Big Tech Rentiership and the Techno-Feudal Hypothesis

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This paper explores the techno-feudal hypothesis in relation to five prominent US technology firms. The companies' revenue streams, expenditures, and asset compositions are analyzed and compared with a sample of large US corporations. Techno-feudal interpretations are contrasted with insights drawn from the research fields of intellectual monopolization, platformization, assetization, and corporate financialization. The findings suggest that, rather than exhibiting distinctively feudal characteristics, Big Tech firms operate as capitalist monopolies engaged in active processes of rentiership, leveraging both intellectual capital and physical infrastructure. This perspective enhances our understanding of the material foundations behind Big Tech market power.
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I. Introduction

In recent decades, Marxist scholars have argued that global capitalism has undergone profound transformations driven by processes of globalization, financialization, and digitalization (Smith, 2006; Lapavitsas, 2013; Mason, 2016). However, a growing number of theorists contend that the resulting trajectory increasingly resembles pre-capitalist socioeconomic formations (Dean, 2020; Durand, 2020; Varoufakis, 2023). In this emerging "techno-feudal" order, the dominant class's earnings are increasingly derived from rents rather than profits. This suggests an alteration in the accumulation model, where the exploitation of labor is gradually replaced by the expropriation of value, particularly among leading companies (Durand, 2022). While this hypothesis does not imply a uniform change impacting all capital holders, it challenges the role of continuous surplus-value creation as the central driver of the current mode of production.

The unproductive extraction of value from assets, driven by the use of property rights under conditions of low competition (Christophers, 2020), evokes images of an economically stagnant and socially unequal feudal past. What distinguishes the present moment from a complete pre-capitalist regression in the techno-feudal narrative is the pivotal economic position of intangible assets and advanced digital technologies, such as platforms, the cloud, and artificial intelligence (AI). These elements propel a data-rich model of monopolistic rent extraction that thrives on network effects and increasing returns to scale (Vasudevan, 2022). Notably, this accumulation model does not necessarily presuppose sustained patterns of investment in tangible capital, such as buildings or equipment (Schwartz, 2022*a*). The specter of techno-feudalism indicates a systemic transformation prompted by two developments: the steady withdrawal of leading corporations from productive activity enabled by their reliance on extra-economic means of value redistribution, such as intangible assets, and the growing infrastructural criticality of information and communication technology (ICT)

This paper examines the suitability of a techno-feudal perspective for interpreting the capital accumulation processes of five prominent US ICT firms – Alphabet (Google), Amazon, Apple, Meta (Facebook), and Microsoft – since the 2008 financial crisis. By analyzing their financial statements, it assesses whether their varying incomes should be conceptualized as economic rents and explores the extent to which their corporate expenditures and asset bases reveal a strategy of intangible-intensive rent extraction in a zero-sum economic game. The paper is organized as follows: First, key Marxist concepts of surplus appropriation are revisited, providing a theoretical basis to review techno-feudalism and alternative paradigms related to Big Tech capital accumulation. Next, the methodology and data are outlined. The research findings are presented, interpreting patterns in the firms' revenues, expenditures, and as-

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sets. The discussion section explores the theoretical implications, followed by the conclusion, which offers suggestions for future research.

II. Theorizing Big Tech Rentiership

A. Exploitation, Expropriation, Rent

In Marxist political economy, inter-firm market competition assumes a pivotal role in accumulation, as it incentivizes profit-maximizing companies to constantly expand their capital while reducing labor-related costs (Marx, 1990). In contrast, techno-feudal scholars envision a structural alteration in this mechanism. Examining monopolistic markets and declining rates of investment and economic growth in advanced economies, economists such as Cédric Durand and Yanis Varoufakis argue that the accumulation processes of leading firms increasingly rely on unproductive rent extraction (Durand, 2020; Varoufakis, 2023). As technology researcher Evgeny Morozov notes, this view contradicts the adage that it is easier to predict the world's end than that of capitalism – although the outcome tends toward an inegalitarian dystopia instead of a classless society (Morozov, 2022).

The concepts of rent and profit are tied to the broader Marxist framework of surplus appropriation. Surplus labor, defined as work exceeding the necessary input for sustaining a worker's life, creates surplus products that are critical for societal progress (Marx, 1990, 647). The mechanisms of appropriating such surplus vary across socioeconomic formations, determined by prevailing production methods and class relations. In Western European feudalism, the institution of serfdom entailed lords' direct appropriation of surplus land produce from peasants in the form of rent. In comparison, under capitalist commodity production the workers' surplus is claimed by the capitalist class as profit[1]. A crucial distinction lies in the relationship of producers to the means of production. Serfs owned tools and livestock (and therefore could independently satisfy their immediate needs) but were tied to the land. Proletarians are completely dependent on continuously selling their labor power on the market for wages, or the means for reproducing their existence. Unlike the non-economic methods of feudal surplus appropriation (e.g., direct force, appeals to tradition), capitalism operates primarily with an economic form of appropriation inextricable from the labor market (Wood, 1981, 75-80). In the Western European context, the transition from feudalism to capitalism marked a shift from surplus expropriation to labor exploitation as the dominant mode of surplus appropriation. Progressive economists, including Guy Standing (2016), Thomas Piketty (2017), and Mariana Mazzucato (2018) have rekindled interest in the notion of economic rent, interpreting it through the neoclassical lens as unearned incomes resulting from market distortions (Stratford, 2023). This perspective links rent to negative outcomes like subpar growth and resource misuse through the concept of rent-seeking (Tollison, 2012), or the attempt to accumulate wealth without contributing to production – often through activities like lobbying and market collusion. Recent work by Mazzucato and colleagues (2023) differentiates such harmful economic activities from "good rents". Such rents are ephemeral, but as argued, they are essential to innovation and growth and possibly beneficial from a socio-economic perspective. In contrast to neoclassical economists, classical political economists such as David Ricardo and Karl Marx understand rents as incomes obtained by owning scarce and valuable assets under limited competition, with land being a primary example. For Marx (1991), rents are deductions from the surplus-value generated in productive capitalist sectors, or derivative revenues arising from monopolistic control over crucial assets in a context of state-enforced property rights.

