

POLICY MEMO

The Western Innovators of the Mobile Revolution: The Data on Global Royalty Flows to U.S. and Europe and Why It Matters

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Summary

The mobile revolution has radically altered our world in ways that were imagined only as science fiction a mere thirty years ago. Western innovators launched this revolution in creating its foundational telecommunications technologies; thus, it is unsurprising that private companies in the United States and Europe receive payments for the use of their telecommunications technologies, which is compensation for the billions in investments and decades of research and development of these inventions. The majority of the commercial implementers—the companies that make and sell consumer products that use these telecommunications technologies like smartphones or connected cars—are in Asia. China in particular has an increasingly growing share of these implementers across all sectors of the global innovation economy. This explains in part China's domestic

industrial policies that seek to lower the royalties paid by its national companies like Huawei or Oppo. Evidence-based policymaking should guide U.S. and European laws and regulations. Data confirm the critical role of reliable and effective patent rights, the rule of law, and courts using due process to resolve disputes have been essential for Western innovators creating the modern world—and will drive the technologies of tomorrow in the internet of things (IoT) and artificial intelligence (AI).

Key Takeaways:

- Innovators in the U.S. and Europe created the telecommunications technologies of the mobile revolution.
- Data on global royalty flows confirm that Western companies have been the innovators, and China and other

Asian companies pay royalties for the use of their patented innovations.

- U.S. and European lawmakers should continue to follow evidence-based policymaking in sustaining this economic success: reliable and effective patent rights, the rule of law in stable legal institutions, and due process in courts in resolving disputes.

Introduction

The mobile revolution has radically altered our world in ways that were imagined only as science fiction several decades ago. Mobile devices went from simple phones the size of masonry bricks in the 1980s to the pocket-sized computers everyone has today. Sales of mobile devices have grown at an exponential rate, and, by 2016, the number of mobile subscriptions surpassed the number of people on the planet.¹ The steady stream of inventions in telecommunications technologies has driven the growth of a massive mobile sector in the global innovation economy with an estimated total economic value of more than \$4.8 trillion.² In other words, technological innovation in mobile communications has changed more than the mobile device sector; it has altered the entire global economy.

As with all past technological revolutions from telephones in the nineteenth century to smartphones in the twenty-first century, a legal and policy debate has raged about the role of patents in the underlying technological innovations. The initial debates over the technological standards in mobile communication, the digital technologies we refer to as 4G and 5G, focused on concerns that licensing practices by innovators could undermine the success of these standards and adversely affect innovation, the industry, and consumers. Academics developed theoretical and economic models that predicted crippling royalty rates imposed on smartphone manufacturers that would reduce investments in new mobile technologies, drive up prices for consumers, and reduce overall innovation.³

After almost twenty years of empirical research testing these predictions, none have been found to exist.⁴ In fact, they are refuted by actual marketplace conditions: the telecommunications sector has grown at an unprecedented rate in which quality-adjusted prices of mobile devices have plummeted, and by all measures, consumers around the world have benefitted.⁵ What emerged was a recognition across jurisdictions throughout the world, especially in many court decisions, of the key importance of an evidence-based approach to policymaking and the resolution of legal disputes.

In the past year, however, a renewed global debate over standardized technologies has returned with a vengeance given announcements of new regulatory regimes or rules on standard-essential patent (SEP) licensing and litigation. In April 2023, the European Union unveiled a massive new regulatory regime dictating conditions for the licensing and litigation of patents on standardized technologies.⁶ This new regulatory regime, comprising extensive new mandates and rules, would effectively impose price controls on the licensing of SEPs, among many other new regulatory requirements and controls. Two months later, China published a draft policy document outlining how it would apply its antitrust laws to SEP licenses, revealing the Chinese Communist Party's willingness to use its own anti-monopoly laws to regulate even more strictly SEP licenses with Chinese smartphone companies.⁷ The Chongqing Intermediate People's Court in China also recently announced on December 18, 2023, a global royalty for Oppo to pay for a license to Nokia's SEPs; the decision departs from globally recognized legal principles in how courts determine royalty rates and, as predicted by many commentators, it artificially reduces Nokia's compensation in favor of Oppo and other Chinese implementers.⁸

As these legal and policy developments unfolded throughout 2023, they prompted a renewed debate about the negative impact on Western companies' global technology leadership.⁹ This is especially important given complaints by EU and U.S.

officials reaching back many years that China blatantly pursues domestic industrial policies in favoring its own domestic companies by forcing Western companies to accept below-market royalties for the use of their patented technologies in smartphones made by Oppo, TCL, Huawei, and others. Last year, the EU filed a complaint in the World Trade Organization (WTO) against China for these practices, which was immediately joined by the U.S. and which is currently pending before the WTO.¹⁰ Thus, there is a geopolitical dimension to this debate given the rise to dominance of China as a strategic and economic competitor to both the EU and U.S.

