Modern models of international competitiveness of Big Tech corporations: internal drivers versus external shocks

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Abstract. This paper examines the contemporary models of international competitiveness adopted by Big Tech corporations between 2010 and 2025. The study aims to identify the internal drivers underpinning the resilience of technological giants and to assess their capacity to withstand external shocks, including sanctions, geo-economic fragmentation, and regulatory shifts. To achieve this objective, the authors employ a comprehensive methodological framework that integrates financial performance analysis (revenue, return on assets), market metrics (market share, international footprint), innovation activity (R&D intensity, patenting), and qualitative attributes such as network effects, lock-in effects, and corporate dynamic capabilities. The empirical basis of the research draws on data from Statista, IDC, and Omdia concerning global smartphone shipments by key vendors from 2009 to 2026. The findings indicate that the primary internal drivers of competitiveness are data network effects, ecosystem-based user lock-in, control over strategic infrastructure (data centers, chips, submarine cables), and sustained R&D investments that often exceed the national budgets of entire countries. External shocks, such as the sanctions imposed on Huawei, have laid bare the vulnerability of even the largest players: the company's shipments plummeting from 240.5 million units in 2019 to 35 million in 2021 underscores a critical dependence on global supply chains and access to digital ecosystems (Android, Google Services). At the same time, Samsung has managed to maintain a stable position (62.8 million units in Q1 2026) owing to its vertical integration and diversification. The conclusions drawn are relevant for the development of corporate strategies and state industrial policy in the context of digital transformation.

Keywords: international competitiveness; Big Tech; network effects; lock-in effect; dynamic capabilities; digital ecosystems; geo-economic fragmentation, technology giants

JEL codes: F23, L10, O32, O33, M16

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Introduction

Between 2010 and 2025, the global economy underwent a fundamental transformation driven by the ascendance of Big Tech corporations. A defining feature of these companies' operations is their use of data as a core resource and the proliferation of network effects [5]. In 2007, not a single digital platform ranked among the world's top ten companies by market capitalization; by 2023, such firms occupied seven of those ten slots [12]. These corporations have evolved into not merely the largest players on the global stage but also pivotal actors shaping technological trajectories, establishing new standards of competition, and exerting substantial influence over institutional environments at both national and supranational levels. In the context of rapid digitalization, the rollout of 5G networks, the advance of generative artificial intelligence, and mounting geo-economic fragmentation, understanding the mechanisms that secure the enduring competitive positions of tech giants holds both theoretical significance and practical import for devising effective strategies at the firm level and for state industrial policy. This underscores the relevance and necessity of investigating the Big Tech phenomenon.

Within the scholarly domain, a debate persists concerning the applicability of microeconomic theories of competitiveness – particularly Michael Porter's framework – to the analysis of platform-based digital ecosystems. The networked nature, data-driven scale effects, and multi-sided markets fundamentally alter conventional understandings of entry barriers and market power, necessitating either an adaptation of existing theoretical constructs or the development of novel approaches [9]. Porter's classic model, formulated to analyze traditional "pipeline" businesses where value is created through a largely controllable linear chain of value addition, proves inadequate for capturing the dynamics of platforms. In platform ecosystems such as Apple iOS, Google Android, or Huawei HarmonyOS, the key asset resides not in internal resources but in the external community of users and complementors. Competitive advantage is forged less through the optimization of internal processes and more through the orchestration of interactions among the different sides of the platform (consumers, developers, advertisers) and the stimulation of positive network effects [17]. This reorients strategic focus from resource control to the management of relationships and the ecosystem itself.

A crucial shift in entry barriers in the digital era is the emergence of data network effects. In traditional industries, barriers to entry are erected by economies of scale in production or capital intensity. A second distinctive feature of Big Tech competitiveness is the lock-in effect – namely, the strategy of ensconcing users within closed ecosystems [3]. Corporations aspire not merely to sell a product but to integrate the consumer into a web of complementary services, from which exit entails considerable cost. For instance, Apple's competitive edge is closely tied to the deep integration of its devices (iPhone), operating system (iOS), and services (App Store, iCloud). Samsung, in turn, relies on the vertical integration of its manufacturing capacities, including its own semiconductor fabrication plants, ensuring command over its value chain. Huawei is forging its own technological ecosystem through the HarmonyOS operating system, the AppGallery application store, and cloud services.

In the Big Tech sector, dominant players can leverage accrued data troves to perpetually refine their algorithms and service offerings. Expanding audiences amass more data, thereby enhancing product quality, attracting new users, and creating a self-reinforcing cycle of growth [4]. This erects hurdles for new entrants that are extraordinarily difficult to surmount with a cheaper or technologically superior alternative alone. Nevertheless, some scholars observe that data scale effects are not absolute barriers, and their potency is contingent on context. Critical factors include not merely volume but also data quality, uniqueness, and the firm's capacity to analyze and monetize that data effectively[1]. "Multihoming" is a scenario, in which users simultaneously engage with several competing platforms, can substantially weaken a leader's market power by lowering switching costs and opening up opportunities for new players [4].

