A systematic mapping study of effective regulations and policies against digital monopolies: visualizing the recent status of anti-monopoly research areas in the digital economy

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ABSTRACT

The number of digital goods and services within the field of the digital economy is growing significantly while simultaneously causing management and regulation problems over them. This makes policy-makers find it hard to keep up with effective regulations and policies or devise effective measures related to the fair government of digital economy domains, thereby digital monopolies are avoided and healthy competition is improved in digital markets. To increase the role of government in the digital economy, this study aims to provide an overview of research areas related to anti-monopoly aspects of the digital economy and outline rising trends and gaps in regulations /policies against digital monopolies. In this regard, we cover and classify research in the area of digital monopolies and effective regulations during the advances of the digital economy, following the inclusion criteria based on the most recent and most promising topics of the digital economy: big data & artificial intelligence, the platform economy, digital trade, financial technology, sustainability, and human welfare. Based on a five-step procedure of conducting systematic mapping, Swale's move/step analysis framework, this paper provides a visual summary of the status of policy research areas and research agendas.

CCS CONCEPTS

• **Digital economy**; • **Monopoly**; • **Systematic mapping**; • **Regulation**; • **Digital platform**; • **Classified portfolio**;

1 INTRODUCTION

Monopolization of digital markets has become one of the main governmental concerns for policymakers and regulators since it poses a set of serious threats to public welfare and state security such as privacy violations and improper use of digital market power. Anti-monopoly agencies have long been searching for effective ways of regulating digital monopolies in different areas of the digital economy such as AI & big data, fintech, and data-driven platforms. Several studies devoted to the management of digital goods and services have contributed to healthy relationships between stakeholders of the digital economy by providing regulations and policies based on research [1 - 3]. However, to the best of our knowledge, only a few studies exist relevant to the systematical overview of the research of digital economy regulations [4-7]. Additionally, most of those studies were not conducted upon multiple areas of the digital economy (singularly, most attention was paid to platform economy or smart cities or big data), which also motivated our research study to involve multiple areas of the digital economy. This scarcity of systematic knowledge may lessen the awareness of policymakers on how to provide grounded regulations and cause slow integration of academic achievements into the digital economy since the tons of studies devoted to digital monopolies contribute to the cognitive load of processing the established knowledge without guiding systems. Thus, this study aims to provide a systematic framework for regulators of the digital economy to see the overall picture of existing practices and research agendas for regulating
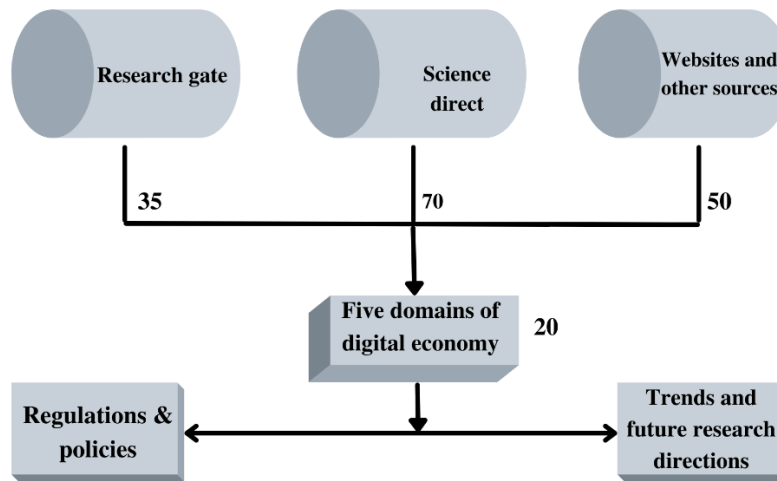
Figure 1: Visual representation of the research plan of our systematic study.

digital monopolies, which is intended to improve the efficiency and qualities of governing e-businesses. A systematic mapping study of 20 digital economy-related primary studies on hot areas of digital business (big data & artificial intelligence, the platform economy, digital trade, financial technology, sustainability, and human welfare) followed the procedures: planning, search execution, selection of primary research studies, data extraction & classification, and analysis & mapping. These procedures were intended to lead to the following research objectives:

- Providing a current visual status of previously established studies on five main areas of the digital economy recently published (mainly in 2021).
- Giving systematic categories of the primary studies according to the monopoly problems they solve
- Identifying trends and research agendas included in digital monopolies and regulations.

The organization of this paper in the remaining sections is as follows. Section 2 describes the systematic planning of the study, research questions, search execution, and the process of identifying primary research studies. Section 3 includes data extraction and classification as well as identification of future research directions and trends on each of the five areas of digital economy research (above-mentioned areas). In section 4, we discuss primary studies and our results about digital monopolies and their regulations. Finally, section 5 contains conclusions.

