THE APPROPRIABILITY METHODS OF INNOVATIVE SMEs: THE CASE OF METU TECHNOPARK

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ABSTRACT

THE APPROPRIABILITY METHODS OF INNOVATIVE SMEs: THE CASE OF METU TECHNOPARK

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SMEs play a vital role in the economy through their innovative activities, yet there is a notable gap in research focusing on their specific choices of appropriability methods and the rationale behind these choices. Appropriability methods provide mechanisms for controlling access to knowledge and could offer either temporary or, in the case of trade marks, lasting monopoly power over innovations. Formal methods include exclusive rights such as patent, utility model, industrial design, copyright, trade mark. On the other hand, informal methods, consist of first-mover advantage, lead-time advantage, complementary sales, and trade secret etc.

This thesis investigates which, and why appropriability methods SMEs prefer in their innovation activities. The thesis, conducted at METU Technopark in Ankara, involved semi-structured in-depth interviews with 29 innovative SMEs. As a result of qualitative analysis, the thesis revealed the usage ranking of different appropriability methods and the factors influencing these choices.

Overall, interviewed SMEs actively engage with appropriability methods, often utilize at least one of the formal and informal methods. Among the 29 SMEs located in METU Technopark, 28 have trade mark applications, and all have non-disclosure agreements signed with either their employees or the firms they collaborate with on

several projects. SMEs' main motivations for employing these methods, particularly for IPR are *"commercial exploitation"* and *"prevention of imitation"*. The nature of knowledge embedded in innovation such as tacit / codified also influences method choices. However, challenges such as difficulties in commercializing patented products due to a lack of complementary assets and inadequate infrastructure reduce the effectiveness of these methods.

Keywords: Appropriability methods, METU Technopark, SMEs, challenges, and effects of appropriability methods

ÖZ

YENİLİKÇİ KOBİLERİN YENİLİKLERİ KORUMA YÖNTEMLERİ: ODTÜ TEKNOKENT ÖRNEĞİ

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KOBİ'ler yenilikçi faaliyetleriyle ekonomide hayati bir rol oynamaktadır, ancak KOBİ'lerin benimsediği appropriability (yeniliği koruma) yöntemlerine ve bu tercihlerin arkasındaki gerekçelere odaklanan araştırmalarda önemli bir eksiklik bulunmaktadır. Yenilik koruma yöntemleri, bilgiye erişimi kontrol altına almayı sağlayan mekanizmalar sunar ve yenilikler üzerinde ya geçici ya da kalıcı bir tekel gücü sağlayabilir. Formal yöntemler, patent, faydalı model, endüstriyel tasarım, telif hakkı ve marka gibi fikri ve sınai mülkiyet haklarını içerir. Öte yandan, enformel yöntemler ise ilk olmanın avantajı (first-mover advantage), lider olmanın avantajı (lead-time advantage), tamamlayıcı satışlar, ticari sır, gizlilik anlaşmaları ve yayın yapma gibi yöntemleri içermektedir.

Bu tez, KOBİ'lerin yenilik faaliyetlerinde hangi yenilik koruma yöntemlerini, neden tercih ettiklerini araştırmaktadır. Ankara'da, bölgenin en fazla patent girişimcisine ev sahipliği yapan ODTÜ Teknokent'te gerçekleştirilen araştırma, 29 KOBİ ile yarı yapılandırılmış mülakatlar gerçekleştirilerek yapılmıştır. Yapılan kalitatif analiz sonucu farklı yenilik koruma yöntemlerinin kullanımına ve bu tercihleri etkileyen faktörlere ilişkin hipotezler ortaya koymuştur.

Sonuç olarak mülakat yapılan KOBİ'ler, fikri ve sınai mülkiyet haklarıyla aktif olarak ilgilenmekte ve çoğunlukla formel ya da enformel yöntemlerden en az birini kullanmaktadır.

METU Teknokent'te yer alan 29 KOBİ arasından 28 tanesinin marka başvurusu ve hepsinin çalişanlari ya da proje yürüttükleri firmalarla imzaladıkları gizlilik anlaşmalari bulunmaktadir. Firmaların yenilik koruma metodlarına ilişkin tercihlerini etkileyen en önemli etmenler "ticari amaçlı kullanım" ve "taklitten korunma" olarak karşımıza çıkmaktadır. Ayrıca, yeniliklerin içerdiği örtük ya da açık bilgi miktarı da, KOBİ'lerin tercihlerini etkilemektedir. Ancak çoğu KOBİ'nin özellikle patent hakkının sağlayabileceği avantajlardan etkin bir şekilde yararlanamadıkları, bu nedenle patent hakkının KOBİ buluşlarını koruma ve yenilik potansiyellerini artırma amacını tam olarak gerçekleştiremediği görülmektedir.

Anahtar Kelimeler: Yenilik koruma metodları, METU Teknokent, KOBİ, yenilik koruma metodlarına ilişkin sorunlar ve etkiler

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LIST OF ABBREVIATIONS

Aselsan	: Military Electronic Industries SA
B2B	: Business to Business
EC	: European Commission
EPC	: European Patent Convention
EPO	: European Patent Office
EU	: European Union
EUIPO	: European Union Intellectual Property Office
EUTM	: European Union Trade mark
FTO	: Freedom to Operate
IPOSs	: Initial Public Offerings
IP	: Intellectual Property
IPR	: Intellectual Property Rights
JPO	: Japan Patent Office
KIPO	: Korean Intellectual Property Office
KOSGEB	: Small and Medium Enterprises Development Organization of Türkiye
METU	: Middle East Technical University
NACE	: Nomenclature des Activités Économiques dans la Communauté Européenne
NDAs	: Non-disclosure Agreements
OECD	: Organization for Economic Co-operation and Development
OHIM	: Office for Harmonization in the Internal Market
OSS	: Open-source Software
PCT	: Patent Cooperation Treaty
R&D	: Research and Development

RCDs	: Community Designs
Roketsan	: Turkey’s Rocket and Missile Center
SIPO	: State Intellectual Property Office
SMEs	: Small and Medium-sized Enterprises
SSB	: Presidency of the Republic of Türkiye Secretariat of Defence Industries
TAI	: Turkish Aerospace Industries Inc.
TEYDEB	: Technology and Innovation Funding Programs Directorate
TOBB	: Union of Chambers and Commodity Exchanges of Türkiye
TRIPS	: Agreement on Trade-Related Aspects of Intellectual Property Rights
TTO	: Technology Transfer Office
TÜBİTAK	: Scientific and Technological Research Council of Türkiye
TÜRKPATENT	: Turkish Patent and Trademark Office
US	: United States
USPTO	: United States Patent and Trademark Office
VC	: Venture Capital
WIPO	: World Intellectual Property Organization
YTC	: Yale Technology Classification

CHAPTER 1

INTRODUCTION

In recent years, small and medium-sized enterprises (SMEs)[1] have been increasingly recognized as key drivers of economic development due to their role in innovation (Lopez, 2009). Recent research from the Organization for Economic Co-operation and Development (OECD) highlights that SMEs play a disproportionately significant role in job creation (OECD, 2023). As a crucial part of the economy, it is vital to support and monitor SMEs regarding their innovative capacities. SMEs not only develop innovations but also disseminate the solutions they create, thus serving as catalysts for innovation. Therefore, understanding the factors that drive them to innovate is an important area of inquiry. Appropriability methods come into play at this point. Appropriability methods provide opportunities for controlling access to knowledge and could offer either temporary or, in the case of trade marks, lasting "monopoly power" over innovations. Formal methods include various forms of intellectual property rights such as patents, copyrights, trade marks, industrial designs, and utility models. Informal methods, consist of first-mover advantage, lead time, complementary sales, and trade secrets etc.

According to the European Union Intellectual Property Office (EUIPO) Scoreboard 2022, registered intellectual property rights (IPR) owners exhibit a higher rate of innovation at 77%, compared to non-owners, where the rate is 57%. Therefore, exploring the appropriability methods used to incentivize SMEs to innovate—what these methods are, which ones are used, for what purposes, and how effectively—is of growing importance.

Although the innovative activities of SMEs are crucial for the economy, micro-level studies about which appropriability methods they choose and why are quite limited (Foray, 2009). Since imperfect appropriability may lead SMEs to underinvest in R&D, slowing technological progress (Levin et al., 1987), it is crucial to be aware of which appropriability methods SMEs use and to enhance the effectiveness of these appropriability mechanisms, given the significant role of SMEs in the economy and their eagerness to innovate.

[1] Micro firms are defined as having between 0-10 employees and a turnover of less than €2 million, small firms as having between 10-49 employees and a turnover of less than €10 million, and medium-sized firms as having between 50 and 249 employees and a turnover of less than €50 million. In this thesis, firms are categorized based solely on the number of employees, as done in OECD SME Reports of 2019, 2021, and 2023.

1.1. SMEs and Appropriability Methods in Türkiye

As indicated in Table 1.1, SMEs are defined as economic units with fewer than 250 employees and annual net sales revenue or a financial balance sheet of less than TRY 125 million. These enterprises are categorized as micro-sized, small-sized, and medium-sized according to the regulation (TOBB, 2020).

Table 1. 1. The Features of SMEs in Türkiye

Criteria	Micro-Sized Enterprise	Small-Sized Enterprise	Medium-Sized Enterprise
Number of Employees	<10	<50	<250
Annual Net Sales Income	< TRY 3 Million	< TRY 25 Million	< TRY 125 Million
Annual Financial Balance Sheet	< TRY 3 Million	< TRY 25 Million	< TRY 125 Million

Source: TOBB (2020)

According to the OECD Report (2019), SMEs constitute 99.8% of businesses in Türkiye. As shown in Figure 1.1, SMEs in Türkiye provide 75% of total employment, account for 67% of total business turnover, and contribute 58% to total exports (OECD, 2023). Thus, SMEs play a crucial role in Türkiye's economic development, contributing significantly to job creation and globalization.

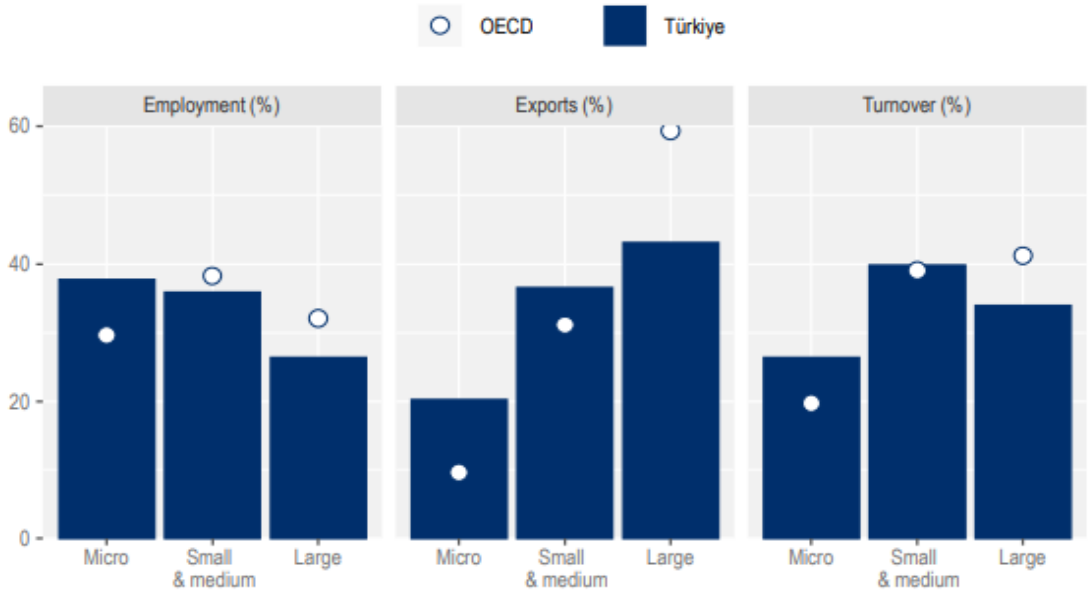

Figure 1. 1. The Share of SMEs on Employment, Export and Turnover

Source: OECD (2023)

1.2. Significance of the Thesis

Despite their growing importance in the Turkish economy, research on their innovative activities and the use of IPR and other appropriability mechanisms is relatively limited. While there are some publications by international authorities and a few academic studies, comprehensive research on this subject remains notably scarce.

Additionally, there is a lack of qualitative research on the combined utilization of these appropriability methods, and existing studies do not specifically focus on SMEs. Moreover, even though the growth of SMEs was essentially driven by a rebound in the performance of micro firms (OECD, 2023), these micro entities have been overlooked in innovation surveys (Akçomak & Kalaycı, 2016). In other words, micro sized firms', less than 10 employees, innovative activities and intellectual assets, are not recorded within innovation surveys. Therefore, surveys have failed to evaluate the appropriability methods and their relations with innovative activities in micro-sized firms. Furthermore, formal appropriability mechanisms, such as trade marks, designs, and copyrights, have received less attention compared to patents. This discrepancy may be influenced by the perception that patents are economically more significant, despite the wider use of trade marks, or it may stem from the lack of available information (Lopez, 2009). As noted by Hussinger (2005), a common limitation of firm-level studies on appropriability tools is that firms typically have multiple inventions and often utilize a combination of different tools. In Türkiye, most studies have focused on firms' use of patent mechanism (Akovalı, 2003; İçin, 2022). Additionally, while there are statistical data on the usage rate of IPR, there is no official data on the use of informal appropriability methods. Thus, determining whether firms use these mechanisms to achieve appropriable returns from their innovation activities requires qualitative research. Therefore, I aim to address this gap by conducting qualitative research in this thesis.

Although the thesis does not focus on a single sector, most of the interviewed SMEs are in the software industry, providing valuable sector-specific insights. This is another key contribution of the thesis. Furthermore, among the 29 firms, some operate in various fields such as defense, education, medical, and communication, despite engaging in primarily software sector. This diversity will help provide a broader understanding of the use of these mechanisms across different areas.

Lack of concentration in appropriability mechanisms, coupled with the absence of studies based on the appropriability methods of SMEs, is the essence of this thesis. In this regard, I

aim to answer to the main question: *"How do SMEs determine their appropriability methods?"* and the sub-questions: *"Which formal or informal methods do SMEs prefer, and why do they specifically choose these methods?"* It is the first research targeted at innovative SMEs engagements with the appropriability methods in Türkiye. By searching for the answers to the questions of which appropriability methods they have preferred to use within their innovation activities and why, I intend to draw a comprehensive framework. I want to understand whether firms prefer patents and other appropriability methods, at which stages of the innovation process these methods are included, and whether different methods are used for different innovations. By understanding how these different methods interact I would like to suggest policies which is important for policymakers, as any policy intervention targeting one type of instrument could impact how firms utilize other protection methods and the level of competitiveness of SMEs.

1.3. Significance of the Study Field

Technoparks are the Technology Development Zones (TDZs) that provide university-industry collaboration, inter-firm co-operations and international collaborations and commercialization (Kondakçı&Yılık, 2022); thus, they are significant ecosystems that boosts R&D and innovation development. I gathered data by conducting semi-structured in-depth interviews with 29 SMEs established in METU Technopark. I choose METU Technopark for many reasons. First, I could easily access the METU Technopark since I am a student at METU. Secondly, according to TDZs Performance Index studies, METU Technopark has been recognized among the most successful technoparks multiple times (İçin, 2022). Additionally, METU Technopark boasts one of the highest numbers of tenant firms and employees within the TDZs (Republic of Türkiye Ministry of Industry and Technology, 2022). Moreover, METU Technopark holds the top position among Ankara technoparks for having the highest number of patent entrepreneurs (Çakır, 2023).[2] All of these features highlight METU Technopark's leading role in fostering innovation and supporting IPR development.

1.4. Limitation of the Thesis

To achieve an understanding whether firms prefer patents and other appropriability methods, at which stages of the innovation process these methods are included, and whether different

[2] Patentpreneurs -patent entrepreneurs-, specifically those established in 2013 or later and holding at least one patent/utility model application and registration (Çakır, 2023).

methods are used for different innovations, it is crucial to ensure a balanced representation of micro, small, and medium-sized enterprises, as this will provide a more comprehensive set of results. While I have been made to classify firms according to NACE codes,[3] conducting separate studies for each sector would enhance the relevance and depth of the sector-specific analysis. Furthermore, I categorized SMEs into micro, small, and medium-sized based solely on the number of employees. For a more robust analysis, it is essential to also consider the firms' turnover and to incorporate this variable into the classification criteria.

The mode of conducting interviews, whether face-to-face or online as requested by the firms, did not negatively impact the interviews' quality. In fact, some online interviews were longer and more productive than face-to-face ones. Therefore, the use of online interviews does not constitute a limitation for this thesis.

Another limitation of the thesis is the calculation of IPR numbers, where application and registration counts were combined to compute percentages. I opted for this approach to give a broad overview, as the thesis primarily focuses on firms' preferences for IPR. However, a more detailed study should be conducted to examine the extent to which SMEs, under budget and time constraints, manage to obtain formal appropriability methods' registrations and whether they follow up on these processes post-registration.

1.5. Organization of the Thesis

In Chapter 2, I firstly summarize the meaning and functions of formal and informal appropriability methods and interactions among them. Secondly, I discuss the shortcomings of empirical studies on appropriability methods and highlight qualitative studies in this field. Subsequently, I use the results of these studies to compare with the information gathered through my qualitative analysis. Additionally, in the last part of the chapter, I review studies related to the appropriability methods on especially emphasizing studies including Turkish firms.

Chapter 3 details the methodology used for data collection. I describe the specific characteristics of the interviewed firms. I also examine in-depth interview questions and the purposes behind them. At the end of this chapter, I discuss data analysis process indicating

[3] NACE (Nomenclature des Activités Économiques dans la Communauté Européenne) serves as a key reference for producing and disseminating statistics related to economic activities across Europe. Retrieved 04 May 2024, from https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF

which approach I choose to analyze the data gathered from semi-structured in-depth interviews.

Chapter 4 compile and organize the data obtained from semi-structured in-depth interviews with 29 firms, structured around key themes. In this chapter, I present and evaluate both descriptive and explanatory findings. These data formed the basis for the discussion and policy chapters.

In Chapter 5, I discuss the findings from the 29 SMEs in METU Technopark to explain why and which appropriability mechanisms these SMEs utilize and how they combine or use them as complementary or substitute methods. Additionally, I address the issues related to the effectiveness of these mechanisms and lay the groundwork for the policy chapter.

In Chapter 6, based on the key points identified through qualitative analysis and I advance policy recommendations and further suggestions using various policy instruments. I provide policy recommendations and policy tools to implement these policies. In the second part of the chapter, I conclude the thesis with a general evaluation and concluding remarks.

CHAPTER 2

LITERATURE REVIEW

Innovation is the process of transforming new ideas and knowledge into new products and services (Levin et al., 1987). However, as Joseph Schumpeter (2013) pointed out, achieving innovation is extremely challenging in a market characterized by perfect competition, where no producer has market power, where there is no product differentiation, and where all firms have equal access to the same technology. In this context, allowing entrepreneurs to have "monopolistic power" over their inventions could incentivize them to innovate and produce (Lopez, 2009).

As explored in the foundational works of Nelson (1959) and Arrow (1962), a major challenge for innovators is the necessity of appropriability. When innovators do not have reliable means to protect the knowledge they generate, they are at a disadvantage compared to competitors who have not borne the often-large, fixed costs of creating that knowledge (Nelson, 1959; Arrow, 1962). These competitors could replicate innovations at much lower costs, or in some cases, at no cost at all (EUIPO, 2017). To address this issue, effective protection of innovations and the ability to secure future returns are crucial for encouraging firms to invest more in research and development (R&D) (Liebeskind, 1996). Appropriation plays a vital role in a firm's lifecycle by enabling them to generate economic value from their innovations and new ideas (Levin et al., 1987). Various appropriability tools could provide temporary or, in the case of trade marks, permanent "monopoly power" over the knowledge created by innovators. Formal methods include IPR such as patents, copyrights, trade marks, industrial designs, and utility models. There are also informal methods,[4] such as first-mover advantage, lead time advantage complementary sales, and trade secrets (Cohen et al., 2000).

According to Teece (1986), the choice of appropriability methods could be influenced by several factors, including the nature of the technology and the effectiveness of available legal

[4] Although in some studies, trade secrets have been included within the classification of IPR as one of the formal methods (Bader, 2023), in this thesis, trade secrets are classified as one of the informal methods of appropriability, as presented in the study of Cohen et al. (2000) (Comino et al. (2015), EUIPO (2017)), since they do not involve a formal application process.

mechanisms. The strength or weakness of appropriability regimes is defined by the firm's ability to generate greater or lesser profits from their innovations (Lopez, 2009).

The nature of the knowledge involved impacts the choice of appropriability methods (Hurmelinna & Puumalainen, 2007). Tacit knowledge, which is often embedded in firms or products, is harder to articulate and transfer, whereas codified knowledge is easier to communicate (Lopez, 2009). This difference influences firms' decisions on which appropriability method to choose. For instance, if tacit knowledge predominates, firms may prefer to use trade secrets (Arora, 1997). However, trade secrets could still be at risk, especially if employees leave and join competitors (Hurmelinna & Puumalainen, 2007).

According to Dosi (2006), the methods firms use to protect their innovations depend on four groups of factors: *"firm-based factors (such as size, absorptive capacity, or innovation strategies), knowledge-based factors (tacit vs. codified), technology-based factors (product vs. process innovations), and industry-based factors."* Additionally, the effectiveness of laws and regulations and their enforcement also significantly influence firms' decisions (Lopez, 2009).

Given these numerous factors, generalizing the relationships between firms, industries, technology features, and the use of different appropriability methods is difficult. While predicting preferences for appropriability methods is challenging, some views attempt to generalize the preferences of SMEs.

One perspective suggests that SMEs are often at a disadvantage in using certain IPR, notably patents, particularly in developing countries where SMEs may be weaker than in developed countries (Lopez, 2009). However, in developing countries, SMEs often focus more on product differentiation than on genuine innovation, making the use of trade marks more relevant (Llerena & Millot, 2013). Another view concerns patenting abroad; SMEs with foreign partners may find it easier to apply for patents in other countries. Thus, the factors influencing the decision on where to patent also merit examination (Lopez, 2009).

Another finding is that smaller firms have fewer patentable innovations than larger firms, as small firms typically engage in incremental innovations (Foray, 2009). Additionally, large firms often have IPR departments or similar structures that facilitate patent applications (Lopez, 2009). Hanel (2005) also notes that the use of all methods increases with firm size, except that small firms use trade secrets less frequently than medium-sized firms. An

interesting finding by Giuri et al. (2007) is that large firms have a much higher proportion of unused patents compared to SMEs, as they face relatively lower costs in patent applications and litigation.

Another perspective involves the effectiveness of appropriability methods. The effectiveness of different methods could change over time; trade secrets may eventually be disclosed, patents could expire or be circumvented, but trade marks can be renewed indefinitely (Hurmelinna & Puumalainen, 2007). Moreover, many patents are vulnerable related to infringement of rights.

The effectiveness of appropriability methods could also vary depending on the type of innovation, the nature of the knowledge involved, and the industries in which firms operate (Levin et al., 1987; Cohen et al., 2002).

Interestingly, there is not always a direct correlation between the effectiveness of a particular appropriability method and its frequency of use (Lopez, 2009). For instance, even if patents are often seen as an ineffective way to protect innovations, firms do not necessarily avoid using them. Similarly, the most effective mechanisms are not always the most frequently utilized. Therefore, the quantity of IPR or the prevalence of informal mechanisms does not necessarily indicate that these methods are being used to their fullest potential for maximizing appropriability returns. Why is the effective use of these mechanisms important for SMEs? Because imperfect appropriability may lead them to underinvest in R&D, slowing technological progress. Since technological progress is a key driver of economic growth (Levin et al., 1987), it is crucial to enhance the effectiveness of appropriability mechanisms, given the significant role of SMEs in the economy and their eagerness to innovate.

At this point, it is useful to explain the specific features of these mechanisms and how they could generate appropriable returns.

2.1. Formal Appropriability Methods[5]

Formal appropriability methods include patents, utility models, trade marks, industrial designs, and copyrights, which grant innovators an exclusive, generally temporary right to

[5] At this point, it is important to clarify that the abbreviation “IPR” used will encompass both “intellectual property rights,” which include copyrights, and “industrial property rights”, which cover methods such as trade marks, patents, and industrial designs.

utilize their innovative outputs. According to Nelson (1959) and Arrow (1962), this exclusivity acts as a crucial incentive for firms to invest in R&D, thereby fostering technological progress. It does so by encouraging the creation of more inventions and their transformation into commercial products, facilitated by public disclosure (Eisenberg, 1996). These formal methods also provide the inventor with a legal right to prevent others from using their innovation (Hall, 2007). So, how do SMEs utilize these methods?

Bader & Süzeroğlu (2023) cited that IPR help SMEs to achieve a sustainable competitive advantage over competitors. Accordingly, IPR could yield a wide range of benefits, including establishing collaborations and licensing arrangements, obtaining loans and VC, and facilitating technology transfers (Brant & Lohse, 2013).

Licensing of IPR is a particularly valuable strategy for SMEs, allowing them to maximize their appropriability returns despite financial and institutional constraints, it enables rapid scaling of activities, expansion into new markets, and generation of additional revenue from their inventions (EPO & EUIPO, 2023). A study by Gambardella et al. (2005) found that SMEs are willing to license approximately 48% of their patented inventions, compared to only 16% for larger firms. Moreover, SMEs license about one-third of these inventions, while large companies license only about 9% (Gambardella et al., 2005). These results indicate the importance of commercialization of IPR for SMEs, which often need financial gains more urgently than larger companies.

Collaborations with other companies, universities, and public institutions also help SMEs to enhance their human and physical capital and IPR playing a key role (Hsu & Ziedonis, 2013). In line with this, OECD recognizes IPR as a one of the crucial elements of knowledge and innovation networks (OECD, 2023).

IPR are also essential for easing access to financing for innovative SMEs (Veugelers & Schneider, 2018). Applying for IPR could reduce information asymmetry between investors and SMEs by disclosing detailed information about the invention or the firm, making investors more comfortable providing capital (Veugelers & Schneider, 2018). Recent studies have shown that SMEs with a higher number of IPR are less likely to go bankrupt (Kato et al., 2021). According to the latest EPO & EUIPO (2023) Report, SMEs with higher patent quality also tend to secure financing more quickly than their peers. Additionally, trade marks are also significant for attracting investors; for example, Block (2014) found that venture capitalists are more likely to fund SMEs that commercialize their products through trade mark ownership.

However, SMEs do not solely use formal appropriability methods to benefit from the monopoly power granted by these rights, prevent unauthorized use, and generate financial returns. Some firms apply for patents not just for appropriability returns but also for employing other strategic benefits. These benefits could include patent blocking,[6] leveraging in negotiations, and preventing lawsuits (Hall & Ziedonis, 2001). Therefore, observing a firm applying for a patent does not necessarily mean that its primary goal is to appropriate the results of innovation. Nonetheless, according to a recent comprehensive study (EPO & EUIPO, 2023), the majority of SMEs primarily apply for patents for *"commercial exploitation"* and *"prevention of imitation"*.

A brief explanation of formal appropriability methods, including patents, utility models, industrial designs, trade marks, and copyrights, is provided below. Summarized information regarding the subject matter of these methods, their legal application processes, and the duration of protection could also be found in Table 2.1.

2.1.1. Patents

Patents are granted for inventions that are novel, involve an inventive step, and are industrially applicable, as defined in Art. 83 of Law No. 6769 on Turkish Industrial Property[7] and Art. 52 of the European Patent Convention (EPC).[8] The criteria for determining novelty and inventiveness are "absolute" and apply globally, regardless of the territorial origin of the invention. Patent protection could be extended for up to 20 years, typically requiring annual payments by the applicant. International patent applications can be filed through the c),[9] or for multiple European countries through the EPC.

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[6] A patent blocking restricts others from using or commercially utilizing an altered version of the product or process covered by the original patented invention, Retrieved 01/08/2024 from https://www.lsd.law/define/blockingpatent#:~:text=A%20blocking%20patent%20is%20a,without%20infringing%20on%20the%20other

[7] Law No. 6769 on Turkish Industrial Property came into force on January 10, 2017, in Türkiye, coinciding with its publication in the Official Gazette. 6769 on Turkish Industrial Property covers all aspects of industrial property and replaces Decree-Laws No. 551, 554, 555, and 556, which addressed patents, industrial designs, geographical indications, and trade marks, Retrieved 01 August 2024, from https://www.wipo.int/news/en/wipolex/2017/article_0004.htm

[8] The EPC, which came into effect in 1977, is a multilateral treaty that established the European Patent Organization (EPO) and provides an independent legal framework for granting European patents. The term "European patent" refers to patents issued under this convention, Retrieved 01 August 2024, from https://www.epo.org/en/legal/epc

[9] The PCT is an international patent treaty administered by the WIPO. The PCT allows inventors to seek patent protection for an invention in multiple countries simultaneously by filing a single "international" patent application, rather than filing separate national or regional applications, Retrieved 01 August 2024, from https://www.wipo.int/pct/en/faqs/faqs.html

A patent grants its owner the right to prevent others from commercially producing, using, storing, or selling the invention for 20 years (Art. 101 of Law No. 6769 on Turkish Industrial Property and Art. 63 of the EPC). This exclusivity allows the inventor to potentially earn "monopolistic" profits from the innovation (Arrow, 1962). However, obtaining a patent requires the inventor to disclose significant knowledge about the innovation, which can facilitate others in designing around the patent. This potential downside may sometimes outweigh the benefits of exercising monopolistic control over the innovation (Bader, 2023).

2.1.2. Utility Models

A firm which registers a utility model receives exclusive rights for 10 years to the grant for inventions are new and applicable to industry and thus, obtains the power to determine who may financially benefit from it (Art. 101,142 of Law No. 6769 on Turkish Industrial Property). Obtaining utility model registration, does not need inventive step as in patent, thus, it takes a shorter period, and costs lower to get registration. However, not every country has utility model registration system. Utility model applications could be filed in Austria, Australia, Brazil, China, the Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Japan, Mexico, Poland, Russia, Spain, and South Korea, on the other hand, for instance, Switzerland and the United States do not have a national utility model (Bader, 2023). Because the inventive step is not required, such as pharmaceutical products and biotechnological inventions, could not be protected by utility models.

2.1.3. Industrial Design

Industrial design protection grants firms the right to protect the appearance of a product, whether produced industrially or handcrafted, provided it is novel and has a distinctive character. This protection grants exclusionary rights that can be renewed up to four times, allowing for a total of up to 25 years (Art. 61 and 69 of Law No. 6769 on Turkish Industrial Property). Industrial designs can be registered at the national, regional (e.g., the EU Design System[10]), or international level (e.g., the Hague System[11]).

[10] The European Union (EU) design system offers a unified registration process, allowing a single design registration to provide protection across all EU member states. Retrieved 01 August 2024, from https://www.euipo.europa.eu/en/designs

[11] The Hague Agreement is an international industrial design convention administered by the WIPO. The Hague System allows designers to seek protection for an industrial design in multiple countries simultaneously by filing a single international application, rather than filing separate national or regional applications. Retrieved 01 August 2024, from https://www.wipo.int/hague/en/

2.1.4. Trade marks

A trade mark is a registered right that distinguishes the goods or services of one entity from those of others, indicating their origin. Trade marks could consist of signs like words (including personal names), figures, colors, letters, numbers, sounds, and the shapes of goods or their packaging, as long as they could be represented on the register in a way that clearly defines the protection afforded to the proprietor (Art. 4 of Law No. 6769 on Turkish Industrial Property). Trade mark owners could indefinitely extend their rights in ten-year increments (Art. 23 of Law No. 6769 on Turkish Industrial Property) and could be registered at the national, regional (e.g., EU Trade Mark System, (EUTM)[12]), or international (e.g., the Madrid System[13]) level, preventing others from capitalizing on the firm's reputation and causing confusion about the product's origin (Bader, 2023).

2.1.5. Copyrights

Copyright is a formal appropriability mechanism used to protect literary and artistic works. The legal requirement for copyright is that a personal creative achievement must be present (Bader, 2023). The copyright owner has legal rights over their creations, which could range from books, music, paintings, sculptures, and films to computer programs, databases, advertisements, maps, and technical drawings (WIPO, 2024g). For the purposes of this thesis, it is also important to note that software could be protected by copyright. However, the protection only extends to the software code itself, not to the algorithms.