Despite the conceptual opposition between labor exploitation and rent extraction, the two models can coexist symbiotically in the Marxist framework. For example, rentiers unintentionally incentivize productive capitalists to increase their share of total surplus-value by innovating and rationalizing production, fostering efficiency gains (Cox, 2022). Additionally, as stressed by economic historian Immanuel Wallerstein (1988), capitalists consistently strive to become rentiers by converting temporary economic advantages into lasting monopolies, for instance through patent law and market-cornering. In the long run, the stability of capitalism relies on a fine balance between market competition and monopoly, which prevents both extreme downward pressures on profit rates and excessive rent extraction (Christophers,

[1]Note that these are ideal types, meant to simply delineate the two modes of production.

2016). This Marxist view contrasts with neoclassical conceptualizations of rent, as it effectively denies the possibility of a rentier-free, perfectly competitive market society. Instead, it defines capitalism as the first historical system where the development of productive capital outpaces that of rent-bearing assets, neutralizing the latter's constraining impact on economic growth (Moreno Zacarés, 2021, 52-54).

B. Techno-feudalism(s)

Drawing parallels between Western European feudalism and the digital economy, the techno-feudal hypothesis has gained traction amidst escalating social polarizations, pandemic-related stock market volatility, and the indispensability of ICT. For Varoufakis (2023), two recent developments – the diminishing importance of market-mediated productive activity for revenue generation and the rising structural power of Big Tech – have dealt capitalism a fatal blow. Tracing these transformations to the privatization of the internet and central banks' responses to the global economic crises, Varoufakis argues that digital platforms constitute not multisided markets, but fiefs that prey upon both workers and subordinated capitalists. Political theorist Jodi Dean (2020) complements this narrative by outlining four attributes of techno-feudalism: fragmentary sovereignty, new lords and peasants, privileged municipalities and desolate hinterlands, and a growing sense of catastrophe. Along similar lines, critical theorist McKenzie Wark (2019) suggests that capitalism's imminent demise results from the turn to ICT as a countermeasure to the effects of secular stagnation. While digital technologies are employed to optimize production processes, they also concentrate power in the hands of the proprietors of their underlying information infrastructures, creating an asymmetric position that facilitates value extraction without direct engagement in production. Furthermore, the distinctive properties of data – such as its quasi-infinite reproducibility – may create inexhaustible revenue sources for their owners through artificial enclosures such as intellectual property (IP) rights.

Durand's discussion of techno-feudalism focuses on the ascendance of ICT companies in the Global North in tandem with the growing significance of intangibles in their asset bases, a dynamic leading to rents that siphon value from consumers and other firms. Like Wark, Durand contends that intangible-rich firms exploit asymmetrical market exchanges, creating sustained patterns of dominance. Building on studies that link the profit-investment puzzle to intangible assets, he argues that large Western firms disproportionately profit from global value chains (GVCs) by specializing in intangible-intensive phases of the commodity lifecycle (Durand, 2020). Additionally, Durand and Milberg (2020) introduce a taxonomy of rents extracted by dominant firms that relate to the creation of artificial enclosures via IP rights. These four types are natural monopolies and their resulting network externalities, differential returns on intangible assets, and data-driven innovations. However, unlike Varoufakis and Wark, Durand does not emphasize that information itself produces value. He instead asserts that the monopolistic control of information pathways in the hands of leading corporations is becoming the primary means of appropriating surplus. Durand (2020) situates techno-feudalism historically by comparing Western European feudalism with the current economic landscape. In this connection, he argues that concentrations of intangible assets erode capitalism's competitive dynamics, leading to a stagnant economy with no systemic incentives to increase productivity by implementing innovative, labor-saving technologies. Focusing on Big Tech firms, Durand (2020, 224) depicts their expenditures in research and development (R&D) and the acquisition of tangible capital as strategies that entrench control over avenues of rent extraction in a zero-sum economic game.

Morozov (2022) offers a critical assessment of the techno-feudal hypothesis. In his analysis, he argues that the proponents of this hypothesis misconstrue the distinction between Western European feudalism and global capitalism, which leads to a problematic understanding of the purported emerging order. Drawing from debates in Marxist historiography, Morozov contrasts two perspectives: one emphasizing capitalism's essential reliance on labor exploitation, and a Wallersteinian alternative highlighting the global coexistence of exploitation in core economies and exploitation in the periphery as a definitory trait of historical capitalism. The latter approach aligns with studies emphasizing the pivotal roles of slavery, racism, and patriarchy in capitalism's evolution, a viewpoint endorsed by Morozov, who asserts that the predatory tendencies emphasized by techno-feudal scholars are inherent to global capitalism. On Morozov's terms, the techno-feudal hypothesis appears oblivious toward longstanding patterns of North-South expropriation, with an excessive focus on developments unfolding in advanced economies.

Political economists Sterenn Lebayle and Nicolas Pinsard (2021) further note that techno-feudal scholars erroneously generalize the notion of rent, obscuring its divergent functions in feudal and capitalist conditions. Following Marx, they argue that feudal rent involves the direct extraction of surplus produce, while capitalist rent arises after the production process through the redistribution of surplus-value among the different segments of the ruling class. However, capitalist redistribution is more susceptible to market competition and political contestation. Monopoly rents stemming from IP rights, for instance, depend on preferential legal frameworks that require continuous investments in lobbying. In effect, Lebayle and Pinsard argue that the techno-feudal metaphor fails to separate passive medieval appropriation from capitalist rentiership, which depends on dynamic and open-ended processes of securing rents through both law and market. The two political economists also criticize the oversimplification of analyzing incomes in the digital economy solely through the lens of rent, emphasizing that Big Tech incomes also include temporary super-profits and "traditional" profits drawn from the exploitation of their workers. The theoretical inconsistencies and oversights in the techno-feudal hypothesis, as highlighted by Morozov and Lebayle and Pinsard, call for further conceptual and empirical work.