In response to the inadequacy of classical models, researchers have proposed adaptations. For example, work on adapting the Five Forces model for digital streaming platforms reveals that contemporary entry barriers are shaped as much by technological infrastructure and sustainability (including access to green energy) as by financial capital [9]. Supplier power undergoes transformation: within ecosystems, holders of intellectual property and creators of original content assume pivotal roles. Consumer power, conversely, is amplified by algorithmic personalization but simultaneously constrained by it, as algorithms can generate 'filter bubbles' and reduce the visibility of alternatives. Novel threats also arise – substitutes can emerge from

[1] Iansiti, M. (2021). The value of data and its impact on competition (Harvard Business School NOM Unit Working Paper No. 22-002). Harvard Business School. Source: https://www.hbs.edu/ris/Publication%20Files/22-002submitted_835f63fd-d137-494d-bf37-6ba5695c5bd3.pdf (accessed on 12.04.2026)

adjacent industries (e.g., video games as substitutes for video content).

This ongoing debate has given rise to extended conceptual models. The 'Five Forces Plus' model, for instance, proposes supplementing Porter's original five forces with three new ones: control over data and algorithms, platform governance (including access rules for complementors), and geopolitical/regulatory pressure [2]. This approach acknowledges that competitive dynamics in the Big Tech era are significantly shaped not only by market but also by non-market factors, encompassing antitrust regulation (such as the EU's DMA/DSA acts) and technological rivalry between jurisdictions (e.g., US sanctions policy against Huawei).

Conceptually, Teece's dynamic capabilities framework is regarded as highly promising for analyzing the competitiveness of digital platforms. Unlike Porter's static model, which captures industry structure at a given moment, dynamic capabilities focus on how firms can create, extend, and transform their resource bases amid rapid technological change. Teece delineates three key micro-foundations of dynamic capabilities: the capacity to sense and identify opportunities, the ability to seize new possibilities, and the capacity for continuous transformation [16]. In this vein, platform ecosystems face three tasks: promptly and accurately recognizing technological trends (e.g., the adoption of the Internet of Things, sensor usage, the transition to AI), timely restructuring the business model (e.g., shifting from device sales to service provision and subscriptions), and reconfiguring the ecosystem of interacting players. Huawei's development of HarmonyOS in response to losing access to Android serves as a compelling illustration of exercising transforming capabilities in the face of an exogenous shock.

Thus, the contemporary academic discourse is pivoting from whether Porter's model is applicable to how it must be modified and which concepts – dynamic capabilities [16], multi-sided market theory [15], or network effect analysis [10] – should complement it to adequately capture competitive processes within digital ecosystems. There is now a general recognition that traditional industry analysis is giving way to ecosystemic, dynamic, and interdisciplinary approaches.

The present study is positioned squarely within this logic. In contrast to works that focus on a single theoretical lens, we propose an integrated model for assessing Big Tech's international competitiveness, merging conventional financial and market metrics with qualitative characteristics inherent to digital platforms: data network effects, the lock-in effect of closed ecosystems, dynamic capabilities for reconfiguring business models in response to technological waves, and the consideration of external regulatory and geopolitical shocks.

The purpose of this research is to identify the internal factors underpinning the international competitiveness of Big Tech corporations and to assess their resilience to external shocks (sanctions, regulatory constraints, geo-economic fragmentation) through an analysis of financial, market, innovation, and non-financial indicators over the period from 2010 to 2025. The object of the study comprises the largest multinational corporations in the Big Tech sector, including Apple, Samsung, and Huawei, alongside other digital platforms and technology firms that define the global competitive environment in the development of smartphones, semiconductors, operating systems, cloud services, and communications infrastructure.

Main Part

An examination of definitions in contemporary economic literature reveals that the concept of "competitiveness" is not universal and must be strictly defined according to the level of aggregation. A typical methodological error is transferring the logic of the micro-level, where competition ends with the bankruptcy of a firm, to the macro-level, where the state does not exit the market by similar rules and where welfare is determined by long-term productivity and the quality of institutions [11]. Following this logic, competition as a rivalry for market share is based on rational resource use and innovation [18], while the competitiveness of a firm itself, according to Porter's classic definition, lies in its capacity to sustain advantages through unique value and proper positioning [13].

Competitive advantages are further subdivided into lower-order ones, which are easily imitable and dependent on external circumstances, and higher-order ones, which are internally cultivated and more durable [13]. The international competitiveness of corporations represents a specific case, entailing the capacity for cross-border operations and benefiting from differences across locations [6]. In studying Big Tech competitiveness, it is essential to distinguish between the macro-level (national productivity and institutions), the meso-level (the sector's position in global value chains), and the micro-level, where the results and strategic potential of individual firms are assessed [7].

