

# **Innovation in an Emerging Economy: Firm-level Evidence from Turkey**

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*Good things come to those who ~~wait~~ work.*

# Abstract

The emerging economy (EE) of Turkey is one of the leading economic and financial centers between Europe and Asia. The country's unique location and close proximity to both economically advanced as well as emerging neighboring markets provides many business opportunities for its domestic firms and multinational enterprises (MNEs). Nevertheless, the globalized world economy and increasing foreign direct investments (FDIs) from MNEs have intensified the economic competition within the domestic market and put additional pressure on Turkish firms. Turkey is thus facing the major challenge of simultaneously supporting its domestic corporate landscape in upgrading and innovation strategies, increasingly investing in a knowledge and technology-based economic development and continuing to be an attractive location for further FDIs. Therefore, the questions arise as to how different types of firms operate in this highly dynamic environment, what kind of internationalization and innovation strategies firms pursue and what role university-industry collaborations (UICs) and national policy play. Employing a mixed-method approach to answer these research questions, I hence conduct a firm-level survey of the manufacturing industry in Istanbul and interview several local research and development (R&D) experts from universities, firms and politics. Consequently, I examine the regional setting for innovation activities of the differentiated corporate landscape in Istanbul. With this thesis, I thus contribute to the understanding of distinct firm characteristics, varying internationalization motives and usage of domestic political support, the interplay between R&D resources, innovation success and internationalization strategies, as well as perceived barriers of using UICs for achieving innovation. Moreover, the study provides separate findings for three diverse types of firms: domestic Turkish firms, Turkish MNEs and foreign MNEs. In this regard, domestic Turkish firms notably benefit from tax incentives and increased contact to collaboration partners and workforce, primarily target advanced markets and use their internal R&D resources to successfully achieve innovation. Turkish MNEs particularly profit from investment and export incentives, target economically advanced markets and use their internal R&D capacities as well as external market knowledge for achieving innovation. Foreign MNEs likewise benefit from investment and export incentives, from establishing political connections in Turkey and make use of external market knowledge as a key factor for their innovation success. In terms of perceived barriers to UICs, insufficient knowledge about UICs opportunities as well as insufficient financial political support or incentives for UICs are the two main obstacles that inhibit the use of UICs for achieving innovation over all types of firms. On basis of the survey results and contextual insights from my interviews, I provide several theoretical and policy implications to the growing literature of the EEs research field.

**Keywords** Emerging Economy, Turkey, Istanbul, Innovation, Research and Development, Multinational Enterprise, Internationalization, University-Industry Collaboration

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# Chapter 1 | Introduction

## 1.1 Motivation and Research Questions

For many years, the emerging economy (EE) of Turkey has been the leading economic and financial center connecting Southeastern Europe and the Middle East, and is currently undergoing a transformation from an emerging to an industrialized economy. By the end of 2017, Turkey was even among the fastest growing economies worldwide. Based on its unique location between Europe and Asia and therefore its close proximity to economically advanced Western and emerging Eastern markets, Turkey attracted an increasing amount of foreign direct investments (FDIs) from multinational enterprises (MNEs), including high numbers of MNEs engaging in research and development (R&D) activities.

Nevertheless, the attempted coup in mid-2016, the severe financial shock in mid-2018 as well as the coronavirus initiated crisis in 2020 have challenged the nation's economic situation and have led to uncertainty in its future economic development. Moreover, the globalized world economy spurring FDIs from foreign MNEs has intensified the domestic competition and resulted in upgrading pressures for indigenous firms. The country is thus facing the major challenge of simultaneously investing in a knowledge and technology-based economic development, supporting the domestic corporate landscape in their innovation and upgrading strategies, and continuing to be an attractive location for further FDIs.

With this thesis, I contribute to the understanding of some challenges that arise from this situation. For instance, I investigate how different types of firms are operating in this highly dynamic environment, what kind of innovation and internationalization strategies firms pursue and what role university-industry collaborations (UICs) and national policy play in that respect. The contextual insights from Turkey thus add to the empirical scope of the EEs research field and contribute to theory building in respective settings.

Consequently, the research questions of this thesis are:

- What are the main characteristics of diverse firms in Turkey regarding their usage of domestic political support and their internationalization motives?
- What are the main internal and external R&D resources that positively affect the innovation success and strategies of firms?
- What are the main barriers to using UICs for achieving innovation from the perspective of firms and local R&D experts?

Subsequently, this thesis is structured as follows. Firstly, in the introduction (chapter one), I will elucidate the relevance of conducting research in EEs, because respective countries and the firms that reside in these contexts are particularly affected by global economic changes and resulting upgrading pressures. Moreover, most theories in Economic Geography (EG) and International Business (IB) are derived from industrialized country contexts, meaning that it is unclear how well assumptions derived from research in industrialized nations apply to EEs and if there is a possibility to gain new insights for the generalizability of existing theories and concepts. Secondly, I will characterize the EE setting of Turkey in terms of its economic development and current transformation towards an innovation-oriented economy, and illustrate how the country compares to other EEs. Thirdly, I focus on the city of Istanbul and its surrounding Marmara region, which is the economic and knowledge center in Turkey. By doing so, it becomes evident why this region is an ideal setting for my firm survey. Fourthly, I will show how this study contributes to existing theories in the research fields of EG, IB and economics. Fifthly, I will demonstrate how the survey sample of firms was compiled, which local R&D experts were interviewed and which methods were used for the subsequent data analyses. Sixthly, I elaborate on the overall research framework and the cohesive articles of this thesis.

After the introduction, I present the three articles, which focus on the main research questions that help to understand the constituting factors that influence Turkey's economic situation, its future development and the resulting consequences for different types of firms residing in EEs. Firstly, article one (chapter two) contributes to the understanding of firms' internationalization strategies and their responses to rising upgrading pressures. Particular emphasis lies on the diverse market-seeking motives as well as usages of financial and institutional support. Hereof, I distinguish between three types of firms: domestic Turkish firms, Turkish MNEs and foreign MNEs. Secondly, article two (chapter three) aims to identify the key factors for innovation in Turkey. By doing so, I test the impact of a number of internal and external R&D resources on the innovation success of firms and additionally highlight insights associated with corresponding internationalization strategies. Lastly, in article three (chapter four), I identify collaboration barriers that actually prevent firms' usage of UICs for achieving innovation and thus form a bottleneck to the emergence of UICs in the first place. These findings are verified, complemented and partly contrasted with insights from pre-study interviews with local R&D experts.

In the conclusion (chapter five), I first summarize the main findings of the aforementioned articles and contextualize them into existing studies within the relevant research fields. Consequently, these results lead to several theoretical and policy implications. In the following, I discuss the research limitations of this thesis,

demonstrate national and regional development perspectives and provide some recommendations for future research on similar topics as well as for conducting firm-level studies in an EE context.

## **1.2 Emerging Economies Setting**

The terms emerging markets (EMs) or EEs describe countries that are in the process of industrialization and rapid economic growth (OECD, 2009). In this regard, EEs provide many business opportunities for FDIs and are highly attractive locations, particularly for MNEs from industrialized countries. From the viewpoint of advanced economies, however, investing and operating in these EEs is considered as relatively riskier than in industrialized contexts, based on possible economic, political and currency risks (Guégan et al., 2014) as well as potentially poor legal systems and insufficient infrastructures (Groh & Wich, 2012). Therefore, internationalization strategies or FDI decisions of industrialized market MNEs into EEs are not only based on driving forces concerning their home country context, but relate especially to the host country environment of the target market (Schmiele, 2012).

After times of sustained high growth and high numbers of FDIs, however, many successful EEs find themselves in a period of economic stagnation referred to as the ‘middle-income trap’ (Cai, 2012; Paus, 2012). The term denotes the fact that growth based on low-wage labor alone and mobilizing factors of production – due to rising wages and costs of production – can no longer be sustained and does not improve wealth above certain limits (Krugman, 1994). Therefore, countries facing the middle-income trap need to change their growth model and find ways of increasing the value added of firms and regional economies to raise productivity. The way commonly sought towards reaching this goal is increasing the technological level of domestic productions and foster innovation, meaning to change the qualitative underpinnings of the factors of production and outcomes of production processes (Gereffi, 1999).

In addition, firms in EEs or similar transition contexts are often confronted with various obstacles at their domestic location, compared to firms that operate in economically advanced markets. These are lower levels of social development in health and education, low domestic demand or low-income consumers, technologically fewer developed suppliers, less developed capital markets, weak institutional frameworks or governance infrastructures, resource scarcity and a lack of absorptive capacity as well as overall low levels of technological development or less sophisticated innovation systems (Cuervo-Cazurra, 2012; Cuervo-Cazurra & Genc, 2011; Hoskisson et al., 2000; Ozturk, 2018). Furthermore, increasing FDIs from foreign MNEs into developing or EEs lead to growing competitive pressures within respective host countries. Domestic firms in these contexts thus need to find technology strategies to remain competitive. In this regard,

the development of strong manufacturing capabilities is an ineffective strategy to compete against foreign MNEs from industrialized countries. Therefore, domestic firms are in need to develop innovation capabilities and focus on their core technologies to successfully survive within the domestic market competition (X. Gao et al., 2006).

Nevertheless, increasing competition through FDIs can also be an enhancing factor for the development of domestic firms, as competition initially pressures firms to engage in innovation activities to become more efficient and remain competitive (De Fuentes et al., 2018). For instance, R&D internationalization or investments from MNEs into EEs are featured by MNEs' increasing engagement in frugal innovation. These innovation types are primarily developed by R&D subsidiaries of foreign MNEs, as successful frugal innovations require a strong local engagement or presence in EEs, based on the fact that organizational structures of MNEs are usually geared towards the development of advanced products for industrialized markets (Zeschky et al., 2011). Respective R&D activities of foreign firms in EEs therefore allow for knowledge and technology spillovers to domestic firms. In a study concerning the manufacturing industry in Turkey, Lo Turco & Maggioni (2019) find that technological relatedness and proximity to co-located foreign firms are significantly positive related to the chances of introducing local discoveries by domestic firms. Hereof, knowledge spillovers of foreign MNEs highly depend on their embeddedness within the local market and absorptive capacity of local firms (Lo Turco & Maggioni, 2019). In addition, Güngör & Gözülü (2012) identify several internal and external factors for the innovativeness of Turkish firms and find international relations as the most outstanding external one (Güngör & Gözülü, 2012). Regarding this, foreign MNEs play a major role advancing the innovativeness of domestic Turkish firms. Nevertheless, internal structures are also highly relevant to foster firms' innovation activities and upgrading strategies.

Innovation is hereof a crucial economic success factor for most firms, regions and nations. The globalized world economy has intensified the competition on knowledge sources for many countries and particularly put pressure on EEs (Dicken, 2011). Conducting R&D and achieving innovation has thus become a highly relevant aspect for EE firms. Consequently, governmental institutions also try to implement measures to strategically stimulate innovation and support firms in their innovative efforts. These national (NISs) or regional innovation systems (RISs) involve relevant actors from industry, academia and politics (Cooke, 2001; Cooke et al., 1997, 1998; Etzkowitz & Leydesdorff, 2000; Freeman, 1995). In most industrialized economies, RISs are a key factor for a thriving regional economic development. For this reason, an increasing number of EEs establish similar systems to foster innovation and regional economic development (Albuquerque et al., 2015). These innovation systems, however, differ between industrialized and EEs contexts, based on their divergent institutional

frameworks. In this regard, RISs in EEs are mostly characterized by their less established indigenous institutions as compared to innovation systems in industrialized countries. Hence, a lack of domestic knowledge resources forces EE firms to focus on knowledge or technology from foreign MNEs (Padilla-Pérez et al., 2009; Vang & Asheim, 2006). In this regard, regional innovation processes in EEs need to be observed as nested in global production or R&D networks (Crescenzi & Rodríguez-Pose, 2012; Yeung, 2009), because upgrading strategies in global value chains (GVCs) not only take place at the firm level (Ernst & Kim, 2002; Gereffi, 1999; Humphrey & Schmitz, 2002), but at the regional level as well (Iammarino, 2005; Padilla-Pérez et al., 2009). Hereof, R&D internationalization of MNEs suggest that R&D investment decisions for a specific country are mainly influenced by the research strength of its domestic universities and likewise positively impact the universities' basic research activities in return (Suzuki et al., 2017). FDI thus not only have a direct impact on EEs' national sales markets or domestic firms, but also on universities and RISs within respective countries.

### **1.3 The Emerging Economy of Turkey**

Turkey has been the historical portal or nexus of trade between Europe and Asia for centuries. Consequently, the country offers optimal business opportunities for its domestic but also foreign firms, providing access to either economically advanced or upcoming neighboring markets as well as a solid transport infrastructures via sea, air and land (Etkin et al., 2000). Since the 1980s, Turkey successfully transformed from a formerly closed into an open and nowadays leading economy in the Middle East and Southeastern Europe (Tatoglu & Demirbag, 2008), attracting increasing amounts of FDIs from major MNEs (Ayden et al., 2018; Erdilek, 2008).

In the mid-1990s, the Turkish government launched several programs and institutions to financially support and encourage firms to invest in their R&D capabilities and innovativeness as well as to engage in UICs. Most vital examples are the Directorship for Small and Medium Sized Enterprises (KOSGEB), the directorship for technology and innovation assessment (TEYDEB) and the technology development foundation (TTGV) (Temel & Glassman, 2013). Today, the Turkish Supreme Council for Science and Technology is the primary government organization responsible for planning and designing R&D-related policies in Turkey. R&D or innovation programs are implemented by the Ministry of Science, Industry and Technology (BSTB), the Scientific and Technological Research Council (TÜBİTAK) and KOSGEB (Belgin, 2019).

Consequently, the country is transforming its economic structures and strategically develops towards an innovation-related environment by implementing measures in

social state policies, education and R&D expenditures (Bakirci, 2018) as well as through direct R&D support for firms' innovation activities (Yildirim, 2017). In this regard, governmental grants for R&D-related activities are grouped in two main categories of direct support for project-based activities such as UICs on one hand and indirect support for institutional support for R&D centers or technology development zones on the other hand (Belgin, 2019). In the past decade, Turkey's industrial policy was thus geared to support high-technology sectors as well as to increase the value added of its firms to upgrade productions (Gezici et al., 2017). The nation's industrial production has grown 16.3 percent between 2015 and 2020, while the production of total OECD only grew 3.2 percent in the same time (OECD, 2020a). In addition, gross domestic expenditure on R&D (GERD) continuously increased in the past ten years up to 1.03 percent in 2018 (TUIK, 2019d). Until 2023, Turkey pursues to reach 300 thousand full-time equivalent of scientific personnel and raise its GERD to 3 percent of its total gross-domestic product (GDP). For the purpose of achieving these goals, the business sector is expected to make a major contribution and is supported with tax deductions, grants, subsidies and further support at the project-based and institutional level (Belgin, 2019).

Nevertheless, the share of high-tech industries is still relatively small and low- to medium-technology sectors dominate the industrial structures instead (De Fuentes et al., 2018; Gezici et al., 2017). Based on required skills and capacities to innovate, Turkey continues to be on the bottom half of OECD countries (OECD, 2016) and its firms' engagement in GVCs is still limited (De Fuentes et al., 2018). It is thus highly relevant for Turkish firms to upgrade their production processes, enhance their innovativeness and play a more important role within GVCs. In terms of innovation, Turkey still has many generic characteristics of other developing or EEs, including limited number of own patents. Most knowledge or technology transfer activities are thus ascribed to foreign firms' R&D-related or innovation activities (Kaygalak & Reid, 2016a). In the Turkish manufacturing industry, foreign firms are therefore much more innovative and use technology transfers from their parent companies as strategic knowledge sourcing. Potential spillovers from foreign MNEs to domestic Turkish firms, however, are limited to labor turnover between both actors. In fact, knowledge and technology spillovers between foreign firms and domestic suppliers only show high-levels of innovativeness if the share of foreign users is high (Lenger & Taymaz, 2006).

From a geographical perspective, FDIs concentrate in certain regions in Turkey, mostly based on agglomeration factors such as financial political support and prior investments of other foreign MNEs within respective regions (Deichmann et al., 2003). These findings relate to internationalization motives of follow-the-leader or competitive strategies among foreign firms in EEs (Malhotra et al., 2003; Morschett et al., 2015). In addition, high levels of productivity, improved infrastructure, coastal access and highly



skilled labor are predominant attractors for FDIs to specific regions (Deichmann et al., 2003). In result, the country is characterized by an unbalanced economic development and regional disparities between advanced Western and economically less developed Eastern regions. Existing economic structures including strong agglomerations of knowledge, highly-skilled people and industry in the Western parts of Turkey further promote regional inequalities (Deliktas et al., 2009). In addition, these geographical patterns and the evolution of industrial agglomerations indicate long-term spatial dependencies for the Turkish context. Precisely, findings from Kaygalak & Reid (2016b) highlight existing regional spillover effects of early industrialized provinces to their neighboring regions, sustaining imbalances between Eastern and Western parts of the country over time (Kaygalak & Reid, 2016b). In the conclusion of this thesis, I outline some regional and national development perspectives concerning this matter.

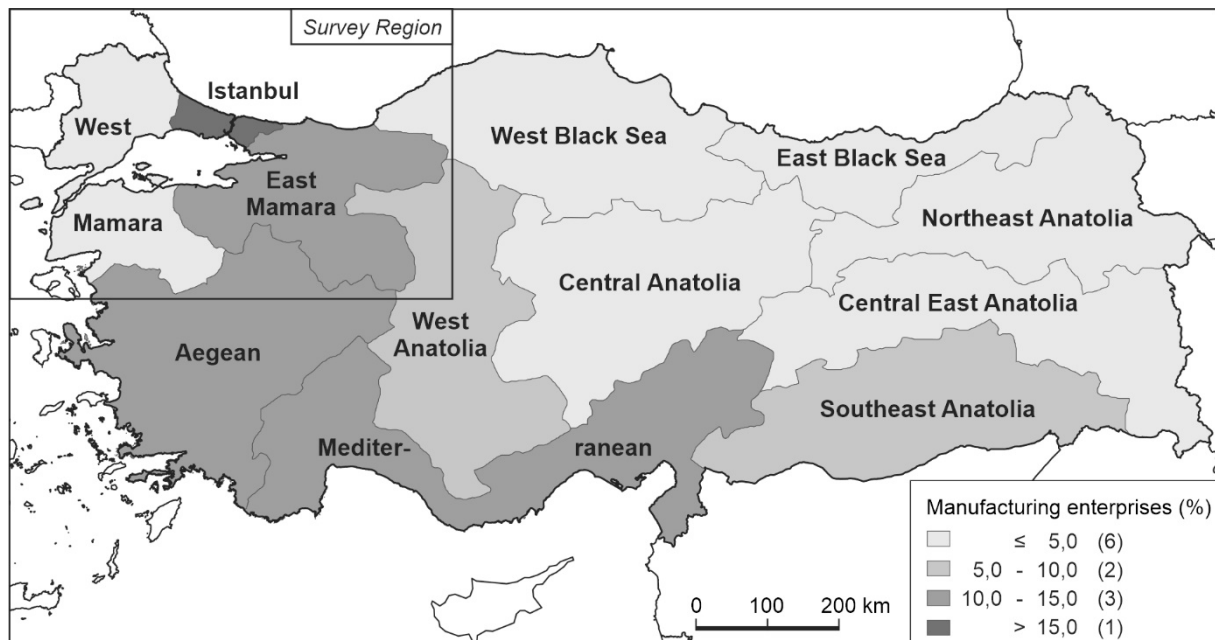
Overall, Uzun (2001) emphasizes that Turkey can thus be considered as a representative setting for many other developing or EEs with a strong focus on technological change. In the view of FDIs into Turkey, political and macroeconomic instabilities are the most relevant hindering factors for incoming FDIs, as stability is a crucial factor in firms' internationalization and expansion strategies (Dumludag, 2009). In comparison to other major EEs, Turkey's value added activities in the manufacturing industry are relatively high. In 2018, Turkey created 21.3 percent value added of manufacturing products, whereas Mexico and India ranged below 20 percent and Russia, Brazil and South Africa even below 15 percent value added (OECD, 2020c). In terms of FDI stocks or levels of FDIs as percentage of GDP, Turkey ranges in the lower end as compared to other EEs. In 2019, only 21 percent of GDP are inward FDIs and 6.5 percent of GDP are outward FDIs. In contrast, Mexico and Brazil are major attractive locations for inward FDIs with over 35 percent of GDP. Moreover, both countries plus China indicate the relevance of their domestic MNEs, as outward FDI stocks of GDP are over 12.6 percent in all countries (OECD, 2020d). Concerning educational measures of public spending on tertiary education, Turkey is leading with 1.24 percent of GDP in 2015 as compared to Mexico, Brazil, Russia and Indonesia who all rank at 1 percent of GDP or below (OECD, 2019a). In relation to R&D indicators, however, Turkey ranges in the lower field compared to China, Russia and Mexico. Both gross domestic spending on R&D as well as the total amount of government researchers are relatively lower (OECD, 2020b). Consequently, respective measures indicate Turkey's current economic and development status, its strengths and weaknesses and its overall development potential.

#### **1.4 Istanbul and the Marmara Region**

As presented in the previous section, the pronounced economic disparities between Turkish regions suggest that knowledge-based economic growth does not relate to the

entire Turkish context. Due to the partly cheap and unskilled labor force, many domestic Turkish firms are still subcontract manufacturer for established corporations from westernized or European countries (Ersoy, 2018). This is true for many regions within Turkey, particularly in Turkey's east, but for major cities of the knowledge economy such as Istanbul and Ankara among few other exceptions. Instead, Istanbul is the main regional hub for industry and trade (Gezici et al., 2017) and hosts the headquarters of the largest Turkish firms and foreign MNEs (Demirbag et al., 2007). In this regard, figure 1.1 shows the share of enterprises in the manufacturing industry for each region in Turkey. Overall, Istanbul and the Marmara region account for 44.32 percent of the nation's total and Istanbul alone is home to nearly 30 percent of all manufacturing firms in Turkey (TUIK, 2020d).

**Figure 1.1:** Manufacturing enterprises (total number) as percentage of total Turkey

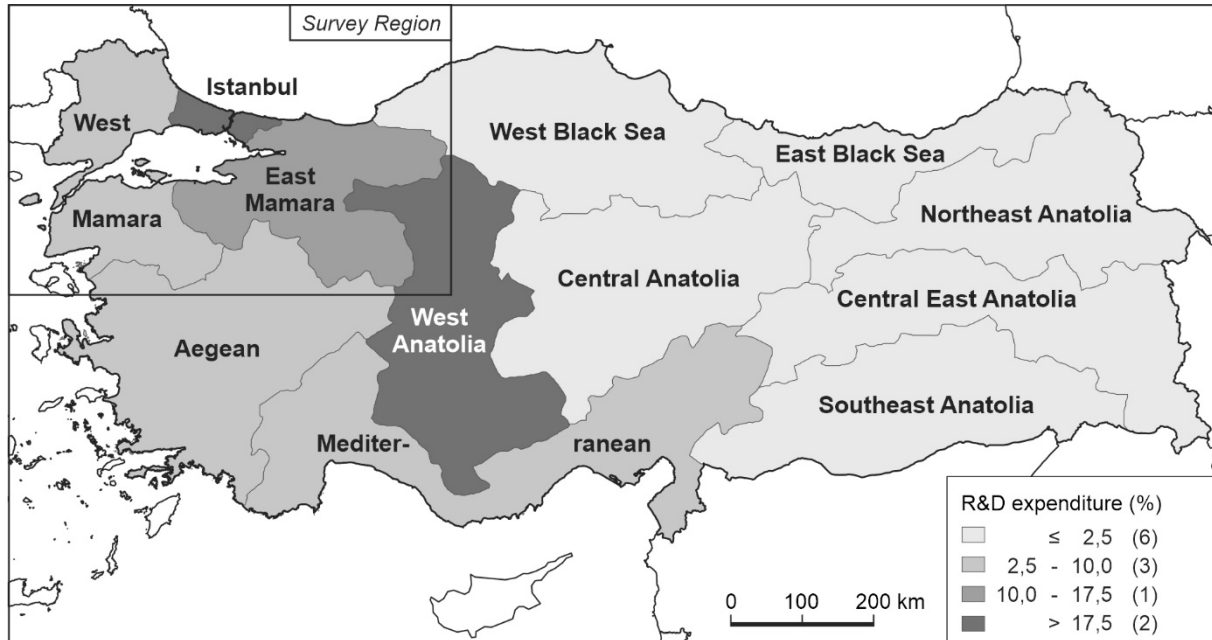


*Source: (TUIK, 2020d); cartography by Stephan Pohl*

In addition, foreign trade indices by imports and export are likewise primarily agglomerated in Istanbul and its surrounding Marmara region. Figures A.1.1 and A.1.2 in the appendix illustrate the share of Turkish regions regarding manufacturing imports and exports. In both figures, it is highly evident that the majority of all foreign trade activities are located in Istanbul and the Marmara region, with 77.80 percent imports and 71.01 percent exports of the nation's total. Again, Istanbul alone accounts for more than half of both trade indices' share (TUIK, 2020a, 2020b). Consequently, more than 45 percent of production profits and net value added is created in Istanbul and the city is home to the largest number of headquarters of the top 500 corporations in Turkey

(Ersoy, 2018). In result, Istanbul is clearly the main economic center of Turkey with 31 percent of total Turkish GDP in 2018 and the primary region for FDIs of major MNEs (Gezici et al., 2017; TUIK, 2019b).

**Figure 1.2:** R&D expenditure (1.000 TL) as percentage of total Turkey



Source: (TUIK, 2020e); cartography by Stephan Pohl

Furthermore, the knowledge-based orientation of Istanbul is also evident when looking at the share of R&D expenditures (see figure 1.2) and the share of R&D personnel (see figure A.1.3 in the appendix) among the Turkish regions. Istanbul and the Marmara region account for 44.27 percent of R&D expenditure and employs 43.92 percent of the nation's R&D personnel. Hereof, Istanbul shows the highest shares of R&D personnel with 27.33 percent and only the West Anatolia region, where the capitol Ankara is located, has a higher share of 33.77 percent of total R&D expenditure as compared to Istanbul with 25.33 percent of the nation's total (TUIK, 2020f, 2020e). Moreover, the share of education enterprises (figure A.1.4 in the appendix) shows once again the unequal distribution among Turkish regions. In this regard, Istanbul and the Marmara region demonstrate the highest share of 43.1 percent of educational firms in Turkey (TUIK, 2020c).

The total number of patent applications, as a main indicator of innovativeness or knowledge production, are also highly concentrated around the most industrialized and large-sized metropolitan areas. Istanbul's share accounts for nearly 44 percent of all patents. Hence, almost half of Turkey's knowledge production concentrates in Istanbul, while the city only accounts for one fifth of the total population. Moreover, innovation

processes in Turkey highly relate on spatial proximity to industrial clusters (Kaygalak & Reid, 2016a). In comparison of average R&D efficiencies among Turkish regions, Istanbul clearly was the most efficient one in each year between 2012 and 2016. Even though other regions are also strong in producing patents, however, their high technology exports remain relatively scarce, which leads to low economic efficiency scores. For the improvement of necessary commercialization of knowledge in these peripheral regions, further investments in R&D expenditures and R&D personnel as well as support for UICs are needed to enhance R&D efficiencies of respective regions (Belgin, 2019). In terms of location quotients for the medium and high technology sector, the West Anatolia as well as East and West Marmara region show the highest location quotient values compared to other regions in Turkey. In addition, Istanbul is the leading region in terms of knowledge-intensive service industries (Çelik et al., 2019). For decades, Istanbul and the Marmara region has thus been the manufacturing base of Turkey, which fosters the attractiveness of the region and encourages future investments and firm entries (Ersoy, 2018; Gezici et al., 2017). For this reason, Istanbul and the Marmara region provide an ideal context to conduct research on innovation and to answer the main research questions of this thesis.

### **1.5 Theory Contribution**

This thesis mostly builds on two streams of literature, namely EG and IB. In recent decades, the research field of EG has changed from a purely empirically oriented to an increasing theoretically founded science. During this, EG mainly adopted economic or business theories and transferred them into spatial contexts or issues. Therefore, independent geographical theory development or adaptations from sciences other than economics are the exception (Liefner & Schätzl, 2017). Furthermore, the economic and particularly IB literature provides relevant concepts to understand firms' behavior and strategies on both global and national scale. In addition, theories in EG lie an important foundation for economic structures, development processes and the overall spatial aspect of research approaches. In this regard, both fields of IB and EG studies are highly interconnected, deal with research questions from a similar point of view and can thus profit from each other perspectives. This is particularly true for observing international firm activities.

For instance, K. E. Meyer (2004) encourages IB scholars to focus increasingly on MNEs as they play a crucial role in the economic development of many EEs. It is therefore highly relevant to learn more about positive and negative spillovers from FDI in EEs and thus understand the spatial setting of respective countries (K. E. Meyer, 2004). Other studies also focus on the link between IB studies, EG and knowledge management, and hereof analyze the relevance of geographical distance for innovation

processes as well as knowledge transfers or spillovers among MNEs (Jasimuddin et al., 2015). Mudambi et al. (2018) also draw on IB and EG literature, as the authors highlight the important nexus of both research streams to understand emerging economic developments such as the knowledge economy of the twenty-first century. Integrating IB and EG perspectives thus helps to examine main strategic imperatives of MNEs, which are the creation of specialized knowledge capabilities that reside in distinct geographical locations as well as delivering these capabilities to the global market (Mudambi et al., 2018). I hereof contribute to the comprehension of MNEs engagement in EEs as well as upcoming outward FDI strategies of MNEs from Turkey. Consequently, I add my findings to concepts in both IB and EG literature and likewise use theories derived from both research streams.

Despite the fact that the research in EG on the geography of innovation is fragmented, the diverse schools of thoughts have common underlying questions or objectives that focus on regional economic development processes in terms of cooperative or networked production processes, reflected in RISs and cluster theories. In addition, most research streams emphasize the growing importance and explanatory power of knowledge and learning processes for the understanding of inter-regional differences regarding their development status and dynamics. Most EG theories thus reflect the fundamental changes in production processes in the course of establishing the knowledge-based economy and society (Liefner & Schätzl, 2017). In that respect, this thesis contributes to the understanding of economic growth based on knowledge creation and innovation activities among different actors within the EE setting of Turkey. My findings help to understand the underlying factors that shape the economic development of countries and regions, the upgrading efforts of domestic firms and the integration of FDIs from major MNEs.

In prior sections of this thesis, it became quite evident why EEs and particularly Turkey are highly relevant and interesting contexts to study. This becomes even more clear, as theories or concepts concerning technology or innovation-related topics are mainly derived or generated in industrialized countries, and subsequently applied to EEs without questioning their adaptability in respective settings (Beyhan & Cetindamar, 2011). In addition, the majority of EE studies are geographically biased towards China, India or Latin America, whereas other EEs remain under-researched (Jormanainen & Koveshnikov, 2012). Therefore, it is highly relevant to focus on insights from emerging or developing countries, particularly from the field of IB, R&D research or technology management, to capture the specific characteristics of these contexts to enrich existing theories and understand their actual applications in EEs (Cetindamar et al., 2009). It is thus important to check the applicability of existing theories from Western contexts in EEs, to not only understand their limitations but also verify their generalizability.

Therefore, additional explorative studies are required to develop a more widened perspective from different EEs (Nielsen et al., 2018), meaning that research findings help to extend the empirical scope of the EEs literature and create theories that are more universally valid (Ramamurti, 2016).

In this thesis, I particularly take a geographical perspective to study innovation in Turkey. By doing so, I use the concepts of NISs and RISs as main theoretical foundations. In this regard, NISs are not only spatial agglomerations of scientific and educational institutions, industrial structures and labor markets in a national context, but rather include specific institutions and programs such as R&D incentives, supportive tax systems or protections of intellectual property rights (IPRs) that aim to strategically foster and shape innovative activities at the national level (Acs et al., 2017). Active governance of NISs thus enables countries to achieve system wide harmonization of certain standards, agreement protocols or protective laws that can reduce IPR issues in RISs or UICs at the regional level (Cunningham & Link, 2015). Not only is governance important for the successful emergence of innovation in RISs or NISs, but political connections are also a crucial economic success factor for firms themselves. In a study of political connected firms in Turkey, Özcan & Gündüz (2015) show much higher performance levels in value added, sales increase and profit rates for firms with political connections than non-connected ones. By use of this political support, old or traditional domestic business groups are even able to maintain their position without many challenges from upcoming small- and medium-sized enterprises (SMEs) or foreign MNEs (Özcan & Gündüz, 2015). From the perspective of firms, both internal capabilities as well as openness towards external knowledge sources are crucial success factors for upgrading strategies and innovation performances (Caloghirou et al., 2004). This relates for instance to interactions between industrial firms and universities. In this respect, absorptive capacity and learning is not only relevant at firm level, but can be also applied to the regional, sectoral or country level, where the concept are used to observe inter-firm connections, technology transfer channels and firms' linkages to external knowledge sources (Abreu, 2011).

Overall, knowledge creation and innovation are key terms in this thesis and refer to new, improved or advanced products or processes, which highly differ from the firms' previous products or processes. In addition, resulting innovation have been made available for external users in form of products or have been brought into firms' internal usage as processes (OECD/Eurostat, 2018). Moreover, innovation in terms of EG is often considered in its degree of novelty, for instance new to the firm, new to the regional or national market or new to the world, as well as discerned by being radical, incremental or adaptive. Theories in EG are thus able to identify influencing factors that have an impact on the emergence of innovation, such as firms' internal and external

resources, regional actors or potential collaboration partners and their resources as well as policy-making. Consequently, innovation itself is an explanatory factor for the knowledge-based economic development of regions or nations, for upgrading efforts and economic performances of domestic firms and foreign MNEs as well as their internationalization success.

In this regard, delivering economic performance is the main objective for firms to engage in innovation activities in the first place and collaborate with external partners such as universities and political institutions. Therefore, it is highly relevant to gain knowledge about factors that either foster or inhibit firms' innovation performances overall. For instance, Álvarez & Crespi (2015) find that small firm sizes and financial constraints have a negative impact on the innovativeness of firms, particularly in terms of product innovation (Álvarez & Crespi, 2015). Blanchard et al. (2013) show that both financial and non-financial obstacles can have a negative impact on firms' propensity to innovate. In addition, the authors find that UICs as knowledge source does not have any significant influence on firms' innovation performances (Blanchard et al., 2013). Other studies find varying barriers that prevent, hamper or stop firms in their innovation activities (D'Este et al., 2012, 2014). Findik & Beyhan (2017) measure innovation performances of Turkish firms and find significant differences among process and product innovators, as well as between firms that are engaged in both activities. As their findings suggest, firms differ mostly based on their size, meaning that smaller firms are rather product-orientated whereas larger firms focus on process oriented impacts on innovation (Findik & Beyhan, 2017). Hueske & Guenther (2015) systematically review and summarize existing studies on factors that hamper firms' innovation achievements and classify barriers into firms' external environment as well as at the organizational, group and individual level (Hueske & Guenther, 2015). Altogether, various formal, informal as well as financial-, skill- and resource-related factors can have an impending impact on firms' innovation performance (Demirbas et al., 2011). Nevertheless, barriers that relate to costs are most relevant to inhibit innovation activities (Álvarez & Crespi, 2015; Antonioli et al., 2017; Galia & Legros, 2004; Madrid-Guijarro et al., 2009; Mohnen et al., 2008; Santiago et al., 2017). I contribute to this research stream and investigate firms' usage of internal and external sources for achieving innovation, particularly with respect to UICs.

