DETERMINANTS OF EARLY PERFORMANCE
OF NEW TECHNOLOGY-BASED FIRMS
SUPPORTED BY GOVERNMENT:
TURKISH CASE

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I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

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This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

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ABSTRACT

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OF NEW TECHNOLOGY-BASED FIRMS
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This master's thesis aims to analyze the determinants of the early-stage performance of New Technology-Based Firms (NTBFs) supported by the Turkish government and develop policy recommendations in order to enhance the current support mechanisms.

The main contribution of this study is that it is the first study to analyze the determinants of the early-stage performance of NTBFs supported by the government in the Turkish context.

For this reason, a specific government support program was chosen. 1512 Entrepreneurship Support Program was chosen for analysis since it contained more support mechanisms than other techno-entrepreneurship support programs in Turkey.

In order to analyze the determinants of the early-stage performance of NTBFs, data were collected from three sources: the TUBITAK Database, surveys and in-depth interviews. The data obtained were analyzed by means of both quantitative and

qualitative analysis methodologies. The data collected from the TUBITAK Database and surveys were analyzed quantitatively using Probit with Sample Selection Models. In terms of qualitative analysis, the data collected by means of in-depth interviews were used to verify the results of the quantitative analysis.

The analysis results show that level of education, full-time dedication, prior experiences and characteristic features of techno-entrepreneurs, the area of technology of the business idea and teamwork existence are the determinants of the early-stage performance of NTBFs. Age and gender of the techno-entrepreneur, firm strategy and external factors, such as business mentors, independent auditors and venture capitalists are found to have a lower impact on the performance of NTBFs.

Keywords: Techno-entrepreneurship, new technology-based firm (NTBF)

ÖZ

DEVLET DESTEĞİ İLE KURULAN
TEKNOLOJİ TABANLI YENİ FİRMALARIN
ERKEN PERFORMANSINI ETKİLEYEN FAKTÖRLER:
TÜRKİYE ÖRNEĞİ

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Bu yüksek lisans tezi, Türkiye'de devlet desteği ile kurulan teknoloji tabanlı yeni firmaların erken aşama performansını etkileyen faktörleri analiz etmeyi ve mevcut destek mekanizmalarını iyileştirme için politika önerileri geliştirmeyi amaçlamaktadır.

Bu çalışmanın literatüre temel katkısı Türkiye'de devlet desteği ile kurulan teknoloji tabanlı yeni firmaların erken performansını etkileyen faktörleri analiz eden ilk çalışma olmasıdır.

Bu sebeple, özel bir devlet destek programı analiz için seçilmiştir. 1512 Girişimcilik Destek Programı Türkiye'deki diğer devlet kaynaklı destek programlarından daha fazla destek mekanizması içerdiğinden bu analiz için seçilmiştir.

Teknoloji tabanlı yeni firmaların erken aşama performansını etkileyen faktörleri analiz edebilmek amacıyla üç farklı kaynaktan (TÜBİTAK Veritabanı, anketler ve yüzyüze mülakatlar) veri toplanmıştır. Toplanan veriler hem nicel hem de nitel analiz

yöntemleri ile analiz edilmiştir. TÜBİTAK Veritabanı ve anketler yoluyla toplanan veriler Probit ile Örneklem Seçimi yöntemi ile nicel olarak analiz edilmiştir. Derinlemesine mülakat yöntemi ile toplanan veriler ise nicel analiz sonuçlarını doğrulamak için nitel olarak analiz edilmiştir.

Analiz sonuçlarına göre, teknogirişimcinin eğitim düzeyi, tam zamanlı olarak teknoloji tabanlı yeni firmada çalışması, daha önceki deneyimleri ve karakteristik özellikleri ile iş fikrinin teknoloji alanı ve takım çalışması yapılması teknoloji tabanlı yeni firmaların erken performansını etkileyen faktörlerdir. Teknogirişimcinin yaşı ve cinsiyeti ile firma stratejisi ve iş rehberi, izleyici, risk sermayedarı gibi dış faktörlerin teknoloji tabanlı yeni firmaların erken performansı üzerinde etkileri daha azdır.

Anahtar Kelimeler: Tekno-girişimcilik, teknoloji tabanlı başlangıç firması

To my lovely son,

Efehan Turan

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LIST OF ABBREVIATIONS

EU: European Union

ICT: Information and Communication Technologies

KOSGEB: The Small and Medium Industry Development Organization

NTBF: New Technology-Based Firm

TEKMER: Incubation centers of NTBFs affiliated with the Small and Medium
Industry Development Organization

TEYDEB: The Directorate of the Technology and Innovation Grant Programs

TTO: Technology Transfer Offices

TUBITAK: The Scientific and Technological Research Council of Turkey

VCP: Venture Capital Performance

CHAPTER 1

INTRODUCTION

With the development of technology in the current era techno-entrepreneurship has gained increasing importance. The aim of techno-entrepreneurship is to implement the specificities of entrepreneurial activities in technology-intensive environments. The current popularity of techno-entrepreneurship derives from the fact that the risks inherent in techno-entrepreneurship are combined with the risk factors associated with entrepreneuring with the ones due to the highly uncertain nature of the development of technologies development. This "squared risk" is a real challenge for new high-tech ventures (Therin, 2007). Therefore, governments intervene in the market in order to reduce this risk.

The aim of the present study is to analyze the determinants of early performance of New Technology-Based Firms (NTBFs) supported by government in Turkey and develop policy recommendations in order to enhance the current support mechanisms. Thus, the research question of this study is "What are the determinants of the early-stage performance of NTBFs supported by the Turkish government?"

The main contribution of the study to the related literature is that it is the first study to analyze the determinants of the early-stage performance of NTBFs in the Turkish context. It is also the first study to analyze the determinants of the early-stage performance of the government-supported start-ups. Therefore, this study opens a new road to researchers to enlarge the discussion about the determinants of the early-stage performance of NTBFs supported by the Turkish government.

For this analysis, 1512-Entrepreneurship Support Program, which is a specific policy tool, was chosen due to its comprehensive context; it contains more support mechanisms than any other substitute support program. Detailed information about 1512- Entrepreneurship Support Program is presented in Chapter 3. 1512- Entrepreneurship Support Program is run by The Scientific and Technological

Research Council of Turkey (TUBITAK), which is the leading agency for management, funding and conduct of research in Turkey. TUBITAK was established in 1963 with a mission to advance science and technology, conduct research and support Turkish researchers. The Council is an autonomous institution and is governed by a Scientific Board whose members are selected from prominent scholars from universities, industry and research institutions. TUBITAK is responsible for promoting, developing, organizing, conducting and coordinating research and development in line with national targets and priorities.[1]

The main hypothesis of this study is that the current government support mechanism in Turkey for techno-entrepreneurship should be improved by taking into consideration the determinants of the early-stage performance of NTBFs.

The data used to analyze these determinants are collected via TUBITAK Database, surveys and in-depth interviews. The data available on TUBITAK Database were used after the required permission was obtained. However, TUBITAK Database was insufficient to analyze all of the potential determinants of the early-stage performance of NTBFs supported by the Turkish government since the content of the dataset is limited. Therefore, in order to analyze supported applicants in detail, a survey was sent to them via e-mail. The survey response rate was 40% since 95 out of 238 supported techno-entrepreneurs responded. In order to analyze the determinants of the early-stage performance of NTBFs, there was also a need for more detailed data regarding successful applicants. Hence, the techno-entrepreneurs on TUBITAK's Successful Entrepreneurs List were invited for in-depth interviews. The return rate of the in-depth interviews was 22% since 8 out of 36 successful techno-entrepreneurs participated in the in-depth interviews.

To analyze the data both quantitative and qualitative analysis methodologies were used in this study. As a quantitative analysis methodology, potential determinants of the early-stage performance of NTBFs were tested using Probit with Sample Selection

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[1] http://www.tubitak.gov.tr/en/about-us/content-who-we-are

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Models. The in-depth interview analysis methodology was also used for qualitative analysis.

The expected results of this study are listed below:

- The relationship between the educational level of the techno-entrepreneur and the early-stage performance of NTBF is positive.
- If there is no teamwork, the early-stage performance of NTBF will decrease.
- The relationship between time-dedication of the techno-entrepreneur to NTBF and the early-stage performance of NTBF is positive.
- The relationship between prior experiences of the techno-entrepreneur and the early-stage performance of NTBF is positive.
- The area of technology of the business idea will affect the early-stage performance of NTBF.
- Age and gender has no specific effect on the early--stage performance of NTBF.

After this introduction, the literature review on the determinants of the performance of new ventures are presented in the following chapter. The third chapter is dedicated to "Analysis". The data, analysis methodologies and the analysis results are explained in this chapter. Finally, policy recommendations about the techno-entrepreneurship context in Turkey and concluding remarks of the study are presented in the last chapter.

CHAPTER 2

LITERATURE REVIEW

In this chapter, first the conceptual framework of techno-entrepreneurship will be presented. After some definitions of techno-entrepreneurship are presented, examples of national-level entrepreneurship activities will be discussed. In the second part, the determinants of success mentioned in the literature are discussed. Prior to the discussion on these determinants, first the term "the success" is examined. After the presentation on what success is according to literature, the determinants of success in new ventures in general are considered. Then, the literature on the determinants of success for NTBFs in particular is reviewed. In the third part of this chapter, the impact analysis studies in the literature concerning government support given to techno-entrepreneurship is mentioned. Finally, the chapter ends with a summary of the literature review.

2.1. Conceptual Framework

Joseph Schumpeter (1883-1950) has cogitated an invaluable contribution to the literature of capitalism: "entrepreneurship". He highlighted the role of entrepreneurship as an innovator who is the most important unit of the economic system by increasing efficiency and productivity via new technologies and innovation. Schumpeter focused on creative destruction as a precondition for continued economic growth and development. Schumpeter defined "entrepreneurs as individuals who exploit market opportunity through technical and/or organizational innovation" (Schumpeter - 1965). Even though this original frame of entrepreneurs is still valid, by the exponential technological improvement, a new definition has been evolved in the literature: "technological entrepreneurship" or shortly "techno-entrepreneurship".[2]

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[2] There are several expressions focusing on the same or very close definition of technological entrepreneurship, such as, techno-entrepreneurship, techno-preneurship, technological entrepreneurship, science-based entrepreneurship or technology based start-ups, new technology

Technological entrepreneurship basically means the transformation of promising technologies into value. More specifically, technological entrepreneurship consists of a set of behaviors and actions that drive the market process and also a strategy which is based on identifying high-potential, technology-intensive commercial opportunities, gathering/assembling resource and managing rapid growth and significant risk with the final aim to exploit those opportunities for value creation (Petti, and Zhang – 2011).

Techno-entrepreneur is the one who organizes, manages and assumes the risk of a technology-based business enterprise. The relationship between technological innovation and techno-entrepreneurship is specified in Figure 2.1 (Bulsara et al. - 2010). Techno-innovation meaning new product development is only one property that techno-entrepreneurship should involve. There are seven more necessary properties for techno-entrepreneurship, such as feasibility analysis, resources, manufacturing, financial management, human resource management, networks and marketing. Therefore, every techno-innovator is not a techno-entrepreneur. Apart from new product (or service or process) development, there are many necessary properties that a techno-entrepreneur should have. These properties are explained in the following figure.

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based firms (NTBF) etc. Even though there may be nuances between those listed terms, in this study all terms are used as synonyms and the term "techno-entrepreneurship" is preferred more during this study.
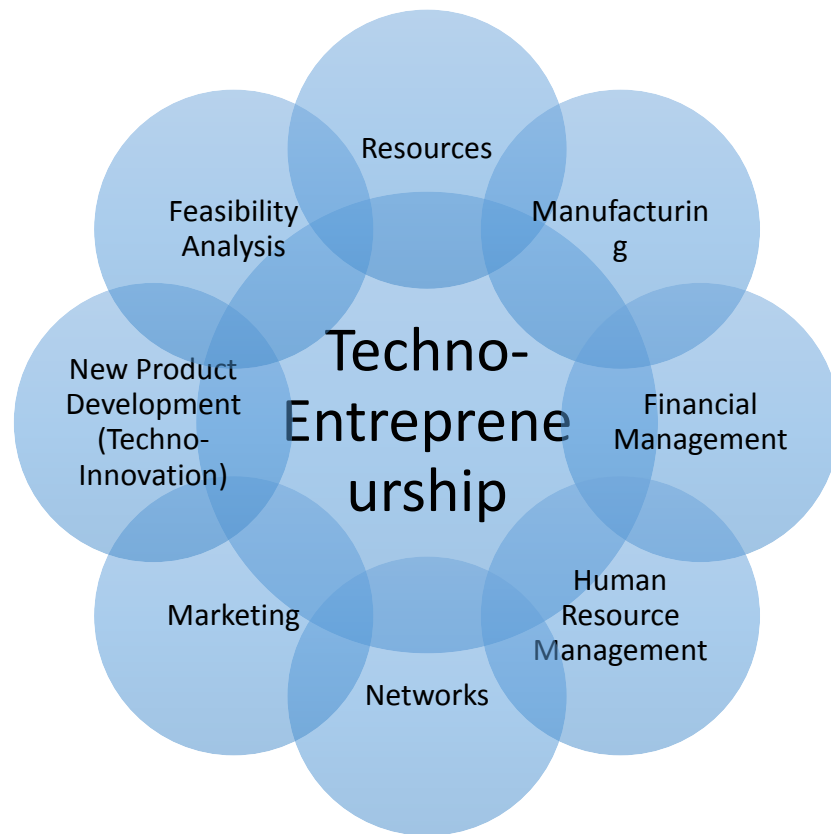
Figure 2.1. Relationship between Techno-Innovation and Techno-Entrepreneurship

Source: Bulsara et al., 2010

Ravesteijn, and Sjoer (2010) enlarged the techno-entrepreneurs' definitions by modeling three types of entrepreneurship. They defined the sustainable techno-innovator as "the techno-entrepreneurs of the future". Their models are summarized in Table 2.1. Models of Entrepreneurship. These three types of entrepreneurs are classic entrepreneur, techno-innovator and sustainable techno-innovator. Classic entrepreneur can be classified as Schumpeterian entrepreneur. Techno-innovator can be classified as current techno-entrepreneur. Sustainable techno-innovator can be classified as the techno-entrepreneur of the future. Ravesteijn, and Sjoer (2010) compare these three types of entrepreneurs according to their final goals, means, technology development, market orientation, market formation, social strategy and knowledge as listed in the first column.

Expectedly, all entrepreneur types have a final goal of profit. The difference between a classic entrepreneur and a techno-innovator in terms of final goal is employment and

continuity. The classic entrepreneur does not have a final goal of employment or continuity, while a techno-entrepreneur does. A techno-innovator does not suffice merely with the goal of profit. However, a techno-innovator does not care about people and the planet, while a sustainable techno-innovator has an ultimate goal of benefitting people and the planet beside profit for sustainable growth.

Although a classic entrepreneur and a techno-innovator use product as means to profit, a sustainable techno-innovator produces services. Ravesteijn, and Sjoer (2010) defines means of future for profit as service.

In terms of technology development, a sustainable techno-innovator differs from a classical entrepreneur and a techno-innovator. While a classical entrepreneur and a techno-innovator focus on increasing labor productivity to make higher profit, a sustainable techno-innovator focuses on increasing resource productivity since a techno-entrepreneur of the future cares about people and the planet for a sustainable growth.

Market orientation is also another difference among the three types of entrepreneurs defined by Ravesteijn, and Sjoer (2010). For a classical entrepreneur, market orientation is determined solely by technology push. However, for a techno-innovator it is determined by both technology push and market pull. A sustainable techno-innovator has a completely different perspective about market orientation. Market orientation for a techno-entrepreneur of the future is problem-solving.

A classic entrepreneur forms the market by marketing activities. However, a current techno-entrepreneur forms the market by scalable products. Diversely, a techno-entrepreneur of the future forms the market by creating niches.

As a social strategy, a classical entrepreneur uses himself as an individual, a while techno-innovator uses networking activities; and a sustainable techno-innovator builds a system. This shows an evolution from individual efforts to whole system.

The last difference between the three types of entrepreneurs is about knowledge. The knowledge of a classic entrepreneur originates from R&D activities. A techno-

innovator adds diffusion to R&D for knowledge creation. However, a sustainable techno-innovator focuses on knowledge management.

Table 2.1. Models of Entrepreneurship

	Classic entrepreneur (Schumpeterian entrepreneur)	Techno-innovator (Current techno-entrepreneur)	Sustainable techno-innovator (Techno-entrepreneur of the future)
Ultimate goal	Profit	Profit, employment, continuity	Profit, people, planet
Means	Product	Product	Service
Technology development	Increasing labor productivity	Increasing labor productivity	Increasing resource productivity
Market orientation	Technology push	Technology push and market pull	Problem-solving
Market formation	Marketing	Scalable product	Creation of niches
Social strategy	Individual	Networking	System-building
Knowledge	R&D	R&D, diffusion	Knowledge management

Source: Ravesteijn, and Sjoer (2010)

> *"Techno-entrepreneurship is a style of business leadership based on the process of identifying high-potential, technology-intensive business opportunities, gathering resources such as talent and cash, and managing rapid growth using principled, real-time decision-making skills. It can be based on either a revolutionary breakthrough in technology or an evolutionary advancement; and it can target an existing market or create an entirely new one. This entrepreneurial process is relevant for both independent start-ups and within established corporations."* (Hemphill – 2005).

Since economists have continued to gather academic research results to show that the national level of entrepreneurial activity is related to economic growth, Hemphill

(2005) defines the parameters of a national technology entrepreneurship policy in a network economy and then focuses on the US Government national technological entrepreneurship policy in his 2005 dated paper. Hemphill (2005) asks how important technology entrepreneurs are with respect to the health of the US, and to address this issue, he directly quotes from The National Academy of Engineering (1995): "The principal economic function of small entrepreneurial high-tech companies is to probe, explore, and sometimes develop the frontiers of the US economy – products, services, technologies, markets – in search of unrecognized or otherwise ignored opportunities for economic growth and development." Hemphill (2005) suggests developing a national technology entrepreneurship policy including specific policies and programs focusing on antitrust, intellectual property rights, and fair trade; R&D funding and tax incentives; and access to financing and seed capital for the US to endure the comparative advantage. Concisely, the national technology entrepreneurship policy approach would require a national government supportive of the commercialization of new product technologies, to keep the legal environment, regulatory framework, and financial assistance and tax incentives that are encouraging for a successful techno-entrepreneurship (Hemphill, 2005).

After mentioning the techno-entrepreneurship policy approach of the US, we can present the techno-entrepreneurship policy approaches of some selected countries. Firstly, examples from the European Union (EU) in general and examples from some specific EU countries are presented.

