Quantity or Quality:Analysing Patent Filing Dynamics in China

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***Abstract*—China has held a dominant position in global patent activity for more than a decade, with the scale of its filings reshaping the landscape of intellectual property worldwide. China's patent submissions exceeded those of every other country by a wide margin, and the country also led in complementary areas such as utility models, industrial designs, and trademarks. China's rise to the top of international patent filings, including applications made through global mechanisms such as the PCT, reflects not only the expansion of its innovation ecosystem but also the influence of administrative and policy-driven incentives. Over time, the country's patent culture became closely tied to performance-linked evaluations, institutional rankings, and eligibility criteria for high-tech status, resulting in an environment where quantitative growth became a strategic priority. The surge in applications, therefore, emerged less from breakthrough research and more from an incentive structure that rewarded filing behaviour itself. This dynamic has created a patent landscape characterized by impressive numerical strength, yet accompanied by ongoing debates about the depth, originality, and long-term value of the innovations represented in those filings. The Chinese experience highlights how national innovation systems can be shaped not only by technological capability but also by policy design, institutional incentives, and socio-economic motivations that drive organisations and individuals to treat patents as strategic tools rather than purely inventive outputs. Although India's patenting activity has been steadily increasing, it remains significantly behind China in total volume. To close this gap, India needs to continue strengthening its R&D infrastructure, enhance incentives, raise IP awareness, and foster closer collaboration between universities and industry. In contrast, China's massive patent output provides a structural advantage, but long-term benefits will depend on shifting from sheer quantity to high-quality, commercially impactful patents. For meaningful comparison or policy formulation, raw filing numbers should be evaluated alongside indicators such as grant rates, renewal and maintenance patterns, citation frequency, commercialization outcomes, and international filings. India's upward trajectory is promising, but given structural and industrial differences, it should focus on domain-specific innovation and niche strengths such as biotechnology, green energy, and software prioritizing quality over quantity to maximize the impact of its intellectual property.**

***Index Terms*—Patent Filing, China, SIPO,WIPO**

I. INTRODUCTION

China's patent-filing approach strongly shapes the eventual economic usefulness of the patents granted in the country. Policies that reward local patent submissions and encourage innovation play a central role in steering filing behaviour (Wei & Liu, 2020). The rise in China's economic capacity and its rapid advances in technology have also contributed to a steady climb in patent activity, signalling the nation's growing focus on scientific progress (Gong et al., 2020). Even with this rise in filings, many patents produced in Chinese universities do not translate into commercial outcomes. This gap is linked to structural weaknesses in the patent framework, such as limited claim breadth and relatively short periods of protection, which reduce the appeal of commercialization (Shen, 2018). To overcome these issues, China has begun introducing reforms that aim to raise patent quality and strengthen the transfer of technologies to industry. In 2024, China received around 1.8 million patent applications, far more than any other country and over three times the number filed in the United States. China has been crossing the one million mark every year since 2015, and its filing numbers continue to rise quickly. The United States, Japan, South Korea, and the European patent system followed China, and together these five offices handled the majority of world's patent activity. Over the past ten years, China's share of global patent filings