## **1.6 Data and Methods**

All Firms and particularly MNEs are the most relevant actors within the globalized economy, providing ideal opportunities to gain knowledge about economic structures and potential developments. Consequently, using a firm-level study to obtain information about the regional economic setting of Istanbul and the Marmara region

follows the notion of ‘studying regions by studying firms’ (Markusen, 1994). In addition, in order to understand the dynamics of business competitiveness and innovativeness, firm-level analysis is also required to capture technological processes at the micro level (Ozcelik & Taymaz, 2004).

Furthermore, the management culture of Turkey is considered to be different from a westernized country setting or industrialized societies, based on different economic, social, cultural and political characteristics (Aycan, 2001; Collings et al., 2010). Overall, economic dynamics and mechanism of Turkey substantially differ from industrialized country contexts as well as partly from other EEs. Using a questionnaire-based survey thus helps to identify characteristics, strategies and activities at firm level and allows to provide managerial implications based on the findings (Ersoy, 2018). Conducting firm-level studies furthermore enables to extend existing theories towards insights from differentiating EEs contexts. Pamukcu (2003) also suggests to conduct firm-level studies for the manufacturing industry in Turkey, to uncover insights about innovation decisions of firms and the influence of FDIs as well as technology spillovers (Pamukcu, 2003).

Consequently, I focus on the R&D-related or innovation-oriented segment of manufacturing firms in Istanbul, as this is the most relevant group in terms of a knowledge-based economic development, upgrading pressures and innovation strategies within EEs. In this regard, all three articles of this thesis cover different topics that relate to characteristics of firms’ innovation strategies or activities as well as to the impact of internal and external factors on firms’ innovation success. Hereinafter, the survey sample of firms as well as selection of local interview partners are geographically derived from the Istanbul Region as well as the West- and East- Marmara region (see for instance figure 1.1).

For data collection, I used a mixed-method approach of interviews with local R&D experts as well as a standardized firm survey. Firstly, prior and during questionnaire development for the firm survey, I conducted ten semi-structured interviews with local R&D experts concerning the innovation environment of Istanbul, particularly in terms of UICs, firms’ innovation strategies and political support in that respect. In 2015 and 2016, I interviewed scientific and managerial personnel from universities, technology and technology transfer offices (TTOs), managers and R&D personnel from Turkish manufacturing firms as well as representatives from state-level institutions. While doing so, I have gained highly relevant information that were used for questionnaire development, its adaption, hypotheses development as well as supplementation and verification of the statistical findings. Secondly, for the main statistical data analysis, I compiled the firm sample based on a TÜBİTAK dataset of over 8.500 firms and only selected firms that reside in Istanbul and the Marmara region and have successfully



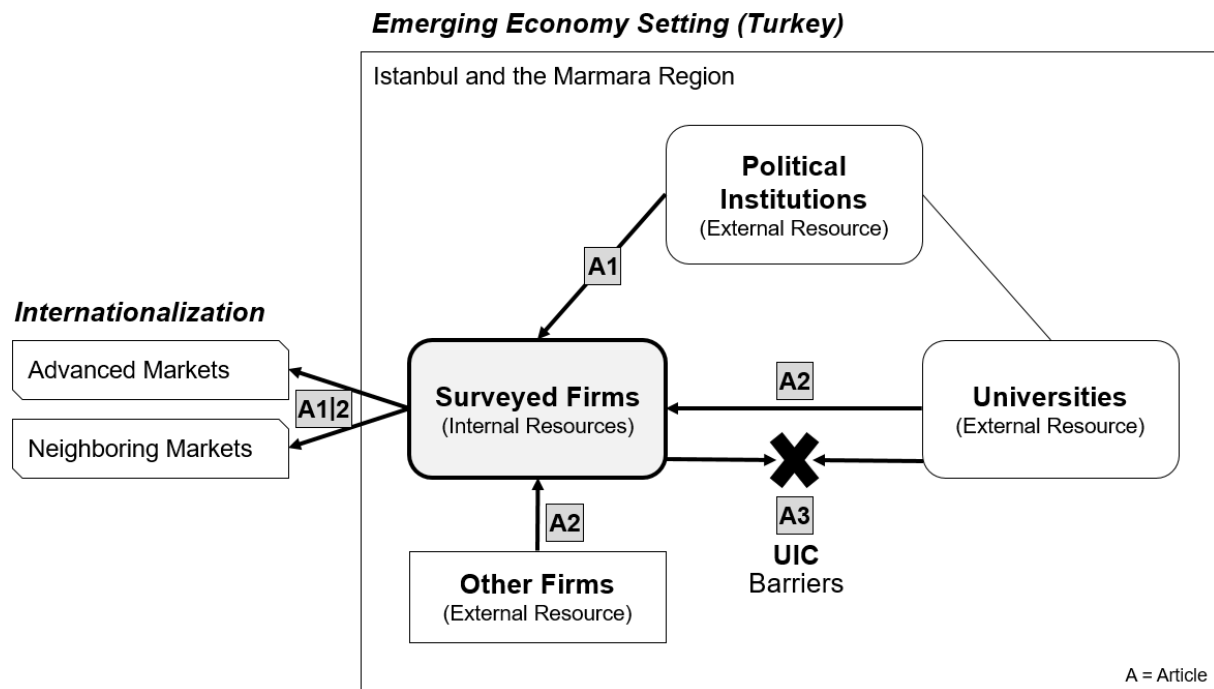
finalized at least three R&D projects funded by TÜBİTAK. Out of 838 firms from this new subset, I received 225 valid questionnaires after data cleaning and omission of unusable surveys. For this, a standardized questionnaire was used to contact firms' general managers and R&D executives, to obtain knowledge concerning firms' basic characteristics, concerning the regional setting for firms' economic success, concerning firms' innovation strategies and activities as well as concerning firms' collaborations with regional scientific partners and regional business affiliates.

Overall, the compiled sample of firms was further distinguished in three different firm types: domestic Turkish firms, Turkish MNEs and foreign MNEs from industrialized markets. The firm types are thus differentiated according to ownership structures and their stage of internationalization. In this regard, foreign MNEs are either 100 percent foreign owned, or have entered a joint venture with a Turkish subsidiary. Firms that are 100 percent Turkish-owned are defined as either domestic Turkish firm or as Turkish MNE according to their current internationalization strategies. Hereof, domestic Turkish firms are showing no outward FDI activities at the time of this study, whereas Turkish MNEs are operating in foreign markets with potentially multiple subsidiaries.

In the following, different methods are necessary to answer the research question of each article. In article one, I used binary logistic regression analysis with the firm type as dependent variable to characterize three different types of firms regarding their market-seeking motives and usages of financial and institutional political support. For article two, I adopted a two-step methodological approach with a dimension reduction via principal component analysis as first step to identify underlying structures among different internal and external R&D resources. Thereafter, I used resulting principal components with in a binary logistic regression analysis with innovation success as dependent variable. In article three, I made use of a mixed-method approach with both binary logistic regression analysis, to test the impact of perceived barriers to UICs from the viewpoint of firms, and with additional insights from semi-structured interviews with local R&D experts from universities and policy, to verify and complement the statistical findings.

## **1.7 Research Framework and Publications**

The three cohesive articles of this thesis were created in an iterative process, as they partly build on one another and gradually go into more detail in terms of firms' innovation process or R&D-related activities. An overview of the research framework is presented in figure 1.3.

**Figure 1.3:** Thesis research framework

*Source: own figure*

Altogether, each article is nested in the context of conducting research within the EE setting of Turkey or Istanbul and the Marmara region at the regional level respectively. In this regard, the RISs provides an ideal framework to learn more about firms' activities and interactions with universities and political institutions within the region. Firstly, in article one (A1) in chapter two, I connect three firm types with their internationalization motives towards economically advanced or neighboring markets as well as their usage of domestic financial and institutional political support. Secondly, in article two (A2) in chapter three, I join the firms' internal capabilities with two external R&D resources from universities and other firms, to test their impact on surveyed firms' innovation success and internationalization activities. Thirdly, in article three (A3) in chapter four, I focus on the perceived barriers of using UICs for achieving innovation from the perspective of firms. In addition, I adds contextual insights from pre-study interviews with local R&D experts from the viewpoint of universities and political institutions. Each article thus contributes to an innovation-related topic in the EE of Turkey.

In more detail, table 1.1 shows all articles and their respective titles, authors, research objectives and prospective journals including the status of publication. Article one was already revised with major changes and awaits further response. Article two is currently under major revision. Article three was only recently submitted in July 2020. In the subsequent chapters, each article is presented in its latest version and prior to final publication.

**Table 1.1:** Articles in this thesis

<b>Title</b>	<b>Author(s)</b>	<b>Research objectives</b>	<b>Journal</b>
Internationalization and Domestic Political Support: A Differentiation of R&D-related Foreign and Domestic Firms in Turkey	Kleiner-Schäfer, Timo Liefner, Ingo Tatoğlu, Ekrem	Characterization of firm types regarding their market-seeking motives and usages of domestic political support	International Journal of Emerging Markets <i>submitted after major revision</i>
The interplay of R&D Resources, Internationalization and Innovation Success in an Emerging Economy: A differentiated Company Comparison from Turkey	Kleiner-Schäfer, Timo Liefner, Ingo	Identification of R&D resources and their impact on firms' innovation success and internationalization strategies	Growth and Change <i>major revision</i>
Barriers to University-Industry Collaboration in an Emerging Market: Firm-level evidence from Turkey	Kleiner-Schäfer, Timo	Identification of firms' perceived barriers to university-industry collaboration for achieving innovation	The Journal of Technology Transfer <i>under revision</i>

*Source: own table*

# Chapter 2 | Article one

## **Internationalization and Domestic Political Support: A Differentiation of R&D-related Foreign and Domestic Firms in Turkey**

Authors Timo Kleiner-Schäfer, Ingo Liefner & Ekrem Tatoğlu

Journal International Journal of Emerging Markets

Status Submitted after Major Revision (March 2020)

### **Abstract**

This paper contributes insights into how different firm types in the emerging market (EM) of Turkey respond to upgrading pressures in terms of internationalization and the usage of domestic political support. Binary logistic regression analysis is used to differentiate and identify characteristics of firms regarding market-seeking strategies and their usage of institutional and financial support. The analysis is based on survey data from firms located in the metro-region of Istanbul: advanced market multinational enterprises (AMNEs), Turkish MNEs (TMNEs) and domestic Turkish firms (DTFs). AMNEs particularly benefit from investment and export incentives as well as from establishing political connections in Turkey. DTFs significantly use tax incentives and primarily seek advanced markets. TMNEs particularly benefit from investment and export incentives and preferably, target economically advanced markets. This paper's findings challenge existing theories such as the concept of psychic distance or liabilities of foreignness, which do not always provide an adequate explanation for internationalization activities of emerging market firms. In addition, it is highly relevant to apply an eclectic or multidimensional concept when conducting research in EMs, to capture the interrelated constructs of upgrading, internationalization and political support. National and regional policies need to pursue different strategies for the surveyed groups of firms in order to attract and maintain foreign direct investments (FDIs) of AMNEs as well as to support outward FDIs of domestic firms and EM MNEs. In particular, policies for market entries and knowledge sourcing in advanced markets become a crucial factor for EM firms to overcome a shortage of resources at home.

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## **Internationalization and Domestic Political Support: A Differentiation of R&D-related Foreign and Domestic Firms in Turkey**

### **2.1 Introduction**

Emerging market countries are considered as attractive locations for foreign direct investments (FDIs) of advanced market multinational enterprises (AMNEs), despite their partially unstable conditions such as poor legal systems, uncertain political conditions or insufficient infrastructures (Groh & Wich, 2012). Moreover, many of them have even become the home market for upcoming emerging market multinational enterprises (EMNEs) (Demirbag & Yaprak, 2015). The role of particularly promising locations in these countries has attracted scholarly interest, for example in connection with cluster theory (Malmberg & Maskell, 2002) or because certain locations provide advantages regarding access to logistics, networks or neighboring markets (Grant & Nijman, 2002).

However, growth based solely on low-wage labor and hence on integration in low value-added activities of global value chains (GVCs) (Gereffi, 1999) cannot be sustained for long and might lead to a period of economic stagnation also referred to as the ‘middle-income trap’ (Cai, 2012; Krugman, 1994; Paus, 2012). Consequently, countries facing this situation are searching for ways to increase the value-added of their firms and raise productivity. Therefore, many firms in emerging economies – EMNEs as well as domestic firms – are forced to upgrade their technological profiles and place more emphasis on providing innovative solutions. This development is clearly linked to competitive pressure from AMNEs in these countries and is often accelerated through political support (Szczygielski et al., 2017). Compared to advanced economies, emerging countries lag behind in access to important resources, creating difficulties in knowledge absorption for firms located in such environments (Ozturk, 2018).

Therefore, it is highly important to understand how firms in emerging markets are responding to upgrading pressures and positioning themselves in the context of innovation and internationalization. The question arises concerning the characteristics of a differentiated corporate landscape within the emerging market of Turkey. This paper thus examines the connection between firms’ internationalization motives and usages of domestic political support, and hence contributes to the broader examination of interconnected constructs of innovation, geography, institutions and internationalization in emerging markets (Newburry et al., 2016).

Previous studies about emerging markets and firm activities within these contexts primarily focus on countries such as Brazil, Russia, India, China and South Africa, summarized as BRICS nations, as well as Mexico, Indonesia, Nigeria and Turkey,

referred to as MINT states (Dicken, 2011). The majority of these studies, however, are geographically biased towards China, India and Latin America, whereas other emerging countries remain under-researched (Jormanainen & Koveshnikov, 2012). Consequently, additional explorative studies and thus a more widened perspective on experience from different countries are required to further develop the field of emerging market research (Nielsen et al., 2018). This is particularly relevant, as there is no uniform development path of emerging countries, but rather very diverse economic structures, characteristics and growth models, such as for instance a strong state influence or growth based on natural resources or domestic market size. On firm level, companies in emerging markets clearly vary in their ownership structure between for example family based firms, state-owned enterprises or highly diversified business groups. However, firm ownership seems not to be the only characteristic that explains economic survivorship, as business success stories also differ among firms with rather similar resources and strategies. In order to better understand the diverse corporate landscape in emerging markets, more empirical evidence is thus desirable to conceptual advance the strategies and needs of firms in respective contexts (Grosse, 2016).

In order to answer this question, the emerging economy of Turkey was selected for a number of reasons. Firstly, Turkey has successfully transformed from a formerly closed economy with limited trade and investment volumes into one of the leading economies in Southeastern Europe and the Middle East (Tatoglu & Demirbag, 2008). Secondly, its unique location between Europe and Asia and respective proximity to advanced Western and emerging Eastern markets has attracted an increasing amount of inward FDIs of MNEs from around the world (Ayden et al., 2018; Erdilek, 2008). Thirdly, Turkey is strategically developing towards an innovation-related environment, transforming its economic structure by implementing mechanisms in education, social state policies and R&D expenditures (Bakirci, 2018) as well as through direct support for innovation-related activities of Turkish firms (Yildirim, 2017).

In addition, following the recent trend of emerging economies increasingly attracting firms carrying out R&D activities in these countries, Turkey has also become successful in addressing MNEs engaging in R&D (Karabag et al., 2011). During the period 2014 to 2016, 64.5 percent of all industrial companies in Turkey reported some form of innovation activity (TUIK, 2017), and the share of R&D expenditure more than doubled from 0.47 percent in 2003 to 0.96 percent in 2017 (OECD, 2020b). In the recent past, Turkey's economic development has shown high GDP growth rates, with 11.5 percent in Q3 of 2017 (TUIK, 2018). However, the severe financial shock in mid-2018 triggered a recession (OECD, 2019b), leading to a decrease in GDP growth rates of -2.6 percent in Q1 of 2019 (TUIK, 2019a), necessitating not only fiscal stimulus, but also direct support for internationally acting firms challenged by foreign-currency (OECD, 2019b).

Therefore, the overall economic situation together with an increasing engagement in R&D and upgrading efforts make Turkey an interesting context to study. Moreover, exemplifying Turkey as a more exceptional case compared to China, for instance, will make generalizations easier and enable the transfer of findings to similar organizations in other emerging markets.

In a comparative study of major AMNEs, upcoming EMNEs and competitive domestic firms in Turkey, this paper aims to analyze differences and similarities in firms' internationalization motives and their use of institutional and financial support. It starts with a review of the underlying literature regarding firms' internationalization motives and political support to develop the hypotheses. Following this, the paper's research approach in terms of survey sampling, data collection, measurement of variables and data analysis are outlined. Binary logistic regression models are used for a comparison between three company categories and their particular characteristics, while keeping the emerging market context of Turkey as a constant. In the end, the main findings and limitations of the study are discussed and a conclusion about theory and policy implications is drawn.

## **2.2 Theoretical background and hypotheses development**

Despite the existence of theoretical and empirical literature that discusses various internationalization motives of both AMNEs and EMNEs (Buckley et al., 2007; Jormanainen & Koveshnikov, 2012; Ramamurti, 2004), emerging markets and their manufacturing hubs (Chaminade & Vang, 2008), technological upgrading of R&D-related firms (Ernst & Kim, 2002; Gereffi, 1999; Humphrey & Schmitz, 2002; Mathews, 2006a) as well as locational factors and political support (Liu et al., 2017; Wu & Liu, 2009), there is still a significant void in the literature regarding the interplay of all these factors, particularly when addressing innovation and upgrading in emerging economies. The method commonly chosen to increase the value-added of firms and regional economies is based on changing the qualitative underpinnings of factors and outcomes of production processes (Gereffi, 1999), for example through substituting pure assembly tasks with tasks that also carry out design and development, advanced marketing or other services (Ernst & Kim, 2002; Humphrey & Schmitz, 2002). However, such a technological upgrading is a difficult undertaking, as it requires considerable effort at certain levels. This includes investments in knowledge, technology and organization at the firm level (Barney, 1991; Pavitt, 1990; Prahalad & Hamel, 1990), fostering external linkages with advanced global players and aiming for higher integration in GVCs (Gereffi et al., 2005; Giuliani et al., 2005), public investment in human capital, institutions and administrative capabilities at the regional and national level (Cooke, 2001; B. Å. Lundvall, 2007), as well as direct political support for firms' innovation

efforts (Szczygielski et al., 2017; J. Wang, 2018). Respectively, configurations of upgrading strategies can exist in various forms in different national contexts.

In addition, there is only very limited knowledge about emerging market firms' needs for higher engagement in R&D activities (Ozturk, 2018). Recent studies show no single method of technological upgrading among BRICS economies, but rather varying and unique upgrading paths of different emerging countries (Dominguez Lacasa et al., 2019). China is a prime example in this regard, delivering the most recent example of a technology oriented transformation promoted by political strategies and transformation (Alon et al., 2009; Garnaut & Song, 2013; Wei & Liefner, 2012; Zhou et al., 2016). However, as a primarily state-led economy with strong governmental influence, China's experiences are difficult to transfer to other emerging market contexts. Consequently, there is a need for evidence of market-driven economies such as the Turkish context.

In the context of factors that characterize the different ways in which MNEs and domestic firms respond to upgrading pressures and resulting opportunities, this study examines factors that relate to market-seeking strategies as well as institutional and financial support. The research focus here is not limited to one company type, instead encompassing three different ones: AMNEs, denoting foreign-owned companies operating in Turkey and multiple other countries, TMNEs originating from Turkey and operating globally, as well as DTFs that were not undertaking any FDIs at the time of the survey. With regard to company-specific differences, arguments are based on underlying theories derived from firms' internationalization strategies discussed by Dunning (1998, 2000) and Johanson & Vahlne (1977), the resource-based view (RBV) (Barney, 1991) as well as the institution-based view (Inst.BV) (Peng et al., 2008). This approach helps to understand firms' internationalization motives and usage of political support. The following literature review will restrict itself to brief discussions of the rationale behind the indicators chosen as independent variables for the analysis presented later.

### ***2.2.1 Institutions and internationalization***

In order to become successful in international markets, firms need to be aware of institutional support options they can utilize at their domestic location. This institutional leverage capability is a key factor to explain the heterogeneity of firms' internationalization success. Only some firms are hence aware of and able to access, adopt and adapt institutional benefits at their home or host country (Landau et al., 2016). Three different firm types are thus compared with respect to internationalization motives and usage of domestic political support to obtain knowledge about their varying institutional leverage capability.



Domestic institutions are key factor of success to provide location-based access to financial or human capital, which can be turned into ownership advantages at firm level and are necessary for firms' internationalization efforts. These location-based advantages are only available to firms nested in geographical contexts supportive domestic institutions (Dunning & Lundan, 2008; Landau et al., 2016; X. Martin, 2014; Nachum & Rolle, 1999). In contrast to domestic competitors, firms operating in foreign markets are dealing with liabilities of foreignness (LOF) they need to overcome to gain access to location-based resources. Among other reasons, these LOF result from institutional distances between firms and the emerging market institutional environment, which oftentimes is considered as a barrier for doing business in foreign markets by MNEs (Kostova & Zaheer, 1999; Rottig, 2016; S. Zaheer, 1995). Therefore, MNEs purposely seek to establish connections and relationships with local governments to adjust to the institutional demands and maintain legitimacy (Ellis, 2000; Rottig, 2016). AMNEs dealing with LOF in the foreign-market context of Turkey are thus in need of institutional support to obtain location-based knowledge.

Furthermore, the level of firms' internal resources and dynamic capabilities are necessary requirements to obtain access to external sources of institutional support in the first place. These specific resources, skills and capabilities at firm level significantly vary among firms and over time (Barney, 1991; Eisenhardt & Martin, 2000; Teece et al., 1997; Wernerfelt, 1984). Based on this resource-based view (RBV), smaller DTFs are in higher need of institutional and financial support, meaning that the domestic institutional environment can provide external resources to generate competitive advantages (Dunning & Lundan, 2008; Landau et al., 2016; X. Martin, 2014). It is thus assumed that particularly AMNEs and DTFs need to gain access to domestic political support. Moreover, internationalization activities are closely connected with firms' ownership structures, as previous research by Hobdari et al. (2011) shows. For instance, larger firms, more productive or capital-intensive firms as well as firms with a high level of investments in R&D are more successful in their internationalization process. On the contrary, state control hampers the internationalization efforts of firms (Hobdari et al., 2011). Consequently, ownership structures are an important factor to understand internationalization success of different kind of firms.

For this study, getting contact to collaboration partners and workforce is used to capture knowledge sources that are external to the firms and facilitate knowledge sharing, interactive learning and the opening of innovation processes (Chesbrough, 2003, 2010; W. M. Cohen & Levinthal, 1989, 1990; Teece, 1977; Teece et al., 1997). Consequently, in transition from absorptive capacity to imitation and finally innovation, different transfer channels are important sources for the technological upgrading of emerging market firms. Two most relevant factors are inter-firm collaboration or

contact, particularly between foreign and domestic firms, and the return of highly trained workforce from advanced markets, defined as reverse brain drain. Both external resources thus enable the spillover and absorption of tacit knowledge at firm level and facilitate a successful catching-up process of emerging market firms (Blomström et al., 2001; Blomström & Kokko, 1998; S.-L. Tsai, 2002). In addition, firms within emerging economies might not only compete with each other, but rather share resources or serve as each other's role models. Internationalization or strategic outward investment of EMNEs is thus also reflected by collaboration within their home country (Hobdari et al., 2017).

Besides these RBV arguments, home-country institutional advantages are a highly enabling factor for emerging markets firms to internationalize. Governments in emerging economies have a strong effect on the international expansion of their domestic firms and MNEs (Hong et al., 2015; Yang et al., 2009; Yaprak et al., 2018). The institutional environment provides various opportunities for firms to engage in internationalization activities and should thus always be included when investigating firms' strategies and behaviors in emerging markets and mid-range economies (G. Y. Gao et al., 2010; Gaur et al., 2018; Hoskisson et al., 2013; Peng et al., 2008; Wright et al., 2005). Based on limited resources, capabilities and experiences, governmental support is hence oftentimes the driving power of emerging market firms' internationalization and can thus influence the levels as well as the location and type of FDIs (K. E. Meyer & Peng, 2005; Peng et al., 2008; C. Wang et al., 2012). In terms of financial incentives, domestic institutions can be a key leverage for DTFs and TMNEs in the internationalization efforts of respective firm types. It is thus highly relevant to incorporate an institutional framework when analyzing outward FDIs from emerging economies (Gammeltoft et al., 2012).

Furthermore, foreign MNEs need to conform to different rules and requirements of the domestic institutional environment they operate in, meaning that firm success does not only depend on economic output measures, but especially on assimilation to local norms, rules and values (J. W. Meyer & Rowan, 1977; Rosenzweig & Singh, 1991; Rottig, 2016; R. W. Scott & Meyer, 1983). MNEs thus need to understand and interpret the regulations and cultural rules of the foreign environment in the right way to successfully operate in these markets. Respective formal and informal rules are particularly relevant in the context of emerging markets, due to their diverse and varying institutional environments (Kostova & Zaheer, 1999; Rottig, 2016; R. W. Scott, 2014). Therefore, emerging economies are characterized by various features that are not present in developed markets such as institutional voids, institutional pressure by domestic governments, higher importance of informal than formal institutions as well as an overall more dynamic institutional change and transition (Rottig, 2016).

Regarding this, conducting business in emerging economies results in higher risks and uncertainties for foreign firms, which is why MNEs operating in these markets need to focus on getting information about initially unfamiliar rules and regulations that are otherwise taken for granted in developed markets (Khanna & Palepu, 1997).

Overall, governments in emerging markets tend to be more involved, have a greater influence and are thus key players in the domestic economic systems (DuBois & Primo, 2016; Hoskisson et al., 2000). This form of state capitalism has particularly originated in BRICS nations, constituting a substantial LOF for especially Western MNEs (Cuervo-Cazurra et al., 2014; Rottig, 2016). It is thus highly relevant for AMNEs to establish political connections to deal with such unique institutional environments and overcome resulting drawbacks when operating in emerging markets. In addition, contact to collaborations partners or joint ventures with domestic companies allows foreign firms to overcome market inefficiencies and get access to different kinds of resources (K. E. Meyer et al., 2009).

### ***2.2.2 Market-seeking motives***

After 1980, increasing inward FDIs in Turkey resulted in competitive pressure on domestic firms, partly leading to a stimulus of outward FDIs of Turkish companies seeking foreign markets (Ayden et al., 2018; Erdilek, 2008). Besides such external push-factors, motives for internationalization on the firm level generally vary among company types and are classified in different ways. This study focuses its analysis on firms' market-seeking strategies discussed by Dunning (1998, 2000). However, possessing strategic assets is also an important requirement for internationalizing and meeting foreign market needs in the first place (Aulakh, 2007; Ramamurti, 2012). EMNEs, for instance, increasingly harness foreign knowledge and innovation sources to strategically build up resources and capabilities at firm level. These strategic asset-seeking investments challenge existing theories of EMNEs' internationalization activities of rather resource- or market-seeking motives (Gammeltoft & Hobdari, 2017). The springboard perspective by Luo and Tung (2007) describes an internationalization strategy of EMNEs in which they rapidly acquire strategic assets in advanced markets. Such firms are able to overcome home-market constraints and become successful due to aggressive and risk-taking expansion (Luo & Tung, 2007).

Turkish companies' outward FDI activities are, however, primarily related to the motive of market-seeking rather than efficiency-seeking strategies among emerging economies (Aybar, 2016; Ayden et al., 2018). This paper assumes that TMNEs are focusing on advanced Western markets as part of their market-seeking strategies to catch up with AMNEs and gain parity with pertinent industry leaders (Awate et al., 2015). This becomes even more relevant with respect to companies' knowledge base

upgrading and consequent global R&D sourcing activities (Ozturk, 2018). However, in order to compete with global competitors in advanced markets, emerging market firms need to upgrade their internal resources and capabilities prior to an internationalization (Aulakh, 2007; Mathews, 2006a; Ramamurti, 2012). Particularly small domestic firms are challenged by such upgrading pressures, which they need to address before internationalizing. In addition, recent studies show cross-border acquisitions of Turkish firms targeting rather less knowledge-intensive services and low-technology manufacturing only to gain access to foreign markets rather than having the actual capabilities to compete in high-technology environments (Yildirim, 2017). Therefore, it is hypothesized that DTFs are less likely to serve advanced markets, instead focusing on neighboring countries with lower competitive constraints.

Nevertheless, not only business reasons but also the location choice itself plays an important role in firms' market-seeking strategies, of which the eclectic paradigm as well as the Uppsala model are two prominent mainstream theories (Ayden et al., 2018). The direction of companies' FDI activities is strongly determined by certain location advantages (Deng, 2009) as well as cultural proximity as a significant determinant for first-time internationalization to reduce the risk of operation in unknown markets (Buckley et al., 2007; Cuervo-Cazurra, 2008). Due to a close psychic distance and cultural proximity (Johanson & Vahlne, 1977), it is thus assumed that DTFs target neighboring markets as part of their initial market-seeking strategies. TMNEs already entered these neighboring countries as part of their internationalization process some time ago, meaning that their current market-seeking strategy is assumed to take place in advanced markets for reasons presented previously. Additionally, Turkey's attractiveness and influence extend far into Middle Eastern and Central Asian states, establishing Istanbul as a major hub for serving and accessing relevant markets (Ayden et al., 2018). Therefore, AMNEs might not only target the Turkish market but also use their subsidiaries in Istanbul to seek neighboring emerging markets.

### ***2.2.3 Institutional and financial support***

With regard to firm-specific skills and capabilities (Barney, 1991), domestic emerging market firms and EMNEs in particular have distinct characteristics and thus potential disadvantages in comparison with AMNEs. These stem from either a weak domestic institutional environment or a lack of internal resources such as missing technological and managerial knowledge (Ayden et al., 2018), both leading to an increasing need for political support. On the contrary, domestic firms and EMNEs may be able to build up locational advantages such as greater location-based knowledge, closer relationships to local governments and supporting industries as well as the realization of home-market-focused strategies that only they can utilize (Williamson & Wan, 2018).

With regard to innovation activities, a lack of internal resources plus unpredictable outcomes of investments in R&D often reduce long-term commitments of firms in knowledge accumulation and thus lead to inadequate spending on R&D (J. Wang, 2018). As markets alone fail to provide sufficient incentives for knowledge production at the firm level, this under-investment in private R&D spending calls for incentives from the public sector to foster innovation and upgrading activities (S. Martin & Scott, 2000; J. Wang, 2018). Financial support in particular plays an important role for companies, with direct R&D subsidies (J. Wang, 2018), tax incentives as well as export and investment incentives providing the most prominent means (Liu et al., 2017). Regarding this, tax incentives will be most effective and important for firms that have limited options for a long-term and planned allocation of profits. In the case of this study, TMNEs and especially DTFs will be the main beneficiaries of financial support. AMNEs are more likely to have sufficient means for internal R&D and correspondingly enhanced innovation strategies.

However, firms' performances and strategies are not only dependent on internal resources and financial support, but also reflect the institutional environment within which they operate. Here, institutions are defined as the normative, regulative and cognitive structures that frame organizational structures, practices and activities (W. R. Scott, 2008). Although Turkey has profited from increasing FDIs in recent years, its partly weak institutional environment continues to be an obstacle preventing the economy from realizing its full investment potential (Apaydin, 2009). In this regard, the institutional context is more than just background characteristics of a host-country, because it directly determines the competitive strategies of primarily foreign companies (Ingram & Silverman, 2002). In fact, institutional quality as for instance effective rule of law or political stability are key institutional determinants of inward FDIs (Paul & Jadhav, 2019). Accordingly, establishing close connections to governments and therefore receiving political support and getting reliable information about the host-market are particularly important for foreign investors operating in such unstable and uncertain environments (Peng & Heath, 1996). This strategy may be difficult, but is sorely needed for AMNEs, as they may suffer from LOF or 'liabilities of outsidership' (Johanson & Vahlne, 2009; S. Zaheer, 1995). Therefore, networking strategies and securing personal ties with government officials and other managers become a crucial part of a firm's performance (Peng & Luo, 2000). Additionally, the ways in which firms are able to use local assets such as innovation-related resources and a highly qualified workforce depends to a large degree on access to regional collaboration partners, as it facilitates knowledge sharing, interactive learning and the opening of innovation processes (Chesbrough, 2003). It is a crucial success parameter for all specialized and

networked companies as incorporated in empirical studies of innovative behavior at the firm level (Liefner et al., 2013; Wu & Liu, 2009).

Even though firms in emerging economies are well embedded within their home country, their often weak institutional environment also poses some challenges to them. Existing market deficiencies or ‘institutional voids’ lead to home country push-factors to avoid disadvantages in the country of origin (Ayden et al., 2018; Buckley et al., 2007; Jormanainen & Koveshnikov, 2012). However, government support in the form of different subsidies such as tax reductions, incentives or networking opportunities are not only positive triggers for domestic firms to internationalize and overcome ownership disadvantages (Buckley et al., 2007; Luo et al., 2010; C. Wang et al., 2012), but are also relevant host-country institutional drivers acting as pull-factors for inward FDIs (Ayden et al., 2018). However, even though governmental incentives for internationalization generally result in outward FDIs, such subsidies are not automatically beneficial for all firm types, but are particularly advantageous for EMNEs (C. Wang et al., 2012).

Combining the RBV and the capability-building perspective helps to understand the positive moderating effect of firm-specific capabilities on international performances of emerging market firms (Lu et al., 2010). Consequently, both firm-specific and institutional resources are relevant factors for emerging markets firms to take the important internationalization step from exports to FDI activities. In particular, firms that are able to leverage institutional advantages are more likely to make this shift and successfully internationalize (Gaur et al., 2014). It is thus highly relevant to take ownership-structures or firm-specific resources as well as institutional support into account when observing internationalization activities of firms, as these constructs highly depend on each other and vary among firms (C. Wang et al., 2012). Therefore, it is quite clear that domestic political support can have a wide influence on different firms operating within the emerging market environment as well as encouraging firms’ outward internationalization activities local or national environment. Institutional and financial support can thus bolster and encourage internationalization efforts of domestic firms, support the national economy, as well as attract and maintain inward FDIs of foreign firms at the same time.