Storey and Tether (1998) have made a review of studies on NTBFs in the EU. As an introduction paper of the Special Issue on NTBFs in Europe, they summarize the role of NTBFs in the EU, the policy environment of NTBFs in the EU and the characteristics of European NTBFs and their founders. As a policy interest, European Commission commissioned a study to review the economic importance of NTBFs in Europe in 1994. As a survival measure, they use the employment data of NTBFs. They summarize the policy environment in EU and conclude that policy makers should recognize the restrictions on access to universities in general and PhDs in particular. The policy makers should also recognize that PhD degree holders may enter the private

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sector as a career path as well as research institutes. Furthermore, policy makers should enhance business skills to potential NTBF founders by providing courses etc.

In another article Storey and Tether presented in the year 1998, they provide a review of public policy environment for NTBFs in the EU. As policy areas they examine science parks, the supply of PhDs in science and technology, the relationship between NTBFs and universities/research institutions, direct financial support to NTBFs from national governments and the impact of technological advisory services on NTBFs. Although all of the key findings of Storey and Tether (1998) are very important, the most relevant part of the study is the section on direct financial support to NTBFs from national governments. They show the direct financial support policy to NTBFs in the EU in a table that is presented below in Table 2.2. In the left side of the table, the countries which give direct financial supports exclusively to NTBFs are shown. In the right side of the table, the countries which give support to all SMEs without any special treatment for NTBFs are presented.

Table 2.2. National government direct financial support policy to NTBFs

	Explicit focus exclusively on NTBFs					Support focusing on SMEs but where NTBFs are important			
	Yes/no	Current no. of schemes	Grant	Interest relief	Other	Current no. of schemes	Grant	Interest relief	Other
Austria	No					2	1		1
Belgium	No					0			
Denmark	No					0			
Finland	No					3	1	1	1
France	No					1		1	
Germany	Yes	1			1	3	1	1	1
Greece	No					2	1		1
Ireland	No					1	1	1	
Italy	No					2	1	1	1
Netherlands	No					2	1		1
Portugal	No					1			1
Spain	No					2	1	1	
Sweden	Yes	1		1		0			
United Kingdom	Yes	2	1	1		0			

Source: Storey and Tether (1998)

In Table 2.3., the support schemes and comments of Storey and Tether are summarized for the countries which give special support to NTBFs. According to these tables, Germany, Sweden and United Kingdom are the countries which explicitly focus exclusively on NTBFs. United Kingdom has two current supporting schemes specifically for NTBFs. One of them is a grant for NTBFs and the other one is interest

relief. Another country which provides interest relief specifically for NTBFs is Sweden. The other EU member state which focuses on NTBFs as exception from SMEs is Germany. The supporting schemes of Germany and Sweden will be explained in detail further on in the chapter.

Table 2.3. National government direct financing policies with an explicit and exclusive focus on NTBFs

National government direct financing policies with an explicit and exclusive focus on NTBFs

Country	Scheme name	Function	Instrument	Comment
Germany	BTU [Equity capital for small technology firms]	To provide an incentive for investors to provide additional support for the birth and development of NTBFs	Promotion of equity capital investments. Variants: guarantees — conducted by Kreditanstalt für Wiederaufbau; co-investment — conducted by Deutsche Ausgleichsbank	The scheme was piloted as BJTU and modified in 1995. Viewed as successful at generating 'additionality'
Sweden	Seed financing of product development in NTBFs (NUTEK)	Easy access to finance for NTBFs	Subsidised interest rates and access to funding	
UK	1. Small Firms Merit Award Scheme (SMART)	To overcome problems in early stage financing of NTBFs	Competition held. Winners receive awards to cover 75% of project costs in Year 1. Further awards possible	Good additionality. Highly regarded scheme
	2. Support for Products Under Research (SPUR)	To provide support for innovative projects at an early stage	30% flat rate support up to maximum of £250,000	Again good additionality

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Source: Storey and Tether (1998)

Delapierre and Savoy (1998) summarize the studies on NTBFs in France and combine the results of these studies. The study includes broad scanning of the statistical apparatus, survival rates analysis, public policy and its effectiveness on NTBFs in France. Although the official data is not collected specifically for NTBFs in France, they summarize the results from the limited studies focusing on NTBFs in France. As a summary, in these studies the most important key findings are as follows. The survival rates of NTBFs is higher than other start-ups. The faster growing firms have dense and convergent networks through which they interact with larger firms and research organizations. In France, instead of special policies for NTBFs, public policy focuses on SMEs in general by supporting their role in the creation of new employment.

Licht and Nerlinger (1998) study the German case of NTBFs. They provide a summary of the research on several issues, such as the incidence of start-up firms in Germany's technology-intensive sectors and their regional clustering. As their data collection methodology, Licht and Nerlinger (1998) choose the survey. The survey includes firm formation dynamics, the regional distribution (West and East Germany) and location characteristics of NTBFs, the participation of these firms in technology transfers, and their participation in public support systems. Licht and Nerlinger (1998) show that despite the number of formations in the late 1980s, the number of firm formations in the very-high-tech manufacturing sectors is not high enough. They also show that regional R&D endowments of research institutes are very influential in their field of specialization. The other important result of this study is that regional endowments of R&D facilities are also important for technology transfer. Although there are several public initiatives at several levels, such as Laender, the federal level, and EC level, SMEs are confused by the huge volume and complex support schemes, and they prefer not to benefit from these public initiatives. Correspondingly, Germany plans for a reduction and simplification in support schemes. The summary of the results is that NTBFs have a crucial role in the transfer, adoption and diffusion of technology.

As an example of NTBFs in small open economies, Autio and Yli-Renko (1998) study the Finnish case for NTBFs. They summarize that NTBFs in small open economies may fall into resource trap and consequently, might have less growth rates than NTBFs

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in countries having larger domestic markets. Therefore, they conclude that to measure the impact of NTBFs in small open economies, the employment that they create should be emphasized rather than their organic growth. For the design of industrial and innovation policy, Autio and Yli-Renko (1998) suggest developing supply side support measures instead of independent growth measures since instead of growing independently, NTBFs in Finland seem to grow as networked NTBFs. For small open economies like Finland, the authors recommend NTBFs to grow internationally and have closer networks with larger firms instead of growing domestically due to the small domestic markets contrary to NTBFs in large economies.

Henrekson, and Rosenberg (2001) aim to suggest a framework for identifying the strategic individual decisions involved in science-based entrepreneurship. By identifying these decisions, they are able to hypothesize what incentive structures should be crucial. They compare the Swedish and the US science-based entrepreneurship policy approaches and suggest that a science-based entrepreneurship policy should focus on strengthening individual incentives for human capital investment and entrepreneurial behavior both within universities and in business. After comparing science-based entrepreneurship policy approaches of Sweden and the US, Henrekson and Rosenberg (2001) conclude that even though Sweden devotes substantial resources to R&D and hosts several world-leading firms with a high R&D intensity, few new jobs have been created in new technology-based firms and there are few examples of science-based success stories. However, the US has commercialized more products than Sweden, and the authors studied the permanent incentive structures in the two countries for human capital investment, for becoming an entrepreneur, for expanding existing entrepreneurial ventures and for universities themselves. They have shown that the relevant incentive structures provide far less encouragement to science-based entrepreneurship and entrepreneurship behavior in Sweden than they do in the US (Henrekson, and Rosenberg – 2001).

The EU has adopted a main objective to support entrepreneurship as of March 2000; the European Council decided to develop the performance of the EU in areas of employment, economic reform and social cohesion. More recently, entrepreneurship promotion has been included in Europe 2020 Strategy. According to Europe 2020

Strategy, entrepreneurship is one of the main facilitators to grow in a smart, sustainable and inclusive way. Entrepreneurship has important economic benefits as being the driving force for job creation, competitiveness and growth. It also has important social benefits in contributing to personal fulfilment and the achievement of social objectives. These are the reasons why the EU encourages entrepreneurial initiatives and unlocks the growth potential of its businesses and citizens (Entrepreneurship in the EU and beyond, European Commission Report, 2012).

The "Entrepreneurship in the EU and beyond" report is based on a survey which covers data from 27 member states of the EU and Croatia, Island, Israel, Norway, Switzerland, Turkey, Brazil, Russia, the United States, China, India, Japan and South Korea in 2012. The summary of the important and relevant key findings of this report is presented below.

- While more than half of the EU respondents expressed their preference to work as an employee rather than being self-employed, non-EU respondents stated that they would prefer to be self-employed. Figure 2.2. shows the total number of respondents who answered the question "If you could choose between different kinds of jobs, would you prefer to be…?". One significant result in the report is that Turkey has the highest rate in preferring self-employment.

- Male and younger respondents are more likely to view self-employment as desirable. This is also an interesting and compatible result with the qualitative analysis results in this study.

- Compared to men, women have stated a lower level of preference to have either started a business or to have taken over one, or to be planning to start one. This is also a compatible result with the data distribution of this study since the application rate of women to the 1512 Entrepreneurship Support Program is lower than that of men. It is important to note that one of the criteria to be granted the financial support of 1512 Entrepreneurship Support Program is to start a business.

- While starting a business has never crossed the minds of a majority of EU respondents, the results of non-EU respondents have changed. Among 40 countries, Turkey has the least rate of respondents who say, "It has never

crossed my mind to start a business." Therefore, Turkey has the highest rate of being a country where starting a business is popular among all the respondents in the survey.

- Going bankrupt and the risk of irregular income are the most pronounced fears when starting up a business.

- Among EU respondents, the most pronounced difficulties perceived when starting up a business are the lack of available financial support, the complexities of the administrative process and difficulty to obtain sufficient information on how to start a business.

- When the respondents are asked, "What would you do if you inherited a large amount of money?", starting a business is the third most popular option among the EU respondents. However, the responses of the majority of respondents in Turkey to this question was found to be starting a business.

- Having taken a course or activity on entrepreneurship is more popular among young and male respondents.

- Responses regarding learning about entrepreneurship at school vary among countries. However, in Turkey, it can be concluded that schools have helped respondents to become an entrepreneur.

Country	An employee	Self-employed	None (DO NOT READ OUT)	Don't know (DO NOT READ OUT)
SE	74	22	2	2
FI	73	24	1	2
DK	66	28	1	5
SI	66	28	4	2
BE	65	30	3	2
DE	65	29	3	3
NL	64	31	3	2
AT	63	34	1	2
UK	63	33	2	2
ES	62	35	1	2
LU	61	36	1	2
SK	61	33	2	4
MT	61	34	2	3
IE	61	37	1	1
CZ	58	37	2	3
EU27	58	34	2	3
FR	57	40	2	1
HU	55	39	4	2
EE	54	35	5	6
PL	50	47	2	1
IT	49	44	3	4
PT	47	49	1	3
RO	47	48	3	2
CY	46	45	5	4
LV	45	49	3	3
EL	43	50	5	2
BG	40	49	5	6
LT	32	58	3	7
IS	46	44	2	8
HR	40	54	3	3
TR	15	82	2	1
NO	73	23	1	3
CH	58	39	1	2
IL	58	34	3	5
JP	56	23	20	1
RU	48	39	8	5
IN	47	47	5	1
US	46	51	1	2
KR	46	53	0	1
BR	33	63	3	1
CN	32	56	8	4

Figure 2.2. The number of respondents preferring to be an employee or to be self-employed in the survey of the "Entrepreneurship in the EU and beyond" Report

Source: "Entrepreneurship in the EU and beyond" European Commission Report, 2012

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After mentioning the techno-entrepreneurship policy approaches of the US and the European Union, we can move slowly from the West to the East. Chorev and Anderson (2006) have developed a model of the factors deemed critical for success in high-tech ventures in Israel and, in this paper they comprise the high-tech new venture environment in Israel. This model is presented in Figure 2.3. In this figure, Chorev and Anderson represent the model of the success of NTBF in Israel. According to this model, a business idea is realized successfully when the business keystones are realized successfully. These business keystones include core team expertise, core team commitment, strategy, customer relations, management, product development, complete solution, organization, funding, networking and marketing strategy. Apart from these internal keystones, there are also external environment factors, such as political situation, general environment and economical situation. Moreover, the most striking indicators of the significant role of the high-tech is international comparison of venture capital investment. Figure 2.4 also demonstrates that Israel has the highest rate of VC investments/GDP in the high-tech sector, 50% higher than the US, three times higher than the UK and considerably greater than Germany or Japan (Chorev, and Anderson – 2006). These figures represent the data between the years 1999 and 2002. Figure 2.5 represents more recent data regarding the international comparison of venture capital investment. The figure representing the 2012 data also serves similar results. Israel has the highest rate of VC investments/GDP. (OECD, 2013)
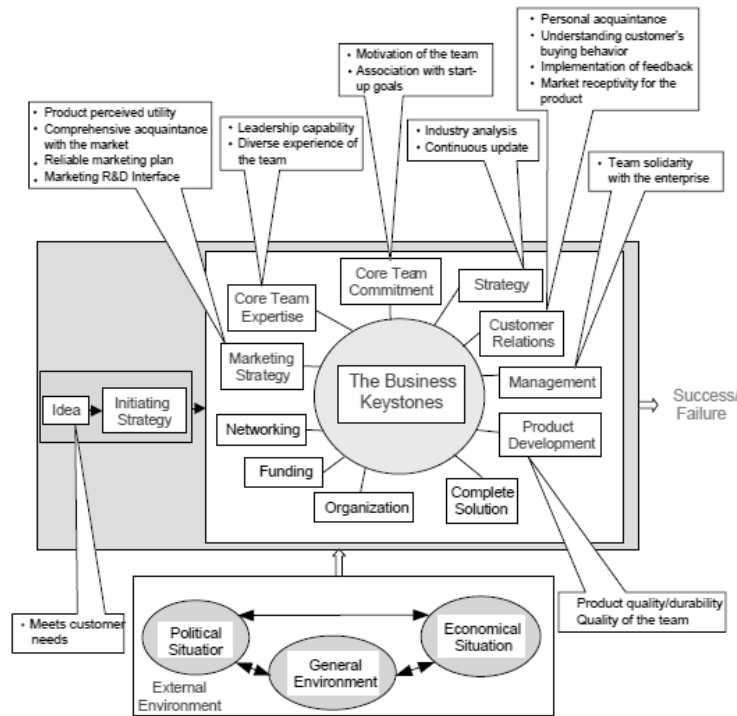
Figure 2.3. The final model of the success of high-tech new venture for Israel

Source: Chorev and Anderson (2006)
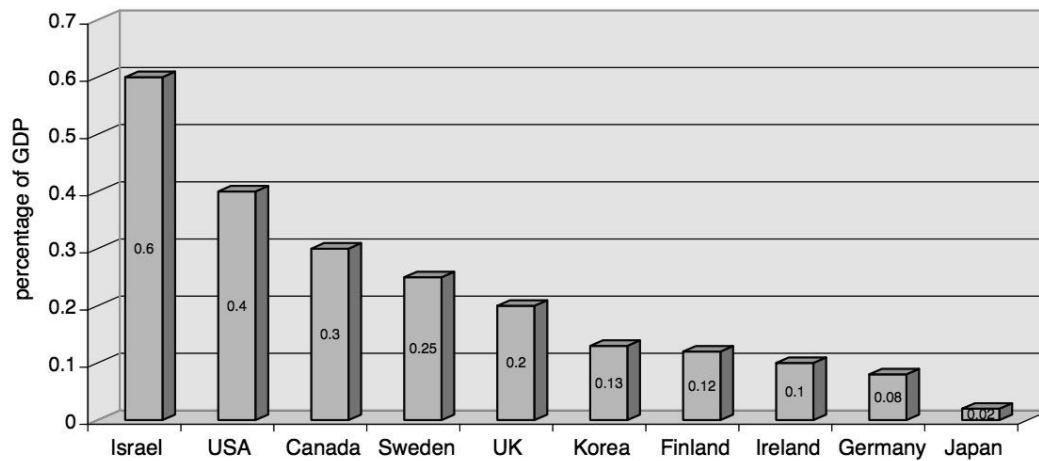
Figure 2.4. International Venture Capital Investment in High-tech as a Percentage of GDP, 1999-2002

Source: Chorev, and Anderson – 2006

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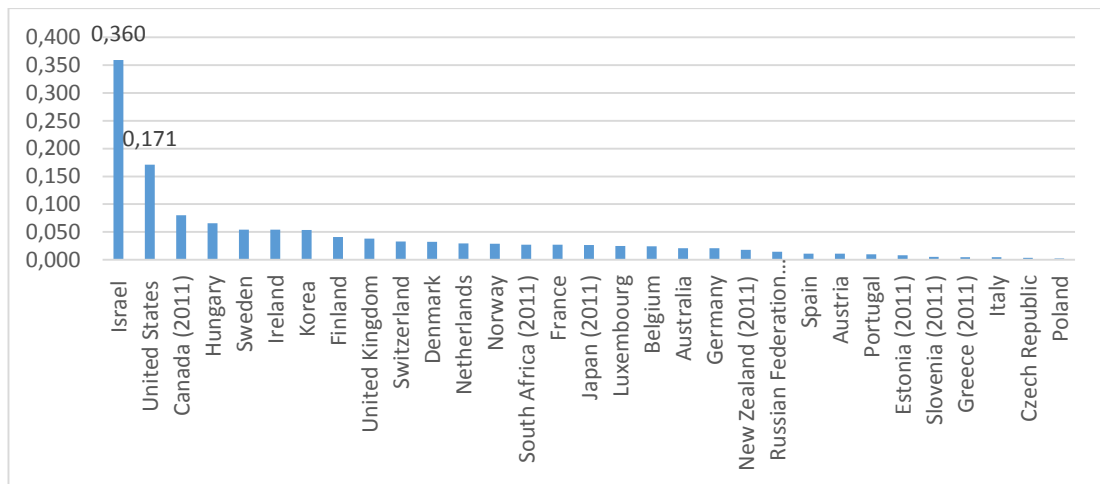
Figure 2.5. Venture Capital Investments as a Percentage of GDP (US Dollars Current Prices), 2012

Source: Entrepreneurship at a Glance 2013 - OECD 2013

When we move to more eastern regions, we can look into Petti and Zhang (2011) to gain insight into the Chinese techno-entrepreneurship context. Figure 2.6 represents the system for technological entrepreneurship in China. Government institutions in China have two main roles in the system for technological entrepreneurship. The first role of the Chinese government institutions is being public investors to Chinese enterprises. Chinese enterprises have science-industry linkages between government research institutions and higher education institutions. These government institutions constitute the second role of the Chinese government in the system. This is the core of the technological entrepreneurship environment in China. There are also some external players in the ecosystem, such as transnational communities, other organizations, private investors and foreign enterprises. The explanations, roles or policy tools are explained briefly in the figure. In China, the system differs from that in the US and the EU mainly with respect to the role of some of the players involved that influences the system's dynamics, specifically the stronger role of governmental research institutions, the so-called transnational communities and foreign enterprises in innovation and entrepreneurship activities. Those differences in roles also affect the way technological entrepreneurship works (Petti, and Zhang – 2011).

