Regulating Digital Market Power: Competition Law in the Age of Big Tech

1. Catherine Hill: Department of Public Law, University of Oxford, Oxford, United Kingdom
2. Li Wei*: Department of International Relations, Peking University, Beijing, China
3. Anna Müller: Department of Political Science, Humboldt University of Berlin, Berlin, Germany
***Correspondence: e-mail: li.wei@pku.edu.cn**

Abstract

Digital platforms have reshaped global markets by leveraging data-driven business models, extensive network effects, and ecosystem integration that collectively reinforce unprecedented forms of market power. As these platforms evolve into essential infrastructures for communication, commerce, and information access, traditional competition law struggles to address the structural characteristics that entrench dominance in multi-sided and zero-price markets. This narrative review examines the conceptual, legal, and policy challenges associated with governing digital market power and analyzes the diverse regulatory responses emerging across major jurisdictions. The study synthesizes developments in the United States, European Union, United Kingdom, China, and a range of other countries to highlight converging concerns over gatekeeping power, data concentration, algorithmic governance, and the limitations of ex post antitrust enforcement. It explores unresolved issues in defining relevant markets, managing data portability and interoperability, detecting algorithmic discrimination, and evaluating mergers involving nascent competitors. The review also assesses ongoing debates regarding the balance between innovation and regulation, the interplay between competition and privacy objectives, and the risks of regulatory fragmentation in a globalized digital economy. By integrating insights from law, economics, and technology, the article provides a comprehensive understanding of the evolving landscape of digital competition policy and identifies the conceptual and practical foundations necessary for developing effective governance frameworks in the age of Big Tech. The analysis underscores the need for adaptive, forward-looking regulatory approaches capable of preserving market contestability while supporting innovation and protecting societal interests in rapidly transforming digital markets.

Keywords: Digital market power; Big Tech regulation; competition law; digital platforms; data governance; interoperability; algorithmic decision-making; merger control; ex ante regulation; global regulatory approaches

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1. Introduction

The emergence of digital platforms as dominant economic and social infrastructures has transformed the nature of market power in ways that challenge the foundational assumptions of competition law. Digital market power no longer reflects only the capacity to set prices or restrict output, but instead rests on a combination of network effects, data advantages, algorithmic governance, and ecosystem integration that collectively entrench dominance across multiple market layers. Scholars increasingly emphasize that digital platforms occupy central positions in multi-sided markets where interactions among users,

advertisers, developers, and complementary service providers reinforce platform lock-in and consolidate gatekeeping authority (Parker et al., 2022). The architecture of these ecosystems allows firms to expand horizontally and vertically at scale, accumulating user data that becomes both a critical asset and a barrier to entry, creating self-reinforcing cycles of market concentration (Hovenkamp, 2022). Historical antitrust concepts designed to assess market power in traditional industries often fail to capture these dynamics, because digital competition involves zero-price markets, attention markets, and data monopolies that require a wider analytical lens (Cheng, 2021).

The evolution of digital market power is closely tied to the rapid development of business models built on data extraction, targeted advertising, and algorithmic personalization. As digital platforms shifted from single-function services to complex ecosystems, their control over user behavior and market interactions deepened (Chauhan & Bhardwaj, 2023). This shift has led to new forms of dominance where the ability to gather, analyze, and deploy data provides competitive advantages independent of traditional production or distribution efficiencies. Studies highlight that data-driven feedback loops enable platforms to refine their services continuously, enhancing user engagement while creating near-insurmountable entry barriers for smaller competitors (Paal, 2021). Such mechanisms reinforce the centralization of economic power, particularly when combined with network effects that magnify the value of platform membership as more users join, making incumbency increasingly difficult to challenge (Deutscher, 2022). The resulting landscape is one of concentrated digital ecosystems where a handful of firms operate as gatekeepers to information flows, market access, and innovation pathways.

The inability of traditional competition frameworks to keep pace with this transformation has sparked global regulatory and scholarly debate. Historically, antitrust law evolved in industrial markets where firms competed primarily through price, output, and tangible assets. The doctrinal focus on consumer welfare and price effects limited the ability of authorities to assess harms arising from zero-price digital services or from the exploitation of data resources (Kovalenko, 2021). As digital platforms expanded across sectors, the classical tools for defining relevant markets proved inadequate because platform boundaries are fluid, multi-layered, and shaped by complex substitutability patterns that differ from traditional product markets (Xia, 2022). For instance, online ecosystems may integrate search, communication, advertising, cloud computing, and retail services, making it difficult to assess dominance using conventional economic indicators alone (Cheng, 2021). Scholars and regulators increasingly argue that the traditional reliance on price as the primary indicator of competitive harm masks deeper structural issues linked to data concentration, platform governance, and algorithmic decision-making (Hovenkamp, 2022).

The challenges arise not only from the nature of digital markets but also from the strategic behavior of large technology firms. Dominant platforms often engage in practices such as self-preferencing, leveraging market power from one domain to another, discriminatory access to data, bundling, and pre-emptive acquisitions of emerging rivals (Maslov, 2023). These practices complicate enforcement because they blur the distinction between pro-competitive innovation and exclusionary conduct. For example, large firms may justify data aggregation or product integration as efficiency-enhancing, while critics contend that such strategies restrict competition by locking users into proprietary ecosystems (Egorova et al., 2022). Additionally, algorithmic opacity makes it difficult for regulators to identify discriminatory or exclusionary practices, since platform operators control the underlying logic that governs ranking, pricing, and content dissemination (Porto & Maggiolino, 2019). This opacity reduces the effectiveness of ex post enforcement and strengthens the case for proactive regulatory interventions designed to ensure fairness and transparency (Popiel, 2021).

