Development Studies

The Bhutanese Innovation Ecosystem

WIPO

The Bhutanese Innovation Ecosystem

Executive summary

This study reveals differentiated trends in Bhutanese participation in the global innovation ecosystem (technological, entrepreneurial and design activities) during the period 2000-2023. Conditional on data availability, the report extends the analysis to subnational levels to identify regional centers of innovation and entrepreneurial activity.

Scientific research stands as the strongest pillar of Bhutan's innovation ecosystem, demonstrating remarkable growth from minimal publication output in the early 2000s to over 400 annual publications by 2021. Technological activity in Bhutan remains limited. Entrepreneurial activities show an overall growth pattern and remain geographically concentrated. In addition, Bhutanese participation in technological and design activities has been decreasing. These results suggest challenges in the generation and protection of patentable and creative innovations.

- Bhutanese **scientific activities** are concentrated primarily in Physical Sciences and Social Sciences.
- In **technological activities**, Bhutanese have participated mostly in Engineering, both mechanical and electrical.
- In **entrepreneurial activities**, Bhutanese have demonstrated a greater presence in health sector and agriculture with strong concentration of the activities in Thimphu and Samdrup Jongkhar.
- In **design activities**, Bhutanese have engaged mainly in packaging related designs.

Introduction

In a world increasingly driven by innovation and knowledge, intellectual property (IP) plays a key role in the economic and technological transformation of countries. This report analyzes innovation activities through a diagnosis of Bhutanese participation in scientific publications, patents, trademarks, and industrial designs around the world between 2000 and 2023. Conditional on data availability, the report extends the analysis to subnational levels to identify hubs of innovation and entrepreneurial activity.

The assessment of scientific, technological, entrepreneurial, and design activities provides insight into Bhutan's innovation landscape. Bhutan participation in scientific publications demonstrates the nation's ability to generate scientific knowledge. Similarly, engagement in technological activities demonstrates the country's ability to develop technological innovations, while participation in entrepreneurial and design spheres indicates Bhutan's potential for business creation and creative development, respectively. A comprehensive evaluation of these dimensions is essential for identifying both opportunities and challenges in establishing a robust environment for innovation and competitive business development.

Context of study

This study is based on data from IP applications or scientific publications filed or published by at least one Bhutanese inventor, designer, applicant or institution both inside and outside the country to analyze Bhutan's technological, scientific, entrepreneurial and design activities between 2000 and 2023.

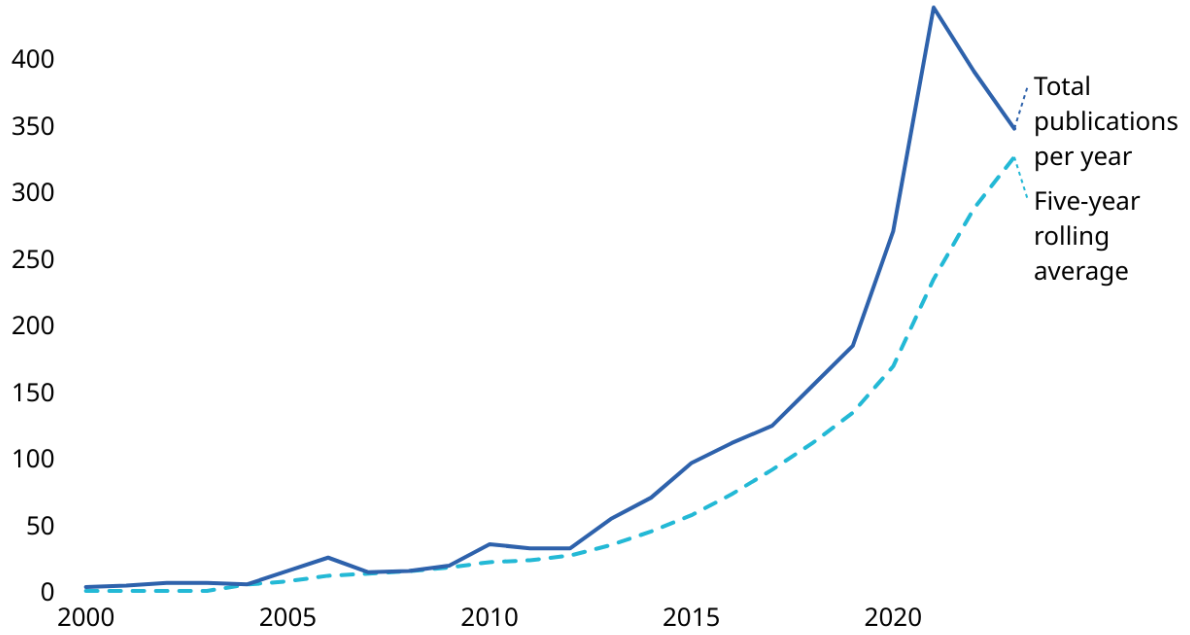
This document provides evidence on Bhutan's participation in national and international IP applications and scientific publications, to contribute to the formulation of policies aimed at strengthening the country's innovation ecosystem. The analysis of trends allows identifying areas of opportunity to improve Bhutanese insertion in global networks of knowledge and technology commercialization. The analysis of this study is one of the results of the project of the Committee for the Development of Intellectual Property on the "Systematization of statistical data and the design and implementation of a methodology for the elaboration of impact studies on the use of the intellectual property system" (CDIP/26/4). Furthermore, this document was shared with government representatives, who reviewed it and offered feedback during its drafting.

Scientific activities of the Bhutanese innovation ecosystem

This section of the report offers evidence on scientific publications in international indexed scientific journals from researchers affiliated with Bhutanese academic institutions. Figure 1 depicts the total annual scientific publications from 2000 to 2024, with a five-year rolling average shown as a dotted red line.

Figure1. A constant growth of scientific production in Bhutan

Scientific publications count per publication year



Source: OpenAlex

Publication output remained minimal (3-6 publications annually) during the early 2000s, reflecting the nascent stage of research activity. A modest but consistent growth phase began around 2005, with publications gradually increasing to approximately 35 per year by 2010. From 2010 to 2020, publications demonstrated accelerated growth, indicating significant expansion in Bhutanese research capacity and output. Peak output was reached in 2021 with 438 publications, representing a remarkable increase from previous years. The decline observed after 2021 (390 publications in 2022, 347 in 2023, and 235 in 2024) may partially result from data truncation, as recent publications might not yet be fully indexed in the database.