According to the Berne Convention,[14] in most countries, copyright protection is automatic without the need for registration or other formalities (WIPO, 2024h). However, some countries have systems for the voluntary registration of works. For example, in Türkiye, copyrights could be registered under Law No. 5846 on Intellectual and Artistic Works, which has been in effect since 1952. This legal right simplifies resolving disputes over

[12] The EU trade mark system offers a unified registration process, allowing a single trade mark registration to provide protection across all EU member states. Retrieved 01 August 2024, from https://www.euipo.europa.eu/en/trade-marks

[13] The Madrid System for the international registration of trade marks is governed by the Madrid Agreement, established in 1891, and the Protocol to that Agreement, established in 1989. This system allows for the protection of a trade mark in multiple countries by obtaining a single international registration that is recognized in each of the designated member countries. Retrieved 01 August 2024, from https://www.wipo.int/treaties/en/registration/madrid/

[14] The Berne Convention for the Protection of Literary and Artistic Works, adopted in 1886, addresses the protection of works and the rights of their authors. Retrieved 01 August 2024, from https://www.wipo.int/treaties/en/ip/berne

ownership or creation and facilitates financial transactions, sales, and the assignment or transfer of rights, thereby providing exclusionary rights on a legal basis (Bader, 2023)

Table 2. 1. The Main Types of Appropriability Methods

Name of the Method	**Subject Matter**	**Legal Application Process**	**Max Duration of Protection**
Patent	Invention - new - inventive step - applicable to industry	Yes	20 years
Utility model	Invention - new - applicable to industry	Yes	10 years[15]
Industrial Design	The appearance of the whole or a part of a product - new - an individual character	Yes	Extendable every 5 years- could be max. 25 years
Trade mark	Words, figures, colors, letters, numbers, sounds and the shape of goods or their packaging - indication of source - capable of distinguishing the goods or services of one undertaking from those of other undertakings	Yes	Extendable every 10 years- could be indefinite
Copyright	Books, music, paintings, sculpture, and films, to computer programs, databases, advertisements, maps, and technical drawings - a personal creative achievement - as a result of intellectual process	 No Some countries included Türkiye needed application to registration but not for protection	70 years after the author's death or from the date of the legal entity's first publication of the work
Trade secret	Manufacturing, industrial, or commercial secrets - Commercially valuable - Reasonable steps to keep it secret	No	Indefinite

[15] In some countries (Georgia, Greece, Estonia, etc.), the duration of utility model protection varies. For instance, in Georgia, the duration is 6 years; in Greece, it is 7 years; and in Estonia, it is 8 years instead of 10.

Table 2.1. (continued)

Non-disclosure Agreements (NDAs)	Manufacturing, industrial, or commercial knowledge	No	Indefinite/ Definite
First-mover Advantage	Enter the market in an early phase - having robust network - no inadvertent disclosure	No	Based on firms' capabilities
Lead-time Advantage	To commercialize the invention before rivals - continuous innovation, manufacture and sales capacity	No	Based on firms' capabilities
Complementary Sales	Additional sales to strength protection of innovation - Sales, service, manufacturing capabilities	No	Based on firms' capabilities
Publishing	Any kind of publishable proprietary process	No	70 years after the author's death

2.2. Informal Appropriability Methods

These informal instruments include various actions firms could take to protect their innovations and enhance their expected returns. Informal appropriability methods are generally cost-effective since they do not involve application or enforcement expenses. However, they lack strong legal guarantees and do not provide robust protection against imitation (Comino et al., 2015). According to Comino et al. (2015), trade secrets are widely used alongside lead time advantages. For example, Davis & Kjaer (2003a) found that lead time, continuous product development, and sales are considered effective appropriation methods in the software sector. Other mechanisms, such as first-mover advantage and complementary sales, have also been highlighted by Cohen et al. (2000). Furthermore, Hurmelinna & Puumalainen (2007) noted that since labor mobility could lead to technology imitation, making appropriability methods like labor legislation, contracts, and human resource management practices crucial components of maintaining secrecy. Practical and technical tools, such as passwords, digital signatures, and copy prevention mechanisms, are also employed in certain industries (Lopez, 2009). As evident, there are many methods available for SMEs to utilize; however, in this thesis, in addition to the methods outlined in Cohen et al. (2000), two additional methods identified through qualitative analysis—NDAs and publishing—are also discussed. A brief explanation of informal appropriability methods,

including trade secrets, first-mover advantage, lead time advantage, complementary sales, NDAs, and publishing, is provided below. Summarized information regarding the subject matter of informal methods, their legal application processes, and the duration of protection could also be found in Table 2.1.

2.2.1. Trade Secret

Trade secret stands out as one of the most widely utilized informal appropriability methods for protecting innovations (Comino et al., 2015; EUIPO, 2017).

An international definition of trade secret could be found in Art. 39 of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) [16] and also it takes place in Art. 2 of the EU Directive on the Protection of Trade Secrets. [17] The definition of requirements encompass;

> "(a) *is secret in the sense that it is not, as a body or in the precise configuration and assembly of its components, generally known among or readily accessible to persons within the circles that normally deal with the kind of information in question;*
>
> *(b) has commercial value because it is secret;*
>
> *(c) has been subject to reasonable steps under the circumstances, by the person lawfully in control of the information, to keep it secret"* (Art. 39 of TRIPS).

Within the EU, Sweden is the only Member State with specific legislation on trade secrets, while all other Member States offer protection to trade secrets through various civil and criminal legislation (EUIPO, 2017). In Türkiye,[18] as in Austria, Germany, Poland, and Spain, trade secrets are protected by unfair competition regulations rather than within IPR Law.
Trade secret, providing indefinite protection, does not require a formal application process or payment of fees. SMEs could apply this method from the very beginning of the innovation process, and there is no need to disclose the tacit or codified knowledge in their inventions.

[16] TRIPS is an international agreement managed by the World Trade Organization (WTO) that establishes minimum standards for various forms of IP regulation. The covered areas include copyrights, trade marks, geographical indications, industrial designs, patents (including protection for new plant varieties), undisclosed information (such as trade secrets and test data). Retrieved 01 August 2024, from https://www.wto.org/english/tratop_e/trips_e/intel2_e.htm,

[17] The Directive of the European Parliament and of the Council on the protection of undisclosed know-how and business information (trade secrets) against unlawful acquisition, use, and disclosure was adopted by the Council on May 27, 2016, Retrieved 01 August 2024, from https://www.wipo.int/wipolex/en/legislation/details/16435

[18] There is a draft law on Trade Secrets, Bank Secrets, and Customer Secrets that has not yet come into force in Türkiye.

The use of trade secrets allows SMEs to achieve appropriability returns due to these advantages (EUIPO, 2017).

On the other side, proving the ownership of know-how is more challenging compared to formal appropriability methods. Moreover, keeping trade secrets through pre-established confidentiality agreements or other forms of leverage could also be costly for SMEs (EUIPO, 2017; Bader, 2023).

2.2.2. First-mover Advantage

Firms could gain a competitive edge by being the first to market, leveraging this advantage to secure appropriable returns. Lieberman (1988) and Montgomery (1998) suggest that pioneering firms could acquire superior resources and capabilities by entering the market early, gaining access to distribution channels, enhancing reputation, and forming linkages with other firms, thus creating a competitive advantage over later entrants (Dahlander, 2004). However, to sustain this competitive advantage and achieve appropriable returns from innovations, firms need a sufficient network (Bader, 2023).

2.2.3. Lead-time Advantage

Lead-time advantage is the practice of quickly commercializing an innovation to capitalize on the benefits of being a first mover (EUIPO, 2017). According to Bader (2023), firms must have the capacity to innovate faster than their competitors, gaining a competitive edge and thus, benefiting from this method. Firms must rapidly innovate, produce, and sell products to prevent competitors from replicating their innovations (Lopez, 2009). This method is suitable for firms capable of continuous innovation, as it could provide significant appropriable returns. Additionally, lead time can be leveraged to gain advantages in manufacturing by progressing along the learning curve and achieving economies of scale while delaying imitation by competitors (Harabi, 1995).

2.2.4. Complementary Sales

Another informal method for firms to derive returns from their innovations is through complementary sales. This mechanism was first noted by Cohen et al. (2000) in a study on appropriability choices among US manufacturing firms, where it became recognized in the literature. After developing an innovation, firms could generate revenue by producing,

selling, and servicing the product. Cohen et al. (2000) suggest that firms could increase appropriable returns by developing incremental innovations and selling them to complement their main innovation. This mechanism also highlights the importance of a firm's capabilities in sales, service, and manufacturing to increase the benefit from innovation.

2.2.5. Non-disclosure Agreements (NDAs)

Firms frequently enter mutual projects, collaborations, or employ consultants, making NDAs crucial for preventing information leaks. NDAs are used to protect manufacturing, industrial or commercial knowledge within and between firms, universities, and public institutions. SMEs may use employee agreements for internal protection and NDAs for external protection. These agreements are typically implemented with specific scopes and time limits extending beyond project lifetimes to manage technology and commercial secrecy (Bader, 2023). NDAs could be easily combined with other appropriability methods (Paallysaho & Kuusisto, 2011). For SMEs, having NDAs in place before applying for patents could enhance the utility of this mechanism (Bader, 2023).

2.2.6. Publishing

Publishing could also serve as an informal appropriability method. By disclosing innovations, firms could prevent competitors from obtaining patents, utility models, or industrial design registrations for similar innovations by eliminating the novelty criterion. For instance, Henkel&Pangerl (2008) found in a qualitative study of 37 firms that publishing is widely used as an appropriability method within German manufacturing firms. The main motivations include the lower cost of publishing and preventing competitors from patenting similar inventions. The publications of the firm could serve as a barrier to the unauthorized use of a similar innovation by another firm. On the other hand, through their own publications, firms could ensure they have freedom to operate (FTO),[19] meaning they could carry out their activities without infringing on the IPR of third parties. Thus, firms use publishing as a strategy to maintain FTO. To ensure FTO, firms may choose to disclose rather than keep the invention secret (Hall et al., 2012).

[19] FTO means you are free to use your product or service as planned without incurring legal liability. Legal liability could arise from the unauthorized use of IPR owned by a third party. Namely, it refers to the freedom of a person or entity to engage in commercial activities such as the use, sale, distribution, possession, or import/export of a product or service without infringing on the IPR of third parties. Retrieved 01 August 2024, from https://www.wipo.int/export/sites/www/tisc/en/docs/tisc-toolkit-freedom-to-operate-description.pdf

2.3. Interaction among Appropriability Methods

As illustrated in Figure 2.1, formal and informal appropriability methods interact in various ways, offering SMEs multiple combinations. Some methods could be prerequisites or complements to others, or they could substitute for one another. For example, NDAs may be essential for maintaining a trade secret, while patents could support establishing lead-time advantages (Hurmelinna & Puumalainen, 2007). Additionally, different methods may be employed at different stages of the innovation process (Lopez, 2009). Initially, firms may rely on trade secrets before the commercialization of a new product, later opting for patents and/or lead-time strategies (Harabi, 1995).

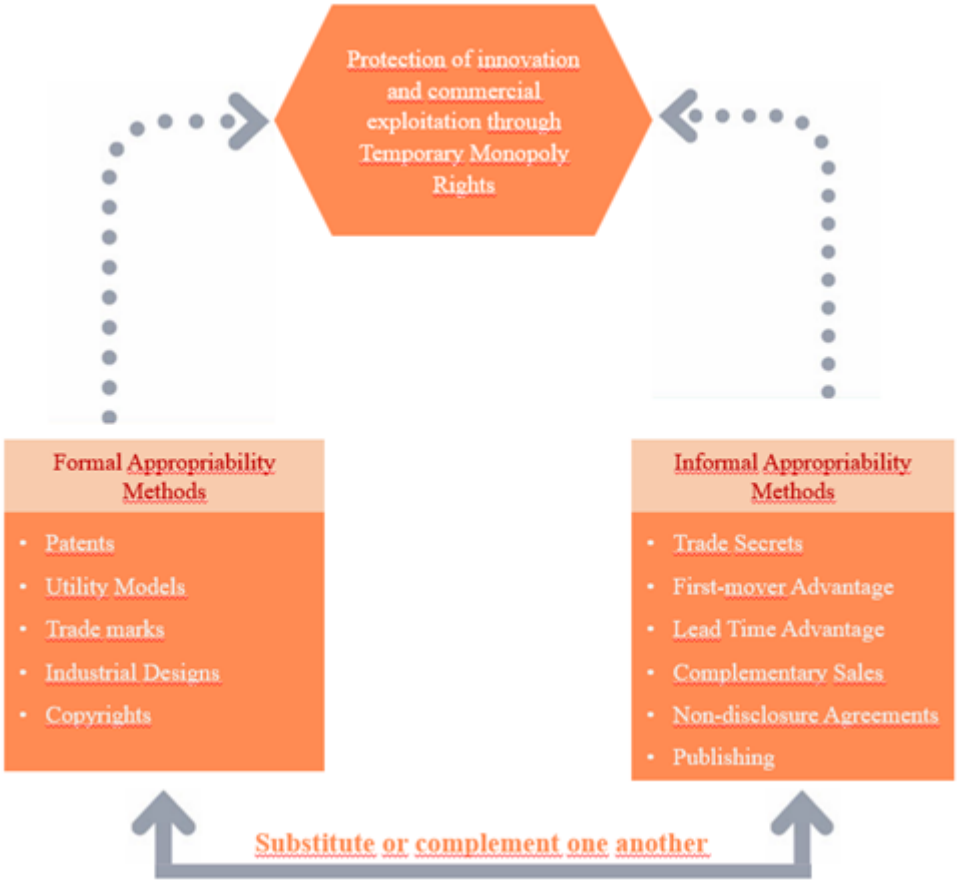

Figure 2. 1. Interaction among Appropriability Methods

Source: Gassmann et al. (2021)

Moreover, multiple methods may be used simultaneously for a particular innovation, especially if it consists of separately protectable parts or features (Cohen et al., 2000). For some SMEs, it is possible to use both trade secret and patent methods for the same product. For instance, according to Arora (1997) and Belleflamme & Bloch (2014), firms might

prefer trade secrets for the tacit knowledge aspects of an innovation, while applying for patents or utility models for the codified knowledge aspects (Hurmelinna & Puumalainen, 2005).

Although patents, are often cited as providing the greatest incentive to innovate (Eisenberg, 1996), they alone do not ensure that a firm will benefit from the innovation. Successful commercialization also requires the development of market-based assets such as marketing, advertising and enhancing consumers' perception (Rogers, 1998). Trade marks are another formal method that helps build these market-based assets (Arora et al., 2008). Greenhalgh & Rogers (2007) suggest that trade marks could be associated with innovative activity. Creating a new trade mark could enhance consumers' perception of innovative products and serve as a foundation for advertising (Davis, 2009). Thus, as indicated by Llerenaa & Millota (2013), trade marks and patents interact as two means of appropriating the benefits of innovation, with their effects likely to be interrelated.

Additionally, the size of the firm affects the interaction between appropriability methods. For example, Arundel (2001) noted that small firms might value patents more strongly than large firms, thus they are less likely to keep their innovations as trade secrets. However, other arguments suggest the opposite may be true. While small firms may use patents to establish a temporary barrier against competitors, the application and enforcement costs might lead them to value secrecy more than patents (Lopez, 2009).

The sector in which a firm operates also influences the relationship between these mechanisms and the firm's preferences. For example, Blind (2003) found that the propensity to patent and the number of patent applications were lower in services compared to manufacturing. Consistent with Blind (2003), a case study of 65 service firms indicated that the most important protection mechanisms were trade marks, secrecy, and lead-time advantages, while patents were the least important formal method. The primary reason for not patenting was that new services often included tacit knowledge were thus not eligible for patenting (Lopez, 2009).

As previously mentioned, it is challenging to generalize findings about firms' choice of appropriability methods. Factors such as the sector, type of innovation, firm's infrastructure, and the balance of tacit and codified knowledge in the product all play a role. Therefore, instead of relying solely on surveys with large samples, it may be more beneficial to conduct micro-level studies. Such studies could provide more comprehensive qualitative data on how

firms use these mechanisms, whether they use them individually or in combination, and how effectively they utilize them.

2.4. Studies on Appropriability Methods

The studies on innovation and appropriability mechanisms should be distinguished based on their scope, methodology, and objectives (Cohen et al., 2000; Blind, 2006; Dernis 2015). Methodologies also vary, with some studies employing econometric techniques or descriptive statistical analysis while others encompass qualitative methods. Factors such as the types and number of included firms, the covered number of years, the richness of databases, and the publication status differ across studies (Lopez, 2009).

The studies about the SMEs' innovative activities and appropriability mechanisms such as formal (patents, trade marks, design, and copyright) and informal tools of appropriability, (secrecy, lead times, and complementary sales) have been relatively limited in the literature. The methodological preference of these studies is often given to econometric techniques, economists generally reliance on statistically significant relationships identified through econometric tests (Cincera, 1997; Duguet & Kabla 1998). However, the use of econometric techniques in studies on innovation and appropriability comes with its own set of challenges (Cockburn, 2009). Frequently, databases employed for these studies were originally collected for different purposes, forcing researchers to adapt their analysis to existing data that may not align perfectly with their specific hypotheses (Lopez, 2009). Additionally, Cockburn (2009) indicated that econometric methods vary in terms of their strengths and weaknesses. According to Lopez (2009), researchers may not always have the luxury of choosing the strongest or most appropriate econometric technique, as their options are often constrained by the availability of data at the time of their research.

Furthermore, while econometric studies provide a broader perspective beyond anecdotal evidence, studies employing qualitative methods offer valuable insights into a firm's decision-making process regarding the use of different appropriability mechanisms (Foray, 2009). According to Lopez (2009), if these studies were systematically conducted, they could illuminate qualitative aspects involved in the innovation and appropriability strategies employed by firms, providing a more nuanced understanding. Following Lopez's (2009) suggestions, in-depth interview techniques or mixed methods have been utilized in studies regarding the use of different appropriability mechanisms in recent years, particularly in Europe (EUIPO, 2016 &2019 &2022 Scoreboard; Kazimierczak, 2019; EPO & EUIPO, 2023).

Another characteristic of qualitative or mixed method studies is the possibility of exploring the variety of appropriability methods a firm could employ, both secrecy and lead times or patents and trade marks. These studies often aim to discern the preferred appropriability methods, identifying which methods are more commonly used or considered more effective by innovative firms (Lopez, 2009).

The initial studies on innovation and appropriability, conducted by Scherer (Scherer et al., 1959) for the US and Taylor & Silberston (1973) for the UK, revealed that patents served as a significant means of profiting from innovation primarily in the pharmaceutical industry. Subsequently, Mansfield (1986) discovered, based on firms' responses, that in only the pharmaceutical and chemical industries, a substantial proportion of innovations would not have been developed or brought to market without patent protection.

The study conducted by Levin et al. (1987) provided additional confirmation of the diminished significance of patents for innovative firms. The study encompassed a survey with 650 R&D-performing manufacturing firms in the US to inquire about their preferred methods for protecting innovations (Levin et al., 1987). Also, Cohen et al. (2000) conducted research involving 1,478 US firms employing from 20 to more than 100,000 workers to understand why firms engage in patenting beyond the direct pursuit of profits through the exploitation of patented inventions. These studies (Levin et al., 1987; Cohen et al., 2000) stood out for incorporating alternative tools of appropriability, such as secrecy, lead times, and complementary sales. Also, Cohen et al. (2000) revealed that the primary motivation for engaging in IPR, and other alternative tools was the prevention of copying, patent blocking, and prevention of lawsuits.

Another contribution of Cohen (2002) to the literature is the discovery that the strategic uses of patents were more widespread in Japan compared to the US through the survey of managers of R&D units of manufacturing firms in the US and Japan. However, Cohen (2002) indicated that surveyed Japanese companies were less inclined to use their patents for exclusivity and more inclined to use them for gaining market access and FTO and design in comparison to US firms.

Hall and Ziedonis (2001) conducted an analysis focused on the firms in the semiconductor industry. Their results revealed that the rise in patent propensity within the semiconductor industry was driven by the strategic use of patents. According to Hall and Ziedonis (2001), this strategic approach allowed firms to negotiate access to external technologies on more

favorable terms, and newcomers in the industry exhibited higher patent propensities to attract venture capital and establish property rights in niche product markets.

Davis and Kjaer (2003a) delved into the patent strategies of 34 small Danish firms operating in high-tech sectors, specifically telecommunications, software, and pharmaceutical-related biotechnology through semi-structured interviews. The study indicated that patents played a crucial role in appropriability, particularly for products in the telecommunications industry, in contrast, the software sector exhibited limited use of patents (Davis & Kjaer, 2003a). Instead, Davis and Kjaer (2003a) revealed that lead time, continuous product development, sales, and customer relations were considered effective appropriation mechanisms in the software sector. Also, the study suggested patents were deemed the most effective means of securing appropriability, with other methods such as lead time, complementary sales, and marketing capabilities, considered impractical in the biotechnology sector (Lopez, 2009). Davis & Kjaer (2003a) identified size as a significant factor affecting small firms, impacting their ability to detect and pursue infringers and hindering the use of blocking patents.

Another study conducted by Davis & Kjaer (2003b) on over 100 small biotech firms in the Medicon Valley biomedical cluster in Scandinavia found that patents were perceived as the sole effective means of appropriation. Moreover, the study suggested that despite being small firms, concerns about litigation costs and other deterrents typically associated with patenting did not dissuade small firms (Davis & Kjaer, 2003b). According to Davis & Kjaer (2003b), this lack of concern was attributed to the likelihood that, by the time the patented product reached commercialization, it would likely be owned by a large pharmaceutical firm.

Dahlander (2004) focuses on the software sector, specifically examining open-source firms in Sweden and Finland through in-depth interviews and revealed that patents were not a common choice among them. According to the study, the software firms relied on secrecy, copyright, lead time, and network externalities, emphasizing the importance of attracting a large user base and rapidly progressing down the learning curve (Dahlander, 2004).

Blind et al. (2006) explored the utilization of various appropriability methods and the motives behind patenting based on a survey of over 500 German firms. The study indicated that lead time advantage was utilized as the most crucial protection mechanism, with patenting abroad and at home ranking second and third, respectively. According to Blind et al. (2006) study, secrecy and trade marks were considered less important than patents.

Hipp & Herstatt (2006) conducted a study on 99 service-intensive German SMEs through a questionnaire and concluded that secrecy, first-to-market strategies, complex design were also preferred as appropriability mechanisms. According to Hipp&Herstatt (2006), only a small percentage of firms (6%) employed formal appropriability strategies, mostly observed in the ICTs. Additionally, the study showed many companies utilized a combination of two or more protection mechanisms, with secrecy and first-to-market commonly paired (Hipp & Herstatt, 2006).

Another study on IPR strategies of SMEs was conducted by Paallysaho & Kuusisto (2006). The researchers studied Finnish and UK firms in three knowledge-intensive service sectors: software consultancy and supply, business and management consultancy services, and advertising. As a result of a telephone survey with 300 firms, trade marks and copyrights dominated among formal IPR, where patents were sparingly used, with software firms exhibiting a relatively higher rate of use (Paallysaho & Kuusisto, 2006). However, the most prevalent appropriability method was non-disclosure contracts, employed by 85% of the surveyed firms and legal instruments were complemented by informal means, including secrecy, publishing, and restrictions on information access (Paallysaho & Kuusisto, 2006).

Gonzalez-Alvarez & Nieto-Antolin (2007), based on a panel of 258 Spanish firms, found that larger-sized firms were more inclined to use patents. Also, firms utilizing tacit knowledge preferred secrecy and motivated employees were considered crucial for implementing a strategy of continuous innovation (Gonzalez-Alvarez & Nieto-Antolin, 2007).

Hurmelinna&Puumalainen (2007) conducted research with 299 Finnish R&D-performing manufacturing firms and revealed that the ranking of the effectiveness of appropriability mechanisms such as lead time, secrecy, contracts, IPR, and human resource management (Hurmelinna & Puumalainen, 2007).

Additionally, a comprehensive study was carried out in the US with a specific focus on the reasons behind start-ups seeking patents (Graham&Sichelman, 2008). This study encompassed an analysis of 12,000 start-ups established in the US between 1998 and 2008. Graham & Samuelson (2008) conducted surveys with all the firms and in-depth interviews with some of the firms, leading to the identification of several reasons motivating their pursuit of patent registration. The study revealed that the start-ups seek for patent registration

to generate licensing revenues, build a portfolio for cross-licensing,[20] and secure investment and financing (Graham & Sichelman, 2008).

Thiel and Peters (2012) found through interviews and a survey involving 89 innovative European SMEs that patenting is crucial for obtaining VC. Additionally, they identified that IP strategies integrating various forms of disclosure and non-disclosure are vital in protecting a firm's core technology. Their findings indicated that publishing inventions, whether in addition to existing patents or as a substitute, could provide substantial advantages in the commercialization process.

Another study for IP bundles[21] was conducted by Helmers & Schautschick (2013). They utilized data from IPR-owned UK SMEs to examine the utilization of patents and trade marks and revealed that only a small fraction of firms applying for both patents and trade marks and bundling did not demonstrate a positive impact on firm performance (Helmers & Schautschick, 2013).

Moreover, several studies have explored the relationship between IPR and VC. Häussler et al. (2012) found that possessing at least one patent application shortened the period from application to the first VC investment. In France, research revealed that firms from various industries utilized selected trade marks (72%) and patents (26%) as collateral to secure loans. This practice had significant positive effects on debt financing, particularly for small, financially constrained firms, and positively impacted overall firm growth (Ciaramella et al., 2022). Block et al. (2014) reported similar findings for trade mark signaling. These studies suggest that IPR are particularly crucial in early funding rounds when information asymmetries between founders and VCs are most significant. In later funding rounds, additional information about the SMEs' prospects becomes available through other means (EPO & EUIPO, 2023).

Dernis et al. (2015) conducted a descriptive study focusing on patent and trade mark filings at various IP Offices. The study explored the economic significance of bundling as part of firms' strategies to capture the benefits of their intellectual assets and identified that industries such as chemicals, pharmaceuticals, food products, computers, and electronics were more likely to form bundles (Dernis et al., 2015).

[20] Cross-licensing agreements are type of legal contracts among two or more parties that grant each party the right to use the patents owned by the others.

[21] The use of at least two types of IPR for the same product (EUIPO, 2020).

In his doctoral dissertation, Kazimierczak (2019) meticulously examined the intricate dynamics of how local patent and trade mark stocks, along with those held by new entrants, impact the growth trajectories of startup enterprises across the 12 member states of the EU. This comprehensive study utilized an extensive dataset encompassing 22,000 manufacturing firms, various regions, NACE codes, and turnover growth metrics. Through the application of quantile regression models and panel data analysis, the research concluded that technological innovation significantly increases the likelihood of exceptional performance by startup companies (Kazimierczak, 2019). Furthermore, Kazimierczak (2019) asserted that trade mark and branding activities help start-ups mitigate certain aspects of the liability of newness that is the challenges and difficulties that newly established entities encounter due to their recent entry into the market. Additionally, local knowledge stocks (patents and trade marks) are crucial factors influencing new firm entry, particularly for innovative firms and those entering high-tech industries (Kazimierczak, 2019).

Another recent study conducted in the US suggested that receiving a patent resulted in an average of 55% increased employment growth and 80% higher sales growth five years later (Farre-Mensa et al., 2020). Additionally, the study indicated that patent owners tend to engage in more and higher-quality subsequent innovations (Farre-Mensa et al., 2020).

In 2023, Bader & Süzeroğlu published a book examining various perspectives on dealing with IP from six different angles: the start-up's view, the investor's view, the corporation's view, the university's view, the global IP office's view, and the IPR attorney's view. This comprehensive study is based primarily on semi-structured interviews. Bader & Süzeroğlu (2023) concluded that an IP management strategy is critical to the successful development of a business.

Additionally, many reports prepared by international authorities focus on firms' IPR strategies. A comprehensive study conducted by the Office for Harmonization in the Internal Market (OHIM),[22] based on a survey of over 130000 European firms, revealed a positive association between holding IPR and firm performance. According to the study, firms with IPR tend to be larger and perform better, with, on average, 29% higher revenues per employee and 20% higher wages (OHIM, 2015).

The EUIPO (2017) investigated EU firms' choice between trade secrets and patents and their overall use of these protection mechanisms. The report concluded that market novelty and

[22] The name of the Office has changed to European Union Intellectual Property Office in December 2015.

innovation in goods are associated with a preference for patents, while process innovations and innovations in services are more often protected through secrecy.

EUIPO (2020) also investigated EU firms that utilize various types of IPR concurrently for the same products. The Report focused on the period between 2014 and 2015 and included 63,286 firms holding a total of 76,202 European Patents, 98,257 EUTMs, and 21,676 Community Designs (RCDs) (EUIPO, 2020). According to the Report, multi-IPR firms[23] have a significant economic impact, representing 31.9% of employment and 35.5% of turnover in the sample. Firms filing all three types of IPR represent 14.1% of employment and 16% of turnover (EUIPO, 2020).

Another the EUIPO Report (2021) analyzed the data of EU firms IPR portfolio and of the commercial database ORBIS.[24] The IPR data for each firm has matched with the commercial information available in ORBIS and the Report uses "labor productivity" as the main indicator (EUIPO, 2021). According to the results of the analysis, there is a systematic, positive relationship between ownership of IPR and economic performance at the individual firm level; firms that own IPR have on average 20% higher revenue per employee than firms that do not (EUIPO, 2021).

In 2016 and 2019, the EUIPO conducted two SME Scoreboards in cooperation with the European Observatory on Infringements of IPR. In 2022, the third iteration of the SME Scoreboard was undertaken using the revised version of the 2016-19 survey questionnaire (EUIPO, 2022). The data collection involved 8,732 SMEs across all 27 EU Member States, comprising 4,278 owners of registered IPR and 4,094 SMEs without registered IPR (EUIPO, 2022). The Report asserted that 10% of SMEs had registered IPR, with national trade marks being the most owned type, followed closely by EUTM and patents (EUIPO, 2022). Other notable appropriability mechanisms included trade secrets (19%), unregistered design rights (16%), and copyrights (10%) (EUIPO, 2022).

The most recent study was collaboratively conducted by the EPO and EUIPO in 2023 (EPO & EUIPO, 2023). According to the study, 29% of micro-sized firms applied for a patent or a trade mark at some point, with 27% having applied for trade marks, 6% having filed patent

[23] IPR-active firms are firms that have applied for at least one of the three types of IPR: European Union Trade mark, Registered Community Designs, or European patents. Multi-IPR firms are the firms that have applied for at least two different types of IPR (EUIPO, 2020).

[24] ORBIS provides financial and other information on millions of companies, gathered from the filings and accounting reports made by these companies (EUIPO, 2021).

applications, and 2% having filed both patent and trade mark applications (EPO & EUIPO, 2023). Additionally, significant variation exists among the countries in the sample. This variation is shown in Figure 2.2. The first column represents the country names and the numbers of firms, while the others indicate, respectively, the proportion of those who applied for any IPR rights, those with trade mark applications, those with patent applications, and those who applied for both trade mark and patent for the same innovation.