C. Big Tech as a Capitalist Phenomenon

In contrast to the scholarship on techno-feudalism, several heterodox research fields contextualize Big Tech accumulation within the broader landscape of contemporary capitalist developments. The first paradigm to consider involves studies on intellectual monopolization (Pagano, 2014), or the concentration of knowledge-based intangible assets (e.g., patents, copyrights, and brands) on the balance sheets of leading global firms. Such asset concentration allows monopolistic economic actors to expand their incomes without commensurate investments in tangible capital. This capacity exacerbates macroeconomic stagnation, restricts market competition by locking other firms in subordinate positions, and augments income inequality (Orhangazi, 2019; Rikap, 2021; Rotta, 2022; Schwartz, 2022*a*). However, studies on intellectual monopoly, such as Baran- Sweezy (1966) and Cowling (1983), do not propose that these processes result in a transition to a feudal-like mode of production. Instead, they revive heterodox theories of monopoly capitalism, arguing that investing in intangible assets empowers leading firms to enclose knowledge as valuable assets, raising barriers to the dissemination of information (Rikap, 2021). Empirical analyses lend credence to the notion that intangible-intensive firms achieve high profitability without proportionate tangible capital formation, often through outsourcing the physical production of commodities to the Global South (Schwartz, 2022*b*; Orhangazi, 2019). Firm-level analyses offer additional insights, with some delving into Big Tech rentiership processes. For instance, political economist Cecilia Rikap (2022; 2023) illustrates how large ICT firms extract rents from IP-protected intangibles derived from collaborations with third parties such as universities, offering little to no compensation for the other contributors. This process not only benefits Big Tech economically but also structures technological evolution in fields like AI to align with the profit-driven goals of market incumbents (Rikap and Lundvall, 2021).

Intellectual monopoly scholarship may inadvertently neglect the nuanced dynamics of Big Tech's underlying platforms. In contrast, studies on platform capitalism and data assetization explore the intricacies of digital services and untangle the processes through which data is transformed into rent-bearing assets. Research in these fields constructs platform taxonomies, acknowledging variation in rent extraction processes among Big Tech business models while situating them as extensions of a distinctively capitalist logic of rentiership (Sadowski, 2020; Birch, 2020). For instance, Srnicek (2017) argues that data itself is not the source of value in the digital economy but a vital input enabling rent extraction. This compels ICT firms to obtain data by continuously monitoring users, shaping spending behaviors and optimizing proprietary services (Zuboff, 2019). For Srnicek (2017), the rise of the digital economy emerged as a capitalist response to economic stagnation, involving the redirection of capital toward platform businesses for their potential to accrue monopoly rents. Combining artificial scarcities and natural monopoly characteristics inherent to the platform model, Big Tech firms foster lock-in mechanisms and economies of scale, while selective investments in cutting-edge technological fields solidify their monopoly positions (Coveri and Guarascio, 2022). Assetization studies further clarify the conversion of information into rent-bearing assets, showing that data does not automatically take an asset form, but must instead be consciously turned into valuable resources via discursive practices

and IP-related limits to access (Birch, 2020). For example, current accounting standards for intangible assets prevent the assetization of user data via traditional economic models of discounted cash flows. As a result, proxy measures like user engagement metrics – rather than user data itself – are often treated as assets by Big Tech managers and investors (Birch and Ward, 2021). Based on available financial data, Big Tech's supposed dependence on intangible assets is thus challenged by assetization studies, as the firms in question report lower proportions of intangibles to total assets compared to other top US companies[2].

The final alternative perspective this paper draws on comes from research on the financialization of non-financial corporations. As described by van der Zwan (2014), corporate financialization operates both as a macroeconomic phenomenon that shifts income generation from productive activity toward financial channels, and a firm-level pursuit of maximizing shareholder value. Financialization scholars examine how firms use financial operations and assets to boost profitability and stock market performance, not as a novel accumulation strategy, but as an extension of existing strategies within advanced capitalism (Klinge et al., 2023; Auvray et al., 2021).

Focusing on US and Chinese Big Tech, Klinge et al. (2023) analyze these firms' financial statements to evaluate their efforts to solidify their monopolistic positions. Their findings reveal common accumulation patterns among Big Tech corporations, characterized as self-reinforcing mechanisms of rent extraction embedded within financialized capitalism. Noteworthy insights include above-average profit rates resulting in increased financial asset holdings for older companies like Apple and Microsoft and the use of cheap debt to fuel mergers and acquisitions (M&A) and share repurchases. Among these notable observations are also the practices of newer companies such as Alphabet, Amazon, and Meta, who prioritize reinvesting in consolidating their market power rather than paying dividends. However, a limitation of their study is its focus on the period from 2000 to 2020, overlooking recent variations in Big Tech financials related to the pandemic and the subsequent AI boom. Fluctuations in market capitalization among large ICT firms, along with waves of layoffs and the meteoric rise of AI startups and hardware providers like Nvidia, raise questions about how Big Tech is navigating the post-pandemic economic landscape. To address this gap, this paper extends the timeline under consideration to 2023, enabling a more comprehensive understanding of Big Tech accumulation patterns since the 2008 crisis.

III. Investigating Big Tech Rentiership

This paper focuses on five prominent US ICT firms (Alphabet, Amazon, Apple, Meta, and Microsoft) and builds upon previous studies highlighted above that frame these corporations as pivotal players in the Global North's digital economy (Durand, 2020; Birch and Cochrane, 2022; Klinge et al., 2023). With a timeline stretching from 2008 to 2023, the analysis examines the evolving strategies of Big Tech rentiership in the wake of the financial crisis[3]. The paper explores patterns in Big Tech financial statements, leveraging the Orbis corporate database for quantitative data, and supplementing this with revenue stream information from the firms' 10-K reports to the Securities and Exchange Commission (SEC). To compare the evolution of Big Tech with that of other large corporations, the paper also analyzes a sample of the largest US non-Big Tech firms[4]. The analysis covers the three components of firms' financial statements – profit and loss (P&L) accounts, cash flow statements, and balance sheets and focuses on stylized corporate indicators such as revenues, expenditures, and asset structures. Additionally, the construction of expenditure-to-revenue ratios highlights the proportion of income allocated toward growth. This exploration of financial data contributes to an empirically grounded discussion on situating Big Tech within the context of a purported shift toward a regressive socioeconomic formation.