At the micro-level, it is appropriate to employ a system of complementary indicators, including financial metrics – revenue, net profit, and return on assets (ROA) (CFA Institute) – as well as market metrics – market share and the scale of international presence[2]. Of paramount importance is the innovation component, measured through R&D intensity and patent activity[3], along with intangible assets such as brand, customer base, and digital ecosystems that create barriers to entry for competitors (IAS 38). Thus, the proposed approach to assessment through a combination of financial, market, innovation, and non-financial indicators enables the consideration of both current operational results and long-term drivers of sustainability for global technology corporations.

Between 2010 and 2025, the scale of investment in research and development became a critical barrier to entry into the industry. In 2024, the five largest US technology companies allocated approximately USD 227 billion to R&D, surpassing the civilian research budgets of most developed nations [1]. A specific feature of competition was the willingness of corporations to fund strategically important yet loss-making projects for years, including developments in artificial intelligence, quantum computing, and autonomous systems. A special place in the competitive struggle was occupied by control over strategic infrastructure – data centers, submarine cable systems, and specialized chips for training neural networks. Huawei, relying on state support and substantial subsidies, managed to take a dominant position in the 4G network market in Africa, controlling up to 70% of the continent's network infrastructure [1]. Control over physical infrastructure is gradually transforming into geopolitical influence: countries that have integrated their digital economies into Big Tech platforms find themselves obliged to follow technical standards set by these corporations.

The competitiveness of the sector is closely linked to dynamic capabilities – the ability to rapidly reallocate resources and reconfigure business models under the influence of new technological waves [3; 8]. The strategic deployment of artificial intelligence enables operational efficiency fundamentally unattainable for traditional firms, making the speed of adaptation an independent competitive advantage. A significant dimension of the competitive struggle remains the role of state industrial strategy, particularly in the context of US-China rivalry. Chinese corporations' benefit from subsidies and the closed nature of the domestic market, allowing them to ramp up R&D investments: in 2023, Huawei's R&D expenditure exceeded the combined spending of European competitors Nokia and Ericsson [1]. By the mid-2020s, the sector faced systemic challenges, including antitrust investigations, data protection legislation, issues of algorithmic bias and disinformation, and the environmental agenda related to the high energy consumption of data centers and water usage for cooling AI systems [1; 12].

Let us consider the development of the smartphone market since 2009 in its dynamics (Fig. 1).

Based on the presented data on worldwide smartphone shipments from the fourth quarter of 2009 to the first quarter of 2026, several well-founded conclusions can be drawn. The global smartphone market expanded rapidly from 53.9 million units in Q4 2009 to a peak of 430.7 million in Q4 2016, driven by the proliferation of smartphones and the replacement of feature phones. After 2016, however, growth slowed and gave way to saturation. The COVID-19 shock caused shipments to drop to 275-277 million units in early 2020. The subsequent recovery was incomplete: the 2016 peak was never regained, and by 2022-2023 the market had entered stagnation, with figures declining from 314.5 million in Q1 2022 to 268.5 million in Q1 2023. A modest rebound in late 2023 proved temporary. In 2024-2025, shipments stabilized within a 292-336 million range, yet remained well below the 2016 high. By Q1 2026, another decline followed (289.7 million).

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[2] *OECD/Eurostat. (2018). Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation. Paris: OECD Publishing; Luxembourg: Eurostat. Source: https://www.oecd.org/content/dam/oecd/en/publications/reports/2018/10/oslo-manual-2018_g1g9373b/9789264304604-en.pdf (accessed on 02.03.2026)*

[3] *OECD. (2015). Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development. Paris: OECD Publishing. Source: https://www.oecd.org/content/dam/oecd/en/publications/reports/2015/10/frascati-manual-2015_g1g57dcb/9789264239012-en.pdf (accessed on 02.03.2026)*

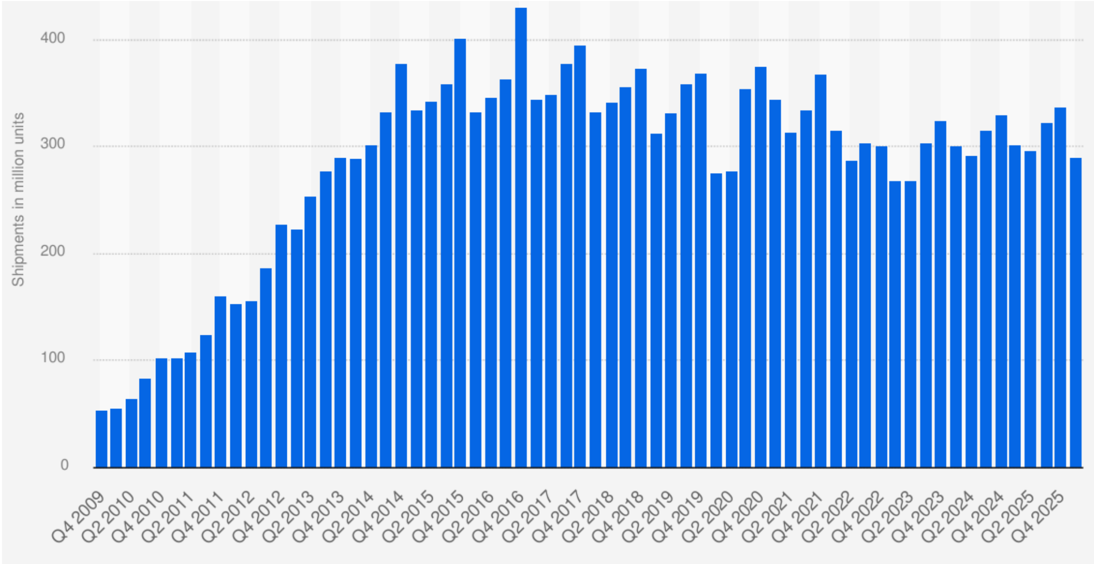

Figure 1. Smartphone shipments worldwide from 4th quarter 2009 to 1st quarter 2026 (in million units)
Source: based on IDC[4]