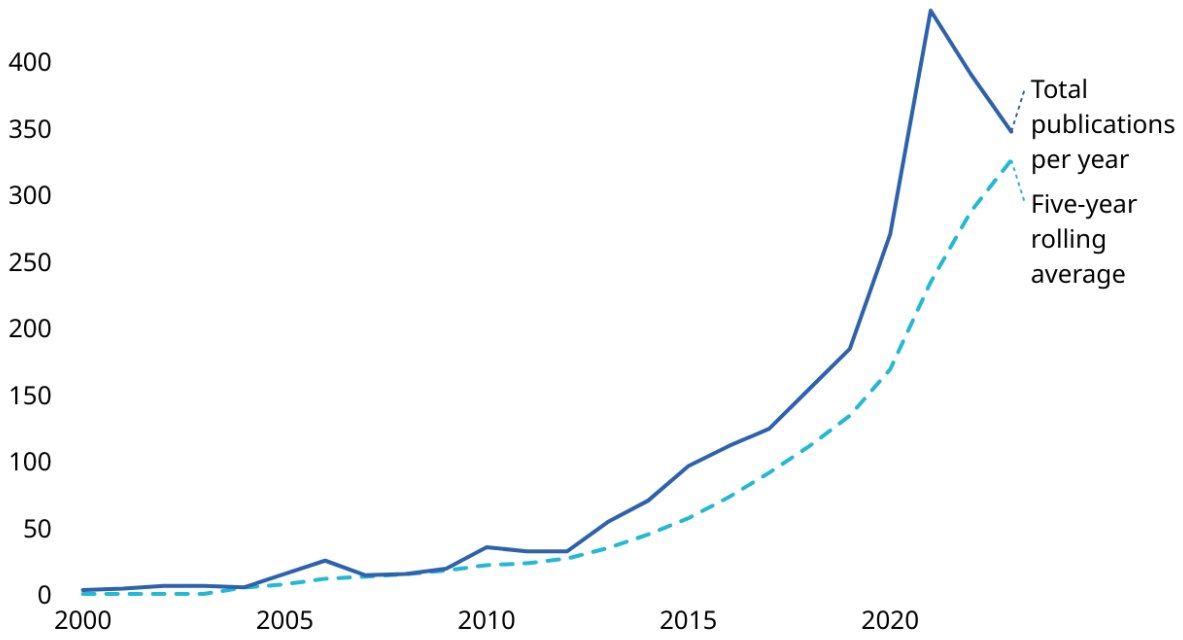
Despite the recent decline, the five-year rolling average continues to show an upward trend, suggesting the overall trajectory of Bhutanese research output remains positive. The substantial growth from 2015 to 2021 (124 to 438 publications)

represents a 253% increase over six years, indicating successful research capacity building initiatives.

Figure 2 confirms the growth of Bhutanese scientific publications across all scientific domains. For instance, **physical sciences** demonstrate the highest absolute volume with 700 publications during 2012-2023, compared to just 80 publications in 2000-2011, representing an 8.78-fold increase. Health sciences exhibit the most significant growth factor among main categories at 21.70-fold increase (from 21 to 466 publications), indicating substantial development in medical research capacity. Social sciences show the second-highest growth rate (20.46-fold) and second-highest volume (682 publications) during 2012-2023, up from only 34 publications in the earlier period. Life sciences recorded moderate growth (9.48-fold) with 422 publications in 2012-2023 compared to 45 publications in 2000-2011.

Figure1. A constant growth of scientific production in Bhutan

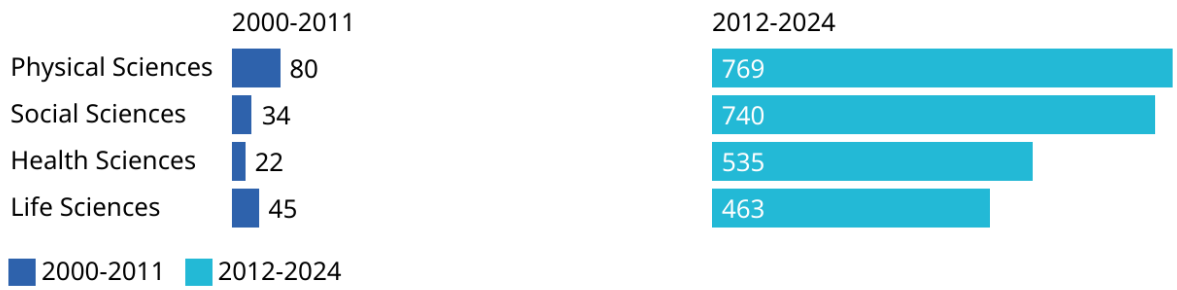
Scientific publications count per publication year



Source: OpenAlex

Figure 2.Physical and social sciences dominate the topics of Bhutanese research

Scientific publications count per domain



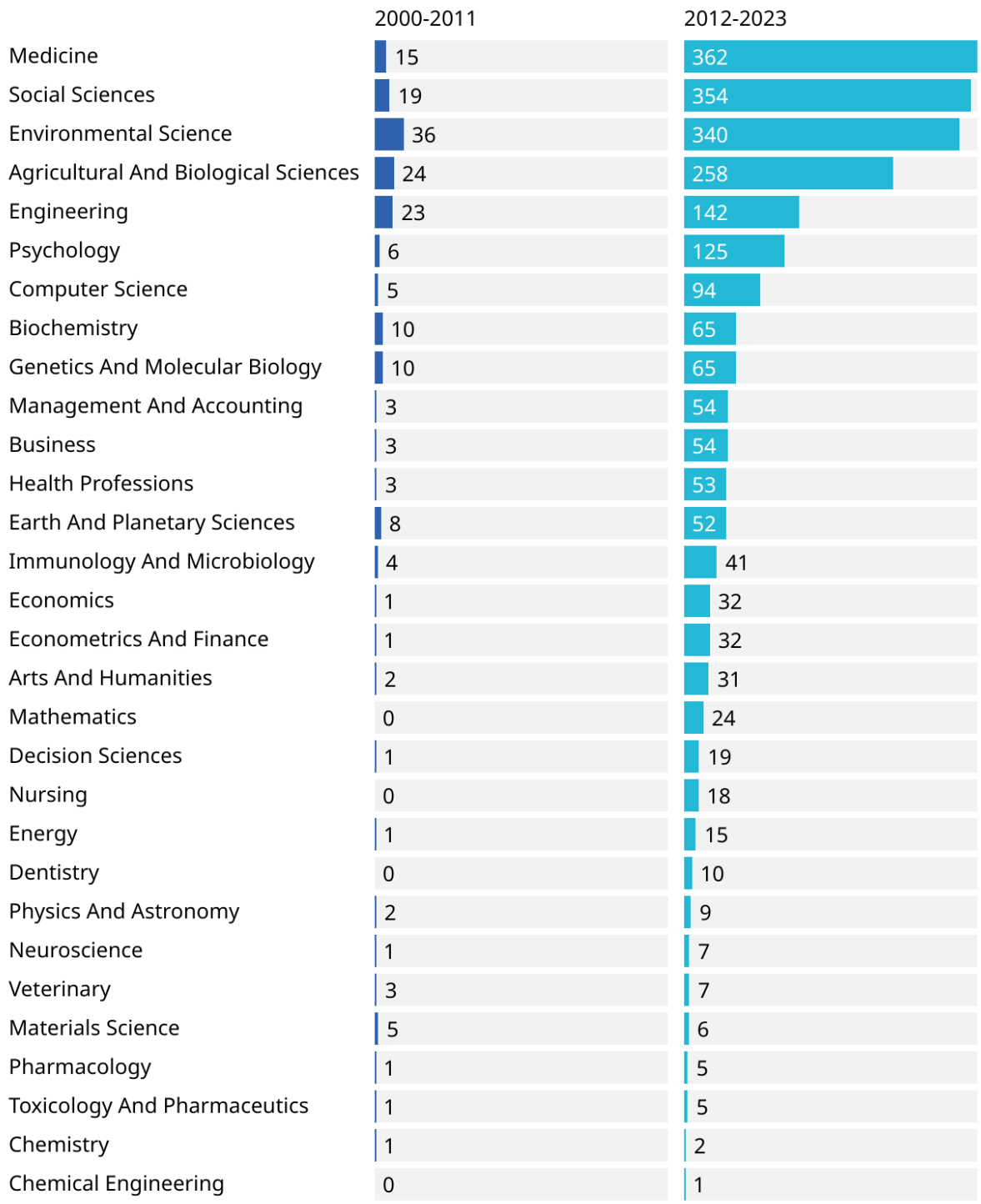
Source: OpenAlex

Regarding fields of publication, **Error! Reference source not found.** confirms that:

- **Medicine** leads with 362 publications in 2012-2023 (up from 15 in 2000-2011, 24.13-fold increase), while **Environmental Science** ranks third with 340 publications (9.44-fold increase).
- **Economics, Econometrics, and Finance** show the highest growth rates (32.00-fold from 1 to 32 publications each), followed by Psychology (20.83-fold), Computer Science (18.80-fold), and Management/Business (18.00-fold), indicating significant research diversification.
- **Agricultural and Biological Sciences** remain important with 258 publications (10.75-fold growth), while several specialized fields (Decision Sciences, Energy, health specialties) emerged in 2012-2023 with minimal prior representation.
- **Underdeveloped areas** include Materials Science (1.20-fold), Chemistry (2.00-fold), and Veterinary Science (2.33-fold), showing limited growth.