[2]However, this conclusion should be taken with a grain of salt, not only due to challenges in valuing intangible assets but also because certain Big Tech business lines gaining prominence in recent years (e.g., cloud services) inherently rely on a combination of tangible and intangible assets. I thank an anonymous reviewer for pointing this out.

[3]Due to space constraints and data availability issues, the case selection excludes Chinese and European Big Tech, while acknowledging the necessity for subsequent studies to explore these firms in relation to the techno-feudal hypothesis

[4]The sample includes all US corporations with a current market capitalization exceeding $10 billion. Consistent with the methodology used by Orhangazi (2008), firms from the finance, insurance, and real estate (FIRE) sectors are excluded based on their US Standard Industrial Classification Codes. This exclusion is motivated by the substantial weight of financial assets of financial assets on FIRE balance sheets, which would severely distort the comparison sample. Consequently, the comparison sample contains 479 corporations.

Specifically, it questions the notion that these companies should be conceptualized as passive rentiers that rely on intangible assets while avoiding productive activities and capital formation.

A. Revenues

Big Tech experienced spectacular economic growth after 2008. By the end of 2023, these firms had a collective market capitalization exceeding $10 trillion, accounting for more than a quarter of the total capitalization of the S&P 500 index (2022). Big Tech experienced a sharp post-pandemic setback in 2022, with a decline of $3.8 trillion in market capitalization. This downturn can be attributed to global economic changes and a shift in investor focus. Meta was hit the hardest, experiencing a 71% decline in its capitalization. However, amid the AI boom of 2023, Big Tech stocks experienced a strong rebound, with values exceeding even their 2021 peak. Examining the firms' P&L accounts shows a steady increase in operating revenues, with cumulative sales in 2023 more than 11 times higher than in 2008. This remarkable sales growth enables Big Tech to spend more on internal development and to diversify by acquiring competitors, further reinforcing their market dominance (Klinge et al., 2023). The five firms also demonstrate exceptional profitability compared to other large corporations in our sample, with Big Tech averaging a 19.39% profit rate in 2023.

The techno-feudal literature attributes Big Tech's economic ascent to a platform model characterized by network externalities, increasing returns to scale, and high entry costs (Durand, 2020). As platform capitalism scholars further highlight, this model relies on extensive data capture through service cross-subsidization and user engagement maximization (Srnicek, 2017; Zuboff, 2019). While these insights enable parallels between Big Tech and traditional natural monopolies – supporting the relevance of rent in conceptualizing ICT income streams – Boyer (2022) calls for a more nuanced analysis that acknowledges the varied service models and potentialities among platforms. Using self-reported revenue-by-segment data from annual SEC filings, this paper categorizes Big Tech's income generation into three ideal types: advertisement (Alphabet, Meta), e-commerce (Amazon), and hardware/software (Apple, Microsoft) (see Figure 1). Recognizing the multi-source nature of each firm's revenue aligns with Christophers' (2020) argument that rents constitute only part of rentier firms' incomes. The analysis also considers aggregate shifts in Big Tech revenues, such as the growing prominence of rentier incomes – particularly in advertising and cloud services.

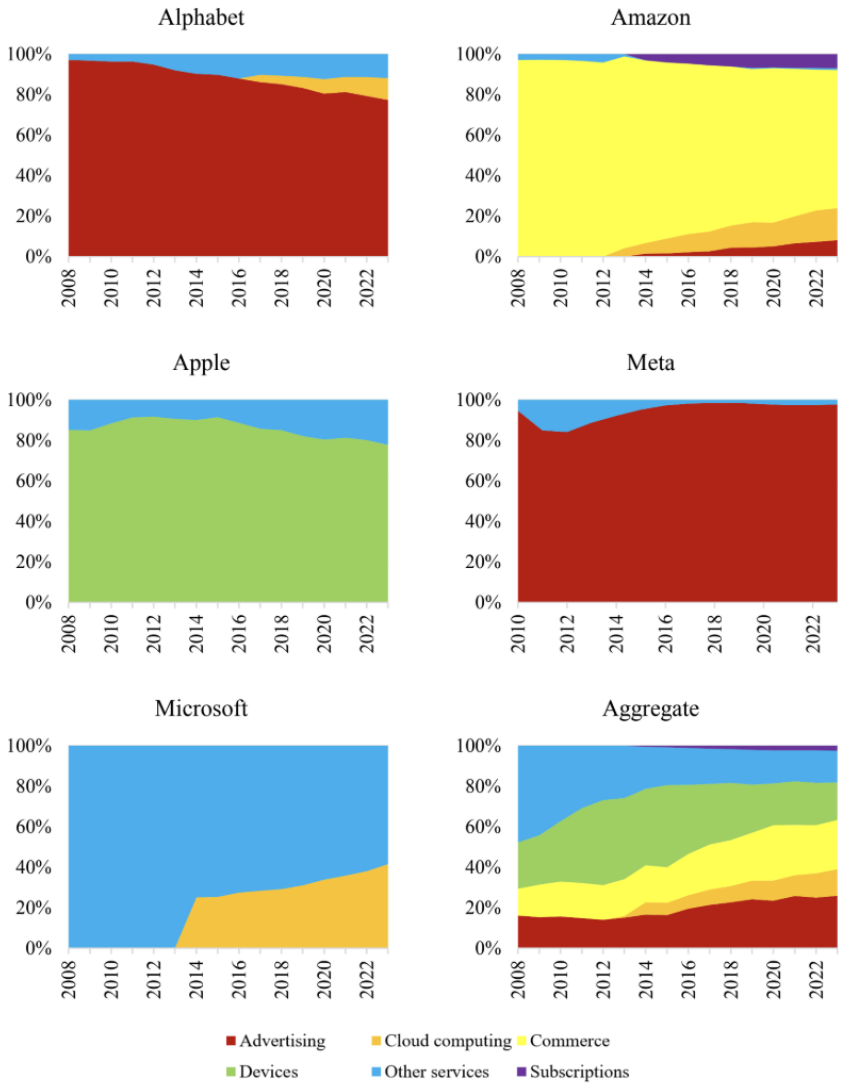

FIGURE 1. REVENUE COMPOSITIONS (PERCENTAGE OF TOTAL REVENUE)

Source: SEC filings
Note: Amazon and Microsoft started reporting cloud computing and subscriptions as separate business segments only in the early 2010s; Meta did not file 10-K reports before 2010; for Microsoft, the "Other services" category includes business productivity tools and personal computing software.