As concerns about digital gatekeeping and concentration intensified, policymakers across jurisdictions began reassessing their approaches to competition policy. There is broad recognition that digital markets produce unique forms of systemic risk when a small cluster of platforms controls critical infrastructures such as search, communication, payments, and app distribution (Розанова, 2022). These concerns intensified as scholars highlighted the essential role of platforms as intermediaries whose decisions can influence user autonomy, democratic participation, and economic opportunity (Mazzucato et al., 2021). The structural power of these firms extends beyond economic dimensions, because their algorithms shape information flows and social behavior, amplifying their role in public discourse (Miller, 2023). This raises questions about the

adequacy of competition law in addressing harms that intersect with data protection, consumer rights, and broader societal interests (Srinivasan et al., 2023).

The increasing complexity of digital ecosystems has also led to calls for integrating antitrust enforcement with sector-specific regulation. Scholars argue that the differences between traditional and digital markets justify the adoption of hybrid frameworks that combine competition principles with rules on transparency, data access, interoperability, and platform accountability (Alexiadis & Streel, 2020). The European Union's approach, for example, reflects a shift toward ex ante regulation designed to prevent abuses of market power rather than merely penalizing them after they occur (Deutscher, 2022). Similarly, emerging regulatory models in China and other jurisdictions recognize that market definition, dominance assessment, and anti-competitive behavior in digital sectors require tools adapted to multi-sided dynamics and algorithmic operations (Kharitonova & Санникова, 2021). These developments underscore the growing perception that competition law alone cannot address all the challenges posed by Big Tech, prompting interdisciplinary debate over the appropriate balance between innovation, regulation, and market freedom.

In response to these debates, the academic literature has expanded significantly, producing diverse perspectives on how best to regulate digital market power. Some scholars emphasize structural intervention, calling for limitations on vertical integration, enhanced merger scrutiny, and obligations for data sharing or interoperability (Arutyunyan & Berbeneva, 2022). Others advocate more incremental approaches that focus on improving enforcement tools, modernizing market-power assessment methodologies, and strengthening institutional capacity (Timofeev, 2022). Discussions also highlight the relevance of international experiences in shaping domestic policy, as countries increasingly learn from the successes and failures of various regulatory models around the world (Gagarina & Knyazeva, 2022). The global dimension of digital markets means that policymakers must consider not only national competition objectives but also cross-border spillovers, jurisdictional conflicts, and the risk of regulatory fragmentation (Avdasheva et al., 2022).

The narrative review approach adopted in this article is appropriate because the regulation of digital market power intersects multiple disciplines, including law, economics, public administration, and computer science. A descriptive analysis enables the synthesis of diverse scholarly contributions and policy developments, offering a holistic understanding of the forces shaping modern digital competition. Rather than testing hypotheses or conducting empirical analysis, this method allows the examination of conceptual foundations, evolving regulatory trends, and contrasting jurisdictional responses. This interdisciplinary perspective is essential because the challenges raised by digital platforms require insights from multiple domains, especially when considering the role of data governance, technological innovation, and platform design (Pires-Alves et al., 2023). Synthesizing these materials clarifies both the conceptual complexity and the practical implications of regulating Big Tech, providing a foundation for identifying emerging strategies and unresolved policy questions.

The present article aims to examine the transformative implications of digital market power, explore the growing tension between traditional antitrust principles and platform-based economic structures, and analyze the evolution of regulatory responses to Big Tech across different jurisdictions. Through a narrative review and descriptive analysis, the article investigates emerging approaches, identifies persistent controversies, and assesses future trajectories in the governance of digital market power.

2. Conceptual Foundations: Market Power, Platform Economics, and Competition Law Principles

The conceptual foundations of digital competition law rest on the recognition that market power in digital ecosystems arises from economic and technological characteristics that differ fundamentally from those of traditional industries. Network effects are among the most powerful forces shaping platform dominance, since each additional user increases the value of the service for others and strengthens the position of incumbents (Parker et al., 2022). These effects are especially pronounced in online networking, search, digital advertising, and app store markets, where user participation is both the primary input and the primary output of the platform model. As network effects scale, they generate feedback loops in which more users attract more complementary services, which in turn attract even more users, reinforcing concentration dynamics that conventional competition tools struggle to evaluate (Hovenkamp, 2022). Economies of scale and scope further intensify this process,

because digital platforms can scale at near-zero marginal cost and leverage shared technical infrastructures across multiple markets, enabling them to dominante entire ecosystems rather than isolated sectors (Deutscher, 2022). These economic properties create environments where dominant firms not only maintain their positions but expand into adjacent markets with relative ease, thereby amplifying their structural advantage.