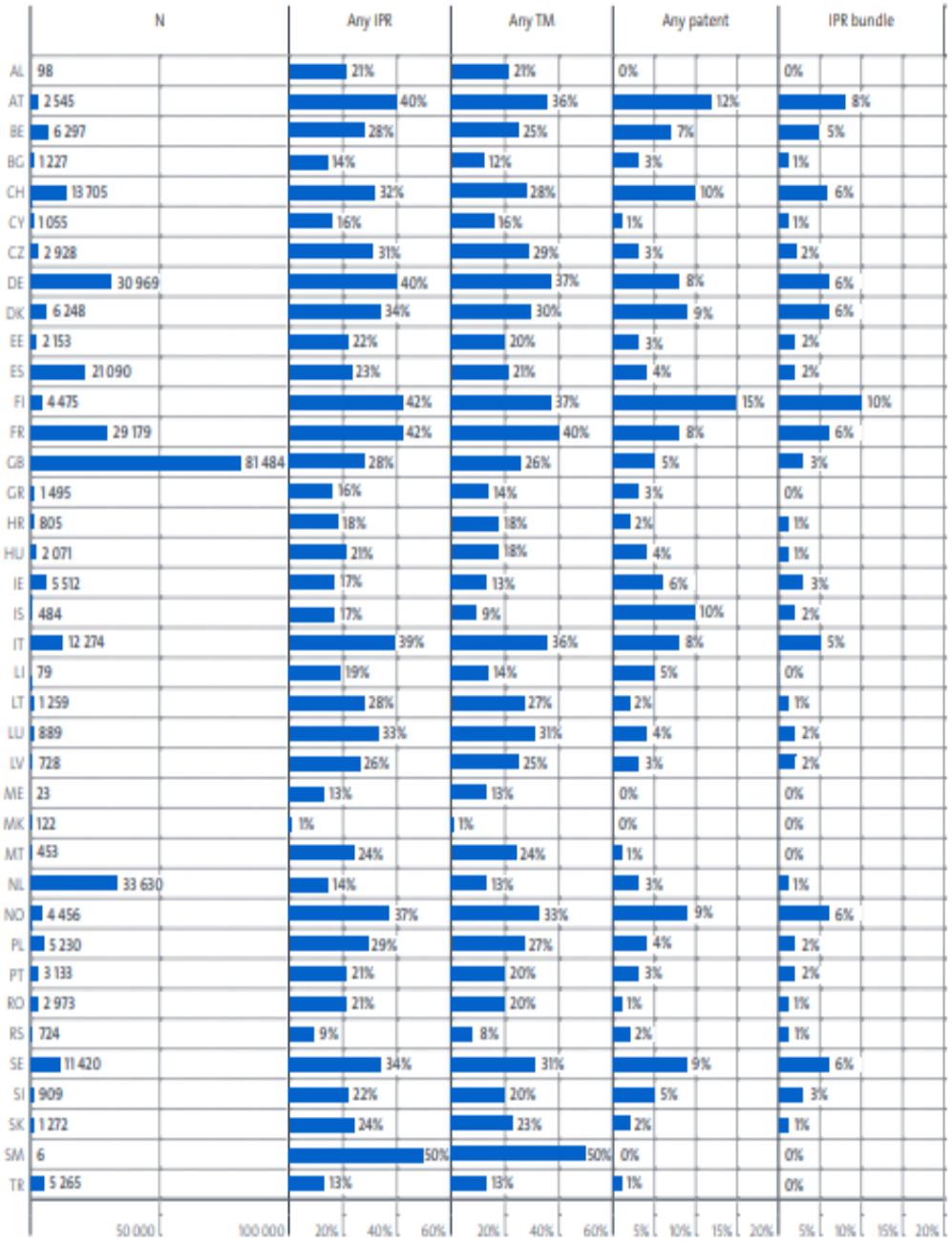

Figure 2. 2. Share of Firms Filing IPR per Country

Source: EPO&EUIPO, 2023

According to Figure 2.2, firms based in Austria, Switzerland, the Czech Republic, Germany, Denmark, Finland, France, Italy, Luxembourg, Norway, and Sweden are more likely than average to have applied for any IP right. Furthermore, firms from these countries are not only more likely to file separate trade mark and patent applications but also they tend to combine the two forms of IP protection (EPO & EUIPO, 2023).

2.5. Studies on Appropriability Methods Involving Türkiye

The international report titled *"Matching Crunchbase with Patent Data",* conducted by the OECD, involved an analysis that combined Crunchbase[25] with the EPO World Patent Database (OECD, 2017). The Report encompassed a database comprising approximately 50,000 patent-holding companies, collectively possessing 12 million patents, and 25,000 individual inventors, who filed for 2.2 million patents in OECD countries including Türkiye (OECD, 2017). The study revealed that the important role of IPR assets in securing VC and the characterization of the IP portfolio of high growth patenting start-ups (OECD, 2017). [26]

Another OECD (2018) publication, *"A Portrait of Innovative Start-Ups Across Countries,"* extensively explored the patenting activity of start-ups in OECD countries using Crunchbase data. The research highlighted a strong correlation between the presence of IPR—specifically the involvement of an inventor in the founders' team—and the success of start-ups. Overall, this research provided valuable insights into the global landscape of innovative start-ups, elucidating factors that significantly influence their composition, structure, and success.

Another report compiled by the EPO and EUIPO in 2023, involved a detailed examination of 5,265 Turkish start-ups based on Crunchbase data (EPO & EUIPO, 2023). The meticulous analysis, which included cross-referencing patent and trade mark data of Turkish start-ups, revealed that 13% of the start-ups applied for either a patent or a trade mark at some point (EPO & EUIPO, 2023). Among them, 13% applied for trade marks, and 1% filed patent applications (see Figure 2.2). The Report provided statistical data on patent and trade mark

[25] Crunchbase covers firms active in all countries of the world, providing information about acquisitions and initial public offerings (IPOs), including the date of exit events and, in some cases, the exit value of a firm. Crunchbase classifies a firm into one or several sectors, using its own unique classification system rather than standard industry classifications used by Eurostat or other statistical offices (EPO & EUIPO, 2023).

[26] Considering that most start-ups typically have fewer than 10 employees and recognizing the scarcity of studies related to Türkiye, these works have been included in the literature review to provide information on micro-sized firms.

applications of the 5,265 Turkish start-ups; however, it does not encompass the preferences on other appropriability mechanisms besides patent and trade mark.

Furthermore, a dissertation conducted by Gökovalı (2003) aimed to explore the correlation between patents and specific economic variables at the sectoral level within the Turkish economy, covering the period from 1985 to 1998. In the doctoral thesis, Gökovalı (2003) meticulously organized patent data based on sectoral classifications, employing two concordances, namely the Yale Technology Classification (YTC) and MERIT. The primary conclusion drawn from the thesis was that variables such as capital, labor, domestic patents, and foreign patent stock had a positive influence on economic growth. Additionally, Gökovalı (2003) asserted that factors such as renewal fees, economic growth, and import share collectively contribute to the prolonged duration of patent protection. The thesis is significant in demonstrating the positive relationship between patents and economic growth.

Additionally, Aktalay (2004) conducted a master's thesis titled *"Intellectual Property Management Strategy in New Technology-Based Start-Up Companies,"* which aimed to provide a guide elucidating the reasons and methodologies behind the development and adoption of IP management strategies in new technology-based start-up companies. The study was the first academic study on this subject in Türkiye offering distinct IP strategies tailored for innovative SMEs (Aktalay, 2004). Notably, it is essential to indicate that this is a descriptive study, lacking field research on start-up companies and failing to reflect the specific approaches of these companies regarding IP rights and regulations.

A master's thesis titled *"Impact of Patent Incentives on Innovation Performance of Technology-based Firms: The Case of METU Technopark"* was recently completed in 2022 by İçin (2022). The thesis involved 36 semi-structured interviews with firms established in METU Technopark. The conclusion encompassed that the patent incentives do not have any significant effect on the innovation performance of technology-based firms; however, they create educational, structural, and R&D-based behavioral changes (İçin, 2022). Also, the thesis concluded that patent incentives are not effective regarding commercialization and lack-of commercialization is a mutual limitation for all firms. This study only includes research on firms' perspectives on patent incentives. In this respect, it does not include firms' preferences on IPR and other appropriability mechanisms and their effects on firms' innovative activities.

All the above-mentioned studies regarding Türkiye fall short of understanding SMEs perspectives on IPR and other informal appropriability methods. To achieve a more

comprehensive understanding, I believe that qualitative research should be conducted with SMEs. This approach allows for deeper insights into how SMEs formulate their appropriability strategies and the driving forces and limitations behind their decisions to either apply for or abstain from them. Additionally, such studies provide data on the effectiveness of these mechanisms for SMEs, offering clues to understand the lower levels of innovative activities among SMEs.

CHAPTER 3

METHODOLOGY

This chapter presents the methodology of the research. The thesis is based on qualitative method, which generates data through semi-structured in-depth interviews. The thesis employs inductive reasoning, enabling the researcher to derive new concepts and hypotheses directly from the qualitative data. I conducted semi-structured interviews which are the key for qualitative data generation. Twenty-nine interviews were conducted with SMEs located at METU Technopark. Overall, in this chapter, research question**,** purpose of the research and data generation process will be discussed.

3.1. Research Question and Purpose of the Research

The thesis aims to address the main question: *"How do SMEs determine their appropriability methods?"* and the sub-questions: *"Which formal or informal methods do SMEs prefer, and why do they specifically choose these methods?"* Within the context of existing literature, the added value of the thesis lies in providing a comprehensive analysis of the appropriability methods of SMEs in METU Technopark. By examining which appropriability methods SMEs prefer in their innovation activities and the reasons for these choices, my goal is to gain insight into their preferences for both formal and informal methods. Additionally, I aim to explore how these methods function as innovation incentives by offering exclusive rights and economic benefits. Consequently, to our knowledge, the thesis will be the first to focus on SMEs at METU Technopark, examining their interactions with both formal (patents, trade marks, designs, and copyrights etc.) and informal appropriability methods (trade secret, lead times, and complementary sales etc.).

3.2. Qualitative Data Generation Process

Michael Polanyi (1966) declares in "The Tacit Dimension" that *"we can know more than we can tell"*, thus introducing us to the concept of tacit knowledge, which could not express outside the action of the person who has it; thus, it is difficult to reproduce it (Foray,

2004). Tacit knowledge consists of experiences, ideas, commitment, and competence, which are subjective and experiential. In this regard, researchers, doing qualitative research, are inquirers aimed at obtaining tacit knowledge embedded in the people by focusing on questions related to phenomenon being investigated. Consequently, the research findings are the creation of the interaction process between inquirers and inquired (Guba, 1990).

In that respect, the persuadability of the inquirer is crucial to make inquired to share his/her experiences, ideas, or knowledge. Because of obtaining the knowledge embodied in the people requires the goodwill of the people who have the knowledge to share (Foray, 2004).

As Patton (1990) indicate *"the interaction between inquirer and inquired discovers patterns that are hidden in the details; thus, the outcome is unpredictable and could not be generalized"*. Inspired by this approach, as a researcher, I employ qualitative techniques to comprehensively gather and interpret data, following an interpretivist approach. Interpretivism relies on inductive reasoning, which involves generating hypotheses as a result of the research. In this context, semi-structured interviews enable the researcher to uncover new concepts and hypotheses that emerge directly from the data (Bryman, 2012).

In this thesis, I employ semi-structured in-depth interviews as one of the qualitative methods, aiming to understand SMEs' attitudes towards appropriability methods as accurately as possible. This involves becoming an active inquirer to generate data that elucidates how their ecosystems function. By conducting semi-structured in-depth interviews and engaging with SMEs at METU Technopark, I seek to uncover the nuanced ways in which these enterprises conceiving and implementing their appropriability methods. This qualitative data generation allows for a rich, contextual understanding of the unique challenges and opportunities faced by SMEs in protecting their innovations and enhancing their competitive edge.

3.2.1. Interview Design

3.2.1.1. Categorization of Sample

Based on data from 2022, in the METU Technopark, 50% of 419 firms are from the software-informatics sector, 20% are in electronics, 15% operate in machinery and design, 6% are in medical technologies, 6% focus on energy and environment, and the remaining 3% conduct R&D in other fields such as advanced materials, agriculture, food, aerospace, and automotive (İçin, 2022).

Initially, I planned to conduct interviews with start-ups established within the last five-six years and located in METU Technopark. However, since the founding years of some of the firms were not listed on their websites, I had to send emails to all of them. My initial idea was to have a sample consisting solely of start-ups, but since only twelve start-ups responded, I also included older firms that replied.

In my research, I utilized the NACE codes of firms to classify their activities. Out of the 29 firms that responded positively to my interview request, 19 had the NACE code "62.01.01/Computer programming activities." However, these SMEs operated in various sub-sectors. For instance, while one firm with the 62.01.01 NACE code was engaged in the automotive industry, another was involved in the healthcare sector. Additionally, I interviewed ten firms with different NACE codes that provided services in defense, nanotechnology, acoustics, telecommunications, and security. Detailed information on these firms is presented in Table 3.1.

The number of employees in these firms ranged from as few as 3 to a maximum of 190. Due to the reluctance of some firms to disclose their annual net sales, I was unable to classify them based on their fiscal situations. However, according to the "Regulation on the Definition, Qualification, and Classification of Small and Medium-Sized Enterprises," the fact that all interviewed firms have fewer than 250 employees indicates that they qualify as SMEs.

3.2.1.2. Communication with Sample

I sent 386 emails introducing myself, my thesis topic, and my interview request. As the email addresses of some firms were not available on their websites, I attempted to reach them via LinkedIn or phone. Similarly, for those firms from which I received email delivery failure notifications, I made further attempts to contact them by phone or by writing to their employees on LinkedIn.

2 firms that I reached via email expressed interest but requested more information over the phone before deciding whether to accept the interview. After providing brief information about the subject of the thesis over the phone, they stated that they would forward my request on to the directors of the firms. Once the directors approved, I conducted the interviews. However, 2 other firms that responded by email declined to participate due to concerns about the confidentiality of IPR knowledge.

Some firms I contacted by phone immediately declined the interview request. On the other hand, two firms I reached by phone requested a second, more detailed email. After I sent these emails, they responded positively, agreeing to participate in the study.

According to the 2023 Patent Report of Türkiye (Çakır, 2023), I made further attempts to reach out to firms with the highest number of patents, focusing on those located in METU Technopark and those I had previously been unable to contact via email, using LinkedIn. 2 firms responded positively to these outreach efforts. In the end, I established communication with 25 firms via email, 2 by phone, and 2 through LinkedIn. All participants were fully informed about my thesis it could be concluded that they participated voluntarily.

3.2.1.3. Profile of the Sample

Since I have not got any prior knowledge of the organizational structures of the firms, I could not specifically select the interviewees. I conducted with those who responded to the invitation or were referred due to their relevance. Generally, the initial respondents to my email invitation were the firm founders. Two founders directed me to other employees to discuss the topic further. In total, I interviewed with 15 firm founders. The remaining 14 interviews were with employees in positions such as innovation manager, R&D incentives specialist, patent expert, or legal advisor. While one might assume the most productive interviews would be with the patent expert, some founders were more knowledgeable about IPR and informal appropriability methods. All the interviewed founders were male, while the interviewed women held positions such as innovation manager, software engineer, or legal advisor. The overall distribution of interviewees and firm-related information is detailed in Table 3.1. To protect privacy, the interviewees' personal information is not disclosed.

Table 3. 1. Information on Interviewees

INTERVIEW ID	INTERVIEW TYPE	INTERVIEWEE POSITION	SECTOR	YEAR FOUNDED	NUMBER OF EMPLOYEES	NACE CODE
A1	**Face-to-face**	Founder-Male	Medical	**2010**	**32**	**32.50.09**
A2	**Face-to-face**	Finance Manager-Male	Telecom-Education	**2004**	**40**	**62.01.01**
A3	**Face-to-face**	Legal Counsel and Contract Manager-Female	Defense Industry	**2012**	**190**	**62.01.01**
A4	**Online**	Founder-Male	Security	**2021**	**5**	**62.01.01**
A5	**Online**	Founder-Male	Medical	**2016**	**10**	**26.60.01**
A6	**Face-to-face**	Founder-Male	Defense Industry	**1984**	**22**	**26.51.08**

Table 3.1. (continued)

A7	**Online**	Strategic Partnerships and Innovation Manager-Female	Medical	**2019**	**30**	**62.01.01**
A8	**Online**	Patent Expert-Trade mark-Patent Attorney-Male	Medical	**2011**	**19**	**62.01.01**
A9	**Face-to-face**	Software Engineer-Female	Medical	**2007**	**18**	**62.01.01**
A10	**Online**	Founder-Male	SSB, Medical, Security	**2007**	**18**	**26.70.19**
A11	**Face-to-face**	Founder-Male	Defense Industry	**2017**	**12**	**72.19.01**
A12	**Online**	Founder-Male	Defense Industry	**2018**	**5**	**62.01.01**
A13	**Face-to-face**	Legal Counsel-Female	Education	**2018**	**39**	**74.90.90**
A14	**Online**	Founder-Male	Construction	**2018**	**3**	**62.01.01**
A15	**Online**	Marketing and Strategy Manager-Female	Automotive	**2011**	**110**	**62.01.01**
A16	**Face-to-face**	Operations Manager-Female	Communication	**2005**	**150**	**62.01.01**
A17	**Face-to-face**	Operations Manager-Female	Security	**2021**	**18**	**62.01.01**
A18	**Online**	Founder-Male	Agriculture	**2017**	**10**	**62.01.01**
A19	**Online**	Founder-Male	Gaming	**2020**	**3**	**62.01.01**
A20	**Online**	R&D Incentives Expert-Male	Automotive-Defense	**1997**	**140**	**28.99.90**
A21	**Online**	Founder-Male	Custom Solutions-Intelligence-Medical-Telecom	**2007**	**53**	**62.01.01**
A22	**Face-to-face**	Founder-Male	Multiple Sectors	**2004**	**80**	**62.01.01**
A23	**Online**	Founder-Male	Durable Goods and Defense	**2020**	**3**	**26.40.10**
A24	**Face-to-face**	Founder-Male	Energy	**2017**	**6**	**35.11.19**
A25	**Face-to-face**	Founder-Male	Public Software (AFAD, Istanbul Metro, etc.)	**2007**	**18**	**62.01.01**
A26	**Online**	Founder-Male	Acoustics	**2020**	**4**	**26 40 10**
A27	**Online**	R&D and Quality Control Director-Male	Defense Industry and Telecom	**2018**	**60**	**62.01.01**
A28	**Online**	Business Manager-Female	Medical	**2022**	**7**	**26.60.01**
A29	**Face-to-face**	Operations Manager-Female	Communication	**2003**	**15**	**62.01.01**

3.2.1.4. Question Structure

I designed semi-structured in-depth interviews to collect data through a series of questions. I prepared questions in Turkish to ensure that interviewees feel comfortable expressing themselves. Interviewee consent for recording the interview is also obtained in Turkish. The

thesis aims to analyze preferences for formal and informal appropriability methods and to examine whether these methods complement each other or serve as substitutes, their role in different stages of the R&D process, tendencies toward commercializing innovations, and suggestions for addressing related issues. In accordance with the aim of the thesis, I prepared 42 questions (27 main and 15 sub-questions) to understand participants ideas, feelings, beliefs on these topics. First, I aimed to classify the firm both sectoral and as micro, small, or medium-sized by asking questions related to the firm's age, size, and sector. Then, I asked questions about innovation and technology development to draw a framework for the companies' R&D activities and expenditures. Following this, I asked questions that varied based on whether they have applied for IPR, which I considered relevant to the process. After asking a few questions to gather their opinions and experiences regarding the financial returns of appropriability methods, I inquired if they had encountered any infringements related to these methods and what strategies they used to deal with such situations. Finally, I asked a few questions to gather the firms' thoughts on what could be done to enhance the effectiveness of these methods for innovative SMEs. Detailed information on the questions and their purposes is presented in Table 3.2.

Table 3. 2. Interview Questions

Questions	**IPR-active SMEs**	**Non-IPR-active SMEs**	**Main Goal**
When was your firm founded?	X	X	**To have an introductory information on firm age**
How many employees does your firm have?	X	X	**To classify firms as micro, small, and medium-sized enterprises**
In which main sector or technology field does your firm operate? Which sectors do your primary customers belong to?	X	X	**To classify firms based on NACE codes and to interpret firms' sectoral conditions regarding appropriability methods**
Does your firm engage in exporting?	X	X	**To understand firms' economic capacities and commercialization position to interpret the choices of appropriability methods**
Do you have a foreign partner?	X	X	**To understand firms' international position and interpret ownership of IPRs**
Does your firm have an R&D center as defined by Law No. 5746?	X	X	**To understand how firms engage in R&D activities**
How many R&D personnel are employed at your firm?	X	X	**To determine the percentage of a firm's employees involved in R&D**
Approximately what percentage of your revenue is allocated to the R&D/technology development budget?	X	X	**To assess the financial importance firms attribute to R&D**

Table 3.2. (continued)

What types of innovation does your firm engage in?	X	X	**To classify firms based on innovation types and interpret these classifications concerning the application of IPRs**
Have you applied for any IPR (patent, utility model, trade mark, and industrial design, copyright)?	X	X	**To classify firms as IPR-active and non-IPR active**
If so, which ones?	X		**To classify firms as Multi IPR or not and understand the composition of IPR portfolios**
Do you have any international IPR applications?	X		**To classify firms based on international position and export strategies, analyzing any correlations**
Why did you apply for IPR?	X		**To understand the motivations driving SMEs to apply for IPR**
Why do you think applying for IPR is important?	X		**To determine the role of IPR in firm positioning**
Does it hold any significance for innovative activities?	X		**To understand the importance of IPR in innovative activities**
In whose name have you made the application? **Have you collaborated with TÜBİTAK, KOSGEB, universities, or any individuals or institutions?**	X		**To analyze the frequency and issues surrounding collaboration and ownership**
If so, what are the reasons for choosing these collaborators?	X		**To understand the reasons of cooperation**
If not, what are the reasons for not choosing these collaborators?	X		**To understand why some firms choose not to engage in cooperation**
What challenges have you faced during the IPR application process?	X		**To understand experiences of SMEs regarding the IPR application**
Have you used an IPR attorney?	X		**To assess whether firms have sufficient knowledge and budget to apply independently**
Have you received any public incentives? If so, would it have made a difference for you?	X		**To understand firms' awareness of incentives and how they have benefited from them**
Does your firm have a patent department or employ an IPR expert?	X		**To understand insights into firms' IPR know-how and their management of IPR applications**
Does the firm offer IPR training programs?	X		**To understand the significance firms place on IPR and their efforts to create an IPR culture**
Why have you not applied for any IPR?		X	**To understand reasons why firms may choose not to apply for IPR**
Do you think your sector has influenced this decision? Would your opinion change if you were in a different sector?		X	**To understand the relationship between non-IPR-active firms and their sectors**
Does being a non-owner IPR SME affect your innovative activities?		X	**To understand whether being non-IPR-active hinders firms' innovative activities**
Have you used informal methods to protect your innovations, such as trade secrets, first-mover advantage, lead-time advantage, complementary sales, or non-disclosure agreements?	X	X	**To understand how IPR-active and non-IPR-active firms utilize and prefer informal appropriability methods**
If so, what are the advantages and disadvantages of these methods compared to IPR?	X	X	**To understand the advantages and disadvantages of informal appropriability methods on innovative activities**

Table 3.2. (continued)

If not, why have you not utilized these informal methods?	X	X	**To understand how firms substitute other mechanisms**
Are you aware that you might benefit from using open-source software?	X	X	**To understand firms' attitudes toward using third-party software and their attention to copyright issues**
Would you like to publish your software on open-source platforms?"	X	X	**To understand whether firms are aware that publishing code initiates copyright protection and their openness to sharing knowledge**
What do you think about funding function of IPR for SMEs?	X	X	**To understand the impact of IPR on securing venture capital or loans and whether this is relevant to their firms**
Are you aware that selling IPR-related products provides tax exemption?	X	X	**To evaluate firms' awareness and use of tax incentives**
Do you believe that your IPR applications and registrations have contributed to an increase in your firm's value?	X	X	**To understand firms' positions on the importance of IPR for firm value**
Have you licensed any of your IPR or received licenses from others?	X	X	**To understand the rate of commercialization of firms' IPR**
Have you collaborated with METU TTO or any other organization?	X	X	**To understand the role of TTOs in the commercialization process**
What do you perceive as the potential threats to your appropriability methods?	X	X	**To understand SMEs' awareness regarding the types and occurrences of threats**
Are you aware of the steps to take if you encounter any infringement of your appropriability methods?	X	X	**To understand the measures firms take to prevent threats and the extent of information they possess about legal processes**
How is your firm affected by any encountered infringement?	X	X	**To understand firms' responses to infringement and any damages incurred**
Do you believe that there is adequate information, education, and incentives regarding appropriability methods in Türkiye?	X	X	**To review the adequacy of current information dissemination and incentives**
What regulations do you think should be implemented to positively impact innovation in your sector concerning appropriability methods, and what are the current shortcomings?	X	X	**To design policy recommendations to enhance the effectiveness of appropriability methods in Türkiye**

3.2.1.5. Conducting Interviews

In January 2024, I initiated the interview process. Before entering the data collection phase, I conducted four pilot interviews to test the interview guide and ensure the robustness of the procedure.

Interviews were conducted using two primary communication mediums, scheduled in advance: face-to-face meetings and teleconferences via Zoom and Microsoft Teams. 13 interviews were conducted face-to-face in the interviewee's office upon personal request, 14

via Zoom, and the remaining 2 through Microsoft Teams. In total, I conducted 29 interviews between January 26, 2024, and March 15, 2024.

On average, the semi-structured interviews lasted approximately 55 minutes. The longest interview, conducted via Zoom, extended to one hour and thirty minutes, while the shortest, constrained by the participant's limited time, lasted 32 minutes. Teleconferences averaged 48 minutes, whereas face-to-face meetings averaged 53 minutes.

To record the interviews, I used a voice recorder application on my cell phone, securing prior permission from the interviewees to facilitate detailed transcription and analysis. Following a brief introductory conversation, the interviews commenced immediately after obtaining recording permission. One participant did not consent to audio recording; in this instance, I took comprehensive notes during the interview and revisited any unclear points to ensure completeness.

3.3. Data Analysis

The recordings of 28 SMEs allowed me for re-listening and a detailed assessment of the interviewees' responses, facilitating notetaking, data interpretation, and minimizing the risk of misinterpretation. I had ability to listen retrospectively which was offered valuable flexibility in interpreting the data. Furthermore, I took reflective notes during the interviews to document spontaneous questions, insights, and annotations.

As a result of the interviews, I transcribed the audio recordings and converted them into transcription documents. Additionally, I digitized the handwritten reflection notes, thus, all twenty-nine interviews were included in the data analysis. I uploaded the transcriptions to MAXQDA software for coding. MAXQDA, a software program designed for computer-assisted qualitative and mixed methods data analysis, was utilized to map and analyze the raw data from the interviews. In this context, I conducted semantic coding for the transcriptions uploaded to MAXQDA to interpret the underlying themes, patterns, and concepts in the data.

As outlined in the section of qualitative data generation process, the thesis adopts an inductive reasoning approach, allowing the researcher to derive new concepts and hypotheses directly from the qualitative data. To achieve this, I first conducted coding without dependency on any theoretical perspective, using a broad and neutral perspective.

Through this approach, I identified 148 codes, along with their frequency in the transcriptions, from the interviews. Afterwards, I grouped the generated codes under themes. By interpreting these themes, I formed theme components and connected them to a central theme framework. Through this theme, I identified the challenges SMEs face and the drivers that motivate them to employ appropriability methods. This allowed me to develop hypotheses regarding which appropriability methods SMEs choose and why they opt for certain methods. A list of these codes and themes are provided in Appendix A.

CHAPTER 4

FINDINGS

In this section of the thesis, the findings from the interviews are presented and analyzed. Initially, interview responses under the theme of "the portfolio of appropriability methods of SMEs" is discussed. This section includes an analysis of their preferences between trade marks and patents, as well as among copyrights, and trade secrets, illustrated through figurative representations.

The subsequent section of the chapter classifies interview responses under the theme of "effects and challenges". The effects of appropriability methods for SMEs are categorized based on the driving factors that prompt SMEs to adopt these methods. These effects are delineated as scope of protection, financial gain, globalization, strengthening innovation, marketing, strategic uses of patents and the nature of knowledge.

Conversely, the challenges are categorized and analyzed based on the constraints SMEs encounter with formal and informal appropriability methods. These challenges encompass ineffectiveness of protection administrative hurdles, lack of knowledge, firm specific factors, the costs associated with application and enforcement and conflict of interest on ownership of patents. These findings form the basis of the discussion chapter, where the data will be further analyzed.

4.1. The Portfolio of Appropriability Methods of SMEs

Out of the 29 SMEs interviewed, 28 have at least one IPR application or registration. All 28 of these firms have either trade mark applications or registrations. Additionally, 16 have either patent applications or registrations, 6 have copyright registrations, 5 have design registrations, and three have utility model registrations. Among the 28 IPR-active firms, 18 are identified as multi-IPR firms. The following Figure 4.1 displays the numbers of SMEs utilized appropriability methods classified according to the sizes of firms.

All the firms indicated that they have NDAs with employees, consultants, and/or the companies they collaborate with. Additionally, 21 firms use trade secrets as one of their appropriability methods.

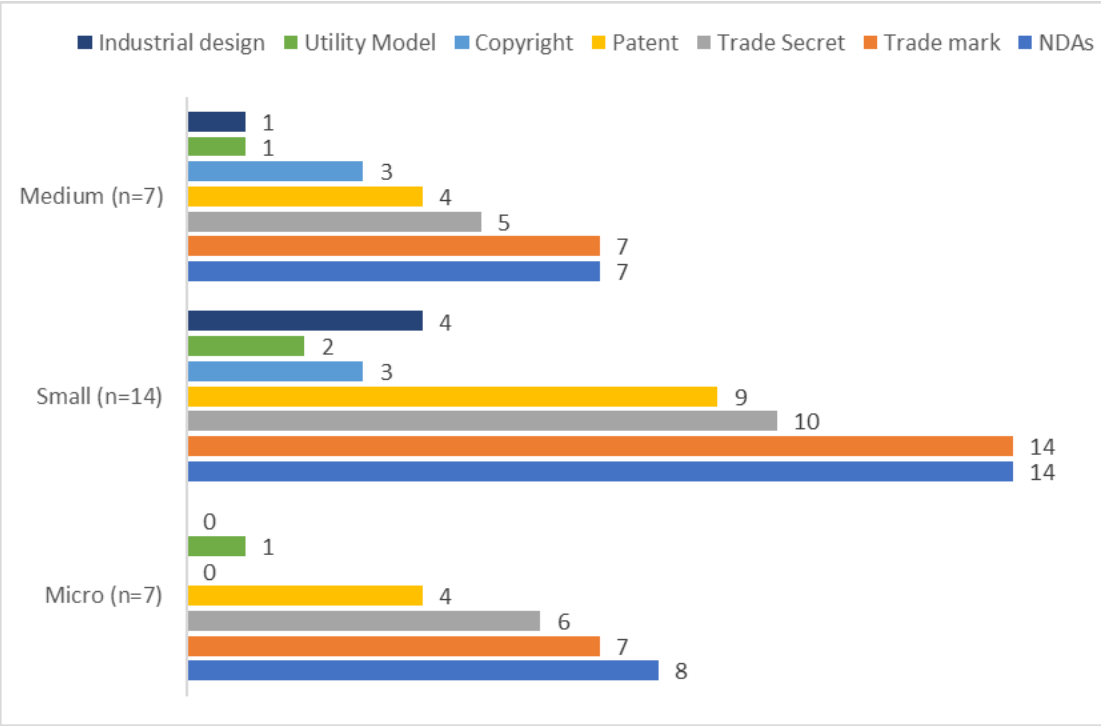

Figure 4. 1. The Numbers of SMEs utilized Appropriability Methods by Firm Size

The SMEs stated that, aside from NDAs and trade secrets, they do not use other informal appropriability methods such as lead-time advantage or complementary sales. A firm founder provided the following explanations regarding the informal methods they employ:

> *We certainly implement trade secrets and NDAs, but as you know, these measures often come into play when things don't go as planned. Nonetheless, we place importance on NDAs and make efforts to use them. We also designate certain information as trade secrets. I'm not sure if we could enforce these measures 100%, but we are making efforts to do so. (Interview-12)*

Additionally, 3 of the interviewed firms have foreign partners, with their IPR applications filed under the names of the Turkish firm. For the remaining firms, the applications are made either in the names of the firm owners or the firm itself. Out of the 16 patent-owned firms, only 3 have employees listed as inventors on the patent applications.

4.1.1. The Preferences of Trade mark and Patents

Patents alone do not ensure that a firm will benefit from innovation; the development of market-based assets is also crucial for the successful commercialization of innovations

(Rogers, 1998). Trade marks are one such asset. Recent studies indicate that trade marks can be associated with innovative activities (Greenhalgh & Rogers, 2007). Utilizing a new trade mark could enhance consumers' perceptions of innovative products and provide a foundation for advertising. Additionally, when a product is introduced to the market under a specific trade name, consumers are likely to remain loyal to this pioneering name even after competitors emerge (Davis, 2009). Thus, trade marks and patents are two distinct but complementary methods for appropriating the benefits of innovation.