Consequently, and based on the elucidations above, it is hypothesized that:

**Hypothesis 1 (market-seeking motive).** Both AMNEs and DTFs are more likely to be characterized by the market-seeking motive of serving ‘neighboring markets’ than TMNEs.

**Hypothesis 2a (institutional support).** ‘Contact to collaboration partners and workforce’ is more important for both AMNEs and DTFs than for TMNEs.

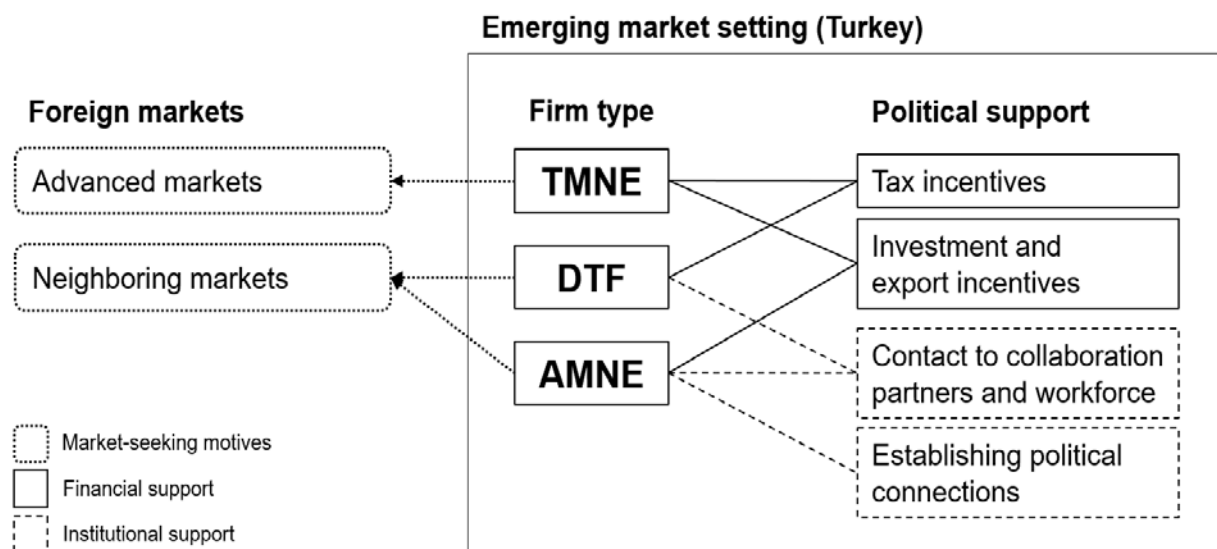
**Hypothesis 2b (institutional support).** ‘Establishing political connections’ is more important for AMNEs than for both TMNEs and DTFs.

**Hypothesis 3a (financial support).** ‘Tax incentives’ are more important for both TMNEs and DTFs than for AMNEs.

**Hypothesis 3b (financial support).** ‘Investment and export incentives’ are more important for both AMNEs and TMNEs than for DTFs.

A graphical abstract of the hypothesized firm characterizations as presented in hypotheses one to five are shown in figure 2.1. In summary, the following assumptions are made for each firm type: Based on domestic push factors such as upgrading pressures and outward FDI policies, TMNEs are supposedly using financial support in terms of tax incentives as well as investment and export incentives to primarily seek advanced markets. Based on RBV, Inst.BV and psychic distance arguments, smaller DTFs might mainly use institutional support in form of contact to collaboration partners and workforce as well as tax incentives to rather target cultural closely related neighboring markets. Based on inward FDI policies and besides operating within the Turkish market, AMNEs presumably use their subsidiaries in Istanbul to get access to neighboring emerging markets, and additionally seek institutional support in terms of contact to collaboration partners and workforce as well as establishing political connections to overcome LOF within Turkey.

**Figure 2.1:** Graphical abstract of the hypothesized firm characterizations



*Source: own figure*

## **2.3 Research methods**

### ***2.3.1 Survey sample and data collection***

For decades, Istanbul has been the major economic and manufacturing center of Turkey (Akgüngör, 2006) as well as the main regional hub for industry and trade, comprising 30.5 percent of the Turkish GDP and harboring the majority of FDIIs (Gezici et al., 2017) (TUIK, 2016). The city hosts the headquarters of the largest Turkish companies as well as the regional headquarters of several AMNEs, dominated mainly by MNEs from Europe and the US (Demirbag et al., 2007). In addition, TMNEs based in the greater metro-region of Istanbul are increasingly involved in internationalization processes through exports and outward FDIIs while entering joint ventures and R&D partnerships with AMNEs (Ayden et al., 2018; Demirbag et al., 2009). Istanbul thus provides an excellent setting to investigate how market-seeking strategies and a usage of political support may vary among R&D-intensive AMNEs, TMNEs and DTFs. In addition, upgrading pressures mostly affect the innovation-oriented segment of firms, which is why firms engaging in R&D-related activities were used for this study.

In order to capture the innovation-oriented segment of firms, the sampling frame for the survey's company selection was based on the database of the Scientific and Technological Research Council of Turkey (TÜBİTAK), which is the leading agency for the management, funding and conducting of research in Turkey. As of 2015, the TÜBİTAK database included 8560 companies throughout Turkey, which successfully completed at least one R&D project based on funding from TÜBİTAK. Of these companies, 3987 are located in the greater metro-region of Istanbul.

From the TÜBİTAK database, a new dataset was compiled based on the geographic location of companies and the number of successfully completed R&D projects. Only those firms headquartered in the greater metro-region of Istanbul and with at least three successfully finalized projects were included. However, selected companies are not innovative by default only because they completed a R&D project funded by TÜBİTAK. In fact, this procedure only served to capture the most relevant group of R&D-related firms for this study. Following the exclusion of these companies, the new dataset consisted of 838 companies. As the focus of this study is on differences and similarities of firms in an innovation-related environment, with a distinction between their ownership structure and origin, a pre-selection of companies according to certain industry classifications was avoided. After targeting general managers or senior R&D executives with a single questionnaire, 265 responses were received, of which 40 were omitted due to having missing values or no solid R&D background. Having an effective response rate of 26.85 percent (225/838) is thus satisfactory given the topic and the type of potential respondents.



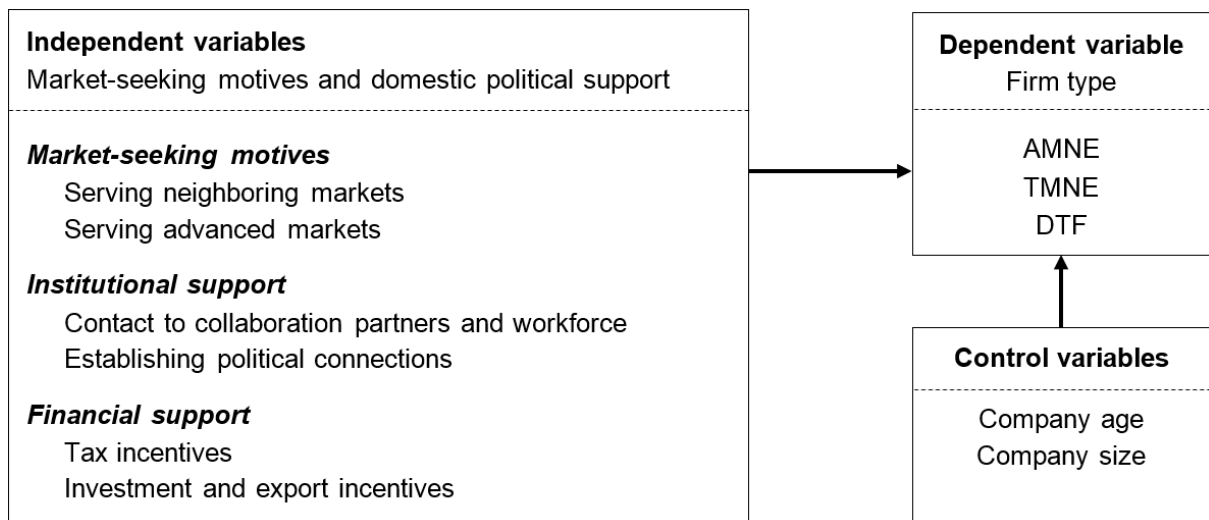
First, a test for non-response bias for the mail survey was conducted by comparing responses from early and late respondents (Armstrong & Overton, 1977), finding no statistically significant differences ( $p > .10$ ). Subsequently, a comparison of a randomly selected group of 50 non-participant companies and the 225 respondents revealed no significant differences for any firm-level indicators. Therefore, it is concluded that non-response bias would not pose a significant problem within the study.

### 2.3.2 Measurements of variables

The following is a brief description of the dependent, independent and control variables used in this study.

Overall, the hypotheses presented incorporate six independent variables and related hypotheses indicating how they might characterize the different firms. Two sales markets represent firms' market-seeking strategies and two institutional as well as two financial support factors represent the external environment that the metro-region of Istanbul provides to its companies. In order to complement the analysis, two of the usual control variables incorporated in many firm-level studies are applied as well: company age and company size. The subsequent methodological framework of the hypothesized relationships between independent variables, control variables and different company types is shown in figure 2.2.

**Figure 2.2:** Methodological framework



*Source: own figure*

The firm type (AMNE, TMNE and DTF) was treated as the dependent variable. Since this paper's aim is to identify characteristics of firms regarding their market-seeking strategies and usages of domestic political support, the "dependent variable" does not indicate an outcome, but rather provides a classification of certain companies. The three

different firm types are thus differentiated according to their ownership structures and internationalization stage. Consequently, AMNEs are by definition either 100 percent foreign and hence of non-Turkish ownership, or have entered a joint venture with a Turkish firm. Firms, which are 100 percent Turkish-owned, are categorized as either TMNEs or DTFs, with the latter type being distinguished by its current absence of internationalization activities. Hence, DTFs are defined as showing no FDI activities at present, whereas TMNEs are operating in foreign markets with potentially multiple subsidiaries abroad. The independent variables were measured as follows:

*Market-seeking motive* was measured using a five-point scale concerning the level of agreement (1=strongly disagree to 5=strongly agree) for statements in which respondents were asked about the company's choice of using the metro-region of Istanbul as an export base to serve certain markets. The items 'serving neighboring markets' and 'serving advanced markets' were derived from the following statements: 'Our company wants to serve neighboring markets (including Middle East, Eastern Europe or Central Asia)' and 'Our company wants to serve advanced markets (including US, Western Europe or Japan)'.

The usage of *political support* was measured by two constructs: *institutional* and *financial support*. For both constructs, relying on a five-point scale (ranging from 1=not at all important to 5=very important), the respondents were asked about the importance level of political or bureaucratic support instruments and their influence on the company's economic success in the metro-region of Istanbul over the last three years. The following items measured the importance of *institutional support* for the firms' economic success: 'providing contact to regional collaboration partners and workforce' and 'establishing political connections'. Here, access or contact to collaboration partners and workforce is used to capture external knowledge sources to the firms. *Financial support* was measured with three variables: 'tax incentives', 'investment incentives' and 'export incentives'.

As control variables, *company age* and *company size* are used. Both are common in many firm-level studies to control for firms' internal resources and were measured through ordinal scales. For *company age* – indicating experience and cumulative capability development – respondents were asked about the length of the company's operation in the metro-region of Istanbul based on a five-point ordinal scale. The *company size* – as an indicator of asset endowment and capacity – was measured using the total number of full-time employees in 2015 relying on six ordinal categories.

In order to establish content validity of the measures, the procedure suggested by Hair et al., (2007) was adopted. Firstly, exploratory in-depth interviews with five senior executives in Turkey were conducted, providing their first-hand experience of the issues studied. Secondly, an initial version of the survey was revised through discussions with

expert scholars and R&D specialists. Finally, four senior executives completed a pre-test survey that provided final fine-tuning opportunities and confirmed that the survey achieved a satisfactory level of maturity and clarity.

Having sufficient observations or events per variable (EPV) is a crucial factor in statistical analysis. Low EPV values of less than ten can lead to major problems and may influence the validity of logistic models (Peduzzi et al., 1996). However, more recent methodological studies suggest a number of five to nine observations per variable for statistically adequate and significant results. Nevertheless, the usage of larger case numbers is always preferable (Vittinghoff & McCulloch, 2007). With regard to achieving these numbers, the control variables are limited to only two, based on the usage of six independent variables and relatively low numbers of observations for AMNEs and TMNEs, resulting in EPV values of 6.38 for AMNEs ( $n=51$ ), 7.63 for TMNEs ( $n=61$ ) and 14.13 for DTFs ( $n=113$ ). Table A.2.1 in the appendix provides the measurement and descriptive statistics of variables used in this study.

Industry classes of all surveyed firms are as follows: 161 manufacturing firms (71.6 percent), 26 information and communication firms (11.6 percent), 17 firms in manufacturing-related or manufacturing-supportive industries (7.6 percent) and a heterogeneous mix of six other industry classes (9.3 percent). A more detailed division of industry classes was not possible or meaningful for two reasons. Firstly, the majority of large or multinational firms within the survey sample has a heterogeneous range of products from many different industry classes. For many firms, it was thus not possible to assign a single or major industry class. Secondly, for cases in which a subdivision of industry classes was possible, results show once again a very heterogeneous structure of sub-divided industry classes, which are impractical to use in further analysis. Based on these reasons and having such a dominant distribution of manufacturing firms anyway, industry classes were not used as dummy variables in subsequent logistic regression analysis. However, descriptive figures of the industry classes for all firm types are reported in table A.2.1.

### ***2.3.3 Data analysis***

Binary logistic regression is used to estimate the probability that the independent variables concerning market-seeking strategies and political support may characterize different company types. Hence, the interpretation of the statistical results cannot be carried out as in a regular causal-effect model. Here, it is rather used for a cross-comparison of firm types to gain an understanding of their different characteristics and behaviors. This method was chosen over other techniques due to the categorical and inherent nature of the dependent variable. Similar research on TMNEs and DTFs likewise used binary logistic regression with a characterization of company types as the

dependent variable (Demirbag et al., 2009, 2013, 2016; Mellahi et al., 2013; Tatoglu et al., 2003). For this, the binary logistic regression models can be expressed as:

$$P(Y_i = 1) = \frac{1}{1 + e^{-(\alpha + X_i \beta)}}$$

Here,  $Y_i$  is the dependent variable, which is defined as a dummy variable with a value of either 0 or 1, where a value of 1 denotes the probability of an event occurring rather than another denoted by 0. The intercept is shown as  $\alpha$ , and  $X_i$  is the vector of the independent variables with  $\beta$  as the vector of the regression parameters (Amemiya, 1981). In general, the sign of the regression coefficients  $\beta$  estimates the impact of the independent variables on the dependent variable, where a positive coefficient increases the probability of an event occurring, while a negative sign of the parameter implies the opposite effect on the outcome variable. Here, the regression coefficients estimate the degree to which an independent variable characterizes firm types.

## 2.4 Findings

The correlation matrix (Spearman's R-square) of the variables for the sample of 225 companies is summarized in table 2.1. When looking at the pairwise correlations, a strong positive and significant correlation between both financial support variables as well as between the two market-seeking variables can be found. These correlations are comprehensible, as both pairs of variables measure a similar topic. Another strong and positive correlation between 'contact to collaboration partners and workforce' and both financial support variables can be observed. Furthermore, company size also positively and significantly correlates with company age to a high degree.

**Table 2.1:** Correlation matrix (Spearman's r-square) of the variables

Variables	1	2	3	4	5	6	7	8
1 Serving neighboring markets	1.00							
2 Serving advanced markets	0.64**	1.00						
3 Contact to collaboration partners and workforce	0.09	0.10	1.00					
4 Establishing political connections	0.07	0.10	0.28**	1.00				
5 Tax incentives	0.11	0.17*	0.47**	0.27**	1.00			
6 Investment and export incentives	0.27**	0.29**	0.56**	0.32**	0.78**	1.00		
7 Company age (time spent of operation)	0.02	0.04	0.08	-0.00	-0.04	-0.02	1.00	
8 Company size (number of employees)	-0.04	0.02	0.08	0.13	0.06	0.04	0.42**	1.00

Notes: \*  $p < .05$ ; \*\*  $p < .01$  (two-tailed test);  $N = 225$

Source: own table

Due to these partially strong correlations between the explanatory variables, an analysis of variance inflation factor (VIF) and tolerance values are used to test for a multicollinearity problem. Several authors suggest that VIF values should not be larger than 10 (Kutner et al., 2005; Wetherill et al., 1986) and tolerance values should not be lower than .20 (Menard, 2002). Nevertheless, these rule of thumb values vary between studies and should therefore be questioned and not solely used for the elimination of certain variables (O'Brien, 2007). However, since no tolerance value is lower than .28 and none of the VIF values are higher than 3.6, multicollinearity in the independent variables does not seem to be a problem.

To test the hypotheses, three binary logistic regression models were created: (1) comparison between AMNEs and TMNEs, (2) comparison between AMNEs and DTFs, and (3) comparison between TMNEs and DTFs. The outcomes of these models are reported in table A.2.2 in the appendix. For binary logistic regression model 1, TMNEs are assigned with a value of zero as the base model. For models 2 and 3, DTFs are used as the base model with a subsequent value of zero. Positive and negative observed coefficients need to be interpreted accordingly.

Starting with reliability measurements, all three models have fairly high and significant chi-square values. Therefore, the prediction models fit significantly better to the surveyed data than a null model. The Cox & Snell as well as the Nagelkerke pseudo R-square models also indicate a good overall fit with a high explanatory power for model 2 and an adequate explanatory power for model 1 and 3. With regard to effect size values, models 1 and 3 show a medium effect size, whereas model 2 shows a strong effect size. In addition, the precision of all models' classification rates is significantly higher than expected by chance. Finally, the non-significant ( $p < .10$ ) chi-square values of the Hosmer & Lemeshow Test indicate no significant differences between observed and predicted values. Hence, a good overall fit of the selected variables can be assumed (Hosmer et al., 2013). Looking at the coefficients of the independent variables in each model, five hypotheses about firms' market-seeking motives as well as the usage of institutional and financial support are tested.

No support can be found for hypothesis 1, as negative but non-significant coefficients in both models 1 and 2 are present. It seems that AMNEs and DTFs are less likely to be characterized as using Istanbul to serve 'neighboring markets' than TMNEs. Moreover, some support can be found for TMNEs seeking advanced markets, as the coefficient for 'serving advanced markets' is negative and significant ( $\beta = -.343$ ,  $p < .10$ ) in model 1, but negative and non-significant in model 3. As a result, TMNEs are more likely to be characterized as using their home base to serve 'advanced markets' than AMNEs, whereas no difference in comparison between TMNEs and DTFs can be observed.

Only partial support is found for hypothesis 2a, with a negative and highly significant coefficient ( $\beta = -.787, p < .01$ ) of ‘contact to collaboration partners and workforce’ in model 2 and a negative but non-significant coefficient in model 3. Accordingly, having ‘contact to collaboration partners and workforce’ is more likely to be important for DTFs than for AMNEs, whereas no significant difference in the likelihood between TMNEs and DTFs can be found. However, hypothesis 2b about ‘establishing political connections’ is fully supported, as the coefficients in model 1 and 2 are both positive and significant ( $\beta = .372, p < .05$ ;  $\beta = .419, p < .10$ ). Therefore, ‘establishing political connections’ is more likely to be important for AMNEs than for DTFs as well as TMNEs.

Regarding hypothesis 3a, the coefficients of ‘tax incentives’ are negative and significant ( $\beta = -.455, p < .10$ ) in model 1 and even more significantly negative ( $\beta = -.753, p < .05$ ) in model 2. These findings show full support of the assumption that ‘tax incentives’ are more likely to be important for both TMNEs and DTFs than for AMNEs. In more detail, tax incentives are also of higher relevance for DTFs than TMNEs. Hypothesis 3b is also supported, finding coefficients of ‘investment and export incentives’ positive and significant in both models 2 and 3, where a positive coefficient ( $\beta = .844, p < .50$ ) in favor of AMNEs and a similarly positive coefficient ( $\beta = .728, p < .50$ ) in favor of TMNE can be observed. Correspondingly, ‘investment and export incentives’ are more likely to be important for both AMNEs and TMNEs than for DTFs.

With regard to the control variables, the coefficients of company age show non-significant values for all three models. However, a positive and significant coefficient of company size for all models can be observed, which are positive and moderately significant in model 1 ( $\beta = .233, p < .10$ ) and highly significantly positive in model 2 ( $\beta = 1.430, p < .01$ ) and model 3 ( $\beta = .962, p < .05$ ). According to these results, both AMNEs and TMNEs are characterized as having a higher number of total employees than DTFs, while AMNEs are also more likely to have a larger company size than TMNEs. These significant differences in firm size consequently result in a diverse range of internal capabilities or resources at firm level. Moreover, the ownership structures of the surveyed firms play a significant role as well, as DTFs are smaller and predominately family-owned, whereas AMNEs and TMNEs are mainly large enterprises or highly diversified business groups. These findings lead to theoretical assumptions in terms of internationalization and varying needs for political support, which is why it is important to keep these size and ownership differences in mind when interpreting the results of this study.

A summary with the degree of support for all hypotheses is shown in table 2.2.

**Table 2.2:** Degree of support for hypotheses (summary)

Hypotheses	Degree of support
<b>Market-seeking motives</b>	
<i>Hypothesis 1:</i>	
Both AMNEs and DTFs are more likely to be characterized by the market-seeking motive of serving ‘neighboring markets’ than TMNEs.	Not supported
<b>Institutional support</b>	
<i>Hypothesis 2a:</i>	
‘Contact to collaboration partners and workforce’ is more important for both AMNEs and DTFs than for TMNEs.	Partially supported
<i>Hypothesis 2b:</i>	
‘Establishing political connections’ is more important for AMNEs than for both TMNEs and DTFs.	Supported
<b>Financial support</b>	
<i>Hypothesis 3a:</i>	
‘Tax incentives’ are more important for both TMNEs and DTFs than for AMNEs.	Supported
<i>Hypothesis 3b:</i>	
‘Investment and export incentives’ are more important for both AMNEs and TMNEs than for DTFs.	Supported

*Source: own table*

## 2.5 Discussion

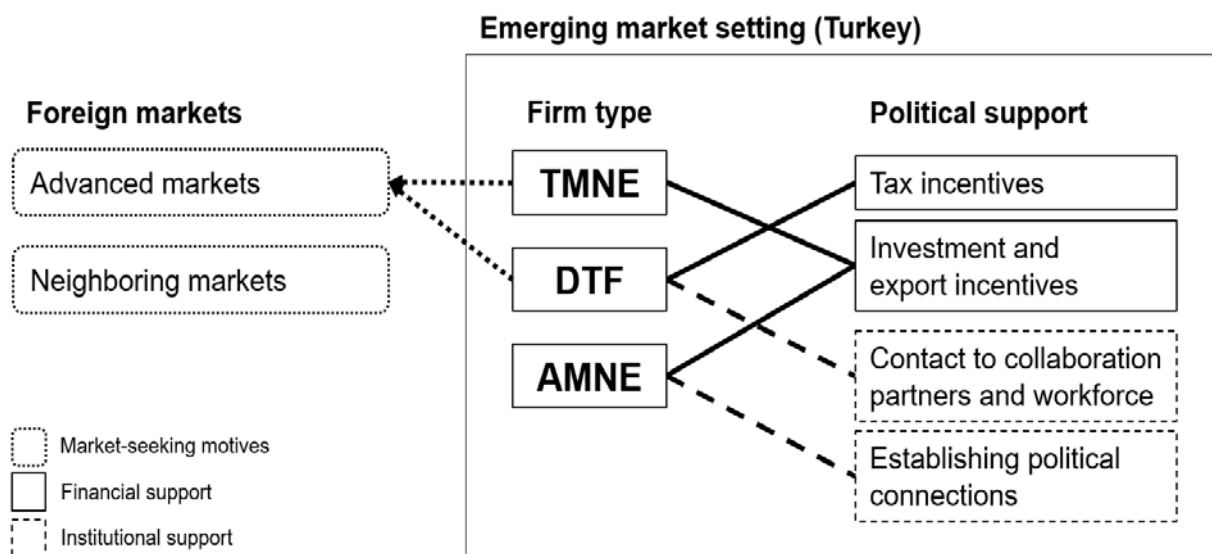
### 2.5.1 Differences and strategies

In terms of differences and strategies of the firm types examined, the results of this study will now be discussed in more detail. An updated graphical abstract of the results can be found in figure 2.3.

Concerning *market-seeking motives*, the hypothesis of using Istanbul to serve neighboring markets was not supported, as no significant difference in characterization between the three company types was found. Neither AMNEs nor DTFs seem to favor these surrounding emerging markets, which is a different outcome than expected. This could be related to AMNEs preferably seeking the Turkish market as well as EMNEs and DTFs rather targeting advanced markets in accordance to the model results. Additionally, uncertain conditions in some surrounding countries – particularly in the Middle East – might also be a reason for not primarily targeting corresponding markets. Furthermore, it is interesting to observe that using Istanbul to serve advanced markets is not of greater importance just for TMNEs. Although this assumption was supported when comparing the two MNE types, no difference between DTFs and TMNEs can be found. In fact, DTFs show higher levels of being characterized by

market-seeking strategies of serving advanced markets than AMNEs, which is an interesting outcome of this study. From a springboard perspective (Luo & Tung, 2007), both TMNEs and DTFs seem to equally target advanced markets as part of their prospective market-seeking strategies. The authors Padilla-Perez & Gomes Nogueira (2016) find similar results for outward FDIs from developing economies firms, where not only large and mature firms but also domestic SMEs actively engage in market-seeking strategies (Padilla-Perez & Gomes Nogueira, 2016). In this regard, not only large EMNEs are in favor of public incentives for outward FDI activities (Ayden et al., 2018), but particularly small- and medium-sized domestic firms benefit from positive effects of financial public support on their export and internationalization intensity (Ciszewska-Mlinarič, 2018). Therefore, accessing knowledge and technologies in advanced markets becomes highly important for all types of Turkish firms to overcome a shortage of resources and capabilities within their home market (Ozturk, 2018). In addition, research on the catching-up strategies of Chinese EMNEs provides similar results in terms of R&D internationalization to gain access to superior resources abroad (Schäfer & Liefner, 2017). Finding that AMNEs do not preferentially serve advanced markets could be a biased result, as responses from AMNEs operating within the Turkish market were collected. Respondents from these subsidiaries may have a different market-seeking motive of favoring the Turkish market than they would have in a different country setting.

**Figure 2.3:** Graphical abstract of the results



*Source: own figure*

In terms of *institutional support*, two-sided results for the hypothesis that providing contact to collaboration partners and workforce is of greater importance for AMNEs



than for both Turkish firm types can be found. Particularly when comparing AMNEs with DTFs, a significantly greater importance for the latter company type is proven. This could be related to firms' internal resources, which are reflected in larger company sizes of AMNEs than those of DTFs. AMNEs might be in less need of this institutional support form due to their overall larger resource base and thus easier access to the workforce as well as collaboration partners with the help of their corporate network. Therefore, as the possibility to make use of local assets depends to a large degree on access to regional collaboration partners (Chesbrough, 2003), this situation becomes particularly sinister to small DTFs. Moreover, full support for the assumption that establishing political connections is of greater importance for AMNEs than for both Turkish firm types can be found. It seems that this form of institutional support is particularly important for AMNEs to overcome their LOF within the foreign market setting of Turkey (Johanson & Vahlne, 2009; S. Zaheer, 1995) and secure personal ties with government officials as an important part of their company performance (Peng & Luo, 2000). Gaining access to reliable information about the Turkish market hence seems to be an important factor for foreign companies. Here, DTFs and TMNEs show equally low importance ratings of this institutional support, as they might already be well connected and familiar with the national and/or regional setting.

Furthermore, full support is found for the hypothesis that *financial support* with regard to tax incentives is a more important factor for both TMNEs and DTFs than for AMNEs. Particularly DTFs are in need of such incentives to overcome resource-based disadvantages compared to larger and already economically successful AMNEs. This is also true when comparing TMNEs with DTFs, where the latter type benefits significantly more from tax incentives. Such financial incentives are particularly important, as they may foster investments in technology and organization at the firm level (Barney, 1991; Pavitt, 1990; Prahalad & Hamel, 1990), and thus directly support companies' upgrading efforts (Szczygielski et al., 2017; J. Wang, 2018). For hypothesis two of the financial support category, the assumption that investment and export incentives are more likely to be important for both MNEs than for DTFs is also fully supported. Due to strong international activities, Turkish EMNs as well as AMNEs rate the importance of such incentives significantly higher than the currently less internationalized domestic Turkish companies do. However, no significant difference between TMNEs and AMNEs concerning the importance of investment and export incentives is found. In addition to that, descriptive results for the import share of total sales show higher values for AMNEs than TMNEs, whereas export share of total sales values are higher for TMNEs. Based on an inward FDI stock from and an outward FDI stock to primarily Europe and the US (Demirbag et al., 2007), the importance of import and export incentives for attracting investments from more diverse parts of the world

and fostering outward FDIs of TMNEs to more different destinations is evident (Ayden et al., 2018).

### ***2.5.2 Limitations and implications***

Due to the exploratory nature of this study, results and implications need to be interpreted with caution. Firstly, using a single-country setting is a limitation to the generalizability of the results. Therefore, conducting a similar research approach in a different emerging economy setting would be interesting to compare the outcomes of this study and would help to generalize the results in other contexts and thus extend the existing literature in the field of emerging market research (Nielsen et al., 2018). Secondly, the intended focus on R&D-intensive firms also produces specific outcomes for a certain group of firms rather than for ones without any R&D-related activities. Thirdly, internationalization of companies is a multifaceted concept of different motives, strategies and activities with no unique or correct process (Ietto-Gillies, 2010). Although market-seeking strategies are a vital and relevant aspect of firms' internationalization, other variables could have been used to measure this category. In addition, having more cases of AMNEs would be desirable to compare different countries of origin.

## **2.6 Conclusion**

In the ongoing approach to add more insights to the understanding of emerging markets and how firms in these countries are responding to upgrading pressures, this paper contributes with a characterization of three different company types and key factors of their market-seeking strategies and usage of political support within Turkey. In a novel comparative survey of R&D-intensive companies in the metro-region of Istanbul, several commonalities and differences between the groups of firms are observed. Overall, AMNEs particularly benefit from investment and export incentives as well as from establishing political connections. DTFs, to a highly significant degree, use tax incentives as financial support as well as contact to collaboration partners and workforce as institutional support, and target advanced markets as part of their prospective market-seeking strategy. TMNEs particularly benefit from investment and export incentives and primarily target advanced markets as well. These results lead to theory and policy implications.

As a general finding of this study, single theories such as internationalization motives and the RBV arguments are too unilateral on their own, particularly when looking at emerging market settings. In combination, both theoretic constructs provide a much better understanding of firms' behaviors in respective contexts. It is thus highly relevant to consider the interplay of market-seeking strategies and firms' resource bases

as well as resulting usages of different institutional and financial support. Particularly with regard to both Turkish company types – despite their diverse resource bases and assumed divergent internationalization motives – a similar path in their market-seeking strategies of targeting advanced Western markets rather than neighboring emerging markets was found. In this regard, LOF or outsidership do not seem to pose a problem for Turkish firms, as they deliberately seek advanced over neighboring emerging markets. Therefore, having a close psychic distance is not the main motive for Turkish firms' internationalization, leading to the assumption that respective theories discussed by Johanson & Vahlne (1977, 2009) do not provide an adequate explanation for market choices of emerging market firms. This papers' finding rather support the springboard perspective discussed by Luo & Tung (2007), where EMNEs successfully and rapidly target advanced markets to overcome their home-market constraints.

In sum, an overall theoretical implication of this study is the fact that a unidimensional approach to the interrelated concepts of upgrading, internationalization and political support is too limited for a comprehensive analysis. Within emerging market settings, it is thus highly relevant to apply an eclectic or multidimensional concept to capture basic characteristics and business strategies of a heterogeneous corporate landscape operating in such contexts.

In terms of capacity building and upgrading processes, firms respond in various ways to institutional support and financial incentives. In addition, regional and national policies need to make allowance for different firm motives to attract and maintain foreign investment on the one hand and support internationalization strategies of EMNEs and domestic firms on the other. Hence, developing R&D policies to enable Turkish firms' R&D sourcing at home and abroad becomes a crucial aspect in this regard, as particularly offshore R&D sourcing is gaining importance over time (Ozturk, 2018). This particularly applies for smaller R&D-related companies, as these are in greater need of financial support due to their lack of internal resources. Governmental strategies and programs to promote these R&D activities and upgrading efforts, such as increasing public and business expenditure on R&D, are indispensable for future economic development. Beyond the Turkish context, respective results may also hold true for companies in similar emerging markets, dealing with upgrading pressures and the need for technological transformation.

# Chapter 3 | Article two

## **The interplay of R&D Resources, Internationalization and Innovation Success in an Emerging Economy: A differentiated Company Comparison from Turkey**

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### **Abstract**

Knowledge and innovation capacities are unevenly distributed on a global scale, with national or regional settings playing a crucial role when it comes to the production and usage of knowledge. In particular, emerging economies (EEs) are less equipped with relevant institutions and resources, meaning that firms residing in such contexts are likewise dealing with lacking innovation capabilities. However, achieving innovation is highly relevant for the economic development of firms and regions. Therefore, we aim to identify key factors for innovation strategies in a differentiated corporate landscape that might affect innovation success. Survey data from the innovative segment of manufacturing firms in Istanbul is used with a two-step methodological approach. We apply dimension reduction through principal component analysis and use resulting components in logistic regression analysis to estimate their effects on firms' innovation success. The results reveal not only important findings about factors for the innovation success of firms, but also highly relevant insights about firms' innovation strategies. The usage of internal and external R&D resources varies with firm type. In addition, we find that external R&D resources determine firms' internationalization strategies. Hereof, we suggest policy implications for distinct firm types to support diverse innovation strategies and consequently innovation success.

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## The interplay of R&D Resources, Internationalization and Innovation Success in an Emerging Economy: A differentiated Company Comparison from Turkey

### 3.1 Introduction

In order to compete in a technology-driven world, achieving innovation is becoming a central factor to thrive economically. For firms in emerging economies (EEs) with their rising labor costs, corporate success thus increasingly depends on innovation abilities. However, the geographies of innovation demonstrate an uneven distribution of knowledge and innovation capacity among countries and regions. Knowledge is often produced, used, accumulated and enhanced in certain places (Dicken, 2011). Therefore, the national or regional setting plays a crucial role when it comes to respective capacities of knowledge production and learning (Cooke et al., 1997). In particular, EEs are rather less equipped with relevant resources and institutions. There is not only a variation in educational levels but also in public and private spending for research and development (R&D) as well as scientific personnel. For instance, the G20 countries accounted for 92 percent of global R&D spending and 87 percent of all global researchers in 2013 (UNESCO, 2015). Consequently, domestic firms within EEs are likewise dealing with limited resources and lacking innovation capabilities due to relatively less developed scientific environments (Ozturk, 2018).