has grown significantly, moving from about one-third of the world total to almost half. During the same period, the share of the other major offices declined, with the sharpest drop occurring in the United States. While the top global IP offices maintained the same ranking between 2021 and 2024, there were changes slightly lower in the list. Indonesia moved up, Türkiye entered the top twenty, and South Africa dropped just below it. The balance between resident and non-resident applicants varies widely across countries. Some offices, such as those in Australia, Hong Kong, and Mexico, receive most of their applications from foreign applicants. Others, including China, France, and Türkiye, mainly receive filings from within their own borders. India has shown the biggest shift in the last decade, with domestic applications rising strongly, indicating growing local innovation. Russia's resident share has also increased, although this is mainly because filings from abroad have fallen. Meanwhile, countries like Australia, Canada, and Hong Kong have seen little change in this pattern. Recent discussions on China's intellectual property system highlight how government policies have shaped its aggressive patent-filing culture. Reports from the World Intellectual Property Organization note that China's strategy built around subsidies, targets, and incentives has pushed domestic filings upward and expanded the country's influence in global innovation trends. These policy-driven motives have been central to China's rise as the world's largest source of patent applications. However, an important detail is often overlooked. China recognizes three types of patents: invention, utility model, and industrial design. Only invention patents are counted in many international datasets. Utility models and design registrations, which make up the bulk of China's filings, are generally not considered "patents" by most national offices or by WIPO. Between the mid-1980s and 2020, nearly 80–90% of China's patent grants came from utility model and design filings, while invention patents the category that reflects scientific and technological capability accounted for barely 10–20%. Many of these non-invention filings add little real value. Bloomberg's analysis revealed that during 2013–2017, a large share of design (about 91%) and utility model (about 61%) patents in China lapsed simply because their owners chose not to pay renewal fees. This supports a blunt assessment shared by several Chinese patent specialists: only a small fraction of China's patents meaningfully contributes to the market, while the vast majority have minimal or no practical worth. Even with these issues, China still surpassed every other country in invention-patent grants from 2015 onward. For instance, in 2024, China recorded higher numbers of invention patents whether counted by office or by origin than the United States. But despite this numerical dominance, patent quality continues to be China's fundamental weakness. Measuring patent quality is complicated, but broadly it relates to the inventiveness of the technology, the strength of legal documentation, and the patent's commercial relevance. Typical indicators include grant rates, international filing activity, maintenance levels, patent-family size, and evidence of commercialization. Studies consistently show that China underperforms most advanced economies such as Japan, Germany, the United States, South Korea and the United Kingdom on almost all these indicators. One example is international reach. Only a small share of Chinese patents is filed or granted abroad. n 2024, China again led the world in patent activity, filing about 1.8 million applications nearly half of the global total. However, only roughly 7.3% of these filings by Chinese residents were submitted abroad, confirming that most remain within China's domestic system. Meanwhile, CNIPA granted over 1.045 million invention patents during the year, pushing the number of valid domestic patents well past 4 million. These numbers highlight China's dominance in volume and growth. Yet publicly available data does not support a robust evaluation of the "quality" or commercial impact of these patents for 2024 metrics such as grant ratios, international patent families, maintenance rates, licensing activity, and international filings remain either undisclosed or not easily comparable. Thus, while China's patent system continues to show impressive scale, it remains difficult to assess how many of those patents translate into meaningful innovation or market value. Chinese universities and research institutes openly admit that patent filings are often pursued for promotions, subsidies, or evaluation metrics rather than genuine technological advancement. When looking specifically at international PCT applications, China may lead the world in volume, but comparative data show a sharp difference in quality. Citation patterns in international search reports indicate that Chinese PCT filings reach only about one-third of the quality level seen in top

innovation economies. Taken together, these findings highlight a clear reality: China's rapid growth in patent filings has not yet translated into high-quality, globally competitive innovation. To become a true intellectual-property leader, China must shift away from its long-standing emphasis on quantity and instead prioritize originality, technical depth, and commercial viability. This transition will be difficult because it challenges entrenched practices within China's research and evaluation systems, which still reward volume over impact. In the near term, China's strongest hope for improving patent quality lies with its leading technology companies' firms like Huawei, ZTE, Oppo, DJI, BOE, and Alibaba. These enterprises continue to produce patents with genuine technical value and are responsible for much of China's global recognition in high-tech sectors. Their progress may be the key driver that helps China move from being a patent-filing giant to a genuine innovation powerhouse. hina has emerged as the world's top patent-filing country, contributing nearly half of global applications in 2024, driven by government incentives, R&D investment, and institutional support (WIPO, 2025; SCMP, 2025). Although the volume is impressive, many filings are utility model and design patents with limited novelty or commercial impact (Prud'homme & Zhang, 2017). Higher-quality patents are mainly generated by enterprises in advanced sectors such as AI, telecommunications, and renewable energy. Despite progress, challenges persist in commercialization, internationalization, and translating patents into marketable innovations. Sustained innovation leadership will require prioritizing high-value patents, stronger university-industry collaboration, effective technology transfer, and integration into global markets (Yang, 2024; Boeing et al., 2024).