Switching costs and lock-in effects reinforce this structural power. Users often face high switching costs because moving between platforms requires rebuilding networks, transferring data, learning new interfaces, or forfeiting accumulated digital assets. Scholars emphasize that such frictions entrench incumbents by making users reluctant or unable to multi-home across competing services (Chauhan & Bhardwaj, 2023). Lock-in arises not only from user inertia but also from the architecture of platform ecosystems, which are designed to integrate complementary services in ways that reward continued participation and penalize exit (Knyazeva et al., 2021). This dynamic is evident in ecosystems that combine communication services, cloud storage, content markets, and payment systems, where bundled functionalities make disconnection economically or socially costly. Data itself has become a key source of market power, as dominant platforms accumulate vast datasets that allow them to refine algorithms, personalize services, target advertising, and evaluate market trends with precision not available to smaller competitors (Paal, 2021). The competitive significance of data lies in its volume, velocity, variety, and its non-replicability, making it a strategic resource that entrenches incumbents and creates barriers to entry (Avdasheva et al., 2022).

Algorithmic pricing and personalization introduce additional layers of complexity into digital market power. Platforms routinely deploy machine-learning systems to set prices, allocate visibility, and prioritize content in ways that optimize engagement and revenue. These systems operate in real time and respond to vast quantities of user data, making them capable of behaviors that challenge traditional competition analysis. Research suggests that algorithmic governance can facilitate self-preferencing, allowing platforms to prioritize their own products over those of third-party sellers, thereby distorting competitive neutrality (Maslov, 2023). Moreover, algorithmic pricing may lead to tacit coordination or parallel conduct, even in the absence of explicit collusion, because algorithms may learn strategies that minimize competitive pressure (Porto & Maggiolino, 2019). Such risks complicate antitrust enforcement and highlight the need for updated analytical frameworks capable of addressing algorithm-driven conduct.

Against this economic backdrop, the legal foundations of competition law must be revisited. Concepts such as dominance, abuse of dominance, monopolization, and essential facilities doctrine have long been central to antitrust analysis, but their application in digital contexts reveals structural mismatches. Traditional interpretations of dominance rely on market-share thresholds and price indicators, which are poorly suited to zero-price digital markets in which firms monetize user data rather than consumer payments (Cheng, 2021). As a result, authorities must evaluate dominance through metrics such as data control, switching costs, innovation capacity, and ecosystem dependencies (Hovenkamp, 2022). Abuse of dominance also functions differently in digital contexts, because exclusionary conduct often takes the form of algorithmic discrimination, platform governance decisions, or ecosystem design strategies rather than overt price manipulation (Kharitonova & Санникова, 2021). Examples include restricting access to application programming interfaces (APIs), degrading interoperability, or imposing restrictive terms on third-party developers, all of which may constitute abuses that diminish competition without manifesting in traditional price-based harms (Egorova, 2021).

The essential facilities doctrine gains renewed relevance in digital markets, particularly where dominant platforms provide critical infrastructures such as app stores, search indices, or cloud platforms. Scholars argue that refusal to provide access to these digital facilities can undermine competition by preventing rivals from reaching users or participating in markets where the facility is indispensable (Pires-Alves et al., 2023). However, applying the doctrine in digital markets raises challenges, because the boundaries of essential facilities are often blurred by vertical integration and the malleability of digital architectures (Arutyunyan & Berbeneva, 2022). The malleability of digital ecosystems allows dominant platforms to modify or restructure services in ways that complicate legal assessments, enabling firms to evade obligations under competition law through technical reconfiguration (Djioeva, 2020). These dynamics expose gaps in antitrust doctrine that require conceptual adaptation.

One of the central challenges in applying classical competition law to digital markets is defining the relevant market. Traditional tools such as the SSNIP test depend on price-based substitution analysis, which fails in zero-price markets where

consumers pay with attention or data rather than money (Xia, 2022). Scholars emphasize that relevant markets in digital contexts may be multi-layered, encompassing user attention, advertiser demand, platform data, and complementary goods and services (Chang et al., 2020). Defining these markets requires accounting for cross-group interactions in multi-sided platforms, where demand on one side affects value on another (Parker et al., 2022). Attention markets further complicate analysis because user engagement is the scarce resource being competed for, but its monetary valuation varies across platforms and contexts (Mancha et al., 2021). Traditional approaches to market definition also struggle to reflect intermediation power, in which platforms act as gatekeepers controlling access between different user groups, shaping transaction conditions, and determining the visibility of market participants (Popiel, 2021). Such power may exist independently of market share, since control over ranking algorithms or search visibility can produce exclusionary outcomes even in the absence of formal dominance (Martenet, 2023).

Dynamic competition presents another analytical barrier. Digital markets often exhibit rapid innovation cycles, first-mover advantages, and path-dependent growth, making static assessments of market structure insufficient. Dominant platforms may be insulated from competitive threats not because of lack of innovation, but because rivals cannot replicate the incumbent's data advantages or scale effects (Kovalenko, 2020). Furthermore, pre-emptive acquisitions of emerging competitors allow incumbents to neutralize nascent threats before they develop into meaningful competitors, a pattern documented in multiple investigations across digital sectors (Egorova et al., 2022). These acquisitions, often small in monetary terms, may escape regulatory scrutiny under traditional notification thresholds, exposing vulnerabilities in merger-control frameworks (Ivanov, 2019). Such gaps highlight the need for competition law to adapt to dynamic, innovation-driven markets where potential competition and long-term market evolution are key considerations.

