue, and infrastructure coverage represent different market characteristics and may produce different interpretations of competitive conditions. Research concerning broadband measurement recognizes the relevance of measurement methods and institutional coordination, underscoring the need to distinguish between indicators of connectivity and the economic dimensions of telecommunications markets (Frias et al., 2025). Spectrum allocation creates an additional analytical challenge because the economic value of radio frequencies is influenced by technological development, while spectrum reservation and allocation arrangements can affect the distribution of infrastructure opportunities among potential and established network operators (Rana, 2026; Zagdanski et al., 2025). These considerations expose a contextual and methodological research gap concerning how successive operator mergers, subscriber-based and

revenue-based concentration measures, spectrum-related entry barriers, and strategic conduct can be assessed within a single analytical framework. The gap is particularly relevant to Indonesia after the establishment of XLSmart, since the resulting three-operator structure requires an assessment that distinguishes the immediate arithmetic effects of consolidation from subsequent changes in market shares and operator strategies. Available international studies provide conceptual and methodological foundations for such an assessment, but their different institutional settings, market configurations, and analytical objectives do not substitute for a country-specific examination of Indonesia's recent restructuring.

The unresolved relationship between telecommunications concentration, infrastructure investment, and competitive behavior has direct implications for competition policy and the economic governance of digital infrastructure. Merger assessment based exclusively on the reduction in the number of operators risks overlooking potential investment efficiencies, whereas an evaluation centered solely on infrastructure expansion may underestimate barriers that prevent alternative service providers from challenging established market participants. Infrastructure sharing offers a potentially relevant mechanism for reducing deployment costs and resource duplication, but its competitive implications depend on access conditions, investment incentives, and the organization of network ownership (Oughton, 2025). Research addressing broadband infrastructure sharing in developing economies further highlights the importance of institutional and operational conditions in extending connectivity, suggesting that infrastructure efficiency and competitive accessibility should be evaluated as separate policy concerns (Kibinda et al., 2025). Spectrum policy presents comparable trade-offs because allocation decisions influence operators' capacity to deploy networks and may affect the opportunities available to existing firms and potential entrants (Zagdanski et al., 2025). The governance of telecommunications markets is also shaped by political and institutional influences, which can affect regulatory priorities and the implementation of market-oriented policy arrangements (Howell et al., 2025). For Indonesia, these considerations are relevant to competition supervision by the Indonesian Competition Commission and spectrum management by the Ministry of Communication and Digital Affairs, particularly following the consolidation of major operators and the allocation of additional spectrum for mobile broadband development. An insufficiently differentiated assessment of market concentration could result in policies that either constrain economically beneficial infrastructure coordination or permit structural conditions that weaken long-term competitive pressure. The scientific significance of the problem lies in determining which observable aspects of market structure and operator conduct can be established from available evidence, while its practical significance concerns the development of more transparent, proportionate, and empirically grounded competition oversight.

The present study is positioned within industrial organization research by applying the Structure–Conduct–Performance framework to the restructuring of Indonesia's mobile telecommunications industry, with particular attention to market concentration, entry barriers, and operators' strategic responses. Its proposed contribution differs from research emphasizing individual dimensions of telecommunications development by integrating structural concentration measures with qualitative examination of corporate consolidation, infrastructure requirements, spectrum allocation, and commercially relevant operator behavior. Studies of concentration and national competitiveness provide a broader structural foundation, while research concerning broadband pricing offers an additional perspective for interpreting market conduct without assuming that concentration alone determines consumer prices (Bardey et al., 2022; Katz & Jung, 2025). Research on mobile telecommunications strategies under 5G development is particularly relevant to examining whether competitive differentiation increasingly involves network quality, technological investment, and service portfolios rather than subscriber acquisition alone (Liu et al., 2024). The commercial challenges associated with creating value from 5G further justify examining operators' strategic priorities alongside their relative market positions (Whalley & Curwen, 2024). Methodologically, the study employs the three-firm concentration ratio and the Herfindahl–Hirschman Index to examine changes in market structure across selected observation periods, while incorporating subscriber-based market shares and revenue-based sensitivity analysis to distinguish structural patterns arising from different economic indicators. The analysis encompasses the consolidation of Indosat and Hutchison 3 Indonesia, the subsequent formation of XLSmart, and the transition toward a three-operator market, allowing the structural implications of successive mergers to be considered within a common

analytical framework. Its specific novelty lies in combining these successive consolidation events with post-merger concentration assessment and a comparative interpretation of spectrum constraints, infrastructure scale, and strategic conduct using available secondary evidence through the first quarter of 2026. This contribution is analytical and contextual rather than causal: it extends the scope of descriptive competition assessment without claiming to identify merger-induced price changes, coordinated behavior, or consumer welfare effects that cannot be established from the available data.

This study aims to analyze the oligopolistic market structure of Indonesia's mobile telecommunications industry by examining the development of market concentration, the structural consequences of successive operator mergers, barriers to market entry, and the strategic conduct of major telecommunications companies. Specifically, it seeks to identify changes in market concentration across selected periods before and after corporate consolidation through the application of the three-firm concentration ratio and the Herfindahl–Hirschman Index. The analysis also examines the implications of using subscriber-based market shares and revenue-based indicators for interpreting the distribution of market power among telecommunications operators. Particular attention is directed toward the structural effects of the Indosat–Hutchison 3 Indonesia and XL Axiata–Smartfren mergers, including changes in the number of major competitors and the resulting configuration of the national mobile telecommunications market. The study further evaluates barriers associated with radio-frequency spectrum availability, infrastructure requirements, capital intensity, and the strategic advantages of established network operators. Operators' strategic conduct is assessed through available indicators of average revenue per user, network investment, infrastructure expansion, and service differentiation, while recognizing the limitations of descriptive evidence for establishing causal relationships or coordinated pricing practices. The expected scientific contribution consists of a structured and empirically grounded application of industrial organization analysis to successive consolidation events within an emerging telecommunications market, supported by the integration of quantitative concentration measures and qualitative institutional assessment. Its methodological contribution concerns the comparative interpretation of concentration indicators and the identification of measurement limitations associated with heterogeneous telecommunications data. The practical contribution is to provide an analytical basis for evaluating post-merger market conditions, improving the interpretation of competitive risks, and informing competition supervision and spectrum-related policy decisions without exceeding the inferential limits of the available evidence.