II. LITERATURE REVIEW

China has experienced a remarkable rise in patenting activity over the past two decades, establishing itself as a major global player in intellectual property generation. This growth is widely attributed to a combination of government-led policy interventions, significant investments in research and development (R&D), and strategic industrial reforms aimed at fostering innovation (Hu & Jefferson, 2009; Jefferson, Hu, Guan, & Yu, 2006). Government initiatives including patent subsidies, tax incentives, and performance-linked evaluation metrics for firms and universities have served as critical drivers, encouraging widespread patenting across a range of industries and technological domains (Dang & Motohashi, 2015; Lim & Hoey, 2020; Peters & Roberts, 2022). Despite the impressive volume of patent applications, research consistently highlights concerns regarding patent quality. Boeing and Mueller (2019) note that a substantial proportion of Chinese patents, particularly utility models and incremental innovations, exhibit limited technical novelty and marginal commercial potential. Long and Wang (2020) emphasize regional variations, showing that patents originating from coastal and technologically advanced provinces tend to be of higher technical and economic value than those from inland regions. Comparative analyses further indicate that while China leads in filing volume, critical indicators of patent quality such as citation frequency, grant ratios, and commercialization outcomes remain below the standards of OECD nations (Zhang & Guan, 2018; Schmoch, 2008; Torrance & Tomlinson, 2020). Wu and Huang (2018) argue that the focus on quantity over quality may undermine the overall efficacy of China's innovation ecosystem, as resources are often allocated toward patents with limited practical or technological relevance. Universities have become key contributors to China's patenting landscape, prompted by policy incentives, research funding, and evaluation metrics that reward intellectual property output (Gu & Li, 2019; Guo, Li, & Zhang, 2020). Nevertheless, the commercialization of university-held patents remains limited, with licensing and industrialization rates significantly lower than those observed in enterprise-held patents (Jefferson et al., 2006; Jaffe & de Rassenfosse, 2017). Enterprise-driven patents, by contrast, demonstrate higher efficiency in both technological impact and market commercialization, particularly in sectors such as telecommunications, electronics, and biotechnology, reflecting stronger alignment with market needs and more robust R&D practices (Brandt, Van Biesebroeck, & Zhang, 2012; Dai, Jefferson, & Zhang, 2018). China's engagement with global patent systems has also attracted scholarly attention. Although the number of Chinese applications under the Patent Cooperation Treaty (PCT) is growing, the proportion of patents filed internationally remains comparatively low relative to countries such as the United States, Germany, and