Nevertheless, in a globalizing world economy, EEs are interesting destinations for foreign direct investments (FDIs) from multinational enterprises (MNEs), based on business strategies such as asset- or market-seeking (Dunning, 1998, 2000). Major MNEs from advanced markets, operating in an EE setting, serve as role models for domestic firms to undergo a catching-up process and consequently obtain access to competitive markets. Hence, the literature on domestic latecomer firms in EEs focuses on technology followership as the primary strategy for business development (Hobday, 1995; Hobday et al., 2004; Mathews, 2006a). Nevertheless, it is unclear whether these spillover-related approaches (Blomström & Kokko, 1998; Gorg, 2004) are contributing to successful innovation in any EE context. In addition, a more differentiated view about the domestic and foreign company population in EEs is necessary to identify the distinct factors affecting firms' innovation strategies and innovation success.

For this study, the country of Turkey was selected for a number of reasons. Firstly, Turkey has been one of the leading economic centers connecting Southeastern Europe and the Middle East for many years (Tatoglu & Demirbag, 2008), and is currently in a transformation stage from an emerging to an industrialized economy. Secondly, due to its unique location between Europe and Asia and thus close proximity to both markets, Turkey has attracted an increasing amount of FDIs from countries around the world

(Ayden et al., 2018), including an increasing number of MNEs engaging in R&D activities (Karabag et al., 2011). Thirdly, the country is constantly transforming its economic structure towards an innovation-related environment by implementing mechanisms in education and social state policies as well as direct support for innovation activities of domestic firms (Bakirci, 2018; Yildirim, 2017). During the period 2016 to 2018, about 36 percent of all enterprises in Turkey reported some form of innovation activity, of which 35 percent received public financial support (TUIK, 2019c). In the past ten years, the share of gross domestic expenditure on R&D steadily increased from 0.81 percent in 2009 to 1.03 percent in 2018 (TUIK, 2019d). Nevertheless, Turkey is still in the bottom half of OECD countries regarding competences and capacities to innovate as well as required interactions and skills for innovation (OECD, 2016). In addition, even though Turkey is well integrated into global value chains (GVCs), Turkish firms are mostly involved in low value-added activities, resulting in a situation in which policy-makers try to find a way to increase the value-added of domestic firms to raise productivity. Therefore, the question arises concerning key factors for innovation success, such as internal and external R&D resources, that might positively affect firms' innovation strategies. The results deliver a differentiated pattern of factors affecting innovation success in an EE context that is heavily influenced by economic globalization.

In order to answer this question, this study analyzes survey data from the innovative segment of manufacturing firms in Istanbul. With the help of principal component analysis (PCA), three principal components of various R&D resources are identified for further analysis: internal resources, external technological knowledge and external market knowledge. With the use of logistic regression, the impact of the respective components on the innovation success of firms are modeled. To capture the results for a differentiated corporate landscape within the EE setting of Turkey, three firm types are compared: domestic Turkish firms (DTFs), Turkish MNEs (TMNEs) and advanced market multinational enterprises (AMNEs).

This paper is organized as follows. Firstly, the theoretic framework of this study is presented. Secondly, hypotheses are developed with underlying theories regarding internal and external factors for innovation success in EEs as well as innovation strategies of different firm types. Thirdly, survey sampling and data collection, measurement of variables and data analysis are outlined. Hereafter, PCA is used to identify principal components of the R&D resources and binary logistic regression analysis is used to test the hypotheses. Finally, results are discussed and theoretical as well as policy implications are drawn.

## **3.2 Theoretical framework and hypotheses development**

### ***3.2.1 Emerging markets and internationalization strategies***

Explaining the economic rise of poor or peripheral countries has attracted the interest of social scientists, economists and economic geographers, at least starting with the development of the Asian Tiger economies in the last decades of the 20th century (Gulati, 1992; Lall, 1996). A number of key terms have since been applied that help to structure and understand this phenomenon. The perspectives of GVCs (Dicken, 2011; Gereffi, 1999) as well as latecomer firms and technological catching-up (Mathews, 2006b) have proven most seminal in this context. They stress the fact that EEs and their firms initially start from a position of limited science and technology (S&T) or R&D resources and a weak institutional framework, restricting firms to low value-added activities. Therefore, the context of EEs creates difficulties for firms in such contexts to access external and advanced knowledge sources (Ozturk, 2018). Globalization thus provides opportunities for these firms to enter global production networks and to learn how to master higher value-added activities (Ernst & Kim, 2002; Hobday, 1995; Humphrey & Schmitz, 2002; Mathews, 2002). Involvement in GVCs becomes a crucial knowledge source for EE firms, particularly within knowledge-intensive or high-tech industries (Hu & Mathews, 2005). Therefore, FDIs – both inward and outward – create opportunities for EE firms to collaborate along value chains, to exchange goods and services and to either benefit or suffer from spillover effects (Blomström & Kokko, 1998; Gorg, 2004). However, in order to overcome locational disadvantages and benefit from these opportunities, internal capacities are crucial for domestic firms not just to recognize, but also to understand and thus utilize available knowledge sources. Hereinafter, latecomer firms are strategically able to access advanced knowledge through linkages to other firms, leverage of available resources and subsequent learning (Mathews, 2002).

In the context of a globalized economy, companies seek to build a competitive position and concentrate on those activities that match their own capabilities. This contributes to different internationalization motives, i.e. market-seeking or asset-seeking (Dunning, 1998, 2000), to the emergence of different types of firms, domestic or MNEs, and to different needs regarding the home and host regions. In this context it is widely accepted that AMNEs usually seek market access in EEs, and do not predominantly try to place R&D activities there, while EE MNEs' outward investments in industrialized countries or advanced markets are aligned towards accessing technological knowledge (Ayden et al., 2018; Haasis & Liefner, 2019). In particular, companies from EEs that actively pursue a strategy of technological upgrading may seek not only to exploit the limited technological capacities of their home base, but also to benefit from technological capabilities residing in other regions or with other firms (Mathews, 2006a).

### ***3.2.2 Innovation capacities in Emerging Economies***

However, effective technological upgrading of firms critically depends on broader strategies at the domestic location that involve efforts and investments in organization, knowledge creation and technological development at the firm level (Pavitt, 1990; Prahalad & Hamel, 1990), public investments in human capital, institutions, administration and the S&T system at the regional and national levels (Cooke, 2001; Hu & Mathews, 2005; Lundvall, 2007), assistance for domestic firms to establish closer linkages with advanced global players and stronger embeddedness in GVCs (Gereffi et al., 2005; Giuliani et al., 2005; Humphrey & Schmitz, 2002), as well as direct political support for firms' innovation efforts (Szczygielski et al., 2017; J. Wang, 2018). Hu & Mathews (2005) identify public R&D funding as an important lever for latecomer economies to catch up with technological leaders, indicating that latecomer countries become more innovative when specializing on certain industries (Hu & Mathews, 2005). While it is clear that innovation is to a large degree rooted in specific skills, resources and capabilities at the firm level (Barney, 1991; Eisenhardt & Martin, 2000; Teece et al., 1997; Wernerfelt, 1984), innovation capabilities also involve knowledge from sources external to the firm (Chesbrough, 2003, 2010; Cohen & Levinthal, 1989, 1990; Teece, 1977; Teece et al., 1997). Here, firms' usage of external resources highly depends on access to collaboration partners and political support. In particular, collaboration facilitates not only interactive learning, knowledge sharing and the opening of innovation processes (Chesbrough, 2003), but is also a highly relevant success factor for firms' innovative behavior as incorporated in previous studies (Liefner et al., 2013; Wu & Liu, 2009). Hence, empirical research on innovation processes, systems and outcomes highlights the importance and varying influence of both types of knowledge, internal and external, as well as public financial support (Szczygielski et al., 2017), since market alone provides insufficient incentives for knowledge production and long-term R&D investments of firms (S. Martin & Scott, 2000; J. Wang, 2018). Although it can be assumed that innovation output in the EE context is often more incremental than radical, the spectrum of innovation is still broad. Innovations in EEs thus involve low-cost and frugal, adaptive and architectural as well as many forms of user-driven innovation (Ernst & Kim, 2002; Henderson & Clark, 1990; Malecki, 1991; Zeschky et al., 2011). Moreover, foreign firms' subsidiaries in EEs have the option to either use or forego involving local capabilities in their innovation processes (Liefner et al., 2013), whereas domestic firms need to make use of their absorptive capacities (Mathews, 2002) or need to target advanced markets to gain access to superior knowledge and thus obtain strategic assets (Buckley et al., 2007; Jormanainen & Koveshnikov, 2012; K. E. Meyer, 2004; Ramamurti, 2004). Due to the fact that such a possession of strategic assets or internal capabilities is an important requirement to internationalize and meet



advanced market needs in the first place (Aulakh, 2007; Ramamurti, 2012), R&D sourcing becomes an enabling factor for EE firms to upgrade their knowledge bases in their home country (Ozturk, 2018). Here, absorptive capacity in terms of diffusion channels, interaction mechanisms and internal R&D resources is a highly relevant factor for successful transfer of technological knowledge (Lin et al., 2002).

The various types of innovation output, reflected in the standard measurements of innovation in the Oslo Manual (OECD/Eurostat, 2018), depend on different knowledge inputs. Regarding this, firms pursue diverse R&D strategies to achieve innovation and thus benefit from varying forms of political support. The policy on innovation distinguishes in this respect between demand-pull and technology-push strategies that both foster innovation. User-driven or demand-pull strategies have a focus on innovation for market needs, where market research and consumer needs indicate the way to achieve innovation (Scherer, 1982). The respective innovation strategy includes rather fast and incremental innovation but with low risks and profit. Technology-push strategies, however, are independent of market needs and indicate a focus on rather long-term radical innovation but with high risks and potential profits. This type of supply-driven innovation strategy draws heavily on basic and applied scientific knowledge (Dosi, 1982). However, the two concepts are criticized, which is why weaker versions of both strategies are necessary to explain innovation (Nemet, 2009). In this regard, not only must both concepts exist simultaneously for innovation to result, but they even closely interact with each other (Arthur, 2007; Mowery & Rosenberg, 1979; Nemet, 2009). In addition, demand-pull absorptive capacities of firms are relevant to access market-related knowledge (i.e. competitors, suppliers and customers), while technology-push absorptive capacity is an essential source to benefit from external scientific or technological knowledge (i.e. collaboration with scientific partners, acquisition of technology or licensing) (Murovec & Prodan, 2009). Recent studies have revealed the policy effects of these demand-pull or technology-push innovation strategies (Costantini et al., 2015; Hoppmann et al., 2013; Nemet, 2009; Peters et al., 2012), their effects on absorptive capacity and internal capabilities at the firm level (Murovec & Prodan, 2009; Piva & Vivarelli, 2009) as well as the diverse approaches within the vast amount of literature on the topic (Chidamber & Kon, 1994; Di Stefano et al., 2012).

However, no matter what strategies are pursued, this study does not focus on the measurement of innovation success with quantifiable performance indicators such as patents or new products (OECD/Eurostat, 2018), but rather on the self-assessment of firms as being successful in achieving innovation. This approach helps to identify the supposedly relevant factors or capabilities for firms' self-evaluation of innovation success and effective innovation strategies (Björkdahl & Börjesson, 2012).

### ***3.2.3 Studies about the Turkish context***

In the following section, recent studies from the Turkish context in terms of economic development, R&D support and innovation-related activities of firms are briefly described.

The city of Istanbul has established itself as a leading hub for exchange and manufacturing (Akgüngör, 2006; Ersoy, 2018) and is one of the largest and most prosperous urban economies in the Middle East (Ayden et al., 2018). Both inward FDIs and increasingly outward FDIs of TMNEs have been the central factor for the city's and country's economic development in recent years (Ayden et al., 2018). In a comparative study between Turkish regions, Akpınar et al. (2015) highlight Istanbul as the only globally competitive and leading innovation center throughout Turkey. The nation's highest numbers in total wages, firms' revenues and high-tech activities result in an overall productivity level that is twice as high as that of all other Turkish regions (Akpınar et al., 2015). However, the Turkish economy and Istanbul have been affected by globalization-related factors and hence require the technological upgrading of domestic firms. Ersoy & Taylor (2012) find that technological developments in terms of employment in high-tech industries are uncorrelated with the economic development of Turkish regions (Ersoy & Taylor, 2012). It thus seems that technological knowledge was a less relevant factor for the economic growth of Turkey in the past and has only slowly emerged since then. In addition, Turkey's partly weak institutional environment affected the country negatively and prevented the economy from realizing its full potential of FDIs (Apaydin, 2009; Erdal & Tatoglu, 2002). Karabag et al. (2011) thus emphasize that a sufficient scale of production, private capital and specific public policies are needed to attract international R&D in the future (Karabag et al., 2011).

Nevertheless, according to Mercan (2016), domestic firms residing in Istanbul and the Marmara region focus on successfully integrating themselves into the globalized economy, attaching importance to management knowledge and prioritizing technology transfer from other places (Mercan, 2016). Hence, TMNEs increasingly focus on R&D internationalization to advanced markets, trying to catch up and gain parity with AMNEs and respective industry leaders in the long term (Awate et al., 2015). Nonetheless, TMNEs' outward FDI activities have primarily been attributed to market-seeking motives up to now (Aybar, 2016; Ayden et al., 2018). At the same time, increasing public efforts are visible that seek to strengthen the domestic scientific and educational knowledge base and aim to promote firm-level upgrading through public support (Bakirci, 2018; TUIK, 2019d; Yildirim, 2017). However, with respect to the private sector in Istanbul, Huggins & Strakova (2012) indicate a demand gap for innovation-related services provided by universities or the national government. In particular, small and medium-sized enterprises (SMEs) are not sufficiently aware of

existing support options. Overall, the authors describe a lacking innovation culture as the biggest weakness of the city as well as the whole country. Consequently, continuous efforts to create and support an innovation culture are supposedly a highly relevant task (Huggins & Strakova, 2012).

Özçelik & Taymaz (2008) find an acceleration effect of public R&D support on the private R&D investment of firms in the Turkish manufacturing industry. Smaller firms profit more from public R&D and increasingly engage in R&D. Furthermore, domestic R&D activities and technology transfer from abroad are indicated as complementary processes (Özçelik & Taymaz, 2008). In addition, Taymaz & Ucdogruk (2013) analyze R&D support programs on researcher demand in Turkey and find a positive effect of such programs in raising the demand for researchers within the Turkish manufacturing industry (Taymaz & Ucdogruk, 2013). In a study by Fazlioglu et al. (2019), the authors indicate an existing positive and complementary relation between different forms of innovation, meaning that one type of innovation triggers other innovation activities of firms. In addition, the authors underline the importance of internal R&D with regard to innovation output and productivity of firms, since internal R&D activities build up important firm-specific knowledge. Moreover, the utilization of external R&D resources is often restricted by low levels of firms' absorptive capacities. Therefore, policy interventions and subsidies should be allocated to firms' internal R&D investments instead of promoting external ones (Fazlioglu et al., 2019). Nonetheless, Fındık & Beyhan (2015) find a positive relation between external collaboration and firms' product innovation. Hence, firms that collaborated with external partners during their innovation process observed a positive effect on their product and process innovation activities (Fındık & Beyhan, 2015). Other studies indicate that Turkish firms indeed have strong collaboration ties with external partners, but existing partnerships only have a weak impact on their innovation performance (Cetindamar & Ulusoy, 2008).

Furthermore, evidence from studies about the Turkish manufacturing industry reveal positive effects of innovation activities on firms' financial performance (Gunday et al., 2011; Karabulut, 2015), and a strong emphasis on the positive effects of technological innovation compared to non-technological innovation (Atalay et al., 2013). Meschi et al. (2011) show a positive and significant relationship between R&D expenditures and skill upgrading of Turkish manufacturing firms, together with a positive impact of foreign technological transfer on the firm level (Meschi et al., 2011). In addition, Özçelik & Taymaz (2004) emphasize that R&D activities are a crucial success factor for Turkish manufacturing firms (Ozcelik & Taymaz, 2004). Furthermore, Uzun (2001) describes internal R&D and the size of firms as the main factor for technological innovation activities of firms within the Turkish manufacturing industry, together with product quality improvements and the opening up of new markets as central objectives for firms'

innovation strategies (Uzun, 2001). Based on the innovation success of Turkish firms, Güngör & Gözölü (2012) emphasize international relations as a highly relevant external factor as well as R&D activities, technological licensing, formal training and managerial experience as significant internal factors. Moreover, the authors still observed a group of firms that invest in internal capabilities but are not involved in any innovation activities (Güngör & Gözölü, 2012). In addition, Beyhan & Fındık (2014) emphasize the importance of firms' internal R&D activities and open innovation strategies for the likelihood of a collaboration with universities, thereby gaining access to external scientific knowledge (Beyhan & Fındık, 2014). However, findings from Temel et al. (2013) indicate negative effects on the profit growth of firms between innovation strategies and collaboration with university (Temel, Scholten, et al., 2013). Empirical evidence by Lenger & Taymaz (2006) reveals findings about innovation activities and technology transfer of foreign and domestic firms in the Turkish manufacturing industry. In this regard, foreign firms show higher levels of innovativeness and a direct transfer of required technology from abroad. Horizontal spillovers show negative effects and vertical spillovers have a positive impact on high-tech suppliers only. Hence, the authors emphasize the importance of tacit knowledge and remind us that technology cannot simply be transferred through passive spillover mechanisms (Lenger & Taymaz, 2006). In addition, Pamukcu (2003) find a non-significant effect of technology spillovers on firms' probability to innovate. According to the author, the presence of foreign firms within the Turkish manufacturing industry does not have an effect on innovation activities of domestic firms, and neither do exporting, technological licensing or collaboration with a foreign partner (Pamukcu, 2003).

Considering the large number of studies about innovation in Turkey, this EE is indeed a highly relevant context to study. However, there is a void in the literature about the interplay of factors influencing the innovation success of firms, such as different forms of R&D resources as well as internationalization strategies. Consequently, our study aims to address this research question with a focus on distinct firm types within the metropolitan region of Istanbul.

Based on the theoretical framework concerning firms' internal capabilities, we postulate that internal R&D resources are likewise relevant for successfully achieving innovation for all types of firms. The internal resource base is used for continuous upgrading efforts, for gaining access to external knowledge as well as for various innovation activities. Therefore, we assume that:

**Hypothesis 1:** Internal R&D resources have a positive effect on being successful in achieving innovation for all types of firms.

With respect to external R&D factors, we expect that different types of external resources also affect diverse innovation strategies of firms. Therefore, we hypothesize that:

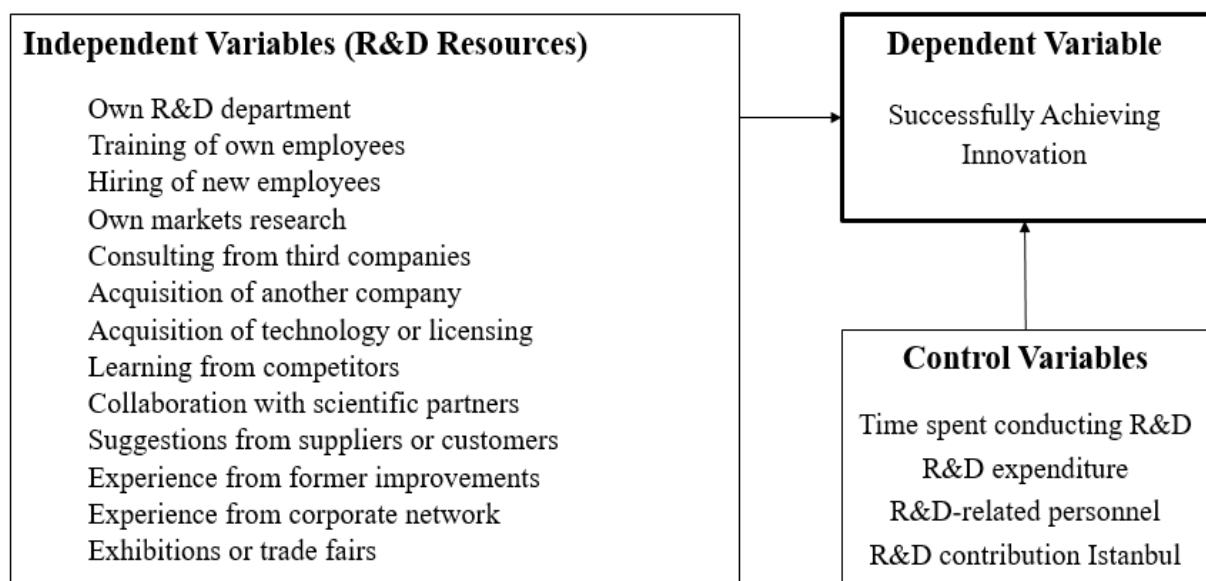
**Hypothesis 2:** External R&D resources in terms of technological knowledge have a positive effect on being successful in achieving innovation for TMNEs.

**Hypothesis 3:** External R&D resources in terms of market knowledge have a positive effect on being successful in achieving innovation for all types of firms.

We assume here that TMNEs already have sufficient knowledge about the domestic market, meaning that the respective firms prefer to pursue technological innovation strategies. AMNEs, however, presumably choose Turkey based on market-seeking strategies. Therefore, external resources with respect to market knowledge will be the main factor for innovation success of foreign firms in Turkey. DTFs might not be able to utilize external resources altogether, as respective firms still need to focus on building up internal capabilities in the first place.

Overall, the hypotheses presented test various forms of internal and external R&D resources and their potential effects on the innovation success of different firm types within the EE setting of Turkey. In order to extend the analysis, four of the usual R&D-related control variables are applied as well. The subsequent research framework of the hypothesized relationship between firms' innovation success, independent variables and control variables is shown in figure 3.1.

**Figure 3.1:** Initial research framework



*Source: own figure*

### **3.3 Research method**

#### ***3.3.1 Survey sampling and data collection***

Explaining the economic rise of poor or peripheral countries

For decades, Istanbul has been the major hub for industry, trade and manufacturing within Turkey, harboring the majority of headquarters from TMNEs, AMNEs and DTFs (Ersoy, 2018). Besides being the main economic center with 31 percent of total Turkish GDP in 2018, Istanbul is also the primary region for inward FDIs with the nation's highest share of MNEs (Gezici et al., 2017; TUIK, 2019b). With regard to R&D-related figures, the city accounted for the nation's highest share of R&D personnel with 27.3 percent and second highest R&D expenditure with 25.3 percent in 2018 (TUIK, 2019d). Istanbul thus provides an excellent setting to investigate how R&D resources affect the innovation success and strategies of innovation-oriented DTFs, TMNEs and AMNEs within Turkey.

The survey sampling was based on the database of the *Scientific and Technological Research Council of Turkey* (TÜBİTAK). As the leading agency for management, funding and conducting research in Turkey, TÜBİTAK is a very helpful data source for capturing the innovation-oriented segment of Turkish companies. From the database, a new dataset of 838 firms was compiled based on the geographic location in Istanbul and including only those which successfully completed at least one R&D project funded by TÜBİTAK. After targeting senior R&D executives and general managers, 265 questionnaires were received, 40 of which were omitted due to a substantial number of missing values. Having an effective response rate of 26.85 percent is satisfactory given the topic and type of potential respondents. Also, a test for non-response bias from early and late respondents showed no statistical problems with the data collected for this study (Armstrong & Overton, 1977). For the purpose of content validity of the chosen measurements, the suggested procedures by Hair et. al (2007) were adopted (Hair et al., 2007). Firstly, exploratory interviews with senior experts in the field of R&D and management in Istanbul were conducted to develop an initial version of the survey. Secondly, the questionnaire was then revised through discussions with other scholar experts. Finally, a pre-test of the survey was conducted with randomly selected firms and adjusted accordingly until it reached a satisfactory level of clarity and maturity.

#### ***3.3.2 Measurement of the variables***

In the following section, the classification of firm types as well as the dependent, independent and control variables are briefly described.

The firm types (DTF, TMNE, AMNE) are differentiated according to their ownership structure and internationalization stage. Firms defined as AMNEs are either 100 percent foreign-owned or have entered a joint venture with a Turkish firm. Firms,

which are 100 percent Turkish-owned, are categorized as either TMNE or DTF and are further distinguished according to their internationalization activities. At the time of this study, DTFs are defined as showing no FDI activities abroad, whereas TMNEs are operating in foreign markets.

The firms' self-assessment of innovation success was treated as the dependent variable. Therefore, 'innovation success' was measured using a five-point scale regarding the level of agreement (1 = strongly disagree to 5 = strongly agree) for statements about the company's awareness for innovation. The dependent variable was derived from the following statement: 'Our company is successful in achieving innovation'. As binary logistic regression is used for data analysis, only firms that agreed with this statement ('agreement' or 'strong agreement') would be denoted as 'being successful in achieving innovation'.

Various forms of R&D resources were treated as independent variables and were measured based on the frequency (1 = never used to 5 = frequently used) with which they were used for achieving innovation. Each item was derived from a five-point frequency scale based on following question: 'To what extent have the following aspects been used for achieving innovation in Istanbul and the Marmara region?'. In total, thirteen forms of R&D resources were rated.

As control variables, the 'time spent conducting R&D (in Istanbul)', the 'R&D expenditure (of total sales)', the 'R&D-related personnel (of white collar employees)' as well as the firms' 'R&D contribution in Istanbul (compared to the entire corporate network)' were used. All variables were measured with ordinal scales and are commonly used in firm-level studies to control for firms' R&D capacities. The R&D-related personnel and expenditure represent firms' internal innovation capabilities, whereas the time spent conducting R&D in Istanbul and the locations' significance with regard to the entire corporate network illustrate the importance of the firms' R&D location in Istanbul.

Tables A.3.1 and table A.3.2 in the appendix provide the detailed measurements and descriptive statistics of all variables used in this study. Overall, values are relatively high across all firms and variables. This is due to the fact that our survey sample covers the innovation-related sub-population of manufacturing firms in Istanbul.

### ***3.3.3 Data analysis***

Having an adequate number of observations or events per variable (EPV) is a vital factor for statistical analysis. Low EPV values of less than ten might lead to statistical problems and could influence the validity of logistic models (Peduzzi et al., 1996). Recent methodological studies suggest a number of at least five to nine EVP for statistically adequate analysis, even though larger case numbers are preferable

(Vittinghoff & McCulloch, 2007). Concerning the large set of thirteen independent variables and four control variables, EVP values for the three logistic models (DTFs  $(113/17) = 6.65$ , TMNEs  $(61/17) = 3.60$ , AMNEs  $(51/17) = 3.00$ ) are presumably too low to provide satisfactory results. In addition to this methodological limitation, there are also theoretical aspects that need to be taken into account. All of the R&D resources might have an effect on firms' innovation success, however it can be expected that some variables partially overlap and correlate with each other. Therefore, instead of making a preselection of specific variables, we make use of principal component analysis (PCA) for dimension reduction and the identification of potentially interconnected variables. PCA is a common method for variable reduction that is similar to exploratory factor analysis. With the help of this technique, a large number of variables are condensed to a smaller set of variables or principal components, which account for the majority of the total variance. Using this two-step approach of methodological analysis is thus a huge advantage of our study, as it not only reveals hidden structures and relationships between variables within the dataset, but resulting components can also be subsequently used for further analysis.

Hereinafter, binary logistic regression analysis is applied to estimate the effects of these components on the innovation success of firms. For this, the binary logistic regression models can be expressed as:

$$P(Y_i = 1) = \frac{1}{1 + e^{-(\alpha + X_i \beta)}}$$

Here,  $Y_i$  is the dependent variable, which is defined as a dummy variable with a value of either zero or one, where a value of one denotes the probability of an event occurring rather than another denoted by zero. The intercept is shown as  $\alpha$ , and  $X_i$  is the vector of the independent and control variables, with  $\beta$  as the vector of the regression parameters (Amemiya, 1981). The sign of the regression coefficients  $\beta$  estimates the impact of the independent on the dependent variable, where a positive coefficient increases the probability of an event occurring, while a negative sign of the parameter implies the opposite effect on the outcome variable. Here, the regression coefficients estimate the degree to which firms assess themselves as being successful in achieving innovation. Coefficient results are reported as exponentiation of the  $\beta$  coefficient ( $Exp(\beta)$ ), given an odds ratio of the independent variables.

### 3.4 Computation and findings

The correlation matrix (Spearman's r-square) between the independent and control variables for the survey sample of 225 firms is shown in table A.3.3 in the appendix. All



independent variables are positively and significantly correlated with one another, illustrated by moderate to strong correlation coefficients (Akoglu, 2018). In particular, variables with a similar focus as either internal or external R&D resources are interrelated. For example, ‘learning from competitors’ is strongly correlated with the ‘acquisition of technology or another company’, whereas ‘experiences from former improvements’ are related to ‘suggestions from suppliers and customers’ or ‘knowledge from corporate network’. Internal resources such as an ‘own R&D department’ as well as the ‘training and hiring of employees’ are also interrelated. Thus, PCA is subsequently used for dimension reduction and to identify connected variables. When taking control variables into account, correlations with independent variables illustrate the reliability of firms’ responses. For instance, R&D expenditure, R&D-related personnel and the R&D contribution in Istanbul are positively and significantly correlated with firms’ internal R&D resources.

**Table 3.1:** Rotated component matrix for PCA of the independent variables

	Rotated Component Matrix <sup>a</sup>		
	Component		
	1	2	3
Acquisition of another company	<b>.805</b>	.086	.064
Acquisition of technology or licensing	<b>.719</b>	.235	.182
Consulting from third companies	<b>.692</b>	.042	.272
Learning from competitors	<b>.554</b>	<b>.502</b>	.009
Collaboration with scientific partners	<b>.466</b>	.295	<b>.421</b>
Suggestions from suppliers or customers	.123	<b>.795</b>	.026
Experience from former improvements	.107	<b>.755</b>	.224
Knowledge from corporate network	.156	<b>.655</b>	.316
Exhibitions or trade fairs	.118	<b>.558</b>	.066
Training of own employees	.154	.033	<b>.831</b>
Own R&D department	.008	.209	<b>.775</b>
Hiring of new employees	.325	.115	<b>.621</b>
Own market research	.392	.326	<b>.466</b>

Extraction method: principal component analysis.

Rotation method: Varimax with Kaiser normalization.

<sup>a</sup>Rotation converged in 5 iterations.

*Source: own table*

In the following section, the results for the PCA of thirteen variables measuring firms’ R&D resources are described. The suitability of this analysis is confirmed by the Kaiser-

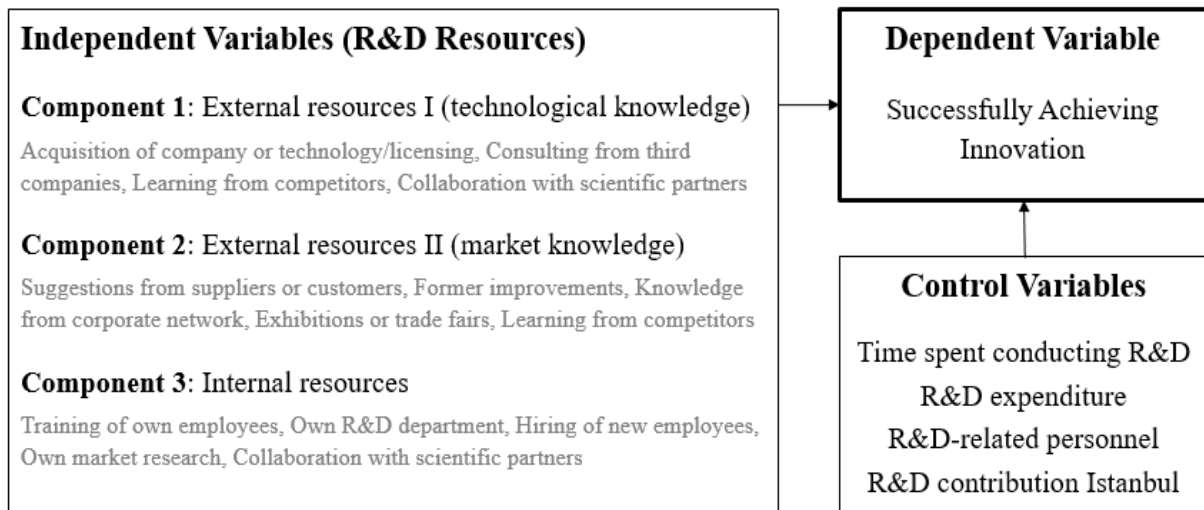
Mayer-Olkin (KMO) measurement of 0.867 and a statistically highly significant Bartlett's test ( $p < 0.01$ ). Individual KMO measurements for the observed variables show consistently high values of more than 0.80, proving 'meritorious' to 'marvelous' measurements of sampling adequacy (Kaiser, 1974). Subsequent analysis shows a three-component solution for components with an Eigenvalue greater than one and a total of 56.66 percent of total variance explained, with individual component explanation of 36.42, 10.74 and 9.49 percent of total variance. The resulting three-component solution with highlighted component scores is shown in the rotated component matrix in table 3.1. Resulting component scores for each firm are saved and used as independent variables during further analysis with binary logistic regression.

The interpretation of the PCA results is consistent for the variables used and can be described as follows. Principal Component 1 can be described as 'external resources I (technological knowledge)', Component 2 as 'external resources II (market knowledge)' and Component 3 as 'internal resources'. In more detail, Component 1 contains R&D resources that are related to external factors such as acquisitions of another company, technology or licensing as well as consultation from third companies, revealing a focus on technological knowledge internalization. Component 2 likewise includes external resources, however related factors such as suggestions from suppliers and customers, experience from former improvements as well as knowledge from corporate networks and exhibitions or trade fairs can be summarized as market knowledge. Finally, Component 3 contains internal resources, namely the training of existing and the hiring of new employees as well as an own R&D department and market research. Both R&D resources 'learning from competitors' and 'collaboration with scientific partners' show their highest factor scores with Component 1, but also load on Component 2 and 3 which need to be interpreted accordingly. The variable 'learning from competitors' could be related to either technological or market knowledge, depending on the competitor as well as the firms' innovation strategy. The external resource 'collaboration with scientific partners' is most likely linked to technological knowledge, although it is also closely related to internal resources, as internal capacities are required to work with scientific partners in the first place. In addition, it is important to note that the resulting components have been established from our survey data alone, but match well with basic insights from previous theoretical considerations (Cohen & Levinthal, 1989, 1990; Mathews, 2002). Hence, a consolidated research framework after the use of PCA is shown in figure 3.2.