RESEARCH METHODS

The study employed a descriptive qualitative research design supported by quantitative analysis of secondary data to examine the oligopolistic market structure of Indonesia's mobile telecommunications industry. The qualitative component addressed barriers to market entry, corporate consolidation, spectrum allocation, and the strategic conduct of telecommunications operators, while the quantitative component measured market concentration through operator market shares and established concentration indices. The analytical framework was based on the Structure–Conduct–Performance (SCP) paradigm, with emphasis on the relationship between market structure and competitive conduct rather than causal estimation of market performance. The units of analysis comprised Indonesia's major mobile network operators, including Telkomsel, Indosat, Hutchison 3 Indonesia, XL Axiata, and Smartfren, together with their consolidated entities, Indosat Ooredoo Hutchison and XLSmart. Secondary data covered the 2020–2025 period, supplemented by available first-quarter 2026 information to represent the market following the establishment of XLSmart. The documentary sources consisted of corporate annual and financial reports, telecommunications operator disclosures, publications issued by the Ministry of Communication and Digital Affairs, documents and merger assessments from the Indonesian Competition Commission, and relevant telecommunications industry publications. Data collection was conducted through document review, focusing on subscriber numbers, corporate revenues, market shares, merger transactions, network infrastructure, spectrum holdings, capital expenditure, and average revenue per user. Historical market structures were examined using four approximately aligned quarterly observations: the second quarter of 2021, the first quarter of 2024, the first quarter of 2025, and the first quarter of 2026. These observations provided a basis for comparing market conditions before and after major corporate consolidation, while recognizing differences in reporting periods and the availability of comparable operator-level information.

Quantitative analysis employed the three-firm concentration ratio (CR3) and the Herfindahl–Hirschman Index (HHI) to assess the distribution of market shares and changes in industry concentration. CR3 was calculated by summing the market shares of the three largest operators, while HHI was calculated using the formula $HHI = \Sigma(S_i)^2$, where S_i represents each operator's market share expressed as a percentage. Market shares were primarily calculated from reported mobile subscriber numbers, with revenue-based concentration analysis used as an additional assessment where financial information was available. Changes associated with corporate mergers were assessed using $\Delta HHI = 2 \times S_A \times S_B$, where S_A and S_B represent the pre-merger market shares of the merging operators. The resulting concentration measures were interpreted using the thresholds specified in Indonesian Competition Commission Regulation No. 3 of 2023, including the HHI and ΔHHI criteria relevant to comprehensive merger assessment. Comparisons between pre-merger and post-merger observations distinguished concentration changes attributable to the mathematical combination of operator market shares from changes observed across different reporting periods. Qualitative analysis involved descriptive examination of documentary evidence concerning spectrum scarcity, infrastructure investment requirements, network scale, corporate consolidation, and strategic indicators, including average revenue per user, capital expenditure, and service differentiation. The quantitative concentration measures and qualitative documentary findings were interpreted jointly to assess the relationship between industry structure, entry barriers, and observable competitive conduct without treating their associations as evidence of causality or coordinated pricing. Data credibility was addressed through source triangulation by comparing information reported across corporate disclosures, regulatory documents, and telecommunications industry publications, while discrepancies in reporting periods, subscriber definitions, and revenue coverage were considered when interpreting the indicators. The analysis acknowledged that SIM-card subscriptions do not necessarily represent unique users and that consolidated corporate revenues may include services outside the mobile telecommunications segment, limiting direct comparisons between subscriber-based and revenue-based market concentration.

RESULTS AND DISCUSSION

Market Concentration and Structural Transformation in Indonesia’s Mobile Telecommunications Industry

Indonesia's mobile telecommunications industry experienced substantial structural transformation following successive mergers that reduced the number of major operators from five to three between 2021 and 2026. The consolidation of Indosat with Hutchison 3 Indonesia in 2022, followed by the integration of XL Axiata and Smartfren into XLSmart in 2025, altered the distribution of subscribers, competitive positions, and market concentration. These developments reflect the structural characteristics of oligopolistic industries, in which a limited number of firms control substantial market shares and maintain strategic interdependence in investment and commercial decisions. Bardey et al. (2022) established the relevance of telecommunications market concentration to broader economic competitiveness, indicating that changes in market structure warrant examination beyond the numerical reduction of competitors.

The distribution of subscribers demonstrates the persistence of Telkomsel's leading position despite changes in the composition of competing operators. In the second quarter of 2021, Telkomsel accounted for approximately 47.04% of subscribers among the five operators examined, followed by Indosat at 16.68%, XL Axiata at 15.78%, Tri at 12.23%, and Smartfren at 8.26%. The establishment of Indosat Ooredoo Hutchison subsequently combined two established subscriber bases, producing a stronger competitor without eliminating the relative advantage held by the market leader. Fikri and Firmansyah (2024) similarly identified persistent concentration in Indonesia's cellular telecommunications industry, suggesting that corporate restructuring occurred within an already concentrated market rather than creating concentration from an initially competitive structure.

The concentration analysis employed the three-firm concentration ratio (CR3) and the Herfindahl–Hirschman Index (HHI) to distinguish changes in the combined market share of leading operators from changes in the distribution of market power. CR3 indicates the proportion of subscribers controlled by the three largest firms, whereas HHI assigns greater weight to operators possessing relatively large market shares through the squared-share calculation. The distinction becomes particularly relevant when examining markets undergoing consolidation because the

disappearance of smaller independent operators may increase concentration without proportionately changing the leadership position of the largest firm. Morais and Viana (2025) employed industrial concentration indicators to examine structural changes in Brazil's mobile telecommunications sector, providing a relevant methodological comparison for assessing concentration in markets characterized by corporate restructuring.

The selected quarterly observations indicate that Indonesia's mobile telecommunications market remained highly concentrated before and after the two mergers, although the magnitude of concentration varied across observation periods. The subscriber-based HHI increased from approximately 2,958 in the second quarter of 2021 to 3,727 in the first quarter of 2026, while CR3 increased from 79.5% to 100% among the operators included in the dataset. These changes indicate a transition from a concentrated five-operator structure toward a three-operator configuration in which the distribution of market shares became increasingly relevant for assessing competitive asymmetry. Research on mobile telecommunications investment and technical efficiency emphasizes the importance of examining market structure alongside other economic characteristics rather than interpreting concentration as an independent measure of market performance (Elliott et al., 2025).

Table 1. Changes in Market Concentration Following Telecommunications Operator Consolidation

Observation period	Number of operators	CR3 (%)	HHI	ΔHHI	Classification
Q2 2021, before IOH merger	5	79.5	2,958	–	HHI > 2,500
Q2 2021, pro forma IOH	4	91.7	3,367	+408	Spectrum III
Q1 2024	4	90.2	3,228	–	HHI > 2,500
Q1 2025, before XLSmart	4	89.8	3,212	–	HHI > 2,500
Q1 2025, pro forma XLSmart	3	100.0	3,557	+345	Spectrum III
Q1 2026, observed	3	100.0	3,727	+514*	Spectrum III

Source: Authors' calculations based on mobile subscriber data presented in the research dataset.