Over the entire 2009-2026 period, the market thus passed through three distinct phases: rapid growth in the early 2010s, saturation and peak volumes in the mid-2010s, and cyclical instability with pronounced external shocks from the late 2010s onwards. A key finding is that the smartphone market, being highly saturated in developed economies, no longer exhibits its former growth rates, with its dynamics now largely determined by macroeconomic conditions, device replacement cycles, and geopolitical factors affecting global supply chains.

The smartphone market features multiple suppliers whose market shares shift over the analyzed period under the influence of a combination of factors (Fig. 2).

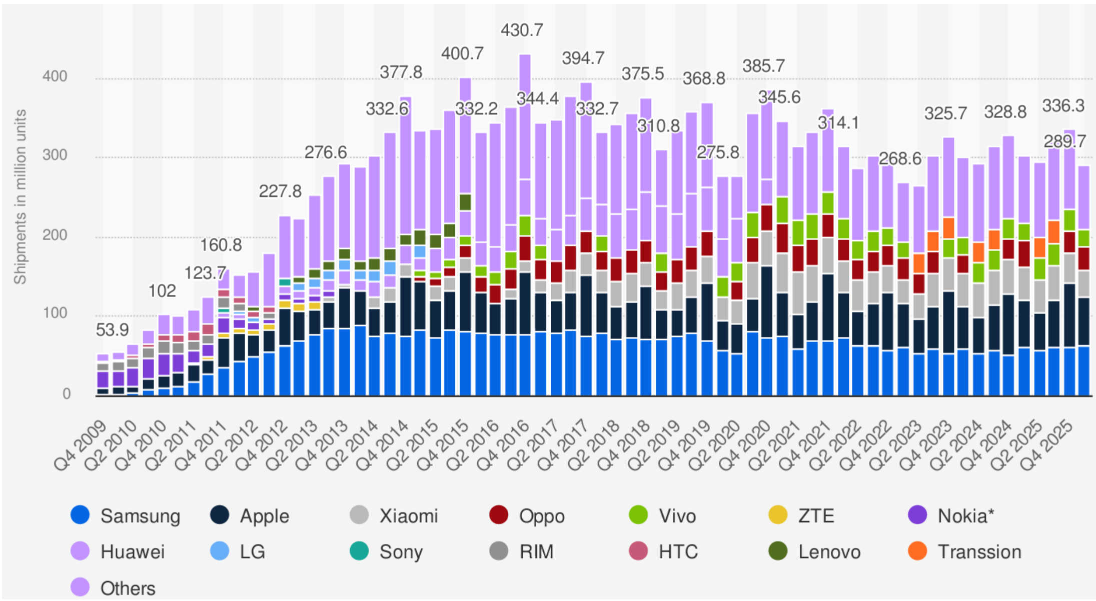

Figure 2. Smartphone shipments worldwide from 1st quarter 2009 to 1st quarter 2026, by vendor (in million units)
Source: based on IDC[5]

Overall, the market structure underwent radical changes over the sixteen years under review. At the

[4] *IDC. (2026). Smartphone shipments worldwide from 4th quarter 2009 to 1st quarter 2026 (in million units). Source: https://www.statista.com/statistics/728644/quarterly-global-smartphone-shipments-by-quarter/ (accessed on 02.03.2026)*
[5] *IDC. (2026). Smartphone shipments worldwide from 1st quarter 2009 to 1st quarter 2026, by vendor (in million units). Source: https://www.statista.com/statistics/271490/quarterly-global-smartphone-shipments-by-vendor/ (accessed on 02.03.2026)*

beginning of the period, Nokia and RIM (BlackBerry) dominated, but they had completely lost their positions by the mid-2010s. They were supplanted by Chinese manufacturers Xiaomi, Oppo, Vivo, and Transsion, which by 2025-2026 consistently rank among the leaders, although they do not achieve the volumes of Samsung and Apple. The "Others" category, which constituted a significant market share at the beginning of the period (up to 174 million units in Q4 2014), gradually shrank as the market consolidated around a few major vendors; however, it had risen again to 80.1 million units by Q1 2026, possibly indicating market fragmentation due to the emergence of new brands, especially from China and India.