The system for technological entrepreneurship in China

Transnational Communities

New Enterprises, Scientific Publications, Patents/Licences, Attraction of FDI, Development of Research Labs and Institutes, Research and Managerial Knowledge, Networking

(From 1978 to 2005 770,000 Chinese studied abroad and 180,000 have returned)

Governmental Institutions

(ex. NSGSTE, NDRC, MoST, MoE, MoF, MIIT Local Gov.)

Policies & Regulations
(ex. SciTech Plans, S&T / IPR Laws)
S&T Programs, Funds & Incentives
(ex. 863 Program, Innofund, procurement, taxes exemptions)
SOE address

Other Organizations
(Ex. C.A.S.T., C.A.M.O.T. International Standard Bodies such the ITU)

Standards, Frameworks, Benchmarks...

Science – Industry Linkages

Technology Transfer Offices
Public Programs (ex. Torch Program / HDTZ)
Intermediaries (ex. the Technology Market)
Personnel Mobility
Cooperation (Co-publication, R&D Collaboration, Joint Labs, Co-patenting/Licensing)
Interflow of tech talents

Government Research Institutes
(ex. CAS, CASS, NSFC, State Labs, DRC, CAE)

R&D: mainly Basic , Strategic & Applied Research
(Natural Science, Public Goods, Hi-Tech)
Technology Diffusion & Commercialization
(through SETRCs)

Higher Education Institutions
(ex. Tsinghua, Beida, Ministries Un, Private Un.,)

Qualified human S&T Human Resources
(Ex. Engineers, PhDs...)
R&D: mainly Applied & Engineering Research
(through personnel & Key Labs)
Technology Diffusion & Commercialization
(through Outsourcing from companies and joint participation to S&T programs; Spinoffs)
Local Development (6075 firms incubated and 110.200 entrepreneurs at work)

Public Investors
(Ex. "Innofund")

Private Investors
(Ex. Shenzen Capital Group, Innovation Works / DG C.P.)

Financial Capital & Expertise

Chinese Enterprises
(SoEs, Private)

Largest performers of R&D: mainly experimental development but not only
(for example Lenovo and Huawei)
Market-oriented innovation
(devise business models to exploit technological opportunities in the Chinese market)
Financial Resources
(most of enterprise self-fund)
Qualified human resources
(for example Lenovo Star)

Foreign Enterprises
(Ex. Intel, Microsoft, IBM, Siemens)

Technologies and managerial knowledge providers
(through exports, licences and set up of R&D labs and cooperative ventures)

Figure 2.6. The System for Technological Entrepreneurship in China

Source: Petti and Zhang (2011)

2.2. Influencing Factors of Success

Several academic research studies have been carried out, analyzing the factors which influence the success or failure of new ventures. The first subtitle in this chapter is the question of 'What is success?' This subsection dwells on how success is defined and measured in the literature. Then in the same section, explanations about the reasons why some parameters are suitable for this study, while others are not are also presented. In the next part, the literature review of studies about the importance of several influencing factors of success is given. The last part of this subtitle focuses especially on the influencing factors of success in technology-based start-ups.

2.2.1. What is Success?

Success can be defined literally as an achievement of an action within a specified period of time or within a specified parameter. Success can also mean completing an objective or reaching a goal. Success can be expanded to encompass an entire project or be restricted to a single component of a project or task. It can be achieved within the workplace, or in an individual's personal life. [3]

However, in this study, success indicates the measure of the new venture's performance. In the literature there are plenty of success measures to measure the new ventures' performance. Some of them are summarized in this part. It is also indicated in this section whether or not these measures are suitable to measure the success status especially for 1512 Entrepreneurship Support Program. If not, the reasons are also explained in the same section.

As a success measurement, researchers mostly prefer to use some financial measurements, such as growth, profit, return rate of assets, sales, market share, marketing costs, production costs, general and administrative costs, and return on investment. While analyzing the 1512 Entrepreneurship Support Program, it is impossible to use these financial measurements as indicators of performance except from sales due to the fact that the firms in the target group of this analysis are separated into two groups according to their ages. The elder group includes 2-year-old firms,

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[3] http://www.businessdictionary.com/definition/success.html#ixzz3oNDjXPwd

while the younger group includes 1.5-year-old firms. It is too early to regard these financial measurements as success indicators. If they were to regarded as success indicators, very limited number of firms could be classified as successful, and all other firms would be classified as unsuccessful. Nonetheless, it is impossible to use those variables to measure the performance of the graduates of the 1512 Entrepreneurship Support Program.

Foster (2015) defines growth as an expansion in the firm size over a given period of time. She argues the questions of how growth should be measured and what an appropriate time frame for measuring growth is. Foster (2015) concludes that although which indicators should be used to measure growth in small business is a challenging question, in literature, the changes in sales, assets, employment, market share and profits are the most commonly used indicators. Foster (2015) also states that if the examination time is too short, it may not allow growth to occur, or if the examination time is too long, it may be impossible to analyze the determinants that indicate growth. In literature, while some recommend that these firms should be studied for a 3-year period, others state that a 3-year period is too short to analyze innovative small firms. In this study, the time period is 2.5 years for 112 sample points and 2 years for 126 sample points. Therefore, changes in assets, employment, market shares and profits are impossible to be used as indicators of success.

In the literature, some non-numeric success measurements are also used, such as surviving at least 4 years, surviving at least 8 years, overall life span, and venture creation. As it is indicated in the previous paragraph, as the target group of this study is younger than 3 years, it is impossible to use surviving years. It is also too early to wind up an equity company in two years. Required by the legislation of the 1512 Entrepreneurship Support Program, it is an obligation to start an equity company in order to get supported. Therefore, this requirement directly eliminates the possibility of the usage of some measurements, such as venture creation, and indirectly eliminate the possibility of the usage of some measurements, such as surviving at least 4 years, surviving at least 8 years and overall life span.

Although the literature serves numerous possible performance indicators, the only indicator can be used in analyzing the 1512 Entrepreneurship Support Program is sales.

Since graduates of the 1512 Program are active in very different industries, in this study success is measured by whether the techno-entrepreneur makes his business idea commercialized or not.

2.2.2. Influencing Factors of Success in New Ventures

There are plentiful influencing factors listed for the success in new ventures. Numerous academic studies emphasize the importance of personal characteristics of the founder in the success of a new venture, such as Herron and Robinson (1993), Jo and Lee (1996), Gatewood et al. (1995), Begley and Boyd (1987) and Ciaverella et al. (2004).

Herron and Robinson (1993) aimed to investigate the influence of the entrepreneur on the new venture performance. Firstly, they introduced the basic theoretical models focusing on the relationship between personal characteristics of the entrepreneur and the performance of the new venture. Then, they derived a structural, causal model of the relationships between entrepreneurial characteristics and performance with the help of current psychological, management, economic, and entrepreneurship policy. Then, they further derived a psychology-based model that is more comprehensive and realistic than prior models in the entrepreneurship literature. The enhanced Hollenbeck-Whittener Model specified in Figure 2.7 is one of the basic models listed in their paper. Figures 2.8, 2.9 and 2.10 present Sandberg's basic New Venture Performance Model, the Preliminary Venture Capital Performance Model, and the Enhanced Venture Capital Performance Model, respectively. In the Simple Hollenbeck – Whitener Model, the effects of personality traits on job performance are mediated by motivation and moderated by ability. This model is not shown in the figure. In the Enhanced Hollenbeck – Whitener Model, job performance is the evaluation of a set of behaviors. Ability and personal traits are determinants of behavior and indirectly of job performance because in this model, behavior is viewed as a casual determinant of performance. This model is shown in Figure 2.7. In Sandberg's Model, the determinants of new venture performance are the characteristics of the entrepreneur, the structure of the industry in which the venture competes, and its business strategy. This model is shown in Figure 2.8. Combining the Enhanced Hollenbeck – Whitener Model and Sandberg's Model, a more sophisticated

model of venture capital performance (VCP) is created: the Preliminary VCP Model. This model is shown in Figure 2.9. After this preliminary VCP model, the Enhanced VCP model is developed by the following propositions. Firstly, aptitude and training shape the skills of an entrepreneur. Then, personality traits and skills shape motivation. Motivation affects entrepreneurial behavior. Then, organizational strategy and the external environment structure affect behavioral context which is a determinant of VCP. Then VCP affects the motivation of the entrepreneur. This relationship circle is explained in Figure 2.10. The analysis in this study is closest to the Enhanced VCP Model since training, skills, personal traits, firm strategy and external environmental structure are analyzed as potential determinants of the early-stage performance of NTBFs supported by the government.
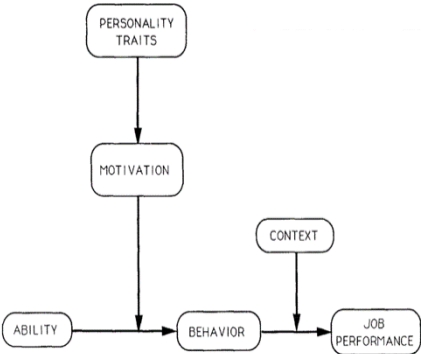
Figure 2.7. Enhanced Hollenbeck – Whitener Model

Source: Herron, and Robinson (1993)
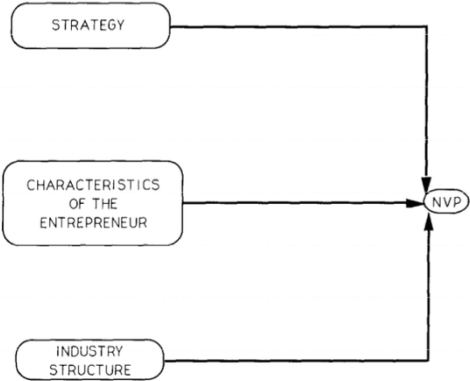
Figure 2.8. Sandberg's basic NVP Model

Source: Herron, and Robinson (1993)
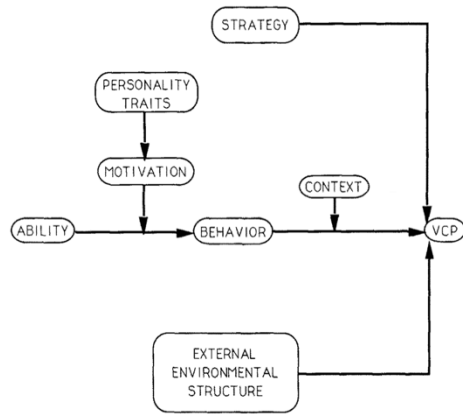
Figure 2.9. Preliminary VCP Model

Source: Herron, and Robinson (1993)
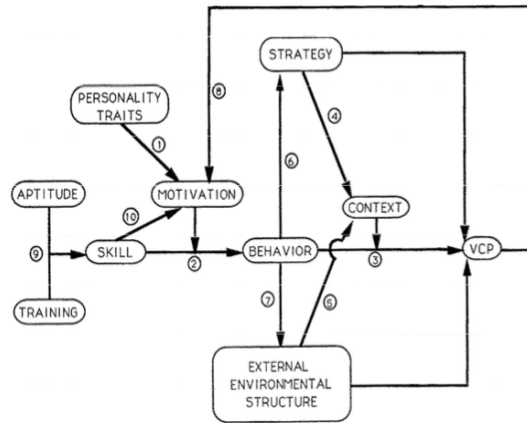
Figure 2.10. Enhanced VCP Model

Source: Herron, and Robinson (1993)

Jo and Lee (1996) assessed how an entrepreneur's background relates to the performance of a new venture during the early stages. They collected data from 48 new start-up firms in Korea. They chose both profit and growth as dependent variables in order to measure the performance. When they took profit as the dependent variable, the results showed that the relative profit tended to be higher when an entrepreneur had a higher level of education and experience. When they took growth as the dependent variable, the results were similar; if the entrepreneur had start-up, managerial and high-growth experience but lacked knowledge of business, the growth was lower. Apart from its tremendous results, this study is also important due to its sample chosen from Korea, which is a developing country like Turkey. The authors state that the ventures in developing countries include two kinds of firms: technically progressive ventures (like developed countries) and import substitution ventures. Because of this feature, the ventures in developing countries are diverse in their characteristics.

Gatewood et al. (1995) aimed to explore whether certain cognitive factors of potential entrepreneurs could be used to predict their subsequent persistence in business start-up activities and in new venture creation success. This article focused on the success of creating a new venture, but the influencing factors are also representative of success in new ventures. After the target group created a new venture, they were asked "Have you completed the first sale?" The answer of that question constitute the success measurement of the second part of their analysis. One of the important points of this research is the performance measurement of the second analysis. We also used the sales question to measure the performance.

Another academic study examining the prevalence of psychological attributes in a sample of established entrepreneurs is reported in a paper by Begley and Boyd (1987). Begley and Boyd (1987) found out that five psychological attributes were widely regarded as hallmarks of the entrepreneurial personality. These attributes are need for achievement, locus of control, risk-taking propensity, tolerance of ambiguity, and Type A behavior.[4] As financial performance indicators, they preferred to use growth,

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[4] "Type A behavior is an action-emotion complex that can be observed who is aggressively involved in a chronic, incessant struggle to achieve more and morel in less and less time, and if required to do so, against the opposing efforts of other things or other persons" (Friedman and Rosenman (1974)).

return on assets and liquidity. The contribution of this paper is that it isolated psychological dimensions which might differentiate successful from less successful entrepreneurs. In order to isolate these dimensions, they investigated whether these characteristics were identical to those which distinguish entrepreneurs from managers. As a control group, non-founder managers in small enterprises were preferred. The results of this study indicated that founders scored higher than non-founders in need for achievement, risk-taking propensity, and tolerance of ambiguity. The results also indicated that there were few connections between psychological attributes and corporate performance. For further studies, the authors suggest not generalizing all results influencing success in new ventures due to the fact that the characteristics someone has as a founder may not always lead her to the success in new ventures if she is a non-founder manager in small ventures.

Ciaverella et al. (2004) investigated the relationship between an entrepreneur's personality and long-term venture survival. They measured survival in two ways: the likelihood the venture will survive for at least 8 years and the overall life span of the venture. As independent variables, they choose the 'Big Five' personality attributes: extraversion, emotional stability, agreeableness, conscientiousness, and openness to experience. Their data collection methodology involved surveying graduates of a large university about their work histories. Their results indicated that the entrepreneurs' conscientiousness was positively related to long-term venture survival especially beyond the adolescence stage. Interestingly, their results also indicated that there is a negative relationship between entrepreneurs' openness and long-term venture survival. Moreover, there is no relationship between emotional stability and agreeableness and long-term venture survival.

In contrast to the researchers attaching importance to personality characteristics of founders on new ventures' success, there are several researchers claiming that personality characteristics are not powerful enough to explain the performance of new ventures.

To illustrate these researchers, Sandberg and Hofer (1988), argue that the influence of industry structure and strategy of the venture is higher than the influence of the personal characteristics and human capital of entrepreneurship. They reject the

traditional academic model of new venture performance, which argues that success is based solely on the characteristics of the entrepreneur and support instead the broader model which argues that success depends not only on the characteristics of the entrepreneur, but also on the structure of the industry entered and the strategy of the venture involved. Their results indicated that the interactive effects of industry structure, strategy, and the entrepreneur has more influence on the performance of new venture than any of the variables in isolation. Even industry structure is more important than either strategy or the characteristics of the entrepreneur.

Another research which argues that other influencing factors apart from the personal characteristics should be regarded while testing the new ventures performance is Gartner et al. (1999). Their research question was 'Can the survival of a new venture be predicted?' They investigated the influence of individual characteristics, entrepreneurial behavior, strategy and environment to test the performance of new venture. They selected these four influencing factors by requesting the predictions of the reporters and experts in Inc. Magazine. The respondents pointed out 85 influencing parameters and Gartner et al. (1999) classify them into four categories listed above. The measure of a new venture survival for this study was the venture's ability to survive at least 4 years. Their results indicated that individual characteristics are not stable predictors of venture success; very few of the entrepreneurial behavior measures are significant predictors; however, two strategic variables and one environmental variable are significant predictors of new venture survival.

Duchesneau and Garner (1990) also argue that the influencing factors apart from personal characteristics are significant in a new venture's performance. They classify three types of factors: the characteristics of the lead entrepreneur, start-up processes undertaken during the founding of the firm and firm behaviors after start-up, including management practices and strategic behaviors. They chose 26 small, young firms as samples: 13 successful, 13 unsuccessful firms. To measure the success, they checked the financial performance indicators. Their results indicated that entrepreneurs in successful firms are more likely to have broad business and prior start-up experience, entrepreneurial parents, a high but moderated self-reliance, risk reducing behaviors, long working hours, extensive communication efforts and ability, and a personal investment in the firm. Moreover, in successful firms, entrepreneurs have a clear,

broad business idea that provided organizational will and confrontation. Additionally, successful firms are more flexible, participative, and adaptive organizations and their sales are more than those of unsuccessful firms.

Apart from personal characteristics, industry structure and firm behavior/strategy, it would be beneficial to explain the other factors encountered in the literature of the influencing factors of new ventures performance.

Although Duchesneau and Garner (1990) focus on the influence of the entrepreneur's personality on new ventures performance, they also show that lead entrepreneurs in successful firms are more likely to have been raised by entrepreneurial parents.

In contrast to Duchesneau and Gartner (1990), Ciaverella et al. (2004) indicate that personality factors are more predictive of venture survival than industry, start-up experience, or the age and gender of the entrepreneur.

Sexton and Upton (1990) focus on the roles of female and male entrepreneurs in terms of psychological characteristics and their role in gender-related discrimination. According to their results, although females scored significantly lower on energy level and risk taking, they scored significantly higher on the scale's autonomy and change and reported a higher need for independence and a stronger desire for new and different experiences. The scores of the females and males in the other indicators were similar. Therefore, the authors concluded that gender had no effect on the new ventures' performance due to the fact that females have similar traits with males despite their few strengths and weaknesses.

2.2.3. Influencing Factors of Success in New Technology-Based Firms

Kakati (2003) declares that the influencing factors of success in high-tech new ventures should be different from the influencing factors of success in low-tech new ventures. Kakati (2003) gives reference to Kakati (1999) who studied low-tech ventures and states that customization strategy is the least effective strategy in low-tech ventures in contrast to high-tech ventures. He explains this result with the intuitive observation that relative to low-tech ventures, high-tech ventures can charge higher price premium for their unique and customized offerings and therefore, price is no longer an important purchase criterion. However, in low-tech ventures, customers are

familiar with the products and bargaining power is lower than it is in high-tech ventures. Hence, this section is designated to an exact focus on the literature of influencing factors of success in new technology based firms. Rather than exact conceptual division of the literature in the previous section, it is preferred to continue both conceptually and chronologically in order to show the evolutionary change in the literature. The most important evolutionary change in the literature is that rather than focusing solely on the atomistic entrepreneur, the research includes more comprehensive and inclusionary, both internal and external factors, such as the strategy of the start-up, marketing etc.