The concentration indicators presented in Table 1 demonstrate that both mergers produced substantial increases in HHI beyond the 150-point threshold applied in the Indonesian Competition Commission's merger assessment framework. The Indosat–Tri merger generated an estimated increase of approximately 408 points, while the XL Axiata–Smartfren merger produced an additional estimated increase of approximately 345 points. These changes represent the mechanical concentration effects of combining previously independent market shares and should not be interpreted as direct evidence of reduced consumer welfare or anticompetitive coordination. Brito and Vasconcelos (2023) examined the competitive effects of mergers and spectrum divestment remedies in mobile telecommunications markets, reinforcing the analytical distinction between structural consolidation and its potential consequences for market competition.

A further structural characteristic emerged after the creation of XLSmart, when CR3 reached 100% among the three major operators included in the analysis. At this level, the concentration ratio no longer distinguishes variations in market power because every included operator contributes to the combined share, regardless of differences in their relative size. HHI remains more informative because it reflects the unequal distribution of subscribers, with Telkomsel controlling approximately 48.77%, Indosat Ooredoo Hutchison 29.83%, and XLSmart 21.39% in the first quarter of 2026. Čihák (2025) examined competitive conditions associated with entry into the Slovak mobile telecommunications industry, offering a contrasting analytical setting in which changes in the number of market participants can be considered alongside the strategic positions of incumbent operators.

The difference between subscriber-based and revenue-based market concentration introduces an additional consideration concerning the measurement of economic dominance. Available financial information for 2025 indicates that Telkomsel generated IDR 109.3 trillion in revenue, compared with IDR 56.5 trillion for Indosat Ooredoo Hutchison and IDR 42.5 trillion for XLSmart, producing a revenue-based HHI of approximately 3,905. This estimate exceeds the subscriber-based HHI for the first quarter of 2026, but the comparison is limited by different reporting periods and the inclusion of fixed-broadband or other nonmobile activities within reported corporate revenues. Frias et al. (2025) addressed methodological challenges in mobile broadband measurement, supporting the need to

distinguish indicators according to their underlying definitions and analytical purposes rather than assuming that different telecommunications metrics represent equivalent market characteristics.

The persistence of high concentration also requires interpretation in relation to the economic characteristics of telecommunications infrastructure and the incentives associated with corporate consolidation. Large operators maintain extensive network infrastructure, substantial spectrum holdings, and significant capital requirements, potentially enabling economies of scale while creating structural disadvantages for prospective market entrants. The relationship between concentration and investment is not necessarily unidirectional because investment incentives may respond differently to competitive pressure, market scale, and the technical requirements of network development. Jung and Katz (2023) examined heterogeneity in the relationship between broadband investment and coverage expansion, while Oughton (2025) addressed the potential cost and resource implications of infrastructure sharing, indicating that network expansion and competitive market structure represent related but analytically distinct dimensions of telecommunications performance.

The Indonesian evidence indicates that successive mergers reinforced an oligopolistic structure already characterized by substantial concentration, while the resulting distribution of market shares remained unequal among the three major operators. Market concentration measures establish the extent of structural consolidation but do not independently demonstrate whether operators adopted coordinated pricing, restricted output, or generated efficiency improvements sufficient to compensate for diminished competitive alternatives. The implications of merger-related concentration consequently require interpretation alongside observable strategic conduct, barriers to entry, and the institutional arrangements governing telecommunications competition. Fikri and Firmansyah (2024) and Fauziah et al. (2026) identified highly concentrated conditions in earlier periods of Indonesia's cellular telecommunications market, while the present analysis extends the structural assessment to the post-XLSmart configuration using concentration indicators that differentiate successive merger effects from subsequent changes in the distribution of subscribers.

Barriers to Market Entry and Infrastructure-Based Competitive Advantages

The oligopolistic structure of Indonesia's mobile telecommunications industry is reinforced by substantial entry barriers associated with spectrum availability, infrastructure requirements, and capital-intensive network operations. The transition toward three major operators has concentrated essential operational resources among Telkomsel, Indosat Ooredoo Hutchison, and XLSmart, limiting the practical opportunities for new firms to establish comparable nationwide networks. These barriers extend beyond initial investment expenditures because potential entrants must secure suitable frequency allocations, establish extensive network coverage, and develop sufficient commercial scale to compete with established operators. Fikri and Firmansyah (2024) identified substantial minimum efficient scale requirements in Indonesia's cellular telecommunications industry, supporting the interpretation that structural concentration is maintained partly through economic conditions that disadvantage prospective competitors.

Radio-frequency spectrum represents a particularly significant entry barrier because mobile telecommunications services depend on access to frequency bands with different propagation characteristics and network capacities. Spectrum scarcity creates competition for limited resources, while allocation procedures determine which operators can develop network coverage and increase service capacity. The economic significance of individual frequency bands also changes with technological development, particularly as mobile networks transition toward higher-capacity broadband services and more advanced wireless technologies. Rana (2026) examined the relationship between technological evolution and spectrum valuation, providing a relevant analytical basis for understanding why spectrum access constitutes both an operational necessity and a source of strategic competitive advantage.

Indonesia's 2026 allocation of the 700 MHz and 2.6 GHz frequency bands illustrates the relationship between spectrum management and the persistence of established market positions. The 700 MHz band was designated primarily to support wider network coverage, whereas the 2.6 GHz band was intended to strengthen mobile broadband capacity and the development of advanced telecommunications services. The allocation process involved the three existing major operators, with no additional nationwide mobile network operator identified among the participants receiving spectrum allocations. Zagdanski et al. (2025) examined the implications of spectrum set-asides for

private and public mobile networks, highlighting the relevance of allocation arrangements to the distribution of infrastructure opportunities and competitive conditions.

The distribution of spectrum resources among established operators reflects differentiated investment priorities and network development strategies rather than identical approaches to infrastructure expansion. Telkomsel received allocations of 2 × 10 MHz in the 700 MHz band and 80 MHz in the 2.6 GHz band, while Indosat Ooredoo Hutchison received 2 × 10 MHz and 60 MHz, respectively. XLSmart obtained 2 × 15 MHz in the 700 MHz band and 50 MHz in the 2.6 GHz band, indicating a comparatively larger allocation in the lower-frequency band and a smaller allocation in the higher-frequency band. These differences are relevant to the relationship between network coverage and capacity, particularly because broadband investment does not necessarily produce uniform infrastructure outcomes across operators and geographic markets (Jung & Katz, 2023).