Throughout almost the entire period under consideration, Samsung was the unequivocal leader in shipment volume, demonstrating steady growth from 1.8 million units in Q4 2009 to peak values around 85-88 million units in 2013-2014. Samsung's shipments gradually declined after 2015, fluctuating between 53 and 83 million units, yet by Q1 2026 it still led the market with 62.8 million units, albeit without its earlier growth momentum.

Apple followed a different pattern, with pronounced seasonality tied to annual iPhone launches and year-end holiday demand. In Q4 2025, Apple posted a record 81.3 million units. Unlike other vendors, Apple consistently raised its quarterly peaks over time – from 8.7 million units in 2009 to over 80 million in 2025 – reinforcing its premium-segment strength.

Huawei showed the most dramatic trajectory. The company grew from 5.7 million units in Q4 2011 to an all-time high of 66.6 million in Q4 2019, becoming a major global player and a direct rival to Samsung and Apple. However, after 2019, coinciding with the imposition of US sanctions, Huawei's shipments plummeted: in Q4 2020, they amounted to 32.2 million units, and from 2021 onward, the company disappears entirely from the IDC statistics for leading vendors. This disappearance is a direct consequence of losing access to key components, including mobile processors and Google services, which forced Huawei to refocus on the domestic Chinese market and develop its own HarmonyOS ecosystem.

In summary, the key observation is a radical transformation of the competitive landscape: Samsung retained volume leadership but lost its growth momentum; Apple consolidated its position in the premium segment with stable seasonality and record peaks; Huawei made a rapid ascent to leadership before, under external constraints, practically vanishing from global statistics, vividly illustrating the vulnerability of even the largest tech corporations to geopolitical and regulatory shocks.

As noted, Apple is one of the leading smartphone manufacturers, and analyzing its production dynamics suggests significant influence from various factors (Fig. 3).

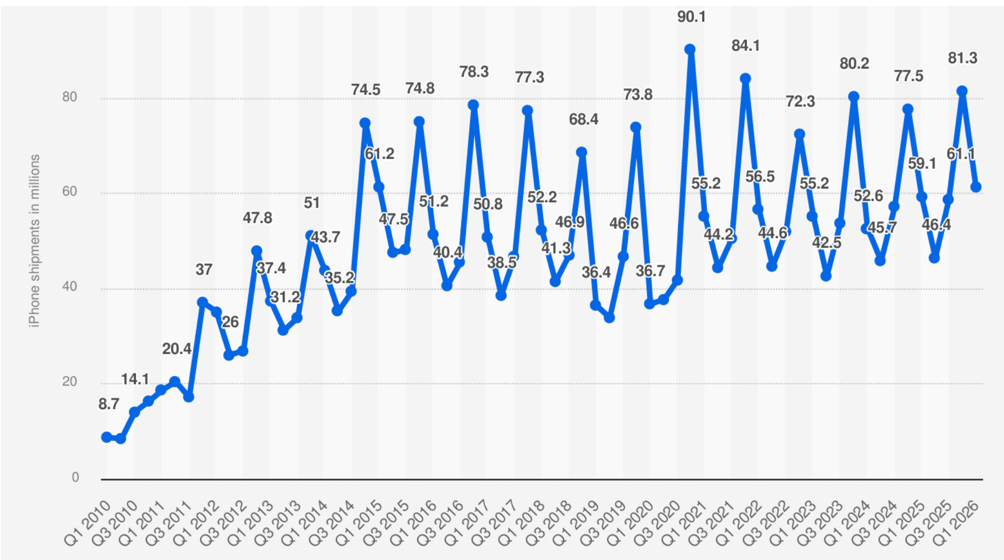

Figure 3. Apple shipments of smartphones worldwide from 1st quarter 2010 to 1st quarter 2026 (in million units)

Source: based on IDC[6]

[6] *IDC. (2026). Apple shipments of smartphones worldwide from 1st quarter 2010 to 1st quarter 2026 (in million units). Source: https://*

Apple demonstrates a resilient business model characterized by predictable seasonality, long-term growth in peak shipments, and a capacity to recover swiftly from external shocks. A key strategic advantage for Apple is not the pursuit of volume leadership in any given quarter, but the ability to generate maximum sales during the industry's most critical fourth quarter, ensuring high-capacity utilization and stable cash flow. At the same time, the Q1 2026 figure of 61.1 million units aligns with the long-term trend, confirming the absence of abrupt negative changes in consumer demand for its products.

The pronounced and robust seasonality of Apple's shipments is striking. Apple's Q4 peaks are driven by annual iPhone launches and holiday sales. In 2011, Q4 shipments reached 37 million units, up from 18.6 million in Q1; by 2015 the gap widened from 61.2 million to 74.8 million; and in 2020 Q4 hit a record 90.1 million, nearly 2.5 times the 37 million posted in Q4 2011. Although Q4 figures dipped to 72.3 million in 2022 and 80.2 million in 2023, they recovered to 81.3 million in Q4 2025, underscoring sustained premium demand despite overall market saturation.