The advertisement model is often characterized as the quintessential form of extra-economic expropriation in the digital economy (Zuboff, 2019). Srnicek (2017, 49-60) identifies three key stages in this model: the extraction of user data, its algorithmic processing, and the commercialization of the resulting information for advertising purposes. The commodity being traded is therefore not raw user data itself, but tailored advertising spaces created through data science and sold to third-party bidders. Firms' monopolistic control over data holdings creates scarcity, turning advertising spaces into rent-bearing assets. Advertisers pay rents to access these spaces, while sellers expand data collection to generate more customized user profiles. Although this advertisement platform model serves primarily as a mechanism for rent extraction, it can also indirectly boost the realization of surplus-value at the aggregate level, as third-party firms leverage advertising to accelerate commodity sales. Alphabet and Meta closely align with the advertisement model, effectively forming a digital ad duopoly. Their combined market share was approximately 57% in 2023, influenced by increased competition from established firms, particularly Amazon, as well as new entrants like TikTok. Although Alphabet has diversified its income streams since 2008, reducing the proportion of advertising in its operating revenues, its advertising incomes have surged more than tenfold since 2008, reaching $237.9 billion in 2023. In contrast, Meta represents an even purer model, with advertising accounting for 97.8% of its revenues in 2023, showing the significance of user data assetization in its business model.

Despite a declining trend since 2013, retail continues to be Amazon's primary revenue source, accounting for 68.2% of its total revenues in 2023. According to Boyer (2022, 1860), the company's competitive advantage lies in its efficient intermediation between buyers and sellers, making it resemble a traditional commercial capitalist. By acting as a mediator, Amazon extracts a share from the aggregate surplus-value pool rather than engaging in surplus-value production. Theoretically, its revenues align more closely with commercial profit than with land rent, as described by Marx (1991, 379-416). However, this perspective may overlook Amazon's distinctive accumulation processes driven by data assetization. Amazon has been presented as a data-driven innovation rentier that monopolizes information from both its customers and third-party sellers, leveraging this market position to optimize internal processes and forecast consumer demand (Rikap, 2022; Durand and Milberg, 2020). This data-intensive accumulation strategy – crucial for maintaining leadership in the e-commerce sector – incentivizes Amazon to subsidize user prices for unprofitable services such as product delivery while generating net profits from AWS, its cloud business. Consequently, Srnicek (2017) primarily categorizes Amazon as a cloud rentier, noting the increasing proportion of its cloud-related revenues since 2008 relative to its e-commerce income.

The hybrid hardware/software model, exemplified by Apple and Microsoft, predominantly generates income through the sale of devices and the provision of digital services. While both companies hold significant market positions in productive activities – particularly in the personal computer operating system and global smartphone markets - rentier elements still underpin their accumulation strategies. Schwartz (2022*a*) discusses how Microsoft's reliance on copyright-protected proprietary software, such as Windows, creates artificial enclosures for rent extraction through a legally enforced monopoly. Similarly, Durand (2020) notes that Apple benefits from intangible-differential rent, capitalizing on the uneven distribution of intangible intensity in GVCs. This disparity allows Apple to scale its operations more efficiently and cost-effectively within its GVCs compared to other participants. Acknowledging the rentier aspects within the hardware/software model offers a nuanced understanding of how rent extraction intersects with productive activities in the business models of Big Tech firms.

The exploration of the cumulative evolution of Big Tech reveals a notable trend: a sustained proportional increase in income from advertising and cloud computing. By the end of 2023, advertising accounted for 25.8% of Big Tech revenues, driven not only by established players like Alphabet and Meta but also by Amazon's more recent entry into this sector. While Amazon's advertising revenues for 2023 represent only 12.7% of the combined totals of Alphabet and Meta, they have grown significantly, increasing from 1.4% to 8.2% of Amazon's operating revenues between 2014 and 2023. Likewise, cloud computing revenues have risen from virtually zero in 2013 to 13.1% of Big Tech revenues in 2023. These trends indicate an escalating process of rentiership, notably affecting the income shares generated by various digital services.

The analysis of revenue sources highlights substantial variations in Big Tech business models, particularly in their reliance on rentier activities such as advertising and cloud computing. Companies like Alphabet and Meta lean heavily on rent-based revenues from digital advertising, while Amazon increas-

ingly draws income from cloud services, and Apple and Microsoft balance hardware and software sales with rentier elements like platform fees. Despite these differences, the overall trend points to a growing share of rent income across the sector, particularly since 2013.

B. Expenditures

Historically, R&D expenses have been closely linked to economic growth, as they foster innovation and improve efficiency in production. However, the outcomes of corporate R&D are often codified into IP-protected intangibles, granting firms enduring advantages and facilitating rent extraction (Klinge et al., 2023). Within the literature, the discussion around Big Tech's R&D spending is polarized between techno-feudal scholars and their critics (Durand, 2022; Morozov, 2022). While the former understand it as reinforcing predatory capabilities, the latter emphasize its generally productive effects. A synthesis of these perspectives, framed within monopoly capitalism scholarship, argues that continuous R&D is crucial for Big Tech to maintain market dominance (Lebayle and Pinsard, 2021; Coveri and Guarascio, 2022; Rikap, 2023). In this context, the firms' rentiership functions as an active process that safeguards opportunities for rent extraction, potentially yielding positive productivity effects at the aggregate level. During the period of examination, Big Tech's R&D spending has consistently increased, exceeding $222.9 billion in 2023. Additionally, Big Tech has ranked at the top of global R&D spending charts since 2021.