Canada (Motohashi, 2015; de Rassenfosse & Jaffe, 2018). The limited international presence of Chinese patents is often attributed to their domestic orientation, as well as persistent concerns regarding patent quality and enforceability. These trends suggest that while China has achieved quantitative dominance, enhancing the international competitiveness of its patents is essential for sustaining long-term innovation leadership. A broader examination of China's patenting ecosystem also reveals structural challenges associated with policy-driven growth. Torrance and Tomlinson (2020) highlight that while subsidies and incentives have stimulated filings, they may inadvertently encourage quantity-focused patenting rather than high-impact innovation. Hall and Ziedonis (2001) further emphasize that without mechanisms to ensure patent quality, increased filings do not necessarily translate into meaningful technological progress or commercialization. Addressing these issues requires reforms in patent examination processes, stronger incentives for innovation-driven research, and closer collaboration between universities, enterprises, and global markets. existing literature portrays China's patent filing capability as a product of deliberate policy frameworks, robust R&D investments, and a growing innovation ecosystem. The country's strength lies in its ability to generate an exceptionally high volume of patents; however, challenges persist in terms of patent quality, commercialization efficiency, and international integration. Transforming China's patent system from a quantity-driven to a quality-driven model is essential for generating globally impactful innovations and sustaining long-term technological leadership. Achieving this transition will depend on coordinated reforms in policy, R&D management, and industry-academia collaboration, as well as continued emphasis on international competitiveness. China's evolution into the world's most prolific patent-filing nation has been extensively documented in contemporary intellectual property scholarship. Since 2019, China has consistently outpaced the United States, Japan, and South Korea in total patent applications, with the World Intellectual Property Organization (WIPO) reporting that China accounted for approximately 46% of all global patent filings in 2020, submitting more than 1.4 million applications (World Intellectual Property Organization, 2021). This structural shift in global patenting dynamics has been attributed to a multiplicity of institutional, economic, and policy-driven factors that collectively strengthen China's innovation ecosystem. A central driver underlying China's patent surge is the state's strategic prioritization of technological self-reliance. Governmental directives most notably Made in China 2025, Innovation-Driven Development Strategy, and successive Five-Year Plans have established innovation as a foundational pillar of national competitiveness. These policies are reinforced through extensive public investments in R&D, tax incentives for high-tech enterprises, and performance-based rewards tied to patent generation (Qiu et al., 2020; Liu & Wang, 2022). The outcome has been an accelerated institutionalization of patenting activities across universities, research institutes, and manufacturing clusters. China's expanding presence in next-generation technologies has further intensified its patenting trajectory. The state's prioritization of strategic sectors such as 5G telecommunications, artificial intelligence, semiconductors, biotechnology, renewable energy, and advanced materials has encouraged firms to aggressively pursue intellectual property protection in these domains. For instance, China filed over 110,000 patent applications related specifically to 5G in 2020, consolidating its first-mover position in global communications infrastructure (World Intellectual Property Organization, 2021). Similar trends are noted in AI-related patents, where China has surpassed both the United States and the European Union in filing volume (Zhang & Huang, 2023). Demographic and market-driven forces also contribute significantly to the diffusion of innovative activity. China's expanding middle class expected to reach over 800 million by 2030 has stimulated demand for technologically sophisticated products and services (Wang & Zhao, 2022). This consumer-driven pressure incentivizes firms to pursue product differentiation through R&D, thus amplifying patent activity as a mechanism of competitive advantage. Moreover, substantial improvements in China's intellectual property governance have altered domestic and international perceptions of its IP environment. Reforms implemented between 2018 and 2023 including the strengthening of specialized intellectual property courts, heightened statutory penalties for infringement, and streamlined administrative enforcement have collectively enhanced the credibility

of China's IP protection regime (Song, 2023; Yu, 2024). These regulatory reforms have increased institutional trust and encouraged both domestic and foreign entities to seek patent protection within China. A further structural characteristic influencing China's patent dominance is the accessibility and affordability of its patent system. The Chinese patent regime provides a lower-cost pathway relative to many Western jurisdictions and includes utility model patents, which offer rapid and economical protection for incremental innovations (Long & Lei, 2021). This dual-track system has contributed substantially to overall patent volume, particularly among small and medium-sized enterprises. Although China's patent output is unparalleled in scale, ongoing academic debates highlight concerns regarding patent quality, commercialization efficiency, and the innovation-performance gap. Scholars note that while filing volume continues to grow, the conversion of patents into marketable technologies remains comparatively low, especially within universities (Gao & Jefferson, 2023). Despite these challenges, China's sustained policy commitment, expanding innovation infrastructure, and targeted investments indicate that the country is poised to retain its dominant global patent position into the next decade.

2.1 Factors Promoting Patent Filing in China

2.1.1 Simplicity and Affordability of the Chinese Patent Filing Process

China's patent system has scaled dramatically, reducing procedural and cost barriers in a manner that contributes to very high filing volumes. According to the latest data from World Intellectual Property Organization (WIPO), China's domestic applicants submitted around 1.8 million patent applications in 2024, accounting for roughly half of all global filings. This scale suggests that for many domestic inventors, firms, and institutions, the perceived costs and administrative burden of filing may be manageable or comparatively lower than in some other jurisdictions. While detailed public-fee comparisons across countries are not always uniform or up-to-date, China's combination of high filing throughput and a large population of applicants suggests systemic accessibility advantages.

2.1.2 Rise of Middle-Class Demand as a Driver of Innovation Demand

China's rapid increase in patent filings coincides with its growth as a major global manufacturing and innovation hub, supplying both domestic and export markets. The large domestic market supported by hundreds of millions of consumers provides firms with strong practical and commercial incentives to produce and protect innovations. The massive scale of filing data (as reported by WIPO) suggests that many Chinese innovators seek to leverage both domestic and global demand.