Figure 3. Medicine and Environmental Science: Driving Bhutan's Research.

Scientific publications count per fields



Source: OpenAlex

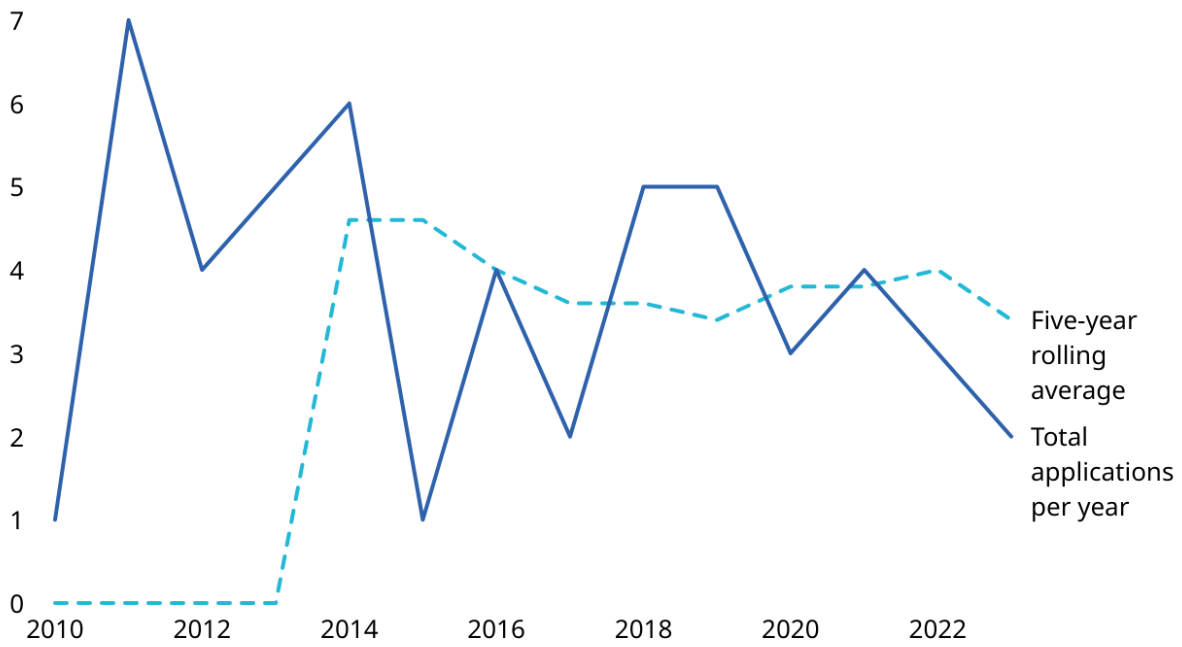
Technological activities of the Bhutanese innovation ecosystem

The technological activities of Bhutan's innovation ecosystem are analyzed through patent applications filed by at least one Bhutanese, inventor or applicant, in any office around the world. Their evolution makes it possible to analyze the (patentable) technological dynamics of the Bhutanese innovation ecosystem and its integration into international technological knowledge networks.

As displayed in

Figure 4.Patent applications' count remains constant but low

Patent applications count per application year

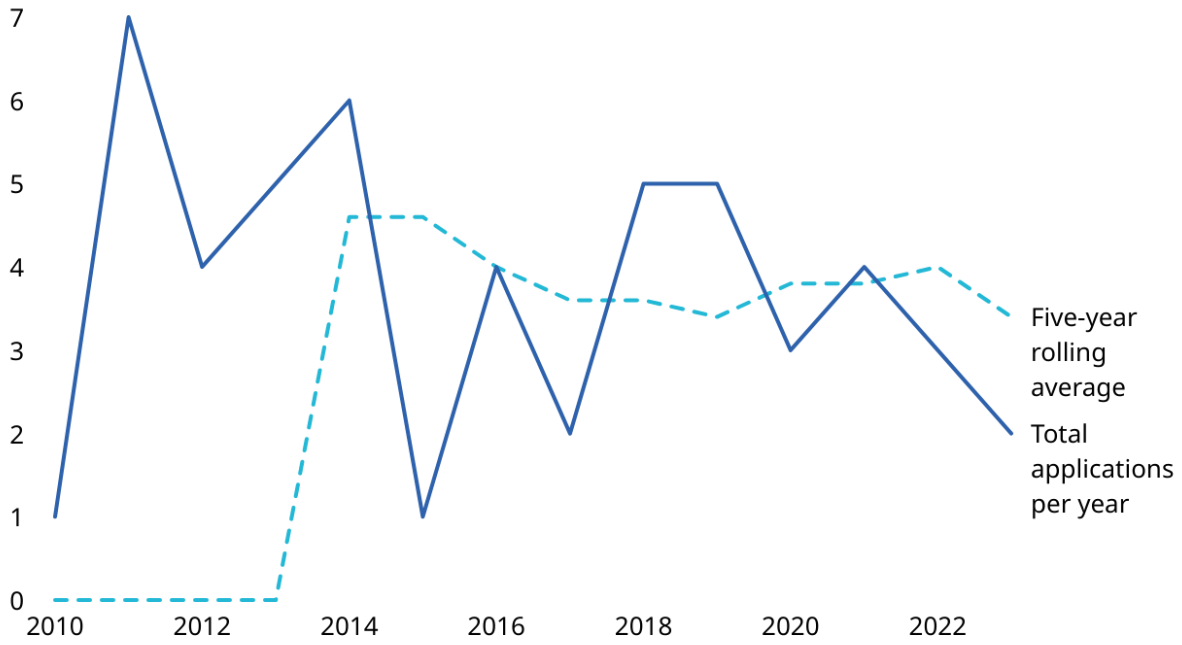


Source: IPAS, DoMCIIP and WIPO collection

, we observe a relatively stable but low patenting activity since 2010, averaging around 4 patents a year, for a grand total of 52 patented inventions globally. As this number remains limited, we recommend being careful on the interpretation of those results, which may only represent a fraction of the actual Bhutanese technological activity. Regarding subnational distribution almost all patent applicants are in the capital region Thimphu (77,8%), with very few exceptions located in Punakha (22,2%).