In order to answer this study's research questions and to test the hypotheses, three binary logistic regressions are modelled, one for each type of firm: (1) DTFs, (2) TMNEs and (3) AMNEs. The outcomes for these models are reported in table A.3.4 in the appendix. Consequently, binary logistic regression is used to predict the probability

that firms assess themselves as being successful in achieving innovation. We thus attempt to identify R&D resources that are statistically relevant for firms to fall into the category of successfully achieving innovation (denoted as one in our models).

**Figure 3.2:** Consolidated research framework (after dimension reduction with PCA)



*Source: own figure*

With regard to reliability measurements, all models demonstrate high and significant chi-square statistics which are most significant for model one ( $p < 0.01$ ) and model two ( $p < 0.05$ ). The predicted models thus fit significantly better for the survey sample than a null model. Also, the ‘Cox and Snell’ and ‘Nagelkerke’ pseudo-r-square models indicate a good overall fit, explaining about 38 percent of the variance for models one and two as well as about 43 percent for model three (based on the Nagelkerke r-square values). The models demonstrate medium to large effect sizes, indicating good validity for subsequent analysis (J. Cohen, 1992). Finally, the non-significant chi-square values of the ‘Hosmer and Lemeshow’ test show that no significant differences ( $p > 0.10$ ) between observed and predicted values are present. Therefore, another good overall fit for the selected independent and control variables can be assumed (Hosmer et al., 2013).

With regard to model one, only one independent variable has a statistically significant effect on DTFs being categorized as successfully achieving innovation: Component 3 relating to internal resources has a highly positive and significant ( $\text{Exp}(\beta) = 3.244$ ,  $p < 0.01$ ) impact on innovation success. Increasing the usage of internal resources is thus related to a 224.4 percent higher chance of DTFs assessing themselves as being innovative. Both external components 1 and 2 are statistically insignificant, but indicate a negative effect of technological knowledge ( $\text{Exp}(\beta) = 0.787$ ,  $p > 0.10$ ) and a positive one for market knowledge ( $\text{Exp}(\beta) = 1.464$ ,  $p > 0.10$ ) for the innovation success of

DTFs. This result is even more evident when taking the control variables into account, of which the R&D-related personnel variable also shows a high positive and significant impact ( $\text{Exp}(\beta) = 3.741, p < 0.10$ ).

Regarding model two, we can find two positive and significant independent variables. Both internal resources ( $\text{Exp}(\beta) = 2.517, p < 0.10$ ) as well as external market knowledge ( $\text{Exp}(\beta) = 2.919, p < 0.05$ ) have a notably positive and significant impact on TMNEs' innovation success. External resources in terms of technological knowledge show a likewise positive but non-significant coefficient ( $\text{Exp}(\beta) = 2.094, p > 0.10$ ). With regard to the control variables, the time spent conducting R&D ( $\text{Exp}(\beta) = 0.419, p < 0.10$ ) and the R&D expenditure ( $\text{Exp}(\beta) = 0.506, p < 0.10$ ) are negative and significant for TMNEs' innovation success, whereas the R&D contribution in Istanbul shows positive and significant results ( $\text{Exp}(\beta) = 2.059, p < 0.10$ ).

Concerning model three, only external resources with regard to market knowledge indicate a positive and significant effect for AMNEs to assess themselves as being innovative ( $\text{Exp}(\beta) = 2.922, p < 0.10$ ). Both internal resources ( $\text{Exp}(\beta) = 0.935, p > 0.10$ ) as well as technological knowledge ( $\text{Exp}(\beta) = 0.592, p > 0.10$ ) show negative and insignificant coefficients. Furthermore, all control variables are statistically insignificant, however R&D expenditure ( $\text{Exp}(\beta) = 1.285, p > .10$ ) and R&D-related personnel ( $\text{Exp}(\beta) = 1.768, p > 0.10$ ) indicate a positive impact.

**Table 3.2:** Degree of support for hypotheses (summary)

Hypotheses	Degree of support
<b><i>Internal resources</i></b>	
<i>Hypothesis 1:</i>	
Internal R&D resources have a positive effect on being successful in achieving innovation for all firm types.	Partially supported
<b><i>External resources</i></b>	
<i>Hypothesis 2:</i>	
External R&D resources in terms of technological knowledge have a positive effect on being successful in achieving innovation for TMNEs.	Not supported
<i>Hypothesis 3:</i>	
External R&D resources in terms of market knowledge have a positive effect on being successful in achieving innovation for all firm types.	Partially Supported

*Source: own table*

A summary with the degree of support for all hypotheses is shown in table 3.2. Hypothesis 1 is partially supported for DTFs and TMNEs. No support is found for Hypothesis 2. Hypothesis 3 is partially supported for TMNEs and AMNEs. In the following section, the findings are discussed in more detail.

### **3.5 Discussion and conclusion**

#### ***3.5.1 Summary of the main results***

The results from three binary logistic regression models reveal important findings about firms' innovation activities. From these, we gain not only results about important factors for firms to assess themselves as being successful in achieving innovation, but also relevant information about firms' internationalization strategies, as both external resources components are related to either demand-pull (market knowledge) or technology-push (technological knowledge) strategies.

Firstly, it is evident that internal R&D resources are still the main success factor for DTFs for achieving innovation. This can also be observed when looking at the coefficients for the control variables where R&D-related personnel is the main influencing factor. Both external R&D resources have a non-significant influence on innovation success. It is thus evident that DTFs still need to build internal capacity in the first place before assessing external resources, particularly with regard to technological knowledge, which shows a negative coefficient. In addition, the time spent conducting R&D in Istanbul has a small positive but also insignificant coefficient, which still is an important aspect for DTFs compared to TMNEs and AMNEs.

Secondly, internal R&D resources also have an effect on the probability of TMNEs being categorized as successfully achieving innovation. However, a negative significant coefficient for internal R&D expenditure can be observed, whereas R&D-related personnel indicates a positive but insignificant impact on innovation success. Furthermore, we find a highly positive and significant coefficient of firms' R&D contribution in Istanbul compared to the entire corporate network, whereas the time spent conducting R&D in Istanbul has a negative significant effect. In this regard, it can be assumed that R&D activities located in Istanbul only recently became important for TMNEs' innovation activities, indicating the relative importance of the firms' location there. In addition, this result also highlights that only those firms, which allocate the core of their R&D activities to Istanbul can indeed successfully innovate in this place. In terms of external resources, Component 2 reveals a highly positive and significant coefficient, whereas Component 1 is also positive but insignificant. Hence, external resources in terms of market knowledge have a high influence on the innovation success of TMNEs. However, the insignificant finding for external technological knowledge

indicates that TMNEs keep their core competencies in Turkey and do not yet have enough power to compete globally in advanced markets (Ayden et al., 2018).

Finally, internal resources of AMNEs subsidiaries in Istanbul do not have an effect on them being categorized as successfully achieving innovation. Although both R&D expenditure and R&D-related personnel show a positive coefficient, these findings are insignificant. In addition, the time spent conducting R&D in Istanbul as well as the R&D contribution in relation to the entire corporate network shows negative and insignificant coefficients. It is thus evident that Istanbul is not the prime location for R&D activities of AMNEs. Regarding external resources, market-related knowledge shows a highly positive and significant influence on foreign firms' innovation success, while technological knowledge resources show a negative coefficient. Hence, AMNEs supposedly pursue a demand-pull, i.e. market-seeking innovation strategy.

In summary, Hypothesis 1 is only partially supported, as internal R&D resources are just relevant for DTFs and TMNEs as being important for achieving innovation. However, this finding does not imply that internal capacities are irrelevant for AMNEs at all, but rather illustrates that respective firms assess these resources as unimportant for achieving innovation in Turkey. This might also be due to the fact that AMNEs assess internal capacities as granted anyway and in fact exploit external resources. Hypothesis 2 is not supported, as findings suggest insignificant effects of external technological knowledge on innovation success of TMNEs, which is also true for DTFs and AMNEs. Finally, binary logistic regression analysis only partially supports Hypothesis 3, as external market knowledge is only relevant for TMNEs and AMNEs. This finding is most likely related to lacking internal innovation capabilities of DTFs.

### ***3.5.2 Limitations***

Based on the exploratory nature of this study, findings and implications need to be interpreted with caution. Firstly, the single country setting might be a limitation to the generalizability of our results. Therefore, conducting a similar study in a different EE setting could help to contrast our findings and add to the existing body of literature in the field of EE research (Nielsen et al., 2018), particularly as compared to studies from the technology-driven East Asian or resource-based Latin-American context. Secondly, our spatial or geographic focus on Istanbul as well as the intended sampling of R&D-intensive firms also produce specific outcomes for certain firm types and within metropolitan regions. One should thus not generalize the results for the entire EE of Turkey and over all sectors or for non-innovative firms. Finally, the self-assessment of firms as being successful in achieving innovation needs to receive some attention when interpreting the results. Although the usage of this type of dependent variable does not allow for an objective measurement of innovation success, it still allows for different

insights about firms' self-evaluation on innovation strategies and supposedly important factors for essential internal innovation capabilities. Nevertheless, it would be desirable for future research to make use of an objective R&D output measurement as an outcome variable.

### ***3.5.3 Theoretical implications***

Our findings have important implications for the theoretical understanding of innovation in an EE context. Firstly, our results underline the importance of distinguishing between internal and external resources and between technological and market knowledge. They hence resonate with recent approaches to rediscover user-driven and technology-oriented innovators and their particular relevance in EEs (Liefner & Losacker, 2020). Most importantly, however, these findings underline that an understanding of factors affecting innovation in EEs critically depends on differentiating the roles of firms in the process of economic globalization. Only through categorizing firms according to their internationalization strategies does it become possible to identify key differences regarding the influence of different types of resources. Hence, in terms of the firms' exposure to global competition, future studies on innovation in regional settings that are similar to that of Istanbul should seek to implement internationalization as a categorizing perspective or as an independent factor. Otherwise, an important factor contributing to a differentiated pattern will be overlooked.

### ***3.5.4 Policy implications***

As a policy finding of this study, our results indicate that a mere focus on technology-push strategies neglects other aspects that explain innovation success of firms within an EE setting. Even though our survey sample captures information for a highly competitive region with one of the highest R&D shares and the most innovative firms (Akpınar et al., 2015), results suggest that such a technology-driven approach is not a vital strategy for all types of firms. Therefore, policy-makers should not only rely on building technological capacities, but also need to make room for various forms of political support to foster innovation efforts and strategies. Hence, it is necessary to distinguish between different firm types, as relevant input factors for innovation success vary among them. In this regard, DTFs are most in need of support for internal R&D capabilities, particularly related to white-collar personnel. Such a form of support should enable firms to increase their absorptive capacities and consequently their ability to make use of external technological knowledge (Fazlıoğlu et al., 2019). With regard to TMNEs, firms would greatly profit from support aiming at building internal R&D capabilities. Furthermore, TMNEs are already utilizing external resources in terms of

market knowledge as part of their innovation strategies. However, further support for TMNEs' technology-push strategies are most relevant for these firms to pursue an internationalization process of targeting advanced and competitive markets (Ayden et al., 2018) as well as offshore R&D sourcing (Ozturk, 2018). In contrast, AMNEs target the Turkish market for market-seeking reasons and embark on an innovation strategy that is based on external market knowledge. Policy-makers could further support AMNEs in this strategy or encourage more technological innovation and R&D activities within Turkey, hoping for spillover effects on domestic Turkish firms (Blomström et al., 2001).

Hence, in order to support the heterogeneous corporate landscape in Turkey, different policy options are conceivable and depend on the strategy that national and regional governments would like to pursue. A policy approach to support DTFs in their effort to establish innovation capacities could be the facilitation of higher shares of R&D or white-collar personnel within these firms, as well as an increasing investment in higher education and R&D spending. Respective policies might also foster technology-push strategies to support domestic TMNEs (Ayden et al., 2018). However, this still requires large investments in public and private R&D. Another policy could be focusing on a demand-pull strategy, especially if there is no strong historical tradition in technology development. For this, policy needs to foster the financial base as well as consulting and other institutions within the market environment. It seems that Turkey is pursuing such a demand-pull strategy, as a fiscal stimulus just recently boosted the domestic demand in 2019. However, geopolitical uncertainties and low investor confidence are still resulting in a weak external trade demand and a projected GDP growth rate below potential. Therefore, a more transparent and simplified macroeconomic policy framework would be necessary to rebuild international and domestic confidence as suggested by the OECD (OECD, 2019b) as well as to foster innovation activities of domestic firms.



# Chapter 4 | Article three

## **Barriers to University-Industry Collaboration in an Emerging Market: Firm-level Evidence from Turkey**

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### **Abstract**

University-industry collaborations (UCIs) are one of the main sources of external knowledge or technologies for industrial firms, particularly in the context of emerging markets (EMs). It is thus highly relevant to not only understand factors that might foster UICs, but identify potential barriers that prevent firms from using UICs for achieving innovation. In order to address this aspect, we conduct a firm-level study of the research and development (R&D) related segment of the manufacturing industry in Istanbul. Pre-study interviews with local R&D experts from universities, political institutions and manufacturing firms provide initial insights about the innovation environment of Istanbul and complement our statistical results. Therefore, logistic regression analysis is used to test several barriers to UICs for firms that either do or do not use UICs for achieving innovation. With this approach, we are able to identify barriers that actually prevent UICs and thus form a bottleneck to collaborations in the first place. Our findings suggest that only a lack of knowledge about UIC opportunities as well as insufficient financial political support or incentives for UIC are relevant barriers that inhibit firms' usage of UICs during their innovation process. Interestingly, mostly all other barriers even have a statistically negative impact for the group of firms that do not use UICs for achieving innovation. On basis of this firm-level evidence and our insights from the pre-study interviews, we are able to provide several theoretical, managerial and policy implications and thereby contribute to the growing literature on barriers to UICs in EMs.

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## **Barriers to University-Industry Collaboration in an Emerging Market: Firm-level Evidence from Turkey**

### **4.1 Introduction**

University-industry collaborations (UICs) are one of the most important interactions for transferring technologies and stimulating innovation activities strategically. These collaborations between universities and industrial firms are, however, no guarantee for the emergence of innovation and its success. In fact, there are cognitive or cultural differences between these institutions in terms of expectations, requirements and collaboration goals (Bjerregaard, 2010; Gilsing et al., 2011; Muscio & Pozzali, 2013). It is thus important not only to understand the different collaboration forms or knowledge and technology transfer channels, but also particularly to address potential barriers to collaboration. By doing this, one can identify firms' varying needs and implement relevant support measures or even regional innovation systems (RISs) to foster innovation consequently.

There is a vast body of literature about UICs, its forms of collaboration or transfer channels, enabling factors for successful collaboration as well as barriers to success, all of which we will cover in this article. Most studies, however, stem from an industrialized country context or are biased towards emerging market (EM) firms' insights, primarily from China, India or Latin America, leaving other EM contexts under-researched (Jormanainen & Koveshnikov, 2012). As a result, the question arises as to how well theories and implicit assumptions from a Western context apply to EMs and whether there are chances to gain new insights for the generalizability of existing theories (Beyhan & Cetindamar, 2011; Collings et al., 2010; Liefner, 2013; Ramamurti & Singh, 2009). It is thus highly relevant to extend existing knowledge towards explorative studies from EMs to understand different experiences on the basis of varying institutional contexts and diverse economic structures (Cetindamar et al., 2009; Kruss & Visser, 2017) and thus be able to inform policy in respective developing economies (Filippetti & Savona, 2017). This is even more important considering the fact that EMs will play a major role in the future globalized economy, meaning that we need to learn more about these diverse settings and further develop the field of EM research (Nielsen et al., 2018) as well as expanding or enriching existing theories in new ways (Ramamurti, 2016). This is particularly true for the seven largest EMs according to their gross domestic product (GDP), namely Brazil, Russia, India, China, Mexico, Turkey and Indonesia (Guégan et al., 2014). In addition, there is little information about barriers to UICs particularly from Turkey.

For many years, Turkey has been the leading economic and financial center between Southeastern Europe and the Middle East, and is currently transforming from an

emerging to an industrialized market country (Etkin et al., 2000; Tatoglu & Demirbag, 2008). Based on its unique location between advanced Western and emerging Eastern Markets, the country is attracting increasing numbers of foreign direct investments (FDIs) and multinational enterprises (MNEs) that are locating their research and development (R&D) activities there (Ayden et al., 2018; Karabag et al., 2011). Furthermore, the country is perpetually transforming its economic structures into a more knowledge-based system, fostering innovation activities of its domestic firms and implementing measures in education as well as public and private R&D (Bakirci, 2018; Yildirim, 2017). Nevertheless, limited R&D activities together with a lack of technological knowledge result in low value-added of many Turkish firms, meaning that the export of high technological products remains at low levels (Yaşar, 2019). Identifying ways to increase the value-added of its domestic firms to raise productivity and move up in global value chains (GVCs) is therefore a highly important success factor for the country's future economic development.

From a firm-level perspective, however, it is not only internal skills or capabilities, but also external resources that are highly important for most innovation and upgrading strategies (Chesbrough, 2010; W. M. Cohen & Levinthal, 1989, 1990; Teece et al., 1997). This becomes even more relevant if firms lack internal R&D resources or have no knowledge about the regional economic environment. Technology transfers via UICs as an external knowledge source might therefore gain center stage in firms' successful innovation processes. In our case study of the Turkish context, we thus observe industrial firms that attempt to access knowledge from local universities based in Istanbul and the Marmara region. By using a survey sample of the R&D-related segment of manufacturing firms in Istanbul, we distinguish between two groups of firms that have received public R&D funding and are actively attempting to achieve innovation, but which either do or do not use collaboration with universities as a part of their innovation strategies. This leads to our research question about obstacles to UICs during the innovation process from the perspective of firms: 'What barriers prevent the use of UICs for achieving innovation?' For answering this question, binary logistic regression analysis is used to test several obstacles to UICs for two groups of firms that either do or do not use collaboration with universities as an external knowledge source during their innovation process. With this approach, we are able to identify barriers that actually prevent UICs and thus form a bottleneck to collaborations.

This paper is organized as follows. Firstly, the theoretical frameworks about forms of and barriers to UICs in EMs are presented. Secondly, hypotheses are developed based on the literature review of underlying theories, existing studies as well as insights from pre-study interviews with experts from universities, industrial firms and government

institutions in Istanbul, which complement the statistical results of this study. Thirdly, our survey sampling, data collection, measurement of the variables and subsequent empirical data analysis are outlined. Following this, binary logistic regression analysis is used to test the impact of barriers to UICs in view of firms' innovation strategies. Finally, results are discussed, limitations are mentioned and economic, managerial and policy implications are drawn.

## **4.2 Theoretical framework and hypotheses development**

### ***4.2.1 The setting for UICs in emerging markets***

Prior to accessing external knowledge sources, it is necessary that firms achieve and obtain sufficient levels of internal knowledge or R&D capacities (Barney, 1991; Eisenhardt & Martin, 2000; Teece et al., 1997) to successfully identify, adopt and use innovation or technologies (Abreu, 2011; Chesbrough, 2003; W. M. Cohen & Levinthal, 1989, 1990; Lin et al., 2002). Absorptive capacities are thus highly relevant, as they enable firms to acquire external knowledge sources in the first place. Together with a strategic positioning in network structures, firms can also enhance their performance and innovativeness through absorptive capacities (W. Tsai, 2001; A. Zaheer & Bell, 2005). This is particularly important for firms in EMs in relation to an increase in foreign competition and the concepts of upgrading and technological catch-up (Kotabe et al., 2011; Pavitt, 1990; Prahalad & Hamel, 1990). Chari (2015) developed an integrated model for the main literature strands on EM firms' catch-up and upgrading process, namely upgrading through spillovers, linkages, acquisitions and internal R&D (Chari, 2015).

However, absorptive capacities are not only relevant for spillovers from inward FDI or R&D alliances between firms (Blomström & Kokko, 1998; Görg & Greenaway, 2004; C.-S. Kim & Inkpen, 2005; Zhang et al., 2010), but especially relate to firms' knowledge sourcing from universities, as UICs evidently influence the innovative activities of manufacturing firms in particular (Löf & Broström, 2008). For becoming more competitive, UICs in terms of knowledge and technology transfer is thus considered the most important external knowledge source for firms (Kaufmann & Tödtling, 2001; Mascarenhas et al., 2018), particularly in EMs (Bastos et al., 2014; Guerrero et al., 2019) and with universities that are spatially close by, as geographic proximity facilitates all forms of UICs and is positively associated with the frequency of collaborations (Broström, 2010; Crescenzi et al., 2017; D'Este et al., 2013; D'Este & Iammarino, 2010; De Fuentes & Dutrénit, 2016). The importance of close proximity between actors in a RIS is summarized in the triple helix model, which was originally developed within advanced market contexts. This concept captures the activities and interactions between the political sphere, academia and firms on an institutional level, and thus provides an

ideal systematic approach for observing the emergence and development of knowledge within a regional environment (Etzkowitz & Leydesdorff, 2000). Further developments and adaptations of the model also allow the realization of its usage within a developing or EM setting, where it has previously been a normative rather than an analytic concept (Etzkowitz et al., 2005). Other scholars criticize the triple helix concept as not providing a realistic guiding framework to discuss UICs in developing countries (Eun et al., 2006). Nevertheless, within a RIS or triple helix concept, in addition to specific demands and requirements from the firm side or governance claims of regional policymakers, universities play a particular role and need to adapt prior to an interaction with industrial firms. The provision of a university-trained workforce through their tertiary education function is thus only a basic requirement for firms' upgrading (Lall, 2000), with a much greater need for the development of universities from having a sole focus on teaching and basic research to a more widened perspective or emerging 'third role' in terms of entrepreneurial engagement and application or commercialization of scientific knowledge (Etzkowitz et al., 2000). Ultimately, applied knowledge becomes the relevant factor for interacting with partners outside the scientific environment. Therefore, universities need to evolve or strategically develop over time to establish close contact with firms and practically test or even commercialize new knowledge. This evolving function has important policy implications as well, as policymakers from EMs increasingly expect universities to engage in more UICs and thus incorporate a third entrepreneurial role into their traditional research and educational functions (Etzkowitz et al., 2000; Pinho & Fernandes, 2015). For instance, this transformation could be realized through administrative changes or adoption of enterprise cultures, such as establishing a strengthened managerial steering core, a more diversified funding base as well as an increasing entrepreneurial culture among scientific personnel. By doing this, entrepreneurial universities can strategically develop their third role of knowledge commercialization and technology transfer (Clark, 1998). However, universities' search for new funding bases through a commercialization of scientific knowledge and stronger UICs might weaken the relationship between politics and universities as universities become less dependent on public educational funding. In the same way, policymakers are able to promote the emergence of UICs by partly withdrawing from their previously strong financing policy and allowing industrial firms to take their place (Schiller & Liefner, 2007).

Overall, the development of entrepreneurial universities is a relevant aspect, as these types of universities are considered as contributing to the local economy and interacting with industrial partners to a much higher degree than traditional teaching or basic research-oriented universities (Temel & Durst, 2018). Entrepreneurial universities are thus directly involved in a knowledge-based regional economic development and

contribute to the concept of innovating regions (Etzkowitz & Klofsten, 2005), or even to an entrepreneurial society by directly engaging with local communities and providing thinking and leadership to enhance entrepreneurial capital to ensure a thriving society (Audretsch, 2009, 2014; Breznitz & Feldman, 2012). Padilla-Pérez et al. (2009) confirm that in EM contexts, universities not only play a vital role in providing highly skilled human capital, but also contribute new industry-specific knowledge for firms. This is particularly true when firms move up to more innovative activities and acquire advanced technological capabilities (Padilla-Pérez et al., 2009). In comparison to UICs in advanced markets, however, these interactions might be much weaker and more oriented towards teaching-related collaborations. In addition, only some EM firms might have the internal absorptive capabilities as well as the interest to engage in strong and long-term UICs anyway (Padilla-Pérez et al., 2009). Other studies from developing markets put forward the concept of academic capability building. With insights from the Thai context, Liefner & Schiller (2008) develop a framework for the analysis of academic capacities in EMs based on different functional and organizational tasks. However, the authors find that a contribution of Thai universities to technological upgrading or economic development has only just emerged, as academic capabilities are still low (Liefner & Schiller, 2008; Schiller & Liefner, 2007).

It is thus relevant to consider that universities in EMs might not be able to contribute to upgrading at the firm or regional levels immediately, but need time to transform their organizational and functional structures in the first place to develop academic capacities and evolve into an entrepreneurial university. Laursen & Salter (2004) even suggest that researchers tend to overestimate the direct effects of universities as a knowledge source for firms' innovation strategies, as these might be concentrated in only a few industrial sectors (Laursen & Salter, 2004). For this reason, it is unclear to what extent universities in EMs are even able to generate new knowledge or commercialize their research, promote a technological upgrading process and thus function as a driver of a high-technological development (Chatterjee & Sankaran, 2015; Doutriaux, 2003), as they might merely contribute in their educative function to build up human capital within learning systems (Schiller & Liefner, 2007). In a recent study by Schiller & Lee (2015) from five emerging Asian countries, the authors show that UICs do not have a statistically significant impact on the catch-up process of the respective EMs. These findings are based on low academic and technological capabilities at the university as well as the firm level, and consequently lead to only minor UICs. Instead, domestic firms rely on foreign knowledge sources or collaboration with customers and parent companies (Schiller & Lee, 2015). However, other studies find contrasting results for the importance of UICs in EMs (Guerrero et al., 2019; Pinho & Fernandes, 2015).

As Crescenzi & Rodríguez-Pose (2012) point out, there is no such thing as an optimal geography of innovation or comprehensive RIS that fits all contexts. Both developed as well as emerging markets display highly varying regional or territorial processes in their distinct contexts (Crescenzi & Rodríguez-Pose, 2012). Therefore, it is highly relevant to observe the activities between industrial firms and universities for each context individually, as interactions and dynamics between the two actors in a RIS or learning region can have varying functions for the regional innovativeness. Observations thus help to identify relevant factors to foster local UICs and regional economic development respectively.

In this article, we do not focus on the RIS of Istanbul and the Marmara region itself, but rather use this concept as a systematic research framework to identify relevant actors in the regional economic environment as well as their R&D activities and interactions with each other, providing policy implications for our findings. In this regard, the next sections focus on the knowledge or technology transfer channels between firms and universities and particularly on barriers to UICs.

#### ***4.2.2 Forms of UICs***

The field of UIC research is relatively broad and contains many review articles that summarize existing studies categorized largely into different sub-themes within the broader topic of UICs. Most studies focus on factors that foster UICs in both industrialized and EM contexts. However, it is highly relevant to obtain more information about barriers to these collaborations, in particular for the distinct institutional environments in varying EMs. In the next section, we thus briefly shed some light on existing studies about UIC forms and barriers with a subsequent emphasis on EMs overall and on Turkey in particular.

Firstly, it is quite well established as to how UICs can work successfully and with particular insights from firms' activities in industrialized or newly emerged economy contexts. Selected studies of the vast body of literature focusing on the respective UIC topics are shown in table A.4.1 in the appendix. In this regard, several studies cover UIC topics from EMs and focus on overall patterns, promoting and hindering factors as well as their UICs' impact on innovation performances from the perspective of industrial firms and academics.

Furthermore, many review articles provide systematic overviews of the state of UIC literature and identify theoretical key aspects of transfer or interaction channels, potential barriers or obstacles to UICs and promoting factors thereof. Agrawal (2001) divide existing studies on UICs into four categories or research streams about firm characteristics, university characteristics, and the geography of localized spillovers and channels of knowledge transfer. Ankrah & AL-Tabbaa (2015) cover UIC motivations,

forms, its formation and operationalization, facilitating and inhibiting factors as well as outcomes in terms of benefits and drawbacks. Rybnicek & Königsgruber (2019) identify determinants for UICs and distinguish between institutional, relationship, output and framework factors. In this regard, the authors add moderator aspects such as different phases, scales, organizational levels and disciplines that might explain the success of UICs (Rybnicek & Königsgruber, 2019). Nsanzumuhire & Groot (2020) systematically review and distinguish between existing UIC studies in major themes of interaction channels, mechanisms and barriers. Mascarenhas et al. (2018) provide a systematic literature review of the main co-cited references in the field of UIC studies using a co-citation analysis. For the understanding of scientific practices, firms' production processes as well as new trends in this research field better, the authors identify four clusters of UIC subtopics. Overall, they conclude that firms increasingly focus on cooperation with universities (Mascarenhas et al., 2018).

Many factors are thus relevant for the success of UICs. Most importantly, however, internal knowledge sources and absorptive capacities are the two main determinants for incorporating incoming spillovers and increasing the likelihood and intensity of R&D-related UICs (Aristei et al., 2016; Beyhan & Fındık, 2014). In a study from Mexico, Guerrero et al. (2019) show that firms predominately use UICs to explore new knowledge, to gain access to resources and capabilities from universities, to engage in long-term and radical innovation activities as well as to access public funds and subsidies that are tied to mandatory UIC activities (Guerrero et al., 2019). In this regard, public R&D funding and particularly firm size positively influence a firm's R&D proportion in external partnerships with universities and increase the chances for further or more intense UICs and R&D collaborations (Aristei et al., 2016; De Fuentes & Dutrénit, 2016; Fontana et al., 2006; Laursen & Salter, 2004; Segarra-Blasco & Arauzo-Carod, 2008; Yu & Lee, 2017). In another firm-level study from Mexico, De Fuentes & Dutrénit (2012) identify and categorize UICs in terms of drivers and channels for interaction as well as perceived benefits thereof. All interaction channels have a positive impact on firms' benefits from UICs, but differ significantly between short and long-term effects (De Fuentes & Dutrénit, 2012). For the Latin American context, Arza (2010) identifies main UIC interaction channels and their resulting benefits in terms of economic and intellectual outcomes. Van Gils et al. (2009) explore the relation between UICs and different types of R&D activities to identify patterns of firms' knowledge transfer organization. The authors find linking factors between short and long term orientation of R&D activities and technical competence leveraging and building as well as with incremental and intermittent innovations (van Gils et al., 2009). In addition, Bekkers & Bodas-Freitas (2008) show that differences in the importance of UIC transfer channels are not primarily related to industrial sectors, but are rather



explained by the characteristics of knowledge sources, disciplinary origin as well as organizational and individual characteristics of involved personnel (Bekkers & Bodas-Freitas, 2008).

Other studies focus on the effects of UICs on the research performance of academic personnel. Respective studies evaluate either the co-existence or synergy between academic research and UIC knowledge transfers or modes of separation and substitutions between the two processes (Kwon & Martin, 2012; Manjarrés-Henríquez et al., 2009). D'Este & Perkmann (2011) investigate motivations for a UIC from the perspective of academics, and identify commercialization, learning as well as access to funding and to industry resources as main motivations. In addition, UICs are most successful when they contribute to both academic research and industrial application, maintaining research autonomy for scientific personnel instead of enforcing entrepreneurial behaviors on them (D'Este & Perkmann, 2011). Perkmann et al. (2013) provide a comprehensive overview of existing studies about knowledge commercialization and various forms of academic engagement in UICs. Franco & Haase (2015) also investigate researchers' motives to engage in UICs and their usage of varying collaboration channels. Belkhdja & Landry (2007) find varying factors affecting the UIC probability of researchers as well as perceived barriers to collaboration with firms and governmental institutions. These relate to research budgets, the radicality of research as well as the degree of risk-taking culture, among other factors (Belkhdja & Landry, 2007). For the EM of Brazil, Garcia et al. (2019) analyzed how outcomes, benefits and barriers affect academics' engagement with industrial firms. The authors find that perceived intellectual benefits and commercial results from previous collaborations positively affect UICs (Garcia et al., 2019). In a study about motivators and barriers to collaboration between academics and firms or government agencies, Ramos-Vielba et al. (2016) find that advancing research goals is the main motivator for researchers to engage with governmental partners, whereas opportunities to apply scientific knowledge act as the central motivation for UICs. Furthermore, the authors identify that risks to scientific credibility pose a primary barrier to collaboration with both external partners (Ramos-Vielba et al., 2016). In addition, Kruss & Visser (2017) find intellectual or scientific norms as the main driver for academics, particularly if universities have a strong reputation or high scientific productivity, leading to the fact that researchers are less motivated by financial interests or incentives for engagement in UICs (Kruss & Visser, 2017). Markman et al. (2004) also highlights that monetary incentives have no or only little effect on scientists' motivations to engage in entrepreneurial activities (Markman et al., 2004). Different natures or cultures of universities and business thus constitute a principal barrier to UICs. Overall, it is important to note that universities are not simple repositories of

exploitable knowledge that are easily available to firms. In contrast, existing obstacles to communication and technology transfer in UICs need appropriate mechanisms to remove respective barriers and facilitate bi-directional interactions (Uyarra, 2010). Our article, however, primarily focuses on a firm-level perspective of barriers to UICs. Only very limited insights from the viewpoint of academics are derived from our pre-study interviews.

#### ***4.2.3 Barriers to UICs***

In contrast to advantageous factors for successful UICs from the perspective of industrial firms and researchers, many studies identify or summarize barriers to UICs. Ankrah & AL-Tabbaa (2015) outline factors that could either facilitate or impede UICs and sort these into categories of capacities and resources, legal and contractual mechanisms, managerial and organizational issues, technology-related issues, political and social issues as well as other potential obstacles. De Wit-de Vries et al. (2019) identify influencing factors of knowledge transfer in academic engagement that are related to cognitive and institutional differences, varieties of goals and social capital. Nsanzumuhire & Groot (2020) categorize existing studies about UIC obstacles into misalignment, motivation, capability, governance, and context-related barriers, and furthermore distinguish between factors from developed and developing countries. Gilsing et al. (2011) focus on the difference of technology transfer mechanisms and barriers between science-based and development-based industries and identify key aspects in both regimes. While the transfer mechanisms are relatively different from each other, the authors find distinct similarities among major barriers to the technology transfer process, such as conflicts of interest, risk of information leakage or too general scientific knowledge (Gilsing et al., 2011). Bruneel et al. (2010) find that most obstacles to UICs derive from orientations, attitudes and behaviors of the scientific personnel. In addition, a university's long-term orientation and other collaboration constraints related to intellectual property rights or administrative procedures are most relevant. In this regard, Tartari et al. (2012) specify two main sets of barriers to UICs from the viewpoint of academics, which are related to the orientation of research and the transactional costs of collaborating with industrial firms. Research orientation-related barriers can be reduced with more industrial work and UIC experience on the part of academics. Reducing transactional costs, however, is more complex, as they are related to conflicts with Technology Transfer Offices (TTOs), based on TTOs' low profiles and a lack of flexibility. The operating environment thus plays a vital role for researchers' engagement in UICs (Tartari et al., 2012). Muscio & Vallanti (2014) indicate perceived barriers from the perspective of academics that relate to a misalignment of commercial benefits or incentives of UICs as well as conflicting goals or too much distance between

academic research and business needs (Muscio & Vallanti, 2014). Garcia et al. (2019) also note that transactional factors or even potential economic benefits might act as a major barrier or discouragement to more collaboration with industrial firms in the EM of Brazil (Garcia et al., 2019). Furthermore, Lopes & Lussuamo (2020) find low experience levels and a lack of inter-organizational trust as the most frequent UIC barriers for the context of developing regions in EMs. Hall et al. (2001) show that IPR issues might act as an unbridgeable barrier between firms and universities, particularly if projects are rather short-term and knowledge or technologies are difficult to commercialize. In contrast, the fewest barriers are present if projects are long-term oriented, technologies are applicable for firms, and lead participants in UICs have prior knowledge therein (Hall et al., 2001). Moreover, Davey et al. (2016) investigate the role of varying drivers and barriers on academic entrepreneurship and find significant differences of UICs among European regions. Identified barriers are categorized into groups relating to awareness, funding, culture and the usability of results. Only cultural barriers, however, have a significant effect on the academic entrepreneurship in Europe (Davey et al., 2016).