2 METHODS

The approaches taken in this paper rely on the above-mentioned procedures of systematic mapping study. The main research questions of this paper include:

- What regulations or policies have digital monopolies in five main areas of the digital economy been applied to and how can they be categorized visually?
- What is the validation of anti-monopoly research in the digital economy?

- What trends and limitations exist in recent digital economy research?

2.1 Systematic planning & search process: the process of identifying primary research studies

The scope of this systematic mapping study includes anti-monopoly research of five digital economy fields (Big data & AI, the platform economy, financial technology, digital trade, sustainability, and human welfare) solving digital monopoly issues. To identify these research studies, the following schema guided us (see figure 1 below): search of scientific data from target databases such as research gate, science direct, foreign policy.com, forbes.com, finextra.com, our queries were based on the keywords (such as AI, Big data, Smart Cities, digital platform) related to previously mentioned five domains of the digital economy.

The main pool of selected journals and websites included the Journal of Government and Economics, Research Policy, International Journal of Intelligent Networks, Electronic commerce research, and applications, foreign policy.com, forbes.com, and finextra.com. The number of papers derived from databases and websites was 155 in total. Because of a limited range of digital economy domains selected for our study (five main domains), we only considered scientific works relevant to those domains. This cut-off is mainly based on the following reasons:

- **Legal framework:** Our main attention is paid to the identification of regulations and policies to build a framework that applies to overcoming digital monopolies. Thus, narrowing down the scope of research is crucial to retrieve information from relevant sources.
- **Trends and agendas:** Our secondary objective is to identify trends and research agendas in policy and regulation intervention for reining digital monopolies. That is why we only included sources indicating research directions and trends.

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Table 1: Keyword-based analysis of selected sources from five main domains of the digital economy and distribution percentage of concepts (or concept-related content) across those sources.

Domains of Digital Economy	Big Data & AI (% of papers in this domain)	Financial technology (% of papers in this domain)	Platform economy (% of papers in this domain)	Digital trade (% of papers in this domain)	Sustainability and human welfare (% of papers in this domain)
Keywords based inquiries					
Digital Monopoly	100%	100%	100%	98%	100%
Policy& Regulations	87%	89%	80%	90%	96%
Computer science & ICT	100%	100%	100%	100%	100%
Data & Data Analysis	100%	50%	82%	70%	65%
Government & Digital Economy	97%	96%	99%	95%	94%
Digital privacy & Digital Assets	89%	90%	98%	89%	95%

The percentage-based statistics of selected venues and their respective number of papers are shown in Table 1. To reach the recent status of anti-monopoly research of the digital economy, we included papers published in the years 2020, 2021, and 2022. The table was built by using keyword and target content distribution analysis approaches. This means that we inquired about the selected sources (20 sources) derived from the search process with different keywords and analyzed the content distribution of the sources against keyword-based concepts.

2.2 Inclusion criteria

Our inclusion criteria were based on two important reasons for effective search performance. The first is to include domain-based sources, which means the relevancy of sources to at least one of the chosen domains of the digital economy. The second is the concept distribution score which indicates how much content of the source belongs to the domain-specific concepts (such as digital monopoly, data analysis, and government & digital economy). If this score (in percentage) was greater than 50%, the source was included for inquiry. After the inclusion of relevant sources, the secondary analysis of keyword-based concept distribution across the selected sources was conducted. Table 1 above is the result of that secondary analysis; the percentages mean the content distribution of sources across six keywords. We considered the number of papers within each domain as a whole and calculated the distribution of concepts within this whole dataset with discourse analysis methods (such as the Move & step analysis method).

The authors of this paper examined each paper and annotated them individually. To be clearer, each author analyzed sections of the written sources (for example, the IMRDC section of research articles, Introduction, body, and conclusion of website sources). The paper was included or excluded based on the inclusion criteria mentioned above. In the case of conflict resolution, meetings, discussions, and voting were organized to reach the concession of content and domain mismatch problems.

In total, we identified 20 primary studies across five domains of the digital economy that meet the inclusion criteria. The distribution of the final pool of documents over each domain is represented in figure 2 below.

As it is clear from this diagram, the largest portion of this pie chart belongs to the platform economy. This is because this domain of the digital economy has become a hot discussion of the business community and there is an increasing number of scientific words that explored data-driven platforms and the monopolistic power of those platforms across different digital markets (especially Amazon, Alibaba, Google, etc.).

3 RESULTS

This section outlines data extraction and classification as well as identification of future research directions and trends.