Figure 4.Patent applications' count remains constant but low

Patent applications count per application year

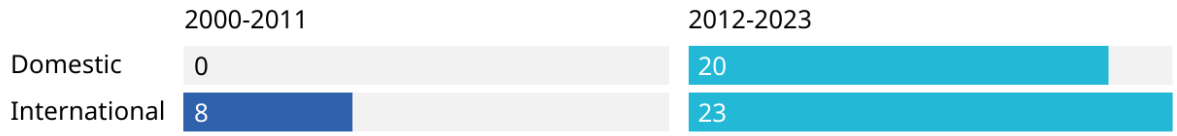


Source: IPAS, DoMCIIP and WIPO collection

As displayed on Error! Reference source not found., among the 52 total patents for the period 2012-2023, 31 of them have been applied in other countries while 21 have been applied domestically. International applications have more than doubled over 10 years.

Figure 5. Bhutanese Technological activity is both international and domestic

Patent applications per applications offices

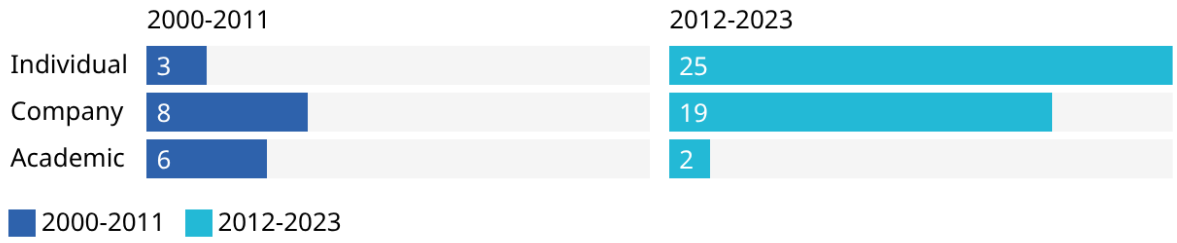


Source: IPAS, DoMCIIP and WIPO collection

Error! Reference source not found. shows that Bhutan presents a relatively strong share of individual inventors with strong growth, along an equivalent in size but less dynamic private sector, while academic patenting remains limited. These results suggest that patenting represents a stronger interest for entrepreneurs than for academic institutions.

Figure 6. Most patents are applied by individual inventors

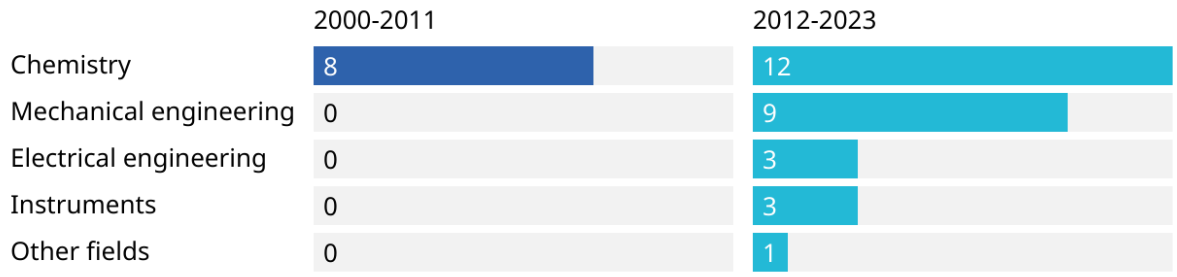
Patent applications count per applicant type



Source: IPAS, DoMCIIP and WIPO collection

Figure 7.Bhutanese technological activity is mostly oriented toward engineering

Patent applications count per Technological Sector

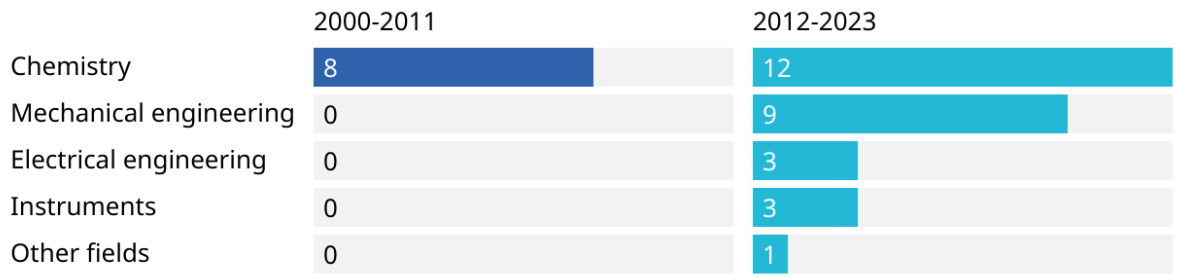


Source: IPAS, DoMCIIP and WIPO collection

displays Bhutan technological activity by sector. Chemistry is the leading sector, representing almost 40% of applications and the only sector presenting applications in the first period. Engineering, both mechanical and electrical, comes second representing 25% of applications.

Figure 7.Bhutanese technological activity is mostly oriented toward engineering

Patent applications count per Technological Sector



Source: IPAS, DoMCIIP and WIPO collection

Error! Reference source not found. compares the concentration of technological activity by relying on the Herfindahl-Hirschman Index (HHI, see Methodological notes for more details) between international and domestic patents. Results clearly indicate that international applications are more diverse than domestic, suggesting high concentration for the domestic market. The decrease in concentration for international applications between the first and second periods echoes results from Figure 7 and inform us that chemistry applications from the first periods were international.

Figure 8. International applications are very diverse, when resident ones are concentrated

HHI index per office and periods

Source: IPAS, DoMCIIP and WIPO collection

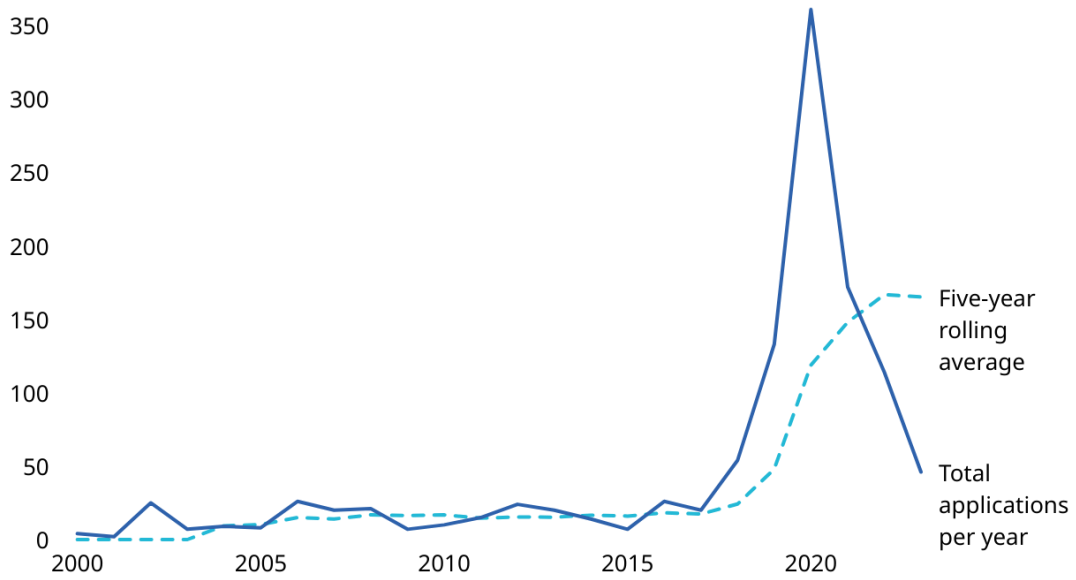
Entrepreneurial activities of the Bhutanese innovation ecosystem

The entrepreneurial activity of Bhutanese is analyzed in this section through a diagnosis of trademark applications in Bhutan and the rest of the world filed by at least one Bhutanese applicant. This indicator reflects not only the dynamism of the local entrepreneurial ecosystem, but also the capacity of Bhutanese entrepreneurs to expand and protect their businesses in different markets.

shows stable applications number between 2000 and 2017 (mostly below 26 applications per year), a peak around 2020 (361 application) followed by a steep decline afterwards (46 applications in 2023). The five-year rolling average shows a gradual upward trend, reaching approximately 150-160 applications by the end of the period. This smoothed trend line confirms the overall growth pattern despite the recent decline from the 2020 peak, suggesting that while the extraordinary spike in 2020 may have been anomalous, the general trajectory for Bhutanese trademark applications remains positive compared to pre-2018 levels.