Between 2008 and 2023, Big Tech firms allocated an average of 7.4% to 13.8% of their operating revenues to R&D expenditures, significantly higher than the comparison sample's average of approximately 2.3%. Among Big Tech companies, Meta leads in proportional R&D spending, while Apple lags, indicating a potential underinvestment in innovation activities. Although firms are not required to disclose detailed R&D information to regulators, proxy studies on patents reveal that Big Tech focuses on cutting-edge technologies such as AI, cloud computing, and big data processing – areas seen as essential for consolidating their monopoly positions in the long run (Rikap, 2021; Rikap and Lundvall, 2021).

Big Tech's data-intensive business models require substantial capital expenditures (CapEx) for developing the material infrastructure of the digital economy such as submarine cables, data centers, and high-performance processors. These investments create formidable barriers to market entry and enable large firms to lease their infrastructure through cloud computing services (Srnicek, 2017). As shown in the previous subsection, cloud computing has become a significant and increasingly important revenue source for Big Tech, especially amid the post-ChatGPT AI boom. While Big Tech's net CapEx is lower than its R&D spending, it has shown consistent growth since 2008. Notably, Amazon has experienced the largest absolute increase in CapEx since 2020, representing almost a third of total Big Tech CapEx in 2023. This surge may be attributed to shifts in pandemic-driven demand and changes in executive management strategies, as well as AI-related data center investments.

The comparison of expenditures to operating revenues reveals significant differences. Meta consistently exhibits the highest proportional net CapEx, while Apple tends to underinvest, reflecting its strategy of offshoring device production. Since 2014, Big Tech has consistently outperformed the sampled firms in proportional CapEx spending, primarily driven by the capital-intensive nature of cloud computing. This proportional CapEx disparity between Big Tech and the comparison sample has tended to widen over time, with Big Tech averaging 9.1% of operating revenues in 2023, compared to 6.2% for the sampled firms. Moreover, in absolute terms, Alphabet, Amazon, and Meta emerged as the leading corporate CapEx spenders in 2023, surpassing industrial giants like General Motors, Verizon, and Exxon.

As emphasized in previous sections, Big Tech's M&A is pivotal in consolidating market power. From the perspective of intellectual monopolization scholars, M&A facilitates capital centralization by acquiring horizontal competitors and utilizing GVCs to disarticulate vertically (Rikap, 2022). Financialization studies highlight that Big Tech's M&A activities are fueled not only by their liquid financial assets, such as cash, but also by increasing amounts of debt (Klinge et al., 2023). In contrast, techno-feudal and platform capitalism scholars argue that Big Tech M&A follows a distinct logic: prioritizing data accumulation over traditional horizontal or vertical integration, resulting in diversified business ventures (Srnicek, 2017; Durand, 2020).

Despite these perspectives, Big Tech's financial statements show sporadic surges in cash-financed net M&A. Since 2008, Microsoft has led M&A spending, with a cumulative total of $96.3 billion, followed by Alphabet and Amazon. Apple, on the other hand, prefers smaller acquisitions and has the lowest

M&A spending relative to revenues. Meta made notable acquisitions in the early 2010s (Instagram and WhatsApp), contributing to its significant, although less frequent, M&A outlays. Although Big Tech's M&A spending per revenue is generally lower than that of the sampled firms, this does not undermine the significance of M&A in their strategies. Instead, it highlights the growing role of debt, as opposed to cash, in financing these acquisitions.

As the analysis of Big Tech expenditures shows, these firms strategically allocate resources to sustain market dominance amid rapid technological change, challenging a simplistic view of their activities as purely predatory in a zero-sum game. Significant investments in R&D, CapEx, and M&A allow them to drive innovation, expand infrastructure, and reinforce competitive advantages. While rent extraction plays a role, Big Tech's expenditures reveal a complex strategy of balancing rentier practices with productive activities and capital formation.

C. Assets

Since 2008, Big Tech's total assets have increased nearly 13-fold, reaching $1.92 trillion by 2023, with tangible assets accounting for over a third of this figure. Tangibles, such as plant, property, and equipment, have grown steadily. This growth is driven by considerable CapEx particularly in infrastructure vital to the digital economy. Amazon is the most tangible-intensive among Big Tech firms, with substantial holdings in warehouses and data centers, while Apple, relying on an outsourced production model, has the lowest ratio of tangible assets to total assets. Despite being often overlooked, this physical infrastructure is crucial to the operation of global information systems.

Both techno-feudal and intellectual monopoly theories stress that Big Tech's accumulation of intangible assets is playing a foundational role in these firms' ascent (Durand, 2020; Rikap, 2021). Leading international accounting standards define intangibles as non-physical and non-monetary assets (e.g., copyrights, brands), although they always possess a physical aspect, such as the tangible computer media used for storing data. In 2023, Microsoft held the largest amount of intangible assets among Big Tech firms, valued at $77.3 billion. While Meta's intangible assets have remained relatively stable since 2014, both Alphabet and Amazon have seen substantial growth in this area. In contrast, Apple stopped reporting its intangible holdings after 2017. Previous research indicates that most intangibles on Big Tech balance sheets consist of goodwill, rather than copyrights or trademarks (Birch and Ward, 2021; Klinge et al., 2023). Goodwill, which arises from M&A, underscores the critical role of market consolidation in Big Tech's valuations. However, it also highlights the limitations of current accounting practices in capturing the value of intangibles generated through internal R&D, which are often missing from balance sheets. As a result, the dominance of goodwill suggests that the true value of Big Tech's intangible assets may be significantly underestimated.

To address this mis-measurement issue, this paper adopts the methodology proposed by Franco et al. (2024) (see also Peters and Taylor (2017)). It estimates the value of organizational and knowledge intangibles based on firms' selling, general, and administrative (SG&A) expenses, as well as their R&D expenditures. The holistic analysis of the asset bases of Big Tech reveals compelling trends (see Figure 2).

For all Big Tech firms except Apple, there is a notable shift over time toward a higher proportion of tangible assets, largely at the expense of their current assets. This growing tangible-intensity is particularly evident in Amazon, whose operational model relies heavily on physical assets such as warehouses. For other firms, this trend reflects their substantial investments in developing physical infrastructure to support the data- and processing-heavy demands of cloud computing and AI-related services. For all Big Tech firms except Microsoft, the share of non-goodwill intangibles in their asset bases has increased, largely driven by substantial R&D spending that generates knowledge intangibles. In 2023, Amazon emerged as the most intangible-intensive firm, with non-goodwill intangibles constituting over two-thirds of its total assets. This shift toward durable assets, both tangible and intangible, is accompanied by a proportional decrease in current assets, likely reflecting the firms' use of extensive cash reserves to finance their expenditures.