Even off-peak quarters show growth: Q2 shipments rose from 26 million in 2012 to 46.4 million in 2025, reflecting a broadening customer base and some flattening of seasonal swings in absolute terms. An exception was Q2 2019 with 33.8 million units, which may be attributed to the anticipation of new models and upgrade delays.

The COVID-19 pandemic, contrary to initial pessimistic forecasts, did not lead to a long-term decline in Apple's shipments. After a dip in the first half of 2020 (36.7 million and 37.6 million in Q2), the company posted a historic high of 90.1 million units in Q4 2020. This phenomenon can be explained by pent-up demand, the shift to remote work and learning that spurred device upgrades, and the successful launch of the 5G-capable iPhone 12 lineup.

Regarding the consolidation of Apple's global position, its share of worldwide smartphone shipments stood at approximately 15.7% in Q1 2010 (8.7 million out of 55.4 million total shipments), whereas by Q1 2026, with shipments of 61.1 million out of a global total of 289.7 million, its share had risen to roughly 21%. Thus, Apple has managed not only to maintain but also to strengthen its market position amid intense competition from Samsung and Chinese manufacturers.

A sale dynamic unusual for a rapidly developing market is observed for Huawei (Fig. 4).

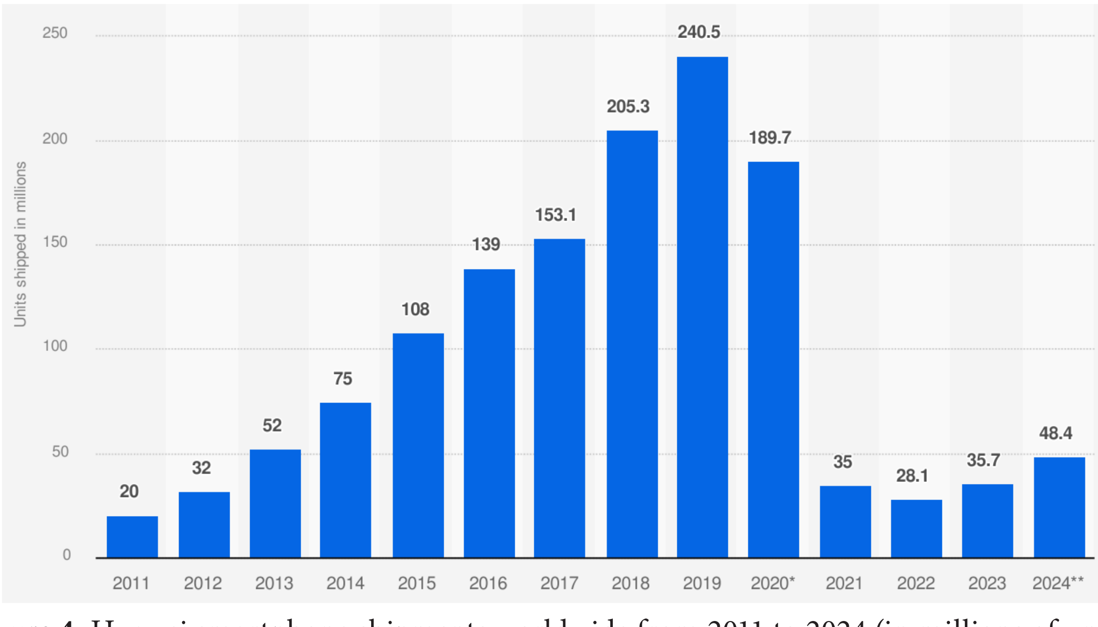

Figure 4. Huawei smartphone shipments worldwide from 2011 to 2024 (in millions of units)
Source: based on Omdia[7]

Huawei demonstrated consistent growth, from 20 million units in 2011 to its historical peak of 240.5

www.statista.com/statistics/299153/apple-smartphone-shipments-worldwide/ (accessed on 02.03.2026)
[7] *Omdia. (2025). Huawei smartphone shipments worldwide from 2011 to 2024 (in millions of units). Source: https://www.statista.com/statistics/1636119/number-of-smartphones-distributed-worldwide-by-huawei/ (accessed on 02.03.2026)*

million units in 2019. However, from 2020 onwards, a sharp drop in shipments occurred – down to 35 million in 2021 – linked to sanctions and the sale of the Honor brand. In subsequent years, shipments stabilized at a low level (28-48 million units). In 2024, a 35.8% growth to 48.4 million units was noted, yet this figure remains five times lower than the 2018-2019 peaks.

We contend that the decline in shipment volumes from 2020 can be attributed to several factors, principally the US-imposed sanctions. Starting in May 2019, the company was placed on the "Entity List", prohibiting US manufacturers from supplying Huawei with components, software, and technologies without special licenses [14]. A key consequence was the loss of access to Android and Google Mobile Services, rendering new Huawei smartphone models devoid of Google Play, YouTube, Gmail, and other services, thus making them less appealing to users outside China.