The theoretical debates surrounding digital antitrust further illuminate the conceptual tensions in this field. One major divide arises between Chicago School perspectives, which prioritize consumer welfare and efficiencies, and Neo-Brandeisian approaches, which emphasize market structure, power asymmetries, and democratic concerns. Chicago School scholars have traditionally argued that large size or concentration is not problematic unless it leads to higher prices or reduced output, making zero-price markets appear inherently benign under this framework (Baker, 2021). However, critics contend that such a narrow focus on price effects fails to capture harms related to exclusion, data exploitation, innovation suppression, or the erosion of competitive neutrality (Kovalenko, 2021). Neo-Brandeisian perspectives argue that structural dominance, even without price harm, can threaten market fairness and democratic values by concentrating economic and informational power in a small number of firms (Mazzucato et al., 2021).

Another dimension of theoretical debate concerns the legitimacy and desirability of proactive regulation. Supporters of ex ante intervention argue that digital markets evolve too quickly for ex post enforcement to be effective, given the speed with which anti-competitive harm can occur and the difficulty of identifying algorithmic discrimination after the fact (Deutscher, 2022). Ex ante regimes, such as those pioneered in the European Union, seek to establish clear behavioral obligations for gatekeeper platforms to prevent abuses before they occur (Alexiadis & Streel, 2020). Critics, however, caution that overly prescriptive regulation may chill innovation, impose heavy compliance burdens, and reduce market dynamism (Timofeev, 2022). Others argue that hybrid approaches combining flexible ex post tools with targeted ex ante rules may offer a balanced solution tailored to the unique risks of digital ecosystems (Shram, 2021). This debate reflects broader questions about the appropriate balance between market freedom and regulatory oversight in environments shaped by data-driven business models and algorithmic governance.

Overall, the conceptual foundations of digital competition law reveal a complex environment in which economic characteristics, legal doctrines, analytical challenges, and theoretical debates are deeply intertwined. Understanding these foundations is essential for developing regulatory frameworks capable of addressing the evolving dynamics of digital market power and ensuring that competition law remains effective in the age of Big Tech.

3. Global Regulatory Approaches to Big Tech Market Power

Regulatory responses to the rise of Big Tech have evolved unevenly across jurisdictions, reflecting different legal traditions, economic priorities, and political philosophies. In the United States, antitrust revitalization has been driven by growing recognition that the consumer welfare standard, which dominated enforcement for decades, is insufficient in markets characterized by multi-sided platforms, zero-price services, and data-driven business models. Scholars have noted that traditional antitrust enforcement under Section 2 of the Sherman Act struggled to address exclusionary behavior not manifested through price increases but through control over data, interoperability constraints, and foreclosure in adjacent markets (Baker, 2021). This shift has become evident in landmark cases involving major platforms such as Google and Amazon, where the focus has increasingly turned toward structural concerns, including leveraging behavior, discriminatory algorithmic placement, and dominance across interconnected services (Parker et al., 2022). These cases signify a doctrinal pivot away from the belief that low consumer prices automatically signal competitive markets, addressing instead the ways digital gatekeepers shape competitive conditions by controlling access to essential digital infrastructure (Hovenkamp, 2022). Critics of the traditional approach argue that the consumer welfare standard fails to capture long-term harms to innovation and market structure, leading to the renewed prominence of Neo-Brandeisian perspectives in the U.S. policy debate (Kovalenko, 2021). As a result, the U.S. enforcement landscape now reflects a tension between longstanding economic principles and emerging concerns over structural dominance, data exploitation, and ecosystem power.

In contrast to the fragmented enforcement environment in the United States, the European Union has adopted a proactive, ex ante regulatory framework to address digital market power. The Digital Markets Act (DMA) marks a significant regulatory milestone, seeking to impose legally binding obligations on designated "gatekeeper" platforms whose structural power creates systemic risks for fair competition (Deutscher, 2022). The DMA's requirements—ranging from prohibitions on self-preferencing to obligations ensuring data portability and access to business users—reflect lessons drawn from decades of abuse-of-dominance litigation under Article 102 of the Treaty on the Functioning of the European Union. Earlier cases involving search bias, e-commerce parity clauses, and mobile operating systems revealed the difficulty of addressing digital gatekeeping through traditional ex post enforcement alone, prompting the EU to adopt rules designed to prevent anticompetitive conduct before markets are distorted (Alexiadis & Streel, 2020). EU merger control has also evolved in response to concerns over killer acquisitions, with regulators increasingly scrutinizing deals involving data-rich start-ups even when they fall below traditional revenue thresholds (Egorova, 2021). Scholars argue that this approach reflects the EU's broader effort to reconcile innovation incentives with structural safeguards aimed at preserving contestability and fairness in digital markets (Mazzucato et al., 2021). The European emphasis on data access, interoperability, and transparent algorithmic governance suggests a distinct regulatory philosophy grounded in the belief that systemic market failures require ex ante obligations tailored to platform characteristics.