According to chronological order, the initial studies in the literature have previously been explained. Stuart and Abetti (1987) aimed to establish a theoretical and empirical framework to determine the success potential of a new high-tech venture and the most effective entrepreneurial and managerial techniques to realize this potential. In the first stage of their study they ran a pre-pilot study on 15 small start-ups. Since all the firms are in the incubation center and are less than 3 years old, they did not choose to measure the business performance by sales, profits, return on equity, market shares, etc. After they realized that the first study is not sufficient, they focused on the firms which are older than the ones in their first study. They revealed a very comprehensive theoretical model to explain the relationship. Their results indicated that the characteristics of the entrepreneurs or the entrepreneurial team were positively correlated with the performance and that compatibility was important for success. However, Stuart and Abetti (1987) phenomenally indicated that organizational environment, market factors and R&D intensity are negatively correlated with success. Although the findings of Stuart and Abetti (1987) as regards the characteristics of entrepreneurs or an entrepreneurial team are consistent with the basis of this study, the other findings regarding external factors are in conflict with the basis of this study.

In Stuart and Abetti's (1990) study, they again focused on the success of technological ventures. Stuart and Abetti (1990) found a negative relation between educational level of the entrepreneur and new ventures performance. They indicated that advanced education beyond the bachelor's degree was negatively related to performance. Personality is not an influencing factor in firm performance. Certain personality types may tend to start firms but the existence or lack of that personality profile does not

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affect performance. According to Stuart and Abetti (1990), the most significant influencing factor is entrepreneurial experience. They express that 'Experience is the best teacher.' Again, although the findings of Stuart and Abetti (1990) regarding prior experiences of entrepreneurs are similar to the basis of this study, the other findings with respect to educational level and the personality of entrepreneurs are in conflict with the findings of both their previous study and the basis of this study.

The findings of Kakati (2003) supported some of the findings of Stuart and Abetti (1987) and (1990). The study focused on seven performance variables to measure success, namely sales, market share, marketing costs, production costs, general and administrative cost, profit and return on investment. He indicated that R&D intensity has negative relationship with success. He also indicated that successful ventures appear to follow multiple patterns of strategic behavior. Another important finding of this study is that the presence of diversified skills and capabilities balanced with business skills and capacities such as marketing, input-sourcing, and general management is a critical factor for success.

Arora and Faraone (2003) highlighted the way to combine technical abilities with entrepreneurship in engineering education; they also listed important success factors in the development of an effective and efficient knowledge worker for the 21st century. They stated that the first important factor for the success of a techno-entrepreneur is the know-how. They also stated that apart from the know-how, answering the "whether, what, why, when, whom, where and how much" questions are also important for the success of a techno-entrepreneur.

Colombo et al. (2004), Bulsara et al. (2009), Tajeddini and Mueller (2009) and Okamuro et al. (2011) all focused on the importance of human capital on the survival of technological start-ups.

Colombo et al. (2004) analyzed 391 young Italian firms operating in high-tech industries both in the manufacturing and service sectors in order to check the effect of human capital of the founder on the size of start-ups. Colombo et al. (2004) found that industry specific professional knowledge, managerial and entrepreneurial experiences, education and general working experience have a positive effect on firm size. They classified human capital as generic and specific, like Gary Becker's famous

classification in 1975. As generic human capital, they looked into formal education and professional experience. As specific human capital, they looked into a managerial position in another firm and prior self-employment episode. They also added wealth and financial constraints to their model and concluded that the effect of generic human capital on firm size is less than the specific one. The summary of the results is that the more educated, the better-qualified, and probably the wealthier founders have larger firm size. Their policy recommendation is that the government should intervene in the market and even public support should be given to the firms whose founders have more human capital. The present master's thesis also examines the question of whether or not the firms whose founders have more human capital have more possibility to commercialize their business idea. Colombo et al. (2004) focus on the firm size as a measure of survival/success. In the evaluation of the 1512 Program, it is too early to use firm size as a measure of success because half of the target population is 2-year-old firms and the other half of the target population is 1.5 year-old firms.

Bulsara et al. (2009) analyzed the skills which a successful techno-entrepreneur should have. They defined the techno-entrepreneurship as the entrepreneurship in the area of technology and the person who undertakes techno-entrepreneurship is termed as techno-entrepreneur. They stated that a successful entrepreneur has to have managerial skills to utilize resources effectively, should be able to make appropriate feasibility analysis, should have skills related to marketing, human resource management, financial management, manufacturing management and networks. Apart from the aforementioned human capital characteristics, the survey in this thesis also measures the effect of managerial skills and managerial education or experience. Although the 1512 Program contains much training about marketing, human resource management, financial management, manufacturing management and networks, these human capital features of the techno-entrepreneurs possibly have effect on the success of techno-entrepreneurs.

Tajeddini and Mueller (2009) compared the characteristics of techno-entrepreneurs in the UK and Switzerland. The previously mentioned articles were about the characteristics and the human capital feature of successful techno-entrepreneurs. However, Tajeddini and Mueller (2009) focused on the characteristics which somebody has to have to become a techno-entrepreneur in the UK and Switzerland.

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They summarized their results as follows: while autonomy, propensity for risk and locus of control are higher in the UK, need for achievement, tolerance of ambiguity, innovativeness and confidence are higher in Switzerland.

Okamuro et al. (2011) examine the effects of founder-, firm-, and industry- specific characteristics on R&D cooperation. Although Okamuro et al. (2011) focused on the possible effects of these parameters on cooperation, it is an important article to identify the parameters. They remind the importance of human capital for survival of start-ups. The earlier studies mostly ignored the effect of human capital of founders on survival, but the contribution of this article to the literature is that they used educational background, prior innovation output and work experience as indicators of human capital. They concluded that educational level, prior innovation output, and prior work experience affect cooperation positively. At the end of the paper, their policy recommendation is clear that the government should consider the human capital of the founder when deciding whether to support or not. The present thesis not only measures the educational level, prior project experience and prior work experience, but it also searches for more information about the relatedness of education and business plan; if there is prior project experience, which fund agency is supported and if there is prior work experience how many years of experience they have.

In addition to the researchers supporting the importance of human capital of techno-entrepreneur on survival of the firm, Wright et al. (2007) determined that not only the human capital of the founder but also the human capital of the team was important in the survival of the firm.

Wright et al. (2007) sought to address the role that the human capital characteristics of individuals and teams played in the complex process of technological entrepreneurship. In their article, they added this special issue to the literature concerning academic entrepreneurship, technology transfer and innovation and corporate spin-offs. In this master's thesis, the main focus is the human capital characteristics of techno-entrepreneurs. However, the prior work experience of the team was also measured in the survey owing to the importance attached to the experience of team workers.

In contrast to the advocates of the idea that the human capital of founds and/or teams is important, Davidsson and Honig (2003) argue that human capital is not important, whereas social capital is highly important.

The research question of Davidsson and Honig (2003) was whether entrepreneurs begin with different levels of human or social capital and whether these endowments affect their rate of success. They found that human capital is not important, whereas social capital is very important. Previous studies tend to support the existence of a positive relationship between human capital and entrepreneurial activity. In the current master's thesis, the main focus is on human capital but there are some questions in the survey seeking to measure the level of social capital. Davidsson and Honig (2003) recommend to the public policy makers to raise the social capital level by business incubators, business advice, marketing assistance and encouragement of networking. The 1512 Entrepreneurship Support Program includes all these activities.

Apart from the human capital versus social capital debate, Thamhain (1990), Oakey (2003) and Colombo and Grilli (2005) argue the importance of teamwork in the success of technological start-ups' survival.

Thamhain (1990) mentions the importance of teamwork in a new product process. He uses the input and output model to summarize these results in two sections: The first one is characteristics of innovative, creative performance and the second one is characteristics of an innovative teamwork/environment. For the first one, there are four important characteristics: (1) number of innovative number of innovative ideas commercialized, adopted or recognized by the organization; (2) established organizational objectives met; (3) adaptability to changing requirements and conditions; and (4) commitment. For the second part; there are three important characteristics; (1) task definition, (2) people management and (3) organizational support. Although the existence of teamwork is also counted as an independent variable in the model of this thesis study, it is not so detailed as it is not the main focus of the thesis.

In another article, Oakey (2003) emphasizes the importance of teamwork. Additionally, he states that in techno-entrepreneurship firm, the brain of the founder is

the most important asset of the firm. Oakey (2003) also emphasizes the importance of managerial skills in techno-entrepreneurship.

Colombo and Grilli (2005) analyzed 506 young Italian high-tech firms in 2005. The summary of Colombo and Grilli (2005) is that education and prior work experience of the techno-entrepreneur is essential for growth when growth is used as a success measure. They also contributed to the literature with the finding that while managerial and technical education is very important, other education has no impact on success. They emphasize that the teamwork and prior entrepreneurial experience are also important for success. They state that "the likelihood of survival of new firms and the growth of surviving firms have generally been found to be positively related to the age, education and work experience of founders." All these indicators such as teamwork, education, prior work experience, prior entrepreneurship experience and more have been taken into account in the present master's thesis.

Apart from Oakey (2003) and Colombo and Grilli (2005), Hindle and Yencken (2004) focus on the knowledge input regarding the survival of start-ups.

Hindle and Yencken (2004) focused on Australian academic spin-off firms and their survival. They stated that knowledge inputs are important for the survival of academic spin-off firms. They divided knowledge in two as tacit and codified. In Hindle and Yencken (2004), there was no data analysis but they recommended 20 case studies for future study. Case studies can be more informative in the evaluation of these kinds of support programs. Therefore, in the present thesis the in-depth interview method has been chosen for an in-depth case study analysis.

Chorev and Anderson (2006) and Petti and Zhang (2011) can be listed as country-specific examples investigating the influencing factors of high-tech new ventures' performance.

Chorev and Anderson (2006) aimed to determine the critical, important and less important influencing factors influencing the high-tech venture's performance in Israel. They indicated that idea, strategy, the core team's commitment, expertise and marketing are critical factors; management, customer relationships and research and

development are important factors; and the economic, political and the general business environment are the least important factors.

Petti and Zhang (2011) investigated the influencing factors for Chinese high-tech new ventures. They classified the factors into three groups as (i) internal processes, which are opportunity search, capital budgeting, knowledge management and change management, (ii) external network attributes, which are weak and strong ties with appropriate actors, non-redundancy and geographical sparsity of enterprise's network, (iii) institutions, which mean institutional support and integrative and innovation learning and customer oriented cultures. According to Petti and Zhang (2011), all these three factors positively affect the high-tech new venture's performance in China.

2.3. Review of Impact Analysis Studies of Techno-Entrepreneurship Government
Supports

The following part of this chapter includes review of evaluation studies regarding the research question of what the determinants of the performance of NTBFs supported by government are. Some studies that are included in this section are those by Klette et al. (2000), Del Monte and Scalera (2001), Kropp and Zolin (2005) and Revest and Sapio (2010).

Klette et al. reviewed some recent micro econometric studies evaluating the effects of government-sponsored commercial R&D programs, such as The SEMATECH research consortium and SBIR in the US, Japanese research consortia, government support to commercial R&D projects in Norwegian high-tech firms and government support to commercial R&D projects in Israeli firms. They pay particular attention to the conceptual problems involved. They summarize five important articles about impact analysis of such government-sponsored commercial R&D programs listed above. Klette et al. argue that the microeconomic approach should be supplemented with detailed case studies to get a more precise estimate of the economic returns from the few, outstanding innovations that might typically generate a very large share of the economic benefits emerging from risk-oriented R&D subsidy programs.

Del Monte and Scalera (2001) argue that the purpose of government subsidies is to offset a gap with firms that do not need subsidies. Therefore, the success of a subsidy program should not be evaluated by comparing the survival rates of subsidized and non-subsidized firms. They analyzed the Law 44 in Italy related with Imprenditoria Giovanile, which is the government agency responsible for the distributions of government funds. From this point of view, it is not appropriate to compare the survival rates of techno-entrepreneurs subsidized by the 1512 Program and non-subsidized firms. As the government should not support a techno-entrepreneur who establishes a start-up and realizes his technology-based business idea in any case even without government subsidy.

Kropp and Zolin (2005) focus on the impact analysis of The Small Business Innovation Research (SBIR) Program in the USA. They state that "Survival rates, rates of commercialization, and rates of technology transfer are posited to be higher for

technology firms that participate in programs such as SBIR than for comparable firms which do not participate in the programs." As a performance measure they take many parameters, such as sales growth, profitability etc. As it is indicated above, parameters like sales growth and profitability are not applicable to the techno-entrepreneurs supported by the 1512 Program on grounds that half of the target population are 2-year-old firms and the other half is 1.5-year-old firms. Therefore, as a performance measure, sales are chosen in the current thesis.

Revest and Sapio (2010) explained the technology-based entrepreneurship supports in the European Union. Accordingly, there are many different practices in different countries in the EU. For instance, while the Germany support system focuses on the bank system, the support system in the United Kingdom is similar to the USA system, which is more market based. They stated that market failures occur in two ways in these kinds of support programs. Entrepreneurs do not have enough capital to do innovative activities; in addition to this, the government has inadequate information about the specific innovation activity projects. There is an asymmetric information problem and lack of capital problem. One of the research questions of the paper was whether the European policy initiatives were successful in bridging the funding gaps of NTBFs. Therefore, they evaluated the support programs in the EU and as a summary they stated, "European governments have adapted their fiscal and legal environments to the needs of small high-tech firms, combining national and regional measures. R&D tax incentives and public venture capital seem to have produced beneficial effects" (Revest and Sapio, 2010: 198).

2.4. Summary of Literature Review

With the changes in technology, the importance of high-technology ventures performance is getting higher and higher in terms of economic growth and development. Therefore, academic studies on the influencing factors of technology-based new venture's performance come into prominence in terms of both national technological entrepreneurship policies and economic activities. Although there are many studies about the influencing factors of technology-based venture's performance the literature is quite dispersed.

Briefly, the literature focuses on the human capital, personal characteristics or psychological attitudes of techno-entrepreneurs, the role of teamwork, prior experiences as well as the strategy of start-up and market conditions. The literature is summarized in the following tables.

As it can be seen in Table 2.4. Literature Summary about Success Factors in New Ventures, the literature focuses on personal characteristics of the founder, industry structure and firm strategy for new ventures. The studies which agree on personal characteristics of the founder are powerful determinants of success in new ventures are those by Begley and Bond (1987), Herron and Robinson (1993), Gatewood et al. (1995), Jo and Lee (1996) and Ciaverella et al. (2004). Contrary to them, Sandberg and Hofer (1988), Gartner et al. (1999) and Duchesneau and Garner (1990) argue that personal characteristics of the founder are not powerful determinants of success in new ventures. Apart from personal characteristics, the literature on success factors in new ventures also focus on external factors, such as industry structure and firm strategy. These studies were conducted by Sexton and Upton (1990) and Duchesneau and Garner (1990).

Table 2.4. Literature Summary of Success Factors in New Ventures

Success Factors in New Ventures	Personal Characteristics of the Founder	Powerful	Begley and Bond (1987)
			Herron and Robinson (1993)
			Gatewood et al. (1995)
			Jo and Lee (1996)
			Ciaverella et al. (2004)
		Not powerful	Sandberg and Hofer (1988)
			Gartner et al. (1999)
			Duchesneau and Garner (1990)
	Industry Structure and Firm Strategy		Sexton and Upton (1990)
			Duchesneau and Garner (1990)

In Table 2.5. Literature Summary about Success Factors in New Technology-Based Firms, the literature focuses on personal characteristics of the founder, the human capital of the team, social capital, teamwork, knowledge input and education for NTBFs. There are also studies which dwell on samples of countries regarding success factors in NTBFs. Although Stuart and Abetti (1990) and Kakati (2003) state that personal characteristics of a founder is not a powerful determinant of success in NTBFs' performance, there are several studies defending the importance of the personal characteristics of the founder, such as Stuart and Abetti (1987), Colombo et al. (2004), Bulsara et al. (2009), Tajeddini and Mueller (2009) and Okamuro et al. (2011). Apart from the personal characteristics of the founder, Wright et al. (2007) focuses on the importance of the human capital of the team. As a different discussion from the effect of human capital of founders and the human capital of the team,

Davidsson and Honig (2003) argue that social capital is one of the determinants of success in NTBFs. Thamhain (1990), Oakey (2003) and Colombo et al. (2005) also make different points and argue the importance of teamwork in the success of NTBFs. Apart from human capital, social capital and teamwork, Oakey (2003), Colombo and Grilli (2005) and Hindle and Yencken (2004) argue the influence of knowledge input as a determinant of success in NTBFs. Although Stuart and Abetti (1990) state that education is not a powerful determinant in the success of NTBFs, Arora and Faraone (2003) focus on the importance of education in the performance of NTBFs. There are also studies on specific countries studying the determinants of success in NTBFs, namely those by Chorev and Anderson (2006) and Petti and Zhang (2011). While Chorev and Anderson (2006) convey examples from the Israel context, Petti and Zhang (2011) report an example from the Chinese context.

Table 2.5. Literature Summary of Success Factors in New Technology-Based Firms

Success Factors in New Technology-Based Firms			
Personal Characteristics of the Founder	Not powerful	Stuart and Abetti (1990)	
		Kakati (2003)	
	Powerful	Stuart and Abetti (1987)	
		Colombo et al. (2004)	
		Bulsara et al. (2009)	
		Tajeddini and Mueller (2009)	
		Okamuro et al. (2011)	
Human Capital of the Team		Wright et al. (2007)	
Social Capital		Davidsson and Honig (2003)	
Teamwork		Thamhain (1990)	
		Oakey (2003)	
		Colombo et al. (2005)	
Knowledge Input		Oakey (2003)	
		Colombo and Grilli (2005)	
		Hindle and Yencken (2004)	
Country Examples		Chorev and Anderson (2006)	
		Petti and Zhang (2011)	
Education	Powerful	Arora and Faraone (2003)	
	Not Powerful	Stuart and Abetti (1990)	

Impact analysis studies about the public policies and programs regarding NTBFs are summarized in Table 2.6. Chronologically, Klette et al. (2000) examined SEMATECH and SBIR, Del Monte an Scalera (2001) examined Law 44 in Italy, Kropp and Zolin (2005) examined SBIR, and Revest and Sapio (2010) examined the EU policies.