Table 2. Spectrum Allocation and Infrastructure Characteristics of Indonesia's Major Mobile Telecommunications Operators

Indicator	Telkomsel	Indosat Ooredoo Hutchison	XLSmart
Spectrum holdings before 2026 allocation (MHz)	165	135	152
700 MHz allocation	2 × 10 MHz	2 × 10 MHz	2 × 15 MHz
700 MHz bid value (IDR billion)	642.50	507.48	Approximately 1,060
2.6 GHz allocation (MHz)	80	60	50
2.6 GHz bid value (IDR billion)	545.84	372.00	231.60
Reported BTS infrastructure	280,434	More than 250,300	More than 225,000
BTS reporting period	June 2025	2024	End of 2025
Reported 2025 capital expenditure (IDR trillion)	Not separately available	13.3	11.2
Capital expenditure/revenue (%)	Not available	23.5	26.4

Source: Compiled from the telecommunications operator information, infrastructure disclosures, and spectrum allocation records included in the research dataset.

The indicators presented in Table 2 demonstrate that competition among Indonesia's major telecommunications operators involves substantial commitments to spectrum acquisition and physical network infrastructure. Telkomsel maintained the largest reported BTS network, while Indosat Ooredoo Hutchison and XLSmart also operated extensive infrastructure requiring significant financial resources for maintenance, expansion, and technological modernization. The reported capital expenditures of Indosat Ooredoo Hutchison and XLSmart represented 23.5% and 26.4% of their respective 2025 revenues, illustrating the financial intensity associated with sustaining telecommunications operations. Elliott et al. (2025) examined the relationship between market structure, investment, and technical efficiency in mobile telecommunications, supporting the analytical relevance of considering infrastructure expenditure alongside market concentration without assuming that higher investment necessarily demonstrates greater productive efficiency.

The economic significance of large telecommunications networks extends beyond the number of installed base transceiver stations because infrastructure scale affects service availability, network integration, operational costs, and the ability to accommodate technological expansion. Established operators possess advantages associated with existing transmission facilities, network management systems, customer relationships, and complementary digital service portfolios, which prospective entrants would need to develop or access through commercial arrangements. Infrastructure sharing may reduce some of these costs, although its effects depend on the technical configuration of networks, contractual conditions, and the incentives of infrastructure owners. Oughton (2025) examined the potential reductions in energy requirements, emissions, and deployment costs associated with mobile infrastructure sharing, while Kibinda et al. (2025) identified infrastructure sharing as a relevant consideration for broadband development in emerging economies.

Minimum efficient scale constitutes another dimension of market entry because a telecommunications operator must distribute substantial fixed costs across a sufficiently large customer base to maintain commercially sustainable operations. Fikri and Firmansyah (2024) estimated minimum efficient scale indicators of approximately 44–48% for Indonesia's cellular telecommunications industry during 2010–2022, interpreting these values as evidence of substantial structural barriers. Such estimates should be understood within the measurement framework of the underlying study rather than treated as a universal minimum market share required for every potential entrant. The existing concentration of subscribers among three established operators suggests that prospective competitors would face substantial difficulties in simultaneously securing infrastructure resources, achieving customer scale, and maintaining the investment necessary for nationwide service delivery.

The transition toward fifth-generation telecommunications further complicates competitive entry because technological modernization requires additional spectrum capacity, infrastructure integration, and commercial strategies capable of supporting advanced services. Operators already possessing extensive network assets may be better positioned to upgrade existing facilities than firms required to establish new networks, although technological innovation can also create opportunities for alternative service configurations and specialized providers. Liu et al. (2024) examined the competitiveness and strategies of Chinese mobile network operators during the 5G transition, while Whalley and Curwen (2024) addressed the commercial challenges associated with generating economic value from fifth-generation telecommunications investments. These studies indicate the relevance of distinguishing technological development from effective market contestability, particularly when network modernization occurs within an industry characterized by limited operator participation.

The interaction between spectrum scarcity, infrastructure requirements, and market concentration creates a regulatory challenge involving the balance between investment efficiency and competitive accessibility. Policies emphasizing network development may support broader telecommunications coverage, but the allocation of essential resources exclusively among established operators does not independently establish that opportunities for future market entry are sufficient. Institutional arrangements governing telecommunications infrastructure and spectrum access consequently affect the conditions under which firms compete, invest, and potentially enter the market. Howell et al. (2025) examined political influences on telecommunications and internet economy markets, indicating that competitive outcomes must also be interpreted in relation to the institutional environment governing market development.

The Indonesian evidence identifies entry barriers operating through mutually reinforcing economic and institutional mechanisms rather than through a single isolated constraint. Spectrum access determines the technical feasibility of mobile network operations, infrastructure scale influences cost structures and service capacity, and capital requirements affect the ability of potential entrants to establish commercially viable operations. The absence of new nationwide operators in the observed 2026 spectrum allocation is consistent with limited market entry, although the available evidence does not establish which individual barrier was decisive in preventing additional participation. The findings support the continued examination of spectrum allocation, infrastructure-sharing arrangements, and market access conditions as complementary elements of telecommunications competition policy, with infrastructure efficiency and competitive accessibility assessed through distinct indicators rather than presumed to produce identical outcomes (Kibinda et al., 2025; Zagdanski et al., 2025).

Strategic Conduct, Competitive Dynamics, and Consumer Welfare Implications in Indonesia’s Telecommunications Oligopoly

The concentration of Indonesia's mobile telecommunications market has created conditions in which the commercial decisions of Telkomsel, Indosat Ooredoo Hutchison, and XLSmart are increasingly interdependent. The limited number of major operators means that adjustments in service pricing, network investment, customer acquisition, and technological development may influence the competitive positions of rival firms. Available industry information indicates a strategic shift from expanding subscriber numbers toward improving average revenue per user (ARPU), network capabilities, and operational efficiency, although these changes cannot independently establish

coordinated commercial behavior. Liu et al. (2024) examined competitive strategies among mobile network operators during the transition toward 5G, providing a relevant basis for interpreting technological differentiation and commercial positioning as components of strategic conduct in concentrated telecommunications markets.

The distribution of ARPU among Indonesia's three major operators indicates differences in their approaches to revenue generation and customer management. Telkomsel reported ARPU of approximately IDR 41,800 during the first half of 2025, while Indosat Ooredoo Hutchison recorded IDR 44,000 and XLSmart reached IDR 44,800 in the fourth quarter of the same year. These figures suggest that differences in subscriber scale do not necessarily correspond to proportional differences in revenue generated per reported subscriber, although the comparison is constrained by variations in reporting periods and revenue composition. Katz and Jung (2025) examined the determinants of mobile broadband pricing across national markets, supporting the analytical importance of distinguishing observed revenue indicators from the underlying pricing mechanisms and market conditions influencing telecommunications services.