3.1 Data extraction and categorization of primary studies

We based the development of our classification scheme on the protocol advised by Peterson et al. [7]. This protocol can be described concerning the following statements:

- Keyword-based contribution of the documents is applied to their abstract. In the case of a poorly structured abstract, a whole document analysis will be conducted.
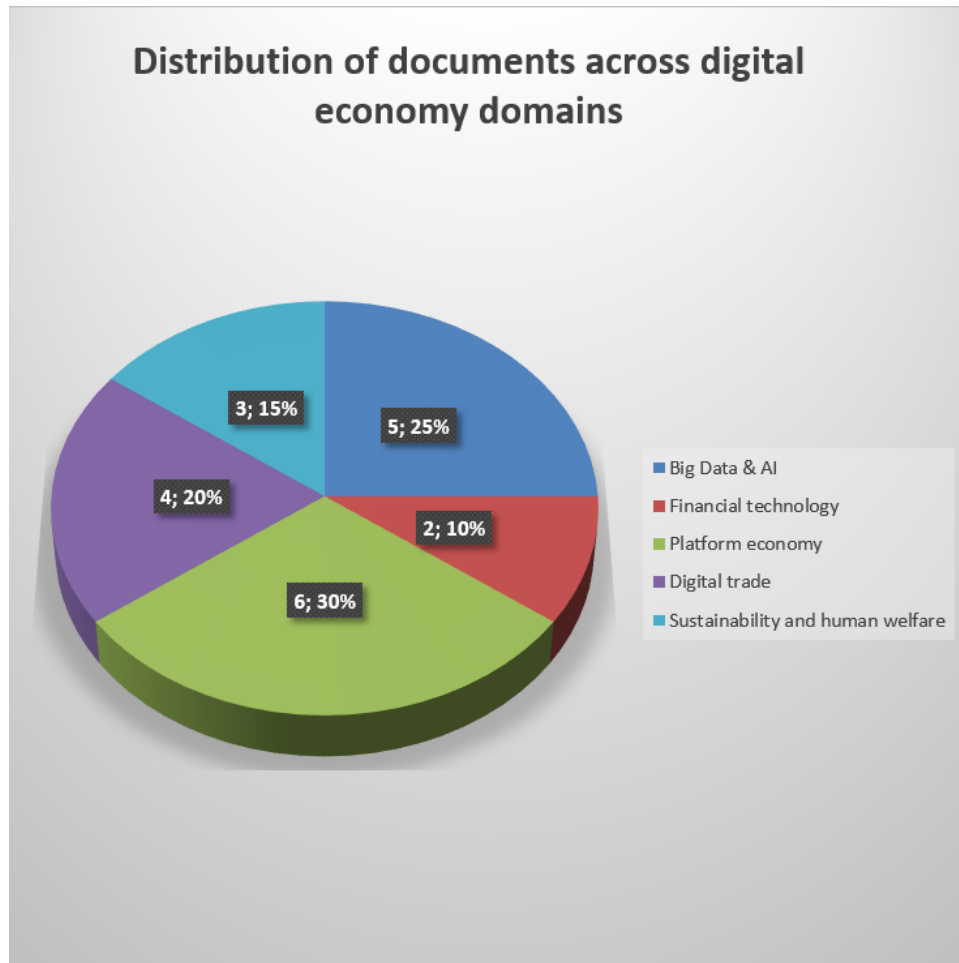
Figure 2: Distribution of key documents across five target domains of the digital economy.

- Assigning documents into preexisting categories is done with their determined keywords, if there are no pre-established categories, new categories are devised.

During the classification of the selected documents of previous studies, we adopted a useful widely used framework of document analysis that was developed by John Swales (1981). Many researchers have performed improvements and applications for this framework so far across different domains [8, 9]. Each of the authors coded necessary rhetorical functions individually through the main sections of the documents by using this useful analytical tool. The categorization of each author was further examined by each member of the classification group. The discussion session was also held to achieve conflict resolutions and mutual agreements over categorizations.

At the ultimate stage of the categorization process, three different categories of anti-monopoly regulations and policies research have been formed in our pool of the selected documents of studies: privacy-related digital monopoly regulations, the regulatory framework of data-driven monopolies, regulating digital platform monopolization. What follows next is the summary of the selected

documents under each category and an outline of the ways for further improvement.