Findings regarding firms' preferences for patents and trade marks indicated that firms use these two methods complementarily. I found that out of 29 interviewed SMEs 16 have applied for patents and have also made trade mark applications. Firms in the medical, durable goods and energy sectors represent half of those applying for patents.

Firms with NACE code 62.01.01—computer programming activities—focused on developing hardware and software for agriculture, communication, defense, and medical sectors, make up half of the total number of firms applying for patents.

Regarding the numbers of patents and trade marks, 28 companies have a total of 83 trade mark applications/registrations and 16 companies have a total of 95 patent applications/registrations. Among the 83 trade mark applications, 6 are international trade mark applications under the Madrid Protocol and within the 95 patent applications/registrations, 13 are international patent applications/registrations under the PCT.

Furthermore, as a result of qualitative analysis, I also found that 7 interviewed firms had created an IP bundle by applying for both patents and trade marks for the same R&D output. These firms generally apply for patents before trade mark. One of the reasons is that firms initially aim to legally protect the developed product itself. An interviewee stated that they prefer to use the trade mark during the product's market launch phase.

> *If you are a technopark firm or an R&D firm, the first thing you would do is to initiate a project. There are stages involved in project development. During these stages, you first assess the public benefit, state benefit, and international benefit of the project. Once these assessments are made, you proceed to create your project. Then there is the matter of patenting. Why patent first and then trade mark? The trade mark is essentially your market-facing identity. (Interview-A2)*

Some of the firms believe that trade mark applications are easier than patent applications. One of the firms indicated that:

Applying for a patent is more challenging, whereas obtaining a trade mark has become relatively easier. It could now be done and tracked through the e-Government portal. (Interview-A13)

Similarly, another interviewee mentioned that creating and applying for trade mark is easier:

Engineers find obtaining a trade mark easier. They often perceive patenting as a form of rocket science, which seems daunting to them. (Interview-A3)

4.1.2 The Preferences of Copyright and Trade Secret

Computer programs are protected by Patent Law in the United States (US) and Japan, as they are considered technical inventions rather than intellectual works. However, within the Continental European legal system, which includes Türkiye, computer programs are regarded as *"intellectual and artistic works"* and are protected under Copyright Law. In Türkiye, computer programs are classified as Literary and Scientific Works under Art. 2/1 of Law No. 5846 on Intellectual and Artistic Works and are protected by copyright.

Out of 29 interviewed SMEs 6 have applied to The General Directorate of Copyrights under Republic of Türkiye of the Ministry of Culture and Tourism to register their source codes and have received Registration Certificates. Other firms stated that they prefer to protect their codes as trade secrets.

According to the responses from the firms, there are two reasons for this preference. First, the constantly evolving nature of codes in the software world makes applying for copyright registration somewhat pointless. A firm founder expressed this sentiment as follows:

There is no point in copyright protection because the code of today differs from the code of tomorrow. Therefore, applying for copyright is not useful. (Interview-A27)

Although a firm has received a Copyright Registration Certificate, their thoughts on the matter were as follows:

The source code is constantly changing. We applied for copyright, but due to the changes, it is no longer valid, thus, copyright is a difficult matter. (Interview-A22)

Another reason for not applying for software copyright is the belief that the copyright registration would not provide an effective protection mechanism:

We do not trust copyright protection; in fact, the strongest method is not to write source code down anywhere. (Interview-A11)

These firms prefer to keep their codes as trade secrets:

We have our own codes, solutions, products, and platforms, codes that we do not disclose publicly. These need to be protected because a lot of effort has gone into them, and they are critically important. We could say that we protect them as trade secrets. (Interview-A25)

Additionally, firms were asked whether they use open-source software (OSS)[27] resources and whether they publish their own codes. These questions aimed to understand firms' attitudes towards using others' software and whether they pay attention to copyright, as well as to see if they are aware that publishing their codes automatically initiates the copyright process. All interviewed SMEs stated that they benefit from open-source codes and pay attention to necessary copyright arrangements when using these codes. On the other hand, most software firms do not know that copyright protection starts from the date of code publication.

Firms that keep their source codes as trade secret have stated that they do not publish their codes on OSS platforms. However, only one software firm indicated that they are considering publishing some of their source codes. At this point, these codes will no longer be categorized as trade secrets and will be accessible to relevant parties:

We have decided to publish some codes and methods. Not entirely, but partially. It is crucial to draw the line well between protecting trade secrets and sharing open-source code. (Interview-A27)

4.2. Effects of Appropriability Methods for SMEs

4.2.1. Scope of IPR Protection

4.2.1.1. Legal Protection

Formal IPR grant inventors the legal authority to prevent others from using their innovations, thereby providing appropriability of innovations. Trade marks, patents, utility models, industrial designs, and copyrights offer legal guarantees to prevent others from using their

[27] Open-source software refers to computer programs made available under a license that permits the copyright holder to grant users comprehensive rights. These rights include the ability to utilize, examine, modify, and disseminate both the software and its source code, without restriction, to anyone and for any purpose (EUIPO, 2020).

innovations. For instance, patents grant the right to prevent others from using newly invented technologies, while trade marks provide legal protection for investments in intangibles and distinctive product characteristics that appeal to consumers, potentially for an indefinite period (Arora et al., 2008). This monopoly controls over inventions not only safeguards firms' innovations but also incentivizes the creation of new innovations. An interviewee expressed the safety provided by registered patents as follows:

> *Patenting genuinely innovative products mitigates many risks in any business. For instance, the patent we obtained provides comfort, especially as it is an examined patent. Thus, for products subject to patents, we view it as a protective measure; someone else might create it, but as long as we have the patent, we feel more secure. (Interview-A20)*

4.2.1.2. Prevention of Imitation

Most of SMEs recognizes IPR as legal guarantee provided by national and international regulations, and a valid method for preventing imitation.

An SME that was interviewed with trade mark, patent, and utility model applications simultaneously stated that the reason of the IPR applications is protection of innovation and prevention of imitation:

> *Filing an IPR application is important, especially to protect the new things we develop from being copied by others. (Interview-A7)*

Similarly, preventing the copying of developed innovations is a key factor driving firms to apply for IPR:

> *It is a strategic decision to publish an innovation on a website and use it in marketing. The primary reason is that you do not want someone to come and copy something you have worked hard on. (Interview-A28)*

Accordingly, another interviewee expressed the importance of IPR applications as follows:

> *In my opinion, trade marks and patents are significant for innovative activities. We encounter copies, and there are rival firms established by former colleagues and try to use same trade mark or patent. In this sense, we find trade marks and patents to be important. (Interview-A20)*

Another firm founder emphasized the importance of IPR applications, stating that concerns about imitation play a significant role in determining the countries for patent applications:

> *We patented it in the USA but not in Türkiye. There is no market in Türkiye that would copy and sell my product; my markets are in Israel and the USA. (Interview-A6)*

One of the interviewees explained the importance of trade mark ownership for the prevention of imitation as follows:

> *When you sell on a site like Trendyol, others might sell products using your visuals. The visual is yours, but the product delivered is different. If you have a registered trade mark, you could defend yourself. They do not send the product shown, but since it is a small item, you do not care much about what you receive. The visual looked better, but you get something similar at best. However, if you have a trade mark, you could have such products removed. (Interview-A29)*

4.2.2. Financial Gain

Well-managed IPR could provide a wide array of benefits, such as fostering collaborations and licensing agreements, attracting venture capital, increasing firm value (Brant & Lohse, 2013), and taking advantage of tax exemptions.

4.2.2.1. Commercialization of IPR

Sichelman (2010) contends that patent commercialization involves all activities that follow the initial invention. These activities include developing, testing, manufacturing, and selling the invention, thereby converting it into a marketable product or service. The commercialization of IPR includes licensing, leasing, and transferring the exclusive right. According to the Lopez (2009), SMEs often seek to license or sell patents due to their limited production and marketing capabilities, which are essential for successfully commercializing these inventions.

It has been observed that some of the firms have begun selling their innovative products in the domestic market, thus commercializing their inventions. A total of 14 firms are engaged in exports, and 12 of these companies have filed for patents. However, only some of these firms are exporting their patented products. Additionally, there are software firms that license their software. Among these, the ones engaged in exports are selling their software to companies abroad. Additionally, one firm (A9) reported licensing its trade mark to a foreign company, while another firm (A11) granted a design license to a company operating domestically. Both firms stated that the revenues for trade mark and design licenses were

substantial and provided them with significant revenue. However, neither firm collaborated with the METU Technology Transfer Office (TTO) during this process. On the other hand, firms have expressed concerns about the lack of recognition of the value of IPR in Türkiye. An interviewed firm with trade mark, patent, and copyright registrations remarked:

> *We have a triple application routine, we work on all three aspects to protect our rights: trade mark, patent and copyright. These need to be reflected in our balance sheets, appearing as rights in our 260 accounts. To include them as rights, we need to follow this triple system by obtaining the trade mark and patent. Once we do that, I could value them at, say, 10,000,000 TL. But later, I might sell it for 10,000,000 USD; firms and banks do not know this. (Interview-A2)*

Furthermore, firms have criticized the insufficient emphasis on the commercialization of patents in both the private and public sector in Türkiye. One interviewee indicated that:

> *In the USA, it has become a culture to patent as an entrepreneur and make money by licensing it. Investors also invest in this and make their money from it. They do not do it just to have a score; after all, thousands of patents come out of MIT and Stanford, and they all get commercialized. Forget about the number of patents; what matters is commercialization. (Interview-A6)*

Similarly, another interviewee stated:

> *Everyone pays attention to patent numbers. TÜBİTAK and technoparks like numbers, but they do not matter; the quality does. Very few turns into commercial products. TTOs do not work sufficiently on commercialization of IPR. (Interview-A23)*

Firms, especially those producing high-tech products, have highlighted the challenges they face in commercializing their innovations:

> *There is also the mindset of obtaining a patent just to have it, but if you are not commercializing it and making money, it has no value, especially in our high-tech work. The sector does not quickly adopt and use our products; almost all sectors in Türkiye are focused on reducing costs. Therefore, your product does not quickly turn into commercial value. (Interview-A24)*

4.2.2.2. Venture Capital

Investing early in IPR protection could serve as a credible indicator of otherwise hidden value to venture capital managers and investors (Colombo, 2021), assisting them in making

decisions under uncertainty (Hottenrott et al., 2016). The OECD Report (2017) underscored the crucial role of IPR in securing venture capital and shaping the IP portfolios of high-growth and inclusive SMEs.

Most of the interviewed firms had completed their first round of investment and were involved in negotiating with investors for the second and third rounds. However, among these firms, only two (A20 and A24) received VC due to their IPR applications, allowing them to establish their firms through patent applications.

One of these firms collaborated with METU on a project that resulted with a patent, which facilitated the founding of their firms. The founder of this firm shared the following about their establishment:

> *The firm was founded alongside the patent, but the patent held by the three founding partners and has a share of METU. Since we have not yet mass-produced the patented product, we did not transfer it to the firm; it is held personally. We first applied for the patent, without examination in Türkiye, and with examination in the USA and Europe. The European patent is still under examination; we applied with METU in 2015, and the firm was founded in 2017. (Interview-A24)*

The other firm, which also established its firm based on a patent but had to close it due to the inability to transition to mass production, had its founder explain:

> *For instance, we have a patent related to the X topic, and it was genuinely something patentable and capable of generating income. A spinoff was created, however, we had to shut down the firm due to difficulties in mass production and operational issues. (Interview-A20)*

Additionally, a founder who is also a member of an investment committee emphasized the critical importance of IPR applications/registrations for attracting venture capital:

> *From the perspective of venture capital, applying for and registering IPR is important. It is a positive aspect, and as a board member of a investment support firm and a member of the investment committee, it is something we look for to ensure others do not copy the product. (Interview-A6)*

An operations director, who has also served as a trade mark/patent attorney, highlighted the significance of patent applications/registrations for investors:

> *Over the past 10 years, a process has emerged where some people made money, showing that entrepreneurship ca could n be profitable. Consequently, there is a new*

wave of investors. In this wave, patents have been very useful in explaining your product to these investors and securing investment. (Interview-A8)

An interviewee believes that they could have secured more investment if they had patent applications:

We completed the first investment round. We leveraged the C certificate for the implant, but if we had a patent application, we could have secured more investment. I could say this with high confidence. (Interview-A28)

Another interviewee from another software firm noted the crucial importance of IPR applications/registrations for investors:

It is also necessary for making future investments. If you are going to seek investment in the coming years, investors view this differently. Even though software firms might think patents are not obtainable or important, we do not see it that way. I think a firm that does not protect its trade mark or patent rights will not be taken seriously by investors. I have met a few people from the investment ecosystem who place great importance on this. Trade mark and patent applications are more critical for small companies who need investment (Interview-A27)

An interviewee, drawing from their own experiences, expressed the importance of trade mark applications/registrations for investors and shared their thoughts on the matter as follows:

In the beginning, we were trying to sell with only small number of devices in the field, having a trade mark signaled to the other party that we were committed. That is why I think it is valuable. You could not assess the financial value of a newly established firm based on the individual, but if the founder registered the trade mark before establishing the firm, it creates a sense of commitment and reliability. We have seen the benefits of this from our own experience. (Interview-A29)

4.2.2.3. Firm Valuation

All twenty-nine firms strongly believe that having IPR applications would increase their firm's value. One founder expressed their thoughts on this matter:

"Having patents, trade marks, or design registrations could significantly increase firm value. It means that what you have done has been validated by someone in a position of authority." (Interview-A14)

Another firm highlighted that IPR registrations increase firm value by eliminating the predictability of innovations by rivals:

> *When we look at the transformation of our patented product into marketable products, this could be evaluated not just through product sales but also by eliminating the predictability of these innovations by others. This, in turn, enhances the value of the firm. (Interview-A8)*

Although the firms acknowledged that IPR applications/registrations enhance firm value, none of the interviewed firms have conducted IPR or firm valuation assessments. An interviewee believes that IPR valuation could not be done objectively:

> *When it comes to patent valuation, the perspective is important. Are you on the buying side or the selling side? This applies to companies and works of art as well. You could change it by filling in the gaps. It is a valuable initiative, but it is not going well now. We need to create more valuable patents. (Interview-A8)*

A software firm founder, who has only trade mark registrations, stated that both trade mark and patent registrations increase the value of firms:

> *A product with your trade mark significantly enhances the firm's worth. If we think beyond the sector, patents could also create value. If you have a patent, it adds value to the firm. The amount varies depending on the situation, but it certainly creates added value. For some, it produces one unit; for others, it produces ten units, but there is always an impact on firm value. (Interview-A25)*

4.2.2.4. Tax Exemption

According to the Law No. 4691, firms operating in technopark are exempt from Income and Corporate Tax on the earnings derived from R&D, software, and design activities. However, firms without an R&D center within the technopark could not benefit from this exemption:

> *I am aware of the tax exemption on the sale of patented products, but we couldn't benefit from the Technopark tax advantage because the patents we obtained were not developed there. However, I know there is such an advantage for products developed in the Technopark, but we did not take advantage of it. (Interview-A20)*

On the other hand, SMEs lacking a Technopark-based R&D center could benefit from a Corporate Tax exemption based on Law No. 5520 on Corporate Tax on the sale of patented products. This exemption provides a 50% reduction in corporate tax on all earnings obtained from the rental, transfer, sale, or marketing of inventions in Türkiye (TÜRKPATENT). An interviewee who was aware of this tax exemption stated that calculating is a significant challenge for firms:

I am aware of the tax exemption. I am making a large product where a part of it is patented; in software, it is difficult to calculate, while in hardware it would be easier. I could not get an expert to value the software. Am I selling the product just because it has that function? It is hard to prove. I could not separate it out. I do not know the exact cost. According to whom, and based on what? I want to know how to calculate the tax exemption on the profit margin from the sales if there is a patent within the product. Let's call it X. I put it in different products, and it has different costs based on the function. How do I calculate and determine the tax on the profit from its sales? It would be easy if it were a fully patented product, but it is hard on the software side. Selling a car, perhaps the main feature is the battery. Maybe the car is bought for the battery, but it is not easy to identify. I would only deduct the VAT for the battery. This is uncertain. (Interview-A27)

4.2.3. Strengthening Innovation

Innovation activities are defined in Oslo Manual as follows:

> *Innovation activities include all developmental, financial, and commercial activities undertaken by a firm that are intended to result in an innovation for the firm. They include R&D, engineering, design, and other creative activities; marketing and brand equity activities, IP-related activities, employee training activities, software development and database activities, activities related to the acquisition or lease of tangible assets, and innovation management activities* (OECD, 2018). According to this definition, all interviewed firms are involved in innovative activities.

4.2.3.1. R&D Activities of SMEs

According to the Oslo Manual (OECD, 2018), a product innovation is *"a new or improved good or service that differs significantly from the firm's previous goods or services and that has been introduced on the market"*. All the interviewed SMEs have reported engaging in product innovation. Under Law No. 5746 on the Support of Research and Development Activities, all these firms conduct R&D, and 26 of them are automatically considered R&D centers due to their location within METU Technopark. The majority of the firms' R&D expenditures are on personnel costs. Most or all employees in micro and small firms work as R&D personnel, while for medium-sized enterprises, at least one-third of the employees are engaged in R&D activities.

SMEs conduct their R&D activities in two main ways. First, especially for firms working with the defense industry, they develop products through a process they refer to as "localization". Second, they develop products driven by commercial concerns or the search for a specific solution. One firm described these two different product development processes as follows:

We initiate projects in two ways: One arises from a subject, where we think we could make money from it, leading to R&D projects. The other type starts from orders we receive, mainly localization projects in the defense industry, where we localize products that exist abroad. Of course, patents are important for our innovative activities. For instance, we will apply for a patent related to the production process of a product we localized. Next year, we will likely have two patent applications, not for the product but for the production method, as there are already enough patents for the product. We aim to innovate the process. (Interview-A20)

4.2.3.2. Encouraging R&D

IPR are used not only to protect R&D outputs but also as a source of information, inspiration, and guidance at the initial stages of R&D for some of the firms. For example, the founder of one firm explained how they use patent research in their R&D processes as follows:

First, we conduct a patent search before moving on to an R&D project. The first three months of our projects typically involve literature research, including patent searches. If you ask what we research, we perceive patents to understand the focus and priorities of developers who created certain technologies. We identify what problems they addressed and see if we need a similar solution. We design our own work to protect any unique aspect we create. We view patent files not as obstacles but as tools to overcome barriers. (Interview-A1)

Similarly, another interviewee stated:

You first create your project and then address the patent issue, checking if it has been previously patented. If it has, you might be allowed to work on certain aspects, and if it has been done before, you pivot your project. You need to be the first. (Interview-A2)

Another interviewee mentioned that at the beginning of each R&D project, they first analyze what could be patented:

In every project we start, we first research what could be patented. We check for any prior patents related to the same idea. Sometimes we find that someone else has already patented what we thought could be patented. In such cases, we focus on the patentable features. (Interview-A9)

Moreover, some of the interviewed SMEs have indicated that they conduct patent research during their R&D project processes to avoid infringing on others' IPR rights. One of firm founders explained why they utilize patent applications as follows:

> *Most of the time, we even benefit from patent applications. Our contracts state that intellectual property rights belong to us, and if I infringe on someone else's IPR, the responsibility is on you. If there is a possibility of infringing on someone's patent, we must investigate it. We utilize international sites and national platforms without using an attorney. We use USPTO. If you search with the right keywords, you find it. (Interview-A6)*

To avoid infringing on others' IPR rights, only one firm has adopted a more formal approach by conducting a FTO analysis. The interviewee stated:

> *We conducted a FTO analysis; we did it during the project stage as well. FTOs provide information but do not go into details. The claims must not overlap. Since we know the product best, we also conduct patent research. Even if we have a consulting firm, we review it again. (Interview-A28)*

4.2.3.3. Collaborations with Other Organizations

Collaborative firms, even smaller ones, tend to be more innovative than their non-collaborative ones, including larger firms (OECD, 2023). Partnering with other firms or research organizations allows SMEs to leverage their strengths and tap into their partners' expertise and resources to fill gaps (EPO, 2023). Therefore, accessing knowledge and innovation networks, such as universities, is crucial for SMEs to innovate and transform.
University-industry cooperation combines academic knowledge, human resources, and R&D capabilities with industry expertise and financial independence to accelerate R&D activities. This partnership benefits both firms and academic institutions (İçin, 2022). Firms aim to utilize their academic networks to boost growth in turnover and profitability (Valentin, 2000). According to the OECD SME Outlook 2023, Türkiye is among OECD countries where SMEs cooperate most with universities, and IPR is recognized as a key government tool that fosters this collaboration.

Accordingly, as a result of qualitative analysis, I found that nearly all firms collaborate with universities in both Europe and Türkiye. As a result of these collaborations, some firms have filed patent applications, while others have not produced any patentable R&D outputs. An interviewed SME that partnered with METU on a project filed both national and international patent applications. The founder of the firm provided the following details about their patent application:

> *We are both the applicants and the inventors. A certain percentage belongs to METU, and another to the Technopark. Academics are the applicants. We have a separate protocol for this. This partnership has been beneficial; they completed the*

> *writing and financial process. Given the long and costly processes, it was very beneficial for us that METU received incentives when applying. The patent firm with which they had an agreement followed it up. (Interview-A25)*

Law No. 5746 on the Support of Research and Development Activities grants firms the right to employ academics. One of the interviewees shared his thoughts on the matter:

> *We work with academics in various ways. We do not employ all of them through outsourcing methods. Law 5746 provides an exception for us. It allows the employment of academics who otherwise could not work. We could employ professors part-time according to Law 5746. We have about 16 academics. We work with professors and their students. As a result of these collaborations, we also filed a patent application. (Interview-A27)*

Collaborations with universities sometimes manifest in Scientific and Technological Research Council of Türkiye (TÜBİTAK) projects. For instance, a TÜBİTAK project was conducted to utilize a material developed by a professor at METU, resulting in a patent application.

> *There is a professor at METU who, along with his team, developed a material that fully integrates with the body. We discussed making it a personalized implementation. We wrote a TÜBİTAK project, and it resulted in a collaboration agreement between the professor and the firm, leading to our patent application. (Interview-A28)*

Besides university-industry collaborations, I also discovered that firms also engage in various projects with TÜBİTAK. For example, two SMEs (A28 and A9) filed patent applications, and another firm (A11) obtained a design registration as a result of a TÜBİTAK project.

In TÜBİTAK project applications, a new practice introduced in the last five years involves asking if there is a patent or if a patentable outcome is expected from the project. Projects with existing patent applications or those expected to result in patents receive additional points. A firm (A10) mentioned that technopark has a scoring system regarding the activities of firms that places significant emphasis on patents. All these factors encourage firms to file patent applications due to the additional points they provide.

4.2.3.4. Public Incentives

Incentives play a crucial role in fostering creativity and invention among individuals and legal entities (Johnson, 2012). There are support programs[28] designed to increase the number

[28] TÜBİTAK 1507-SME R&D Startup Support Program, TÜBİTAK 1602 – Patent Support Program, KOSGEB Industrial Property Incentives, Tax Exemption on Industrial Property Rights (TÜBİTAK n.d.).

of national and international patent and trade mark applications, encouraging individuals and legal entities to pursue these registrations.

Firms could utilize the TÜBİTAK 1602 Patent Support Program,[29] for patent applications. Among the seven firms that filed PCT applications, three have benefited from the Program, using it to cover their PCT application and research fees. One firm, which found this support crucial in their decision to file a PCT application, stated:

> *Actually, the PCT is the least expensive option, especially with the incredible support from TÜBİTAK. It used to be costly, but now you do not pay the application fee or the research fee; the only fee you pay is the priority fee, which I recall being 30 CHF. Applying in Türkiye is more costly, and there is also the translation. Since TÜRKPATENT (Turkish Patent and Trademark Office) started organizing research reports, it has become the most cost-effective option. (Interview-A8)*

Another firm founder (A23) mentioned that, under the METU Technopark Patent Application Program, national patent application and attorney fees were covered by the program's officials.

4.2.4. Globalization

IPR are considered as vectors in the process of globalization and essential resources in the pursuit of comparative advantage (Gurry, 2005). To secure effective protection in future strategic markets, firms must be prepared to invest significant resources in building an international IPR portfolio early in their development process (EPO, 2023).

An R&D specialist at one of the interviewed firms stated that globalization of their innovation is one of their strategic goals, and their trade mark and patent applications will contribute to this objective:

> *We have a main strategic plan for 2018-2030. We completed the first five years in 2023. The goal for the first five years was to release products, and the goal for the second five years is globalization. We aim to create a global trade mark image and support this perception with patent registrations to become known everywhere, to be mentioned in tenders in developed countries, or to be part of the main manufacturers' share system. We are targeting larger markets and want to increase exports.(Interview-A27)*

[29] The Program aims to support real and legal entities to increase the total number of national and international (PCT) patent applications. The support is provided based on the examination report fees to be issued by TÜRKPATENT, EPO, JPO, SIPO, KIPO, USPTO (TÜBİTAK, 2015).

4.2.4.1. Export-International IPR Relations

As shown in the Table 4.1, as a result of qualitative analysis, I found that 5 out of the 6 firms with international trade mark applications and 6 out of the 7 firms with international patent applications are engaged in exports.

Table 4. 1. The Relation of Export &International IPR Applications

	n	%
International Trade mark Application (n=6)		
Export Oriented	5	83.3
Non-export Oriented	1	16.7
PCT Application (n=7)		
Export Oriented	6	85.7
Non-Export Oriented	1	14.3

Additionally, 2 firms that expressed intentions to start exporting were also found to have international trade mark and patent applications.

These firms have selected specific countries for their trade marks under the Madrid Protocol and for their patents under the PCT. The interviewed firms indicated that their choice of countries is based on the markets to which they export. Firms with ambitions to expand internationally have also planned their country selections based on potential export destinations or locations where they intend to establish branches. One interviewee explained their firm's actions as follows:

> *As X firm, we will apply for trade mark registration in a few more countries. We made an international trade mark application because our goal is to expand abroad. We are also members of the Exporters' Association, which has a support management system that covers part of the cost, and we will receive support under the Turquality Program. (Interview-A17)*

An interviewed firm founder mentioned that they selected countries based on target markets:

> *We work B2B. We have a silencer product, we aim to develop plans based on the target markets where the firms will sell the silencer, and accordingly, file national-level applications in those areas. (Interview-A23)*

An interviewee highlighted the importance of their patent applications by emphasizing both exports and technology transfer:

> *However, a patent is a significant asset for the firm because we present ourselves as a firm that produces and exports technology. We transfer technology abroad, especially to the Middle East, not just export products. Therefore, I think it is very important to increase the number of inventions and patents. (Interview-A3)*

4.2.5. Marketing

4.2.5.1. Advertising

Some firms, emphasizing the importance of trade marks in marketing, believe that a trade mark could enhance consumers' perception of innovative products and serve as a foundation for advertising. For instance, an interviewed firm that applied for a trade mark to attract customers stated:

> *It is crucial to ensure that the name X sticks in people's minds; for example, if a customer has heard of you, it becomes easier for them to buy your product. In this sense, the trade mark is important. This year, we put in the effort to change our logo and made a new trade mark application in 2023. In marketing, owning a trade mark, branding, revising the trade mark, and becoming well-known are very important.(Interview-A22)*

An executive of an interviewed firm emphasized the marketing importance of national and international trade mark applications/registrations for their promotional and advertising functions, expressing his thoughts as follows:

> *Having a trade mark is important for marketing and advertising. Even years ago, Coca-Cola designed something that we still remember. The product and the name have become synonymous, which is why trade mark registration is important. It reflects the firm's process and prestige. (Interview-A28)*

4.2.5.2. Barrier to Entry

Firms could utilize patents to create unnatural barrier for market entry (Levin et al., 1987). The objective in this case is to legally prevent competitors from entering the market for a specified period—legally up to 20 years. Essentially, these firms use patents to delay competition. One of these firms explained their strategic use of patents as follows:

> *A patent is important for having high market entry barriers. Why do you get a patent? I think it is crucial for delaying competition. (Interview-A6)*

4.2.5.3. Prestige

Firms also view IPR as a mark of prestige for both customers and investors. In this context, some SMEs gauge their prestige by counting the number of trade marks and patents they possess. Others believe that patenting high-tech products, having international trade mark/patent registrations, and successful commercialization contribute significantly to their prestige.

A marketing manager expressed the importance of IPR rights for their firm as follows:

> *We provide a reliable and innovative solution for our partners and customers. It also brings prestige. (Interview-A15)*

An operations director at an interviewed firm stated that, particularly in communication industry, patent applications are a significant element of prestige for firms:

> *Prestige is something entirely different. For investors, especially in our industry, it is important from a prestige standpoint. The patent process is lengthy and involves gathering documents, developing ideas, collaborating on those ideas, following the process, and gaining experience. (Interview-A16)*

4.2.6. Strategic uses of Patents

Despite believing that protecting innovation through patents would be ineffective, firms sometimes make patent application. Among the 16 patent-owner SMEs, the number of firms that apply for patents for strategic purposes is quite low. Nonetheless, it is necessary to address the findings related to these firms.

4.2.6.1. Leverage against Large Firms

For SMEs with institutional and financial constraints, competing with established large firms in the same sector is challenging. Some of the interviewed SMEs indicated that they apply for patents to compete with these larger firms. For example, a founder of a firm producing durable goods explained their reasoning for applying for a patent to compete with large companies as follows:

> *In the work we do, it is not possible to simply transfer my rights to Firm Y with a simple agreement for a patent that belongs to me. The reason we apply for patents is that it gives us strength to compete with large firms. (Interview-A23)*

4.2.6.2. Prevention of Suits

Enforcement costs could be a significant burden for SMEs. To avoid being accused of IPR infringement by other firms, some SMEs find it important to apply for patents from the outset. For example, one firm anticipates its growth over time and, to proactively prevent potential IPR-related lawsuits in the future, has chosen to apply for patents early on.

> *As you grow larger, you will start dealing with trade mark or patent lawsuits. You might have to handle IPR infringement cases. To prevent lawsuits against you, you need to have something to show, such a patent. (Interview-A18)*

On the other hand, another SME believes that securing product rights both in Türkiye and in international markets will protect them from potential lawsuits.

> *On the other hand, we want to associate everything with this place, retain all rights, and avoid dealing with lawsuits in the international market. (Interview-A09)*

4.2.7. The Nature of Knowledge

Firms employ various appropriability mechanisms to protect knowledge and capture returns from innovations. Some firms rely on secrecy (Arundel, 2001), which could be implemented sequentially—protecting an invention with secrecy in its early stages and patenting it later—or simultaneously when an invention comprises multiple elements (Lopez, 2009). For instance, when innovations involve both codified and tacit knowledge, firms may patent the codified knowledge while keeping the tacit knowledge secret (Arora, 1997). Additionally, firms might combine patenting and secrecy by keeping the codified part of an invention secret, retaining the option to patent the invention at a later stage (Graham, 2004).

The interviewed firms have chosen to use either patents, trade secrets, or a combination of both. Additionally, some non-patent owner SMEs has utilized publishing as an appropriability method. Table 4.2 illustrates their preferences regarding these mechanisms.

Table 4. 2. Patenting vs. Trade Secret

	Patent	**Don't patent**
Secrecy	Patent-secrecy combination	Secrecy only
Non-secrecy	Patent only	Disclosure–publishing

Source: Graham (2004)

As shown in Figure 4.2, out of 29 SMEs, 8 have patents but still prefer trade secrets for their software or other developed products, 8 have patents but do not use trade secrets as an additional mechanism, and 10 use trade secrets because they lack of patentable subject matter. 3 SMEs, despite having patentable R&D outputs, opted to keep their innovations as trade secrets, using trade secrets as a substitute for patents. These SMEs stated that the level of know-how and tacit knowledge in their products is high.