Figure 9.Trademarks applications show strong growth after 2017

Trademark applications count per application year

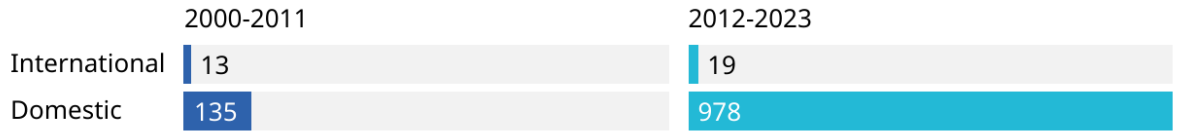


Source: IPAS, DoMCIIP and WIPO collection

As shown in

Figure 10. Bhutanese entrepreneurial activity is mostly domestic

Trademarks application count per office and periods

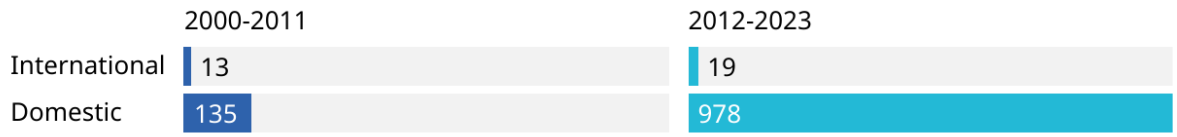


Source: IPAS, DoMCIIP and WIPO collection

, Bhutanese mostly applied for trademarks in Bhutan, with a strong growth since the 2010s. On the contrary, international applications remain limited and show contraction over the years. Those results suggest that companies and entrepreneurs mainly rely on trademarks to gain an advantage on the domestic market.

Figure 10. Bhutanese entrepreneurial activity is mostly domestic

Trademarks application count per office and periods



Source: IPAS, DoMCIIP and WIPO collection

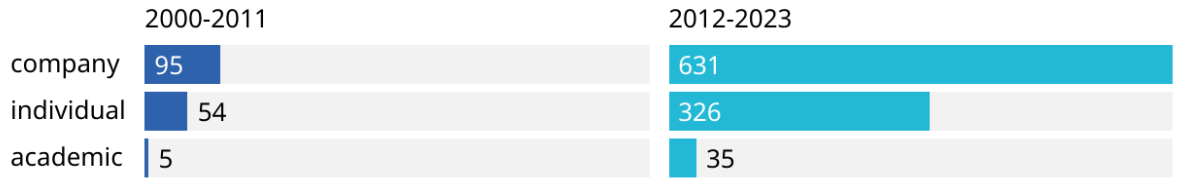
Like technological activities, entrepreneurial activities can be carried out in different organizational settings. Typically, trademark applications – both national and international – are made by private companies. However, individuals may also apply for a trademark, which is often associated with entrepreneurial activities in a smaller private business context (e.g. SMEs, microenterprises or startups). Additionally, academic institutions can apply for trademarks to develop economic exploitation of their research output.

Error! Reference source not found. confirms that Bhutanese companies consistently represent the primary applicants for trademarks, maintaining their dominant position throughout the observed periods. Individual applicants closely follow corporate applicants, with both categories demonstrating comparable growth trajectories over the past two decades. While academic institutions generate a comparatively modest number of trademark applications overall, this sector exhibits the most significant percentage growth rate among all applicant categories. Overall, data reveals a maturing intellectual property landscape in Bhutan, with diversification across different types of institutional applicants despite the relatively limited absolute

volume of applications.

Figure 11.All categories of applicants demonstrate consistent upward trends

Trademarks applications count per applicant type



Source: IPAS, DoMCIIP and WIPO collection

Error! Reference source not found. displays Bhutan technological activity by sector. Applications are concentrated in the health sector, especially in the second period, reporting the strongest growth across all sectors. It is seconded by Agriculture, which was the most important during the first period, suggesting a switch in the Bhutanese entrepreneurial activity towards new sectors. Business services display the strongest growth, after health, moving up from the 7th to the 4th most important sector. Finally, research and technology show the slowest growth, multiplying the number of brands by only 1.12 between the two periods.

Figure 12.Trademarks applications are concentrated in the health sector

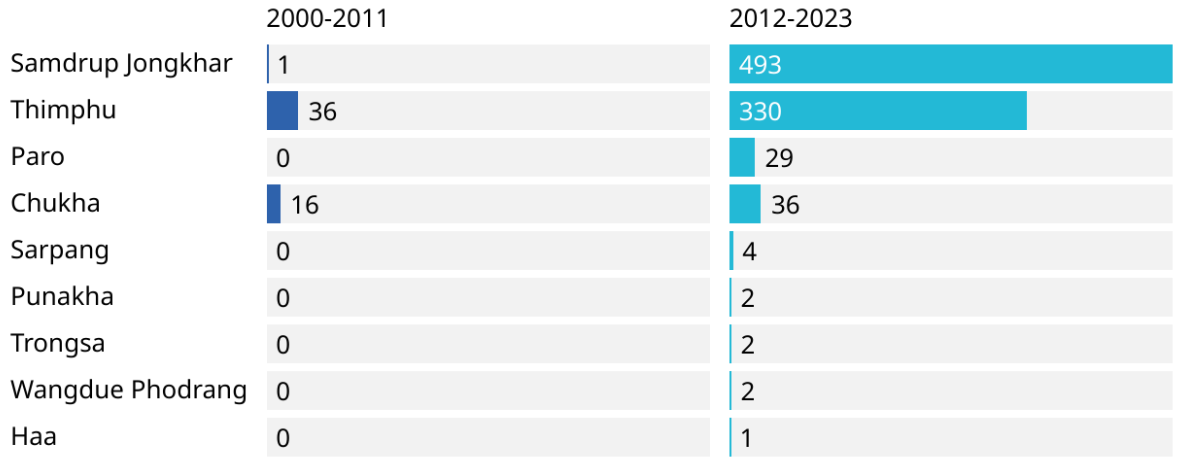
Trademarks applications per sector

Source: IPAS, DoMCIIP and WIPO collection

At the sub-regional level,

Figure 13. Samdrup Jongkhar and Timphu concentrate most of the entrepreneurial activity