The reduction in reported subscriber numbers introduces a methodological and economic consideration when interpreting operators' commercial performance. Telkomsel's subscriber base declined from approximately 158.88 million in the first quarter of 2025 to 153.67 million in the first quarter of 2026, while Indosat Ooredoo Hutchison reported 94 million subscribers and XLSmart recorded 67.4 million in the latter period. Declining subscriber totals may reflect inactive SIM-card removal, subscriber-base rationalization, customer switching, or changes in commercial strategies, but the available documents do not quantify the contribution of each mechanism. Frias et al. (2025) addressed methodological challenges associated with mobile broadband measurement, reinforcing the need to distinguish changes in administrative subscriber indicators from changes in actual service consumption or competitive performance.

Differences in network investment and service development also indicate that Indonesia's major telecommunications operators do not compete exclusively through subscriber acquisition. Telkomsel has emphasized network development and integrated fixed-mobile services, Indosat Ooredoo Hutchison has pursued revenue improvement and network investment, and XLSmart has prioritized infrastructure integration and operational efficiency following consolidation. These strategic orientations reflect distinct combinations of infrastructure scale, financial resources, and organizational priorities, although their effectiveness cannot be established solely from investment announcements or reported revenue growth. Whalley and Curwen (2024) examined the challenge of creating economic value from 5G, indicating that technological investment requires corresponding commercial capabilities before improvements in network infrastructure can be interpreted as sustainable competitive advantages.

Table 3. Indicators of Strategic Conduct and Competitive Positioning among Indonesia's Major Mobile Telecommunications Operators

Indicator	Telkomsel	Indosat Ooredoo Hutchison	XLSmart
Q1 2026 subscribers (million)	153.67	94.00	67.40
Q1 2026 subscriber market share (%)	48.77	29.83	21.39
2025 reported revenue (IDR trillion)	109.30	56.50	42.50
Reported ARPU (IDR thousand)	41.80	44.00	44.80
ARPU reporting period	H1 2025	Q4 2025	Q4 2025
2025 capital expenditure (IDR trillion)	Not separately available	13.30	11.20
Capital expenditure/revenue (%)	Not available	23.5	26.4
Reported network	280,434	More than 250,300	More than 225,000

.

infrastructure (BTS)				
Principal strategic emphasis	5G expansion and integrated services	Revenue improvement and network development	Network integration and operational efficiency	

Source: Compiled from operator financial disclosures, telecommunications industry information, and market data included in the research dataset.

The indicators presented in Table 3 demonstrate that Telkomsel maintains the largest subscriber base and reported revenue, whereas Indosat Ooredoo Hutchison and XLSmart exhibit different combinations of customer scale, ARPU, and infrastructure expenditure. The relationship between subscriber market share and reported revenue suggests that market leadership encompasses more than customer numbers, particularly where operators provide integrated telecommunications services. Differences in ARPU and capital expenditure should nevertheless be interpreted cautiously because the available observations do not establish equivalent revenue definitions, customer characteristics, or network investment requirements. Elliott et al. (2025) examined market structure, investment, and technical efficiency in mobile telecommunications, reinforcing the need to evaluate financial and operational indicators jointly rather than treating any single measure as conclusive evidence of superior competitive performance.

The strategic consequences of corporate consolidation are particularly relevant to the relationship between operational efficiency and competitive pressure. The formation of XLSmart created opportunities for integrating network assets, consolidating infrastructure expenditures, and coordinating operational resources within a single corporate entity, while simultaneously eliminating Smartfren as an independent competitor. The observed restructuring is consistent with the possibility that mergers may produce efficiency improvements, but the available descriptive evidence does not isolate merger-specific savings or establish their distribution between operators and consumers. Brito and Vasconcelos (2023) examined mergers and spectrum divestment remedies in mobile telecommunications markets, providing a relevant theoretical basis for distinguishing potential efficiency benefits from the competitive consequences of reducing the number of independent firms.

Pricing behavior constitutes a central dimension of oligopolistic competition, yet the available indicators provide limited grounds for identifying coordinated pricing practices. ARPU reflects average revenue derived from customers and may change because of tariff adjustments, variations in data consumption, differences in customer composition, or changes in service portfolios. Similar ARPU levels among competing operators therefore cannot independently demonstrate price parallelism, tacit collusion, or restrictions on competitive behavior without comparable information concerning tariffs, service quantities, and temporal pricing adjustments. Aimene et al. (2021) identified differences in the price effects of mobile operator consolidation across service categories, indicating that evaluations of telecommunications pricing should distinguish unit data prices from voice-service prices and other revenue measures.

Consumer welfare implications must also be interpreted through the distinction between structural market concentration and observable service outcomes. The reduction from five major operators to three narrowed the range of independent nationwide network providers, potentially affecting consumer choice and the competitive alternatives available to mobile service users. Network consolidation and infrastructure investment may support service availability and technological modernization, but the available data do not establish whether these developments reduced consumer expenditure, improved affordability, or generated equivalent benefits across income groups. Bardey et al. (2022) examined telecommunications concentration in relation to economic competitiveness, while Oughton (2025) addressed infrastructure-sharing efficiencies, indicating that market structure and infrastructure performance require separate assessment before conclusions concerning broader economic welfare can be supported.

Regulatory oversight becomes particularly significant when concentration is sustained by substantial entry barriers and operators possess the capacity to influence market conditions through investment and service strategies. Indonesia's competition authority and telecommunications regulator face the analytical challenge of distinguishing legitimate commercial coordination within merged entities from conduct that could weaken competition among remaining independent operators. Periodic monitoring of mobile-service prices, network quality, active subscribers, spectrum

utilization, and investment outcomes would provide a more informative evidentiary basis than concentration indices alone, particularly when corporate disclosures employ different reporting definitions. Howell et al. (2025) examined institutional and political influences on telecommunications markets, supporting the relevance of regulatory arrangements to market development, while Zagdanski et al. (2025) highlighted the significance of spectrum allocation arrangements for the organization of mobile network resources.

The evidence indicates that Indonesia's telecommunications oligopoly is characterized by concentrated market shares, differentiated investment priorities, and commercial strategies increasingly associated with revenue optimization and infrastructure development. Structural consolidation has reduced the number of independent competitors, but the available secondary data do not establish a causal relationship between mergers and consumer prices, nor do they demonstrate coordinated conduct among the remaining operators. Research on market entry and telecommunications competition emphasizes the relevance of competitive responses to changes in market participation, while broadband infrastructure studies identify investment conditions as an additional determinant of market development (Čihák, 2025; Kim, 2026; Kibinda et al., 2025). The analytical contribution lies in distinguishing observable structural and strategic characteristics from competitive outcomes that remain unverified, providing a basis for post-merger monitoring that integrates concentration measurement, infrastructure conditions, pricing information, and consumer-oriented performance indicators.