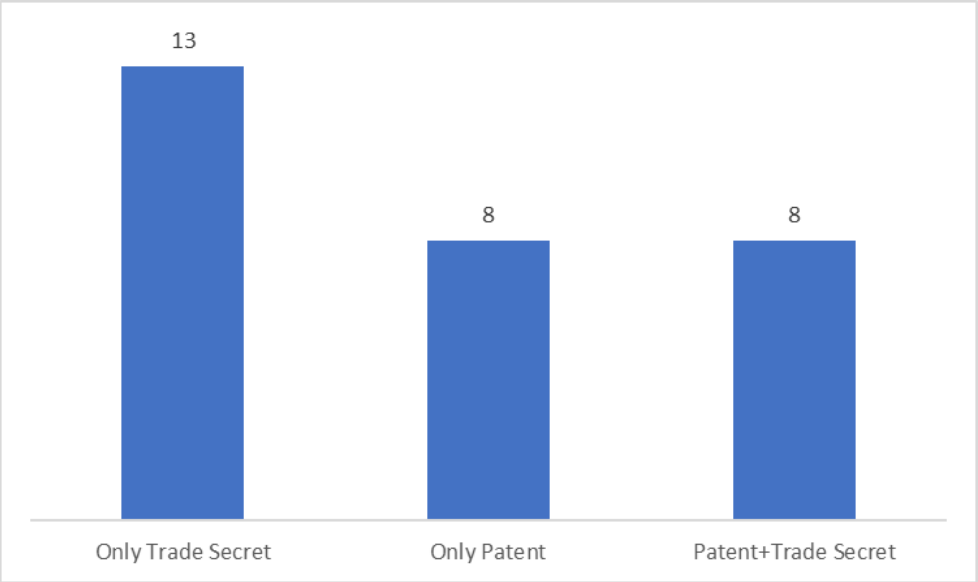

Figure 4. 2. The Preference of Patent and Trade Secret

The numbers include both patent applicants and registrants

One firm with 3 national patents and 3 PCT registrations specifically mentioned not using the trade secret mechanism, as they have no innovations suitable for trade secrecy and do not see the need for such a mechanism.

> *We do not keep things as trade secrets; we do not have a situation where we hide a product that could be patented. Calling something a trade secret does not make much sense to us. (Interview-A27)*

On the other hand, a software firm that prefers trade secrets due to the absence of patentable subject matter resulting from R&D activities explained:

> *Since software could not be patented, we face difficulties in that area, and one of the things I mentioned as a trade secret is software. We developed an algorithm that is completely new and unused. (Interview-A9)*

Firms that choose to keep their inventions as trade secrets despite having patentable subject matter also exist. One such firm explained:

> *In our field, people tend to patent trivial things rather than real innovations because it is a new area, and there is fear of copying. The technology is very new. There are not many patent applications in the laser field to avoid giving others the idea. I provide the design drawing, but it could not be replicated due to many tricks involved. These tricks could be patented, but if I write them down, everyone will learn them. So, not applying for a patent is a strategic decision. (Interview-A10)*

Another interviewee, relying on the extensive know-how within their developed products, preferred to maintain them as trade secrets rather than patenting them:

> *Since the products we develop are niche items in very niche areas, and there are limited academic studies on these products, we have not pursued many patents. We keep the know-how of our products as trade secrets because their know-how is very high, and we retain it within our organization. (Interview-A26)*

As shown in Table 4.2, firms may combine patents and trade secrets to protect different aspects of the same invention or apply them to separate inventions. Firms may opt to blend both strategies by protecting certain aspects of a technology through patents while keeping other elements confidential (Belleflamme & Bloch, 2014). One interviewed firm chose to apply for a patent for a product while keeping some of its features as trade secrets:

> *We use alternative mechanisms. We keep things as trade secrets, of course. Our product operates solely on geometry. It could be scaled up and used. We applied for patents with the initial prototype, and all applications showed industrial applicability. However, the claims did not include an inventive step because we did not want to fully disclose everything and wrote them generally. We later learned to narrow down the claims. Initially, we disclosed less, which was insufficient for the inventive step. When you write everything down, you present it to the public; you should not disclose everything as you may not be able to follow up on it. (Interview-A9)*

Another reason some firms prefer trade secrets over patent applications, despite having patentable subject matter, is the high cost of patent applications and maintenance processes:

> *We need an institutional mechanism to monitor whether anyone is copying our work. Currently, there is no one to track this. We made continuous payments, but there was no end in sight, so we stopped monitoring. We could think of our current protection method for our developments as trade secrets.*

While Table 4.2 presents publishing as an alternative, none of the interviewed firms exclusively chose publishing over trade secrets or patents. However, during the interviews, it was found that firms often combine publishing with trade secrets and/or patents as another mechanism.

One firm, which protects its code as a trade secret due to the lack of patentable subject matter, also chose to publish some of their developed solutions:

> *We publish extensively, both personally and on behalf of the firm. We have articles in international journals describing algorithms and solutions we developed. (Interview-A25)*

Additionally, a firm founder mentioned that a patent application resulting from an R&D project in partnership with a university was also turned into a research paper:

> *One of the founders of our firm was a professor, and he was involved in the patent application. For instance, that work also turned into a publication. (Interview-A14)*

4.3. Challenges Related to Appropriability Methods for SMEs

4.3.1. Ineffectiveness of Protection

4.3.1.1. Lack of Trust in Legal Protection

In certain instances, patents are deemed an ineffective means of safeguarding innovations; nonetheless, this does not mean that firms stop utilizing them (Lopez, 2009). Within this scope, there are firms that refrain from applying for patents due to their belief in the ineffectiveness of patent protection. Additionally, there are firms that think the appropriability returns insufficient but still apply for patents due to their strategic uses.
Firms' views on the inadequacy of the legal protections, especially regarding patent applications, present a significant challenge.

The interviewed founder operating in the acoustic field indicated:

> *Honestly, we do not have a patent application. We might have been misled regarding patents, but we were scared off by being told that their protection is weak and that it is easy to invent around them. Our motivation is low due to these negative opinions. (Interview-A26)*

Similarly, another interviewee cited that:

> *No matter what you do, a patent could be circumvented. For a good engineer, it is very easy to work around a patent. Therefore, I do not know how much protection it provides. (Interview-A6)*

Some companies have expressed concerns that Law No. 6769 on Turkish Industrial Property does not provide sufficient enforcement measures for the protection of IPR rights and that companies struggle to monitor whether their patented products are being copied. The founder of one of the interviewed SMEs shared the following views on IPR protection:

> *I do not believe the law provides full protection. I have little confidence in it. You must monitor and detect violations and prove them, which is challenging for companies of our scale. There is also a sector-specific issue; if you are working with the Presidency of the Republic of Türkiye Secretariat of Defence Industries (SSB), everything is confidential, making it impossible to know if your work is being copied. In the consumer market, patent protection is easier to enforce because the volume is high, and it is easier to detect copies since everyone has access to the product. In the defense industry, it is not possible. (Interview-A10)*

Another interviewee stated that in terms of international competition, Law No. 6769 on Turkish Industrial Property fails to protect the IPR of Turkish firms against products imported from China and India:

> *The Law does not provide protection. You need to do it like in India, where they have legalized copying from Europe. India copies it if it suits them, and China copied for years and eventually made better versions. They did this over 30 years, and now I could not protect myself against China. (Interview-A21)*

Additionally, there is a concern among SMEs that their patents might be forcibly taken by larger companies. One of the SMEs interviewed reported having faced such a situation and emphasized that this risk is always present in their sector. The founder of the firm described the difficulties experienced with a larger firm as follows:

> *When we first established the firm, we had a dispute with Firm X. Our contract stated that the IPR would belong to us, but I already had a patent application. I fought to develop and sell the products. They asked for a one-month period to sign the licensing agreement, saying there would be no changes and to either sign or leave. We left. I do not know if we did the right thing, but especially in the durable goods sector, there is such an issue. There are many patent cases in courts. X has many patent applications, and they might be doing it this way. (Interview-A21)*

4.3.1.2. Misappropriation of Trade Secret

Since trade secrets lack strong legal guarantees, some of the SMEs recognize that this protection could be precarious and could become less effective over time. They understand that embedded know-how and tacit knowledge may be transferred to new firms when

employees change jobs, potentially reducing the effectiveness of innovation protection. Although no specific feedback was received from the interviewed firms, an interviewee expressed concerns about the potential disclosure of trade secrets, stating:

> *We use the trade secret mechanism. However, when people change jobs, the details we have kept secret are sometimes shared. We are aware of this situation. Apart from that, we continue with NDAs. (Interview-A14)*

4.3.1.3. Infringement of IPR

Under Law No. 6769 on Turkish Industrial Property and Law No. 5846 on Intellectual and Artistic Works, using IPR without the owner's consent, producing imitations, transferring them to third parties, and possessing them for commercial purposes are considered as IPR infringement.

Out of 29 SMEs, 2 reported experiencing IPR infringement. One of these firms (A29) faced a lawsuit over the copying of their software, which concluded in their favor due to the existence of a copyright registration. The interviewee explained the legal process as follows:

> *Years ago, someone coded a part of our software that we had registered. I think they wrote us for money, later claiming they developed the software and taking us to court. There was no penalty because we had the initial registration. They were not granted any rights, and we did not suffer financially. We won the case. They used the existing software, added to it, and registered it with a notary, claiming they made it first. Republic of Türkiye of The Ministry of Culture and Tourism issued a certificate of registration for part of the record. Since we had an older registration, the case was dismissed. (Interview-A29)*

The other interviewed SME that encountered infringement operates in the medical sector. They discovered that another firm was producing and selling products very similar to their patented/utility model-registered items. A lawsuit was filed against the infringing party; however, the firm suffered losses due to a decline in sales during this period. The interviewee described this process as follows:

> *We filed an infringement lawsuit regarding a utility model and a patent. The initial expert reports indicated infringement, but the second report was against us. The final decision was that there was no infringement, and the case is now in the appellate court and will go to the Supreme Court. We saw that they had made a very similar product in tenders and at trade fairs. We believe a technical feature of ours was copied, which negatively impacted us. Sales we intended to make to one or two places were affected. These products are sold every 5 to 10 years, so we lost 20-30 sales to them and will not be able to sell to these hospitals for 5 years. (Interview-A8)*

SMEs working with IPR attorneys have reported that they stay in communication with them regarding infringement violations, and any identified issues are immediately reported to them by these attorneys. On the other hand, firms that do not work with attorneys could not allocate time for "systematic monitoring" of IPR violations, nor do they employ personnel dedicated to this task.

For firms, the greatest threat to trade mark is the likelihood of confusion. According to, Art.6 of Law No. 6769 on Turkish Industrial Property "likelihood of confusion" is defined as: *"if there exists a likelihood of confusion on the part of the public, including the likelihood of association with the earlier trade mark, due to identity with, or similarity to, the earlier trade mark and the identity or similarity of the goods or services covered."* While firms may not be familiar with this legal definition, they are aware of the threat but unsure of the process to follow. One interviewed firm expressed their concerns regarding this situation as follows:

> *The biggest threat, in my opinion, is the emergence of a new trade mark with very similar visuals and names, especially when there is no trade mark registration in Türkiye. An application could be made for a foreign product. There is not much we could do, but we would probably contact someone from the trade mark office to start a process. This process requires some expertise. (Interview-A25)*

Another interviewed SME founder indicates that the use of similar trade marks could have negative consequences for their business:

> *Another firm doing something similar to our product in our sector is a threat to us because we invest a lot of effort in building trade mark perception. We do not want this perception to be damaged or for another firm to use something similar because we constantly invest in the trade mark. (Interview-A26)*

4.3.1.4. Confidential Patent

According to Art.124 of Law No.6769 on Industrial Property *"if the TÜRKPATENT is of the opinion that the invention that is the subject of the application matters in terms of national security; sends a copy of the application to the SSB to receive their opinion and notifies the applicant of the situation. Upon the patent applicant's request, the SSB may allow the invention that is the subject of the patent application to be used partially or completely."*
According to this Article, if a patent application pertains to national security, the applications are converted into secret patents, and the Ministry of National Defense

decides on the usage by the applicant. This situation poses a challenge for companies developing products and/or methods in the defense industry.

An interviewed SME operating in the defense industry shared its views on the matter as follows:

> *There is an option for a secret patent, but there are uncertainties. How will something be declared a secret patent? If it is given to the Ministry of National Defense, how could we use it again? We do not know this. Therefore, I am not considering applying for a patent in this field. (Interview-A11)*

On the other hand, another SME developing products for the defense industry expressed their support for the concept of secret patents as follows:

> *In the defense industry, an invention is considered a bad thing, which I disagree with. When it involves national defense, they convert the invention into a secret patent. So, I do not agree with the approach that patents should not or could not be obtained in the defense industry. (Interview-A3)*

4.3.2. Administrative Hurdles

4.3.2.1. Inertia of Bureaucracy

These findings are related to cumbersome bureaucratic processes. Although Dan (2013) suggests that university cooperation accelerates the innovation process and the production stages, one of the interviewed firms was unable to finalize its university-industry collaboration due to bureaucratic procedures at the university. An interviewee commented on this issue:

> *We tried to collaborate with a university, but we could not make much progress because the patent-related work did not yield positive results. Reaching the university was difficult, and communication there was more challenging. Industry and academia operate differently. We need to sell the product quickly, but academia could be slow. This is a disadvantage for industry-academia collaborations. We could not progress due to timing issues. (Interview-A4)*

The feedback from interviewed firms revealed several challenges in accessing and utilizing support programs from TÜBİTAK and Small and Medium Enterprises Development Organization of Türkiye (KOSGEB). These challenges include slow application and follow-up processes, difficulties in obtaining necessary information from their websites, and issues

with tracking the progress of applications. As a result, some firms did not benefit from these support programs, despite being aware of the TÜBİTAK Patent Support Program and the KOSGEB International Trade mark Support Program. The inefficiency caused by bureaucratic processes deterred these firms from applying. One of the interviewees highlighted issues related to inertia:

> *There are incentives at TÜBİTAK and KOSGEB. KOSGEB has incentives for trade marks, but their processes are also very arduous. KOSGEB's process seems simple, but in written communication, the bureaucracy is excessive, and the provided information is not very clear. You learn about the exact amount during the process, but you do not know if it is sufficient. The bureaucracy is overwhelming, and the process is not very attractive to us. The process needs to be much easier."(Interview-A12)*

4.3.2.2. Lengthy Patent Examination Process

Firms typically submit trade mark, patent, utility model, and design applications through TÜRKPATENT and track the processes there. However, the interviewed firms expressed concerns about especially the duration of national and international patent examinations. An interviewee mentioned that these delays affect the predictability of planning in terms of time and cost.

> *The publication needs to happen within 6 months, and after that, another 6 months must pass. In another case, it has published before 6 months' time limit. In some cases, two years have passed, and the research report has not come. We could not reach the patent experts. Some things take a long time, and some are very fast. I am responsible for this in management, but I have to tell the management that this or that will not happen within 12 months. When it takes 6 months, my expertise loses its value. (Interview-A8)*

4.3.3. Lack of Knowledge

As a result of qualitative analysis, I found that most of the interviewed SMEs have inadequate knowledge of IPR and public incentives. SMEs do not have enough resources to reach the related legal context. In essence, some of the interviewers have an awareness of self-ignorance regarding IPR issues, and they asked many related and unrelated questions while we were in the interview.

4.3.3.1. Lack of IPR Know-how

Out of the 29 interviewed firms, it was found that 10 had participated in IPR training organized by the METU Technopark, while 2 held annual training within the firm.

Despite this, most firms seemed to lack adequate knowledge about IPR and the application processes. This was reflected in their own statements:

> *We do not know what strategy to follow. In which countries should we file applications? For which part of the product should we file a patent application? What should we patent? Perhaps we need to break it down into parts and file patents that way. We are not very aware of this. (Interview-A7)*

Another interviewee stated they were unsure which IPR applications to pursue for their products, finding the procedures confusing and eventually deciding to give up:

> *I do not know how to classify our product. Should we call it a patent, an intellectual property right, or a utility model? Honestly, I am unsure. I investigated their procedures, validity periods, renewals, and the need for legal processes. I decided not to pursue it and gave up. (Interview-A12)*

The founder of a software firm with only trade mark registration acknowledged during the interview that they learned many things about IPR they were unaware of:

> *The questions helped clarify some topics for us. For example, we learned from you that the design of a website could be registered. (Interview-A22)*

Additionally, another firm founder confused the concepts of trade marks and patents, using the term "patent" incorrectly in place of "trade mark".

> *Before establishing the firm, we obtained **patent** to ensure there were no infringements and then conducted all our activities under the name Z." (Interview-A26)*

4.3.3.2. Asymmetric Information about IPR Supports

Out of the 29 interviewed firms, 3 mentioned benefiting from TÜBİTAK incentives to apply for PCT. However, it is noteworthy that some firms within the same ecosystem were unaware of these incentives. Similarly, only 2 firms were informed about KOSGEB's International Trade Mark and National Patent Support Program, as well as the trade mark support under the Turquality Program of the Ministry of Trade of the Republic of Türkiye. This situation suggests a problem of asymmetric information among firms.

A founder of a firm with only trade mark registration expressed their lack of knowledge about patent support in Türkiye:

TÜBİTAK provides R&D support, but it does not offer patent support for products resulting from R&D. Costs arise, and we do not have detailed knowledge, and resources are limited. (Interview-A26)

This asymmetric information also extends to tax exemptions. While some interviewed SMEs knew about the tax advantages provided by the technopark and the 50% corporate tax exemption on sales of patented products, others were unaware of any tax exemptions. Given that SMEs are innovative firms with budget constraints, not benefiting from such government incentives poses a challenge during the patent application process:

I do not know if I could benefit from tax exemptions; I have no information on this. Yes, there are many things we do not know. We could not keep track of all these programs, incentives, and exemptions. It is not easy to access this information. (Interview-A7)

4.3.4. Firm Specific Factors

The choice of IPR could be influenced by factors such as the sector in which a firm operates, the number of employees, and whether there is an IPR unit within the firm.

4.3.4.1. Sector of Activity

The patentability of R&D outputs varies by sector. For instance, firms developing software often find it challenging to protect their outputs through patents in Türkiye and Europe. These firms may choose to protect their innovations through copyright, providing legal rights to exclude others from using their innovations, or by keeping their software as a trade secret, which, however, lacks legal guarantees. Among the interviewed firms, ten preferred to keep their software as trade secrets because their outputs were not considered patentable subject matter:

I have never heard of a project outcome resulting in a patent, whether national or international. If we were in the machinery sector and did as many R&D projects, we would have some outcomes subject to patents. As I said, software could not be patented, making it difficult to obtain patents in our sector. We could say we protect these as trade secrets. (Interview-A14)

An interviewed chemical industry firm noted that it could not detect IP infringement on its products, making patenting not worthwhile for them as an appropriability return:

Being in the chemical sector puts us in a gray area for patents. Who will even notice an IP infringement on our product? Even if I obtained a patent, I wouldn't know if

someone used my process unless I inspected their production facility. So, obtaining a patent does not protect me; it's an unnecessary expense. (Interview-A24)

Another firm founder mentioned that obtaining a patent in sectors with high import penetration rates is not beneficial, as low-cost imported products outcompete their innovations, rendering a local patent meaningless:

In the plastics sector, Türkiye is completely dependent on imports, so we could not compete with foreign production. Companies in Türkiye generally expect quick returns and want to turn a profit quickly. Thus, it is believed that patents in this field are useless in Türkiye. (Interview-A14)

In fast-paced markets where patents could not keep up with the speed of competition, not filing for patents could be a strategic decision for firms:

A product must quickly enter the market, and patents could not keep up with that speed. Competing with China is difficult because they ignore patents and everything else. You either win or lose the game in the market instantly, and patents could not keep up with those dynamics. (Interview-A1)

4.3.4.2. Lack of Time and Staff

Smaller companies, especially those with fewer employees and where most staff are involved in R&D, often lack dedicated personnel for handling IPR issues. In such firms, responsibilities for IPR matters typically fall to a few key individuals, such as firm founders, legal advisors, operations managers, or R&D directors, who are not IPR experts and juggle these duties alongside their primary roles. Out of 29 SMEs, only one has a director who handles IPR applications and is also a trade mark-patent attorney.

An interviewee, despite not being an IPR expert, noted the difficulty and time-consuming nature of handling patent application:

Describing the work in a patent application is very difficult. It was a very tiring process for me. A friend of mine said he uses AI to write it, but getting it written in a way that could be patented is very difficult. (Interview-A23)

Another founder stated that they would have filed more patent applications if they had enough personnel:

Patents are indeed a hassle. You could obtain one or two patents a year. There is nothing preventing you. You just need to have ideas. If you write the claims more

narrowly, you could have many patents, but you need people in the firm dedicated to this task. (Interview-A18)

A small-sized firm withdrew its patent application due to a lack of personnel to monitor potential infringements and budget constraints.

We could not monitor whether the trade mark or patent is being infringed due to time constraints. There should be a separate unit, not necessarily many people, but someone must be in the firm, if you want to obtain patents or trade marks. Currently, there is no one to track if anyone is copying these. We think of such things. It seems like the work of corporate firms. We made continuous payments, but there was no end in sight, so we withdrew the application. (Interview-A10)

Among the interviewed 7 medium-sized firms, only 4 had dedicated IPR units. However, even among those with IPR units, 22 firms overall worked with patent attorney firms when filing patent applications. An interviewee explained the reason for this collaboration, emphasizing the complexity and specialized nature of the patent:

Do not misunderstand; we write all the descriptions ourselves. They make minor adjustments. They sometimes try to change things because they do not know the technology and terminology. (Interview-A27)

4.2.5. Cost of Application and Enforcement

SMEs involve application or maybe enforcement cost, therefore, IPR application, mostly patents, need to be considered again to apply for these firms. Especially international trade mark and patent applications have very costly for the firms compared to national IPR applications.

A firm noted that the expenses incurred during the application and monitoring processes could only be justified if the patents were commercialized or if the sales volume of the patented products was high.

We are not selling the patents currently, so they are a cost to us. The products containing them are not selling much, so the application and monitoring costs are high for us. (Interview-A27)

4.3.5.1. Cost of Application

For SMEs, there are significant costs associated with registration fees and annual routine payments, besides the IPR application fees. Additionally, it is time-consuming to apply and

keep track on the application, especially for patents. Thus, 22 interviewed SMEs stated that they worked with an IPR-attorney firms, especially for patent applications where the technical knowledge and professionalism required for drafting description, explaining the subject of the invention, and the claims are essential:

> *Applying for a patent is difficult; it hardly seems possible to do it yourself. Therefore, companies often turn to patent attorneys." (Interview-A13)*

> *As far as I observe, we do not like patent paperwork much. Writing them could be boring for engineers, so they prefer someone else to do it on their behalf. Patent attorneys are hired for this reason; they handle the jargon and guide on how to write everything." (Interview-A20)*

These IPR-attorney firms typically require annual payments, which could be a substantial expense for SMEs:

> *You work annually with attorney firms. We pre-purchased the drafting of 50 patents. You accept this cost upfront. That is how they operate. (Interview-A27)*

4.3.5.2. International IPR Applications

Compared to national applications, international trade mark and patent applications are particularly costly for SMEs. Some of the firms expressed a desire to file international patent applications but refrained due to the high costs involved:

> *Protecting patents is important. When you go to Deutsche Telekom in Europe, patents are important. Since we are in the productization phase, patents are important. We were going to apply to the EPO, but the costs were too high, so we gave up. (Interview-A21)*

> *Having patents generally provides an advantage, but tracking and maintaining them is difficult and costly, especially registering them in Europe, which is long and expensive. It may not be a good path for SMEs. (Interview-A23)*

In this context, two SMEs stated that the incentives for international applications are insufficient.

> *Something is holding us back. Our target is USPTO; we follow TPE, PCT, and then US patent. There is no support in that area, and the cost starts from $8,000 to $10,000 each. (Interview-A6)*

> *In terms of incentives, I would prefer if there were incentives for international applications. It does not end with PCT. There could be specific incentives for*

companies that meet certain PCT conditions. The costs are very high, and I will have to allocate significant resources. (Interview-A27)

4.3.5.3. Cost of Enforcement

Another challenge for innovative SMEs is the potential cost of IPR infringement and enforcement processes. Especially micro-sized companies believe that these costs are beyond their capabilities:

> *For small innovative firms, legal processes are very costly and lengthy, making the topic of patents somewhat intimidating for us. (Interview-A14)*

> *This is one of the reasons I wanted to talk to you. If someone infringes on our patent, it would be overwhelming for us. How will we cope? It takes millions of dollars in the US. There are many SMEs in the US that have gone bankrupt after filing patent lawsuits. Large companies have substantial financial and legal power. (Interview-A23)*

4.3.6. Conflict of Interest on Ownership of Patents

IPR can increase collaborations between firms and public institutions. However, these collaborations may also bring about issues concerning IPR ownership. Some interviewed firms, engaged in projects with universities, TÜBİTAK and defense industry firms, reported encountering ownership disputes at the end of these projects. Moreover, determining whether an invention is an employee invention and managing potential conflicts of interest between employees and employers can challenge the sustainability of firms' innovative activities and the patent applications related to their R&D outputs.

4.3.6.1. Employees-Employer Ownership Dilemma

Art. 113-120 of Law No. 6769 on Turkish Industrial Property address employees' inventions, ownership rights, and the amount to be paid when claiming rights. Additionally, there are regulations regarding the rights of employers and employees concerning inventions. However, I observed that SME representatives were unclear about evaluating whether an invention made within the firm qualifies as an employee invention and calculating the amount due to the employee based on ownership rights. An interviewee shared his views on the ownership of employee inventions:

> *There is still uncertainty regarding the rights of the employee and the firm when a patent is obtained by the firm. This might be one of the factors hindering the*

widespread adoption of patents. Will it be considered an employee invention or not? If an employee claims rights, how will they protect themselves, and how will the firm protect itself? In the USA, such things are much more defined. The firm may have the right to use the patent, but the employee is named as the inventor. If you leave the firm, you have certain rights as the inventor. This is not defined in Türkiye. The person who makes the invention is the employee, but why should they bother if they do not have a future benefit from the invention? It requires a lot of time and financial resources. (Interview-A6)

On the other hand, Art. 121 of the Law No. 6769 on Turkish Industrial Property applies to inventions resulting from scientific studies and research conducted at universities. According to Art. 121 and Art. 30 of related Regulation, if a university claims ownership rights of an academic invention, the academic inventor loses exclusive rights to the invention. Additionally, under Art. 121.8 of Law No. 6769 on Turkish Industrial Property, if the university decides to hold exclusive rights, it must share the earnings with the inventor. This share, which varies by university, must be mutually agreed upon, but the academic inventor is entitled to at least one-third of the earnings from the invention.

One interviewee, the owner of an academic spin-off,[30] highlighted that as both an academician and an innovator, Law No. 6769 on Turkish Industrial Property could demotivate academics from creating inventions due to potential conflicts with universities over sharing patents revenues:

Personally, I would not apply under this Law. The amount provided by the university is insufficient, and it is already a hassle. The technology of our work is very nascent, and scaling it takes a lot of time. Therefore, there is no need with the new Law. I would write the article and move on. It is not worth doing for one-third of the earnings. For someone who knows these processes, this law is negative. Why should I take on such a workload for one-third of the earnings? (Interview-A24)

4.3.6.2. University-TÜBİTAK-SMEs Ownership Dilemma

As previously mentioned, SMEs often collaborate with universities and TÜBİTAK on various projects. However, issues have arisen regarding the ownership of R&D outputs, particularly patent applications, resulting in disputes over which party holds the rights. An interviewee mentioned their attempt to resolve these issues through pre-established agreements:

In the context of university-industry collaboration, work is being done where I consider the idea produced not to belong to the individual or the university, but to

[30] Academic spin-offs are companies founded by academicians to commercialize their patents.

the industry. This is why you make such an agreement at the beginning because it could be a potential issue. Some professors say they want to write a paper. We say, of course, you could write a paper, but with our knowledge because we need to maintain the novelty criterion for public disclosure. However, problems could arise. For instance, one professor wanted to immediately publish a project to which he had contributed, claiming he should be able to write a paper. We did not allow it. (Interview-A3)

Another interviewed firm founder, who frequently encountered IPR ownership issues with both universities and TÜBİTAK, suggested that it might be better not collaborating with TÜBİTAK and university:

We worked with the university and TÜBİTAK. However, there are always issues related to IPR with them. Therefore, we proceed with an approach where everyone owns what they do. There are attitudes where everything must belong to me. When you do a project, a document related to IPR is produced, and issues arise while filling it out. The university claims everything belongs to them, putting the professor in a difficult position, which becomes apparent after the application is accepted. (Interview-A18)

4.3.6.3. Defense Industry-SMEs Ownership Dilemma

Several SMEs work with defense industry firms such as Turkey's Rocket and Missile Center (Roketsan), Military Electronic Industries SA (Aselsan), and Turkish Aerospace Industries Inc. (TAI), mainly on "localization" projects. In these collaborations, the ownership of any patentable subject matter belongs to the defense companies. Interviewed SMEs expressed the challenges of this arrangement:

The contracts state that IPR belong to the SSB. Therefore, you do not have such an option. Since the SSB have paid the research expenses, she says the IPR belong to me. (Interview-A6)

We do not grant rights, which is why we could not work with Roketsan for a long time. We developed a solution for Roketsan, and they wanted the IPR rights along with the production rights. They offered to pay for three months of our work, saying we designed and developed it in three months. We strive not to work with such companies anymore. (Interview-A10)

Another firm explained that while the product patents belong to Roketsan, process innovations that arise during the product development belongs to them:

We mainly work with Roketsan, Aselsan, and TAI. If we discover something through the product, it belongs to us because it is a localization process. If it is a production method that could be patented, it belongs to us, and we could not share it. We

consider it know-how. For example, if they come to you with a request to develop a specific product, and if that product is developed, it becomes a product. We do not demand intellectual rights from them; we develop it on their behalf, so it is normal for the rights to belong to them. (Interview-A20)

CHAPTER 5

DISCUSSION

The thesis seeks to answer the questions of why and which appropriability methods SMEs in METU Technopark have preferred to use within their innovation activities. In the previous chapter, findings have been represented to answer the question of which appropriability methods have been used by the 29 SMEs. Additionally, exploratory findings have discussed to understand why these methods were chosen by SMEs in the METU Technopark for their innovation activities. This chapter examines the use of appropriability methods, as well as the challenges and effects associated with these methods under the five categories to address the research question. The discussions are presented using figures and tables to facilitate comprehension and evaluation.

5.1. The Use of Appropriability Methods

As shown in Figure 5.1, according to the results of qualitative analysis, out of the 29 interviewed SMEs, 28 have at least one trade mark application. Among formal methods, the most preferred innovation protection method is trade mark, followed by patent with 16 firms, copyright with 6 firms, and industrial design with 5 firms. The least common form of IPR is utility model, held by only 3 firms. These ranking align with the latest EUIPO (2022) report, which investigates the appropriability methods preferred by SMEs.[31]

Among the informal appropriation methods, NDAs are the most used measures. All of SMEs reported using NDAs, making them the most frequently used appropriation methods of any kind. This finding aligns with the literature, specifically with the survey results of Paallysaho and Kuusisto (2011), which identified NDAs as the most used appropriability methods among 300 Finnish and UK SMEs.

[31] Since there has been no similar study conducted for Türkiye, the EUIPO SME Scoreboard 2022 is used for comparison purposes.

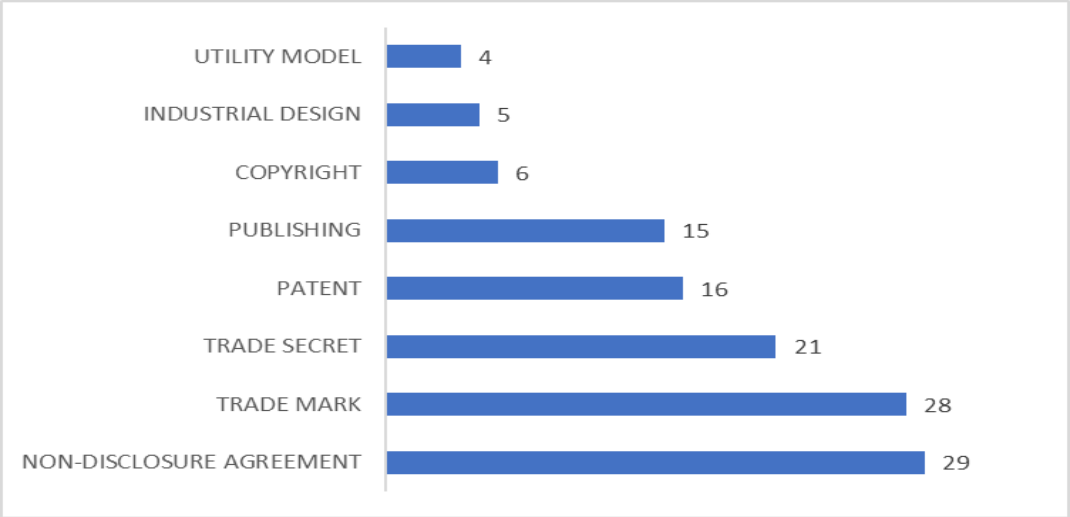

Figure 5. 1. The Number of SMEs Preferring IPR or Informal Methods

NDAs are followed by trade secret, used by 21 SMEs, and publishing is in third place, used by 15 firms.