Overall, it is not only relevant which type, but also how many UIC barriers firms perceive. Antonioli et al. (2017) show that firms which only face single constraints use cooperation as a coping strategy to deal with the respective barriers, whereas the presence of multiple and varying barriers inhibits the establishing of UICs, particularly if firms lack financial resources, skills or knowledge about markets and technologies (Antonioli et al., 2017).

Consequently, many studies have focused on the diminishing factors for UIC barriers that facilitate successful collaborations. Based on the perspective of researchers, Bjursell & Engström (2019) find several hindering factors that influence UICs on the individual as well as on the intra and inter-organizational level. The authors highlight the importance of removing collaboration obstacles rather than adding driving forces for UICs. In this regard, establishing trust and openness towards varying collaboration partners' needs or goals as well as implementing rewards systems and resource allocations are the most important measures to diminish UIC barriers (Bjursell & Engström, 2019). De Wit-de Vries et al. (2019) also emphasize that trust, communication, experience and the use of intermediary institutions are highly relevant facilitators to help resolve UIC barriers (de Wit-de Vries et al., 2019). Furthermore, findings from Bruneel et al. (2010) likewise show that establishing trust between firms and universities is the main mechanism for lowering barriers in UICs. This holds particularly true for diminishing or mitigating orientation and transaction-related barriers, referring to divergent expectations, varying rules and regulations, and protection of intellectual property rights (IPRs) (Bruneel et al., 2010). In addition, Ramli

& Senin (2015) identify various factors for diminishing orientation and resource-related barriers to UICs, as limited time and lacking resources are key factors that hinder successful collaborations from the viewpoint of academics (Ramli & Senin, 2015). In general, high levels of human capital have a positive impact on reducing firms' barriers to achieving innovation (D'Este et al., 2014) and thus facilitate successful knowledge transfers.

#### ***4.2.4 Studies about the Turkish context***

In the next section, relevant studies from the Turkish context about firms' innovation activities as well as UIC forms and barriers from the perspective of both universities and firms are presented.

In their firm-level study of the manufacturing and service industry in Turkey, Beyhan & Fındık (2014) identify open innovation strategies of firms as the most important factor for UICs. In addition, the authors relate their findings to the theoretical contributions of firms' absorptive capacities and subsequent access to external knowledge sources (Beyhan & Fındık, 2014). Fındık & Beyhan (2015) study the impact of UICs on the innovation performance of Turkish firms and find a positive relationship between firms' external collaborations and their product as well as process improvements. In addition, firms' internal R&D capabilities have a strong positive influence for both types of innovation orientations (Fındık & Beyhan, 2015). Temel et al. (2013b) conducted a study on the profit growth of Turkish SMEs in terms of innovation-based strategies, collaboration with universities and market competition. Overall, innovation strategies help SMEs to better survive in competitive markets. In addition, the authors find a U-shaped relationship between SMEs' profit growths and collaboration with universities, meaning that UICs have a negative effect on the profit growth if collaborations are low and a highly positive impact on firms' profits when UICs exceed a certain threshold. It is thus evident that time is a highly relevant factor for firms to benefit from UICs (Temel, Scholten, et al., 2013). In their case study about Fiat's R&D subsidiaries in EMs, Athreye et al. (2014) describe the Turkish subsidiary as well embedded within local knowledge networks, collaborating with universities and scientific institutions as well as accessing R&D incentives through R&D activities within technology zones and parks. Despite this high technological capability, however, the Turkish firm is still less embedded within Fiats' global MNE network (Athreye et al., 2014).

Furthermore, Temel et al. (2013a) explored the effects of firms' collaboration with external partners and their innovativeness. Firstly, the authors find that any form of R&D engagement positively influences firms' innovation performances, although collaboration with customers seems to be the key success factor. In contrast, collaboration with universities does not enhance firms' innovation success. The authors

explain this finding with a rather strong teaching focus of Turkish universities, low absorptive capacities of Turkish firms and only a few efficient TTOs available (Temel, Mention, et al., 2013). In a study by Orduna-Malea & Aytac (2015), the authors explore the relationship between the Turkish industry and academic system based on web indicators. They find a strong disconnect between universities and the industrial sector in Turkey in terms of missing links or URL mentions on their internet sites. This is a notable result, as connections between university and industry in terms of web indicators are typically more elevated in countries with high levels of innovation activities and successful UICs (Orduna-Malea & Aytac, 2015). Beyhan & Rickne (2015) point out that UICs are not very strong within the Turkish context, meaning that government agencies have been launching programs to stimulate and support interactions between firms and universities (Beyhan & Rickne, 2015). Aycan (2001) likewise mentions an imbalance between science and practice, describing a partly negative attitude of Turkish firms towards using scientific knowledge sources. A main aspect of this bias concerning academic knowledge is the time factor, which is considered as highly costly for firms. Instead, Turkish organizations mostly work with consulting firms that base their practices and knowledge on sources other than scientific knowledge (Aycan, 2001). In a study on collaboration activities of Turkish manufacturing firms, Cetindamar & Ulusoy (2008) find that firms collaborate with other firms to a high degree, although the impact on their innovation performances is very limited. Furthermore, collaboration with universities or scientific partners can even be neglected in terms of its impact on firms' innovativeness (Cetindamar & Ulusoy, 2008). Şendoğdu & Diken (2013) even find a positive correlation between the frequency of UICs and upcoming problems among Turkish firms in Konya (Şendoğdu & Diken, 2013). Moreover, Yüksel & Cevher (2014) conducted a study about the UIC processes in Turkey and identified the relevant institutions or measures that foster collaboration activities. The authors describe UICs as an emerging concept within Turkey with potential for improvement and identify several governmental programs and institutions that constitute relevant support infrastructure for UICs (Yüksel & Cevher, 2014). For the nanoscience industry in Turkey, Beyhan & Rickne (2015) identify three central motivations of academics for UICs, namely the increase of resources for academic research, direct learning from firms, and the commercialization of scientific knowledge. In this regard, researchers' motivations to interact with industrial firms also differ among forms of UICs (Beyhan & Rickne, 2015). In a study by Yalçıntaş et al. (2015), the authors observe various advantages and disadvantages of UICs from the perspective of Turkish academics. As their results show, collaborations are more supported in technical fields such as science and engineering than in social sciences. In addition, forms of UICs are not known well enough among scientific personnel, meaning that

insufficient information as well as the setup and management of R&D projects are perceived as highly negative aspects. In addition, TTOs are described as the most advantageous and effective support structure for UICs (Yalçıntaş et al., 2015). Kaymaz & Eryiğit (2011) identify factors hindering UICs from the perspective of academics. The authors determine several barriers such as high bureaucracy, lack of previous experience, ineffective government policies or legal regulations, lack of mutual interests, remoteness from research fields, strong miscommunication as well as ineffective TTOs or collaboration centers (Kaymaz & Eryiğit, 2011). Moreover, Ciritcioglu et al. (2016) identify key obstacles to UICs among firms in the woodworking industry. According to the authors, most firms have insufficient knowledge about collaboration opportunities or have little interest therein. In addition, miscommunication between firms and universities seems to be the main reason for weak UICs, meaning that TTOs or technology support facilities could be helpful to strengthen collaborations (Ciritcioglu et al., 2016). In their qualitative study with academics and industry experts, Peksatici & Ergun (2019) find diverging institutional logics or cultures together with resulting pressures for both sides as the main barrier to effective UICs within the aviation industry in Turkey (Peksatici & Ergun, 2019). In addition, Demirbas et al. (2011) examine perceived barriers to innovation activities of Turkish SMEs and find formal, informal as well as financial and skill-related factors hindering firms' innovation performances. These factors include a lack of governmental R&D policies, increasing costs of innovation and lacking internal resources at the firm level (Demirbas et al., 2011). In their study of Turkish firms and local universities, Temel & Glassman (2013) identify major obstacles preventing R&D collaborations between the two institutions. From the perspective of firms, the most important UIC barriers are the length of scientific research procedures, highly bureaucratic decision-making processes, administrative costs, a necessity of funds for UICs as well as the perception of less skilled or knowledgeable scientific personnel than their own employees are. In this regard, the authors develop a model of building awareness, building trust and experience as well as providing transition opportunities to collaborations to diminish barriers and further encourage more UICs (Temel & Glassman, 2013). Ranga et al. (2016) analyze the technology transfer capacities of Turkish universities critically and thus emphasize their still nascent stage of experience. This is mainly based on weak technological foci, a lack of market orientation and hence a publication orientation of the scientific research, leading to several obstacles in terms of licensing, patenting and spin-offs (Ranga et al., 2016).

Lenger (2008) investigates the role of the state in RISs in Turkey. The author concludes that based on centralized administrative structures on the national level, there is a lack of regional perspectives or direct regional policy-making. Even though universities are

the primary actors and have a strong impact in the RISs of Turkey, the national government plays an indirect role in regional policy-making through these state universities. In results, regional policy-making hardly occurs, as the central state's influence leaves little room for regional initiatives or decision-making processes. This situation, however, is constantly changing and regional concerns are growing (Lenger, 2008). Olcay & Bulu (2016) conducted research about the potential contribution of technology parks and TTOs to Istanbul's development towards becoming an innovative urban space. In interviews with managers from the respective institutions, the authors find that both institutions have substantially increased UICs in Turkey since the 1990s. Even though technology transfer processes are still in a 'crawling state', TTOs and the provision of collaboration funds by the Turkish Scientific and Technological Research Council (TÜBİTAK) point out Istanbul's high potential to create technological innovation and become an innovative city (Olcay & Bulu, 2016). Furthermore, De Fuentes et al. (2018) explore perceived barriers to innovation on the part of successful and unsuccessful innovating firms for the EM settings of Turkey and Mexico. The authors identify firm and context characteristics that influence firms' perception of barriers and that differ between successful and unsuccessful innovators. These relate to financial, organizational, labor, regulatory and public support barriers. As a result, De Fuentes et al. (2018) show that for large unsuccessful firms, barriers related to qualified labor and a lack of public support are most relevant, whereas small firms perceive regulatory barriers as most hindering. Overall, low numbers of R&D personnel are a commonly perceived barrier to innovation (De Fuentes et al., 2018). Our study partly relates to these findings, however we distinguish between groups of successful and unsuccessful innovating firms and thus investigate the barriers to particularly external knowledge sourcing and UICs in more detail. Nevertheless, by using more recent survey data from 2016, we hope to extend these interesting findings by De Fuentes et al. (2018) for the case of Turkey.

Overall, it became evident that barriers or obstacles to successful UICs can have various causes, such as inadequate knowledge about collaboration partners or opportunities, cost and time-related obstacles, lack of interest, distinct fields of study or technology, lack of financial or political support, lack of trust, divergent goals and expectations, varying rules and regulations as well as high administrative and bureaucratic burdens, among other factors. All impediments either can be relevant for just one collaboration partner or can mutually affect universities and industrial firms alike. In the subsequent analysis of this article, most of these barriers are used to test their influence on the likelihood of firms not using UICs for achieving innovation.

### 4.3 Insights from pre-study interviews and hypotheses

For capturing the most relevant segment of R&D-related or innovation-oriented firms for our analysis, this study focuses on a survey sample from Istanbul and the surrounding Marmara region. The majority of manufacturing clusters in Turkey are located in the central or western regions, for instance in Istanbul and its neighboring provinces (Akgüngör, 2006). In comparison to other major cities within the country, Istanbul shows by far the highest concentration of firms and headquarters (HQs) and is home to the largest number of HQs of the top 500 corporations in Turkey (Ersoy, 2018). Moreover, the city accounts for more than 45 percent of net value added and production profit as well as more than half of all exports nationwide (Ersoy, 2018). Not only are economic indicators on the highest level, but Istanbul is also among the most knowledge-intensive cities. Of all regions within Turkey, Istanbul displays the highest levels of scientific or R&D-related personnel, the highest amount of technology product exports as well as the highest number of patents granted (Belgin, 2019; TUIK, 2019d). This includes strong agglomerations of knowledge-intensive industries as well as an important bridging function to globalized knowledge networks (Ersoy, 2018). Overall, Istanbul is the most R&D-efficient region in Turkey (Belgin, 2019) and has the highest share of knowledge-intensive service industries (Çelik et al., 2019). In addition, the city's surrounding Marmara regions show the highest location quotient values for medium and high-technology sectors in Turkey (Çelik et al., 2019). Therefore, the city is a major hub for most innovation and R&D-related activities of different types of firms and in particular for inward FDIs of foreign MNEs.

Despite having an optimal location to answer the research question of this study, it was still very important to gain more in-depth knowledge about the local environment. During questionnaire development and pretesting of the firm survey, we thus conducted several interviews with experts about the innovation setting of Istanbul and the importance of UICs concerning this matter. Between 2015 and 2016, we interviewed scientific and managerial personnel from universities, technology parks and TTOs, representatives from institutions at the state level as well as managers and R&D personnel from leading Turkish manufacturing firms. While doing so, we gained considerable prior knowledge about collaboration behaviors of firms and universities as well as both success factors and barriers to UICs for the case of Turkey or Istanbul in particular. These insights have contributed partly to the hypothesis development of this study and are as follows.

Istanbul is the center for successful and strong UICs within Turkey, based on the city's economic strength, inward FDIs of major MNEs and its strong universities. Interview partners stated that in many fields, Turkish universities are technologically advanced compared to domestic firms. Despite this situation, most domestic firms assume that



collaborations with universities are not necessary, meaning that raising firms' awareness for the importance of UICs is highly needed. In addition, most domestic firms are not used to collaborating with universities, meaning that it is hard for them to find Turkish firms with which to collaborate. As a result, many universities plan to collaborate with foreign partners rather than with Turkish firms, mainly from Western European countries, as foreign MNEs are supposedly more willing to engage in UICs. Nevertheless, foreign firms face more difficulties when establishing UICs or reaching out to technology parks and universities than their Turkish competitors. After UICs are established, however, the interviewees mention no difference in UICs between Turkish and foreign firms. Overall, UICs are supposedly quite successful in generating outcomes and projects are mostly short-term oriented with an average duration of one year. In addition, UICs with large firms are more successful than with SMEs.

Furthermore, government funding, such as incentives and tax reductions, is the most important driver for UICs. Moreover, settling in technology parks or development zones is highly interesting for firms due to various forms of financial support for R&D or innovation-related activities. Consequently, most innovative firms in Istanbul reside within technology parks and thus engage in collaborations with universities to a high degree. This is because UICs are mandatory for firms when settling in a technology park and wanting to profit from existing benefits and support structures. In addition, government institutions support different types of firms according to their specific needs, which mostly differ in the size of the firms. From the perspective of firms, university graduates as a highly skilled human resource are a main beneficial factor from residing close to universities, and access to them is created through internships or joint trainee programs.

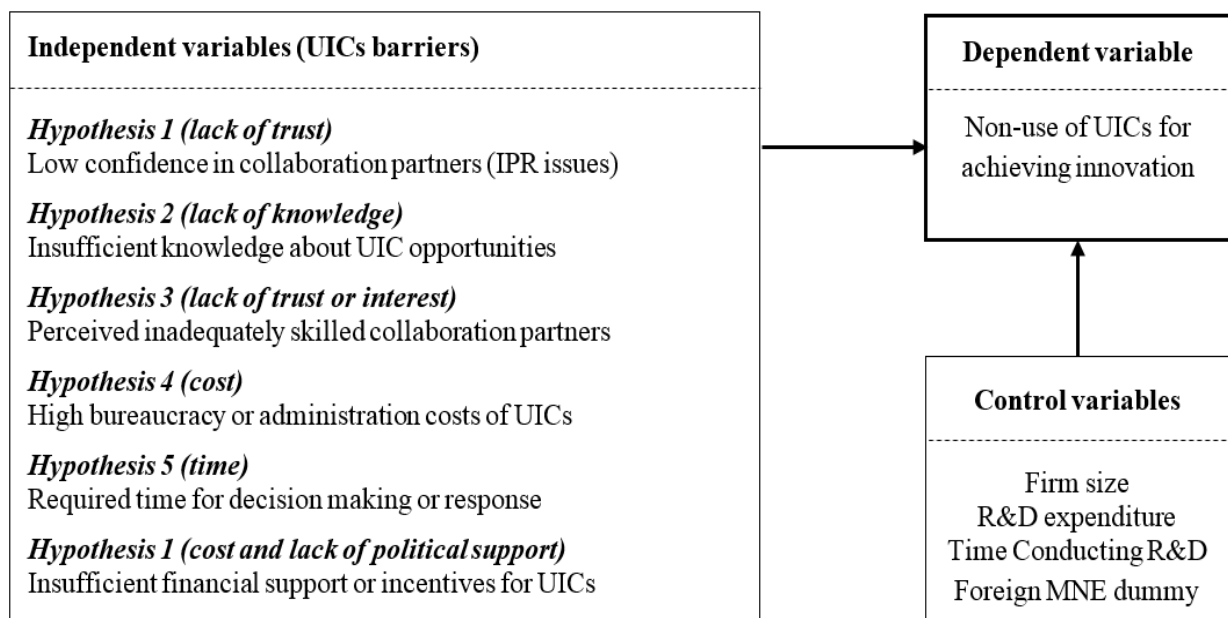
The most relevant obstacles or barriers to UICs for the case of Istanbul are a lack of interest from domestic firms, insufficient knowledge about UIC partners, different expectations of outcomes, firm size, a lack of trust and the time needed for UICs. Most firms have had unsatisfactory experience in prior collaborations and are not able to describe what they need or expect from an UIC in the first place. As a result, researchers often try to solve firms' 'problems' without even knowing what to address. These processes thus take a long time, resulting in dissatisfied firms. Firms indeed often expect scientific research to be a solution for everything as well as to have a clear outcome. If these high expectations are not met, firms consider UICs to be a failure and a waste of money. In addition, time is also a highly relevant factor and most firms do not recognize the long-term value of an UIC and would like to earn money quickly instead. This is particularly true for Turkish SMEs, as they have low confidence in collaboration with universities. Furthermore, firms might know their problems or have ideas on what to develop, but still have no or insufficient knowledge about where to find appropriate

collaborations at universities. Overall, academics are willing to engage much more in UICs, but are not able to find interested firms, as these are supposedly more engaged in R&D-related collaborations with their customers.

TTOs can thus be a solution to diminish some of the existing factors inhibiting UICs. One of TTOs' main tasks is actually the commercialization of scientific knowledge. TTOs are, however, also a highly relevant mediator for successful UICs and thus have an important bridging function between universities and industrial firms. In this regard, building trust for a collaboration is necessary and only possible through TTOs' provision of guarantees and liabilities for both sides. Firms and scientific personnel are thus able to obtain ongoing support and hold TTOs responsible if agreements prior to an UIC are not kept. In addition, TTOs are active in searching and matching firms with scientific personnel, as researchers do not have the resources or time to find potential collaboration partners outside the scientific environment. Moreover, prior to the foundation of TTOs, researchers mostly waited passively for firms to contact them and did not actively search for collaboration opportunities themselves.

Altogether, these insights provide important information for the subsequent hypothesis development and the interpretation of the statistical results.

**Figure 4.1:** Research framework



Source: own figure

The research framework and hypotheses of this study are shown in figure 4.1. In the following section, we address the subsequent research question: 'What barriers prevent the use of UICs for achieving innovation?' Based on the presented studies about UIC

barriers, findings from the Turkish context in particular and insights from our interviews with local experts, we *hypothesize* that:

- H.1* ‘Low confidence in collaboration partners (IPR issues)’ has a statistically positive impact on ‘not using UICs for achieving innovation’.
- H.2* ‘Insufficient knowledge about UIC opportunities’ has a statistically positive impact on ‘not using UICs for achieving innovation’.
- H.3* ‘Perceived inadequately skilled collaboration partners’ has a statistically positive impact on ‘not using UICs for achieving innovation’.
- H.4* ‘High bureaucracy or administration costs of UICs’ has a statistically positive impact on ‘not using UICs for achieving innovation’.
- H.5* ‘Required time for decision-making or response’ has a statistically positive impact on ‘not using UICs for achieving innovation’.
- H.6* ‘Insufficient financial support or incentives for UICs’ has a statistically positive impact on ‘not using UICs for achieving innovation’.

In the next section, we test the impact of the respective UIC barriers and examine firms that either do or do not use UICs as an external knowledge source for achieving innovation. With this approach, we are able to identify barriers that actually prevent UICs and therefore represent a bottleneck to UICs. The independent variables refer to different UIC barriers of lacking trust, a lack of knowledge, a lack of interest as well as cost and time-related factors. In addition, we control for several firm characteristics.

## **4.4 Research method and findings**

### ***4.4.1 Survey sampling and data collection***

For the subsequent survey sampling, we used a database from TÜBITAK, which is a highly useful source for identifying the most R&D-related segment of firms in Turkey. As of 2015, the database included over 8,500 firms nationwide that successfully completed at least one R&D project funded by TÜBITAK. Of these, nearly 4,000 firms are located in Istanbul and the Marmara region, from which we compiled a dataset involving firms that finalized at least three R&D projects successfully. As a result, we identified 838 firms whose general managers and R&D executives were approached to participate in our study. Consequently, we received 265 questionnaires, 40 of which we omitted due to missing values or a lack of R&D-related activities. Overall, having an effective 26.85 percent (225 of 838) response rate is a satisfactory result given the topic and potential respondents. In terms of content validity of the questionnaire measures, we adopted the procedures suggested by Hair et al. (2007). Firstly, as presented in the previous section, we conducted several pre-study interviews with local experts from

universities, technology parks, TTOs, state-level institutions and manufacturing firms about the innovation environment and firms' R&D-related activities in Istanbul. Based on these findings and the literature review, we then developed an initial version of the questionnaire. Secondly, we revised the survey draft through discussion with other scholar experts. Finally, a pre-test of the survey was conducted with randomly selected firms and adjusted accordingly until the questionnaire reached an adequate level of clarity and maturity.

#### ***4.4.2 Measurement of the variables***

In the following section, the measurements of the dependent, independent and control variables used in this study are described.

We gained knowledge about three distinct types of firms and their assessment of barriers to UICs. These firms are defined as either foreign MNEs with 100 percent foreign ownership or a joint venture with a Turkish firm, or as domestic Turkish firms (DTFs) and Turkish MNEs, which are 100 percent Turkish-owned and distinguished only by their internationalization activities. Detailed information about descriptive figures for each type of firm is illustrated in appendix 1 and 2.

The outcome or dependent variable is derived from a set of questions about firms' usage of various R&D resources during their innovation process: 'To what extent have the following aspects been used for achieving innovation in Istanbul and the Marmara region?' The respective answers were measured on a five-point Likert scale, ranging from '1-Frequently used' to '5-Never used' regarding the frequency of using 'collaboration with scientific partners' for achieving innovation. As binary logistic regression is used for the statistical analysis, only firms that would 'never' or 'almost never' use UICs are denoted as a 'non-use of UICs for achieving innovation'.

Furthermore, the independent variables were derived from a question about different factors concerning barriers to collaboration with scientific partners: 'To what extent have the following aspects been important barriers to collaboration with regional scientific partners?'. The answers are likewise based on a five-point Likert scale, ranging in their importance levels from '1-Not at all important' to '5-Very important'. Consequently, the higher the selected answer, the more relevant the barrier to UICs.

In addition, we used several control variables to test the robustness of the observed results for UIC barriers, and all variables were measured on a five-point Likert scale. Both variables 'Time spent conducting R&D (in Istanbul)' and 'R&D expenditure (of total sales)' control for firms' internal R&D capabilities. It is assumed that higher levels of respective capacities have a negative impact on not using UICs in the innovation process. We also involve 'firm size' to control for firms' internal capabilities, as larger firms should have more resources to use UICs for achieving innovation. The dichotomy

variable ‘Foreign MNE’ observes the influence of firms’ foreign ownership, as we assume that the respective group of firms tend to collaborate more successfully with universities. These control variables are commonly used in similar studies at the firm level (Fontana et al., 2006; Laursen & Salter, 2004; Liefner et al., 2006; Yu & Lee, 2017). Overall, tables A.4.2 and A.4.3 in the appendix provide the descriptive figures for all dependent, independent and control variables used in this study. These values are shown separately for each type of firm to obtain more detailed information about the respective firms’ characteristics as well as their assessment of perceived barriers to UICs with regional scientific partners.

#### ***4.4.3 Data analysis***

Firm-level barriers to UICs or innovation can be considered from different angles. Perceived barriers to innovation can be discerned by successful and unsuccessful innovators (De Fuentes et al., 2018), between postponed and abandoned innovation projects (Galia & Legros, 2004), by difficulties that prevent firms from undertaking innovation activities in the first place (D’Este et al., 2012) or differentiate between barriers that stop firms from further engaging during their innovation process (D’Este et al., 2012, 2014). In addition, Blanchard et al. (2013) highlight the importance of distinguishing between firms that either fail or do not even intend to innovate, to measure barriers to innovation performances properly. In our survey sample, we observed firms that engage in R&D-related activities and are willing to collaborate with universities, but which either do or do not use UICs as an external knowledge source for achieving innovation.

Subsequently, binary logistic regression analysis is used to estimate the effects of the barriers to UICs on the outcome variable of firms that do not use UICs for achieving innovation. For this, the binary logistic regression models can be expressed as:

$$P(Y_i = 1) = \frac{1}{1 + e^{-(\alpha + X_i\beta)}}$$

Here,  $Y_i$  is the dependent variable, which is a dummy variable with a value of zero or one, where a value of zero denotes the probability of an event not occurring rather than another denoted by one. The intercept is described as  $\alpha$ , and  $X_i$  is the vector of the independent as well as control variables, with  $\beta$  as the vector of the regression parameters (Amemiya, 1981). The value of the regression coefficient  $\beta$  estimates the impact of the independent on the dependent variable, where a coefficient above one increases the probability of an event occurring, while a value below one implies the opposite effect on the outcome variable. Here, the regression coefficients estimate the

degree to which firms are not using UICs for achieving innovation. Coefficient results are reported as exponentiation of the  $\beta$  coefficient ( $Exp(\beta)$ ), given an odds ratio of the independent variables.

#### ***4.4.4 Findings***

Firstly, the Spearman's rank correlation matrix of the independent and control variables for the survey sample of 225 firms is illustrated in table A.4.4 in the appendix. All correlation coefficients between the independent variables show positive and highly significant pairwise correlations with weak to moderate correlations (Akoglu, 2018). This is a reasonable result, as we expect all UIC barriers to be positively correlated among each other. In particular, 'High bureaucracy or administration costs' as well as 'Required time for decision-making or response' and 'Insufficient financial support or incentives for UICs' are highly positively correlated. Furthermore, most control variables indicate no correlation among each other or with independent variables, however the 'Firm size (total employees)' is correlated positively with the dummy variable 'Foreign MNE' as well as the 'Time spent conducting R&D (in Istanbul)'. In addition, significant negative correlations of 'Insufficient financial support or incentives for UICs' with 'Foreign MNE' and 'Firm size (total employees)' can be observed, indicating that large foreign firms do not assess a lack of financial political support as a relevant barrier to UICs.

Based on these partly strong correlations, we use tolerance values and the variance inflation factor (VIF) to test for a potential multicollinearity problem. In this regard, tolerance values should not be lower than 0.2 (Menard, 2002) and VIF values should not exceed 10 (Kutner et al., 2005). The results suggest that multicollinearity is not a problem in either statistical model, as none of the VIF values are higher than 2.23 and no tolerance values are lower than 0.43. The results of the binary logistic regression analysis are reported in table 4.1.

Starting with reliability measurements, both models indicate a good overall fit for the chosen variables with highly significant chi-square values ( $p < 0.01$ ), meaning that our predicted models fit significantly better for the survey sample than a null mode. Moreover, the 'Cox and Snell' and 'Nagelkerke' pseudo r-square values likewise indicate a good overall fit for both models. Based on the Nagelkerke r-square values, about 20 percent of the variance in baseline model one and about 30 percent in model two (with control variables) are explained. In addition, large effect sizes of both models indicate a good validity for subsequent data analysis (J. Cohen, 1992). Finally, chi-square values of the 'Hosmer and Lemeshow' test indicate no significant differences between predicted and observed variables in both models. Consequently, another good overall fit for the independent and control variables can be assumed (Hosmer et al., 2013).

**Table 4.1:** Binary logistic regression analyses

<b>Variables</b>	<b>MODEL 1</b>	<b>MODEL 2</b>
	(baseline model)	(with controls)
	<b>Non-use of UICs for achieving innovation</b>	<b>Non-use of UICs for achieving innovation</b>
	<i>Exp</i> ( $\beta$ )	<i>Exp</i> ( $\beta$ )
<b><i>Independent variables</i></b>		
Low confidence in collaboration partners (IPR issues)	.567 **	.571 **
Insufficient knowledge about UIC opportunities	1.619 **	1.572 *
Perceived inadequately skilled collaboration partners	.516 ***	.525 ***
High bureaucracy or administration costs	.702	.696
Required time for decision-making or response	.978	1.064
Insufficient financial support or incentives for UICs	1.817 ***	1.639 *
<b><i>Control variables</i></b>		
Firm size (total employees)		.910
Time spent conducting R&D (in Istanbul)		.826
R&D expenditure (of total sales)		.637 **
Foreign MNE (dummy variable)		.191 *
<i>Intercept</i>	.588	3.340
<b><i>Reliability measurements</i></b>		
Model chi-square	26.042 ***	37.219 ***
Cox and Snell r-square	.113	.165
Nagelkerke r-square	.197	.297
Effect size (Nagelkerke r-square)	.495	.650
Hosmer and Lemeshow chi-square	4.405	3.270
Included cases (N)	217	206

Notes: \*  $p < .10$ ; \*\*  $p < .05$ ; \*\*\*  $p < .01$

Source: own table

In terms of hypotheses testing, model one serves as the baseline model and model two incorporates different control variables to validate the effects of the independent variables.

Regarding model one, a total of four variables indicate a statistically significant impact on the outcome variable, however only two independent variables are positively related to not using UICs for achieving innovation. These are ‘Insufficient knowledge about UIC opportunities’ ( $\text{Exp}(\beta) = 1.619$ ,  $p < 0.05$ ) and ‘Insufficient financial support or incentives for UICs’ ( $\text{Exp}(\beta) = 1.817$ ,  $p < 0.01$ ). Firms perceiving these types of barriers thus have a 61.9 and 81.7 percent higher chance of not using UICs for achieving innovation. Consequently, hypotheses two and six are accepted. In contrast, both variables concerning ‘Low confidence in collaboration partners (IPR issues)’ ( $\text{Exp}(\beta) = 0.567$ ,  $p < 0.05$ ) and ‘Perceived inadequately skilled collaboration partners’ ( $\text{Exp}(\beta) = 0.516$ ,  $p < 0.01$ ) have a significant negative impact on the independent variable and thus have no relevance for firms not using UICs for achieving innovation. The other two variables on cost and time-related barriers have no statistically significant effect.

In model two, considering the control variables, the same four independent variables still show a statistically significant impact on the outcome variable. Both variables about ‘Insufficient knowledge about UIC opportunities’ ( $\text{Exp}(\beta) = 1.572$ ,  $p < 0.1$ ) and ‘Insufficient financial support or incentives for UICs’ ( $\text{Exp}(\beta) = 1.639$ ,  $p < 0.1$ ) have a positive impact on not using UICs for achieving innovation, with a 57.2 and 63.9 percent higher chance respectively. In the same way, the variables ‘Low confidence in collaboration partners (IPR issues)’ ( $\text{Exp}(\beta) = 0.571$ ,  $p < 0.05$ ) and ‘Perceived inadequately skilled collaboration partners’ ( $\text{Exp}(\beta) = 0.525$ ,  $p < 0.01$ ) indicate a negative effect on the dependent variable. No significant impact of the variables according to hypotheses four and five can be found. Overall, results from baseline model one are robust.

Concerning the control variables in model two, only the ‘R&D expenditure (of total sales)’ ( $\text{Exp}(\beta) = 0.637$ ,  $p < 0.05$ ) and the ‘Foreign MNE (dummy variable)’ ( $\text{Exp}(\beta) = 0.191$ ,  $p < 0.1$ ) have a statistically significant impact that is negative for both variables. Consequently, higher R&D expenditures as well as firms being of foreign ownership are much less likely to not use UICs for achieving innovation. Interestingly, both ‘Firm size (total employees)’ and ‘Time spent conducting R&D (in Istanbul)’ have no statistically significant impact.

**Table 4.2:** Degree of support for hypotheses (summary)

Hypotheses	Results
<b><i>Hypothesis 1 – (lack of trust)</i></b>	
‘Low confidence in collaboration partners (IPR issues)’ has a statistically positive impact on ‘not using UICs for achieving innovation’.	Not supported
<b><i>Hypothesis 2 – (lack of knowledge)</i></b>	
‘Insufficient knowledge about UIC opportunities’ has a statistically positive impact on ‘not using UICs for achieving innovation’.	<b>Supported</b>
<b><i>Hypothesis 3 – (lack of trust or interest)</i></b>	
‘Perceived inadequately skilled collaboration partners’ has a statistically positive impact on ‘not using UICs for achieving innovation’.	Not supported
<b><i>Hypothesis 4 – (cost)</i></b>	
‘High bureaucracy or administration costs of UIC’ has a statistically positive impact on ‘not using UICs for achieving innovation’.	Not supported
<b><i>Hypothesis 5 – (time)</i></b>	
‘Required time for decision-making or response’ has a statistically positive impact on ‘not using UICs for achieving innovation’.	Not supported
<b><i>Hypothesis 6 – (cost and lack of political support)</i></b>	
‘Insufficient financial support or incentives for UICs’ has a statistically positive impact on ‘not using UICs for achieving innovation’.	<b>Supported</b>

Source: own table



In summary, table 4.2 provides the results for all hypotheses tested during the logistic regression analysis. We find full support for hypotheses two and six. All other hypotheses are rejected, which is a very interesting finding that we will discuss in more detail in the next section.