From 2020, sanctions were tightened: the ban extended to the production of its own Kirin processors, as TSMC and other foundries could not use US equipment to manufacture chips for Huawei. In November 2020, the company sold its sub-brand Honor to shield it from restrictions; prior to 2020, statistics included Honor shipments, and after – did not, which also accentuated the apparent decline. As a result, Huawei was compelled to retreat from the global market almost entirely, concentrating on China, and lost ground in Europe, India, and other regions. The development of its own HarmonyOS operating system could not swiftly compensate for the absence of Google's ecosystem overseas. Even the recovery to 48.4 million units in 2024 is largely attributable to the domestic Chinese market; without access to cutting-edge technologies and global distribution, reaching previous volumes exceeding 200 million units is no longer feasible for Huawei.

Samsung is one of the leaders among global smartphone suppliers (Fig. 5).

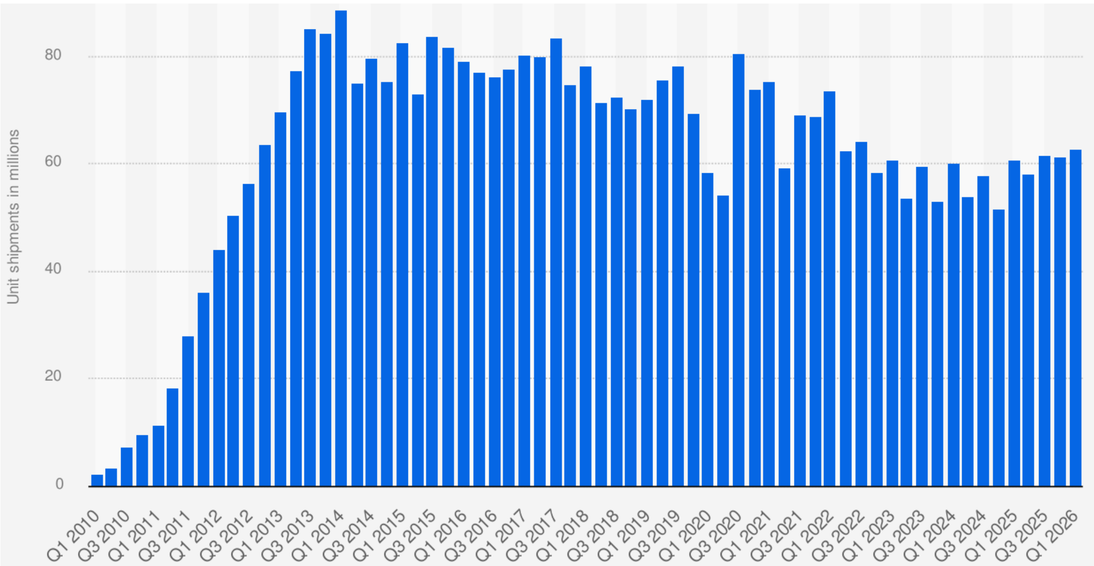

Figure 5. Smartphone unit shipments of Samsung worldwide from 1st quarter 2010 to 1st quarter 2026 (in million units)

Source: based on IDC[8]

Samsung exhibited stable growth in smartphone shipments from 2010, peaking in Q1 2014 (88.5 million units). Thereafter, some volatility in the indicator was observed, but values generally remained high. From 2020, shipment volumes declined and stabilized in the 50-75 million units per quarter range. In Q1 2026, shipments reached 62.8 million units, indicating a recovery from lower values in 2023-2024. Despite fluctuations, the company maintains a strong market position globally.

The empirical analysis is based on an annual panel dataset covering three major Big Tech companies – Apple, Samsung and Huawei – over the period 2010-2025; for Huawei, the series ends in 2024 due to data availability constraints. Financial indicators are drawn from the companies' official reports and consolidated statements, while information on global smartphone market dynamics is taken from industry statistics. This

[8] *IDC. (2026). Smartphone unit shipments of Samsung worldwide from 1st quarter 2010 to 1st quarter 2026 (in million units). Source: https://www.statista.com/statistics/299144/samsung-smartphone-shipments-worldwide/ (accessed on 02.03.2026)*

combination of firm-level and market-level data makes it possible to assess how innovation activity, financial efficiency and selected external factors affect profitability in the core smartphone segment.

Gross profit margin, calculated as gross profit divided by revenue, is used as the dependent variable. This indicator is chosen because it captures the ability of a firm to transform strategic and innovation-related decisions into sustainable profitability in its main line of business. The explanatory variables include indicators of innovation activity, overall financial performance and the external business environment. Innovation activity is proxied by R&D intensity, measured as R&D expenditure as a share of revenue, and by the logarithm of absolute R&D spending. Financial performance is represented by net profit margin and return on assets (ROA). In addition, the model includes several controls reflecting institutional and market conditions, namely sanctions dummy for Huawei after 2019, the growth rate of the global smartphone market and the share of foreign revenue in total revenue.

To control for unobserved firm-specific characteristics that remain relatively stable over time, such as business model, brand strength and the home-country institutional setting, the study employs a fixed-effects panel model with standard errors clustered at the firm level. The initial specification includes a broader set of regressors, after which a more parsimonious version is selected as the baseline following multicollinearity diagnostics. Therefore, the regression table reports both the extended and the compact specifications, whereas the discussion below focuses primarily on the baseline model (Table 1).