Additionally, the literature indicates that SMEs commonly use informal appropriability methods, with lead-time advantage being particularly prominent (Laursen & Salter, 2005; Cohen et al., 2000). Some studies have shown that firms even prefer lead-time advantage over patenting (Byma & Leiponen, 2007). However, the lead-time advantage requires ongoing innovation, necessitating a high commitment to more intensive human resource practices. The 29 interviewed SMEs do not possess such an intensive working routine to follow such a continuous innovation strategy.

As a result of qualitative analysis, I also found that utility models are the least preferred appropriability method among firms. Despite the absence of a novelty requirement for utility models, their limited preference is due to the 10-year protection period and the fact that not every country allows registration. Furthermore, there is a distinct lack of prestige compared to patents.

The relative scarcity of design applications could be linked to the lack of a design culture, absence of design incentives, unfamiliarity with the distinction between trade marks and designs, and a lack of awareness regarding what could be registered as a design. Furthermore, the strategic uses of these two methods, beyond protecting innovation—such as blocking, use in negotiations, and prevention of suits—are more limited compared to patents and trade marks. This limitation makes it more challenging for firms to prefer utility model or design methods.

5.1.1. The Combination of Appropriability Methods

The most preferred methods to combine is NDAs for SMEs. This mechanism is combined with all other methods. Firms that possess formal and informal appropriability mechanisms use these agreements to protect the tacit knowledge embedded in the firms and their products. In firms developing products with high levels of tacit knowledge, the trade secret mechanism is more commonly preferred. However, due to the lack of strong legal guarantees offered by this mechanism, firms attempt to secure these guarantees through legal agreements. Firms are aware that when employees or even partners leave the firm, there is a risk that know-how will be transferred to other firms, leading to the transfer of tacit knowledge. Thus, firms try to compensate for these vulnerabilities through NDAs. For this reason, all firms, including those using the trade secret mechanism, prefer to sign NDAs with employees, consultants, and/or collaborating companies.

Furthermore, I evaluated that trade marks are included in all combinations of formal appropriability methods most preferred by twenty-eight firms. Firms mostly choose trade marks to obtain legal entitlement to prevent imitation and use them as a commercialization tool. Additionally, SMEs indicates that trade mark applications are easier to make and follow up on.

Table 5. 1. Challenges Related to Appropriability Methods for SMEs

Theme Components	**Themes**
Ineffectiveness of Protection	Lack of Trust in Legal Protection Misappropriation of Trade Secret Infringement of IPR Confidential Patent
Administrative Hurdles	Inertia of Bureaucracy Lengthy Patent Examination Process
Lack of Knowledge	Lack of IPR Know-how Asymmetric Information about IPR Supports
Firm Specific Factors	Sector of Activity Lack of Time and Staff
Cost of Application and Enforcement	Cost of Application - International IPR Applications Cost of Enforcement
Conflict of Interest on Ownership of Patents	Employees-Employer Ownership Dilemma University-TÜBİTAK-SMEs Ownership Dilemma Defense Industry-SMEs Ownership Dilemma

The decision of the firms to apply for patents depends on whether their R&D activities result in a patentable subject matter.[32] Some of the firms did not file patent applications because they could not develop patentable innovations due to the nature of their sectors.[33] For firms that have patentable subject matter, the decision to apply was influenced by the type of knowledge involved (tacit-codified) and the challenges SMEs confront with (see Table 5.1). Table 5.1 presents the themes generated from the qualitative analysis and the theme components with which they are associated. These theme components and themes have been grouped under the title "challenges related to appropriability methods" as factors influencing SMEs' appropriability preferences.

5.1.1.1. Non-patent owner SMEs

As a result of qualitative analysis, I found that out of 29 SMEs, 13 have not apply for patents because their R&D activities have not resulted in patentable subject matter. All these firms operate in the software sector. Since computer programming could not be patented in Türkiye and Europe, these firms could not make patent applications. Interviewees indicated that they would pursue patents if they developed a patentable product. As detailly shown in Table 5.2, these companies typically choose to keep their software as trade secrets, with some obtaining copyright registration. This finding aligns with the studies by Davis & Kjaer (2003a) and Dahlander (2004), which concluded that software firms are less likely to utilize patents.

Additionally, I discovered that a notable aspect of software firms has tendency to publish articles related to R&D outputs, often conducted in collaboration with universities. This suggests that some of the innovations they could not patent are instead disclosed through publications, indicating a lack of concern about disclosure. It's also worth noting that publishing could use as an informal appropriability method. By disclosing their innovations, the firms could prevent rivals to obtain patent registration related with the same topics by eliminating the novelty criterion for patentability in those areas.

On the other hand, there are a few interviewed firms that have created a patentable asset but chose not to apply for a patent. These SMEs, concern about the probability of imitation, also

[32] "Patentable subject matter" is the concept that determines whether an invention is eligible for a patent application.

[33] Since all firms engage in product innovation, it is not possible to differentiate based on whether they engage in process or product innovation at this point.

mentioned the challenges posed by cost of application, lack of time, and insufficient staff. As a result, all these firms opted to protect their innovations as trade secrets, using this mechanism as a substitute for patents. The interviewees believe that the tacit knowledge embedded in their products was significant enough to protect them, and thus, they are reluctant to share their know-how. Consequently, I assess that firms with a high level of tacit knowledge chose not to apply for patents, instead relying on trade secrets. This finding aligns with the literature, specifically with the views presented by Blind et al. (2003) and Gonzalez-Alvarez & Nieto-Antolin (2007), which suggest that firms employing more tacit knowledge than codified prefer secrecy.

Non-patent owner SMEs have utilized other formal appropriability methods. It appears that, within the range of formal appropriability methods, these firms predominantly preferred trade marks to obtain legal entitlement, prevent imitation of innovation, and secure indefinite monopoly rights.

In conclusion, qualitative analysis revealed that out of 29 SMEs, 13 of have not applied for patents, however these firms' R&D expenditure-to-turnover ratio is not lower than that of firms that filed patent applications. Despite studies in the literature suggesting that *"patents are likely to be used in companies with internal R&D and high innovation expenditure"* (EUIPO, 2017), I found that some firms with high R&D expenditures have not filed patent applications. Therefore, not applying for patents does not necessarily indicate a lack of R&D activity or innovative ideas. These firms have not faced blocking patents, patent litigation, or issues like trade secret misappropriation that could hinder their R&D processes.

As summarized in Table 5.2, the primary reasons for not applying for patents included the risk of disclosure, and sector of activity rendering their R&D outputs not eligible for patenting. Other challenges have indicated as the cost of application, lack of time and staff, and IPR knowledge gaps.

Table 5. 2. The Preferences of Appropriability Methods of SMEs'

Firm Size	Patentable Subject Matter	NDAs	Trade mark	Trade Secret	Patent	Copyright	Industrial Design	Utility Model	Publishing	Challenges	The Nature of Knowledge	Literature
Micro+Small	Yes	Yes	Yes	Yes Substitute to Patents	No	No	No	No	No	Ineffective Protection - The Possibility of Disclosure The Cost of Application Lack of IPR Knowledge	Tacit Knowledge > Codified Knowledge	Blind et al. (2003) Gonzalez-Alvarez and Nieto-Antolin (2007)
Micro+Small+Medium	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Sectoral Conditions - not eligible output for patenting Lack of IPR Knowledge	Tacit Knowledge > Codified Knowledge	Davis & Kjaer (2003a) Dahlander (2004)
Micro+Small+Medium	Yes	Yes	Yes Complementary for patents	No	Yes	Yes	No	Yes	Yes	The Lack of Legal Protection for Trade Secrets The Cost of Application and Enforcement Administrative Hurdles Conflict of Interest	Codified Knowledge > Tacit Knowledge	Gonzalez-Alvarez and Nieto-Antolin (2007) Llerenaa & Millot (2013)
Micro+Small+Medium	Yes	Yes	Yes Complementary for patents	Yes Complementary for patents	Yes	No	Yes	Yes	Yes	Administrative Hurdles The Cost of Application and Enforcement Lack of IPR Knowledge Conflict of Interest	Codified Knowledge ≥ Tacit Knowledge	Arora (1997) Belleflamme and Bloch (2014)

5.1.1.2. Patent owner SMEs

Out of the 29 interviewed SMEs, 16 have applied for patents and all patent-owner SMEs also applied for trade marks. Some of these firms made trade mark applications simultaneously with patent applications, while others chose to apply for trade marks after their products were ready for the market. These firms use trade marks for commercial purposes, leveraging their marketing effects to enhance consumers' perception of their innovative products. In this context, as shown in Table 5.2, I found that trade marks and patents complement each other for these group of SMEs. This finding aligns with the results of Llerenaa & Millot (2013), which suggest that patent and trade mark complement each other in terms of innovation protection and commercialization.

Some of the interviewed SMEs do not use trade secrets despite having patent applications. These firms have not seen the need to employ trade secrets, as the innovations resulting from their R&D were primarily codified knowledge, with less emphasis on tacit knowledge embedded in the product. Therefore, there was no information they wanted to keep secret. The finding is consistent with the study by Blind et al. (2003) and Gonzalez-Alvarez & Nieto-Antolin (2007), which posits that *"firms that employed mostly codified knowledge preferred patents."*

Additionally, interviewed firms may combine patents and trade secrets to protect a single invention or apply them to different inventions. This is common among firms developing products by integrating software and hardware. As noted in the works of Arora (1997) and Belleflamme and Bloch (2014), both protection methods—patent and trade secret—are used in a complementary manner by some of the interviewed SMEs. These firms apply for patents for the products themselves while keeping other innovations, such as software, as trade secrets. I also understood that software is not merely a collection of codes but includes tacit knowledge of developers, which firms wish to keep as secrecy. In conclusion, firms patent the codified knowledge and keep the tacit knowledge secret, thus, patent and trade secret mechanisms complement each other for these group of SMEs.

On the other hand, as a result of qualitative analysis, I found that some of the patent-owner SMEs also use the publishing as an informal method. By disclosing their innovations, the firms could prevent rivals to obtain patent registration related with the same topics by eliminating the novelty criterion for patentability in those areas. These interviewed firms often collaborate with universities, involve university professors in their R&D projects, and

even employ academics within the firm. These firms apply for patents due to the patentable subject matter of their R&D output, while also publishing all or part of their work. I also found that these firms prioritize patent applications and subsequently publish articles. The finding aligns with the study by Thiel & Peters (2012), which suggests a positive relationship between patenting and publishing mechanisms.

In conclusion, patent-owner SMEs primarily aim to protect their innovations legally and commercialize the patented products to achieve financial returns. However, a few firms also apply for patents for "strategic" purposes.

When it comes to the number of applications, patents are the most frequently applied for IPR. 16 patent-owner SMEs have a total of 95 patents, while 28 trade mark-owner SMEs have 83 trade marks. Therefore, the average number of patent applications/registrations per firm is higher than that of trade mark applications. One of the reasons to explain this noteworthy distribution is that one of the SMEs has filed multiple patent applications for single innovative product, significantly increasing the total number of patent applications. Another explanation could be the fact that SMEs do not tend to apply for trade marks for products that may not be commercialized. If the product is not ready to be launched on the market, firms may be reluctant to file a trade mark application.

Qualitative analysis reveals that most of the patent applications/registrations are made by small-sized firms. This high percentage is partly due to the larger share of small-sized firms compared to micro and medium-sized firms among the total interviewed SMEs. Additionally, 2 small-sized firms (A1 and A12), with the highest number of patent applications significantly raise the average number of patents in this group. These 2 small-sized firms operate in the medical sector and their patent applications constitute half of all patents. These firms focus on medical products, with one of them notably increasing its patent numbers through multiple applications for a single product. This observation aligns with Brazilian SMEs data indicating that among other sectors the medical sector has a higher patenting rate (Lopez, 2009).

Moreover, it is noteworthy that these 2 small-sized firms, which account for nearly half of the total number of patent applications/registrations, possess high patent know-how and literacy. These firms conduct internal patent trainings and one of them has been recognized as the most patent-owner SME within the scope of TÜRKPATENT Hezarfen Project, which included comprehensive patent training for all employees.

These small-sized SMEs operate in medical sector, and they begin their R&D projects by exploring the patentability opportunities and utilize patents as a knowledge resource. This makes it easier to file patents compared to SMEs that lack patent know-how. Consequently, consistent with İçin (2022), I could say that firms with high patent know-how tend to file more patent applications.

Furthermore, 2 SMEs have been benefiting most from TÜBİTAK and Technology and Innovation Funding Programs Directorate (TEYDEB) supports. One of the reasons to file patent applications is the accessibility of public incentives, as expressed by the firms themselves. The finding asserts the importance of public incentives for SMEs and their positive impact on innovation activities and patent applications, consistent with the findings of Kaufmann & Tödtling (2002), Almus & Czarnitzki (2003), and Yalçın & Çetin (2021).

Although Hanel (2005) suggests a linear relationship between firm size and the use of all IPR methods; however, the share of medium-sized firms in the total number of patent applications is relatively low, significantly less than that of small-sized firms. Medium-sized firms, which typically have more R&D personnel and IPR units and are more institutionalized with a higher share of R&D expenditure, might be expected to have more patent applications. As a result of analysis, it becomes clear that they develop projects in two main ways: solution-oriented R&D projects and "localization" projects in collaboration with the defense industry. Localization projects focus on adapting existing products for the domestic market via reverse engineering. As a result, the chances of developing an invention that meets the novelty criteria for a patent application are weak. Moreover, if such an invention is created, the IPR would be owned by the defense industry firm. Consequently, these factors have led to a relatively low number of patent applications for interviewed medium-sized firms.

5.2. The Effectiveness of the Different Appropriability Methods

After evaluating the numbers related to usage of appropriability methods, I will analyze in more detail the factors that influence firms to apply for these methods. Since there is not necessarily a linear relationship between the effectiveness of a particular appropriability method and its rate of use, this discussion is necessary. The literature (Hall & Ziedonis, 2001) suggests that some IPR, particularly patents, are increasingly used for purposes other than appropriating returns from innovation, notably for strategic purposes which encompasses patent blocking, use in negotiations, or preventing lawsuits.

Contrary to these views, I found that IPR is primarily chosen by SMEs to legally prevent others from imitating their innovations, meaning that initially, SMEs use IPR to appropriate the returns from innovation rather than for strategic purposes. There are a few firms that consider patents an ineffective method for protecting innovations, yet they still apply. The motivation for these firms is to use patents for strategic purposes. They seek leverage against larger firms in their industry or aim to prevent potential IPR infringement lawsuits. Although there are other effects as shown in the Table 5.3, firms prefer IPR at first to protect their innovation from imitators and get economic benefits through commercialization, get venture capital, increasing firm valuation and leveraging marketing effect. This result has aligned with the recent EPO Report (2023), which concludes *"commercial exploitation",* and the *"prevention of imitation"* are the two key motivations for filing a patent, with these motivations being even more crucial for SMEs. Additionally, I have also found that the nature of knowledge embedded in products significantly affects the choices of appropriability methods.

Table 5. 3. Effects of Appropriability Methods for SMEs

Theme Components	**Themes**
Scope of IPR Protection	Legal Protection Prevention of Imitation
Financial Gain	Commercialization Venture Capital Firm Valuation Tax Exemption
Strengthening Innovation	Encouraging R&D - Collaborations with Other Organizations - Public Incentives
Globalization	Export- International IPR Relations
Marketing	Advertising Barrier to Entry Prestige
Strategic uses of Patents	Leverage against Large Firms Prevention of Suits
The Nature of Knowledge	Tacit-Codified Knowledge

To assess the effectiveness of trade marks in providing appropriability returns, it is crucial to examine how firms utilize this right. All trade mark-owner SMEs considered the legal protection of trade marks sufficient within this context. Despite being aware of potential confusion, none reported experiencing trade mark infringement or related legal issues. This situation is also true for other appropriability mechanisms such as design rights, utility models, trade secrets, and NDAs. All these rights have successfully fulfilled their intended

function of protecting innovation and preventing imitation so far. However, one of the SMEs encountered patent infringement and suffered financial losses during the litigation process. Thus, compared to other appropriability methods, I could conclude that the patent mechanism is less effective in preventing imitation among interviewed SMEs.

Additionally, it is possible to say that trade secret and NDAs are also used to prevent imitation. Although these mechanisms do not provide legal guarantees, firms prefer trade secrets to protect the know-how within their innovations and sign NDAs with employees and business partners to ensure legal protection. The interviewees did not experience trade secret misappropriation, indicating that their innovations protected as trade secrets remained undisclosed.

Although trade secrets and NDAs are not typically viewed as commercial assets that generate financial gain, their cost-effectiveness compared to IPR applications provides an economic benefit. In this context, trade secrets and NDAs are more effective in preventing imitation than other appropriability tools.

As a result of the qualitative analysis, I found the second driving factor for IPR applications is the financial gain through licensing agreements, attracting investments, or selling products. Despite nearly all patent-owner SMEs expressing a desire to license their patents, none have successfully achieved. Out of the 16 patent-owner SMEs, 2 were able to secure venture capital by leveraging their patents. However, these firms were unsuccessful in commercializing their patented products.

In contrast, firms that collaborated with government institutions and defense industries, successfully commercialized their patented products through supported R&D and production initiatives. Moreover, these SMEs used trade marks as leverage through their advertising efforts and increasing effectiveness of both appropriability tools.

However, some of the SMEs could not find high-capacity firms for mass production of their patented product, leading to an inability to commercialize their products. This issue stems from both the insufficient industrial capacity and the lack of networking opportunities for SMEs to connect with larger firms. Consequently, most firms have not maximized the economic benefits provided by patent rights. In addition to the cost of patent applications, the failure to commercialize patents imposes additional costs on firms, making the patent mechanism less effective.

Furthermore, having IPR should allow innovators to fully utilize their rights, as IPR grant temporary monopoly rights over innovations. However, in most firms, the firm owners, rather than the inventors, are listed as both applicants and inventors. Only 3 interviewed firms listed the inventors as the applicants, and just 4 interviewed firms provided incentives to inventors. This situation indicates that inventors could not fully benefit from their innovations, as they do not secure the monopoly rights or satisfactory financial returns from their inventions. The primary purpose of appropriability methods is to incentivize inventors to produce more by granting them monopoly rights over their innovations. However, this situation could discourage innovation within firms, leading to fewer patent applications or the decision to protect innovations as trade secrets.

Some of the interviewed firms are SMEs collaborating with defense industry companies. Their R&D activities are largely project-based, conducted in collaboration with the defense industry. In these cases, the resulting innovations' patent rights belong to the defense industry companies. This creates a conflict of interest for the inventors, who could not fully benefit from their inventions. As a result, the inventors in these firms do not achieve full appropriability returns from their innovations, indicating that patents are not functioning effectively as an appropriability mechanism.

In the next chapter, I will propose policies to address the challenges that diminish the effectiveness of appropriability methods for SMEs in Türkiye.

CHAPTER 6

POLICY RECOMMENDATIONS AND CONCLUSION

This chapter presents the policy recommendations and conclusions of the thesis. Accordingly, recommendations consist of six sub-sections. Each section has a separate key points and different policy suggestions with various instruments. In the last section, the thesis is finalized with the conclusion part. Thus, chapter 6 consists of two sections as policy recommendations and conclusion.

6.1. Policy Recommendations

The qualitative analysis revealed that SMEs employ various types of appropriability methods, but they do not use them as effectively as they should. Therefore, policy recommendations and tools should be provided to enhance the effectiveness of these methods. To accomplish this, I determine the key points based on the codes generated from SMEs' responses. These key points are then linked to the challenges identified through the qualitative analysis, and policy recommendations and tools were presented within this framework. The key points that form the basis of these policies and policy tools are listed below.

- Increasing the Effectiveness of Protection
- Increasing Commercialization Potential of SMEs
- Increasing Knowledge of Appropriability Methods and Public Support Programs
- Accelerating Bureaucratic Processes
- Decreasing the Cost of Application and Enforcement Process
- Creating Resolutions for IPR Ownership Problems

I summarize policy suggestions and instruments in Table 6.1, which presents a comprehensive overview of the key points, recommended policies, and tools to address the challenges faced by SMEs concerning the utilization and effectiveness of these appropriability methods.

Table 6. 1. Policy Recommendations (Further Suggestions)

Key Points	**Recommended Policy**	**Policy Instruments**	**Targeted Type of Challenges**
Increasing the Effectiveness of Protection	Strengthening protection of IPR against imitated products	Increasing the number of customs officers responsible for IPR inspection and employ IPR experts to work alongside them Formulating regulations aimed at preventing IPR infringement through collaboration with WIPO, EPO, EUIPO and national IP Offices	**Lack of Trust in Legal Protection** **The Ease of Inventing-around** **Infringement of IPR**
	Establishing stronger Law and Regulations	Increasing the power of relevant pensions related to IPR infringement (Law No. 6769 -Law No. 5846) and expanding the scope of protection	
	Utilizing stronger sanctions against unlicensed software usage	Establishing an independent institutional body for monitoring the use of unlicensed software and OSS violations	
Increasing Commercialization Potential of SMEs	Strengthening the role of TTOs in managing IPR and facilitating commercialization	Organizing sector-specific meetings collaboration with TTO Keeping track of and informing firms about TÜBİTAK 1702 Patent-Based Technology Transfer calls	**Sector of Activity** **Administrative Hurdles** **Lack of Time and Staff** **Cost of Application and Enforcement**
	Strengthening the network between SMEs and large companies	Establishing an organization similar to the Informatics Valley (Gebze) in Ankara Generating a database where large firms, universities, and public institutions could register, search, and view SMEs patents available for transfer or licensing	
	Supporting mass production capacities of firms for high-tech patented products	Encouraging large firms to sign license agreements with SMEs through tax exemptions and other incentives	

Table 6.1. (continued)

Increasing Knowledge of Appropriability Methods and Public Support Programs	Increasing training for technopark firms and lessening asymmetric knowledge	Organizing sector-specific training twice a year through TÜRKPATENT or IPR attorneys Developing online resources, including tutorials and guides, to help businesses navigate the complexities of appropriability mechanisms Informing firms about free online training organized by international organizations like EPO, WIPO, and EUIPO through TTOs Establishing IPR information hubs similar to the EC IP Help Desk across all technopark campuses Organizing workshops and seminars in collaboration with TÜRKPATENT, TÜBİTAK, and KOSGEB to disseminate knowledge about IPR and address specific industry needs for SMEs	**Lack of IPR Knowledge and Public Support Programs** **Asymmetric Information about IPR Supports**
	Introducing IPR and other appropriability methods starting from elementary school	Training educators through expert organizations (WIPO, EUIPO, EPO, TÜRKPATENT) Organizing competitions, seminars, and collaborative projects among schools	
	Expanding programs to strengthen the connection between SMEs and TÜRKPATENT	Providing consultancy services to SMEs within the scope of the TÜRKPATENT SME-Hezarfen Project	
Accelerating of Bureaucratic Processes	Accelerating TÜRKPATENT patent examination processes	Employing more patent examiners at TÜRKPATENT. Using AI-assisted programs to shorten examination periods.	**Inertia of Bureaucracy**
	Simplifying administrative procedures for TÜBİTAK and KOSGEB patent and trade mark Support Programs	Providing detailed flowcharts on Support Programs on their websites Establishing feedback mechanisms to continuously improve administrative processes based on SMEs experiences	**Lengthy Patent Examination Process**

Table 6.1. (continued)

Decreasing the Cost of Application and Enforcement Process	Providing more affordable IPR Process	Establishing SME funds Implementing sliding scale fees based on the size and revenue of the applicant Clarifying tax exemption calculations based on Law No. 5520 on Corporate Tax and ensuring that SMEs benefit more easily from that incentive	**Cost of Application and Enforcement** **Lack of Time and Staff**
	Augmenting the number of supports providing by TÜBİTAK, KOSGEB and Technopark	Including patent application, research, and examination expenses in TÜBİTAK project budgets Expanding the scope of the 1602 Patent Support Program to cover IPR-attorney fees of international applications	
	Offering incentives to SMEs dealing with litigation process	Providing pro-bono legal services to deal with IPR issues	
Creating Resolutions for IPR Ownership Problems	Providing joint ownership rights for SMEs in joint projects	Fostering collaborations between universities, TÜBİTAK, SMEs and industry to ensure clarity on joint ownership and usage rights Establishing model contracts that should be signed at the beginning of every project Setting up mediation and arbitration mechanisms to resolve disputes over IPR ownership within joint projects	**Conflict of Interest on Ownership of Patents**
	Constituting more clearer regulations for the distribution of patent revenues between employees and employers	Reviewing the Employees' Inventions under Art. 113-120 of Law No. 6769 on Turkish Industrial Property and related Regulations and Guides to create more detailed and sector specific rules Establishing new Regulation tailored for sectors where scaling revenue distribution is challenging, such as the defense industry	

6.1.1. Increasing the Effectiveness of Protection

The legal monopoly provided by IPR could be undermined by the imitation of products, their use without the owner's consent, and possession for commercial purposes. The increasing prevalence of IPR infringement in both national and international markets could erode firms' confidence in the protective mechanisms of IPR. To provide a solution, the current Law No. 6769 on Turkish Industrial Property and Law No. 5846 on Intellectual and Artistic Works should be strengthened by increasing the penalties for infringements and ensuring stronger IPR provisions in the relevant Law and regulations.

As this is an international issue, cooperation with organizations such as World Intellectual Property Organization (WIPO), EPO, EUIPO, and the European Commission (EC) to prepare regulations for preventing IPR infringement is also recommended.

Customs measures for protecting IPR are regulated under Art. 57 of Law No. 4458 on Customs Law, and Art. 100-111 of the Customs Regulation. Financially and institutionally ineligible SMEs often struggle to compete with the imitation's products in some specific sectors of countries like China and India. Increasing inspections related to IPR violations during the customs clearance process could be a solution. In this context, the number of customs enforcement officers could be increased, and IP experts could be employed to work alongside them.

Additionally, software firms have specific concerns about their software being copied. Some of these SMEs prefer to keep their software as trade secrets due to a lack of confidence in copyright protection. To provide more effective copyright protection, I recommend establishing an independent organization tasked with monitoring unlicensed use of software and imposing appropriate penalties could serve as a policy tool in this area.

6.1.2. Increasing Commercialization Potential of SMEs

One of the reasons for the low effectiveness of the patents for SMEs is ineligibility to manufacture or sell patented inventions. They could not turn their inventions into marketable products or services. Additionally, these firms could not license, lease, or transfer their patents in any form. Consequently, SMEs have not been able to generate revenue from their patented products, leading to a reduced incentive for innovation. To address this issue, it is crucial to enhance the commercialization of patented products and support this process through various policies. This objective is outlined in the 12th Development Plan of Türkiye

(2024–2028),[34] which states that *"promoting the use of intellectual assets to support access to financing will continue to be one of the major policies for IPR."* The plan aims to augment the economic benefiting of IPR and measure this value on a sectoral basis under the Policy Measure Commercialization of IP.

In alignment with this plan, I could propose more specific policies based on the issues faced by the interviewed SMEs. One of the biggest problems among these SMEs is their lack of a mass production network to manufacture and sell their patented products. Many SMEs have inventions that remain uncommercialized because they could not reach or agree with firms capable of mass production. This issue is particularly prevalent with high-tech products. Therefore, it is essential for SMEs to engage more frequently with large firms that have mass production capacities in their sectors, and for TTOs to play a more active role in facilitating these connections. Also, I recommend generating a database where large firms, universities, and public institutions could register, search, and view SMEs patents available for transfer or licensing. Additionally, creating an innovation hub like the IT Valley (Bilişim Vadisi) in Gebze near Ankara could improve communication among firms.

Another challenge is the scarcity of firms in Türkiye capable of scaling and producing high-tech products. Expanding international networks to attract foreign investment is one approach, but increasing domestic production capacity is also necessary. As a policy tool, I propose to provide tax reductions or exemptions for large companies which take license from SMEs and produce these patented products. Furthermore, TÜBİTAK partially covers the expenses of SMEs entering into licensing agreements, but many firms are unaware of this support. I could recommend tracking TÜBİTAK 1702 calls for patent-based technology transfer support through METU TTOs or appointed Technopark representatives and inform periodically SMEs to facilitate the transfer of patents.

6.1.3. Increasing Knowledge of Appropriability Methods and Public Support Programs

Despite operating within the same ecosystem, there is a noticeable presence of asymmetric information regarding both IPR and public incentives among SMEs. Some of the firms, even those in the same sector and with a longer history, lack knowledge about the scope of IPR,

[34] The 12th Development Plan, prepared by the Presidency of the Republic of Türkiye Strategy and Budget Office, was approved by the Grand National Assembly of Türkiye General Assembly on October 31, 2023. The policies, measures, and activities formulated at the highest decision-making levels have been developed through an inclusive approach. This approach stems from the significant efforts of the Specialized Commission on Intellectual Property Rights – Working Group, which includes representatives from ministries, public institutions and organizations, and private sector entities from various sectors of society. Retrieved 10 July 2024, from https://www.sbb.gov.tr/wp-content/uploads/2023/12/On-Ikinci-Kalkinma-Plani_2024-2028_11122023.pdf

protection durations, and what aspects need protection. To mitigate this, firms that have previously filed patents in the same sector can be matched with those that have low motivation due to lack of knowledge, facilitating knowledge exchange. Thus, I propose to link Technopark firms in a sector-specific way to lessen asymmetric knowledge and augment collaborations. This matching could be facilitated through METU TTO or by appointing Technopark campus representatives, with separate representatives for each sector to enhance communication among firms.

Firms also face challenges in developing strategies for patenting outcomes from R&D, particularly regarding what aspects to patent. In this context, having a sector specific IPR representative to guide firms from the project design stage would be beneficial. This would act as a guide for firms seeking to increase their patent applications. Therefore, aside from the Intellectual Property and Contracts Unit at METU TTO, I recommend a separate Information and Document Unit linked to TÜRKPATENT could be established within Technopark, with sector representatives appointed to these units.

Another suggestion to reduce asymmetric information is to increase training for Technopark firms. Specific practical training sessions tailored to sectors could be conducted twice a year by TÜRKPATENT or IPR-attorneys. Making these training sessions free would likely increase participation. Additionally, developing online resources with tutorials and guides will help businesses navigate the complexities of appropriability mechanisms.

Moreover, organizing workshops and seminars in collaboration with TÜRKPATENT, TÜBİTAK, and KOSGEB to disseminate knowledge about IPR and public support programs, and addressing specific industry needs for SMEs, could be very effective. METU TTO could also follow online free training sessions offered by international organizations like EPO, WIPO, and EUIPO, and inform firms. Establishing IPR information hubs like the EC IP Help Desk across all Technopark campuses could further support firms.

I observe that almost all interviewed SMEs lack comprehensive knowledge about informal appropriability methods. Firms are unaware of alternative methods or how to implement them. To increase knowledge and expertise on appropriability methods that could be utilized by innovators and to establish a culture of creating, protecting, and benefiting from innovation, a series of educational programs could be introduced starting from elementary school. Through materials and hands-on training designed for children and young people, familiarity and awareness of these methods could be enhanced. It is essential for these

training programs to be conducted by experts trained by specialized organizations such as WIPO, EUIPO, EPO, and TÜRKPATENT. Additionally, various fairs, seminars, and collaborative projects that bring together trainers and students could be considered as policy instruments to further enhance knowledge and expertise in this area.

Furthermore, only one firm has benefited from the training provided under TÜRKPATENT's Hezarfen Project for SMEs. More SMEs in METU Technopark could be included in this project, allowing them to receive training from industrial property experts.