3.2 Privacy-related digital monopoly regulations

Addicted profit-driven e-business may result in Privacy violations. Under this category, we seek to identify effective regulations against monopolizing the power of digital markets arising from match values at the expense of reduced privacy, the most important finding of the data extraction process in this direction is that the aim of competition policy should be the protection of consumers' information rents instead of their privacy [2]. This argument is mainly directed to internet-based matchmakers that earn value by improved matches between sellers and buyers such as Google, and Amazon. Several studies devoted to privacy violations resulted from chasing the monopoly of digital market powers to achieve increasing returns [5, 19-22]. The paper of [3] also claimed the potential conflict between privacy protection and the generation of publicly useful information because of the negative effects of firms' big data

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initiatives on uneducated, poor, technologically less informed layers of the population. This study proposed initiatives for further research and observation about the trade-offs between data markets and personal private interests as an optimal solution for the government.

Chong wang et al. [5] conducted a review of digital privacy-related literature to achieve an interdisciplinary view of digital privacy and practical solution to privacy-related issues. They provided a comprehensive review of managing privacy that informed our legal framework including privacy concerns.

Belleflamme, P. et al [19] explained aggressive pricing of monopolies and their effects on privacy with hidden price conceptualization. This conceptualization also informed this category of anti-monopoly regulations. The job of [21] is also a notable study for consideration of customer privacy in oligopolistic markets. [15] visualized novel economic systems, processes, and segments with the roles of dominant firms and claimed that the monopolistic power of those firms can be displayed with their novel organizational business models in discourse. This claim also helped to shape the general legal framework of privacy-oriented regulation against privacy-reduced and return-oriented monopolistic firms.

In addition to those significant policies and regulations that relate to privacy protection against return-addicted digital monopolies, the boundary resource perspective that initiated the concept of so-called "digital platform governance" proposed by [5] is the second most important contribution to privacy protection over digital monopolies. This perspective of privacy concerns captures many multidisciplinary types of research into a single privacy management practice in the field of the digital economy domain, allowing real-time monitoring of privacy protection for governments.

3.3 Regulatory framework of data-driven monopolies

AI & Big data revolutions have brought growing concerns as new monopolistic power of the digital economy because they tend to naturally gravitate into monopolization. To be more precise, it is clear that resisting high-quality AI-powered companies become very hard for the competitors of that company that holds the market power of digital markets by using advanced algorithms leading to better attraction of customers and their artificial neural networks feeding on data. In this regard, the work of [11, 12] outlined the ways how to end big tech monopolies and the importance of algorithms and data in holding digital market powers. [16] analyzed what roles of government intervention in AI and the data-driven economy will contribute to lessening the role of digital monopolies by revealing the facts of onboarding and tracking customer behavior, which subsequently contribute to the enhanced profitability of businesses. The remarkable work of [1] suggested institutionalized data management for governing shared mobility data, which shed light on our realization of how integrated data platforms support the process of maintaining privacy, agency, and individual participation and tailoring the service of mobility companies to meet the requirements of public policy.

The empirical investigation of [24, 26] clarified the relationships between e-governments and the digital economy in the case of Asian countries. This study is also compatible with the principles of

digital government roles of [3] in terms of how data can be leveraged into profit-oriented goals and lead to a decreased level of privacy protection, which challenges governmental support. Additionally, [16, 27] reported the AI applications of the Asian digital economy in business and social contexts such as natural language processing, and chatbots for customer-facing services thereby revealing how the power of big data and AI penetrated the Asian digital markets.

3.4 Regulating digital platform monopolization

The platform economy is a basic condition for the digitalization of markets, becoming the main character of the digital economy. However, it is concerning that mega-platforms may block access to the market into which a lot of companies thrive to enter with new technologies and innovations [3]. This becomes the new form of digital monopoly that governments must concern about. The argument of the potential monopolistic power of digital platforms was also supported by [1, 12] with their institutional considerations of managing digital platforms. The boundary resource models of [17] explained how to find a balance between platform control and external contribution during third-party development. Urban platform government approaches of [1] are also worthy to include the systematic mapping of this study since it provides basic capabilities of smart city projects including decision-making, processing, and sensing. The integrated data platforms that this study initiated are essential for mediation between different groups of the digital market such as consumers, sellers, and brokers.

The most important finding of this antimonopoly regulation research on the platform economy is the initiative of platform policy about the implementation through platform system design [5]. The important insight derived from this study are as follows:

- Regulations policies of the legal institutions govern platform policies
- Platform policies are related to the design of technical instruments
- Personal data management features of platforms give the possibility for user's information control
- The technical instruments of the platform are related to the platform's personal data management practices
- The design and implementation functions of the platforms allow for empowered digital personality management.
- Personal balance opportunity between platform instrumental benefit and digital privacy

These insights into data platform management enable regulators to build or analyze the design and instruments of digital platforms to avoid discriminatory pricing or improper use of digital privacy data.