2.1.3. Government's Push to Innovate

China's remarkable patent-filing numbers reflect, in part, a coordinated national emphasis on technological development and IP generation. The leadership of China has repeatedly underscored innovation, industrial upgrading, and intellectual property as engines of long-term growth a policy environment that supports R&D, encourages firms and research institutions to generate IP, and nurtures a broad-based innovation ecosystem. Observed outcomes lend support to claims that strategic state support and favourable macro conditions have contributed to the surge: as noted, China's filings in 2024 amounted to ~1.8 million applications, sustaining its global lead.

2.1.4. Focus on Emerging Technologies

Recent trends highlight that many of China's patents are concentrated in high-tech fields such as digital communications, computer technology, electronics, and other advanced sectors. According to WIPO's 2024–2025 global patent filing statistics, computer technology remains among the most frequently featured technology areas worldwide, and Chinese applicants continue to lead in filing volume. This suggests that China's innovation push and industrial upgrading are at least partly aligned with sectors characterized by rapid global technological change, where patent protection can be especially valuable.

2.1.5. Large Population and Market Size

China's population size and the corresponding domestic market create inherent advantages for domestic innovation and patenting. With a population exceeding 1.4 billion, China provides a massive internal user base for new products and services which increases the potential return on innovations and can motivate firms to protect IP domestically as they scale production. Coupled with the large number of domestic patent applications reported in global data (e.g., the ~1.8 million filings in 2024) this

demographic and market scale likely contribute to high filing volumes.

2.1.6. Government Subsidies for Patent Filings

China's rapid growth in patent filings has been significantly driven by extensive government support in the form of subsidies and financial incentives. The Chinese government has implemented policies that reduce the cost burden of intellectual property (IP) protection for individuals, small enterprises, and universities. These measures include direct financial subsidies for patent application fees, reduced examination charges, and rewards for granted patents, particularly in high-priority sectors such as artificial intelligence, biotechnology, and green technologies (WIPO, 2023; State Intellectual Property Office of China, 2022). By mitigating the financial risk associated with patenting, these subsidies have encouraged a broader range of innovators including startups and research institutions to actively pursue patent protection. Moreover, local governments often offer additional monetary bonuses and tax incentives to inventors, fostering a competitive culture of innovation at the provincial level. This state-driven encouragement has played a pivotal role in establishing China as the world leader in patent filings.

2.1.7 Participation in global value chains

Global value chains can act as a powerful catalyst for technological upgrading, productivity growth, and structural transformation in developing economies. By integrating into GVCs, firms and industries obtain access not only to international markets, but also to better intermediate inputs, advanced technologies and global management practices — enabling technology transfer and know-how diffusion. Such integration promotes total-factor productivity growth and sectoral value added, especially when firms move beyond simple assembly towards more sophisticated and innovation-intensive tasks. In many developing countries, GVC participation also stimulates human capital development by raising demand for skilled labour, encouraging training and knowledge accumulation. Moreover, empirical evidence suggests that for developing economies, GVC participation is associated with improved export sophistication, enhanced competitiveness, and sustainable economic progress provided that sufficient domestic absorbative capacity (like institutional strength, human capital, and innovation systems) exists.

III. FINDINGS

3.1 The volume-based indicators (applications, grants, patents in force) clearly show China's structural advantage: a vast stock of patents, continuous high filing and grant activity, and a massive active portfolio.

3.2 India is showing rapid growth and gradually catching up with China in relative terms especially in filings, grants, and the share of resident filings. In 2023, India recorded 64,480 patent applications, a 15.7% increase over the previous year, and resident filings comprised about 55.2% of all submissions the highest ever for India. Meanwhile, China continues to lead globally, with its IP office receiving 1.8 million applications in 2024.

3.3 Normalized metrics such as the patent-to-GDP ratio and resident-filings share show improvement for India, indicating increasing domestic innovation intensity. According to WIPO, both China and India saw improvements in their resident patent-to-GDP ratios in 2024.

3.4 Grant rates appear healthy in both countries (for processed applications). However, this indicator alone does not reveal much about patent quality, inventive novelty, or economic impact. The fact that many applications get granted does not necessarily mean the resulting patents are high-value or commercially exploited.