Table 2.6. Literature Summary of Impact Analysis Studies

Impact Analysis Studies	Klette et al. (2000)	SEMATECH and SBIR
	Del Monte and Scalera (2001)	Law 44 in Italy
	Kropp and Zolin (2005)	SBIR
	Revest and Sapio (2010)	EU

CHAPTER 3

ANALYSIS

Both quantitative and qualitative analysis methodologies are used in this study in order to analyze the determinants of the early-stage performance of NTBFs in Turkey. Firstly, the data is presented in this chapter. Then, both quantitative and qualitative analysis methodologies are discussed. Finally, the results of these analysis methodologies are stated in this chapter.

3.1. The Data

The focus of the study is to analyze the determinants of the early-stage performance of NTBFs supported by the Turkish government. In the previous chapter, various influencing factors in literature have been detailed. The specific support program has been chosen: the 1512 Entrepreneurship Support Program run by TUBITAK in order to focus on the determinants of the early-stage performance of NTBFs supported by the Turkish government.

The details of the 1512 Entrepreneurship Support Program and the reasons why this program has been chosen as a focus of this study are explained in the following section.

3.1.1. The 1512 Entrepreneurship Support Program

The regulation, content, aim, phases and support mechanisms of the 1512 Entrepreneurship Support Program are presented in this section. Subsequently, the reasons why this program has been chosen as a focus of this study are explained.

3.1.1.1. Program Details

The 1512 Entrepreneurship Support Program has been run by TUBITAK since 2012. The first decision has been constituted after the 23rd Supreme Council of Science and Technology meeting on 27th December 2011. The Supreme Council for Science and Technology is the highest decision maker authority on Science and Technology

Policies in Turkey. The Prime Minister is the head of the Council and the secretary is run by TUBITAK. [5]

The 1512 Entrepreneurship Support Program includes activities to transform the innovative business ideas of techno-entrepreneurs into new products, services or product technologies via entrepreneurship trainings, mentorship and capital grant without guarantee.

The aim of the program is to encourage the qualified entrepreneurship and to enable these qualified techno-entrepreneurs to establish NTBFs which are able to develop the innovative, high level technology and international competitive products and services.

The 1512 Entrepreneurship Support Program includes four phases aimed at transforming the innovative business ideas into commercial products, services or processes. These phases are explained below. Techno-entrepreneur may continue to the next phase in the event that the previous phase is accomplished and the approval of TUBITAK is received.

Phase 1 is the stage where the techno-entrepreneur presents the business idea application, and in the event of the approval of this business idea, entrepreneurship trainings and mentorship supports are given in order to transform the business idea to a business plan. Phase 1 ends when the techno-entrepreneur presents his/her business plan.

Phase 2 starts after the evaluation of the business plans. In the case of approval, the capital grant support is given to the NTBFs established by techno-entrepreneurs. In Phase 2, within the scope of the business plan, the conceptual design, the technical and economic feasibility and the technological verification activities, such as prototype, demo, simulation, software algorithm are carried out. In Phase 2, TUBITAK also provides mentorship support and pays for mentorship fees excluding them from the business plan budgets. Those NTBFs that have a potential for commercialization is

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[5] The relevant decision of the 23rd Science and Technology Council on 27th December 2011 is "2011/103: Developing Policy Instruments for the Purpose of Activating and Increasing the number of New Technology Based Firms" (http://www.tubitak.gov.tr /tr/kurumsal/bilim-ve-teknoloji-yuksek-kurulu/toplantilar/icerik-bilim-ve-teknoloji-yuksek-kurulu-23toplantisi-27-aralik-2011)

able to pass directly to Phase 4 with the preparation and approval of the "Commercialization Business Plan".

The aim of Phase 3 is to transform the outputs of the NTBF produced in Phase 2 to the commercial or practical product, service or process if it is not able to commercialize it at the end of Phase 2. Phase 3 starts with the NTBF's application to the TUBITAK Small and Medium Enterprise's Research and Development Support Program. Alumni of Phase 2 of the 1512 Support Program have been evaluated with some specific criteria because of the fact that their technological verification period is followed by TUBITAK. In Phase 3, detailed design, development of commercial prototype, trials and site tests are realized. Those NTBFs that have a potential for commercialization is able to pass on to Phase 4 with the preparation and approval of the "Commercialization Business Plan".

In Phase 4, in case of NTBF's request, TUBITAK sends letters to venture capital firms in order to invite them to become a partner with the NTBF or project output. TUBITAK also periodically organizes project market activities in order to ease the commercialization process of the project outputs.[6]

The 1512 Entrepreneurship Support Program aims to create technology-based startups with R&D capacity for providing innovative products and services to domestic and international markets. An individual who is a university graduate and who is not a company shareholder can apply to the programme. In addition, the applicant must provide the other conditions specified in the call text.

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[6] The 1512 Entrepreneurship Support Program Regulation
(http://www.tubitak.gov.tr/sites/default/files/tubitak_girisimcilik_asamali_destek_programi_uygulama
_esaslari_0.pdf)

Table 3.1. The Phases of the 1512 Program

Phase 1 - IDEA CREATION Transforming new idea to business plan with training and mentor guidance	Phase 2 - TECHNOLOGY VALIDATION Firm establishment with seed capital by TUBITAK, aiming technology validation of the proposed idea
Phase 3 - R&D PERFORMING Advanced R&D project granted under SME R&D and innovation under 1507 SME RDI Grant Programme	Phase 4 - COMMERCIALIZATION TUBITAK organizes project brokerage and partner finding events and facilities beneficiaries' access to finance

In Phase 1, there is no cash-loan; there is only training and mentor guidance to transfer techno-entrepreneurs' new ideas to business plans. In Phase 2, a maximum of 100,000 TRY seed capital is given as grant and the maximum project duration is 12 months. 20% of the project cost is provided as markup for general expenses. An individual mentor is also assigned for each supported entrepreneur. In Phase 3, 75% of the eligible project expenses for projects are supported up to 550,000 TRY and the maximum project duration is 18 months. 10% of the project costs is given as markup for general expenses. Project proposals can be submitted during the opening and closing dates of the call via online application. The Internet address for application is eteydeb.tubitak.gov.tr. [7] In Phase 4, there is no cash-loan. Only commercialization activities are organized during this phase.

3.1.1.2. Why has the 1512 Program been chosen as the focus?

Although there are a few entrepreneurship government supports in Turkey, the main instrument in this study is the first two phases of the 1512 Entrepreneurship Support Program. The reasons behind this selection are justified in this section.

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[7] TEYDEB-Technology and Innovation Grant Programmes Directorate 2014-3 brochure

The first reason is that the 1512 Entrepreneurship Support Program is a grant program for entrepreneurship activities. Then several other entrepreneurship supports are eliminated in the frame.

However, there are two support programs providing capital grants to entrepreneurs: The Techno-Entrepreneurship Capital Support Program run by the Turkish Ministry of Science, The Technology and Industry (BSTB) and Entrepreneurship Grant Program run by Small and Medium Industry Development Organization (KOSGEB). The second reason why the 1512 Entrepreneurship Support Program has been chosen for this study is that it focuses on *"techno-entrepreneurship"* developments. KOSGEB supports entrepreneurship activities regardless of the technological level. Therefore, the Entrepreneurship Grant Program run by KOSGEB is also eliminated on account of its lack of techno-entrepreneurship focus.

The nearest substitute support program is the Techno-Entrepreneurship Capital Support Program run by BSTB. Its purpose, its grant support schemes and the support duration of the programs are almost the same with the first two phases of the 1512 Entrepreneurship Support Program. Nevertheless, the Techno-Entrepreneurship Capital Support Program run by BSTB does not contain technical and managerial trainings, mentorship support, commercialization activities support, more R&D grant support if required etc.[8] Additionally, the alumni of the Techno-Entrepreneurship Capital Support Program run by BSTB is allowed to apply to Phase 3 of the 1512 Entrepreneurship Support Program. From this point of view, the 1512 Entrepreneurship Support Program is more inclusive than the Techno-Entrepreneurship Capital Support Program run by BSTB.

As a result, the 1512 Entrepreneurship Support Program is the most suitable program to analyze the determinants of the early-stage performance of NTBFs supported by the Turkish government since it focuses on technological entrepreneurship and contains several support mechanisms apart from capital grant.

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[8] More information can be found in the authors' own policy document, which compares two nearest substitute support programs. (Turan et al. Türkiye'de Teknogirişim Destekleri Karşılaştırmalı Süreç Analizi: Teknogirişim Sermaye Desteği ve 1512 Girişimcilik Aşamalı Destek Programı – 2013 METU)

3.1.2. Data Description

In this section, the complete data used in the present study are explained briefly. In Figure 3.1. the Data Description scheme is given. Three types of data collection methodologies have been used in this study.

The TUBITAK Database was not sufficient to analyze all of the potential determinants of the early-stage performance of NTBFs supported by the Turkish government since the content of the dataset is limited. Therefore, in order to analyze some details of the supported applicants, a survey was sent to supported applicants via e-mail. The survey response rate was 40% since 95 out of 238 supported techno-entrepreneurs responded to the survey. Thus, the respondents to the survey are the subset of the supported applicants. In order to analyze the determinants of the early-stage performance of NTBFs, there was also a need for more detailed data about the successful applicants. Hence, the techno-entrepreneurs on TUBITAK's Successful Entrepreneurs List were invited for in-depth interviews. This list and the selection criteria are explained in the following sections. The return rate of in-depth interviews was 22% since 8 out of 36 successful techno-entrepreneurs participated in the in-depth interviews. Therefore, in-depth interview participants constitute the subset of the successful applicants of the 1512 Entrepreneurship Support Program.

After collecting data via the TUBITAK Database, the surveys and the in-depth interviews, the data were analyzed. For quantitative analysis, the data obtained from the TUBITAK Database and the surveys were used. For qualitative analysis, the data obtained in the in-depth interviews were used.

With regard to quantitative and qualitative analysis results, policy recommendations and conclusions are presented in order to outline the determinants of the early-stage performance of NTBFs supported by the Turkish government.

Step 1: Data Collection

I) TUBITAK Database

All applicants of 1512 Entrepreneurship Support Program
- 1965 Samples

Supported Applicants of 1512 Entrepreneurship Support Program
- 238 Samples

Successful Applicants on TUBITAK's Successful Entrepreneurs List
- 36 Samples

II) Survey

Sub Sample of Supported Applicants
- 95 Samples
- %40 return rate

III) In-depth Interviews

Sub Sample of Successful Applicants
- 8 Samples
- %22 return rate

Step 2: Analysis

Quantitative Analysis

Qualitative Analysis

Step 3: Conclusion

Policy Recommendations

Figure 3.1. Data Description Scheme

3.1.3. Data Collection Methodologies

The data used in the study were collected via three channels. The data collection methodologies in the study were the TUBITAK Database, a survey and in-depth interviews. The data of all the applicants of the 1512 Entrepreneurship Support Program (1965 samples), the supported applicants (238 samples) and the successful applicants (36 samples) were collected via the TUBITAK Database. However, the TUBITAK Database was not sufficient to analyze all of the potential determinants of the early-stage performance of NTBFs supported by the Turkish government. The content of the dataset is limited. Therefore, a survey was administered to supported applicants in order to obtain more data. 95 supported techno-entrepreneurs responded to the survey. In order to analyze the determinants of the early-stage performance of NTBFs, successful applicants were invited to in-depth interviews. 8 successful techno-entrepreneurs participated in the in-depth interviews. All these data are presented in this section respectively.

3.1.3.1. The TUBITAK Database

The first data collection methodology that was utilized was the current data in the TUBITAK Database. The basic data of all the applicants, the supported applicants and the successful applicants are presented in this section respectively. Although the TUBITAK Database was used for the analysis, there were not enough information in it to analyze the determinants of the early-stage performance in NTBFs supported by the Turkish government. Therefore, a survey and in-depth interviews were also used for data collection. In this section the data collected via the TUBITAK Database are focused on.

3.1.3.1.1. All Applicants

In the first call of the program 745 applications were collected. In the second call of the program 1220 applicants were collected. Therefore, the total population of all the applicants was 1965 samples. In this section, technology group, gender, age, level of education and the city of 1965 applicants are presented.

In Table 3.2. the statistics of all applicants in terms of technology groups are listed. According to the table, almost half of the applicants (40% of all applicants) belong to

Information and Communication Technologies (ICT). The applicants that belong to other technology groups are distributed between 7% and 18%.

Table 3.2. All Applicants in terms of Technology Groups

Technology Groups / Call Year	2012	2012 (%)	2013	2013 (%)	TOTAL	TOTAL (%)
Information and Communication Technologies	323	43%	465	38%	788	40%
Biotechnology and Food and Environment	90	12%	200	16%	260	13%
Electric and Electronic Technologies	135	18%	217	18%	352	18%
Machinery Technologies	83	11%	153	13%	236	12%
Material Technologies	51	7%	85	7%	136	7%
Transportation, Defense, Energy and Textile Technologies	63	8%	100	8%	163	8%
TOTAL	745	100%	1220	100%	1965	100%

When we look at the gender distribution of all the applicants of the 1512 Entrepreneurship Support Program, the distribution does not show an alteration. Women's application to the 1512 Entrepreneurship Support Program is less than a quarter of the men's application. The rate of women in all applicants of the program is very low (16%) according to all applicants' statistics. Table 3.3. shows the gender distribution of the applicants of the program.

Table 3.3. All Applicants in terms of Gender Distribution

Gender/ Call Year	2012	2012 (%)	2013	2013 (%)	TOTAL	TOTAL (%)
Female	112	15%	205	17%	317	16%
Male	633	85%	1015	83%	1648	84%
TOTAL	745	100%	1220	100%	1965	100%

In addition to technological areas and genders of the applicants, statistics related to age are also available in the TUBITAK Database. Table 3.4. shows the age distribution of the all applicants to the program. When Table 3.4. is examined, it can be observed that almost half of the applicants (43%) are between the ages of 25 and 29. The following popular age category of the applicants is the age group of 30-34 years. Their rate is 33%. Therefore, more than three out of four applicants were between the ages of 25 and 34. The reason behind this age distribution may be the application criteria of the the 1512 Entrepreneurship Support Program. One of the criteria which may be a reason of this distribution is the graduation criteria. The first call of the program is open for undergraduate students who are to be graduated within 1 year and for graduates and higher degree holders. The second call of the program is open for the applicants who have been graduated from at least an undergraduate school. Therefore, the applicants' age distribution accumulates to be older than 25 year of ages. The second criterion which may be a reason of this distribution is the maximum age limit. The first call of the program is open for applicants whose last graduation date is less than 5 years. With this criteria, TUBITAK may seeking a close relationship between the academy and the applicant. TUBITAK may assume that an applicant who was graduated more than 5 years ago might have lost his/her academic and technological links and are not appropriate applicants for the 1512 Entrepreneurship Support Program. The decrease in the number of applicants older than 35-39 years of age may be based on this reason. In the second call, the applicants older than 45 years old are not accepted to the 1512 Entrepreneurship Support Program with one exception.

Applicants older than 45 years of age are only accepted if the applicant holds a PhD degree. Therefore, an extra application criterion for candidate techno-entrepreneurs lowers the rate of the applicants who are older than 45. These probable reasons may be influential on the age distribution of all the applicants.

Table 3.4. All Applicants in terms of Age Distribution

Age / Call Year	2012	2012 (%)	2013	2013 (%)	TOTAL	TOTAL (%)
20-24	11	1%	43	4%	54	3%
25-29	327	44%	521	43%	848	43%
30-34	271	36%	377	31%	648	33%
35-39	100	13%	198	16%	298	15%
40-44	23	3%	76	6%	99	5%
45-49	11	1%	5	0%	16	1%
50+	2	0%	0	0%	2	0%
TOTAL	745	100%	1220	100%	1965	100%

Another data of all the applicants of the 1512 Entrepreneurship Support Program, which is available in the TUBITAK Database, is educational levels of the applicants. Table 3.5. presents the educational levels of all the applicants according to call years and in total. More than half of the applicants (55%) have an undergraduate degree; 31% of them hold a Master's degree and only 14% of them hold a doctorate degree.

Table 3.5. All Applicants in terms of Education Levels

Educational Level / Call Year	2012	2012 (%)	2013	2013 (%)	TOTAL	TOTAL (%)
Undergraduate[9]	325	44%	756	62%	1081	**55%**
Master's	265	36%	341	28%	606	**31%**
Doctorate	155	21%	123	10%	278	**14%**
TOTAL	**745**	**100%**	**1220**	**100%**	**1965**	**100%**

The last data presented in this section is the city of the applicants. Table 3.6. shows the city where applicants lived during the application period. In the first call of the program, Ankara was the first city where applications came from. Istanbul follows Ankara in the first year. In the second call of the program, Istanbul became the first city. The city distribution of the second year of the program was more compatible with the population, technological density and industry distribution of Turkey in general. Contrary to the general population, the technological density and the industry distribution of Turkey, the popularity of Ankara in the first call of the program may have occurred due to the fact that the program's area of influence may not be sufficiently widespread enough. Because of the limited area of influence, Ankara (where TUBITAK's head building is located) may be the first city where applications come from. The cities are given in Table 3.5. if number of techno-entrepreneurs exceeds 10 in total. The detailed table is given in Appendix 1.

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[9] As it was previously mentioned, the first call was open for the undergraduate students who were to graduate within 1 year. Undergraduate and more degree holders are appropriate for the 1512 Entrepreneurship Support Program. For the statistics of the first year, undergraduate student applicants are shown within undergraduate degree statistics.

Table 3.6. All Applicants in terms of Regional Distribution

City / Call Year	2012	2012 (%)	2013	2013 (%)	TOTAL	TOTAL (%)
Adana	16	2%	78	6%	94	**5%**
Ankara	248	33%	311	25%	559	**28%**
Antalya	12	2%	13	1%	25	**1%**
Bursa	10	1%	23	2%	33	**2%**
Denizli	1	0%	15	1%	16	**1%**
Elazığ	10	1%	13	1%	23	**1%**
Eskişehir	23	3%	19	2%	42	**2%**
Gaziantep	1	0%	11	1%	12	**1%**
Isparta	11	1%	10	1%	21	**1%**
İstanbul	245	33%	425	35%	670	**34%**
İzmir	40	5%	68	6%	108	**5%**
Kayseri	8	1%	30	2%	38	**2%**
Kocaeli	20	3%	32	3%	52	**3%**
Konya	18	2%	28	2%	46	**2%**
Kütahya	0	0%	10	1%	10	**1%**
Mersin	7	1%	3	0%	10	**1%**
Sakarya	2	0%	14	1%	16	**1%**
Tokat	3	0%	8	1%	11	**1%**
Trabzon	7	1%	11	1%	18	**1%**
Other	63	9%	98	9%	161	**8%**
Total	**745**	**100%**	**1220**	**100%**	**1965**	**100%**

3.1.3.1.2.   Supported Applicants

In the previous section, the data of all applicants of the 1512 Entrepreneurship Support Program is given. In the first call of the program, 112 applicants were supported within 745 applications. In the second call of the program, 238 applicants were supported within 1220 applications. In this section, supported applicants' data from the TUBITAK Database are presented. The technology groups, gender, age, level of education and city of 238 supported techno-entrepreneurs are presented in the following tables.