To ensure continued evidence-based policymaking by EU and U.S. officials in the legal rules and institutions governing SEP licensing, and to assist them in evidence-based policymaking in response to the strategic threat from China, this policy memo describes the royalty flows for SEPs in the global innovation economy. This economic data, which is well-known in the mobile sector, seem to be largely unknown to many policymakers today. This policy memo corrects this gap in the public policy debates by describing these SEP royalty data flows to Western companies.

This data on royalty flows in the global innovation economy is important for several reasons. First, it confirms that the innovators that created the mobile revolution, and that have sustained it for the past several decades, are Western companies, such as Qualcomm, InterDigital, Ericsson, and Nokia. Second, it corrects the false narrative that China is the leading innovator in telecommunications technologies today (a narrative based on a mistaken premise of simply counting patents, which is widely rejected by economists and patent scholars).¹¹ Third, this data reaffirms the presumption that should be given to the laws and policies that were in place several decades ago when Western innovators created the mobile revolution—or, if these policies have since been changed, they should be reinstated through necessary reforms. The global leadership by Western companies

born of Western values of due process, the rule of law, and the protection of property rights should not be mistakenly undermined by unproven academic theories or false policy narratives. This is especially important when the U.S. and the EU face a strategic competitor from an authoritarian regime that neither shares nor supports these same values.

A Summary of Standardized Technologies

Before we can speak of SEP licensing revenue flows, we must first return briefly to first principles about what standardized technologies are and how they came to be. Standardized technologies, such as 4G or 5G, are not born complete and fully adopted in the market like the Greek myth of how Athena emerged as a fully formed adult from the hip of Zeus. They are developed by private organizations that were created in the U.S. and in Europe in the twentieth century. These “standard development organizations” have created over the past century an open, industry-led process in which different stakeholders in the production and sale of a commercial product or service work together in a cooperative process to develop a global standard. In addition to 4G or 5G, there are many different technical standards, such as Bluetooth, Wi-Fi, High Efficiency Video Coding (HEVC), USB memory sticks, the three-prong electrical plug, and even the depths and dimensions of grooves in screws, among innumerable others.

The Innovators and Implementers of Telecommunications Technologies

Among all global technological standards, the largest share of royalty payments for the use of patents on standardized technologies is for wireless telecommunications technologies. The value of the SEPs covering the telecommunications standards in smartphones, such as 4G and 5G, is the value equivalent in the innovation industries of the value of Taylor Swift in the creative industries. The extensive economic values at stake explain the immense geopolitical and private-interest pressures on policymakers and courts in resolving SEP licensing disputes.

Western innovators created the wireless telecommunications technologies that launched the mobile revolution. They invested billions over decades to create and develop further these foundational technologies, and further invested in the global supply chains that produce smartphones. As a result, these companies created a technological launchpad that enabled other inventors to create previously unimagined products and services, such as mobile health apps, Uber and other “sharing economy” services, self-driving cars, and many other innovations.

It is thus unsurprising that Western companies, such as Ericsson or Qualcomm, are the companies receiving royalty payments for the use of standardized telecommunications technologies. In 2022, companies headquartered in the EU and the U.S. collected over 95% of the total royalty payments made to the top SEP licensors.¹² The only company headquartered in Asia among the five top SEP innovators that receive royalties from licensing SEPs is Huawei, and its royalties accounted for only about 5% of the total reported licensing revenue by those companies.¹³

In contrast to the innovators in the EU and U.S., the companies making or using smartphones — “implementing”

in patent law lingo—with standardized telecommunications technologies are mostly based in Asia. In 2022, 81% of all smartphones were produced and shipped to retailers by companies based in Asia. Among these Asia-based smartphone manufacturers, nearly 60% of these shipments were made by companies based in China, such as Oppo, TCL, and Huawei, and slightly over 20% were by companies based in South Korea, such as Samsung (see Figure 1).