CONCLUSION

This study concludes that Indonesia's mobile telecommunications industry exhibited a highly concentrated oligopolistic market structure following successive corporate mergers that reduced the number of major operators from five to three between 2021 and 2026. Subscriber-based market concentration, measured using the Herfindahl–Hirschman Index (HHI), increased from 2,958 in the second quarter of 2021 to 3,727 in the first quarter of 2026, while the revenue-based HHI for 2025 reached approximately 3,905. The Indosat–Hutchison 3 Indonesia and XL Axiata–Smartfren mergers generated estimated concentration increases of 408 and 345 HHI points, respectively, demonstrating substantial structural changes within an already concentrated industry. Telkomsel maintained its dominant position with approximately 48.77% of reported mobile subscribers in the first quarter of 2026, followed by Indosat Ooredoo Hutchison at 29.83% and XLSmart at 21.39%. Barriers to market entry were associated with limited radio-frequency spectrum, extensive network infrastructure requirements, substantial capital expenditure, and the operational advantages of established telecommunications providers. Competitive conduct increasingly emphasized revenue optimization, network integration, technological development, and service differentiation rather than subscriber expansion alone. These findings establish the persistence of structural concentration and strategic interdependence but do not provide sufficient evidence to demonstrate coordinated pricing, merger-induced changes in consumer prices, or causal effects on consumer welfare.

The study contributes to industrial organization research by integrating concentration measurements, merger-related structural changes, entry barriers, and observable operator strategies within the Structure–Conduct–Performance framework. Its principal contribution lies in extending the assessment of Indonesia's telecommunications market to the post-XLSmart configuration while distinguishing the arithmetic effects of corporate consolidation from subsequent changes in subscriber distribution and commercial positioning. The comparison between subscriber-based and revenue-based concentration indicators also demonstrates the importance of consistent measurement definitions when evaluating market power. From a regulatory standpoint, the findings support strengthening post-merger supervision through standardized reporting of active subscribers, mobile-service revenues, unit prices, network quality, spectrum utilization, and infrastructure investment. Competition oversight should distinguish potential efficiency improvements associated with consolidation from risks arising from limited entry opportunities and reduced numbers of independent competitors. The study's conclusions remain subject to limitations involving differences in reporting periods, estimated subscriber figures, consolidated revenue definitions, and reliance on secondary corporate and industry documents. Future research should employ more consistent operator-level data and longer post-merger observations to examine changes in service pricing, network performance, and consumer outcomes using analytical methods capable of assessing causal relationships.

REFERENCES

Aimene, L., Jeanjean, F., & Liang, J. (2021). Impact of mobile operator consolidation on unit prices. Telecommunications Policy, 45(4), 102107. https://doi.org/10.1016/j.telpol.2021.102107

APJII. (2025, 6 August). Survei profil internet Indonesia 2025 [Indonesian internet profile survey 2025] [Survey release, reported by detikINET]. https://inet.detik.com/telecommunication/d-8047759/survei-apjii-pengguna-internet-indonesia-2025-tembus-229-juta-jiwa

Bain, J. S. (1956). Barriers to new competition: Their character and consequences in manufacturing industries. Harvard University Press.

Baker McKenzie. (2022). Indonesia: Competition highlights Q3 2022. Insight Plus. https://insightplus.bakermckenzie.com/bm/antitrust-competition_1/indonesia-competition-highlights-q3-2022

Bardey, D., Aristizábal, D., Gómez, J. S., & Sáenz, B. (2022). Concentration of the mobile telecommunications markets and countries' competitiveness. Telecommunications Policy, 46(1), 102230. https://doi.org/10.1016/j.telpol.2021.102230

Bisnis.com. (2021, 17 September). 5 fakta merger Indosat & Tri: Nilai investasi Rp85,6 triliun, potensi pendapatan Rp42 triliun [Five facts about the Indosat–Tri merger: IDR 85.6 trillion in investment and IDR 42 trillion in potential revenue]. Bisnis.com. https://teknologi.bisnis.com/read/20210917/101/1443513/5-fakta-merger-indosat-tri-nilai-investasi-rp856-triliun-potensi-pendapatan-rp42-triliun

Bisnis.com. (2024, 11 December). Komdigi didesak libatkan KPPU kaji dampak merger XL-FREN, jaga kompetisi sehat [Komdigi urged to involve KPPU in assessing the XL–Smartfren merger and protecting competition]. Bisnis.com. https://teknologi.bisnis.com/read/20241211/101/1823514/komdigi-didesak-libatkan-kppu-kaji-dampak-merger-xl-fren-jaga-kompetisi-sehat

Bisnis.com. (2025a, 28 August). Jumlah pelanggan Indosat, Telkomsel, dan XL SMART semester I/2025: Mayoritas turun [Subscriber counts for Indosat, Telkomsel, and XLSmart in the first half of 2025: Most declined]. Bisnis.com. https://teknologi.bisnis.com/read/20250828/101/1906582/jumlah-pelanggan-indosat-telkomsel-dan-xl-smart-semester-i2025-mayoritas-turun

Bisnis.com. (2025b, 22 April). Merger rampung, XLSmart (EXCL) bakal kejar Indosat cs? [Merger completed: Will XLSmart challenge Indosat and its rivals?] Bisnis.com. https://market.bisnis.com/read/20250422/192/1871175/merger-rampung-xlsmart-excl-bakal-kejar-indosat-cs

Bisnis.com. (2026a, 10 July). Hasil lelang frekuensi 700 MHz & 2,6 GHz: Ini posisi Telkomsel, Indosat, dan XLSMART [Results of the 700 MHz and 2.6 GHz spectrum auction: Positions of Telkomsel, Indosat, and XLSmart]. Bisnis.com. https://teknologi.bisnis.com/read/20260710/101/1987222/hasil-lelang-frekuensi-700-mhz-26-ghz-ini-posisi-telkomsel-indosat-dan-xlsmart

Bisnis.com. (2026b, 6 May). Indosat, Telkomsel, dan XLSmart berebut frekuensi 700 MHz dan 2,6 GHz [Indosat, Telkomsel, and XLSmart compete for the 700 MHz and 2.6 GHz bands]. Bisnis.com. https://teknologi.bisnis.com/read/20260506/101/1971747/indosat-telkomsel-dan-xlsmart-berebut-frekuensi-700-mhz-26-ghz

Bisnis.com. (2026c, 21 July). Indosat, Telkomsel, XLSmart sah jadi pemenang lelang frekuensi 700 MHz & 2,6 GHz [Indosat, Telkomsel, and XLSmart officially win the 700 MHz and 2.6 GHz spectrum auction]. Bisnis.com. https://teknologi.bisnis.com/read/20260721/101/1989855/indosat-telkomsel-xlsmart-sah-jadi-pemenang-lelang-frekuensi-700-mhz-26-ghz