In Table 3.7., the technology group distribution of the supported applicants is presented. The supported applicants' scheme in terms of technology groups does not vary considerably. The reason behind this fact is that the panel evaluation is done according to the technology groups. Every technology group establishes the most suitable evaluation panels according to the relevance of the business ideas/plans, and then the critical passing score is determined in each group with the same mechanism. First, the determination of a passing score mechanism is identified. Then this mechanism is applied within each technology group. Therefore, minimum-passing score varies according to the score distribution of technology groups score distribution. In other words, applications compete within their own technology groups. Therefore, the distribution of supported applicants in terms of technology groups does not show significant alterations within the data of all applicants.

Table 3.7. Supported Applicants in terms of Technology Groups

Technology Groups / Call Year	2012	2012 (%)	2013	2013 (%)	TOTAL	TOTAL (%)
Information and Communication Technologies	39	35%	43	34%	82	**34%**
Biotechnology and Food and Environment	18	16%	16	13%	34	**14%**
Electric and Electronic Technologies	22	20%	29	23%	51	**21%**
Machinery Technologies	13	12%	9	7%	22	**9%**
Material Technologies	6	5%	9	7%	15	**6%**
Transportation, Defense, Energy and Textile Technologies	14	13%	20	16%	34	**14%**
TOTAL	**112**	**100%**	**126**	**100%**	**238**	**100%**

When the gender distribution of the supported applicants is examined in Table 3.8., it can be seen that the percentage of females within the supported applicants (11%) is less than the percentage of females among all applicants (16%). In addition to the low rate of female applicants to the program, the percentage of females that are supported in the program is less. The reason behind this result may be the lack of gender discrimination in the 1512 Entrepreneurship Support Program. For example, the aforementioned entrepreneurship support program of KOSGEB has a gender discrimination criterion. Female applicants in the KOSGEB Program have higher support rate of budget than the support rate of male applicants[10].

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[10] http://kosgeb.gov.tr/pages/ui/Destekler.aspx?ref=8

Table 3.8. Supported Applicants in terms of Gender

Gender / Call Year	2012	2012 (%)	2013	2013 (%)	TOTAL	TOTAL (%)
Female	14	13%	13	10%	27	11%
Male	98	88%	113	90%	211	89%
TOTAL	112	100%	126	100%	238	100%

Table 3.9. shows the age distribution of the supported applicants. The age distribution of the supported applicants is different from the age distribution of all the applicants. Although the accumulation is still between the ages of 25 and 34, in the 25-29-year-old group, the rate of supported applicants (37%) is less than the rate of all applicants (43%). However, within the 35-39-year-old group, the rate of supported applicants (20%) is higher than the rate of all applicants (20%). In other words, the support rate of older applicants is higher than that of younger ones.

Table 3.9. Supported Applicants in terms of Age

Age / Call Year	2012	2012 (%)	2013	2013 (%)	TOTAL	TOTAL (%)
20-24	5	4%	3	2%	8	3%
25-29	43	38%	46	37%	89	37%
30-34	39	35%	38	30%	77	32%
35-39	16	14%	31	25%	47	20%
40-44	6	5%	7	6%	13	5%
45-49	3	3%	1	1%	4	2%
50+	0	0%	0	0%	0	0%
TOTAL	112	100%	126	100%	238	100%

The educational levels of supported applicants are presented in Table 3.10. When the educational levels of supported applicants are compared with the those of all applicants, it can be seen that while the rate of undergraduate degree holders decreases from 55% to 45%, the rate of Master's degree holders increases from 31% to 34% and the rate of doctorate degree holders increases from 14% to 21%. In other words, the higher level of education the techno-entrepreneur has, the higher chance there is for support to be given.

Table 3.10. Supported Applicants in terms of Education Level

Educational Level / Call Year	2012	2012 (%)	2013	2013 (%)	TOTAL	TOTAL (%)
Undergraduate	56	50%	52	41%	108	45%
Master's	42	38%	38	30%	80	34%
Doctorate	14	13%	36	29%	50	21%
TOTAL	112	100%	126	100%	238	100%

Table 3.11. lists the cities of the supported applicants. The regional distribution of the supported applicants also shows variation. There are more supported applicants in more developed cities than there is in less developed cities. The cities are given in Table 3.10. if number of techno-entrepreneurs exceeds 10 in total. The detailed table is given in Appendix 2.

Table 3.11. Supported Applicants in terms of Regional Distribution

City / Call Year	2012	2012 (%)	2013	2013 (%)	TOTAL	TOTAL (%)
Adana	3	3%	8	6%	11	**5%**
Ankara	40	36%	35	28%	75	**32%**
Eskişehir	6	5%	5	4%	11	**5%**
İstanbul	41	37%	42	33%	83	**35%**
İzmir	4	4%	10	8%	14	**6%**
Others	18	15%	26	21%	39	**17%**
Total	**112**	**100%**	**126**	**100%**	**238**	**100%**

3.1.3.1.3.   Successful Applicants

The liability of the governance of the 1512 Support Program is on the Entrepreneurship Support Group under the Directorate of the Technology and Innovation Funding Programs[11]. The Entrepreneurship Support Group has examined the supported firms after the support period. The experts in the Entrepreneurship Support Group evaluate techno-entrepreneurs and grade them from 1 to 5 according to commercialization performance. According to this expert evaluation, 36 techno-entrepreneurs received the highest score (5) in commercialization performance within the two years of the Program. However, TUBITAK expert evaluation is a laboratory work. This pilot working mechanism is open to changes with the evaluation of results. The evaluation mechanism and the statistics of the list of TUBITAK's successful techno-entrepreneurs are explained in this section.

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[11] In order to increase R&D awareness of the private industry and encourage the private industry to invest in R&D and innovation, the Directorate of the Technology and Innovation Grant Programs (TEYDEB) supports research and technology development projects proposed by private companies. The vision of TEYDEB is to support Turkish private companies to be more competitive around the world in the fields of research, technology, management and innovation and become a known enterprise worldwide with exemplary applications. The mission of TEYDEB is to boost the global competitiveness of Turkish private companies equipped with research, technology development and innovation capabilities and play a leading role in the creation of entrepreneurship culture to improve the prosperity of the country. TEYDEB develops incentive mechanisms like initiating a new grant program and executes them.

Every year is separated into two follow-up periods by TEYDEB. The first six months of the year (January, February, March, April, May and June) is named as the "First Period"; and the other six months (July, August, September, October, November and December) is called the "Second Period". TEYDEB requires a "Periodical Improvement Report" for each follow-up period. Firms prepare and report the periodical improvement in the product and in the business of NTBFs within the two months after the period ends. Periodical Improvement Reports are pre-evaluated by the project officer in TEYDEB. After the pre-evaluation of the technical evaluation, the project officer assigns a "Independent Auditors" who is an external and independent expert in the relevant technology field. The follower examines "The Periodical Improvement Report" prepared by the firm and the "Pre-evaluation Report" prepared by the project officer in detail. Then he/she makes an appointment with the firm in order to examine the improvements on site. After the examination on site, he/she prepares a "Periodical Follow-up Evaluation Report" and sends it to TEYDEB. If project improvements are acceptable, the project is continued. Otherwise, it is stopped. This process is a technical evaluation of the project. In order to be a successful techno-entrepreneur, the first condition is to complete the technological evaluation process successfully. Therefore, experts in the Entrepreneurship Support Group first evaluate the technical success of the project by analyzing the reports and judgments of the project officers and followers as binary outcomes: "technologically successful" or not.

The second evaluation by the experts in the Entrepreneurship Support Group is business improvement evaluation. The "Periodical Improvement Report" covers the improvements in business. Firms report the commercialization and business improvements in these sections. In addition to this, the Entrepreneurship Support Group assigns "Mentor (Business Coach)" to each NTBF for the second phase of the program. These mentors are expected to meet NTBF and give business-related suggestions and report the minutes of these meetings in the "Mentor Journal" every month periodically. TUBITAK pays the fees of these meetings on behalf of the techno-entrepreneurs. Mentors are also expected to fill out the "Periodical Improvement Report" in order to analyze the periodical business improvements. These reports are evaluated by the experts in the Entrepreneurship Support Group. The second condition

to be a successful techno-entrepreneur of TUBITAK is the approval of business mentors as in terms of business side.

Consequently, the experts in the Entrepreneurship Support Group evaluate techno-entrepreneurs in terms of two categories: technological success and business success. If these reports are not current enough to evaluate or if more detail information is needed, the experts make phone calls and/or arrange a meeting and/or correspond with techno-entrepreneurs, project officers, followers or mentors.

In the light of all this information and reports, experts grade techno-entrepreneurs' success on the scale of 1-5. The evaluation form is given in Appendix 3. The meanings of the scores are listed in Table 3.12.

Table 3.12. Business Success Scores of the Evaluation by Experts in the Entrepreneurship Support Group in TUBITAK

Score	Explanation
1	Unsuccessful
2	Unsatisfactory
3	Average
4	Successful
5	Very successful

As an outcome of this expert evaluation, 36 techno-entrepreneurs received the highest grade (5) in commercialization performance within the two years of the Program. The technology groups, gender, age, level of education and city of 36 successful techno-entrepreneurs are presented in this section. Due to the small sample size, the statistics in this section are not distributed across the call years.

The successful applicants according to call year are shown in Table 3.13. It is a nice coincidence that the half of the successful entrepreneurship list of TUBITAK is supported with 2012 Call of the Program, the other half is supported with 2013 Call of the Program.

Table 3.13. TUBITAK's Successful Techno-entrepreneurs in terms of the Call Year
of the Program

Call Year	Techno-entrepreneurs	%
2012	18	50%
2013	18	50%
TOTAL	36	100%

The technology groups of successful applicants are presented in Table 3.14. In terms of technology groups, half of the techno-entrepreneurs who are in the TUBITAK's list belongs to ICT Technologies. This result can be explained by the restrictions of the Program Support Scheme. The maximum support amount in Stage 2 is 100,000 TRY and the maximum support duration is 12 months. These restrictions do not vary according to the technology group. Therefore, 12-months and 100,000 TRY is more than sufficient for the applicant whose business plan is in the ICT sector. However, it may not be sufficient for the entire technology verification process of some other technology groups such as biotechnology.

Table 3.14. TUBITAK's Successful Techno-entrepreneurs in terms of Technology Groups

Technology Groups	Techno-entrepreneurs	%
Information and Communication Technologies	18	50%
Biotechnology and Food and Environment	3	8%
Electric and Electronic Technologies	7	19%
Machinery Technologies	3	8%
Material Technologies	3	8%
Transportation, Defense, Energy and Textile Technologies	2	6%
TOTAL	36	100%

The gender distribution in TUBITAK's list of successful entrepreneurs is shown in Table 3.15. The percentage of female techno-entrepreneurs in the TUBITAK's list of successful entrepreneurs is 8%, which is lower than both the percentage of females within the supported entrepreneurs (which is 11%) and the percentage of females within the entire applicants list (which is 16%). These statistics may be interpreted as female techno-entrepreneurs having lower performance than men do; however, the sample size is too small to support this claim.

Table 3.15. TUBITAK's Successful Techno-entrepreneurs in terms of Gender

Gender	Techno-entrepreneurs	%
Female	3	8%
Male	33	92%
TOTAL	36	100%

The age distribution of TUBITAK's Successful Techno-Entrepreneurs List is presented in Table 3.16. Although the age distribution seems to follow the same trend with the statistics of applicants and supported entrepreneurs, the successful entrepreneurs at older ages than 34 is higher than the other groups. With this comparison, it can be interpreted that the older the techno-entrepreneur is, the higher the performance of his firm has.

Table 3.16. TUBITAK's Successful Techno-entrepreneurs in terms of Age

Age	Techno-entrepreneurs	%
20-24	1	3%
25-29	13	36%
30-34	10	28%
35-39	10	28%
40-44	1	3%
45-49	1	3%
50+	0	0%
TOTAL	36	100%

Table 3.17. presents the educational levels of TUBITAK's successful techno-entrepreneurs. The percentage of PhD holders in the application procedure is 14, while it is 21% among supported entrepreneurs. However, the PhD holder rate within successful entrepreneurs is 25%. Consequently, the higher education level techno-entrepreneurs have, the higher performance their firm has. Educational level may be a good explanatory variable for both entrepreneurs' performance of selection within the evaluation panels of the Support Program and NTBF's performance in the market after support.

Table 3.17. TUBITAK's Successful Techno-entrepreneurs in terms of Educational
Level

Educational Level	Techno-entrepreneurs	%
Undergraduate	16	44%
Master's	7	19%
Doctorate	9	25%
TOTAL	36	100%

The following statistics of TUBITAK's Successful Techno-entrepreneurs is regional distribution (Table 3.18.). The most successful techno-entrepreneurs live in Ankara, which is the capital city and where TUBITAK's Head Office is located. On the other hand, most of the applicants and supported entrepreneurs live in İstanbul. The reason behind this result can be estimated that even though İstanbul is the biggest city of Turkey and includes almost every market opportunity, it may be easier to reach the government and market players in Ankara than it is in İstanbul. Due to the fact that the ICT sector has the highest share among successful techno-entrepreneurs, the public ICT sector in Ankara is higher than the one in İstanbul. Moreover, most semi-public institutions in the space and defense sector, such as ASELSAN, HAVELSAN, and ROKETSAN are located in Ankara. Techno-entrepreneurs may be the sub-contractors of these semi-public institutions. As it can be observed in the city distribution tables, the numbers of rows starting from the data of all the applicants to those of the successful applicants. While the more developed cities stay on the list, the less developed cities are eliminated from the list when we move from table for all applicants to the table for successful applicants.

Table 3.18. TUBITAK's Successful Techno-entrepreneurs in terms of Regional
Distribution

City	Techno-entrepreneurs	%
Ankara	15	42%
Antalya	1	3%
Isparta	2	6%
İstanbul	14	39%
İzmir	1	3%
Kocaeli	1	3%
Konya	1	3%
Kütahya	1	3%
TOTAL	36	100%

Due to the lack of information in the TUBITAK Database, it is impossible to compare
the statistics displayed in the following tables of this section with the statistics of all
the applicants and the supported applicants.

Table 3.19. presents the existence of teamwork among TUBITAK's successful techno-
entrepreneurs. According to this table, 69% of the successful applicants indicated that
they worked with a team even after the support duration.

Table 3.19. TUBITAK's Successful Techno-entrepreneurs in terms of Teamwork
Existence

Teamwork Existence	Techno-entrepreneurs	%
Yes	25	69%
No	11	31%
TOTAL	36	100%

Table 3.20. shows information about whether or not the techno-entrepreneur is an academician at a university. It can have observed that 19% of the successful entrepreneurs were academicians at the universities.

Table 3.20. TUBITAK's Successful Techno-entrepreneurs in terms of Academician Status

Academician	Techno-entrepreneurs	%
Yes	7	19%
No	29	81%
TOTAL	36	100%

In Table 3.21., it is shown whether or not techno-entrepreneurs in TUBITAK's Successful Techno-Entrepreneurs List received venture capital investment. Venture Capital Investment data can also be used as both the explanatory and explained variable of NTBF's performance. As an explanatory variable it can increase the sales of NTBFs. In addition, as an explained variable, being able to receive venture capital investment can be a success measure of NTBFs. In either case, 22% of successful entrepreneurs indicated that they received venture capital investments.

Table 3.21. TUBITAK's Successful Techno-entrepreneurs in terms of Venture Capital Investment Status

Venture Capital Investment Status	Techno-entrepreneurs	%
Yes	8	22%
No	28	78%
TOTAL	36	100%

Finally, Table 3.22. shows the sales data of successful applicants. 86% of successful entrepreneurs had made their first sales and 14% of successful entrepreneurs were very close to selling their products. It is not surprising that 86% of the techno-entrepreneurs

on the list had made their first sale and 14% of them were very close to making their first sale since the selection criteria require this situation. The sales variable is important because as a performance measure, the binary sales variable is used in this study.

Table 3.22. TUBITAK's Successful Techno-entrepreneurs in terms of Sales Status

Sales Status	Techno-entrepreneurs	%
Yes	31	86%
Very close	5	14%
TOTAL	36	100%

3.1.3.2. Survey

In order to analyze the determinants of the early-stage performance of NTBFs supported by the Turkish government, the data available in the TUBITAK Database was not adequate. Therefore, to get more detailed information about the supported applicants, a survey was sent to 238 techno-entrepreneurs who were supported with the 2012 Call and 2013 Call of the 1512 Entrepreneurship Support Program. The survey was administered between July 2015 and September 2015 via e-mail. The survey was not administered to the techno-entrepreneurs supported within the scope of the 2014 Call of the Program since their support duration had not yet finished during the survey application. Techno-entrepreneurs who were supported within the scope of the 2012 and 2013 Call of the Program were selected as the survey respondents because they had completed the 1-year-support period of Phase 2 of the 1512 Entrepreneurship Support Program. Due to the fact that Phase 3 and Phase 4 are optional and Phase 2 is the stage where seed capital is given, only the Phase 2 alumni are chosen as survey applicants.

The survey included 25 multiple-choice questions and 2 open-ended questions. All the techno-entrepreneurs could answer all of the questions in fifteen minutes. The survey questions are given in Appendix 4.

The statistics regarding the survey respondents are stated in this section. Some data are available in the TUBITAK Database. These data of the survey respondents are also presented in this section to see the representation power of the survey respondents of all supported applicants sample. The other statistics which are not available in the TUBITAK Database is given in this section for a deeper analysis of the supported applicants.

Table 3.23. presents the call year in which the survey participants were supported. The percentage of survey participants who were supported within the scope of the 2012 Call of the Program was 33%; the same rate in the 2013 Call of the Program was 67%. The difference between the two percentages may be attributed to the fact that the accessibility of techno-entrepreneurs supported within the 2012 Call is getting harder. The e-mail addresses and telephones were not valid when the survey was sent to the supported techno-entrepreneurs. Many e-mails returned and telephones were not in use due to the fact that the time lag between the date of the survey administered and the time when the contact information was given by the techno-entrepreneur supported by the 2012 Call was more than 3 years. Therefore, analyzing the following statistics of the participants' according to years is not preferred.