6.1.4. Accelerating of Bureaucratic Processes

For SMEs, especially during their early years, constraints on staff and finances make interactions with government entities particularly important. In this context, it is crucial to increase the channels, which firms could easily access support programs. Therefore, the operational processes of patent and trade mark incentive programs should be more easily trackable. Thus, I suggest providing detailed flowcharts on TÜBİTAK-KOSGEB websites and establishing a mechanism for collecting user feedback on the process would benefit the firms.

Furthermore, to enhance collaboration between SMEs and institutions and streamline paperwork, public support organizations could be consolidated onto a single platform where SMEs information is recorded and periodically updated. This would reduce the time and financial burden on SMEs.

Another issue for SMEs is the variability in patent examination durations. Firms have reported that the inability to predict these durations makes future planning challenging. To increase predictability in patent examination times, I recommend hiring more patent experts and increase the inspection regarding the time lapses. Additionally, the use of AI-supported programs could help shorten examination periods, making the process more efficient and transparent.

6.1.5. Decreasing the Cost of Application and Enforcement Process

The costly and lengthy nature of patent and international trade mark application processes presents a significant challenge for SMEs. I noted that some SMEs have had to abandon their

patent applications due to the high costs associated with filing and tracking the application. To make IPR protection more affordable for SMEs, I propose several policy recommendations.

One approach is to introduce sliding scale fees based on the size and revenue of the applicant, allowing SMEs with lower revenues to pay reduced application and registration fees. Additionally, SME funds like those implemented by EUIPO could be established. These funds would support SMEs that meet specific criteria in their IPR application and tracking processes.

Art. 5/B of the Law No. 5520 on Corporate Tax establishes an "Exemption for Industrial Property Rights." Under this Article, the portion of income attributed to a patented or utility model-certified invention from the sales of products manufactured in Türkiye is exempt from corporate tax. However, calculating this tax exemption is not straightforward for many SMEs, especially for firms producing both hardware and software. When the entire product is patented, this calculation is straightforward, but it becomes complicated when only a part of the product is patented. I suggest independent experts specializing in these calculations could be employed to support firms in determining the contribution of the patented component to the overall revenue.

To further reduce the costs associated with IPR applications and tracking, I recommend increasing the support limits provided by TÜBİTAK, KOSGEB, and Technoparks. Additionally, Türkiye Exporters Assembly could be encouraged to support international trade mark and patent applications. As another policy tool, the scope of TÜBİTAK's 1602 Patent Support Program could be expanded to cover attorney fees for international patent applications. Also, to cover patent application, research, and examination expenses in all TÜBİTAK-SME joint projects could also be beneficial.

Lastly, the potential for enforcement is intimidating for SMEs. When faced with potential trade mark, patent, software, or design disputes with other firms, SMEs often try to resolve issues out of court to avoid long and costly legal battles. To support SMEs in these situations, I suggest providing incentives for dealing with litigation processes and offering pro bono legal services to assist with IPR issues could be effective measures. I believe that these initiatives would help SMEs navigate the complexities of IPR enforcement without the fear of prohibitive costs.

6.1.6. Creating Resolutions for IPR Ownership Problems

As a result of qualitative analysis, I found and discussed that conflicts of interest often arise in joint projects regarding IPR ownership. This issue of rightful ownership for the actual or potential inventors leads to a decreased incentive for innovation. To address this, I propose the concept of joint ownership. This would allow inventors, whether working within a firm or involved in projects with universities, industry, and TÜBİTAK, to be recognized as co-applicants, thus securing their rights to ownership. To implement this, collaborations between universities, TÜBİTAK, SMEs, and industry should be established to ensure clarity on ownership and usage rights. I also recommend developing standards for IPR agreements and sign them at the beginning of every project to provide clear guidelines on these matters.

Additionally, determining the compensation for employee-inventors when their inventions are commercialized could be complex and that complexity differs from one sector to another. For instance, it is easier to calculate the revenue generated from an invention in the durable goods sector compared to the defense industry, where the added value and revenue attributable to the invention are harder to scale. Therefore, I suggest organizing more explicit regulations for revenue distribution between employees and employers. Reviewing Art. of 113-120 Law No. 6769 on Turkish Industrial Property, and the related Regulation and Guideline on employee inventions to create more detailed and sector-specific regulations could provide clarity. Moreover, the government could also offer incentives to SMEs, with the condition that a significant portion of the earnings from the invention is directly allocated to the inventor. I believe that this would help offset the costs of R&D for SMEs and encourage employees for further innovation.

Additionally, the government could provide support to ensure that SMEs are not unfairly disadvantaged in collaborations with other stakeholders by establishing mediation and arbitration mechanisms to resolve disputes over IP ownership in joint projects.

6.2. Conclusion

In this thesis, I focused on SMEs and their preferences for appropriability methods. I selected METU Technopark, which has the highest number of patent entrepreneurs in Ankara, as the study field and conducted semi-structured in-depth interviews with a total of twenty-nine SMEs. As a result of qualitative analysis, I found the rate of use of appropriability methods and the effects and challenges affecting these choices of SMEs. *"Commercial exploitation"*

and *"prevention of imitation"* are the two key motivations for filing an IPR. Additionally, I found that the nature of the knowledge embedded in products significantly affects the choice of appropriability methods.

All descriptive and explanatory findings show that SMEs are IPR-active firms, combining formal and informal appropriability methods. Most firms preferred NDAs as an informal method and trade marks as a formal method. However, I also found that the number of patent applications was higher than those for trade marks and other formal methods, indicating a high patent propensity among firms. Notably, small-sized firms have filed more patent applications than medium-sized firms. Specifically, two small-sized firms in the medical sector, with the ability to use patents as external knowledge, significantly contributed to this average.

Furthermore, firms in the software sector often relied on a combination of trade marks and trade secrets due to the non-patentable nature of their R&D outputs. Despite not applying for patents, these firms' R&D share were not lower than those of firms that did apply, and they continue to engage in innovative activities. When evaluating the use of other mechanisms for non-patent owners, firms with national and international trade mark registrations that had commercialized products were found to secure their competitive advantages and capture appropriable returns.

Patent-owning SMEs that commercialized their patented products and used trade marks as leverage through their advertising efforts were undoubtedly effective in utilizing appropriability tools. Therefore, I could state that for firms that have filed for patents, combining both mechanisms is an effective strategy to increase their appropriability returns.

IPR provide temporary monopoly rights over innovations, but in most cases, firm owners, rather than the actual inventors, are listed as both applicants and inventors. Only three firms acknowledged the inventors as the applicants, and just four firms offered incentives to their inventors. This suggests that inventors are unable to fully benefit from their innovations, as they do not receive monopoly rights or sufficient financial rewards for their contributions. Appropriability methods are intended to encourage inventors to innovate by granting those exclusive rights over their work, however, this practice discourages innovation within firms, leading to fewer patent applications or the decision to protect innovations through trade secrets.

Some of the interviewed SMEs work with defense industry companies, where their R&D is primarily project-based in collaboration with these larger firms. In such cases, the patent

rights to the resulting innovations are owned by the defense companies, causing a conflict of interest for the inventors who are unable to fully benefit from their creations. As a result, the inventors in these firms do not receive the full benefits of their innovations, highlighting that patents are not serving as an effective appropriability mechanism.

As Teece (1986) noted, *"having an outstanding innovation is not a guarantee of successful commercialization".* Patent-owner SMEs struggled to find high-capacity firms for mass production, which prevented them from commercializing their products. These firms lacked the necessary complementary assets, such as production, sales, and distribution channels. In addition, inadequate infrastructure, insufficient network support and a lack of incentives have reduced the effectiveness of the patent mechanism, hindering its ability to create incentives for more innovation. I put forward a series of policy recommendations and further suggestions to tackle these issues head-on and make the appropriability methods more effective.

The conclusion of the thesis highlights the need for micro-level and sector-specific studies to develop a more comprehensive policy. Especially, conducting research on the combined use of patent and trade secret methods within a specific sector and informing companies about this dual strategy would be beneficial for many SMEs aiming to increase their competitive advantage. By using both methods, companies can file patent applications and license these patents without disclosing key points related to products that involve tacit knowledge. This approach would allow firms to protect their innovations while maximizing the benefits of both appropriability methods.

Put it in a nutshell, this thesis is the first study on SMEs' appropriability preferences and their effective use in Türkiye, thus, it provides a framework and guidance for future research.

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APPENDICES

A. CODEBOOK

- **The Portfolio of Appropriability Methods of SMEs**
  - **The Preference of Trade mark and Patents**
    - Easier application process for trade mark
    - Claims and descriptions for patent
    - Difficulty of filing a patent application
    - Both trade mark and patent for the same product (IP bundle)
    - Trade mark in software firms
  - **The Preference of Copyright and Trade Secret**
    - Confidentiality Agreements with employees
    - Confidentiality Agreements with large firms
    - Confidentiality Agreements with IPR-attorneys
    - Trade secret in software firms
    - Lack of trust in copyright protection
    - Meaningless of copyright registration
    - Continuous software updates
    - Secrecy of source code
    - Common usage of open source
- **Effects of Appropriability Methods for SMEs**
  - **Scope of IPR Protection**
    - The Prevention of Imitation
      - Protection of innovation
      - Prevention of infringement
      - Strategic market selection
      - Importance of having trade marks
    - Legal Protection
      - Safety of protection
      - Legal guarantee
      - Legal proof

- Registered patents
- Monopoly right
- Safeguard function

- **Financial Gain**
  - Commercialization
    - Patent application for commercialization purposes
    - Selling patented products
    - Selling branded products
    - Providing fiscal rights
    - Problems in scaling up production
    - Problems in patent valuation
    - Lack of network support
  - Venture Capital
    - Establishing spin-off
    - Providing equity investments
    - Keep track of IPR applications by investors
    - Different investor profile
    - Importance of patent and trademark for attracting capital
    - Valuable assets for investors
  - Firm Valuation
    - Positive impact on firm value
    - The contribution of trade marks
    - The importance of quantity of patents and trade marks
  - Tax Exemption
    - Tax exemption based on R&D location
    - Intersection of IPR and R&D regulations
    - Corporate tax
    - Lack of knowledge about corporate tax exemption
    - Difficulty of calculation
    - Insufficiency to calculate the exemption

- **Strengthening Innovation**
  - R&D Activities of SMEs
    - Product innovations

        - High R&D expenditure
    - Encouraging R&D
        - Patents as a source of knowledge
        - Cumulative knowledge
        - “Localization” projects
        - R&D-design-production-sales
        - Bespoke Production
        - Patent search before R&D project
        - R&D projects with defense industry
        - Design work for large firms
    - Collaboration with Other Organizations
        - Collaborations with universities
        - Collaborations with TÜBİTAK, KOSGEB
        - Collaborations with defense industry firms
        - Collaborations with METU TTO
        - Collaborations with TÜRKPATENT
    - Public Incentives
        - TÜBİTAK-1602 Patent Support Program
        - KOSGEB-International trade mark applications
        - METU Technopark Support
        - Importance of support for PCT applications
- **Globalization**
    - Export- International IPR Relations
        - Strategic planning for market entry
        - Correlation between trade mark applications and export markets
        - Correlation between patent applications and export markets
        - Importance of being global
        - The role of trade mark in the global market
        - The role of patent in the global market
- **Marketing**
    - Advertising
        - The advertisement function of trade mark
        - Trade mark-promoting function

        - Significance in commercialization
    - Barrier to Entry
        - Tool for competitiveness
        - Prevent competitors
    - Prestige
        - Providing identity and aura
        - Trade mark reliability in the market
        - Firms' Prestige for customers
        - Firms' Prestige for Investors
- **Strategic uses of Patents**
    - Leverage against Large Firms
    - Prevention of Suits
- **The Nature of Knowledge**
    - Extensive know-how as leverage for competitors
    - Tacit knowledge in software
    - Utilize both patents and trade secrets in one product

- **Challenges Related to Appropriability Methods for SMEs**
    - **Ineffectiveness of Protection**
        - Lack of Trust in Legal Protection
            - The ease of inventing-around patents
            - The probability of disclosure
            - The probability of imitation
        - Misappropriation of Trade Secret
            - The possibility of job exchange
            - Lack of legal guarantee
        - Infringement of IPR
            - Patent Infringement-financial damage
            - Copyright Infringement
            - Litigation process
            - Enforcement cost
            - Lack of systemic monitoring
            - Freedom to operate
            - Unfair competition from imitated products
            - Tend to mediate

        - Confidential Patent
            - SME- operated in defense industry
            - Secret projects
            - Misunderstanding of confidentiality patent
    - **Administrative Hurdles**
        - Inertia of Bureaucracy
            - Cumbersome KOSGEB Processes
            - Cumbersome TÜBİTAK Processes
            - Cumbersome Law No. 5746
        - Lengthy Patent Examination Process
    - **Lack of Knowledge**
        - Lack of IPR Know-how
            - Learning the scope of design protection during interviews
            - Lack of knowledge on how to file international trade mark applications
            - Higher contribution of one-on-one meetings
            - Confusion between trade mark and patent
            - Absence of internal-external training programs
            - Uncertainty about which aspects of the product to patent
            - Low patent literacy
        - Asymmetric Information about IPR Supports
            - Knowledge gaps between SMEs
            - Not benefiting from TÜBİTAK, KOSGEB support
            - Unawareness of IPR-related tax exemptions
    - **Firm Specific Factors**
        - Sector of Activity
            - Not eligible output for patenting
            - Defense sector-many aspects remain confidential
            - Difficulty in detecting counterfeits in some sectors
            - Importance of patents in machine industry
        - Lack of Time and Staff
    - **Cost of Application and Enforcement**
        - Cost of Application
            - Costly patent applications
            - Patent-attorney fee

        - Annual agreements with IPR-attorneys
    - International IPR applications
        - High cost of PCT application
        - High cost of international trade mark applications
        - Lack of incentives for international applications
    - Cost of Enforcement
        - Apprehension of filing a lawsuit
        - Lack of support for legal issues
        - High cost of lawsuits

- **Conflict of Interest on Ownership of Patents**
    - Employees-Employer Ownership Dilemma
        - Absence of the inventor's name in patent applications
        - Insufficient regulation on employee' inventions
    - University-TÜBİTAK-SMEs Ownership Dilemma
        - Lack of ownership position of academicians- loss of motivation
        - Ownership issues in joint projects
    - Defense Industry-SMEs Ownership Dilemma
        - IPR belong to Roketsan, Aselsan, TAI

- **Key Points**
    - Increasing the effectiveness of protection
    - Stronger penalties for IPR infringement
    - Independent organization for monitoring software violations
    - Creating networks for commercialization of IPR
    - Supporting mass production capacities of firms
    - Free IPR education on technopark campuses
    - Sector-specific education and support programs
    - Sufficient support for international applications
    - Accelerating patent examination process
    - Creating clear instructions for TÜSİAD, KOSGEB programs
    - Increasing the numbers of support programs
    - Increasing the amount of incentives
    - Pro-bono services for litigation process
    - Designate a separate expert for IPR-related tax calculation
    - Fair IPR-related income distribution between employer and employee

- Fair IPR-related income distribution between SMEs and large defense industry firms

B. INTERVIEW QUESTIONS / MÜLAKAT SORULARI

Başlangıç Soruları

1. Firmanız ne zaman kuruldu?

2. Firmanızda kaç kişi çalışmaktadır?

3. Firmanız hangi ana sektörde / teknoloji alanında faaliyet göstermektedir? Başlıca müşterileriniz hangi sektörlerde yer almaktadır?

4. Firmanız ihracat yapmakta mıdır?

5. Yabancı bir ortağınız var mı?

İnovasyon, Teknoloji Geliştirme Süreciyle İlgili Sorular

6. Firmanızda Ar-ge merkezi (5746 sayılı yasaya göre) var mı?

7. Firmanızda kaç tane Ar-ge personeli çalışmaktadır?

8. Ar-Ge/teknoloji geliştirme bütçesi cironuzun yaklaşık yüzde kaçını oluşturuyor?

9. Firmanız hangi tür inovasyon(ları) yapmaktadır?

Fikri ve Sınai Mülkiyet Hakkına İlişkin Sorular

10. Herhangi bir Fikri ya da Sınai Mülkiyet Hakkını (FSMH) ((Patent, faydalı model, marka, tasarım, telif hakkı)) tescil ettirmek üzere başvuru yaptınız mı?

10.1. Yaptıysanız hangileri olduğunu belirtir misiniz? (Patent, faydalı model, marka, tasarım, telif hakkı)

10.2. Uluslararası marka/patent/tasarım başvurunuz var mı?

FSMH Başvurusu Olanlar için;

11. Neden patent, faydalı model, marka, tasarım, telif hakkı başvurusunda bulundunuz?

11.1. Sizce FSMH'ye ilişkin başvuru yapmak neden önemli?

11.2. İnovatif faaliyetler açısından herhangi bir önem teşkil ediyor mu?

12. Başvuruyu kimin adına yaptınız? İş birliği yaptığınız TÜBİTAK, KOSGEB, üniversiteler vb. kişi ya da kuruluş var mı?

12.1. Varsa, bu kişi ya da kuruluşları tercih etmenizdeki sebepler nelerdi?

12.2. Herhangi bir kişi- kuruluşla işbirliği tercih etmemenizin sebebi neydi?

13. FSMH'ye ilişkin başvuru yaparken ne gibi zorluklarla karşılaştınız?

13.1 Aracı bir firma (vekil) kullandınız mı?

13.2 Teşvik aldınız mı? Alsanız sizin için durum farklı olur muydu?

13.3 Firma içerisinde bir patent birimi var mı? Ya da firma içerisinde bir FSMH danışmanı istihdam ediyor musunuz?

13.4 Firma içerisinde FSMH eğitimleri düzenleniyor mu?

FSMH Başvurusu Olmayanlar için;

14. Neden patent, faydalı model, marka, tasarım, telif hakkı başvurusunda bulunmadınız?

14.1 Sizce bulunduğunuz sektör bu fikrinizde etkili mi, başka bir sektörde olsanız fikriniz ne olurdu?

14.2 FSMH başvurusunda bulunmamanız ya da tescilli bir FSMH'nizin olmaması inovatif faaliyetleriniz açısından olumsuz bir durum yarattı mı?

Enformel Koruma Metotlarına İlişkin Sorular

15. FSMH dışında ürün ve hizmet alanındaki yenilikleri korumak için başkaca yöntemler kullanıyor musunuz?

15.1 Eğer kullanıyorsanız bu mekanizmaların FSMH'ye göre avantajları ya da dezavantajları neler olabilir?

15.2 Neden alternatif mekanizmaları kullanmayı düşünmediniz?

16. Açık kaynak kodlarından yararlanabileceğinizi biliyor musunuz?

17. Firmanıza ait yazılımı açık kaynak platformlarında yayınlamayı tercih eder misiniz?

Finansal Getiri

18. FSMH'na ilişkin başvuru ya da tescil sahibi olmanız başlangıç sermayesi bulmanızda etkili oldu mu ya da olur muydu?

19. FSMH tescilinin şirketiniz için vergi muafiyeti sağladığını biliyor musunuz?

20. FSMH başvuru/tescilinizin firma değerinde bir artış yarattığını düşünüyor musunuz?

21. Herhangi bir FSMH'na ilişkin lisans aldınız mı ya da verdiniz mi?

21.1 ODTÜ TTO ya da başka bir kuruluş ile işbirliği yaptınız mı?

FSMH'ye İlişin Tehditler

22. Başvuru halinde ya da tescil edilmiş olan fikri ve/veya sınai hakkınıza ilişkin tehditler sizce neler olabilir?

23. Herhangi bir ihlal ile karşılaştığınızda ne yapacağınıza ilişkin bilginiz var mı?

24. Herhangi bir ihlal ile karşılaştıysanız firmanız bu durumdan nasıl etkilendi?

Politika Önerileri

25. Sizce mevcut 6769 sayılı Sınai Mülkiyet Yasası ve uygulamaları inovatif firmalar açısından yeterli korumayı sağlıyor mu?

26. Türkiye'de konu ile ilgili sizce yeterli bilgi, eğitim ve teşvik sağlanıyor mu?

27. FSMH ve alternatif yenilik koruma metotları ile ilgili sektörünüzde inovasyonu olumlu etkileyecek ne gibi düzenlemeler yapılmalı, eksiklikler nelerdir?

C. INTERVIEW QUESTIONS

Warm-up Questions

1. When was your firm founded?
2. How many employees does your firm have?
3. In which main sector or technology field does your firm operate? Which sectors do your primary customers belong to?
4. Does your firm engage in exporting?
5. Do you have a foreign partner?

Questions Related to Innovation and Technology Development

6. Does your firm have an R&D center as defined by Law No. 5746?
7. How many R&D personnel are employed at your firm?
8. Approximately what percentage of your revenue is allocated to the R&D/technology development budget?
9. What types of innovation does your firm engage in?

Questions Related to Intellectual Property Rights (IPR)

10. Have you applied for any IPR (patent, utility model, trade mark, design, copyright)?

    10.1 If so, which ones?

    10.2 Do you have any international trade mark/patent/design applications?

For those who have applied for IPR:

11. Why did you apply for IPR?

    11.1 Why do you think applying for IPR is important?

    11.2 Does it hold any significance for innovative activities?

12. In whose name have you made the application? Have you collaborated with TÜBİTAK, KOSGEB, universities, or any individuals or institutions?

12.1 If so, what are the reasons for choosing these collaborators?

12.2 If not, what are the reasons for not choosing these collaborators?

13. What challenges have you faced during the IPR application process?

13.1 Have you used an IPR attorney?

13.2 Have you received any public incentives? If so, would it have made a difference for you?

13.3 Does your firm have a patent department or employ an IPR expert?

13.4 Does the firm offer IPR training programs?

For those who have not applied for IPR:

14. Why have you not applied for any IPR?

14.1 Do you think your sector has influenced this decision? Would your opinion change if you were in a different sector?

14.2 Does being a non-owner IPR SME affect your innovative activities?

Questions Related to Informal Appropriability Methods

15. Have you used informal methods to protect your innovations, such as trade secrets, first-mover advantage, lead-time advantage, complementary sales, or non-disclosure agreements?

15.1 If so, what are the advantages and disadvantages of these methods compared to IPR?

15.2 If not, why have you not utilized these informal methods?

16. Are you aware that you might benefit from using open-source software?

17. Would you like to publish your software on open-source platforms?

Financial Gain

18. What do you think about funding function of IPR for SMEs?

19. Are you aware that IPR registration provides tax exemptions for your firm?

20. Do you believe that your IPR applications and registrations have contributed to an increase in your firm's value?
21. Have you licensed any of your IPR or received licenses from others?

    21.1 Have you collaborated with METU TTO or any other organization?

Threats to IPR

22. What do you perceive as the potential threats to your appropriability methods?
23. Are you aware of the steps to take if you encounter any infringement of your appropriability methods?
24. How is your firm affected by any encountered infringement?

Policy Issues

25. In your opinion, does the current Industrial Property Law and its implementation offer adequate protection for innovative firms, either sector-specific or in general?
26. Do you believe that there is adequate information, education, and incentives regarding appropriability methods in Türkiye?
27. What regulations do you think should be implemented to positively impact innovation in your sector concerning appropriability methods, and what are the current shortcomings?

D. ETHICAL PERMISSION / ETİK KURUL

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ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

18 OCAK 2024

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Prof. Dr. Mehmet Teoman PAMUKÇU

Danışmanlığını yürüttüğünüz Birce Barlas YILMAZ'ın ***"Start-up Firmaların Fikri ve Sınai Mülkiyet Stratejisi Türkiye Örneği"*** başlıklı araştırmanız İnsan Araştırmaları Etik Kurulu tarafından uygun görülerek **0014-ODTUİAEK-2024** protokol numarası ile onaylanmıştır.

Bilgilerinize saygılarımla sunarım

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E. TURKISH SUMMARY / TÜRKÇE ÖZET

YENİLİKÇİ KOBİLERİN YENİLİKLERİ KORUMA YÖNTEMLERİ: ODTÜ TEKNOKENT ÖRNEĞİ

Son yıllarda, küçük ve orta ölçekli işletmeler (KOBİ), inovatif girişimciler olarak ekonomik kalkınmanın önemli itici güçleri arasında giderek daha fazla yer edinmektedirler. Ekonomik Kalkınma ve İşbirliği Örgütü'nün (OECD) 2023 yılına dair yapılan araştırması, KOBİ'lerin özellikle istihdam yaratmada ciddi bir rol oynadığını vurgulamaktadır. Yenilik yaratma ve bir katalizör görevi görerek ortaya çıkarılan yenilikleri yayma misyonu nedeni ile ekonomik kalkınmanın önemli bir parçası olarak görülen KOBİ'lerin inovatif faaliyetlerinin desteklenmesi önemlidir. Bu noktada yenilikleri koruma yöntemleri (appropriability methods) de aynı derecede önem arz etmektedir. Bu yöntemler inovatif faaliyetlerin sonucunda ortaya çıkan yenilikler üzerinde kontrol mekanizması görevi görmektedir. Bu tezde, bu yöntemler literatürde yer aldığı şekliyle formel ve enformel olarak sınıflandırılmıştır. Formel yöntemler, patent, faydalı model, marka, endüstriyel tasarım, telif hakkı gibi fikri ve sınai mülkiyet haklarını içermektedir. Enformel yöntemler ise, ilk olmanın avantajı (first-mover advantage), lider olmanın avantajı (lead-time advantage), tamamlayıcı satışlar, ticari sır, gizlilik anlaşmaları ve yayın yapma gibi metotlardan oluşmaktadır.

Avrupa Birliği Fikri Mülkiyet Ofisi'nin (EUIPO) 2022 Raporu'na göre, Fikri ve Sınai Mülkiyet Hakları'na (FSMH) sahip olan KOBİ'lerin yenilik geliştirme oranı %77 iken, FSMH'ye sahip olmayanlar için bu oran %57'dir. Dolayısıyla, KOBİ'leri yenilik yapmaya teşvik eden yenilik koruma yöntemlerini – bu yöntemlerin hangilerinin, hangi amaçla ve ne kadar etkin kullanıldığını– araştırmak giderek daha önemli hale gelmektedir. Bu doğrultuda bu tez, KOBİ'lerin inovasyon faaliyetleri sonucunda hangi yöntemleri tercih ettiklerini ve bu tercihin ardındaki nedenleri araştırmaktadır.

1. Tezin Amacı ve Katkısı

OECD Raporu'na (2023) göre, Türkiye'deki işletmelerin %99, 8'ini KOBİ'ler oluşturmakta, ayrıca KOBİ'ler istihdamın %75'ini sağlamakta ve ihracata %58 oranında katkıda

bulunmaktadır (OECD, 2023). Dolayısıyla, KOBİ'ler Türkiye'nin ekonomik kalkınmasında önemli bir rol oynamakta, istihdam yaratımı ve küreselleşmeye önemli ölçüde katkı sağlamaktadır. Ekonomide artan önemlerine rağmen, KOBİ'lerin yenilikçi faaliyetleri ile ortaya çıkan yeniliklerin koruma yöntemlerine ilişkin yapılan araştırmalar nispeten sınırlıdır. Bunun yanında, mikro işletmeler, KOBİ'lerin gelişiminde ciddi bir pay sahibi olmasına rağmen (OECD, 2023), bu mikro işletmeler ulusal ve uluslararası alanda yapılan yenilik ölçüm anketlerinde göz ardı edilmiştir (Akçomak & Kalaycı, 2016). Başka bir deyişle, genellikle 10'dan az çalışanı olan mikro işletmelerin yenilik faaliyetleri ve FSMH kullanımlarına ilişkin bilgiler yenilik anketlerinde yer almamaktadır. Bu nedenle, mikro işletmelerin yenilik faaliyetleri ve FSMH kullanımlarına değerlendiren araştırmalar yetersiz kalmıştır.

Tezin bir diğer katkısına temel oluşturan bir başka tespit, akademik çalışmalarda marka, endüstriyel tasarım ve telif hakkı gibi yenilik koruma yöntemlerinin, patentlere kıyasla daha az ilgi görmesidir. Ancak, firmalar zaman zaman aynı inovasyon için farklı yöntemleri bir arada kullanmayı tercih edebilmekte ya da farklı inovasyonlar için birden çok aracı kullanmaktadırlar (Lopez, 2009). Türkiye'de yapılan çalışmaların çoğu, firmaların patent mekanizmasını kullanımına odaklanmıştır (Akovalı, 2003; İçin, 2022). Ayrıca, firmaların FSMH kullanımlarına ilişkin istatistiksel verilere sahip olsak da enformel yenilik koruma yöntemlerinin kullanımına dair resmi bir veriye ulaşmak mümkün değildir. Bu nedenle, firmaların hangi enformel yenilik koruma metotlarını tercih ettikleri nitel araştırma yöntemleri kullanılarak tespit edilebilmektedir. Türkiye'deki KOBİ'lerin inovasyon süreçlerinin hangi noktasında ve neden bu mekanizmaları kullanmayı tercih ettiklerine ilişkin bir çalışma olarak bu tez literatüre bu anlamda bir katkıda bulunmaktadır. Diğer taraftan, bu tez görüşülen KOBİ'lerin farklı yenilik koruma yöntemlerini nasıl kombine ettiklerini ve bu yöntemlerin nasıl etkileşime girdiklerini anlamayı hedeflemektedir. Bu hedef kapsamında, yenilik koruma metotlarının daha etkin kullanılması ile bu metotların kullanım süreçlerinin kolaylaştırılmasını amaçlayan politika önerileri de sunulmaktadır.

Tezde tek bir sektöre odaklanılmamıştır, bununla birlikte, görüşülen KOBİ'lerin çoğunluğu yazılım sektöründe yer almaktadır ve bu nedenle tez, bu sektöre dair değerli içgörüler sağlamakta ve tezin önemli katkılarından birini oluşturmaktadır. Ayrıca, görüşülen 29 firma arasında, ana sektör olarak yazılım sektöründe yer almalarına rağmen, savunma, eğitim, tıp ve iletişim gibi farklı alanlarda faaliyet gösteren firmalar da bulunmaktadır. Bu çeşitlilik, bu metotların farklı alanlarda nasıl kullanıldığına dair bir perspektif sunulmasına yardımcı olmaktadır.

Sonuç olarak, bu tez, *"Yenilikçi KOBİ'ler yenilik koruma metotlarını nasıl belirlemektedir?"* sorusuna ve şu alt sorulara yanıt aramayı hedeflemektedir*: "KOBİ'ler formel ya da enformel yenilik koruma metotlarından hangilerini tercih ediyorlar? Bu tercihlerinde etkili olan faktörler nelerdir?"* Bu tez, Türkiye'deki yenilikçi KOBİ'lerin yenilik koruma metotları ile olan etkileşimlerini hedef alan ilk araştırmadır. KOBİ'lerin yenilik faaliyetleri kapsamında yenilik koruma metotlarından hangilerini ve neden tercih ettiklerine dair soruların yanıtlarını arayarak, KOBİ'lerin yenilikleri ile formel ve enformel yenilik koruma metotlarını nasıl ilişkilendirdikleri, bu metotları kullanmanın ya da kullanmamanın getirdiği faydalara veya yarattığı sorunlara dair kapsamlı bir çerçeve çizmeyi amaçlamaktadır.

2. Tezin Metodu

Nitel araştırma yöntemlerinden biri olan yarı yapılandırılmış mülakat tekniği tezin metodu olarak belirlenmiştir. Bu kapsamda, Ankara'da bulunan diğer teknokentlere kıyasla daha çok patent sahibi girişimcinin yer aldığı Orta Doğu Teknik Üniversitesi (ODTÜ) Teknokent'te (Çakır, 2023) faaliyet gösteren 29 firma ile yarı yapılandırılmış mülakat tekniği ile görüşmeler gerçekleştirilmiştir.

"Küçük ve Orta Büyüklükteki İşletmelerin Tanımı, Nitelikleri ve Sınıflandırılması Hakkında Yönetmelik" kapsamında görüşme yaptığım tüm firmaların 250'den az çalışanı olması, bunların KOBİ olarak nitelendirildiğini göstermektedir.

Firmaların faaliyetlerini sınıflandırmak için NACE kodlarını kullanılmıştır. Görüşme talebime olumlu yanıt veren yirmi dokuz firmadan on dokuzu, "62.01.01/Bilgisayar programlama faaliyetleri" NACE koduna sahiptir. Ancak, bu firmalar çeşitli alt sektörlerde faaliyet göstermektedir. Örneğin, 62.01.01 NACE koduna sahip bir firma otomotiv sektöründe faaliyet gösterirken, bir diğeri sağlık sektöründedir. Ayrıca, görüşülen firmalar arasında savunma, nanoteknoloji, akustik, telekomünikasyon ve güvenlik alanlarında hizmet veren farklı NACE kodlarına sahip on firma da bulunmaktadır.