Table 1 – Fixed-effects Estimates for Gross Profit Margin, 2010-2025

	(1) Extended model		(2) Baseline model	
Variable	Coef.	Std. err.	Coef.	Std. err.
R&D intensity	0.895***	(0.083)	0.685***	(0.059)
ln R&D spending	-3.616***	(1.192)	-1.269***	(0.329)
Net profit margin	0.242*	(0.129)	0.517***	(0.038)
Operating margin	–	–	–	–
Foreign revenue share	0.058	(0.076)	–	–
Sanctions dummy	1.48	(2.104)	–	–
Market growth	-0.065	(0.040)	–	–
Revenue per employee	–	–	–	–
Revenue growth	0.00	(0.016)	–	–
ROA	0.486***	(0.090)	0.319***	(0.035)
Net income per employee	–	–	–	–
Observations	47			
Within R2	0.78		0.73	
F-statistic	15.98***			

*Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.*
Source: Authors

The estimation results indicate that innovation activity is one of the main determinants of profitability in the Big Tech sector. In the baseline specification, R&D intensity has a positive and statistically significant effect on gross profit margin. This result implies that companies allocating a larger share of revenue to research and development are more likely to sustain higher margins in the smartphone business. In economic terms, the finding suggests that innovation is not only a technological necessity but also an important source of competitive advantage and financial resilience.

At the same time, the logarithm of absolute R&D expenditure enters the model with a negative and statistically significant coefficient. This indicates that an increase in the scale of R&D spending does not automatically improve profitability and may, in the short run, put additional pressure on margins if commercialization does not keep pace with investment. The result therefore points to the importance of the efficiency of innovation spending rather than its absolute size alone.

The analysis also shows that broader measures of financial efficiency matter for profitability outcomes. Net profit margin and ROA have positive and statistically significant coefficients in the baseline model, indicating that better cost control and more efficient use of assets are associated with higher gross profitability. This pattern appears particularly relevant for large technology firms, where the monetization of intangible assets, ecosystem services and product differentiation play a central role in maintaining margins.

The additional controls included in the extended specification do not alter the main pattern of results. The sanctions dummy has a negative sign, which is consistent with the additional constraints faced by Huawei after 2019, yet this effect does not overturn the broader relationship between innovation effort and profitability. Similarly, market growth and the share of foreign revenue appear less influential than the internal indicators of innovation and financial efficiency. This suggests that, in the case of Big Tech firms, sustainable profitability depends to a greater extent on internal capabilities than on short-term changes in external conditions.

A closer look at the firms under study helps to clarify these relationships. Apple appears to benefit most strongly from higher R&D intensity and stronger asset efficiency, which is consistent with its premium positioning and ecosystem-based business model. Samsung also demonstrates positive returns to innovation, although its performance seems more sensitive to market cycles because of its more diversified structure. Huawei, by contrast, operates under stronger institutional constraints and maintains a relatively high level of R&D effort, which makes the effective allocation of innovation resources especially important for its profitability dynamics.

Overall, the econometric analysis confirms that the most stable determinants of gross profit margin in the Big Tech sector are R&D intensity, net profitability and efficient use of assets. External and institutional factors also matter, but their role appears secondary compared with firm-level capabilities. The findings therefore support the argument that the long-term competitive advantages of major technology companies are shaped primarily by the quality of innovation management and by the efficiency with which strategic resources are transformed into financial outcomes.

Conclusion

The conducted research establishes that the international competitiveness of Big Tech corporations during 2010-2025 has been determined not so much by traditional factors (low costs, resource access) as by unique internal drivers, including data network effects, ecosystem lock-in, long-term mega-scale R&D investments, and control over pivotal digital infrastructure.

The empirical analysis, focusing on the global smartphone shipments of Apple, Samsung, and Huawei, has demonstrated that companies that have succeeded in building closed ecosystems (iOS, HarmonyOS) or maintaining technological independence (Samsung's vertical integration) show greater resilience to external shocks. At the same time, the Huawei case vividly illustrates that even an industry leader with peak shipments exceeding 240 million units can be significantly weakened by sanctions and the loss of access to global service ecosystems, leading to a fivefold reduction in shipment volumes by 2024. External shocks, including antitrust investigations, data protection legislation, and environmental requirements for data centers, are becoming new normal operating conditions for the sector.

Promising avenues for future research include the quantitative assessment of the contribution of each internal driver to the overall competitiveness of Big Tech, as well as a comparative analysis of the adaptive strategies of American, Chinese, and European technology corporations amidst intensifying geo-economic fragmentation.

CONFLICT OF INTEREST

One of the authors of the article is the editor-in-chief of the journal.

AUTHORS' CONTRIBUTION

Svetlana N. Rastvortseva – conceptualization, project administration, writing – original draft.
Yulia A. Tyushkevich – investigation, writing – review & editing.
Zlata S. Salushkina – formal analysis, writing – original draft.

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