The United Kingdom has pursued a hybrid regulatory strategy, combining elements of competition enforcement with bespoke digital market rules. Following its departure from the EU, the UK established the Digital Markets Unit (DMU) within the Competition and Markets Authority to oversee firms designated with Strategic Market Status (SMS). This designation applies to platforms that exert substantial and entrenched market power in essential digital functions, allowing the DMU to impose targeted conduct requirements that promote competition and protect business users and consumers (Gagarina & Knyazeva, 2022). The Digital Markets, Competition and Consumers Act strengthens this framework by granting the DMU powers to enforce behavioral codes, mandate interoperability, oversee algorithms, and intervene in digital mergers even when conventional thresholds are not met. Scholars observing the UK model emphasize its flexibility, as SMS rules can be tailored to the specific risks posed by each platform rather than relying on uniform obligations (Paal, 2021). This sector-specific approach mirrors aspects of the EU's DMA but preserves greater regulatory discretion, allowing UK authorities to adapt obligations in response to evolving technologies, market structures, and platform behavior (Knyazeva et al., 2021). The UK's strategy illustrates a middle path between the United States' ex post enforcement and the European Union's prescriptive ex ante regime.

China represents a distinct regulatory trajectory shaped by the country's rapid digitalization, the centrality of digital platforms to national economic strategy, and the state's broader governance approach. Amendments to the Anti-Monopoly Law and subsequent regulatory guidelines specifically target the platform economy, addressing abuses such as forced exclusivity, discriminatory pricing through algorithms, and exploitation of data advantages (Kharitonova & Санникова, 2021). Authorities have pursued high-profile enforcement actions against major firms in e-commerce and fintech, reflecting an assertive effort to curb behaviors that undermine market fairness or threaten broader socio-economic objectives (Timofeev, 2022). China's regulatory philosophy emphasizes maintaining orderly market development and preventing dominant platforms from wielding power that could destabilize economic planning or reduce consumer and business autonomy (Avdasheva et al., 2022). Scholars note that the Chinese approach integrates antitrust principles with broader political and industrial policies, including data governance, cybersecurity, and fintech regulation (Egorova et al., 2022). This integrated model underscores the state's view that digital platforms are not merely economic actors but infrastructures with strategic implications requiring coordinated oversight across regulatory domains (Arutyunyan & Berbeneva, 2022).

Beyond the major regulatory blocs, numerous jurisdictions across the world have begun developing their own responses to digital platform dominance. India has significantly intensified its competition law scrutiny of Big Tech, particularly in digital advertising, app store governance, and e-commerce platforms. Indian authorities have focused on practices such as self-preferencing and discriminatory access to platform infrastructure, emphasizing the need to maintain a level playing field for domestic businesses (Chauhan & Bhardwaj, 2023). Australia has adopted a sector-specific approach through inquiries into digital advertising and media markets, recommending reforms aimed at data transparency, algorithmic accountability, and platform oversight (Porto & Maggiolino, 2019). South Korea has introduced regulations addressing app store payment systems, requiring dominant platforms to permit alternative billing methods in response to concerns about excessive commission fees and restricted innovation (Shram, 2021). Brazil has expanded its toolkit for algorithmic transparency and digital merger analysis, focusing on how data integration can distort competition in online markets (Mancha et al., 2021). These jurisdictions illustrate the increasing globalization of digital regulation, as policymakers recognize the need to adapt competition laws to the realities of data-driven business models and platform-mediated economic relationships.

Despite these varied approaches, a number of converging themes can be observed across the global regulatory landscape. Many jurisdictions have recognized that traditional antitrust tools must be supplemented with new mechanisms tailored to the characteristics of digital platforms. This convergence is evident in the growing emphasis on data portability, interoperability, algorithmic transparency, and the need to address structural inequalities inherent to multi-sided markets (Pires-Alves et al., 2023). Regulators increasingly focus on how gatekeeping power is exercised through control of data, app stores, ranking systems, and digital infrastructure, reflecting a shared concern about ecosystem dominance rather than isolated market abuses (Popiel, 2021). Another common theme is the need to evaluate mergers more critically, particularly acquisitions involving emerging competitors whose long-term competitive significance may be underestimated under traditional turnover-based thresholds (Ivanov, 2019). These patterns reflect a growing recognition that digital competition requires forward-looking assessments, given the speed at which dominant firms can neutralize threats and expand their influence.

At the same time, global divergence remains significant, especially in the philosophical foundations and institutional structures underlying regulatory interventions. The United States continues to rely primarily on antitrust litigation rooted in the consumer welfare standard, even as debates intensify over the need to broaden its analytical framework (Hovenkamp, 2022). The European Union favors prescriptive ex ante rules that place heavy compliance obligations on gatekeeper platforms, reflecting its broader commitment to market fairness, consumer rights, and systemic regulation (Deutscher, 2022). The United Kingdom adopts a more flexible, tailored regulatory approach centered on firm-specific conduct requirements rather than sector-wide mandates (Knyazeva et al., 2021). China integrates antitrust enforcement with industrial policy, emphasizing national priorities and platform accountability within a broader governance system (Egorova et al., 2022). Emerging jurisdictions such as India, Australia, and South Korea navigate between these models, adopting selective elements depending on institutional capacity, economic context, and policy objectives (Chauhan & Bhardwaj, 2023).