3.5 Patent survival / renewal data a crucial indicator of whether patents are valued and used shows concerning patterns, at least in some contexts. For instance, Indian resident patents filed between 1995–2005 found that many patents (especially from small firms or limited-scope inventions lapse early, with survival depending heavily on technological scope and firm characteristics. For China, global WIPO data indicate that across many jurisdictions, only about 36.2% of granted patents remain in force for at least 10 years after filing.

3.6 Internationalization and global reach remain limited for both India and China when compared with many developed economies though with different dynamics. China's large domestic patent system reduces its relative need for foreign filings; in contrast, India's evolving innovation system may benefit from increasing international

patenting to boost global competitiveness and technology diffusion

IV. CONCLUSION

China's position as the global leader in patent filings is the outcome of a highly coordinated national innovation agenda, substantial expansion in research and development spending, and institutional mechanisms that actively encourage intellectual property generation across universities, research institutes, and industrial sectors. Data from the World Intellectual Property Organization (WIPO) indicate that China has submitted more than 45 percent of the world's patent applications in recent years, far exceeding comparable filings in the United States, South Korea, and India (WIPO, 2023). This dominance reflects long-term state interventions, including the National Intellectual Property Strategy and multi-decade science and technology development plans, which collectively built a broad-based innovation ecosystem and sharply increased the country's R&D capacity (OECD, 2022). Growth in high-technology sectors particularly telecommunications, artificial intelligence, robotics, and advanced manufacturing has simultaneously contributed to a surge in patentable innovations (Zhang et al., 2021). Reforms such as the establishment of specialized IP courts and the strengthening of administrative enforcement have further increased confidence in China's intellectual property regime (CNIPA, 2022). Yet, these achievements coexist with notable structural weaknesses. A significant portion of China's filings comprise utility model patents, which involve lower novelty requirements and have been linked to concerns about overall patent quality (WIPO, 2023). Domestic incentive schemes that reward sheer patent quantity such as financial subsidies, university scoring metrics, and professional promotion systems have encouraged strategic rather than innovation-driven patenting behaviour (Li, 2020). Moreover, China's comparatively lower patent grant and maintenance rates point to the persistence of quantity-driven applications with limited commercial potential (Hu & Jefferson, 2021). Technology transfer remains another bottleneck: Chinese universities continue to commercialize a very small fraction of their patents, often below 5 percent, whereas research institutions in the United States benefit from robust technology licensing offices and higher university–industry collaboration (Fu et al., 2019). A cross-country comparison highlights substantial differences in institutional design and innovation outcomes. The United States operates a stringent, litigation-heavy IP system, complemented by strong venture capital participation and mature commercialization infrastructures, resulting in patents with greater international scope and market value (USPTO, 2023; Hall & Harhoff, 2012). South Korea's system, governed by KIPO, emphasizes quality, international filing strategies, and corporate-led R&D, producing high grant rates and globally competitive IP portfolios (KIPO, 2023). India, although modernizing its IP regime through digitization, accelerated examination procedures, and increased policy support, still trails these innovation hubs in R&D investment, patent quality, and international filings (IPO India, 2023). Structural constraints including limited private-sector R&D spending, weaker industry–academia linkages, and underdeveloped commercialization channels continue to impede India's ability to translate scientific output into high-value intellectual property. To close this gap, India must adopt a multifaceted strategy: increasing national R&D expenditure to align with global benchmarks, strengthening university technology transfer offices, incentivizing industry–academia partnerships, and promoting high-quality rather than high-volume patenting. Expanding support for deep-tech start-ups, enhancing enforcement mechanisms, and integrating commercialization metrics into publicly funded research evaluations would further strengthen India's innovation ecosystem. Viewed comparatively, China's scale, coordinated policy execution, and rapid institutional evolution have propelled it to the forefront of global patent activity. However, its reliance on volume-driven incentives and uneven commercialization outcomes demonstrates that patent quantity alone is insufficient for long-term technological leadership. As China shifts toward quality-focused evaluation standards and broader international patent strategies, its challenge will be converting immense IP output into sustained global competitiveness an area where both the United States and South Korea currently exhibit structural advantages (OECD, 2022). For India, understanding these contrasts provides a valuable blueprint for strengthening its own innovation capacity and

improving the long-term impact of patent-driven development

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