#### **4.5 Discussion**

Our findings suggest that common perceived cultural barriers between firms and universities do not influence firms' usage of UICs in their innovation processes. These results stand in contrast to other findings from Turkey (Kaymaz & Eryiğit, 2011; Temel & Glassman, 2013) that identify a lack of trust, awareness or insufficient knowledge about the benefits of an UIC as relevant barriers in the first place. For the surveyed firms in our sample, however, we find that these initial difficulties are not relevant obstacles to collaborating with universities. Firms already know about benefits and potential negative outcomes during a R&D process with external scientific partners. For example, the cost-related variable 'high bureaucracy or administration costs' as well as 'required time for decision-making or responses during an UIC' have no significant influence at all. In addition, some barriers even have a statistically negative impact on the dependent variable. For instance, 'Low confidence in collaboration partners (IPR issues)' has a significant negative impact on not using UICs for achieving innovation. This result suggests that IPR concerns do not act as a barrier to UICs for firms in our sample and relates to findings by Bercovitz & Feldman (2007), who show evidence that firms prefer universities as external R&D collaboration partners over other firms, particularly if IPR conflicts are perceived (Bercovitz & Feldman, 2007). In the same way, perceived 'inadequately skilled collaboration partners' from the perspective of firms also have a significantly negative impact on not using UICs for achieving innovation. Surveyed firms therefore do not perceive universities as inadequate collaboration partners, which stands in contrast to statements from our pre-study interviews.

In previous studies, a lack of internal resources or absorptive capacities was found to be the main barrier for firms to access external knowledge sources and establish UICs in the first place. In the case of this study, however, we assume that this does not apply to the firms in our survey sample, as all firms report some form of R&D-related activities and successfully completed at least three R&D projects funded by TÜBİTAK. We still control for firms' internal resources by using their size, their time spent conducting R&D in Istanbul as well as their R&D expenditure, as these are among the main determinants for absorptive capacities and collaboration with external partners (Fontana et al., 2006; Laursen & Salter, 2004; Liefner et al., 2006; Yu & Lee, 2017).

Firms' size and time spent conducting R&D in Istanbul are both insignificant and have no impact on the outcome variable. This indeed is the case, as we observed both large firms and SMEs that are successful in achieving innovation and keen to engage in UICs. In contrast to findings from the pre-study interviews with local experts, we cannot confirm that smaller firms are less in favor of using UICs for achieving innovation. In terms of the time spent conducting R&D in Istanbul, the non-significant but negative impact is also related to the mix of various firm types that have either operated in Istanbul for a long time, are young and only recently established firms, or are MNEs that have only recently invested in Turkey. The significantly negative impact of R&D expenditure on firms' non-use of UICs for achieving innovation elucidates the importance of internal R&D capabilities. Additionally, the dummy variable of 'foreign MME' has a highly negative and significant impact on the non-use of UICs, meaning that the probability of not using UICs in the innovation process is higher for Turkish firms and lower for foreign MNEs. These results are in contrast to findings from similar EMs or the Turkish context, in which the likelihood of universities collaborating with foreign firms' is not higher than for their domestic competitors (Beyhan & Fındık, 2014; Segarra-Blasco & Arauzo-Carod, 2008). This finding, however, relates to insights from our pre-study interviews, where many local experts also stated that foreign firms are more willing to engage in UICs and researchers struggle to find domestic collaboration partners in general.

Furthermore, it is clear that obstacles to UICs are not only one-sided, but affect both firms and universities in similar ways. In this study, we were only able to obtain information from the viewpoint of firms. Nevertheless, there are certain differences regarding what each side perceives as the main barriers and how to deal with obstacles to UICs. Previous studies, however, suggest the importance of TTOs to bridge potential hindrances to UICs. Temel & Durst (2018) illustrate the importance of TTOs for a conversion from teaching-oriented to entrepreneurial universities. This is a highly relevant driving factor for universities to open up towards UICs in the first place, considering the commercialization of knowledge and establishing close contact with industrial partners. TTOs, however, are not simply important actors during the process of universities' knowledge commercialization. Their major benefit is indeed to bring scientists into direct contact with external collaboration partners and thus act as a boundary connector between the two (O'Gorman et al., 2008). Moreover, they also manage universities' intellectual property via patenting and licensing, provide support for scientific personnel with entrepreneurial spin-off or start-up activities, and therefore contribute to a knowledge-based regional development (Olcay & Bulu, 2016; Siegel et al., 2003, 2007). Fitzgerald & Cunningham (2016) conducted a study about mission statements or self-defining purposes and foci of TTOs. The authors find that TTOs

state two principal missions to establish long-term legitimacy and credibility, namely targeting customers and markets as well as providing principal services (Fitzgerald & Cunningham, 2016). Kaymaz & Eryiğit (2011) also highlight the importance of UIC centers within universities, which should be provided with more autonomy in decision-making, fewer bureaucratic obstacles as well as higher and independent budgets (Kaymaz & Eryiğit, 2011). Ranga et al. (2016) provide several implications for the managerial levels of TTOs and universities to improve the work and efficiency of TTOs. In this regard, more activities for capacity building and professionalization of the TTOs' personnel is highly relevant to actively promote and consequently increase the awareness for technology transfer opportunities among the scientific staff as well as in the business environment (Ranga et al., 2016).

During development of the questionnaire and pre-study interviews, we obtained some opposing statements when talking with academics about their assessment of UICs in Istanbul. Most interview partners named, for instance, a lack of interest from firms, different expectations of UIC outcomes, or lacking trust and too much time needed when collaborating. In contrast, results from our statistical analysis revealed that these barriers seem not to play an important role on the firm side. In contrast, only insufficient knowledge about collaboration opportunities as well as a lack of financial political support or incentives are major obstacles to using UICs for achieving innovation. Same results, however, are concerning the importance of TTOs in the collaboration process to overcoming impediments between universities and firms. Insights from these interviews are in line with previous studies and are in line with the statistical results from our analysis. It might be the case that Turkish intermediary institutions already play a vital role in establishing trust and providing responsibilities between the two collaboration partners. Nevertheless, the TTOs' function is even more relevant to diminish the further barriers that we just observed, particularly in terms of signaling universities' willingness to collaborate and proactively search for collaboration partners.

#### **4.6 Conclusion and implications**

This study has focused on the importance of innovation, technology transfer and UICs in an EM. We made use of an empirical analysis of survey data from manufacturing firms in Istanbul to answer the following research question: 'What are the most important barriers to UICs for achieving innovation?'. In addition, the concept of RISs helped to conceptualize connections between each actor in their respective innovation system and allowed the identification of varying needs and support options. In this last section, we point out the limitations of this study and provide implications for firms, universities and policymakers separately.

#### ***4.6.1 Limitations***

There are some limitations to the results of this study. Firstly, using Turkey as a single-country setting might limit the generalizability of our findings to other EMs. It would thus be helpful to conduct a similar research approach in diverse EMs to compare the outcomes of this study and further extend the literature on UIC barriers in EM contexts. Secondly, the geographical focus on Istanbul as well as on a R&D-related segment of manufacturing firms produces specific outcomes for a certain type of firm, particularly with regard to their innovation activities, UIC experience and in metropolitan regions. However, we nevertheless gained important knowledge for a subgroup of firms that engage in innovation and R&D activities but still does not use UICs as an external knowledge source for achieving innovation. Thirdly, as already shown in the literature review of this study, there are a vast number of potential barriers that could have been used for statistical analysis. Nevertheless, we had to limit the number of variables in our models and thus only selected barriers that were most relevant in previous studies about Turkey and frequently named during our pre-study interviews. Finally, as the name suggests, UICs are a two-sided topic and we only focused on the analysis of perceived barriers from the perspective of firms. Although we have gained some worthwhile insights from our pre-study interviews, a proper qualitative analysis with relevant stakeholders or experts from the scientific and political environment in Istanbul would be desirable.

#### ***4.6.2 Theoretical implications***

Our findings contribute to the theoretical understanding of UIC barriers in EMs as well as for the segment of R&D-related manufacturing firms in particular. In this regard, our results reveal the two most relevant barriers to using UICs for achieving innovation: a lack of knowledge about UIC opportunities and insufficient financial political support or incentives. In contrast, significant negative results for barriers relating to lack of trust, lack of interest as well as cost and time-related factors indicate that anticipated barriers in previous studies from the Turkish context do not impede UICs from the perspective of firms. For the R&D-related segment of firms, we thus assume that firms are already aware of the requirements and potential problems of UICs and only suffer from inefficient RISs in terms of universities and political support. In this regard, our findings suggest that RISs are a highly relevant support infrastructure for the emergence of innovation activities and UICs in EMs. For addressing insufficient political financial support or incentives, the significance of governance in RISs and a proactive fostering of firms' innovation activities becomes evident. We will make more recommendations in the section about policy implications in that respect.

In terms of insufficient knowledge about UIC opportunities, the need becomes relevant for a functioning support infrastructure with intermediary institutions at the regional level to ensure communications and interactions between firms, universities and the political sphere (Uyarra, 2010). This is even more relevant considering that the provision of accessibility between firms and universities is a crucial condition for the emergence of UICs in the first place. Our findings thus suggest the relevance of putting intermediary or organizational structures in place that foster universities' and firms' engagement with each other (Cunningham & Link, 2015). In the same way, Kaymaz & Eryiğit (2011) highlight that proactive engagement and communication of policymakers, industrial firms and universities are highly relevant to stimulate UICs on several levels (Kaymaz & Eryiğit, 2011). Close interactions between all actors are the main success factor for diminishing previously identified barriers of insufficient knowledge about UIC opportunities that hinder UICs. TTOs forge important links between the educational and economic systems, meaning that it is vital to learn more about their work and function as intermediary organizations (Markman et al., 2004).

For the Turkish context in particular, further establishing TTOs and supporting them in their organizational development is a highly relevant task, as such intermediary institutions between firms and universities have only just emerged, are less present in Turkish universities and have been poorly organized thus far (Beyhan & Rickne, 2015; Temel, Mention, et al., 2013). Although TTOs are the most effective intermediary institutions for UICs, as they allow for fast and easy procedures and provide financial, legal and technical consultancy for academics, Yalçıntaş et al. (2015) also highlight that TTOs are still not recognized enough in the Turkish context. Moreover, existing TTOs provide insufficient time and resources for the scientific personnel and only support commercializable knowledge from technical fields compared to social sciences (Yalçıntaş et al., 2015). Ciritcioglu et al. (2016) find similar results for the woodworking industry in the East Marmara region, where insufficient knowledge and miscommunication are the main obstacles to UICs from the perspective of firms. The authors also suggest the implementation of technology faculties to deal with respective barriers to collaboration (Ciritcioglu et al., 2016).

Overall, policies to build and maintain firms' networks with universities or public research institutes are highly beneficial in the view of open innovation strategies, as particularly SMEs rely heavily on the respective networks to access external knowledge sources (Hinteregger et al., 2019). Our findings hence relate to the concept of open innovation and awareness for external collaboration with universities. In this respect, firms are able to find and access external assets by adopting searching and matching routines for their specific technological needs and requirements (Perkmann & Walsh, 2007). Implementing searching, screening and signaling strategies are therefore useful

recommendations for managers to actively engage in UICs and consequently achieve successful innovation (Fontana et al., 2006).

#### ***4.6.3 Managerial implications***

Based on the firm-level evidence of this study, we are able to provide suggestions for managers to deal with barriers that inhibit the use of UICs for achieving innovation. A main result of our analysis is that insufficient knowledge about collaboration opportunities is a significant barrier, impeding UICs. It is thus necessary to increase firms' knowledge about collaboration opportunities, meaning that UICs are able to emerge in the first place. In relation to this result, Fontana et al. (2006) highlight the importance of firms' openness to their external environment. This can be measured by a process involving the initial implementation of search strategies for potential collaborations, a subsequent in-depth screening to identify the best UIC opportunities, and a final signaling stage to convince prospective partners (Fontana et al., 2006). Developing strategies to identify potential collaboration partners are valuable suggestions for managers of our survey as well. Although the signaling of UIC opportunities or R&D projects is an associated task of universities or TTOs initially, firms also need to play a more active role in searching and signaling to establish UICs. With regard to the pre-study interviews, moreover, local experts mentioned that firms are not willing to engage in or are not interested in UICs. As our statistical results indicate, however, this seems not to be a relevant barrier from the perspective of firms that prevents UICs in the first place. Therefore, firms' proactive signaling towards universities or researchers is once again highly important to show interest and to actively initiate UICs. Furthermore, interview partners criticized the fact that firms are not able to communicate their research problems properly and have unrealistic expectations for UICs and their potential outcomes. Although we did not incorporate these factors into our analysis, managers should still pay attention and potentially address the issues mentioned from the perspective of universities.

In addition, firms should continuously invest in highly skilled human capital and R&D-related personnel in particular, as these employees not only provide the firms with certain skills and knowledge, but are also a key success factor for identifying and establishing UICs, and hence for consistently overcoming major barriers to innovation activities (De Fuentes et al., 2018). This is also reflected in our results of a significant negative impact of R&D expenditure on the non-use of UICs for achieving innovation. Consequently, firms that invest highly in their internal R&D capabilities and personnel are less likely to face barriers to UICs.

#### ***4.6.4 Policy implications***

The statistically positive impact of ‘insufficient financial support or incentives for UIC’ indicates quite clear policy implications; however direct incentives or financial support for UICs are not the only relevant support measures. In this respect, Özçelik & Taymaz (2008) find that public R&D support positively affects further private R&D investments and R&D expenditures at the firm level, particularly for smaller firms and for late industrialized or EM contexts (Özçelik & Taymaz, 2008). Therefore, public R&D spending can also bolster firms’ internal capabilities or absorptive capacities in the first place, consequently enabling them to make use of external technologies or knowledge sources. Other studies clearly show that the intensity of internal R&D positively and significantly stimulates R&D activities with external partners such as universities (Becker & Dietz, 2004; Bercovitz & Feldman, 2007). D’Este & Perkmann (2011) suggest, however, that instead of solely or excessively focusing on financial incentives for industrial engagement in UICs, a more comprehensive policy strategy should be pursued for promoting collaboration, referring to the needs and requirements of scientific personnel rather than expecting a merely entrepreneurial mindset of universities and their researchers (D’Este & Perkmann, 2011). This refers to results by Bruneel et al. (2010), who find that many UIC barriers are related to attitudes and behaviors on the university side, meaning that reducing perceived barriers on the part of researchers is a crucial factor in fostering UICs overall. Guerrero & Urbano (2017) also highlight that positive effects of financial support for innovation are only evident if firms successfully collaborate with universities (Guerrero & Urbano, 2017).

It is thus critical to consider the impact of TTOs on UICs. These intermediary institutions are highly important for bridging the different logics of universities and industrial firms and thus facilitating successful UICs (Villani et al., 2017). The creation as well as further support of TTOs might thus be a crucial strategy to pursue in the future, particularly as firms have insufficient knowledge about collaboration opportunities. TTOs can be of great help in this regard to signal interest in UICs, show collaboration possibilities, actively approach firms and provide dependability during the collaboration phase. Consequently, developing the marketing skills of TTOs’ personnel can be of great help in finding external collaboration partners as well as purchasers or users of applied scientific knowledge. This is even more relevant considering that inefficient TTOs can also be an obstacle to UICs from the perspective of researchers, as they may cause additional transactional costs of working with firms and may lead to lower levels of flexibility (Tartari et al., 2012). Consequently, UICs need to be considered from a strategic perspective and several shortcomings or skill deficiencies of TTOs need to be addressed by university administrators and policymakers to consistently enhance the effectiveness of technology transfers (Siegel & Phan, 2005). In

this regard, it is useful to support the transformation of universities towards a more entrepreneurial focus. Moreover, it is critical to also consider the impact of TTOs on regional economic development, meaning that investments in TTOs should not only be directed towards already advanced regions to further improve their performance (Ranga et al., 2016), but might also be a beneficial factor for increasing technology transfer activities in the less developed Turkish regions.

Overall, accessing financial support or public incentives for R&D and innovation activities are still major barriers for firms in Turkey (De Fuentes et al., 2018). Therefore, it is important that policies reduce firms' perception of innovation costs to foster R&D investments and increase capacity building, particularly of domestic firms (Santiago et al., 2017). In addition, political institutions should not only increase the awareness of public support, but also most notably improve the conditions for accessing public incentives, for instance through reducing bureaucracy and training for governmental staff (De Fuentes et al., 2018). This is highly relevant, as previous studies suggest that UICs are still not a vital factor for the innovativeness of Turkish firms (Temel, Mention, et al., 2013), meaning that technology transfer between firms and universities is still a new concept in Turkey and the competition for government funding has only emerged since 2012 (Ranga et al., 2016). However, Olcay & Bulu (2016) find that Turkish TTOs currently focus on raising the awareness for their activities among industrial firms and university researchers, meaning that both realize the potentials and opportunities of UICs (Olcay & Bulu, 2016).

Moreover, policies should further strengthen the public education system and might adjust it according to firms' needs. In addition, it is relevant not only to foster UICs constantly, but also to increase graduate mobility between universities and firms overall (De Fuentes et al., 2018). As Padilla-Pérez et al. (2009) suggest, active public innovation policies and strong institutions are vital aspects for developing capability in EMs and fostering innovation at the firm and regional level (Padilla-Pérez et al., 2009). In addition, as academic capabilities of universities are still low or only just developing, education policies should also be geared towards financing higher education in EMs. Therefore, policymakers need to focus on the expansion of tertiary education to support technological catching-up with more advanced or industrialized markets (Schiller & Liefner, 2007). As a result, successful and thus long-term UICs are not only be fruitful for firms, but also have a positive impact on the academic productivity of universities (Cunningham & Link, 2015; Garcia et al., 2020).

Overall, the key elements for a future economic development within EMs are a mix of knowledge sources that are external to firms. In particular, policies should foster access to technologies and applied knowledge from the scientific environment to provide useful conditions to promote further UICs and technology transfer consistently (De Fuentes



et al., 2018). Providing collaboration platforms and networking events for universities and industrial firms or creating online platforms to match overlapping research interests of the two institutions might be a very helpful policy assistance concerning this matter.

# Chapter 5 | Conclusion

## 5.1 Summary of the Main Findings

In the subsequent section, I will cover the main findings from the aforementioned articles and briefly contextualize the results of this thesis in existing studies within the relevant research contexts.

In article one, I characterized three different types of firms and identified key factors of their market-seeking motives and usages of domestic political support in Turkey. I find several commonalities and differences for the R&D-related segment of firms in Istanbul. As a result, foreign MNEs particularly benefit from establishing domestic political connections as well as from investment and export incentives as financial support. Domestic Turkish firms highly profit from tax incentives as well as institutional support in the form of increased contact with collaboration partners and workforce. Moreover, domestic firms primarily target economically advanced markets as part of their prospective internationalization strategies. In addition, Turkish MNEs likewise target economically advanced markets and predominantly benefit from investment and export incentives as financial political support.

In article two, I revealed important findings about firms' innovation success as well as additional knowledge concerning their internationalization activities in terms of demand-pull and technology-push strategies. Firstly, the results from dimension reduction with the principal component analysis showed three main components of firms' R&D resources. The identified components are categorized as internal resources as well as two external resources relating to technological and market knowledge. In this regard, internal R&D resources are the main factor for the innovation success of domestic Turkish firms, as they still need to build their internal capabilities before accessing external knowledge sources. Turkish MNEs also partly rely on internal R&D resources, but primarily profit from external market knowledge for their innovation success. For the group of foreign MNEs, market knowledge is likewise the key factor for the innovation success of these firms.

Lastly, in article three, I identified the most relevant barriers of using UICs for achieving innovation from the perspective of firms. In this regard, logistic regression analysis was used to test the impact of various barriers for firms that either do or do not use UICs in their innovation strategies. By doing this, I was able to identify barriers that actually prevent UICs and thus form a bottleneck for the emergence of collaboration between universities and industrial firms. My findings suggest that only insufficient financial political support or incentives for UICs as well as insufficient

knowledge about UIC opportunities are relevant barriers for firms. Moreover, most other barriers even have a statistically negative impact, meaning that commonly perceived cognitive or cultural differences between universities and firms do not act as actual barriers to UICs. In addition, insights from pre-study interviews with local R&D experts verified, complemented and partly contrasted with these statistical results.

In this respect, Kafouros et al. (2008) find similar results for the interrelated concepts of firms' economic performance, innovations success and internationalization activities. The authors conclude that only if firms show a sufficient degree of internationalization, they are able to benefit fully from innovation in terms of their economic performance (Kafouros et al., 2008). With this thesis, I thus contribute to the authors' findings and highlight the importance of considering firms' internationalization activities when conducting research on innovation performance in EEs. Overall, internationalization motives of Turkish firms are not unilateral or only relate to market-seeking strategies. In terms of internationalization activities of EE firms that operate in other EEs, it might also be relevant to mention that both local and international linkages can have a positive impact on the innovation strategies of firms. Nevertheless, firms' absorptive capacity oftentimes only moderate the relationship between innovation and their local linkages, meaning that these limited internal capacities of EE firms can be too weak to likewise bolster international linkages (Liao & Yu, 2013). My findings are in contrast to that, as both Turkish firm types target economically advanced markets as their prospective market-seeking strategies.

Furthermore, studies from the Chinese context suggest the importance of internal capabilities for the upgrading process of SMEs, whereas integrations in GVCs is not used as external knowledge sources (Peighambari et al., 2014). These findings relate to results from the second article of this thesis and for the group of domestic Turkish firms, which mostly consists of SMEs in our survey sample. For these smaller sized Turkish firms, internal R&D recourses are likewise the main success factor for achieving innovation. Therefore, it seems evident that smaller domestic firms in EEs still rely on their internal capabilities and thus still need to build absorptive capacity before assessing external knowledge resources. For a sample of SMEs in Turkey, Yesilay et al. (2015) also find that firms' internal technological capacities and inward technology transfer positively impact the number of patents of respective firms. In contrast, the authors find no relationship between governmental R&D support and outward technology transfer and patent ownership (Yesilay et al., 2015). It is thus evident, that internal R&D capabilities are highly relevant for SMEs from Turkey to successfully absorb and make use of technology spillovers. In addition, the joint use of both external scientific and market knowledge sources is highly positively related to firms' internal

inventive processes and influences firms' innovation performances and competitiveness (Scandura, 2019).

De Fuentes et al. (2018) additionally highlight that firm size is a relevant factor for perceived barriers to achieving innovation. In particular, smaller firms from EEs report some form of innovation barriers and are associated with overall low levels of productivity anyway, meaning that respective firms further struggle to attract highly skilled personnel. This is particularly risky as R&D employees are the key factor for successful innovators, providing crucial skills and knowledge to the firm and thus addressing financial and organizational barriers to innovation (De Fuentes et al., 2018). For our survey sample, however, firm size is not a relevant factor that explains a non-use of UICs for achieving innovation. In contrast, both observed large and small firms perceive barriers to UICs in the same way. For the context of Asian countries, Lee & Kang (2010) find that UICs are most frequent among firms that already conduct some form of internal R&D and thus have R&D capabilities in the first place. These results indicate that UICs are rather complementary than substituting for the upgrading or catch-up strategies of firms in developing or EEs. Consequently, building absorptive capacity should be the main objective for domestic firms above all (Lee & Kang, 2010). Our findings from the second article suggest the very same result for the group of domestic Turkish firms that mainly use internal resources as prime source for successfully achieving innovation.

Furthermore, Ozcelik & Taymaz (2004) illustrate that R&D activities and innovation are crucial success factors for the internationalization of Turkish manufacturing firms. In addition, rather internal resources than technology transfers from external firms play an important role for the development of domestic Turkish firms (Ozcelik & Taymaz, 2004). These results from the early 2000s highlight the importance of absorptive capacity and crucial upgrading of internal capabilities in the first place. In this regard, I still find similar results for the group of domestic Turkish firms in article two, for which internal R&D resources are the main factor for their innovation success. These results also relate to findings from Guerrero & Urbano (2017) who indicate that firms in the EE of Mexico are more likely to use their internal capabilities than external sources for achieving innovation (Guerrero & Urbano, 2017). In a study concerning the Turkish manufacturing industry, Lo Turco & Maggioni (2019) also find current evidence for the moderating role of domestic firms' absorptive capacity that only enable a small subset of Turkish firms to benefit from spillovers of foreign MNEs in the domestic market.

With findings from the three articles, this thesis contributes to the understanding of different firm types regarding their characteristics, innovation strategies and success factors as well as internationalization activities within the EE of Turkey. Hereof, I am able to provide results for each type of firm separately.

Firstly, domestic Turkish firms are characterized by using tax incentives as financial support. In addition, they benefit from increased contacts to collaboration partners and workforce as a form of institutional support. As a market-seeking strategy, domestic firms aim to serve economically advanced markets. Moreover, respective smaller firms highly depend on their internal R&D resources for achieving innovation successfully, as they still need to build their internal capabilities first to later use external resources. Secondly, Turkish MNEs are characterized by their internationalization motives towards economically advanced markets and mainly benefit from domestic political support in terms of investment and export incentives. This group of firms partly rely on their internal R&D resources for achieving innovation, but particularly use external market knowledge for their innovation strategies. Finally, foreign MNEs only serve the Turkish market, as neighboring or economically advanced markets are no part of their subsidiaries' market-seeking motives. Moreover, foreign MNEs highly benefit from investment and export incentives as a form of financial support as well as establish political connections to overcome their LOF. In terms of innovation strategies, foreign MNEs rely on their external market knowledge resources and thus pursue demand-pull strategies. Regarding barriers to UICs, I did not distinguish between firm types, however, the use of foreign MNEs as dummy variable shows that foreign firms are less likely to perceive barriers to UICs for achieving innovation in Turkey. In general, insufficient knowledge about UIC opportunities as well as insufficient financial political support or incentives for UICs are main barriers that inhibit the use of UICs for achieving innovation over all types of firm. Many other barriers do not impede the probability of firms using UICs for achieving innovation and even show statistically negative effects. Consequently, these findings lead to several theoretical and policy implications.

## **5.2 Theoretical Implications**

Regarding article one, it became evident that for the case of EEs, single theories or concepts regarding firms' internationalization strategies are too unilateral on their own. Therefore, it is highly relevant to consider an interplay of market-seeking motives with domestic political support options and certain firm characteristics. The utilization of a multidimensional or eclectic concept is highly suggested in that respect. Moreover, as both domestic Turkish firms and Turkish MNEs predominantly target economically advanced markets as part of their prospective internationalization strategies, theories relating to initially targeting culturally close neighboring markets (Johanson & Vahlne, 1977, 2015) seem not to fit for Turkish firm types in my sample. Instead, the findings support the springboard perspective (Luo & Tung, 2007) of EEs firms, to overcome constraints at their domestic home-market.

In terms of article two, my findings suggest the importance of not only distinguishing between internal and external R&D resources, but particularly between technological and market knowledge. This relates to the understanding of either technology-oriented or user-driven innovation in EEs. Moreover, the involvement of internationalization activities or strategies as a categorizing perspective of firms in EEs is highly relevant to understand the key factors affecting firms' innovation success.

In article three, I contribute to the overall understanding of perceived barriers to UICs for achieving innovation in the view of firms. Hereof, it became evident that commonly perceived barriers that relate to cultural or cognitive differences between universities and firms are not relevant for the survey sample of firms in Turkey. In this regard, only insufficient financial political support and a lack of knowledge about collaboration opportunities are factors that actually impede UICs. Consequently, the proactive engagement of not only firms, but particularly of TTOs to establish UICs is highly necessary to overcome barriers relating to insufficient knowledge about collaboration opportunities. Intermediary institutions in RISs and between universities and industry are thus highly relevant in an EE context. In addition, the concept of open innovation among firms is a useful strategy to increase the awareness for external collaboration opportunities. Lastly, the introduction of searching, screening and signaling (Fontana et al., 2006) as a firm strategy is most beneficial to find and establish successful UICs and thus make for innovation success.

### **5.3 Policy Implications**

First of all, Yaşar (2019) argues that Turkey still remains in the middle-income trap, as the country has partly failed to invest sufficiently in education and knowledge-based economic developments. Consequently, Turkish firms still have to deal with a lack of knowledge and technology and only show relatively low R&D activities. Consequently, the valued added of domestic products and thus exports of high technological products remain at low levels. Further investments in education and direct subsidies for firms' R&D activities are thus highly needed to upgrade the low value added of the Turkish exports (Yaşar, 2019).

Overall, in terms of upgrading processes and capacity building, regional and national policies need to allow for varying institutional and financial support options, to bolster the diversified corporate landscape within Turkey and each type of firm individually. This relates to specific support for smaller domestic Turkish firms, internationalization ambitions of Turkish MNEs and the further attraction of foreign MNEs. Moreover, government initiatives and R&D policies with the aim to encourage innovation activities of Turkish SMEs could also lead to a growing and successful SME sector and

would have a notable impact on the economic growth, stability and employment in Turkey (Demirbas et al., 2011).

Furthermore, a mere focus on policy support for technology-push strategies neglects other factors that explain innovation success and internationalization strategies of various firm types in EEs. In this regard, policymaker should allow for diverse forms of support instead of relying on capacity building only. Nevertheless, smaller Turkish firms are still in need of support for their internal R&D capacities, whereas Turkish MNEs profit from technology-push support strategies of access to external scientific or technology knowledge sources to target economically advanced markets.

In terms of barriers to UICs, it became evident that insufficient financial political support or incentives have a statistically high impact on firms' non-use of UICs for achieving innovation. Hereof, regional and national policymakers should provide sufficient public UICs funds for firms and universities or TTOs. Moreover, respective public financial support might not only promote UICs directly, but also bolster firms' internal R&D capabilities, to encourage more R&D investments at the firm level. In this regard, public incentives for firms' innovation activities are able to reduce firms' perception of innovation costs and foster R&D investment and internal capacity building. Policy support for UICs is thus highly needed to motivate firms to engage in innovation and higher technologies, which might enhance positive externalities and promote regional and sectoral competitiveness as well (Çelik et al., 2019).

Overall, large public and private investments in higher education and R&D spending are needed to strengthen both the innovation and education systems. Consequently, policymakers should particularly focus on the expansion of tertiary or higher education as well as the academic capabilities of domestic universities.

#### **5.4 Research Limitations**

There are some limitations to the results of this study. Firstly, using a single-country setting restricts the generalizability of my findings. It would thus be relevant to conduct a similar research in a different EE context. Secondly, by using a spatial focus on Istanbul and the Marmara region as basis for the survey sampling, I also find specific outcomes for a highly knowledge- and manufacturing-based metropolitan region, which might be an exception in other EEs and for Turkey itself. Thirdly, the intended focus on the R&D and innovation-oriented segment of firms produced specific results for a certain group of firms. Fourthly, the observed concepts and underlying theories of each article are highly heterogeneous and multifaceted. In this regard, many other variables, that I did not collect in our survey, could have been used to measure firms' internationalization strategies, firms' usage of domestic political support, firms' internal and external R&D resources as well as various barriers to UICs. Fifthly, by using a

single or same respondent of each firm during the survey, the results might suffer from response bias or common method variance (Chang et al., 2010). However, the pre-study interviews helped to partially validate the statistical findings and add further contextual insights on top of that. Sixthly, firms' self-assessment of their economic and innovation success needs some attention, as interviewees might adjust their response behaviors according to assumed underlying hypotheses or they provide a desired image. Consequently, the findings do not allow for objective measurements. Lastly, in terms of barriers to UICs, I only obtained statistical information from the perspective of firms, meaning that an extended survey of universities and political institutions would contribute to a more nuanced picture of the needs and requirements of all stakeholders.

### **5.5 Development Perspectives**

The country is currently, as many other EEs, facing a dangerous collapse in exchange rates due to the coronavirus initiated economic crisis in Q1 and Q2 of 2020 (ARD Börse, 2020). In addition, a severe financial shock in mid-2018 triggered a recession and led to a decrease in the country's GDP growth rates of -2.6 percent in Q1 of 2019 (OECD, 2019b; TUIK, 2019a). Moreover, the attempted coup in 2016 also led to some uncertainty in the economic situation (Martens, 2017). Turkey's economic future thus remains vague, potentially leading to a second economic recession in only two years between 2018 and 2020. In this regard, the future economic development of the country highly depends on the advancement of its domestic firms and upcoming MNEs. Upgrading strategies to increase the value added and thus bolster innovation performances are essential to remain competitive on the national level but particularly at global scale. An awareness and readiness for industrial or manufacturing progress such as Industry 4.0 technologies are hereof a crucial factor to succeed or even survive fierce competitions. In their study concerning the manufacturing industry in Turkey, Sarı et al. (2020) show that a majority of industrial firms are aware of the Industry 4.0 concept and its importance. In addition, larger firms and those from automotive, electrical and electronics as well as machinery manufacturing industries are on the forefront of implementing Industry 4.0 technologies. Nevertheless, the ratio of Turkish manufacturing firms that deal with industry 4.0 for more than one year is with only 15 percent still very low compared to other countries (Sarı et al., 2020). Further awareness for industrial enhancement are thus crucial for the advancement of Turkish firms.

Overall, it is relevant to mention that upgrading and technological capabilities at the regional level are not just based on firm-level knowledge or firms' internal capabilities, but rather a result of close interactions between firms, universities and policy (Lall, 1992; Padilla-Pérez et al., 2009). From a regional perspective, it is thus important to take local specifics of each context into account. Crescenzi & Rodríguez-Pose (2012)



point out, that there is no such thing as an ideal geography of innovation or RISs that can be used for any context. Instead of only adapting insights from industrialized or economically advanced market contexts to EEs, public policies thus need to identify measures for each given regional or local context individually (Crescenzi & Rodríguez-Pose, 2012). In this regard, my findings highlight once again the importance of place-based policies to consider the need of regions and their actors.

In terms of governmental support and public capital formation, the already advanced Western regions of Turkey might attract a majority of production factors, meaning that they draw potential investments away from economically less developed South Eastern parts, which leads to increasing inter-regional imbalances. Based on these negative spillover effects, public investments should increasingly be directed towards more peripheral and fewer developed South Eastern regions (Deliktas et al., 2009). Continuous efforts to further support the innovativeness of Turkish firms and regions is thus a highly important aspect to focus on. This is particularly true for the more Central and Eastern regions of Turkey that lag behind in their innovativeness as compared to the economic and knowledge centers in the Western provinces of Turkey. Varga & Baypinar (2016) provide similar suggestions after they applied a Geographical Macro and Regional modeling approach for regional development effects in Turkey. The authors urge the importance of a systematic and long-term economic policy approach that is based on technology development with measures such as investments in education and R&D support, as well as a better connectedness to European research networks (Varga & Baypinar, 2016).