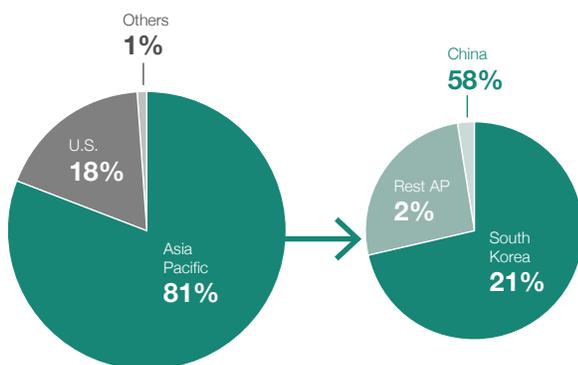
In fact, there are very few Western implementers in the smartphone sector. Apple, which has mostly become a company that makes luxury consumer goods, is the only Western company among the top five smartphone manufacturers in the world. (And even this is a bit of a misnomer, because 95% of all of Apple’s devices and computers, and until recently it was 100%, are manufactured in China.¹⁴) The other top smartphone manufacturers, which serve predominantly the middle- and lower-priced portions of the market now left unserved by Apple’s luxury computer goods, are Samsung, Xiaomi, Oppo, and Vivo.¹⁵

The Next Chapters in the Mobile Revolution: The Automotive Industry and IoT

The new policy debates over standardized telecommunications technologies have largely focused on other sectors than smartphones, such as the automotive sector and IoT. As noted, though, the smartphone sector dwarfs other sectors of the global innovation economy when it comes to royalty payments for cellular technologies. A report by Nokia—the Finnish multinational telecommunications and major innovator in the cellular space—demonstrates that the smartphone sector accounted for around 94% of Nokia’s patent licensing revenue in 2022 (see Figure 2).¹⁶ Other industries, such as automotive, consumer electronics, and IoT, combined accounted for only 6% of Nokia’s licensing review.

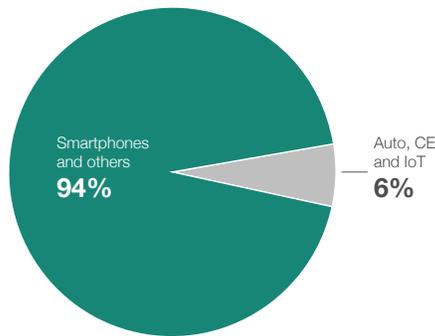
Although only one innovator company in telecommunications technologies, Nokia is not an outlier. The lion’s share of all royalty

Figure 1: Global Smartphone Shipment Shares by Region (2022)



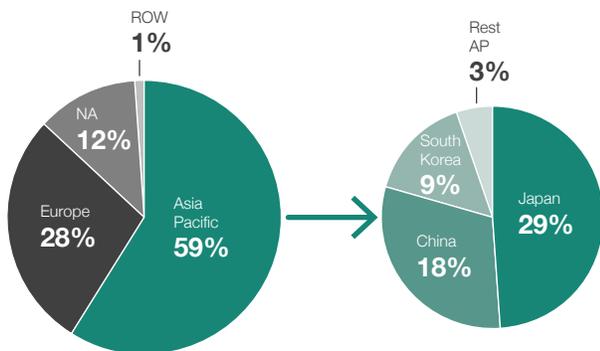
Source: IDC Mobile Phone Tracker, November 2022

Figure 2: Nokia's SEP Licensing Revenue by Industry (2022)



Source: Nokia Annual Report, 2022

Figure 3: Global Auto Shipments (2022)

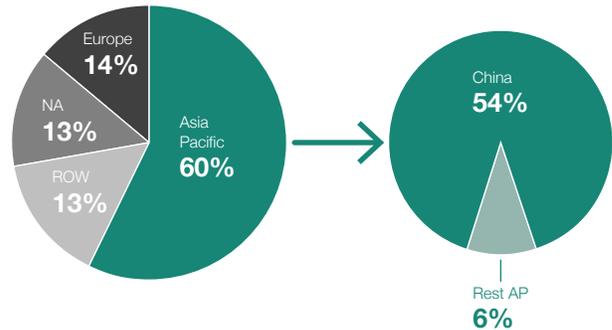


Source: Strategy Analytics, 2022

payments for standardized technologies is paid by smartphone manufacturers in which most licensees are Asia-based companies and licensors are companies in the EU or U.S.

But even in the new sectors into which the mobile revolution is extending its reach, the same geographical pattern in royalty flows exists as in the smartphone sector. In the automotive sector, for example, almost 60% of shipments in 2022 were cars made by companies based in Asia, of which 29% were

Figure 4: Global Module Shipments (Q2 2022)



Source: Counterpoint

Japanese companies and 18% were companies based in China (see Figure 3).