Bloomberg. (2020, 29 December). CK Hutchison, Ooredoo in talks to merge Indonesia telecom units. Caixin Global. https://www.caixinglobal.com/2020-12-29/ck-hutchison-ooredoo-in-talks-to-merge-indonesia-telecom-units-101644265.html

Brito, D., & Vasconcelos, H. (2023). Competitive effects of mergers and of spectrum divestment remedies in mobile telecommunication markets. Telecommunications Policy, 47(10), 102626. https://doi.org/10.1016/j.telpol.2023.102626

Cave, M. (2023). The achievement of digitalisation in the EU and its reliance on gigabit connectivity. Telecommunications Policy, 47(9), 102592. https://doi.org/10.1016/j.telpol.2023.102592

CFOtech Asia. (2026, 11 February). Indosat profit up 12.2% as AI drives ARPU, broadband push. CFOtech Asia. https://cfotech.asia/story/indosat-profit-up-12-2-as-ai-drives-arpu-broadband-push

Čihák, J. (2025). Competition in the Slovak mobile telephony industry: Effects of new entry. Telecommunications Policy, 49(4), 102933. https://doi.org/10.1016/j.telpol.2025.102933

CNN Indonesia. (2023, 27 July). Jumlah pelanggan Telkomsel anjlok 20 juta dalam setahun, cek faktanya [Telkomsel subscriber numbers fall by 20 million in one year: Examining the facts]. CNN Indonesia. https://www.cnnindonesia.com/teknologi/20230727165359-213-978693/jumlah-pelanggan-telkomsel-anjlok-20-juta-dalam-setahun-cek-faktanya/amp

Compass Lexecon. (2023, 28 November). Do four-to-three mobile mergers harm consumers? https://compasslexecon.com/insights/publications/do-four-to-three-mobile-mergers-harm-consumers

detikINET. (2025, 6 March). XLSmart hasil merger XL-Smartfren segera beroperasi, kapan? [When will XLSmart, formed by the XL–Smartfren merger, begin operations?] detikInet. https://inet.detik.com/telecommunication/d-7809652/xlsmart-hasil-merger-xl-smartfren-segera-beroperasi-kapan

detikINET. (2026, 20 May). 31 tahun melayani, Telkomsel bukukan pendapatan Rp 109,3 triliun [After 31 years of service, Telkomsel records IDR 109.3 trillion in revenue]. detikInet. https://inet.detik.com/telecommunication/d-8496928/31-tahun-melayani-telkomsel-bukukan-pendapatan-rp-109-3-triliun

Elliott, J. T., Houngbonon, G. V., Ivaldi, M., & Scott, P. T. (2025). Market structure, investment, and technical efficiencies in mobile telecommunications. Journal of Political Economy, 133(5). https://doi.org/10.1086/734132

Fauziah, R., Yusrina, & Simbolon, E. (2026). Analisi struktuk pasar oligopoli pada industri telekomunikasi di Indonesia [Analysis of oligopolistic market structure in Indonesia's telecommunications industry]. Jurnal Pengabdian Masyarakat dan Riset Pendidikan, 4(4), 28762–28766. https://doi.org/10.31004/jerkin.v4i4.6949

Fikri, M. K., & Firmansyah. (2024). Market structure, conduct, and performance in Indonesia's cellular telecom industry. JEJAK: Jurnal Ekonomi dan Kebijakan, 17(2), 1–18. https://doi.org/10.15294/jejak.v17i2.14358

Fortune Indonesia. (2025). Rekap kinerja emiten telekomunikasi kuartal I penuh tantangan [A challenging first-quarter performance review of listed telecommunications firms]. Fortune Indonesia. https://www.fortuneidn.com/business/rekap-kinerja-emiten-telekomunikasi-kuartal-i-penuh-tantangan-00-3dhnm-78287n

Frias, Z., Lehr, W., & Stocker, V. (2025). Building an ecosystem for mobile broadband measurement: Methods and policy challenges. Telecommunications Policy, 49(5), 102905. https://doi.org/10.1016/j.telpol.2025.102905

Howell, B., Herrera González, F., Serentschy, G., Jamison, M., Potgieter, P., Layton, R., & Herguera García, Í. (2025). Perspectives on political influences on changes in telecommunications and internet economy markets. Telecommunications Policy, 49(2), 102901. https://doi.org/10.1016/j.telpol.2024.102901

Indosat Ooredoo Hutchison. (2026, 9 February). Q4 2025 earnings call transcript. ROIC.ai. https://www.roic.ai/quote/PTITF/transcripts

Investortrust. (2026a, February). Indosat posts strong 4Q25 profit as ARPU hits post merger high. Investortrust. https://investortrust.id/market/94065/indosat-posts-strong-4q25-profit-as-arpu-hits-post-merger-high

Investortrust. (2026b, 15 July). Seleksi frekuensi 700 MHz dan 2,6 GHz rampung, EXCL unggul di 700 MHz dan Telkomsel menang di 2,6 GHz [700 MHz and 2.6 GHz spectrum selection completed: EXCL leads at 700 MHz and Telkomsel wins at 2.6 GHz]. Investortrust. https://investortrust.id/business/109556/seleksi-frekuensi-700-mhz-dan-2-6-ghz-rampung-excl-unggul-di-700-mhz-dan-telkomsel-menang-di-2-6-ghz

Investortrust. (2026c, February). XLSmart (EXCL) bukukan kenaikan laba 63%, dua faktor ini jadi penopang [XLSmart (EXCL) reports a 63% profit increase driven by two factors]. Investortrust. https://investortrust.id/market/94449/xlsmart-excl-bukukan-kenaikan-laba-63-dua-faktor-ini-jadi-penopang

Investortrust. (n.d.). Telco nasional 2026: Telkomsel gas 5G, Indosat benahi harga, XLSmart kejar efisiensi [Indonesian telecoms in 2026: Telkomsel accelerates 5G, Indosat adjusts pricing, and XLSmart pursues efficiency]. Investortrust. https://investortrust.id/business/90241/telco-nasional-2026-telkomsel-gas-5g-indosat-benahi-harga-xlsmart-kejar-efisiensi

Jatmiko, L. D. (2025, 20 April). XLSmart vs Telkomsel vs Indosat: Jumlah BTS, spektrum, dan keunggulan 2025 [XLSmart versus Telkomsel versus Indosat: BTS numbers, spectrum, and comparative strengths in 2025]. Bisnis.com. https://teknologi.bisnis.com/read/20250420/101/1870336/xlsmart-vs-telkomsel-vs-indosat-jumlah-bts-spektrum-dan-keunggulan-2025