"Yenilikçi KOBİ'ler yenilik koruma metotlarını nasıl belirlemektedir?" araştırma sorusu çerçevesinde 42 soru (27 ana ve 15 alt soru) hazırlanmıştır. 13 görüşme yüz yüze yapılırken, 16 görüşme online olarak gerçekleştirilmiş, toplamda 29 KOBİ ile mülakat yapılmıştır.

Mülakatlar sonucunda ses kayıtları deşifre edilerek transkripsiyon dokümanlarına dönüştürülmüş, bu dokümanlar nitel ve karma yöntem araştırmalarında kullanılan

MAXQDA analiz yazılımına aktarılarak anlamsal kodlama işlemi gerçekleştirilmiştir. Yapılan analiz sonucunda toplam 148 kod oluşturulmuş, bu kodlara dayalı olarak temalar ve tema bileşenleri elde edilmiştir. Bu temalar bulgular bölümünde yer almaktadır.

3. Bulgular

Nitel analiz sonuçlarına göre, mülakat yapılan 29 KOBİ'den 28'inin en az bir marka başvurusu bulunmaktadır. Formel metotlar arasında en çok firma tarafından tercih edilen yenilik koruma metodu markadır, bunu, 16 firma ile patent, 6 firma ile telif hakları ve 5 firma ile endüstriyel tasarımlar takip etmektedir. En az sahip olunan FSMH türü ise, 3 firmanın sahip olduğu faydalı modeldir.

Enformel metotlar arasında ise, en çok kullanılan yöntem gizlilik anlaşmalarıdır. 29 KOBİ hem firma çalışanlarıyla hem de ortak projeler geliştirdikleri şirket ya da kuruluşlarla gizlilik anlaşmaları yaptıklarını belirtmişlerdir. Gizlilik anlaşmalarını 21 firma ile ticari sır izlemektedir. Yüksek düzeyde örtük bilgi içeren ürünler geliştiren firmalar, ticari sır metodunu daha sık tercih etmektedir. Ancak, bu metot güçlü bir hukuki koruma sağlayamamakta, firmalar, çalışanların veya hatta ortakların firmayı terk etmesi durumunda, bilgi transferinin gerçekleşeceğini ve böylelikle geliştirilen yeniliklerin kopyalanmasının yolunun açılacağının farkındadırlar. Bu nedenle, firmalar bu açıkları gizlilik anlaşmaları aracılığıyla telafi etmeye çalışmaktadır. Bu sebeple, ticari sır mekanizmasını kullananlar da dahil olmak üzere tüm firmalar, çalışanlar, danışmanlar ve/veya iş birliği yaptıkları şirketlerle gizlilik anlaşmaları imzalamayı tercih etmektedir. Bu metotlara ek olarak görüşülen 29 firma içerisinden 15 firma üniversitelerle yürüttükleri Ar-Ge proje sonuçlarını yayın yaptıklarını belirtmişlerdir. Bu anlamda yayınlanan makalenin içerdiği bilgilerle bağlantılı olarak benzeri bir ürün geliştirmek isteyen rakip firmalar bakımından patent başvuru şartlarından olan yenilik kriterinin gerçekleşmesi engellenebilecektir. Çoğu yazılım firması bu şekilde yeniliklerini korumayı tercih etmektedir.

28 KOBİ marka başvurusunda bulunmayı tercih etmiştir. Diğer formel metotlara göre daha çok tercih edilmesinin ilk sebebi firmaların Ar-Ge faaliyetlerinin sonucunda ortaya koydukları yeniliğin kopyalanmasını engellenmektir. Diğer yandan, markayı piyasa bazlı etkileri yaratabilecek bir metot olarak görmekte, bir pazarlama aracı olarak kullanmaktadırlar. Ayrıca marka, patente konu olabilecek bir Ar-Ge çıktısı üretemeyen yazılım firmalarının daha çok tercih ettiği bir metot olarak karşımıza çıkmaktadır. Marka

başvuru ve takip süreçlerinin daha kolay ve daha az maliyetli olması da firmaların bu tercihlerinin altında yatan nedenlerden biridir.

Firmaların patent başvurusu yapma kararı, Ar-Ge faaliyetlerinin patentlenebilir bir yenilik ile sonuçlanıp sonuçlanmadığına, bu yeniliğin içerdiği örtük bilgi miktarına, firmaların FSMH'ye ilişkin görüşlerine ve başvuru süreçlerinde karşılaşılan zorluklara bağlı olarak değişmektedir. Nitel analiz sonucunda firmaların FSMH'ye ilişkin görüşlerine ve başvuru süreçlerinde karşılaştıkları zorluklara ilişkin oluşturulan kodlar Ek-A'da yer almakta olup, bu kodlara bağlı olarak geliştirilen temalar ile tema bileşenleri Tablo 1'de gösterilmektedir.

Tablo 1. KOBİ'ler için Yenilik Metotlarına İlişkin Sorunlar

Tema Bileşenleri	**Temalar**
Hukuki Korumanın Etkinsizliği	Hukuki Koruma Konusunda Güvensizlik Ticari Sırların Kötüye Kullanımı FSMH İhlali Gizli Patent
İdari Zorluklar	Bürokratik Tembellik Patent İnceleme Sürelerinin Uzunluğu
Bilgi Eksikliği	FSMH Konusunda Bilgi Eksikliği FSMH Desteklerine ilişkin Asimetrik Bilgi
Firma Altyapısı	Sektörel Etmenler Zaman ve Personel Yetersizliği
FSMH Başvuru ve Takip Maliyetleri	FSMH Başvuru Maliyeti - Uluslararası Başvurular FSMH Takip ve Dava Maliyeti
Çıkar Çatışması	Çalışan-İşveren Patent Hak Sahipliği İkilemi Üniversite- TÜBİTAK-KOBİ Patent Hak Sahipliği İkilemi Savunma Sanayi- KOBİ Patent Hak Sahipliği İkilemi

4. Yenilik Koruma Yöntemlerinin Efektif Kullanımı

29 KOBİ ile yapılan mülakatlar ile yapılan nitel analiz sonucunda KOBİ'lerin, FSMH'yi öncelikle yeniliklerinin taklit edilmesini önlemek ve ticarileştirme yoluyla ekonomik fayda

elde etmek, firma değerlemesini artırmak ve özellikle markanın pazarlama etkisinden yararlanmak için bu hakları tercih ettikleri anlaşılmıştır. Bu sonuç, Avrupa Patent Ofisi'nin (EPO) 2023 Raporu ile uyumludur. Raporda, "ticari amaçlı kullanım" ve "taklitten korunma" nın patent başvurusu yapmanın iki temel motivasyonu olduğu ve bu motivasyonların özellikle KOBİ'ler için daha önemli olduğu vurgulanmaktadır.

Yapılan nitel analiz sonucunda bu nedenler dışında FSMH, ticari sır, gizlilik anlaşmaları, yayın yapma gibi enformel yöntemlerin neden seçildiğine ilişkin elde edilen temalar ve tema bileşenleri Tablo 2'de gösterilmektedir. Bu etmenler arasında Ar-Ge sonucunda ortaya çıkan yeniliğin veya bu yeniliğin üretilmesine ilişkin yöntemin içerisinde bulunan örtük bilgi seviyesinin ve bu bilginin paylaşılıp paylaşılmamasına ilişkin görüşlerin de firmaların yenilik koruma yöntemlerini belirleyen etmenlerden bir olması dikkat çekmektedir.

Mülakat yapılan KOBİ'ler arasında yeniliklerini korumak için patentleri etkisiz bir metot olarak gören ancak, yine de patent başvurusu yapan firmalar olduğu görülmüştür. Bu firmaların motivasyonu, patentleri stratejik amaçlarla kullanmaktır. Bu bağlamda, daha büyük firmalara karşı pazarlık gücü elde etmek veya potansiyel FSMH ihlali davalarından kaçınmak istedikleri anlaşılmaktadır.

Tablo 2. KOBİ'ler için Yenilik Koruma Metotlarının Etkileri

Tema Bileşenleri	**Temalar**
FSMH Koruma Kapsamı	Hukuki Koruma Taklitlerin Engellenmesi
Finansal Kazanç	Ticarileştirme Başlangıç Sermayesi Firma Değerlemesi Vergi Muafiyeti
Yeniliğin Güçlendirilmesi	Ar-Ge Teşviki - Diğer Organizasyonlarla İş Birliği Kamu Teşvikleri
Küreselleşme	İhracat- Uluslararası FSMH İlişkisi
Pazarlama	Reklam Pazara Giriş Engeli Prestij
Patentlerin Stratejik Kullanımı	Büyük Firmalara Karşı Avantaj Sağlaması Davaların Önlenmesi
Bilginin Doğası	Örtük ve Açık Bilgi

Yenilik koruma yöntemlerinin efektif kullanımı, bu hakların kullanım oranları ile orantılı olmak durumunda değildir. Nitekim patent sahibi olan çoğu firmanın bu haklarını amaçladıkları şekilde ticari fayda sağlama amaçlarını tam olarak yerlerine getiremedikleri tespit edilmiştir. Patent sahibi olan KOBİ'lerin neredeyse tamamı patentlerini lisanslama isteğini ifade etmesine rağmen, hiçbiri bunu başaramamıştır. Patent sahibi olan on altı KOBİ'den iki firma patentleri sayesinde başlangıç sermayesi almayı başarmış ancak, bu firmalar patentli ürünlerini ticarileştirmede başarılı olamamıştır. Buna karşın, devlet kurumları, savunma sanayi veya Bakanlıklarla iş birliği yapan bazı firmalar, desteklenen Ar-Ge ve üretim girişimleri sayesinde patentli ürünlerini başarıyla ticarileştirmiştir. Ayrıca, bu KOBİ'ler patent aldıkları Ar-Ge çıktısına ilişkin olarak marka başvurusunda da bulunmuş ve markayı bir reklam unsuru olarak kullanabilmişlerdir. Bir anlamda patent ve marka birbirinin tamamlayıcısı olmuş, böylece bu KOBİ'lerin yenilik koruma metotlarından daha efektif faydalanmaları mümkün olmuştur.

5. Politika Önerileri ve Değerlendirme

29 KOBİ ile yapılan mülakatlar ve nitel analiz sonucunda, KOBİ'lerin patent, marka, faydalı model, telif hakkı ve endüstriyel tasarım başvuruları bulunduğunu, bunun yanında ticari sır, gizlilik anlaşmaları ve/veya makale yayınlama gibi farklı metotları da tercih ettikleri tespit edilmiştir. Görüşülen firmalardan bazıları bu yöntemlerden sadece birini tercih ederken, bazıları birden fazla yöntemi aynı anda kullanmaktadır. Ancak çoğu KOBİ'nin özellikle patent hakkının sağlayabileceği avantajlardan etkin bir şekilde yararlanamadıkları, bu nedenle patent hakkının KOBİ buluşlarını koruma ve yenilik potansiyellerini artırma amacını tam olarak gerçekleştiremediği görülmektedir. Bu durumdan yola çıkarak, yenilik koruma yöntemlerinin etkinliğini artırmak için çeşitli politika önerileri ve bu önerilerin uygulanmasında rol oynayacak politika araçları sunulmuştur. Bu önerilerin bir kısmı doğrudan KOBİ cevaplarına dayanarak şekillendirilmiştir. Diğerleri ise nitel analiz sonucunda belirlediğim temalar ve bu temaların bileşenlerine ilişkin olarak sunulmuştur.

5.1. Hukuki Korumanın Etkinliğinin Arttırılması

FSMH'nin geliştirilen yenilikler üzerinde sağladığı geçici tekel hakkı, bu yeniliklerin sahibinin izni olmadan kullanılması, taklit edilmesi ve ticari amaçlarla gelir elde edilmesi durumunda zarar görebilmektedir. Ulusal ve uluslararası pazarda FSMH ile koruma altına alınmış olan yeniliklerin taklit edilmesi ve özellikle bu ihlalleri takip etmekte zorlanan KOBİ'ler açısından bu hakların koruma kapsamının yetersizliğine ilişkin görüşlerin

yaygınlaşmasına sebep olmaktadır. FSMH'ye ilişkin Yasaların güçlendirilmesi amacıyla 6769 sayılı Sınai Mülkiyet Yasası ile 5846 sayılı Fikir ve Sanat Eserleri Kanunu'nun FSMH ihlallerine ilişkin yaptırım kapsamlarının genişletilmesi ve ilgili Yönetmeliklerin ve diğer ilişkili mevzuatın bu yönde değiştirilmesi sunulacak politika araçları arasında yer alabilir. Ayrıca, FSMH ihlali uluslararası bir sorun niteliğinde olduğundan, bu süreçte, uluslararası kuruluşlarla yapılacak iş birliği ile hazırlanacak ortak mevzuatlar da etkili politika araçları olarak kullanılabilir.

FSMH'yi korumaya yönelik gümrük önlemleri, 4458 sayılı Gümrük Kanunu'nun 57. maddesi ve Gümrük Yönetmeliği'nin 100 ila 111. maddeleri ile düzenlenmektedir. Mali ve kurumsal açıdan yetersiz olan KOBİ'ler, Çin ve Hindistan gibi ülkelerden gelen taklit ürünlerle rekabet etmekte zorlanmaktadır. Gümrükten geçiş sırasında FMH ihlallerine yönelik denetimlerin artırılması bir çözüm olabilir. Bu bağlamda, gümrük memurlarının sayısı artırılabilir ve onların yanında çalışacak FSMH uzmanları istihdam edilebilir.

Yazılım firmaları, yazılımlarının kopyalanması konusunda ayrı endişelere sahiptir. Piyasada kullanılan yazılımların kopyalanarak ufak değişikliklerle kullanılması ve KOBİ'ler bu ihlalleri takip etmekte zorlanmaktadır. Buna ilişkin olarak, lisanssız yazılım kullanımını tespit etmek ile görevli bağımsız bir kuruluşun kurulması, bu alanda bir politika aracı olarak önerilmektedir.

5.2. KOBİ'lerin Patentlerini Ticarileştirme Potansiyellerinin Arttırılması

Görüşülen çoğu KOBİ, patentli buluşlarını pazarlanabilir ürün veya hizmetlere dönüştürememektedir. Ayrıca, patentlerini lisanslama veya devretme imkânı da bulamamaktadır. Bunun sonucunda, çoğu KOBİ patentli ürünlerinden gelir elde edememiştir. Bu sorunun üstesinden gelmek için, patentli ürünlerin ticarileştirilmesini artırmak ve bu süreci çeşitli politikalarla desteklemek kritik önem taşımaktadır. Bu hedef, fikri mülkiyetin ekonomik dönüşümünü hızlandırma adı altında On İkinci Kalkınma Planı'nda (2024-2028) da yer almaktadır.

Mülakat yapılan KOBİ'lerin karşılaştığı en büyük sorunlardan biri, patentli ürünlerini üretmek ve satmak için bir seri üretim bandına sahip olmamalarıdır. Birçok KOBİ, seri üretim kapasitesine sahip firmalara ulaşamadıkları veya onlarla anlaşamadıkları için buluşlarını ticarileştirememektedir. Bu sorun, özellikle yüksek teknolojili ürünlerde daha yaygındır. Bu nedenle, KOBİ'lerin, bulundukları sektörlerde seri üretim kapasitesine sahip

büyük firmalarla daha sık iş birliği yapmaları ve bu doğrultuda Teknoloji Transfer Ofislerinin (TTOs) bu bağlantıları kolaylaştırmada daha aktif rol alması önemlidir. Bu iş birliğini arttıracak başka bir politika aracı KOBİ'lerden lisans alarak patentli ürünleri üreten büyük firmalara sağlanacak vergi indirimi veya muafiyeti olabilir. Bunun yanı sıra, Ankara yakınlarında Gebze'deki Bilişim Vadisi gibi bir inovasyon merkezi oluşturmak, firmalar arasındaki iletişimi geliştirebilir.

Ayrıca, Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TÜBİTAK), KOBİ'lerin lisans anlaşması yapmaları durumunda masraflarının bir kısmını karşılamaktadır; ancak birçok firma bu destekten haberdar değildir. TTO'lar veya görevlendirilen teknopark temsilcileri aracılığıyla TÜBİTAK 1702 Patent Tabanlı Teknoloji Transferi Destek Çağrılarının takibi yapılabilir ve KOBİ'ler düzenli olarak bilgilendirilerek teknoloji transferi kolaylaştırılabilir.

5.3. Yenilik Koruma Metotlarına ve Kamu Desteklerine İlişkin Bilginin Arttırılması

Aynı ekosistem içinde faaliyet göstermelerine rağmen, KOBİ'ler arasında hem FSMH hem de kamu destekleri konusunda belirgin bir bilgi asimetrisi mevcuttur. Bu bilgi asimetrisini azaltmak için, aynı sektörde yer alan ve FSMH başvurusunda bulunmuş olan firmalar ile başvuru ve bilgi sahibi olmayan firmalar ODTÜ TTO veya ODTÜ Teknokent kampüs temsilcileri aracılığı ile bir araya getirilebilir.

Bilgi asimetrisini azaltmaya yönelik bir diğer öneri, ODTÜ Teknokent firmaları için verilen eğitimlerin artırılmasıdır. TÜRKPATENT (Türk Patent ve Marka Kurumu) veya patent/marka vekilleri tarafından, sektöre özel pratik eğitimlerin yılda iki kez düzenlenmesi faydalı olabilir. Bu eğitimlerin ücretsiz olması, katılımı artıracaktır. Ayrıca, çevrimiçi kaynaklar geliştirilerek, kılavuzlar ve öğretici videolar ile KOBİ'lerin bilgi seviyesi arttırılabilir.

Buna ek olarak, TÜRKPATENT, TÜBİTAK ve T.C. Küçük ve Orta Ölçekli İşletmeleri Geliştirme ve Destekleme İdaresi Başkanlığı (KOSGEB) ile iş birliği içinde atölye çalışmaları ve seminerler düzenlenerek, FSMH ve kamu destek programlarına ilişkin bilgilerin yayılması sağlanabilir ve KOBİ'lerin sektörel ihtiyaçlarına yönelik çözümler geliştirilebilir. Bu kapsamda TTO'lar, EPO, Dünya Fikri Mülkiyet Örgütü (WIPO) ve EUIPO gibi uluslararası kuruluşların sunduğu ücretsiz çevrimiçi eğitimleri takip ederek firmaları bilgilendirebilir. Ayrıca, ODTÜ Teknokent kampüslerinde, Avrupa Birliği FSHM Yardım Masası'na benzer KOBİ'lere özgü bilgi merkezlerinin oluşturulması firmalara daha fazla destek sağlayabilir.

FSMH ve alternatif yenilik koruma yöntemlerine ilişkin bilgi ve uzmanlığı artırmak, aynı zamanda yenilik yaratma, koruma ve bundan faydalanma kültürünü oluşturmak amacıyla, ilkokuldan başlayarak bir dizi eğitim programı geliştirilebilir. Çocuklar ve gençler için tasarlanmış materyaller ve uygulamalı eğitimler aracılığıyla, bu yöntemlere aşinalık ve farkındalık artırılabilir. Bu eğitimlerin, WIPO, EUIPO, EPO ve TÜRKPATENT gibi uzmanlaşmış kuruluşlardan eğitim almış uzmanlar tarafından verilmesi önemlidir. Ayrıca, eğitmenleri ve öğrencileri bir araya getiren çeşitli fuarlar, seminerler ve iş birliği projeleri, bu alandaki bilgi ve uzmanlığı daha da geliştirmek için politika araçları olarak değerlendirilebilir.

5.4. Bürokratik Süreçlerin Hızlandırılması

KOBİ'ler için, özellikle kuruluşlarının ilk yıllarında, personel ve finansal kısıtlamalar nedeniyle devlet kurumlarıyla olan etkileşimler büyük önem taşımaktadır. Bu bağlamda, firmaların kamu destek programlarına kolayca erişim sağlayabileceği kanalların artırılması kritik bir hale gelmektedir. Bu nedenle, TÜBİTAK ve KOSGEB gibi kuruluşlar tarafından yürütülen patent ve marka teşvik programlarının operasyonel süreçlerinin daha kolay izlenebilir hale getirilmesi gerekmektedir. Bu doğrultuda, web sitelerinde detaylı akış şemaları sunulması ve süreç hakkında kullanıcı geri bildirimlerinin toplanacağı bir mekanizma kurulması firmalar için faydalı olacaktır.

Ayrıca, KOBİ'ler ile kurumlar arasındaki iş birliğini artırmak ve bürokratik işlemleri kolaylaştırmak adına, destek sağlayan kamu kuruluşları tek bir platformda birleştirilebilir ve KOBİ bilgileri bu platforma kaydedilip periyodik olarak güncellenebilir.

Mülakat yapılan KOBİ'lerin karşılaştığı bir diğer sorun ise patent inceleme sürelerindeki değişkenliktir. Firmalar, bu sürelerin öngörülemez olmasının geleceğe yönelik planlamalarını zorlaştırdığını bildirmektedir. Patent inceleme sürelerinin öngörülebilirliğini artırmak için daha fazla patent uzmanı istihdam edilebilir. Ayrıca, yapay zeka destekli programların kullanımı, inceleme sürelerini kısaltarak sürecin daha verimli ve şeffaf hale getirilmesine katkı sağlayabilir.

5.5. FSMH Başvuru ve Takip Maliyetlerinin Azaltılması

Mülakat yapılan KOBİ'ler için özellikle ulusal ve uluslararası patent başvuru ve takip maliyetleri ile uluslararası marka başvuru süreçlerinin maliyetli ve uzun olması ciddi bir sorun teşkil etmektedir.

FSMH Başvuru ve Takip Maliyetlerinin Azaltılmasına yönelik olarak başvuru sahibi firmanın büyüklüğüne ve karlılık düzeyine dayalı olarak kademeli olarak artan FSMH başvuru ücreti sistemi getirilebilir. Ayrıca, EUIPO tarafından uygulanan KOBİ fonlarına benzer şekilde, belirli kriterleri karşılayan KOBİ'lerin FSMH başvuru ve takip süreçlerinde desteklenmesini sağlayacak fonlar oluşturulabilir.

5520 Sayılı Kurumlar Vergisi Kanunu'nun 5/B maddesinde yer alan *"Sınai Mülkiyet Haklarında İstisna"* hükmü, Türkiye'de üretilen ürünlerin satışından elde edilen kazançların patentli veya faydalı model belgeli buluşa atfedilen kısmının Kurumlar Vergisi'nden muaf olmasını düzenlemektedir. Ancak, görüşülen birçok KOBİ bu hesaplamanın yapılmasının kendileri için zaman maliyeti yarattığını, özellikle donanım ile yazılım üretimini bir arada yapan firmalar açısından elde edilen kazançların patentli veya faydalı model sahibi buluşa atfedilen kısmının hesaplamasının mümkün olmadığını dile getirmektedir. Bu sorunun çözümüne yönelik olarak kullanılabilecek bir politika aracı, patentli bileşenin elde edilen kazanca etkisini belirlemek üzere ilgili Bakanlıkta konu üzerinde uzmanlaşmış personellerin istihdam edilmesi olabilir.

Ayrıca, bir diğer politika aracı olarak, TÜBİTAK 1602 Patent Destek Programı kapsamı genişletilerek uluslararası patent başvuruları vekil ücretlerini de karşılayacak şekilde düzenlenebilir. Bununla birlikte, TÜBİTAK-KOBİ ortak projelerinde KOBİ'lerin patent başvuru, araştırma ve inceleme masrafları da proje bütçeleri içine bir maliyet kalemi olarak eklenebilir.

5.6. FSMH Sahipliğine İlişkin Anlaşmazlıkların Çözülmesi

29 KOBİ ile yapılan mülakatlar ve nitel analiz sonucunda hem TÜBİTAK, üniversiteler ve KOBİ'ler ile yürütülen ortak projelerde hem de savuma sanayi şirketleri ile yürütülen projelerde KOBİ'ler çoğunlukla FSMH hak sahipliğine ilişkin sıkıntılar yaşamaktadır. FSMH hak sahipliğinin hangi tarafa ait olacağı KOBİ'ler için bir sorun olarak ortaya çıkmaktadır. Bu soruna ilişkin olarak, ortak hak sahipliği bir politika aracı olarak kabul edilebilir ve ortak projelerde ortaya çıkan buluşların patent başvuru sahibi olarak KOBİ ve diğer proje sahipleri gösterilebilir.

Ortak patent sahipliği konusunda üniversiteler, TÜBİTAK, KOBİ'ler ve savunma sanayi firmaları arasında iş birliği sağlanarak her proje için rehberlik teşkil edecek model sözleşmeler oluşturulabilir. Ayrıca, ortak projelerde FSMH sahipliği konusunda

yaşanabilecek anlaşmazlıkların çözümü için arabuluculuk ve tahkim mekanizmaları kullanılabilir.

Diğer taraftan, görüşülen KOBİ'ler için çalışan buluşçuların buluşlarının ticarileştirilmesi durumunda tam olarak sağlayacakları kazanç miktarının belirlenmesi özellikle bazı sektörler açısından daha zor olmaktadır. Örneğin, dayanıklı tüketim malları sektöründe bir buluşun sağladığı gelirin hesaplanması daha kolayken, savunma sanayinde buluşa atfedilen katma değer ve gelir ölçeklendirmesi daha zordur. Bu nedenle, çalışanlar ile işverenler arasında buluştan elde edilecek gelir dağılımına yönelik daha açık düzenlemelerin yapılabilir. 6769 sayılı Sınai Mülkiyet Kanunu'nun 113-120. maddeleri ve ilgili Yönetmelik ile Çalışan Buluşları Rehberi'nin gözden geçirilerek daha detaylı ve sektör bazlı düzenlemeler hazırlanabilir. Ayrıca, hükümetin buluştan elde edilen gelirin önemli bir kısmının doğrudan buluşçuya ayrılması şartıyla KOBİ'lere teşvikler sunması da faydalı olabilir.

6. Sonuç

ODTÜ Teknokent'te faaliyet gösteren 29 KOBİ, formel ve enformel yenilik koruma metotlarını bir ya da bir den fazlasını kullanmayı tercih etmişlerdir. Çoğu firma, enformel metot olarak gizlilik anlaşmasını ve formel metot olarak da marka başvurusu yapmayı tercih etmiştir. Dikkat çeken bir husus, toplam başvuru sayısı olarak bakıldığında formel metotlar arasında patent başvurularının diğerlerine kıyasla daha fazla olmasıdır. Firmaların neredeyse yarısının patent başvurusu olduğu düşünüldüğünde, firmaların patent yoğunluklarının diğer formel haklara kıyasla daha yüksek olduğunu söylemek mümkündür. Özellikle, küçük ölçekli firmalar, orta ölçekli firmalardan daha fazla patent başvurusunda bulunmuştur. Bu firmalar içerisinde medikal sektörde faaliyet gösteren iki firmanın patent know-how'ının diğer firmalara kıyasla daha yüksek olduğu, Ar-Ge başlangıcında patent araştırması yaparak patent verilerini projelerine yön veren bir unsur olarak kullanmaları ve böylelikle yüksek patent başvuru sayılarına sahip olmaları da ilgi çekici bir başka sonuçtur.

Yazılım sektöründe yer alan çoğu firma genellikle marka ve ticari sır metotlarını birlikte kullanmayı tercih etmektedir. Bu firmaların Ar-Ge çıktılarının yazılım kapsamında değerlendirilmesi ve Türkiye'de yazılımların sadece telif hakkı ile korunması bu firmaların patent başvurusunda bulunamamaları doğal sonucunu oluşturmaktadır. Diğer taraftan bu firmalar, kodlarının günden güne değişebilmesi nedeniyle telif hakkı korumasının yenilikleri için yeterli korumayı sağlayacağına inanmamaktadır. Bu firmalardan bazılarının, formel yöntemlerden ziyade Ar-Ge çıktılarını yayınlamayı tercih ettikleri görülmüştür.

Patent hakkı, başvuru sahibine başvurduğu yenilik üzerinde geçici bir tekel hakkı sağlamakta, bu şekilde icadı ortaya koyan kişinin daha fazla üretmesini ve yenilik üretmesini teşvik etmeyi amaçlamaktadır. Ancak görüşülen KOBİ'ler içerisinde sadece üç firma icadı gerçekleştiren çalışanın ya da çalışanların ismini başvuru sahipleri arasına yazmış ve sadece dört firma, icadı gerçekleştiren çalışanlara teşvik vermiştir. Bu durumda, icadı gerçekleştiren çalışanların patent hakkının sağlayacağı geçici tekel hakkından faydalanamadığı ve patentlerin lisanslanması durumunda ortaya çıkacak kazançtan yeteri kadar pay sahibi olamayacağı sonucuna varılabilir. Patent hakkının yeniliği geliştirenlere münhasır haklar vererek firmaların yenilik yaratma kapasitelerini arttırmayı ve çalışanları yenilik yaratmaya teşvik etmeyi amaçladığını, ancak KOBİ'ler açısından bakıldığında bu durumun firmalar içinde motivasyon kaybı yarattığı ve bu durumun daha az patent başvurusuna ya da yeniliklerin ticari sırlarla korunmasına yol açtığını söylemek mümkündür.

Mülakat yapılan KOBİ'lerin bir kısmı savunma sanayii projelerinde yer almakta ve bu alanda faaliyet gösteren büyük çaplı şirketlerle ortak çalışmalar yürütmektedir. Bu projelerde ortaya çıkan yeniliklerin patent hakları savunma firmalarına ait olmakta, bu da KOBİ'lerin proje sürecinde ortaya koydukları yeniliklerin sağlayacağı münhasır haklardan ve ekonomik getiriden tam olarak yararlanamamaları sonucunu doğurmaktadır. Sonuç olarak, bu firmalardaki mucitler yeniliklerinden tam fayda sağlayamamakta ve patentlerin etkin bir koruma aracı olmadığını göstermektedir.

Tezin ulaştığı bir diğer önemli sonuç, patent sahibi KOBİ'lerin, patent başvurusunda bulundukları ürünlerini seri üretim bandına sokabilecek firmalara ulaşmakta zorlanmalarına ilişkindir. Görüşülen KOBİ'lerin bir kısmı patentli ürünlerine ilişkin ölçeklendirme, tasarım ve üretim maliyetlerini üstlenebilecek şirketlere ulaşamadıklarından patentli ürünlerini ticari değere dönüştürememektedir. Bu firmalar, üretim, satış ve dağıtım kanallarına ulaşmakta zorlanmakta, sonuç olarak ticarileştirilemeyen patentler, patent maliyetlerinin firmalar üzerinde ayrı bir mali yük yaratmasına sebep olmaktadır. Patent mekanizmasının etkinliğini azaltan bu durum, aynı zamanda firmaların yeniliklerini koruma metotlarının kullanımına ilişkin motivasyonunu da azaltmaktadır.

Ulaşılan sonuçlara ilişkin olarak, yenilik koruma metotlarına ve bu metotların daha etkin kullanımına ilişkin olarak çeşitli politika önerileri ve bu önerilerin hayata geçirilmesini kolaylaştıracak politika araçları sunulmuştur. Mülakat yapılan KOBİ'lerden yola çıkarak yenilikçi faaliyetler sürdüren diğer KOBİ'lerin de yenilik koruma metotlarını daha etkin bir

şekilde kullanabilmesi ve bu metotların sağladıkları münhasır haklar ile yaratacakları ekonomik getirinin firmaların yenilik yaratma kapasitelerini arttırması amaçlanmaktadır.

Sonuç olarak, bu tez, yenilikçi KOBİ'lerin yenilik koruma metotlarına ve bu metotların etkin kullanımı üzerine bilindiği kadarıyla Türkiye'de yapılan ilk çalışmalardan biridir, ancak mikro düzeyde ve sektörel bazda yapılacak kalitatif çalışmaların konuya ilişkin daha kapsamlı ve spesifik politika önerileri sunulmasını sağlayacağı düşünülmektedir. Bu anlamda bu tez, gelecekteki araştırmalar için bir çerçeve çizmekte ve bir rehber niteliği taşımaktadır.

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