Table 3.23. Survey Participants in terms of Call Years

Call Year	Survey Respondents	%
2012 CALL	31	33%
2013 CALL	64	67%
TOTAL	95	100%

Table 3.24. shows the technology groups of survey participants. Information and Communication Technologies, Machinery Technologies and Material Technologies adequately represent at the supported applicants. In contrast, the other technology groups seem to have a different distribution. Figure 3.2. shows the comparison of the technology groups of the supported applicants and the survey participants.

Table 3.24. Survey Participants in terms of Technology Groups

Technology Groups	Survey Respondents	%
Information and Communication Technologies	30	32%
Biotechnology and Food and Environment	9	9%
Electric and Electronic Technologies	24	25%
Machinery Technologies	9	9%
Material Technologies	4	4%
Transportation, Defense, Energy and Textile Technologies	19	20%
TOTAL	95	100%
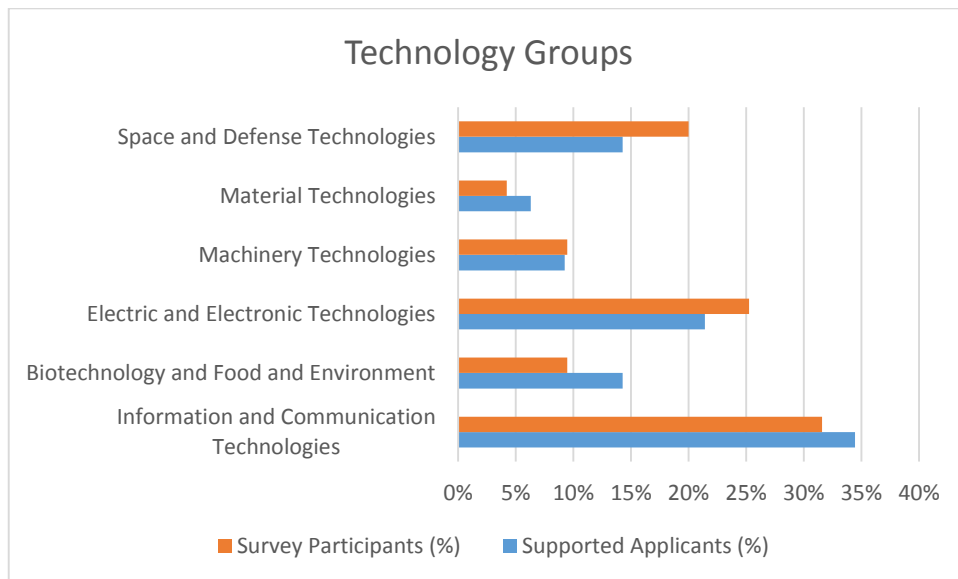
Figure 3.2. Comparison of Supported Applicants and Survey Participants in terms of Technology Groups

Table 3.25. represents the gender distribution of survey participants. In terms of the gender distribution of the supported applicants, the survey responses are representative. Figure 3.3. shows the comparison of the gender of the supported applicants and the survey participants.

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Table 3.25. Survey Participants in terms of Gender

Gender	Survey Respondents	%
Female	9	9%
Male	86	91%
TOTAL	95	100%
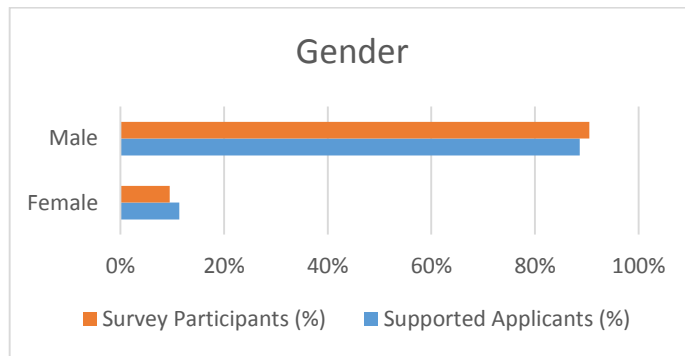
Figure 3.3. Comparison of Supported Applicants and Survey Participants in terms of Gender

Age distribution of the survey participants is shown in Table 3.26. According to age distribution, survey responses show similar trends with the statistics of the supported applicants. Therefore, the survey is representative in terms of age distribution. Figure 3.4. also shows the comparison of age distributions of the supported applicants and survey participants.

Table 3.26. Survey Participants in terms of Age

Age	Survey Respondents	%
20-24	0	0%
25-29	25	26%
30-34	31	33%
35-39	30	32%
40-44	4	4%
45-49	4	4%
50+	1	1%
TOTAL	95	100%
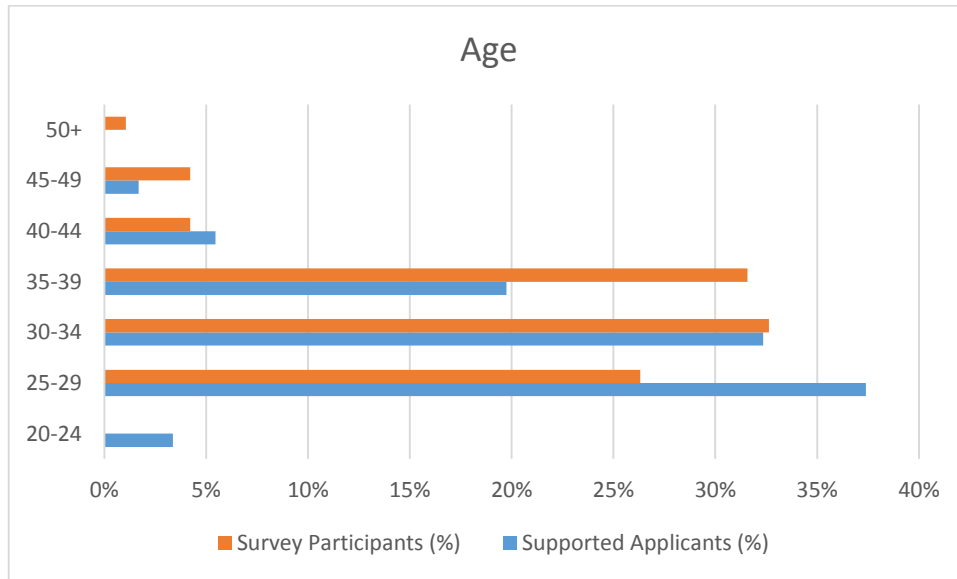
Figure 3.4. Comparison of Supported Applicants and Survey Participants in terms of Age

Level of education is also another indicator available in the TUBITAK Database. Therefore, the educational levels of the survey participants are comparable with the educational levels of the supported applicants in order to determine the representative

power of the survey in terms of educational levels of techno-entrepreneurs. Table 3.27. shows the educational levels of survey participants in a more detailed level of classification. Figure 3.6. shows the comparison of educational levels of the supported applicants and the survey participants in the same classification. As it can be seen in Figure 3.5. the survey was answered more by techno-entrepreneurs with a higher level of education.

Table 3.27. Survey Participants in terms of Educational Level

Educational Level	Survey Respondents	%
Undergraduate	17	18%
Graduate Student	15	16%
Graduate	21	22%
Doctorate Student	16	17%
Doctorate	26	27%
TOTAL	95	100%
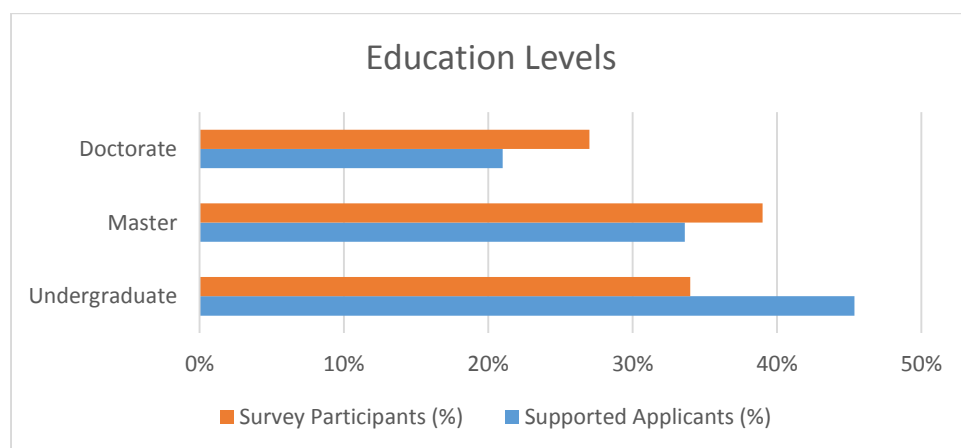
Figure 3.5. Comparison of Supported Applicants and Survey Participants in terms of Educational Levels

The last statistics also available in the TUBITAK Database is the city of the survey participants. Table 3.28. shows the regional distribution of the survey participants.

Figure 3.6. also presents the comparison of the regional distribution of the supported applicants and the survey participants. When the cities of survey participants are compared to the cities of the supported applicants, the distributions seem similar. Hence, survey results are representative in terms of regional distribution.

Table 3.28. Survey Participants in terms of Regional Distribution

City	Survey Respondents	%
Adana	3	3%
Ankara	28	29%
Antalya	2	2%
Bursa	1	1%
Denizli	2	2%
Elazığ	2	2%
Eskişehir	5	5%
İstanbul	34	36%
İzmir	6	6%
Kayseri	2	2%
Kocaeli	4	4%
Konya	4	4%
Sivas	1	1%
Trabzon	1	1%
TOTAL	95	100%
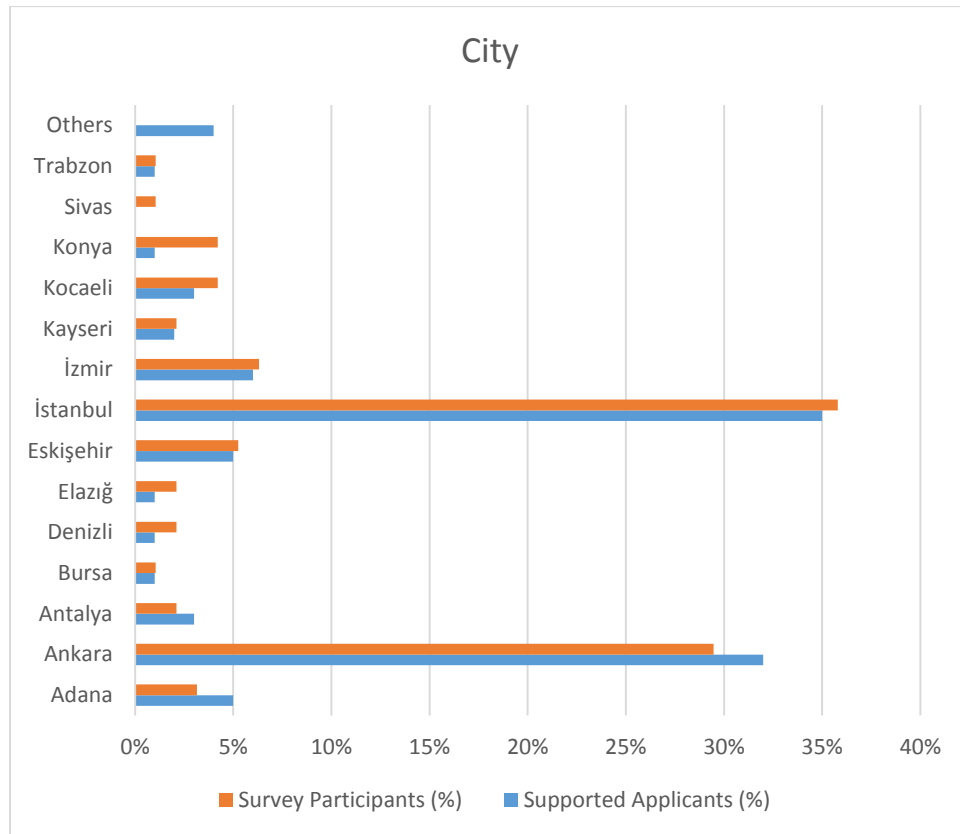
Figure 3.6. Comparison of Supported Applicants and Survey Participants in terms of Regional Distribution

Following statistics presented in this section is collected by means of the survey and were not reached via the TUBITAK Database. Hence, it is impossible to compare the following statistics with any belonging to the supported applicants. Figure 3.8. shows whether there is any entrepreneurship in the family of the survey participants. As it can be in Figure 3.7., very few techno-entrepreneurs (13%) have an entrepreneur in their families.
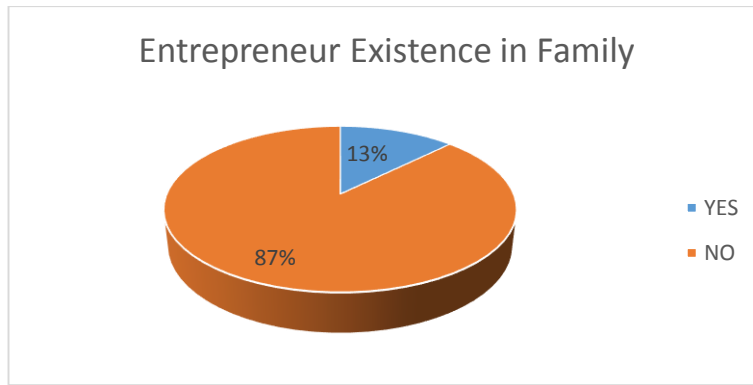
Figure 3.7. Survey Participants in terms of Entrepreneurship Existence in their
Family

Apart from the existence of a family entrepreneurship, whether the business idea of
the techno-entrepreneur was relevant or not to his/her education area was also asked
in the survey. Exactly half of the survey participants (50%) answered that their
business ideas were relevant to their exact expertise areas. Many of the participants
(43%) also stated that their business ideas were closely relevant to their education. The
relevance of the business idea and the education of techno-entrepreneurs are stated in
Figure 3.8.
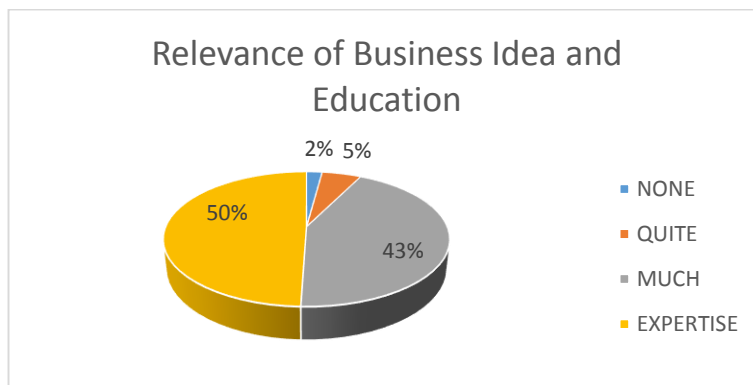
Figure 3.8. Survey Participants in terms of Relevance of Business Idea and
Education

Figure 3.9. presents the venture capital investment status of the survey participants. As
it has previously been indicated, the venture capital investment data can also be used
as both an explanatory and an explained variable of the NTBF's performance. As an
explanatory variable it can raise the sales of NTBFs. Furthermore, as an explained
variable, being able to receive venture capital investment can be a success measure of

NTBFs. As Figure 3.10. shows, only 3% of the survey participants received venture capital investment. Almost a quarter of the survey participants (26%) indicated that they continued to hold meetings with venture capitalists. Another quarter of them (24%) indicated that they did not need venture capital investment even though they were newly established technological based firms. It may be the true that they did not need venture capital investment to grow or they may not have been aware of the importance of venture capital investment in their growth potential. Venture capital status may be thought as one of the performance measures of NTBFs. However, only 3 of the survey respondents had received venture capital and this was a very low observation for analysis.
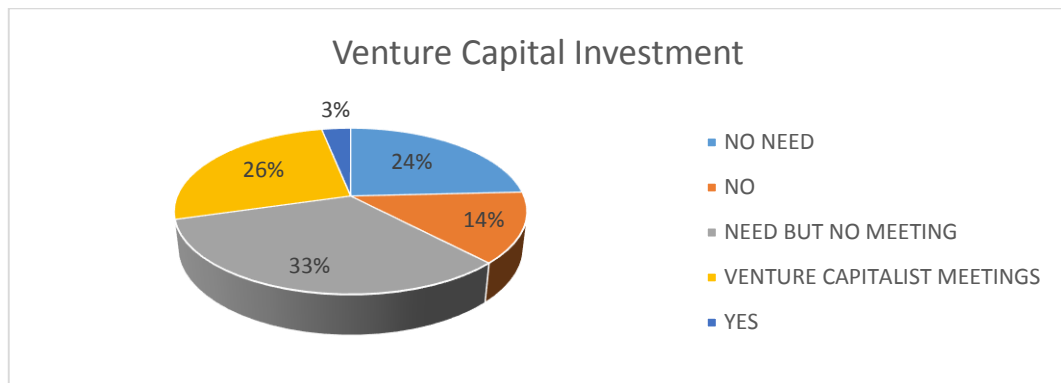
Figure 3.9. Survey Participants in terms of Venture Capital Investment Status

The other information collected via the survey was the working status of the techno-entrepreneurs. Since the 1512 Entrepreneurship Support Program does not limit working in another firm during the support period, some techno-entrepreneurs chose to work in another firm in order to offset the risk of techno-entrepreneurship. However, this risk-averse behavior may decrease the performance of NTBFs. Focusing only on their business idea is very important for techno-entrepreneurs. Some techno-entrepreneurs believe that techno-entrepreneurship was risky and that they should continue working at their better paid jobs and that they could do technologic validation of their business idea in their free times and on weekends. This opinion may be logical in order to decrease the risk of R&D and entrepreneurship. However, if a techno-entrepreneur does not devote enough attention to his/her business idea, the failure probability is likely to increase. Figure 3.10. shows the working status of the survey participants. As it can be observed in the figure, many of them (45%) chose to work

only at NBTFs established by the 1512 Entrepreneurship Support Program. Since almost a quarter of them (26%) are academicians, they work in NTBFs with the permission of their universities. The working hours of academicians are also subject to permission.
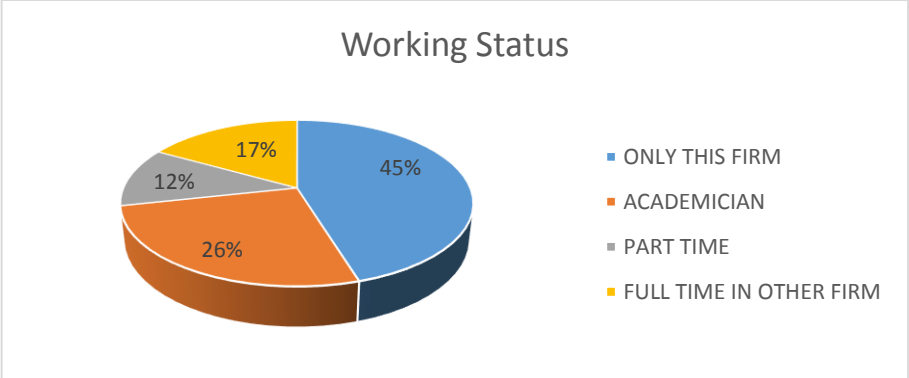
Figure 3.10. Survey Participants in terms of Working Status