Jatmiko, L. D. (2026, 7 July). Jumlah pelanggan Telkomsel, Indosat, dan XLSMART jelang tambahan frekuensi 2,6 GHz [Subscriber numbers for Telkomsel, Indosat, and XLSmart ahead of the additional 2.6 GHz spectrum allocation]. Bisnis.com. https://teknologi.bisnis.com/read/20260707/101/1986220/jumlah-pelanggan-telkomsel-indosat-dan-xlsmart-jelang-tambahan-frekuensi-26-ghz

Jung, J., & Katz, R. (2023). Exploring the heterogeneous link between broadband investment and coverage expansion using unconditional quantile regressions. Telecommunications Policy, 47(9), 102623. https://doi.org/10.1016/j.telpol.2023.102623

Katz, R., & Jung, J. (2025). Drivers of mobile broadband pricing: Cross-national evidence on policy and market dynamics. Utilities Policy, 93, 101879. https://doi.org/10.1016/j.jup.2024.101879

Kibinda, N., Shao, D., Mwogosi, A., & Mambile, C. (2025). Broadband infrastructure sharing as a catalyst for rural digital economy: A systematic review for developing countries. Telecommunications Policy, 49(8), 103028. https://doi.org/10.1016/j.telpol.2025.103028

Kim, M. (2026). Market responses to entry in mobile telecommunications markets: Cross-country evidence. Telecommunications Policy, 50(8), 103255. https://doi.org/10.1016/j.telpol.2026.103255

Komisi Pengawas Persaingan Usaha. (2022, 22 April). ICC comprehensively assesses the merger of Hutchinson with Indosat. ASEAN Competition Portal. https://asean-competition.org/read-cases-icc-comprehensively-assesses-the-merger-of-hutchinson-with-indosat

Komisi Pengawas Persaingan Usaha. (2023). Peraturan Komisi Pengawas Persaingan Usaha Nomor 3 Tahun 2023 tentang penilaian terhadap penggabungan, peleburan, atau pengambilalihan saham dan/atau aset yang dapat mengakibatkan terjadinya praktik monopoli dan/atau persaingan usaha tidak sehat [Indonesian Competition Commission Regulation No. 3 of 2023 on assessing mergers, consolidations, or acquisitions of shares and/or assets that may result in monopolistic practices and/or unfair business competition]. Available from ASEAN Competition Portal: https://www.asean-competition.org/misp/country-pages/indonesia

Kontan. (2021, 29 September). BTS 4G Smartfren Telecom (FREN) mencapai 40.000 unit hingga September 2021 [Smartfren Telecom (FREN) reaches 40,000 4G BTS by September 2021]. Kontan.co.id. https://industri.kontan.co.id/news/bts-4g-smartfren-telecom-fren-mencapai-40000-unit-hingga-september-2021

Liu, Y.-L., Tian, L., Li, C., & Wu, Y. (2024). Analyzing the competitiveness and strategies of Chinese mobile network operators in the 5G era. Telecommunications Policy, 48(2), 102652. https://doi.org/10.1016/j.telpol.2023.102652

Media Asuransi. (2021). Indosat dan Tri merger, jadi operator telko terbesar kedua Indonesia [Indosat and Tri merge to become Indonesia's second-largest telecommunications operator]. Media Asuransi. https://mediaasuransinews.co.id/news-in-brief/indosat-dan-tri-merger-jadi-operator-telko-terbesar-kedua-indonesia/

Morais, W. F. de, & Viana, F. D. F. (2025). Estudo sobre a recente mudança na estrutura de mercado no setor de telefonia móvel no Brasil: Uma análise a partir de indicadores de concentração industrial [A study of recent changes in the market structure of Brazil's mobile telecommunications sector: An analysis using industrial concentration indicators]. Revista Econômica do Nordeste, 56(2), 100–121. https://doi.org/10.61673/ren.2025.1634

Onag, G. (2025, 26 March). XL Axiata-Smartfren merger receives shareholder approval. Light Reading. https://www.lightreading.com/finance/xl-axiata-smartfren-merger-receives-shareholder-approval

Oughton, E. J. (2025). Infrastructure sharing reduces the energy, emissions and costs of universal mobile 4G and 5G broadband. Telecommunications Policy, 49(6), 102961. https://doi.org/10.1016/j.telpol.2025.102961

Rana, M. S. (2026). Impact of technological evolution on the value of spectrum for mobile broadband: Case study of a dense market. Telecommunications Policy, Article 103274. https://doi.org/10.1016/j.telpol.2026.103274

Rewheel. (2024, February). Predicted price increases: Vodafone/Hutchison 4-to-3 UK mobile merger (Public version). https://research.rewheel.fi/downloads/Predicted_price_increases_Vodafone_Hutchison_4_to_3_UK_mobile_merger_PUBLIC_VERSION.pdf

S&P Global Market Intelligence. (n.d.). Asia-Pacific telcos consolidate to compete with market leaders. https://www.spglobal.com/marketintelligence/en/news-insights/research/asia-pacific-telcos-consolidate-to-compete-with-market-leaders

Selular.ID. (2024, June). Infografis perbandingan jumlah pelanggan operator selular 2024 [Infographic comparing mobile-operator subscriber counts in 2024]. Selular.ID. https://selular.id/2024/06/infografis-perbandingan-jumlah-pelanggan-operator-selular-2024/

Selular.ID. (2025, November). Pasar sudah berubah, operator kini tak lagi mengejar sebanyak-banyaknya jumlah pelanggan [The market has changed: Operators no longer pursue the highest possible subscriber counts]. Selular.ID. https://selular.id/2025/11/pasar-sudah-berubah-operator-kini-tak-lagi-mengejar-sebanyak-banyaknya-jumlah-pelanggan/

Tirole, J. (1988). The theory of industrial organization. MIT Press.

Universitas Gadjah Mada. (n.d.). Analisis perubahan struktur-perilaku-kinerja industri telekomunikasi seluler setelah merger PT Hutchison Tri Indonesia Tbk dan PT Indosat Tbk [Analysis of changes in the structure, conduct, and performance of the mobile telecommunications industry after the merger of PT Hutchison Tri Indonesia Tbk and PT Indosat Tbk] [Research report]. Repositori ETD UGM. https://etd.repository.ugm.ac.id/penelitian/detail/244441

Whalley, J., & Curwen, P. (2024). Creating value from 5G: The challenge for mobile operators. Telecommunications Policy, 48(2), 102647. https://doi.org/10.1016/j.telpol.2023.102647

Zagdanski, J., Castells, P., & Bahia, K. (2025). The impact of spectrum set-asides on private and public mobile networks. Telecommunications Policy, 49(7), 102991. https://doi.org/10.1016/j.telpol.2025.102991