Trademark applications per region

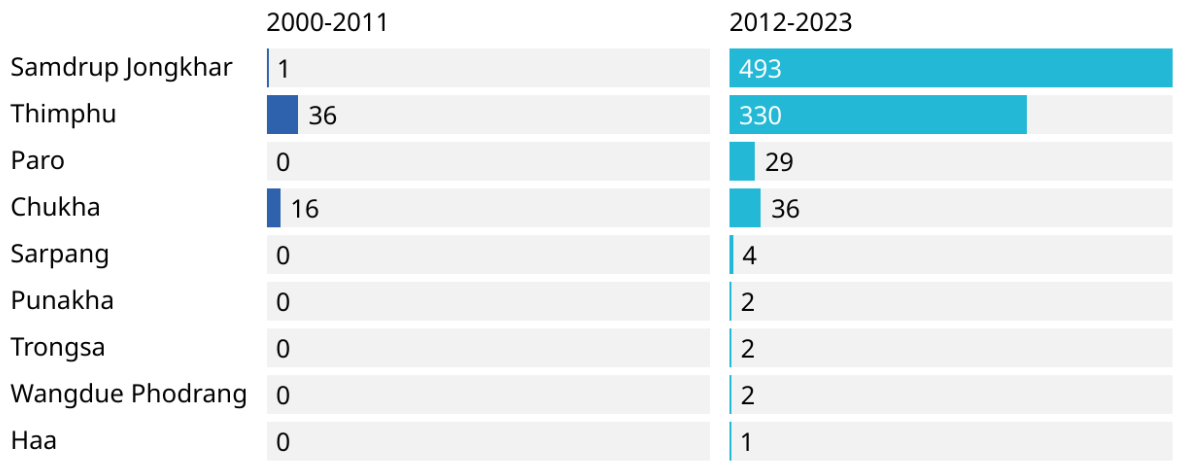


Source: IPAS, DoMCIIP and WIPO collection

Error! Reference source not found. shows that Bhutan's entrepreneurial landscape exhibits a dynamic shift between two principal innovation hubs: Thimphu and Samdrup Jongkhar (Figure 13). During the initial study period (2000-2011), Thimphu was the dominant hub, concentrating on most of the intellectual property applications, seconded by Chukha. However, the second period (2012-2023) witnessed a remarkable transformation as Samdrup Jongkhar emerged as a significant innovation center, becoming the leading application region with close to 500 trademarks in total.

Figure 13. Samdrup Jongkhar and Timphu concentrate most of the entrepreneurial activity

Trademark applications per region

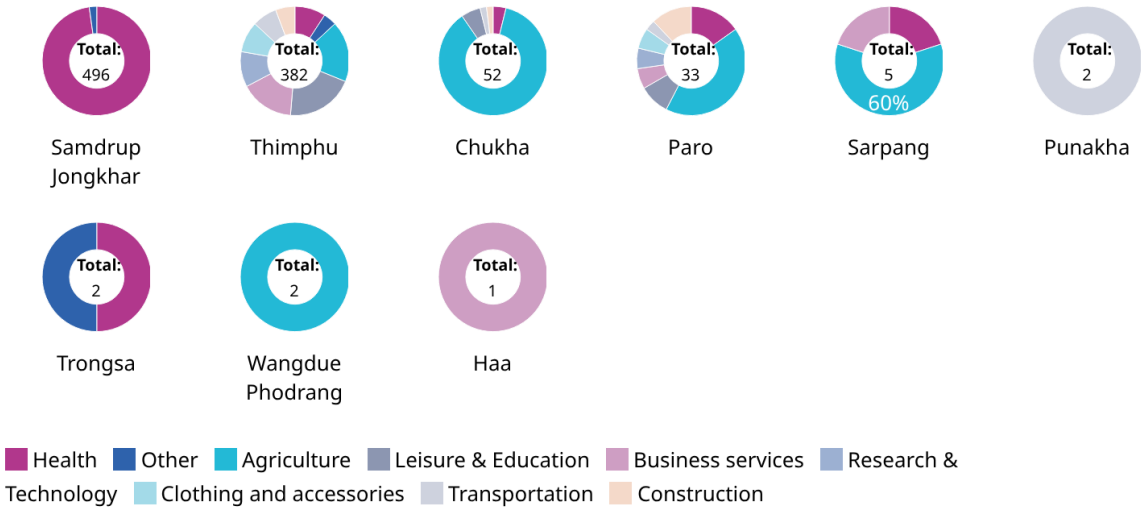


Source: IPAS, DoMCIIP and WIPO collection

Error! Reference source not found. shows the trademark classification distribution across Bhutanese regions. Thimphu (366 trademarks) displays a notably balanced profile with balanced representation across multiple sectors including Leisure/Education (20%), Agriculture (18%), and Business services (16%). This stands in stark contrast to other regions, which exhibit pronounced specialization patterns. Samdrup Jongkhar, despite having the highest trademark volume (494), focuses almost exclusively on the health sector (97.8%), while Chukha concentrates on Agriculture (87.5%). The remaining regions show similar specialization tendencies with significantly lower trademark volumes. This regional distribution highlights Thimphu's diversified economic activity as the capital, compared to the more specialized economic structures prevalent throughout the rest of Bhutan.

Figure 14.Thimphu displays an equilibrated profile

Trademark application share per sector per region



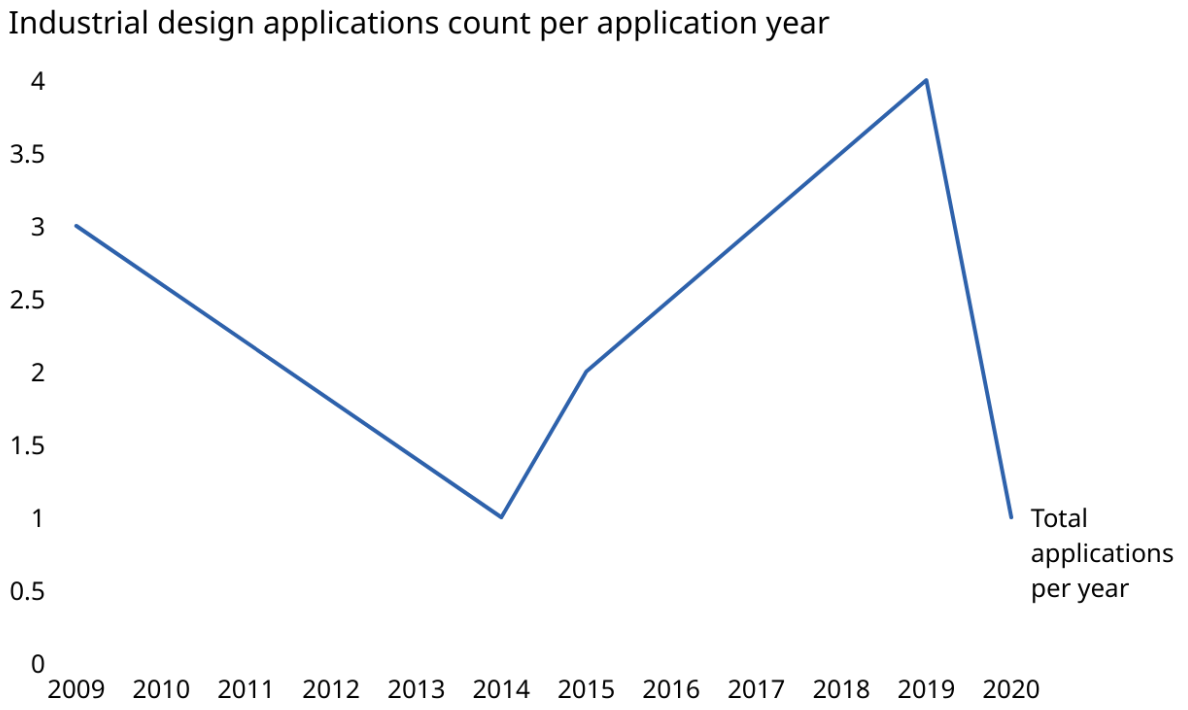
Source: IPAS, DoMCIIP and WIPO collection

Industrial design activities of the Bhutanese innovation ecosystem

The design activity applied to industry in the Bhutanese innovation ecosystem is analyzed in this section through a diagnosis of industrial design applications filed by at least one Bhutanese applicant or designer around the world. This indicator not only reflects the creativity and innovation of Bhutanese designers but also provides information on their interest in protecting their creations in different international markets.