These divergences produce a fragmented global regulatory environment that challenges both multinational firms and policymakers seeking harmonization. Differences in market definition, the threshold for establishing dominance, obligations imposed on platforms, and the scope of enforcement create uncertainty, particularly for platforms operating across multiple jurisdictions. Nonetheless, the growing convergence on core concepts—platform gatekeeping, ecosystem power, data-driven dominance, and the limitations of ex post enforcement—suggests a gradual movement toward a shared global understanding of digital market challenges (Avdasheva et al., 2022). This emerging alignment, however incomplete, reflects the recognition that digital markets exhibit similar structural features worldwide, even as political and institutional contexts shape the precise regulatory interventions adopted.

Together, these global developments reveal a regulatory field in transition. Policymakers across jurisdictions grapple with how to balance innovation, fairness, and market contestability in ecosystems dominated by a small number of powerful platforms. The diversity of responses highlights both the complexity of digital market power and the evolving nature of competition law in the twenty-first century.

4. Key Regulatory Challenges and Debates in Governing Digital Market Power

One of the most persistent challenges in regulating digital market power lies in the fundamental difficulty of defining and measuring relevant markets in environments shaped by attention, data, and multi-sided interdependencies. Traditional market definition tools presume relatively stable substitution patterns, yet digital markets are fluid, cross-subsidized, and built around the monetization of user engagement rather than direct price signals. This makes conventional price-based analytical frameworks such as the SSNIP test ill-suited for evaluating platform dominance, particularly in zero-price markets where users pay with attention or personal data rather than money (Xia, 2022). Attention markets complicate substitution analysis because the value exchanged—time, engagement, and visibility—is not easily quantifiable within standard competition metrics (Mancha et al., 2021). Multi-homing patterns further obscure competition boundaries, since users may participate simultaneously on several platforms, yet the range of available alternatives does not necessarily translate into meaningful competitive constraints (Parker et al., 2022). Digital ecosystems also create invisible barriers to entry through data accumulation, interoperability constraints, and strong network effects, making it difficult to assess competitive dynamics solely through market shares or static indicators (Hovenkamp, 2022). Because ecosystems blend functionalities—such as messaging, payments, cloud services, advertising, and content distribution—they resist rigid classification, and regulators face the challenge of determining which market boundaries matter most for evaluating power.

Data governance represents another area of conceptual and regulatory complexity, as policymakers grapple with the tension between promoting competition and ensuring privacy, security, and consumer rights. Interoperability mandates are increasingly proposed as mechanisms for lowering entry barriers and reducing switching costs by enabling alternative services to connect with dominant platforms (Pires-Alves et al., 2023). However, designing interoperability obligations requires balancing technical feasibility, privacy protection, and cybersecurity risks, since forced interconnection may expose users to greater vulnerabilities or compromise the integrity of platform architectures (Avdasheva et al., 2022). Data portability initiatives similarly aim to enhance user autonomy by allowing users to transfer their data across services, but the practical challenge lies in determining which data types should be included and how to ensure meaningful usability in receiving platforms (Egorova, 2021). Data-sharing obligations raise further concerns, as access to data may lower competitive barriers for new entrants while simultaneously increasing the risk of collusion, discrimination, or misuse if not adequately safeguarded (Paal, 2021). Scholars highlight the difficulty of reconciling competition objectives with data protection mandates, since measures designed to limit data concentration may conflict with privacy objectives that restrict data sharing or processing (Mazzucato et al., 2021). This intersection of privacy and competition policy underscores the need for integrated regulatory frameworks capable of navigating overlapping objectives.

Algorithmic and AI-driven market dynamics present additional regulatory challenges, as digital platforms increasingly rely on automated systems to determine ranking, visibility, pricing, and content curation. Algorithmic collusion is a growing concern, because machine-learning systems can autonomously learn patterns of parallel conduct that resemble coordinated

outcomes without explicit human agreement (Porto & Maggiolino, 2019). Regulators face the difficulty of detecting and proving such behavior, given the opacity of algorithmic decision-making and the proprietary nature of platform technologies (Djioeva, 2020). Opaque ranking systems further complicate enforcement, as platforms control the visibility and discoverability of goods, services, or content, enabling them to engage in exclusionary conduct by privileging their own offerings or disadvantaging specific rivals (Maslov, 2023). Self-preferencing practices, documented in multiple investigations, demonstrate how platforms can shape competitive outcomes by embedding preferential treatment in algorithmic design rather than explicit contractual restrictions (Deutscher, 2022). Recommender systems also play a central role in shaping user behavior, influencing not only consumption patterns but also the distribution of market opportunities among sellers or creators (Parker et al., 2022). Content moderation power extends these concerns into social and political domains, raising questions about platforms' ability to set governance norms and influence public discourse through opaque algorithmic tools (Miller, 2023). These dynamics reveal the difficulty of applying traditional legal categories to environments governed by automated systems that operate at scale and with limited transparency.