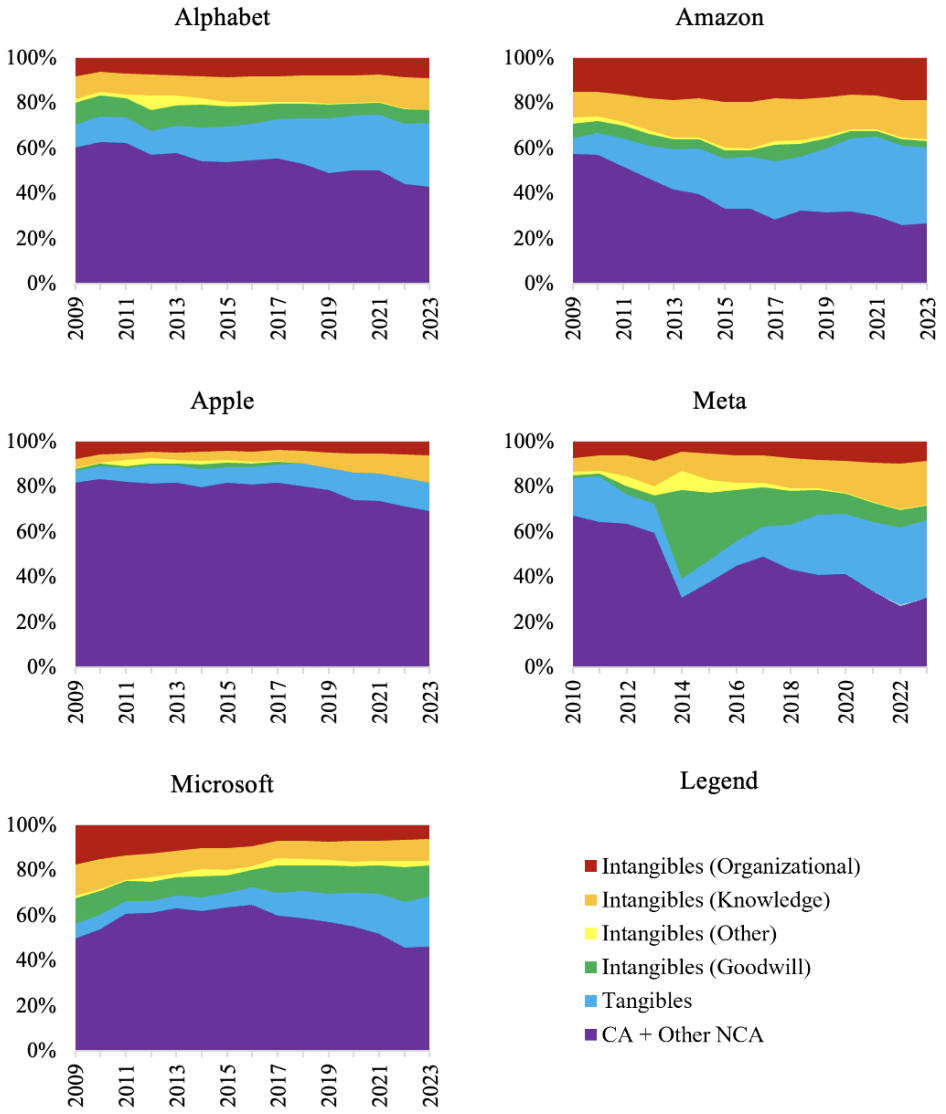

FIGURE 2. ASSET COMPOSITION, BY FIRM (PERCENTAGE OF TOTAL ASSETS)

Source: Orbis
Note: 1) "CA" and "Other NCA" stand for current assets and other non-current assets, respectively; 2) Although Orbis lacks a specific variable for SG&A expenses, it provides a pre-EBITDA metric labeled "Other operating income (expense)", separate from R&D expenditures and cost of goods sold. This metric is utilized as a rough approximation of SG&A. Following Franco and colleagues (2024), knowledge intangibles are determined by summing the current year's R&D expenditure with 80% of the previous year's. Organizational assets are computed as 30% of the current year's SG&A, in addition to 80% of the previous year's.

On the aggregate level, (see Figure 3) Big Tech balance sheets reveal a notable long-term decline in current assets, in contrast to the substantial growth of tangible assets and a more moderate proportional rise in intangibles. By 2023, tangible assets made up nearly 27% of Big Tech's total assets, closely followed by non-goodwill intangibles at 26.4%. This reallocation illustrates the increasing importance of both physical infrastructure and intellectual capital in the firms' business models. In contrast to Big Tech, the asset allocation of the sampled firms remains relatively stable over the period under observation. Non-goodwill intangibles consistently make up just under a quarter of their total assets, only marginally below the proportion seen in Big Tech. However, it is important to note that, in absolute terms, the value of Big Tech's non-goodwill intangibles has risen at a significantly sharper rate than that of the sampled firms. By 2023, Big Tech's non-goodwill intangibles were valued at more than 11 times their 2009 levels, compared to only a doubling in value for the sampled firms. Even this impressive growth is overshadowed by the expansion of Big Tech's tangible assets, whose value in 2023 was 42 times higher than in 2009, showing a major rebalancing toward physical capital.

Aggregate trends suggest that over time, Big Tech has shifted its asset base not toward a greater emphasis on intangibles, but rather toward increased physical capital investments. This shift is marked by a reduction in the share of current assets and a growing reliance on tangible assets, making Big Tech more similar to the other large corporations in our sample.