This geographic pattern is likely to increase in the future, as China has overtaken Japan as the largest exporter of cars in the world.¹⁷

A similar geographic divide exists in IoT. For IoT products and services, licenses have been executed mainly with manufacturers of cellular “modules,” which are the components of products that support a range of 2G, 3G, 4G, and now 5G technologies, such as smart meters. Following the same pattern of royalty flows in smartphone licenses, companies making IoT modules are primarily based in Asia. In 2022, 60% of global module shipments were made by companies based in Asia, and more than half of those shipments were made by companies based in China (see Figure 4).

Global Royalty Flow Data in Legal and Policy Context

The data on global royalty flows is an empirical confirmation of a key insight sometimes overlooked in debates over specific domestic policies or court decisions in the EU or U.S.: Western companies have been the innovators in wireless telecommunication, and Asian companies have been users

of these foundational technologies that launched the mobile revolution. This data is directly relevant to the renewed legal and policy debate in the EU and the U.S. over standardized technologies.

First, the data on global royalty flows attest to the importance of Western companies as innovators in telecommunications technologies. This has been true from the birth of the telecommunications revolution with the telegraph and telephone, invented by Samuel Morse and Alexander Graham Bell, to the mobile revolution today based in the digital telecommunications technology invented by Dr. Irwin Jacob at Qualcomm. Although some commentators and politicians believe that China has been a global leader in telecommunications technologies, this is a mistaken conclusion based on inaccurate methods like simple counting of patents.¹⁸ If one is interested in which patents actually represent real, valuable innovations in telecommunications technologies, then the SEPs for which royalties are paid for the use of these technologies provide (in part) an objective answer to this query. The royalty flows confirm that it is the companies based in the EU and the U.S., such as Ericsson, Qualcomm, InterDigital, and Nokia, that created the mobile revolution with their valuable telecommunications inventions.

Second, Western companies created these technological innovations that radically improved everyone's lives throughout the world through massive, continuous investments of tens of billions in research and development. As economics and history have demonstrated, such investments are only possible on the basis of reliable and effective property rights—patents—that are secured under the rule of law through stable legal institutions like courts that respect due process.¹⁹ This is the legal foundation that led to the invention of the foundational telecommunications technologies that created what we all know today as the mobile revolution. Maintaining this legal system and related policies is critical in continuing the success

of Western innovators in investing in the R&D that resulted in the global technological leadership by the U.S. and EU.

Third, it is important to put data about royalty payments in the broader context, recognizing that these royalties account for a very small value of the value proposition that standards for communication technology create for the entire ecosystem. In the mobile industry, advancements in the cellular space have provided the basis that has enabled the development of massive value. Studies have shown that licensing revenues for cellular technologies account for only 0.17–0.27% of the total \$4.8 trillion in economic value created by those technologies.²⁰ As advanced communication technologies spread to new industry verticals, we are likely to see similar developments in other markets. Although spats over licensing dominate the policy debate, it is important to keep in mind that the costs of accessing these technologies are by several orders of magnitude smaller than the benefits that these technologies create for implementers, markets, and ultimately consumers.

Conclusion

In sum, royalty flows from implementers to innovators in the global innovation economy represent billions paid by Asia-based companies, predominantly in China, to European or U.S.-based innovators. The political and legal pressure to lower these royalty payments is significant, which explains in part the domestic industrial policies implemented in China to achieve this goal. As a simple matter of geopolitics, this is understandable. These royalties are viewed as a “cost” of doing business paid to innovators in other countries. A political regime that views itself in strategic competition with these other countries will seek to grow its own economy through maximizing profits by its own domestic companies by reducing as much as possible economic outflows to these foreign countries. The data on royalty flows explains these efforts by the Chinese Communist Party and the domestic industrial policies it implements through its laws, courts, and regulatory agencies.



The data on global royalty flows for the standardized telecommunications technologies underlying the mobile revolution is also significant for EU and U.S. policymaking. It underscores the effectiveness of the laws and policies in place that prompted the investments and the creation of these innovative technologies by U.S. and EU companies. These are the laws and policies that reflect fundamental Western values: the rule of law, stable legal institutions governed by due process, and the protection of reliable and effective property rights (patents). As the EU and the U.S.

consider regulations, laws, and new institutions that impact these values, such as new regulatory regimes or industrial policies similar to those implemented by China, such proposals should be viewed in light of the legal, economic, and historical evidence about the success of these key Western values in creating and sustaining flourishing societies. The data on global royalty flows is key to evidence-based policymaking by EU and U.S. policymakers that will ensure the continued success of the innovators who created the mobile revolution.

Endnotes

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