As displayed in

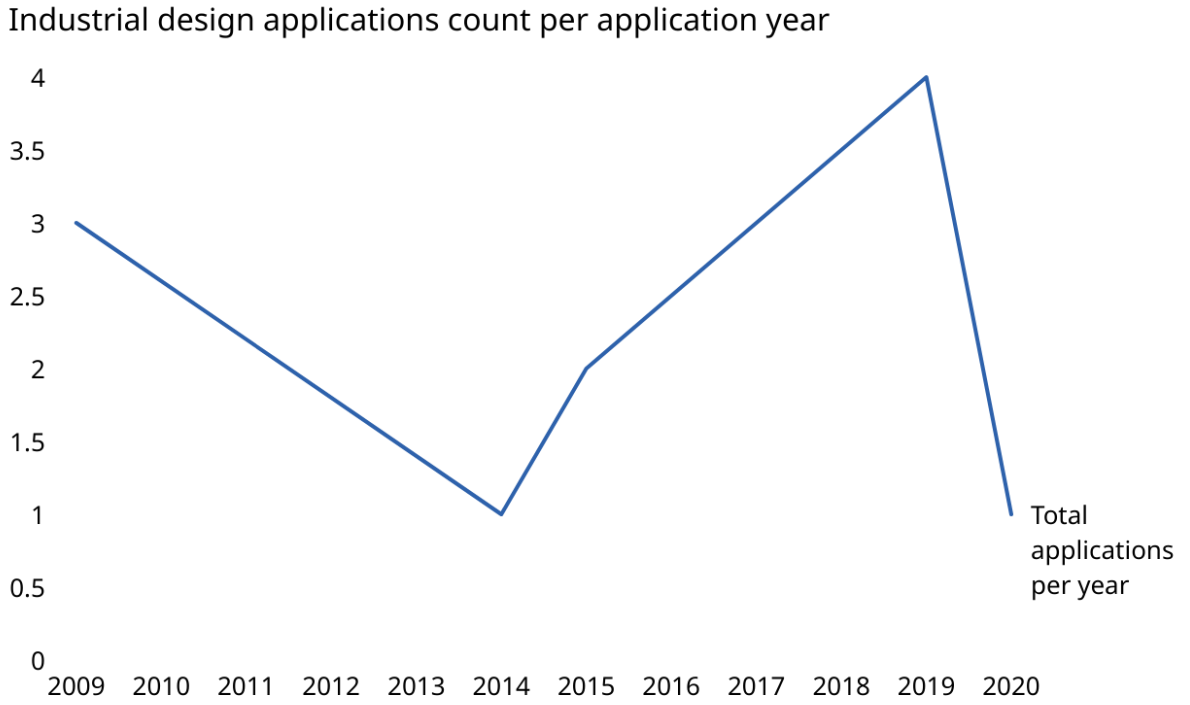
Figure 15. Design Applications in Bhutan: Revival After Initial Decline



Source: IPAS, DoMCIIP and WIPO collection

, we observe a very limited Bhutanese design activity; only 3 designs in 2009, while the number of applications reaches a total of 8 in the second period.

Figure 15. Design Applications in Bhutan: Revival After Initial Decline



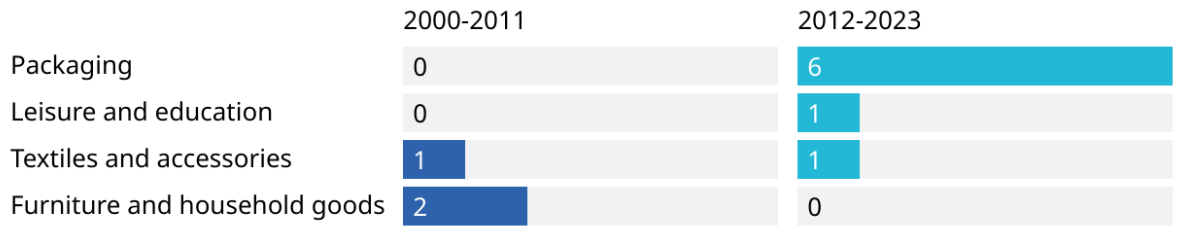
Source: IPAS, DoMCIIP and WIPO collection

Error! Reference source not found. shows how the different designs are categorized in different activities. For instance, packaging designs have emerged as the dominant category in the 2012-2023 period with 6 applications, despite having no applications in the earlier period (2000-2011). Furniture and household goods applications show an opposite trend, decreasing from 2 applications in 2000-2011 to none in the more recent period, suggesting a potential shift away from this sector. Textiles and accessories maintained consistent but minimal activity with exactly 1 application in each period. Leisure and education designs appeared only in the recent period (2012-2023) with 1 application, representing a new area of design interest.

Overall, the data shows a shift in design priorities from household items toward commercial packaging and new product categories, though the very small sample size (total of 11 applications across both periods) limits definitive conclusions.

Figure 16.Design applications are concentrated on packaging

Design applications per sector



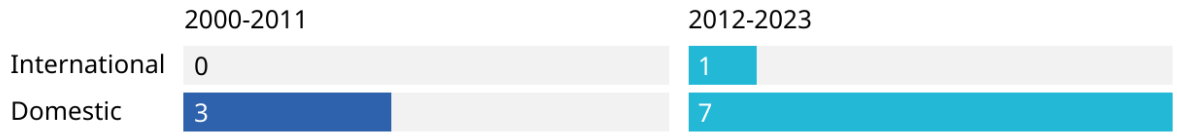
Source: IPAS, DoMCIIP and WIPO collection

Error! Reference source not found. demonstrates that Bhutan's design activity remains almost exclusively domestic in nature, with only a single international design application appearing in the 2012-2023 period. The modest but notable increase from 3 to 7 domestic design applications between the two periods represents 133% growth. This growth may indicate initial steps toward greater recognition of industrial design as a valuable form of intellectual property within Bhutan's developing innovation ecosystem. The near absence of international design applications suggests that Bhutanese designers and companies have yet to pursue significant global protection for their design innovations. The shift in design categories from household goods toward packaging reveals evolving commercial priorities that align with developing consumer markets and retail sectors.

Despite these modest positive indicators, the extremely limited overall volume of design applications indicates that design protection remains at an early developmental stage compared to other forms of intellectual property in Bhutan.

Figure 17. Domestic design applications are increasing but remain limited

Design applications count per offices



Source: IPAS, DoMCIIP and WIPO collection

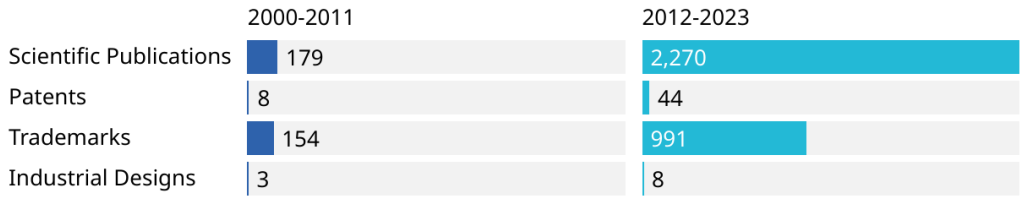
Conclusions

The comprehensive analysis of Bhutan's innovation landscape from 2000 to 2023 reveals a dynamic ecosystem in early but accelerating stages of development (

), with several notable patterns emerging across scientific, technological, entrepreneurial, and creative domains. Furthermore, the analysis reveals the existence of strong geographical differences in entrepreneurial activities.