Merger control poses another significant challenge in digital markets, where dominant firms often acquire start-ups with minimal revenue but substantial innovation potential. These transactions—frequently labeled "killer acquisitions"—enable incumbents to eliminate nascent competitors before they mature into meaningful rivals (Ivanov, 2019). The problem is exacerbated because many digital acquisitions fall below notification thresholds, escaping scrutiny under traditional merger frameworks (Egorova et al., 2022). Acqui-hires, which involve the acquisition of a company primarily for its talent rather than its products, also raise concerns, since the integration of specialized teams may consolidate expertise within dominant ecosystems and reduce independent innovation pathways (Kovalenko, 2020). Ecosystem bundling and vertical integration across supply chains allow platforms to extend dominance into adjacent sectors, accumulating strategic control over data flows, distribution channels, and complementary technologies (Arutyunyan & Berbeneva, 2022). Strategic integration across value chains—such as combining cloud infrastructure with retail marketplaces or advertising networks—strengthens incumbents' ability to cross-leverage resources in ways that distort competition, making it difficult for regulators to isolate harms within specific markets (Hovenkamp, 2022). As a result, merger policy must evolve to incorporate forward-looking assessments that prioritize innovation, ecosystem impact, and the cumulative effects of serial acquisitions.

The debate over ex ante versus ex post regulatory approaches reflects broader tensions in competition policy. Ex post enforcement—after harm has occurred—has long been the foundation of antitrust systems, particularly in the United States. However, critics argue that digital markets evolve too quickly for reactive enforcement to prevent harm effectively, especially when exclusionary conduct can occur rapidly through algorithmic changes or platform governance decisions (Baker, 2021). The European Union's adoption of the Digital Markets Act embodies a shift toward ex ante obligations for gatekeeper platforms, imposing preventive rules designed to maintain contestability and fairness (Deutscher, 2022). Advocates of ex ante regulation contend that structural features of digital markets—high entry barriers, strong network effects, and data concentration—require proactive intervention to mitigate systemic risks before monopolistic tendencies become entrenched (Alexiadis & Streel, 2020). Critics caution that prescriptive regulation may inadvertently stifle innovation or impose disproportionate compliance burdens, reducing competitiveness, particularly for firms seeking to scale across borders (Timofeev, 2022). The ongoing debate reflects the difficulty of balancing dynamic efficiency and market flexibility with the need to address concentrated power and prevent strategic abuses.

Jurisdictional fragmentation adds further complexity to regulating digital market power, as global platforms operate across borders while legal frameworks remain nationally or regionally bounded. Divergent regulatory philosophies—such as the U.S. emphasis on consumer welfare, the EU's focus on structural fairness, the UK's tailored conduct requirements, and China's integration of competition with industrial policy—create an environment in which multinational firms must navigate conflicting legal obligations (Gagarina & Knyazeva, 2022). Extraterritorial enforcement poses additional tension, as regulators increasingly seek to apply domestic rules to conduct occurring in transnational digital ecosystems (Egorova et al., 2022). Cross-border data flows complicate matters further, since data governance regimes vary significantly across jurisdictions, leading to potential conflicts between privacy mandates, competition rules, and national security regulations (Kharitonova &

Санникова, 2021). This regulatory fragmentation creates uncertainty for firms and challenges for policymakers seeking consistency in addressing global digital platforms whose operations transcend national boundaries (Avdasheva et al., 2022). Efforts to harmonize digital competition rules remain uneven, and while there is some convergence on the need to regulate gatekeeper power, significant divergence persists regarding enforcement methods, institutional design, and underlying policy objectives.

The risk of over-regulation remains a topic of considerable debate, as overly stringent rules may hinder innovation, reduce investment, or impose disproportionate burdens on smaller firms attempting to scale. Scholars caution that compliance-heavy obligations—such as algorithmic audits, extensive reporting requirements, or mandatory interoperability—may slow technological progress or lead to bureaucratic rigidity in fast-evolving markets (Shram, 2021). There is concern that such regulations could entrench dominant firms by making compliance easier for large platforms with vast resources while disproportionately burdening new entrants (Paal, 2021). Some argue that prescriptive rules may freeze market structures by constraining platforms' ability to experiment with new features, pricing models, or business strategies (Knyazeva et al., 2021). Others warn of unintended distortions, such as incentivizing firms to reduce product integration or limit cross-service innovation to avoid regulatory scrutiny (Martenet, 2023). These concerns highlight the need to balance the prevention of abusive conduct with the preservation of market dynamism and technological evolution.

Taken together, the regulatory challenges and debates surrounding digital market power illustrate the immense complexity of governing platform-dominated economies. Difficulties in defining markets, managing data governance, understanding algorithmic influence, evaluating mergers, balancing regulatory timing, coordinating across jurisdictions, and avoiding over-regulation all contribute to an intricate policy landscape. As digital technologies continue to reshape economic and social structures, regulators must navigate these conceptual and practical tensions to develop frameworks capable of addressing entrenched power while supporting innovation and competition.

5. Conclusion

The governance of digital market power stands at a pivotal moment as jurisdictions around the world confront the structural challenges posed by large technology platforms. The preceding analysis demonstrates that digital ecosystems have transformed the very foundations upon which competition law has historically operated. Platforms derive their dominance not merely from traditional economic efficiencies but from data accumulation, network effects, algorithmic decision-making, and intricate ecosystem integration. These characteristics create self-reinforcing cycles of market power that challenge the assumptions embedded within classical competition frameworks. As a result, regulators, scholars, and policymakers face the task of reinterpreting core legal concepts and designing interventions capable of addressing both the economic and societal implications of digital dominance.