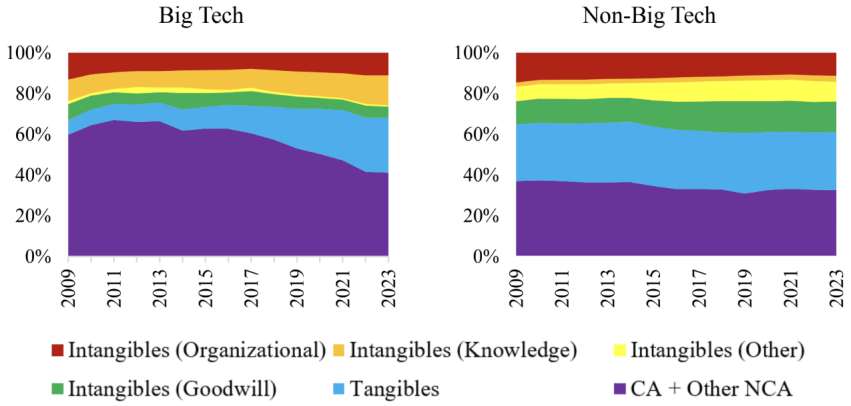

Figure 3. Asset Composition, aggregate (percentage of total assets)

Source: Orbis

IV. Discussion

The three key findings from the analysis of Big Tech financial data in relation to the techno-feudal hypothesis require further reflection. First, the variety of these firms' income streams cannot be fully explained by the economic concept of rent. Second, their expenditures reflect a complex strategy that balances rent extraction with investments in productive activities. Third, the evolution of their asset bases suggests a growing convergence with other large corporations.

The P&L accounts of Big Tech reveal substantial divergences in the firm's business models, reflecting different operational structures and stages of firm maturity. None of these firms relies on a single revenue stream, although their business models can be broadly categorized into three ideal types: advertisement, e-commerce, and hardware/software. While the advertisement model most unambiguously exemplifies rent extraction, the other models represent a mixture of economic exploitation and extra-economic expropriation. However, techno-feudal scholarship often overlooks these distinctions by presenting a uniform rentier model, failing to account for the interplay between productive activities, third-party efficiency enhancements, and truly expropriative practices. A more nuanced analysis of Big Tech's

revenue generation must acknowledge these empirical differences, as well as platform-related advantages such as economies of scale and network externalities – elements that financial accounts alone cannot capture, but which are theorized by platform capitalism and intellectual monopoly scholars.

Big Tech expenditures indicate substantial investments in innovation, physical capital formation, and market concentration. This finding, in turn, challenges the techno-feudal characterization of these expenditures as simply reinforcing expropriation mechanisms. The ever-increasing R&D spending of Big Tech indicates a strong focus on developing advanced technologies, while their CapEx on physical infrastructure demonstrate a commitment to strengthening the material foundation of the digital economy. Additionally, their M&A activity shows a strategic intent to consolidate market power. These spending patterns reflect an interplay between rent extraction and productive investments driving technological advancement and economic growth. Competitive pressures intrinsic to capitalism, which techno-feudal scholars argue have waned, create the necessity for such investments; without competition, Big Tech would lack the incentives to undertake these ambitious initiatives. The dynamic between competition and efforts to curtail it, such as through M&A, highlights Big Tech's dual strategy of fostering growth while seeking to preserve market dominance against rivals.

Over time, Big Tech's asset bases have increasingly shifted from current assets toward tangible assets, while the proportion of non-goodwill intangible assets has remained relatively stable. Nonetheless, these intangibles have grown significantly in absolute terms and at a much faster rate than those of the other sampled firms, reflecting Big Tech's ever-rising R&D expenditures. However, a trend toward convergence is evident, with Big Tech asset structures increasingly resembling those of other large corporations rather than exhibiting completely novel allocations of assets. This finding challenges the notion put forward by the techno-feudal literature that large ICT firms' supposedly more intangible-intensive models signify a departure from conventional asset structures. Instead, it demonstrates that maturing Big Tech firms are leveraging their massive cash holdings to expand their physical capital, aligning more closely with other large corporations.

Overall, techno-feudal scholarship advances an overly simplistic perspective on Big Tech's diverse revenue streams and expenditures. Rather than viewing these firms merely as entities that extract rents from their intangible assets in a zero-sum economic game, it is more illuminating to conceptualize them as monopolistic actors navigating complex forces of market competition and cornering within capitalism. This approach highlights the empirical diversity reflected in their financial statements and facilitates a more nuanced discussion regarding the material foundations of Big Tech's market power. Such insights can inform potential political and legal solutions, including reforms to IP legislation, restrictions on further M&A, the breakup of large ICT firms, and the development of public alternatives.

This does not negate the reality of the broader macroeconomic trends emphasized by techno-feudal theorists. Indeed, productivity growth has slowed in advanced economies, and intangibles are more prevalent on the balance sheets of leading global firms today than in the previous century. However, analyzing these phenomena without relying on the techno-feudal metaphor allows for a more precise understanding of their position within the long cycles of capitalism. Effectively, the techno-feudal metaphor shares the same flaw as neoclassical discussions of rent: it treats rentiership as a distortion of capitalism rather than recognizing it as one of its inherent tendencies. This perspective falsely postulates a form of pristine capitalism devoid of extra-economic expropriation, which has never historically existed.

V. Conclusion

This paper questions the appropriateness of a techno-feudal perspective in analyzing Big Tech, contrasting it with frameworks that do not anticipate an imminent departure from capitalism. The findings suggest that, rather than reflecting feudal traits, Big Tech firms function as capitalist monopolies engaged in active strategies of rentiership, leveraging both intellectual and physical capital. Techno-feudal interpretations often overlook the empirical diversity of these firms, as well as their intersections with productive activities, innovation, and growth, thereby obscuring the complex dynamics at play between Big Tech and the wider techno-economic landscape.

The tension between Big Tech and the techno-feudal hypothesis presents fruitful avenues for further research. Investigating the relationship between the US federal government and domestic ICT giants may reveal not just the state's role in fostering and supporting these firms' dominance, but also Big Tech's

growing influence on public policy. Additionally, exploring Big Tech's shareholder structures within the context of asset manager capitalism could clarify how shared ownership shapes their competitive strategies. Finally, given the Global North bias in techno-feudalism discussions, a comparative analysis of large Chinese ICT firms could uncover divergent trajectories in the alleged shift towards techno-feudalism.

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