Figure 18. All components of the Bhutanese innovation ecosystem are on the rise

Applications count per IP type and periods



Source: IPAS, DoMCIIP, WIPO collection and OpenAlex

Scientific research stands as the strongest pillar of Bhutan's innovation ecosystem, demonstrating remarkable growth from minimal publication output in the early 2000s to a peak of 438 publications in 2021. This 253% increase between 2015 and 2021 signals successful research capacity building initiatives.

In contrast, technological innovation as measured through patent applications remains at an early stage, with activity only beginning after 2010 and remaining limited since then. The significant proportion of international patent applications (60%) suggests that Bhutanese technological innovations, though limited, are developed with global perspectives.

Entrepreneurial activity, reflected in trademark applications, shows a more robust trajectory with substantial growth after 2017. The predominantly domestic nature of these applications reveals that Bhutanese entrepreneurship remains primarily focused on local markets. The sectoral shift from agriculture toward health and business services suggests an evolving economy responding to potentially changing market needs or the development of new capabilities. The noteworthy growth in academic trademark applications, though still modest in absolute terms, indicates emerging university commercialization efforts.

Industrial design activity, while showing signs of revival in the 2012-2023 period, remains the least developed component of Bhutan's innovation ecosystem. The transition from furniture design to packaging applications reflects changing commercial priorities, though the extremely limited international activity suggests minimal global market integration for Bhutanese design innovations.

Cross-cutting patterns reveal a consistent emphasis on domestic activity across all

innovation dimensions except patents, suggesting that while Bhutanese innovators are beginning to integrate with global knowledge networks, commercial exploitation remains primarily local. The health sector emerges as a focal point across multiple innovation dimensions, appearing prominently in scientific publications and trademarks.

In conclusion, Bhutan's innovation ecosystem demonstrates encouraging progress from a low baseline, with scientific capacity developing most rapidly, followed by entrepreneurial activity, while technological innovation and design creativity remain areas for further development. Future policy interventions could focus on strengthening the connections between the scientific strength of Bhutan and its technological and commercial activities, potentially accelerating the country's transition to a knowledge-based economy.

Methodological notes

WIPO International Collection

Intellectual property (IP) data is collected from WIPO (World Intellectual Property Organization). The collection covers the following internationally recognized databases:

- **Scientific Publications**: OpenAlex
- **Patents and Utility Models**: PATSTAT (Statistical Patent Database), Patentscope, and PCT International Collection (Patent Cooperation Treaty)
- **Designs**: WIPO Global Design Database
- **Trademarks**: WIPO Global Brand Database

The WIPO collection comprises internationally recognized databases that provide the best comprehensive coverage of intellectual property across multiple domains, including the main international collections administered by the organization.

Total IP applications filed by at least one Bhutanese applicant

The indicator of total IP applications filed by at least one Bhutanese applicant is defined as the number of IP applications in which at least one of the applicants or the inventor (for patents and utility models) or the designer (for industrial designs) is considered Bhutanese, either by nationality or by residence in Bhutan. This indicator includes applications resulting from international collaborations, which includes cases where there are non-Bhutanese co-applicants, co-inventors or co-designers. It also considers situations where a non-Bhutanese applicant employs a Bhutanese inventor or designer, as well as those where a Bhutanese applicant employs an inventor or designer of another nationality. Patent and utility model applications that include Bhutanese is an indicator that allows an approximation of the technological activities of Bhutanese, while industrial design applications with the presence of Bhutanese are considered as an indicator of the design activities of Bhutanese. In the case of trademarks, the determination of applications with Bhutanese presence is based solely on the nationality or residence of the applicant. This indicator makes it possible to diagnose the entrepreneurial activities of Bhutanese.

Share of international applications in total IP applications filed by at least one Bhutanese applicant.

The indicator of percentage of international applications in total IP applications filed by at least one Bhutanese applicant measures the proportion of applications that have been processed through international systems with respect to the total number of applications involving at least one Bhutanese applicant or inventor in the case of patents and utility models, at least one Bhutanese applicant or designer in the case of industrial designs, and at least one applicant in the case of trademarks. This percentage reflects the degree to which Bhutanese innovators and companies seek protection beyond the national level, either

through the Patent Cooperation Treaty (PCT) for patents, the Madrid System for trademarks, or the Hague System for industrial designs, as well as by filing applications in IP offices abroad.

Types of IP applicants

The types of IP applicants were identified from an iterative process of searching for key terms of institutional affiliation possibly contained in the names of patent, utility model, trademark and industrial design applicants. As a result of this process, the identified applicants were classified into three groups: 1) Academia; 2) Companies; 3) Individuals.

Fractional counting of IP applications

The methodology used in the WIPO Reports on World Intellectual Property Statistics to calculate fractional counts of intellectual property (IP) applications involves assigning a fraction of the application to each applicant and jurisdiction concerned. For example, if a patent application contains two applicants, each is attributed 0.5% of the application. Similarly, if the patent is filed in several countries, each country receives a proportionate share. This approach ensures that each participant's contribution is accurately reflected, which avoids double counting of applications filed by multiple applicants or jurisdictions. In practice, fractional counts of patent applications provide a nuanced view of innovation activity. A high number of non-residents suggest that the country is an attractive market for international innovators, indicating strong foreign interest. Conversely, a high number of residents indicates strong local innovation, showing the country's domestic inventive capabilities. These data can guide policymakers in balancing support for local innovators and attracting foreign investment.

Absolute count of IP applications

The absolute count methodology used in WIPO's Global IP Statistics Reports counts the total number of IP applications filed without adjustment for fractional counts, reflecting the gross volume of applications received by each jurisdiction or organization. This method provides a direct aggregate count of applications and does not adjust for multiple applicants or jurisdictions associated with a single application. For example, if a patent application is filed in three countries, each of those countries will be counted once, even though the application is a single entity shared among them. Similarly, if a patent application includes five different applicants, each of them contributes to the absolute count without any adjustment for fractional counts. This approach results in a straightforward representation of the total level of activity, showing the total volume of IP applications. A high absolute count may indicate a strong interest in protecting innovations in a particular jurisdiction or a high level of inventive activity within that area. For example, if a country experiences a significant increase in the number of patent applications filed, it may suggest that there is growing innovation or an upward trend in the number of foreign entities seeking protection there.

Herfindahl-Hirschman Index (HHI)

The Herfindahl-Hirschman Index (HHI) is a measure widely used in the economic literature to

assess the degree of concentration within a group, calculated as the sum of the squares of the shares of each category. High values of the HHI indicate that a few categories concentrate most of the total, while low values reflect a more diversified environment. In this study, we applied this indicator to analyze the concentration of patent applications in different technological fields, as well as the distribution of trademarks and industrial designs in the Nice and Locarno classes, respectively. In addition, the index can be calculated for a second category, such as international and national applications, allowing us to compare the concentration between the two.

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