Although Istanbul and the Marmara region has been the economic powerhouse of Turkey and has consequently been dominating the national economic growth for the past decades, newly developing Western Anatolian regions have increasingly become influential, accelerating the growth of high-tech regions through skilled labor force (Akgüngör, 2006; Gezici et al., 2017; Gönenç et al., 2012). Moreover, study results from the Chinese context also suggest, that developing or EEs might have a higher spatial diversity in knowledge access than previously thought. In that case, not only large centers provide access to global scientific networks or function as knowledge pools, but also more peripheral regions within respective national contexts are able to attain this function (Liefner & Hennemann, 2011).

Other studies focus on the factor productivity among Turkish manufacturing firms at province level (Karadag et al., 2005) and on effects of public capital formation on private sector performance on the regional level (Karadag et al., 2004). Both studies likewise find inequalities at the province and regional level, meaning that governments should implement development policies to reduce geographical disparities. Public investments should hence be diversified based on specific regional needs (Karadag et al., 2004). In

addition, substantial investments in transport infrastructure towards less developed regions in Turkey might also help to reduce regional disparities, as transport infrastructures play a major role in the economic development and the connection between regions (Önder et al., 2010). It is therefore highly interesting to observe, how other regions within Turkey will develop in the near future, particularly in the context of knowledge and technological capacities.

## **5.6 Research Recommendations**

To answer my research questions and thus write this thesis, I conducted a firm survey and semi-structured interviews with local R&D experts on innovation-related topics in the EE of Turkey. In this last section, based on my research experiences, I therefore provide some recommendations for future research on similar topics and for conducting firm-level studies in similar contexts.

Firstly, conducting firm surveys in an EE setting is mostly challenging and contingent on uncertain outcomes. Fortunately, I had tremendous support prior, during and after our survey in Istanbul, meaning that close interactions with our local collaboration partner Professor Ekrem Tatoğlu was a key success factor of this study in Turkey. This relates for instance to the understanding of the local or national setting in the first place, getting in contact with relevant interview partners or R&D experts, selecting the most relevant group of firms for the survey sample or receiving assistance with data collection and cleaning. Consequently, it is highly recommended to work closely with a reliable partner on-site when conducting firm-level studies in EEs.

Secondly, capturing information concerning three different types of firms was a very helpful approach to distinguish between firms' characteristics and innovation strategies. However, I only obtained homogenous information for the group of foreign MNEs. It would thus be interesting to gather a higher number of foreign firms and from different country settings, to gain more insights and be able to distinguish or compare between the countries of origin of foreign firms. In addition, it would be interesting to observe a group of firms that are not yet engaged in innovation or R&D-related activities.

Thirdly, the usage of single or same respondents of each firm during the survey might produce results that suffer from response bias or common method variance (Chang et al., 2010). These can exist if dependent and independent variables that came from the same source are simultaneously used for statistical analysis. In addition, surveyed firms or respondents might adopt their response behaviors according to the assumed underlying hypotheses or provide a desired public image. In future research, I would therefore suggest the use of different sources for dependent and independent variables or using procedural remedies such as varying scale types and mixing order of questions (Chang et al., 2010).

Fourthly, I mainly observed information of firms' self-assessment in terms of their performance measures such as economic success, innovativeness, usage of internal and external R&D resources or the successful adoption of domestic resources and support opportunities. In this regard, it would be desirable to use data, measurements or indices from third parties that are more objective. Moreover, the Likert-scaled variables in the survey should be substituted by metric measures in future questionnaire development, to allow for statistical analyses of more nuanced relations and patterns that might be overlooked by non-metric scales.

Fifthly, although I held pre-study interviews with various local R&D experts, it would be necessary to compare my quantitative findings with a more in-depth qualitative analysis of the RISs actors from academia and politics. This particularly applies to research questions concerning UICs and barriers therein, as I have only observed findings from a firm-level perspective. It would hereof be interesting to check whether scientific personnel experience the same barriers to UICs as firms do. Moreover, it would also be interesting to focus on the functionality and efficiency of the RISs in Istanbul itself, instead of only using it as a conceptual framework to capture its primary agents. In addition, it is not evident if there even is one single RIS in Istanbul or if many different systems co-exist within the city and surrounding Marmara region.

Lastly, it would be highly interesting to compare my results from Istanbul and the Marmara region with other provinces in Turkey that show similar or even higher levels of education and innovativeness. For instance, the Aegean or West Anatolian regions might be interesting contexts to conduct a similar research approach to make a Within-Turkey comparison. Furthermore, focusing on the economically peripheral regions within Turkey, such as the Central or Eastern parts, could provide valuable insights from rather different contexts. The same applies to conducting similar research in other EEs, to add more contextual insights and expand the empirical scope of the EEs research field.

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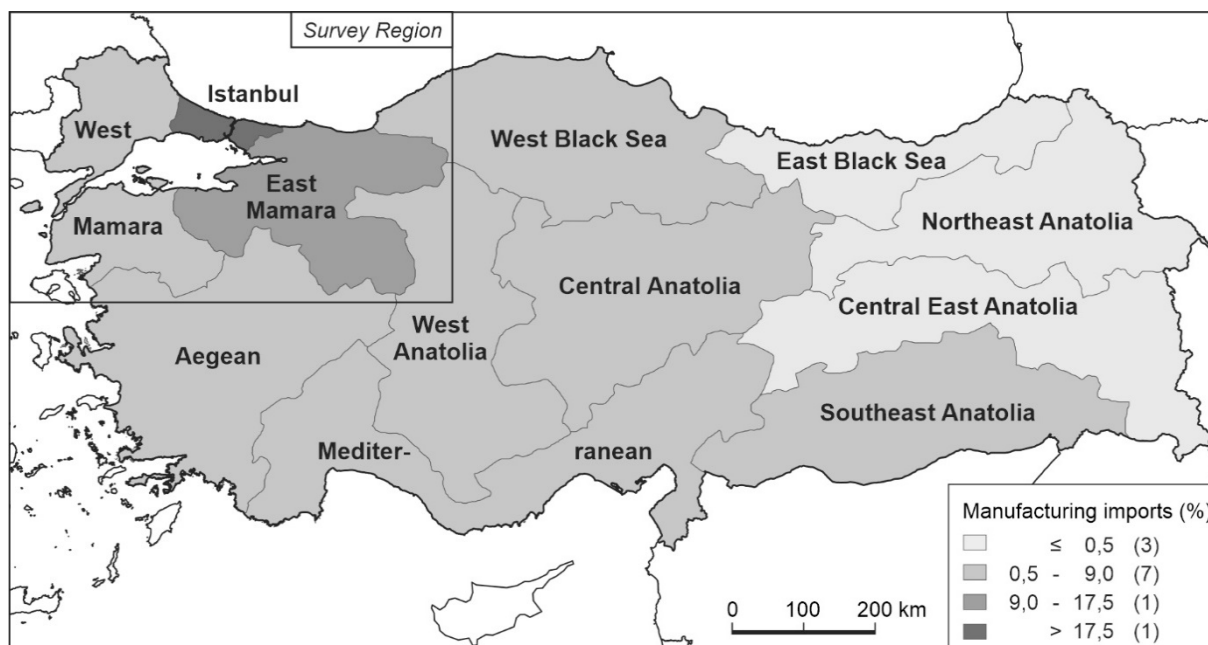
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# Appendix

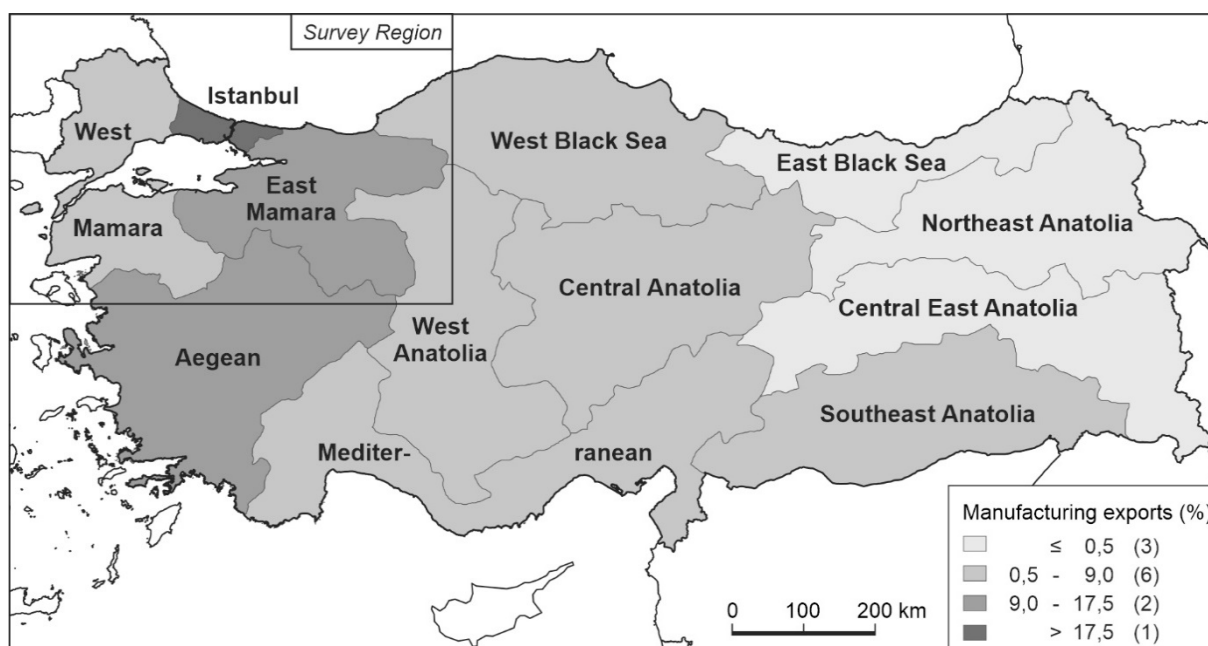
## Appendix – Chapter 1

**Figure A.1.1:** Manufacturing imports (1.000 USD) as percentage of total Turkey



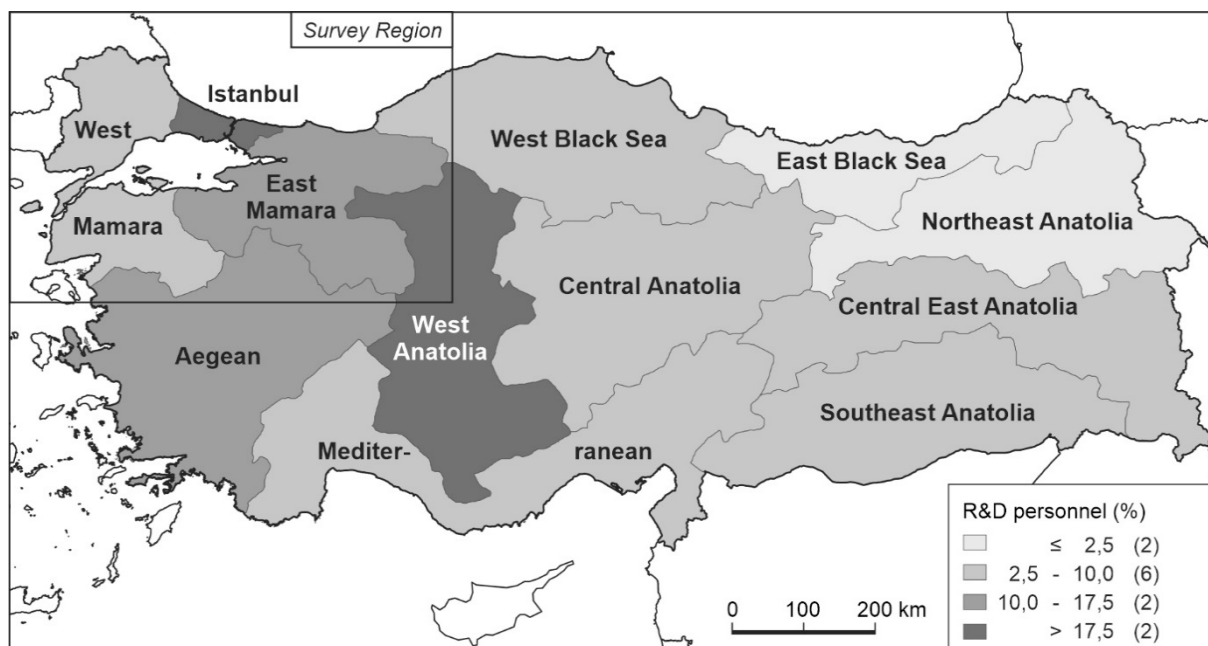
Source: (TUIK, 2020b); cartography by Stephan Pohl

**Figure A.1.2:** Manufacturing exports (1.000 USD) as percentage of total Turkey



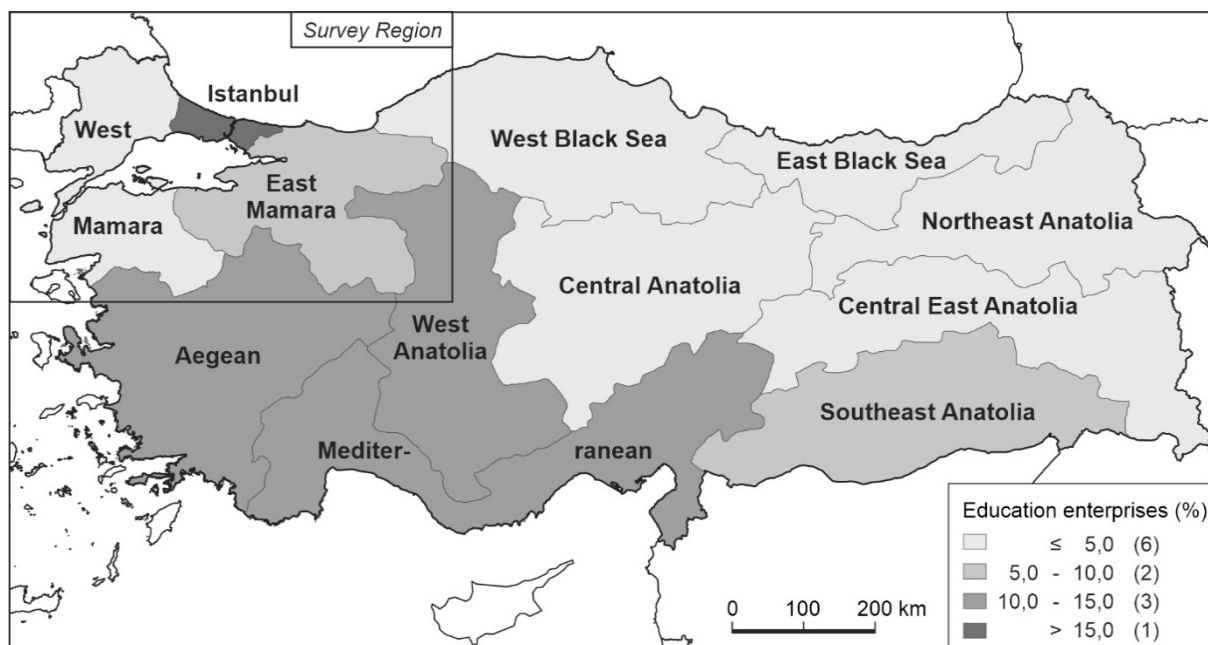
Source: (TUIK, 2020a); cartography by Stephan Pohl

**Figure A.1.3:** R&D personnel (total number) as percentage of total Turkey



Source: (TUIK, 2020f); cartography by Stephan Pohl

**Figure A.1.4:** Education enterprises (total number) as percentage of total Turkey



Source: (TUIK, 2020c); cartography by Stephan Pohl

## Appendix – Chapter 2

Table A.2.1: Descriptive figures of the variables

	Overall		AMNE		TMNE		DTF	
	n	%	n	%	n	%	n	%
<b>Control variables</b>								
<b>Company age (duration of operation)</b>								
< 5 years	21	9.4	3	6.0	4	6.6	14	12.4
5 - 10 years	35	15.6	8	16.0	8	13.1	19	16.8
11 - 20 years	47	21.0	11	22.0	7	11.5	29	25.7
21 - 40 years	66	29.5	10	20.0	19	31.1	37	32.7
> 40 years	55	24.6	18	36.0	23	37.7	14	12.4
<b>Company size (number of employees)</b>								
< 250	112	50.0	13	25.5	22	36.1	77	68.8
250 - 499	43	19.2	12	23.5	7	11.5	24	21.4
500 - 999	23	10.3	3	5.9	10	16.4	10	8.9
1000 - 1999	11	4.9	4	7.8	7	11.5	0	0.0
2000 - 5000	19	8.5	11	21.6	7	11.5	1	0.9
> 5000	16	7.1	8	15.7	8	13.1	0	0.0
<b>Industry class</b>								
Manufacturing	161	71.6	33	64.7	54	88.5	74	65.5
Information and communication	26	11.6	10	19.6	1	1.6	15	13.3
Manufacturing-supportive	17	7.6	3	5.9	4	6.6	10	8.8
Other	21	9.3	5	9.8	2	3.3	14	12.4
<b>Independent variables</b>								
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Serving neighboring markets	4.22	1.03	3.80	1.33	4.31	.99	4.35	.84
Serving advanced markets	3.89	1.28	3.33	1.57	4.05	1.16	4.06	1.13
Contact to collaboration partners and workforce	3.59	1.04	3.33	1.20	3.63	.89	3.69	1.03
Establishing political connections	2.76	1.36	2.96	1.31	2.63	1.29	2.73	1.42
Tax incentives	3.40	1.30	2.98	1.38	3.57	1.24	3.50	1.28
Investment and export incentives	3.45	1.18	3.12	1.22	3.67	1.14	3.47	1.19
<b>N</b>	<b>225</b>		<b>51</b>		<b>61</b>		<b>113</b>	

Notes:  $\bar{x}$  = arithmetic mean; SD = standard deviation

Source: own table

Table A.2.2: Binary logistic regression analyses

Variables	Model 1		Model 2		Model 3	
	AMNE vs. TMNE (AMNE = 1)	Wald statistic	AMNE vs. DTF (AMNE = 1)	Wald statistic	TMNE vs. DTF (TMNE = 1)	Wald statistic
	$\beta$ -Coefficient		$\beta$ -Coefficient		$\beta$ -Coefficient	
<b>Independent variables</b>						
Serving neighboring markets	-.108	.202	-.279	1.207	-.117	.186
Serving advanced markets	-.343 *	3.097	-.617 **	6.638	-.052	.061
Contact to collaboration partners and workforce	-.078	.083	-.787 ***	6.913	-.192	.687
Establishing political connections	.372 **	4.521	.419 *	3.414	-.159	1.067
Tax incentives	-.445 *	2.746	-.753 **	4.997	-.548 *	3.349
Investment and export incentives	.118	.134	.844 **	4.092	.728 **	4.235
<b>Control variables</b>						
Company Age (duration of operation)	-.152	.592	-.067	.092	.087	.269
Company Size (number of employees)	.233 *	3.154	1.430 ***	26.794	.962 ***	22.624
Intercept	1.615	1.733	1.046	.687	-1.567	1.433
<b>Reliability</b>						
Model chi-square	17.894 **		85.307 ***		52.117 ***	
Sensitivity	.574		.638		.492	
Specificity	.729		.927		.908	
Correct ratio	.660		.840		.762	
Proportional chance criterion	.504		.571		.545	
Hosmer & Lemeshow chi-square	2.352		1.947		10.807	
Cox & Snell r-square	.155		.421		.267	
Nagelkerke r-square	.208		.597		.367	
Effect size	.512		1.217		.761	

Notes: \*  $p < .10$ ; \*\*  $p < .05$ ; \*\*\*  $p < .01$

N = 225; AMNEs = 51; TMNEs = 61; DTFs = 113

Source: own table

## Appendix – Chapter 3

Table A.3.1: Descriptive figures of the control variables

Control variables	Total		DTFs		TMNEs		AMNEs	
	N	%	N	%	N	%	N	%
<b>Time spent conducting R&amp;D (in Istanbul)</b>								
< 5 years	39	17.7	24	21.4	7	11.9	8	16.3
5 - 10 years	57	25.9	29	25.9	17	28.8	11	22.4
11 - 20 years	54	24.5	30	26.8	9	15.3	15	30.6
21 - 40 years	45	20.5	21	18.8	14	23.7	10	20.4
> 40 years	25	11.4	8	7.1	12	20.3	5	10.2
<b>R&amp;D expenditure (of total sales)</b>								
< 20%	110	50.5	51	46.8	38	63.3	21	42.9
21 - 40%	48	22.0	26	23.9	10	16.7	12	24.5
41 - 60%	28	12.8	16	14.7	4	6.7	8	16.3
61 - 80%	12	5.5	2	1.8	6	10.0	4	8.2
> 80%	20	9.2	14	12.8	2	3.3	4	8.2
<b>R&amp;D-related personnel (of white collar)</b>								
< 20%	160	73.7	79	73.1	50	83.3	31	63.3
21 - 40%	34	15.7	15	13.9	8	13.3	11	22.4
41 - 60%	11	5.1	6	5.6	2	3.3	3	6.1
61 - 80%	6	2.8	5	4.6	0	0.0	1	2.0
> 80%	6	2.8	3	2.8	0	0.0	3	6.1
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
<b>R&amp;D contribution in Istanbul (corp. network)</b>	4.08	1.07	4.06	.96	4.08	1.15	4.10	1.20
<b>N</b>	<b>225</b>		<b>113</b>		<b>61</b>		<b>51</b>	

Notes:  $\bar{x}$  = arithmetic mean; SD = standard deviation

Source: own table

**Table A.3.2:** Descriptive figures of the dependent and independent variables

<b>Dependent variable</b>	<b>Total</b>		<b>DTFs</b>		<b>TMNEs</b>		<b>AMNEs</b>	
	$\bar{x}$	<b>SD</b>	$\bar{x}$	<b>SD</b>	$\bar{x}$	<b>SD</b>	$\bar{x}$	<b>SD</b>
Being successful in achieving innovation	4.02	0.89	3.89	0.96	4.15	0.79	4.16	0.78
<b>Independent variables</b>	$\bar{x}$	<b>SD</b>	$\bar{x}$	<b>SD</b>	$\bar{x}$	<b>SD</b>	$\bar{x}$	<b>SD</b>
Own R&D department	4.12	1.17	3.99	1.15	4.26	1.18	4.22	1.17
Training of own employees	4.14	0.89	3.96	0.93	4.16	0.93	4.50	0.58
Hiring of new employees	3.61	1.01	3.48	1.07	3.66	0.96	3.86	0.87
Own market research	3.98	0.97	3.92	0.96	3.95	0.99	4.16	0.98
Consulting from third companies	3.36	1.06	3.31	1.07	3.45	1.11	3.39	1.00
Acquisition of another company	2.46	1.36	2.20	1.37	2.52	1.32	2.96	1.23
Acquisition of technology or licensing	3.34	1.28	3.28	1.32	3.30	1.24	3.51	1.25
Learning from competitors	3.24	1.19	3.27	1.21	3.10	1.09	3.34	1.26
Collaboration with scientific partners	3.64	1.08	3.52	1.15	3.72	0.99	3.80	1.00
Suggestions from suppliers or customers	4.08	0.80	4.14	0.78	4.02	0.85	4.02	0.80
Experience from former improvements	4.31	0.81	4.36	0.78	4.25	0.75	4.26	0.94
Knowledge from corporate network	4.00	0.92	3.94	0.97	3.93	0.83	4.20	0.92
Exhibitions or trade fairs	4.02	0.94	4.08	0.93	4.18	0.77	3.71	1.10
<b><i>N</i></b>	<b>225</b>		<b>113</b>		<b>61</b>		<b>51</b>	

Notes:  $\bar{x}$  = arithmetic mean; SD = standard deviation

Source: own table

Table A.3.3: Correlation matrix (Spearman's r-square) of the variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Own R&D department	1.00																
2 Training of own employees	.53**	1.00															
3 Hiring of new employees	.41**	.43**	1.00														
4 Own market research	.32**	.45**	.40**	1.00													
5 Consulting from third companies	.18**	.32**	.32**	.35**	1.00												
6 Acquisition of another company	.16*	.21**	.30**	.32**	.40**	1.00											
7 Acquisition of technology / licensing	.15*	.25**	.30**	.39**	.43**	.48**	1.00										
8 Learning from competitors	.20**	.19**	.32**	.35**	.30**	.48**	.40**	1.00									
9 Collaboration with scientific partners	.34**	.38**	.36**	.30**	.37**	.33**	.41**	.43**	1.00								
10 Suggestions from suppliers / customers	.15*	.18**	.19**	.33**	.16*	.14*	.28**	.42**	.38**	1.00							
11 Experience from former improvements	.26**	.24**	.28**	.42**	.18**	.18**	.31**	.37**	.35**	.52**	1.00						
12 Knowledge from corporate network	.32**	.29**	.31**	.42**	.20**	.30**	.36**	.36**	.28**	.43**	.53**	1.00					
13 Exhibitions or trade fairs	.19**	0.11	.19**	.24**	.20**	.20**	.27**	.24**	.22**	.30**	.31**	.37**	1.00				
14 Time spent conducting R&D in Istanbul	.31**	.26**	.16*	.14*	.18**	0.13	0.08	0.07	0.11	0.09	0.05	0.12	0.08	1.00			
15 R&D expenditure (of total sales)	0.09	.16*	.20**	0.13	-0.05	0.08	.19**	0.08	.25**	.16*	.15*	.15*	-0.04	0.03	1.00		
16 R&D-related personnel (of white collar)	.25**	.19**	.31**	.19**	0.04	0.13	.15*	.16*	.22**	0.05	0.13	0.07	0.01	0.01	.40**	1.00	
17 R&D contribution in Istanbul (corp. network)	.42**	.22**	.19**	.13*	0.07	-0.03	0.04	0.07	.16*	0.07	0.08	0.06	0.04	.28**	0.05	.23**	1.00

Notes: \*  $p < .05$ ; \*\*  $p < .01$  (two-tailed test);  $N = 225$

Source: own table

Table A.3.4: Binary logistic regression analyses

Variables	MODEL 1	MODEL 2	MODEL 3
	Innovation success of DTFs <i>Exp</i> ( $\beta$ )	Innovation success of TMNEs <i>Exp</i> ( $\beta$ )	Innovation success of AMNEs <i>Exp</i> ( $\beta$ )
<b>Independent variables</b>			
Component 1: External resources I (technological knowledge)	.787	2.094	.592
Component 2: External resources II (market knowledge)	1.464	2.919 **	2.922 *
Component 3: Internal resources	3.244 ***	2.517 *	.935
<b>Control variables</b>			
Time spent conducting R&D (in Istanbul)	1.083	.419 *	.405
R&D expenditure (of total sales)	.918	.506 *	1.285
R&D-related personnel (of white collar)	3.741 *	1.209	1.768
R&D contribution in Istanbul (compared to corporate network)	.708	2.059 *	.801
<i>Intercept</i>	2.827	26.164	131.501 *
<b>Reliability measurements</b>			
Model chi-square	30.731 ***	14.212 **	11.749 *
Cox and Snell r-square	.265	.228	.239
Nagelkerke r-square	.384	.386	.431
Effect size (Nagelkerke r-square)	.790	.793	.870
Hosmer and Lemeshow chi-square	4.655	6.209	9.782

Notes: \*  $p < .10$ ; \*\*  $p < .05$ ; \*\*\*  $p < .01$

$N = 225$ ; DTFs = 113; EMNEs = 61; AMNEs = 51

Source: own table



## Appendix – Chapter 4

Table A.4.1. Overview of selected studies with different UICs topics

UICs topic	Studies
UICs interaction channels	Agrawal (2001), Bekkers & Bodas-Freitas (2008), D'Este & Patel (2007)
UICs and mutual trust formation	Hemmert et al. (2014), Kunttu & Neuvo (2019)
UICs determinants in R&D projects	Fontana et al. (2006)
UICs or R&D cooperation and competition	Bolli & Woerter (2013)
UICs in different technological fields and in technological proximity	Meyer-Krahmer & Schmoch (1998), Woerter (2012)
UICs in mature and emergent industries	Bodas-Freitas et al. (2013)
UICs and open innovation	Beyhan & Findik (2014), Howells et al. (2012), Laursen & Salter (2004), Perkmann & Walsh (2007), Temel et al. (2013)
UICs and firms' innovation performances	Hanel & St-Pierre (2006), Jeleč Raguž & Mehičić (2017), Kobarg et al. (2018), Maietta (2015), Un et al. (2010), Yu & Lee (2017)
UICs development over time	Thune & Gulbrandsen (2014)
UICs in EMs from the perspective of firms	De Fuentes & Dutrénit (2012), El Hadidi & Kirby (2017), Eom & Lee (2010), Findik & Beyhan (2015), Fu & Li (2016), Guerrero et al. (2019), Jeleč Raguž & Mehičić (2017), Smirnova (2016), Wong (1999)
UICs in EMs from the perspective of academics	Beyhan & Rickne (2015), El Hadidi & Kirby (2015), Garcia et al. (2019), Kaymaz & Eryiğit (2011), López-Martínez et al. (1994), Yalçıntaş et al. (2015)

Source: own table and compilation of selected UICs studies

**Table A.4.2:** Descriptive figures of the control variables

	<b>Total</b>		<b>DTFs</b>		<b>TMNEs</b>		<b>FMNEs</b>	
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
<b>Firm size (number of total employees)</b>								
< 250	112	50.0	77	68.8	22	36.1	13	25.5
250 - 499	43	19.2	24	21.4	7	11.5	12	23.5
500 - 999	23	10.3	10	8.9	10	16.4	3	5.9
1000 - 1999	11	4.9	0	0.0	7	11.5	4	7.8
2000 - 5000	19	8.5	1	0.9	7	11.5	11	21.6
> 5000	16	7.1	0	0.0	8	13.1	8	15.7
<b>Time spent conduction R&amp;D (in Istanbul)</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
< 5 years	39	17.7	24	21.4	7	11.9	8	16.3
5 - 10 years	57	25.9	29	25.9	17	28.8	11	22.4
11 - 20 years	54	24.5	30	26.8	9	15.3	15	30.6
21 - 40 years	45	20.5	21	18.8	14	23.7	10	20.4
> 40 years	25	11.4	8	7.1	12	20.3	5	10.2
<b>R&amp;D expenditure (of total sales)</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
< 20%	110	50.5	51	46.8	38	63.3	21	42.9
21 - 40%	48	22.0	26	23.9	10	16.7	12	24.5
41 - 60%	28	12.8	16	14.7	4	6.7	8	16.3
61 - 80%	12	5.5	2	1.8	6	10.0	4	8.2
> 80%	20	9.2	14	12.8	2	3.3	4	8.2
<b>N</b>	<b>225</b>		<b>113</b>		<b>61</b>		<b>51</b>	

Notes: DTF = Domestic Turkish Firm; TMNE = Turkish MNE; FMNE = Foreign MNE

Source: own table

**Table A.4.3:** Descriptive figures of the dependent and independent variables

<b>Dependent variable</b>	<b>Total</b>		<b>DTFs</b>		<b>TMNEs</b>		<b>FMNEs</b>	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Non-use of UICs for achieving innovation	2.37	1.09	2.48	1.15	2.33	1.04	2.20	1.00
<b>Independent variables</b>	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Low confidence in collabo. partners (IPR issues)	3.24	1.05	3.28	1.04	3.26	1.01	3.11	1.15
Insufficient knowledge about UIC opportunities	3.32	1.20	3.45	1.17	3.30	1.05	3.04	1.40
Perceived inadequately skilled collabo. partners	3.22	1.18	3.22	1.26	3.33	1.00	3.08	1.22
High bureaucracy or administration costs	3.31	1.25	3.41	1.30	3.33	1.05	3.04	1.34
Required time for decision-making or response	3.47	1.21	3.53	1.22	3.57	1.05	3.20	1.35
Insufficient fin. support or incentives for UICs	3.50	1.25	3.55	1.32	3.65	1.13	3.18	1.22
<i>N</i>	<b>225</b>		<b>113</b>		<b>61</b>		<b>51</b>	

Notes:  $\bar{x}$  = arithmetic mean; SD = standard deviation

DTF = Domestic Turkish Firm; TMNE = Turkish MNE; FMNE = Foreign MNE

Source: own table

**Table A.4.4:** Correlation matrix (Spearman's r-square) of the variables

Variables	1	2	3	4	5	6	7	8	9	10
1 Low confidence in collabo. partners (IPR issues)	1.00									
2 Insufficient knowledge about UIC opportunities	.39**	1.00								
3 Perceived inadequately skilled collaboration partners	.44**	.50**	1.00							
4 High bureaucracy or administration costs	.27**	.38**	.42**	1.00						
5 Required time for decision-making or response	.29**	.44**	.41**	.66**	1.00					
6 Insufficient financial support or incentives for UICs	.32**	.41**	.42**	.54**	.55**	1.00				
7 Firm size (total employees)	-.05	-.06	-.00	-.05	-.04	-.14*	1.00			
8 Time spent conducting R&D (in Istanbul)	.00	-.05	-.05	.07	.02	.00	.31**	1.00		
9 R&D expenditure (of total sales)	.05	-.05	.07	.05	.02	-.05	.03	.03	1.00	
10 Foreign MNE (dummy variable)	-.05	-.11	-.07	-.11	-.10	-.14*	.31**	.02	.08	1.00

Notes: \*  $p < .05$ ; \*\*  $p < .01$  (two-tailed test);  $N = 225$

Source: own table

## **Curriculum Vitae**

Timo Kleiner-Schäfer is a research associate at the Institute of Economic and Cultural Geography at the Leibniz Universität Hannover. He was born 1989 in Germany and received his higher education entrance qualification in 2009 from the Weidigschule Gymnasium Butzbach. He completed a bachelor's (B.Sc.) and master's (M.Sc.) degree in Geography from the Justus-Liebig-Universität Gießen and successfully graduated in 2014. During his master program, he received a scholarship from the Hessen-Wisconsin Exchange Program and spent a semester abroad at the University of Wisconsin-Milwaukee in 2013. He started his PhD at the Justus-Liebig-Universität Gießen in 2015 and followed his supervisor Prof. Dr. Ingo Liefner to the Leibniz Universität Hannover in 2016. During his PhD, he received funding from the German Academic Exchange Service for research stays in Turkey, where he visited Prof. Dr. Ekrem Tatoğlu at the Bahçeşehir Üniversitesi in Istanbul.