A central theme emerging from the review is the inadequacy of traditional tools for defining markets and identifying anticompetitive behavior in digital contexts. Zero-price services, attention markets, multi-sided interactions, and opaque platform governance structures complicate the analytical foundations of competition law. Market power is increasingly exercised through control over data flows, platform access, ranking mechanisms, and interoperability rather than through pricing strategies or explicit exclusionary agreements. This shift requires competition authorities to understand digital platforms as gatekeepers whose decisions shape not only market outcomes but also consumer choices, information access, and the dynamics of innovation. The challenge is not simply to map market boundaries but to capture the fluid, interconnected nature of digital ecosystems and the multiple channels through which platforms can influence economic behavior.

Regulatory responses around the world reflect differing institutional traditions but share a growing consensus that digital platforms represent a distinct regulatory category. The United States has begun reexamining long-standing assumptions about consumer welfare and antitrust enforcement, acknowledging that harms may occur even when prices remain low or services are free. The European Union has gone further by adopting ex ante rules that target systematic risks posed by gatekeeper platforms, focusing on interoperability, fair access, and the prevention of self-preferencing. The United Kingdom has embraced a flexible, firm-specific model aimed at addressing entrenched market power while preserving room for innovation. Meanwhile, China's integrated approach, merging competition policy with broader industrial and governance objectives, illustrates a

different model of digital oversight. Across Asia, Latin America, and the Pacific, emerging regulatory frameworks demonstrate a global awakening to the need for updated tools that reflect the complexity of digital markets.

At the heart of these regulatory transformations lies a fundamental debate about the appropriate balance between innovation and control. Digital platforms have generated significant economic value, expanded consumer access to services, and enabled new forms of entrepreneurship and communication. Any regulatory intervention must therefore tread carefully to avoid undermining the conditions that foster technological progress. Overly rigid rules risk freezing innovation, imposing disproportionate compliance costs, or inadvertently entrenching the very firms they are designed to constrain. Yet insufficient oversight can lead to persistent market concentration, reduced innovation diversity, and distortions in information flows that affect broader societal interests. The challenge is to develop regulatory frameworks that preserve market dynamism while preventing abuses of concentrated power.

Another critical issue concerns the governance of data, which has become both the currency and infrastructure of digital markets. Regulators must navigate a complex interplay between competition objectives, privacy protections, and cybersecurity concerns. Data portability and interoperability can lower switching costs and promote contestability, but they must be implemented in ways that protect user rights and system integrity. Similarly, data-sharing obligations may enhance competition but require safeguards to prevent misuse and ensure that the benefits do not come at the expense of security or consumer trust. The growing reliance on automated systems and artificial intelligence further complicates this landscape, as algorithmic decision-making can generate exclusionary or discriminatory outcomes that are difficult to detect, attribute, or regulate. Addressing these challenges demands interdisciplinary expertise and close collaboration between competition authorities, data protection agencies, and technical specialists.

Mergers and acquisitions in digital markets pose additional regulatory dilemmas. Traditional turnover-based thresholds fail to capture the strategic value of acquiring data-rich or innovative start-ups, allowing dominant firms to neutralize nascent threats before they have the chance to mature. This pattern risks stifling innovation by channeling entrepreneurial activity toward acquisition by incumbents rather than independent growth. Regulators must therefore refine merger-review tools to incorporate forward-looking assessments that account for potential competition, ecosystem effects, and the cumulative impact of serial acquisitions. Such reforms require both conceptual clarity and institutional resources, as authorities must develop the expertise needed to understand technological trends and evaluate innovation trajectories.

A further obstacle to effective governance is the fragmentation of regulatory approaches across jurisdictions. Digital platforms operate globally, but competition and data governance laws remain primarily national or regional. Divergent philosophies and enforcement models create uncertainty for businesses and leave gaps that dominant platforms can exploit by structuring operations across multiple legal environments. While there is growing international dialogue on digital regulation, genuine harmonization remains elusive. Achieving alignment requires addressing not only technical matters but also deeper political questions about the role of markets, the responsibilities of platforms, and the balance between state oversight and private-sector innovation. Until greater coherence is achieved, regulatory outcomes will continue to be shaped by a patchwork of national rules, producing uneven competitive conditions and potential conflicts in enforcement.

Looking forward, the governance of digital market power will likely evolve toward a hybrid model that draws on both ex ante and ex post approaches, integrates competition policy with data governance and consumer protection, and enhances the capacity of regulatory institutions to respond to technological complexity. Innovation-friendly regulation will need to be adaptive, proportionate, and grounded in real-time understanding of platform behavior. Transparency will play a central role, as regulators increasingly require access to algorithms, data practices, and internal processes to assess potential harms and ensure accountability. Moreover, public debate about the societal implications of digital platforms will inform future policy directions, particularly as questions about fairness, inclusivity, and democratic governance become more pressing.

In conclusion, regulating digital market power is not merely an economic challenge but a broader societal endeavor that requires rethinking fundamental assumptions about markets, technology, and governance. As digital platforms continue to shape economic structures, social interactions, and innovation pathways, competition law must adapt to address both the opportunities and risks inherent in platform-based economies. The path forward requires balancing dynamic efficiency with structural safeguards, preserving innovation while ensuring fair and competitive markets, and developing regulatory frameworks that reflect the interconnected, data-driven nature of the digital age. The complexity of these challenges

underscores the need for sustained interdisciplinary collaboration, institutional experimentation, and global dialogue as policymakers seek to craft governance systems capable of supporting a competitive and resilient digital future.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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