3.5 Future research directions and trends in the anti-digital monopoly agency

The systematic mapping study of this paper has also shed light on perspective directions of future research and rising trends in the field of battle against digital monopolies. Below is the outline of research agendas and increasing trends of reining digital monopolies in the digital economy.

[2] indicated the research directions of price regulation by posing the question, what prices depend on the nature of customer

location? that may be misused by monopolistic data-driven businesses to gain even more returns. This can be explained by the fact that if the prices change with customer location, they may be linked to anonymous data (for example, the distance from the closest distribution center instead of considering the customer's delivery address itself).

[5] mentioned important research agendas that academics and policymakers must take into consideration, which are an enrichment of discussing privacy protection from the technical perspective, and unlimiting big data privacy from protecting digital personality only. Furthermore, the research should also need how to use privacy algorithms and blockchain technology in monitoring real-time privacy protection. It is also stressed that evaluative actions must be conducted to the effective management policies and regulations.

Other research agendas stem from our inclusion protocol process where we noticed future work, and research direction sections of the documents. Specifically, we identified [13, 21-42] studies that provided essential research direction to include in future papers. To make it more clear, we applied a systematic coding protocol of move/step framework and linguistic models into the research directions framework, which included individual coding of primary studies and clarifying research directions. We further acknowledge the fact that the role of government must be active across different domains of the digital economy.

Recent work by the authors of this manuscript identified the increasing trends in platform policy design and privacy concern studies and provided systematic guidelines for conducting research in these areas.

4 DISCUSSION

In section 4, we discuss primary studies and our results about digital monopolies and their regulations.

4.1 Quantitative Summary

Our research revealed that privacy-related digital monopoly regulations, using code analysis methods of rhetorical move/step framework, is the largest category of primary studies. The category of the regulatory framework of data-driven monopolies is relatively comparable in size. However, they have significantly fewer primary studies than privacy-related digital monopoly regulations. The category of regulating digital platform monopolization gains the smallest number of primary studies.

Table 1 summarizes the keyword-based analysis of selected sources from five main domains of the digital economy and the distribution percentage of concepts (or concept-related content) across those sources, and the pie chart in Fig 2 shows the distribution of key documents across five target domains of the digital economy. A common topic that our study revealed was that the majority of primary studies proposed privacy violations and protection against monopolies. Another observation is that, except for a few studies on regulating digital platform monopolization [11, 12], the evaluation of the technical design of platforms against its policies in the majority of the primary studies was critical. This emphasizes the need for a policymaking and business community-wide effort

to prepare policy-responsive platforms that support governments, customers, and sellers.

4.2 Limitations of the systematic study

In terms of limitations, we realized that some of our identified categories were more grounded than others. For example, several of the primary studies under the regulatory framework of the data-driven monopolies category were not primarily intended to determine privacy concerns, rather they considered privacy as a customer concern that may be extracted from customer data without consideration of other stakeholders like companies and governments. Additionally, some primary studies may be classified under multiple categories. For instance, the primary study by Nitzberg, M., et al. [12] described techniques for extracting data and platform requirements from the policy. Therefore, it could be classified under both categories, regulating digital platform monopolization and regulatory framework of data-driven monopolies.

5 CONCLUSIONS

We conducted a systematic mapping study of regulations and policies against digital monopolies on five domains of the digital economy: big data & AI, the platform economy, financial technology, digital trade, sustainability, and human welfare. The objectives of this study were to categorize and summarize the primary studies derived from different sources by using Swale's discourse analysis framework and enumerate the regulations to be applied by digital economy policymakers and the research community. Our dataset included 20 primary studies extracted from digital economy venues in the period between 2020 and 2021. These studies were classified, following a systematic coding framework of step & move analysis of textual documents, into three main categories: privacy-related digital monopoly regulations, the regulatory framework of data-driven monopolies, and regulating digital platform monopolization.

The following remarks are provided to conclude the paper: first, while it is crucial to go on the discussions about data privacy based on a technical perspective, platform policy, big data, artificial intelligence, financial technology, and digital trade, investigation of other domains of the digital economy against digital monopolies. According to the findings of this study, it is clarified that active roles of government must exist in crucial aspects of the digital economy such as supervision of market power of e-business, encouragement of increasing innovation, devising an effective legal framework for consumer information rents, effective tax, and incentive systems.

In short, digital assets and digital technologies are more significant than ever in the world of the digital economy, likely making data become the electricity of the modern era. While the scale, scope, and effects of digital goods and services still matter, proper implementation of policies and regulations against digital monopolies is center stage in the world of the digital economy. Governments should support and interfere with the negotiation of digital economy domains and customers, with the only exception of truly exceptional circumstances.

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