The prior experience of techno-entrepreneurs was also asked in the survey. Prior entrepreneurship experience is presented in Figure 3.11., prior project experience is shown in Figure 3.12. and finally prior management and marketing experience or prior management or marketing education existence of techno-entrepreneurs is shown in Figure 3.13. As it can be observed in the figures, although most of the survey participants (77%) had prior project experience, very few of them had prior entrepreneurship experience (15%) and prior management experience or management education (40%). These experiences may be a determinant of the early-stage performance of NTBFs.
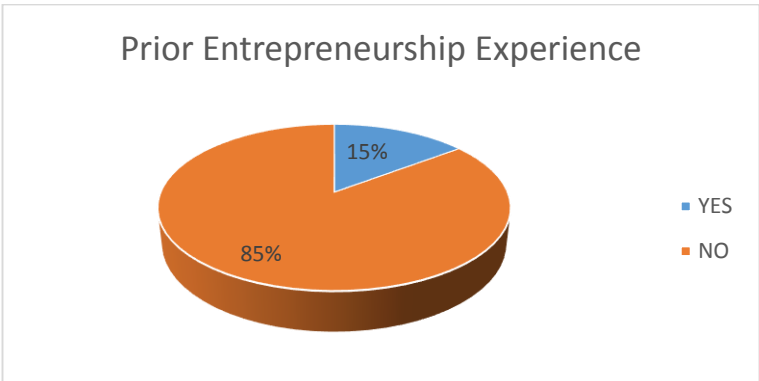
Figure 3.11. Survey Participants in terms of Prior Entrepreneurship Experience

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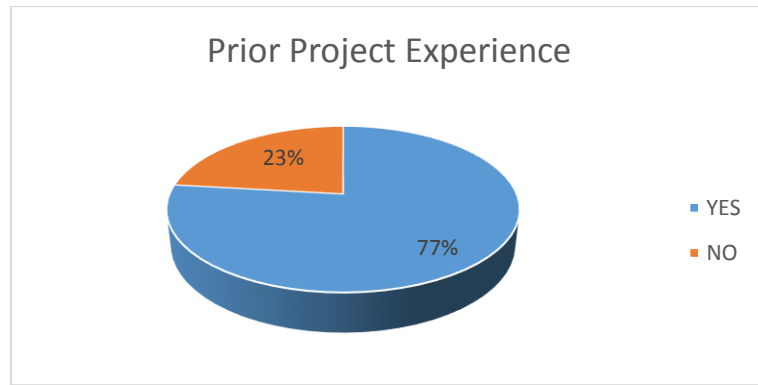
Figure 3.12. Survey Participants in terms of Prior Project Experience
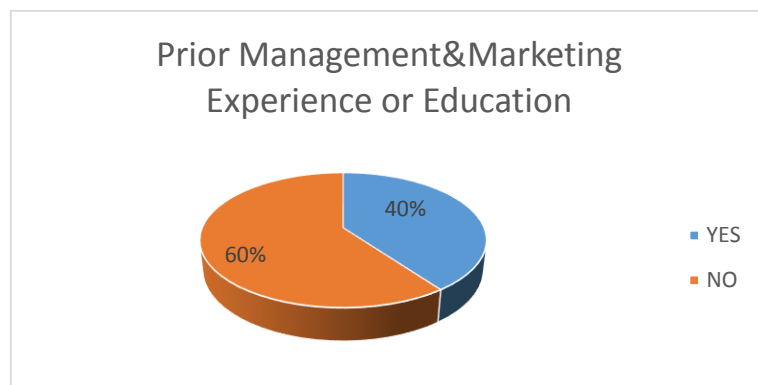
Figure 3.13. Survey Participants in terms of Prior Management/Marketing Experience or Management/Marketing Education

Company location may also be influential on the performances of NTBFs. 61% of the respondents locate their NTBFs in techno-cities or TEKMERs[12]. However, the rate of home offices and other locations is remarkably high (36%). For a NTBF doing technological innovations home offices and other locations are suitable for performance. Figure 3.14. shows the company locations of survey participants.

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[12] TEKMERs are incubation centers of NTBFS and are affiliated with the Small and Medium Industry Development Organization. NTBFs in TEKMERs are benefitting from some other governmental supports as firms in techno-cities. (https://usitem.cbu.edu.tr/db_images/site_402/file/tekmer.pdf)
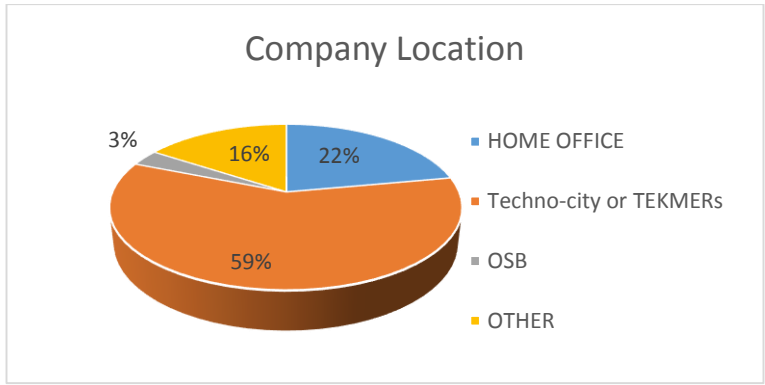
Figure 3.14. Survey Participants in terms of Company Location

Considering teamwork, an extremely high percentage (66%) of survey participants work with a team. Nonetheless, the total professional experience of this 66% is very low. 41% of the techno-entrepreneurs working with a team have less than 10-year professional experience cumulatively. Furthermore, 60% of the techno-entrepreneurs working with a team does not have any project experience with the same team. Although teamwork rate is high, the total cumulative professional experience of the team and the project experience with the same team is quite low. Figure 3.15. shows whether or not techno-entrepreneurs work with a team. In the case of teamwork existence, Figure 3.16. displays the total business experience of the team. In addition to this, in the case of teamwork Figure 3.17. shows whether or not the team has prior project experience with the same team.
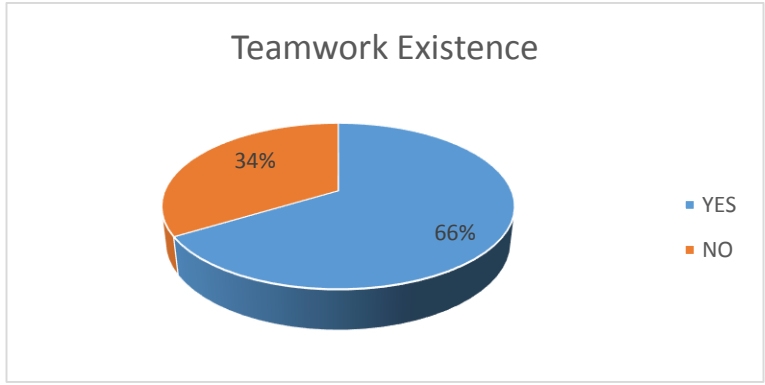
Figure 3.15. Survey Participants in terms of Teamwork Existence
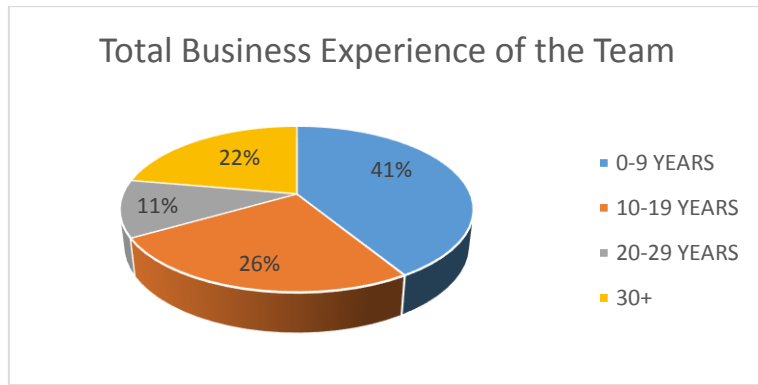
Figure 3.16. Survey Participants in terms of Total Business Experience Years in the Team
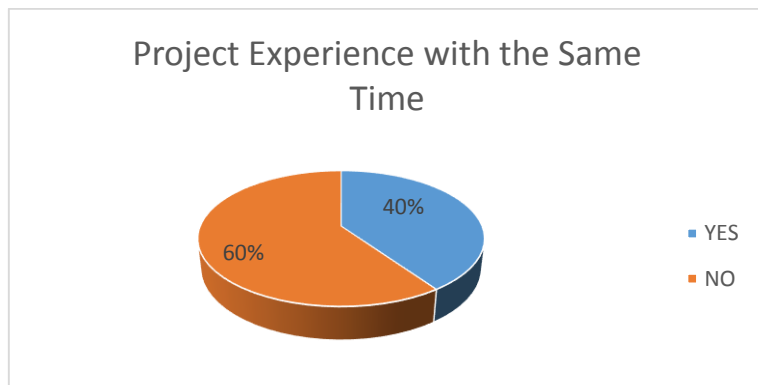
Figure 3.17. Survey Participants in terms of Project Experience with the Same Team

Finally, sales status is very important for the performance measure of NTBFs. Therefore, it is important to interpret the sales status results of the survey. The main desire of the program is to make every techno-entrepreneurs business ideas to be commercialized. However, the real world is risky for techno-entrepreneurs. Not every one of them is able to commercialize their business ideas after technologic verification. Even so, the sales rates of the project products (20%) is not so low. When it is considered that the other product sales can be counted as performance measures in terms of increasing the survival possibility of the NTBF, the rate turns out to be 39%. 43% of the survey participants continue to hold customer meetings in order to sell their products. Figure 3.18. shows the sales status of the survey participants.
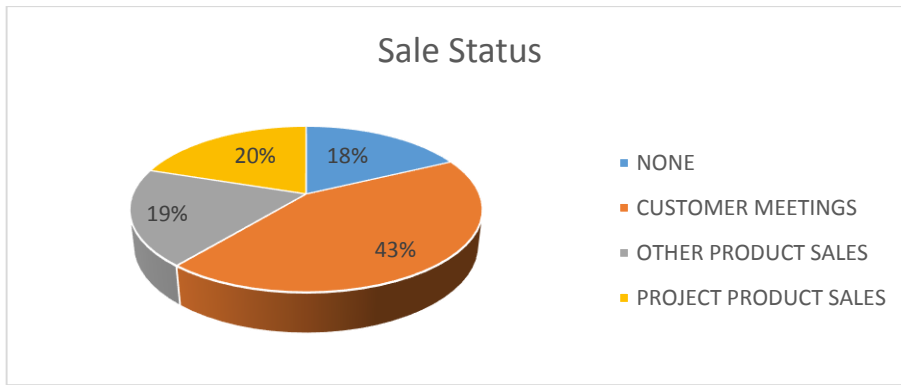
Figure 3.18. Survey Participants in terms of Sale Status

3.1.3.3. In-depth Interviews

The third data collection methodology of this study is in-depth interviews. Via in-depth interviews, more detailed data are collected in relation to the techno-entrepreneurs who are stated in TUBITAK's Successful Entrepreneurs List.

According to the success criteria of TUBITAK, 36 techno-entrepreneurs were found to be successful techno-entrepreneurs supported by the 1512 Support Program in the first two calls of the program. Exactly half of them (18 techno-entrepreneurs) were supported via the first call of the program and the other half were supported via the second call of the program. The techno-entrepreneurs who applied for the third call of the program were being supported during this study. Therefore, both TUBITAK and the author of this study could not evaluate the commercialization success/survival status of the the techno-entrepreneurs who were being supported via the third call of the program. The support duration ended in December 2015. To be able to analyze the success/survival status of that group, at least a one-year period should pass. January 2017 is the closest time for a good survival analysis of the techno-entrepreneurs supported via the third call of the program.

The statistics of TUBITAK's Successful Entrepreneurs List have previously been stated. Every successful techno-entrepreneur was asked to be interviewed. However, only 8 of them accepted to be interviewees in this study. The statistics of this group are explained in this section.

Interestingly, 7 of the 8 interviewees were from the ICT group; and the remaining one was from Defense Technologies. The total successful list of TUBITAK is comprised 50% of ICT group projects and 50% of those in the remaining groups. Therefore, in terms of technology group distribution, the interviewees are quite representative.

2 interviewees were between the age range of 25 and29; 3 of them were between 30 and34 years of age; and the age of 2 of them ranged between 35 and39. Only one of them was older than 45 years of age. Thus, the age distribution is also representative of all successful techno-entrepreneurs.

The level of education of the interviewees is also quite representative. 1 of them held an undergraduate degree; 1 of them was a Master's student; 1 of them held a Master's degree; 3 of them were PhD students and 2 of them held a PhD degree.

All interviewee techno-entrepreneurs were male. Thus, gender seems to be unrepresentative; there were only 3 female successful techno-entrepreneurs among the 36 samples. Therefore, this can not be scalable statistics.

In terms of city distribution, 4 interviewee firms were established in Ankara; the others were established in Isparta, İstanbul, İzmir and Kocaeli. City distribution is quite representative of all successful techno-entrepreneurs.

All of the interviewees had made their first sales. In order to enter the list of success stories of TUBITAK, the first sale or being very close to the first sale is a critical criterion.

Venture capital investment situation and academician situation are also representative. 2 of the 8 interviewees had venture investments and 2 of the 8 interviewees were academicians (1 full time; 1 half time), which is quite similar to the total successful list of statistics.

In terms of teamwork, the interviewee group data are quite representative due to the fact that all of them have teamwork in their jobs and almost the same teams continue to work at the firm.

To sum up, in terms of all the statistics, the interviewee group is sufficiently representing TUBITAK's Successful Entrepreneurs List.

3.2. The Methodology

In the previous part of this chapter, the data have been explained. In the second part of this chapter the analysis methodologies used in this study are explained. Both quantitative and qualitative analysis methodologies are used in this study. The analysis methodologies are explained respectively. After the analysis methodologies are presented, the results of these quantitative and qualitative analysis are explained in the following section.

3.2.1. Quantitative Analysis Methodology

The first analysis methodology employed in this study was the quantitative analysis methodology. Firstly, the theoretical framework regarding the quantitative analysis methodology utilized in this study is explained briefly. Then the econometric models are explained.

3.2.1.1. Theoretical Framework

Regression analysis is one of the main quantitative analysis tools for non-experimental social science researchers. After researchers carefully collect the data, they generally run the Ordinary Least Squares (OLS) regression which is the most common regression type. However, sometimes OLS produces biased estimates due to some certain characteristics of the data (Breen, 1996). The problematic forms of data discussed by Breen (1996) are censored, sample-selected, or truncated data. He explains these data types with the following table.

Table 3.29. Censored, Sample-Selected, and Truncated Samples

Sample	y Variable	Explanatory Variables
Censored	y is known exactly only if some criterion defined in terms of the value of y is met, such as $y>c$. y is a truncated random variable.	x variable values are observed for all of the sample, regardless of whether y is known exactly.
Sample Selected	y is observed only if some criterion defined in terms of another random variable, z is met, such as if $z = 1$. y is a truncated random variable.	x and w are observed for all of the sample, regardless of whether y is observed or not.
Truncated	y is observed only if some criterion defined in terms of the value of y is met, such as $y>c$. y is a truncated random variable.	Explanatory variables are observed only if y is observed.

Source: Breen (1996)

In reference to these different types of data, the data used in the present study is sample-selected data. In order to commercialize his business idea, the techno-entrepreneur must be supported by the 1512 Entrepreneurship Support Program. All applicants to the program are analyzed in terms of sale status under the condition that they are supported by the 1512 Entrepreneurship Support Program.

There are numerous examples of sample-selected data in the social science literature. One of the most commonly used areas of sample selection models is the evaluation research. To illustrate, sample selection models are used in the study of the impact of labor market programs where participation in the program is not random. Therefore, in order to analyze the determinants of participation, the researcher must model both the selection process and the outcome of the program (Breen, 1996). Hence, in the present study, sample selection models are used to analyze the determinants of the early-stage performance of NTBFs supported by the government. In order to do this analysis, we first model the determinants of the "support status of all applicants". Then, we model the determinants of the "sale status of the supported applicants".

There are many sample-selection models. In this study, the "Probit Model with Sample Selection" is used for analysis of both selection equation and outcome equation since the dependent variable of selection equation (support status) and the dependent variable of outcome equation (sale status) are both dichotomous.

Three possible approaches to analyze sample-selected data are a naive OLS, the Heckman two-stage estimator and maximum likelihood (ML). Estimates obtained by OLS is both biased and inconsistent. Heckman two-stage estimators are consistent. ML estimators are also asymptotically unbiased and asymptotically normal. Moreover, ML estimators are generally preferred since ML estimators are more efficient than the two-stage estimators (Breen, 1996). Therefore, the ML approach is chosen for the quantitative analysis of this study.

3.2.1.2.   Econometric Models

To be able to analyze the early-stage performance of NTBFs supported by the 1512 Entrepreneurship Support Program, the two-stage sample selection model should be utilized since in order to be supported by the program, the entrepreneur first has to apply to the program. The program has some applicant criteria. There is also an elimination process in the program. In the first two years of the Program, 1965 applicants had applied for support and only 238 applicants were found to be supportable. Therefore, in the first stage, the models determine the influencing factors on being able to get the 1512 Entrepreneurship Support. What are the determinants of getting techno-entrepreneurship support? In the second stage, the models determine the influencing factors to be able to survive in market as a techno-entrepreneurship supported by the 1512 Entrepreneurship Support Program. What are the determinants of performing higher in market as a techno-entrepreneurship?

The econometric models used in the quantitative analysis of this study are explained in this section. STATA is one of the general-purpose statistical software programs and has been used for quantitative analysis in the present study. Therefore, variables collected from the TUBITAK Database and the survey for quantitative analysis were organized according to STATA. The variables used in the quantitative analysis are presented below.

The independent variables of the selection equations were used to explain the situation whether or not the techno-entrepreneur was supported by government. If he/she was supported by the 1512 Entrepreneurship Support Program, then the dependent variable of the selection equations (support) took the value of "1". Otherwise, the dependent variable of the selection equations (support) took the value of "0".

The independent variables used in the selection equation models were listed alphabetically as age, city_index, city_tto, PhD, uni_index, uni_technic, and uni_tto.

The effect of age on support was not a strict hyphothesis of the study. Therefore, the sign of age was ambiguous.

The city_index variable was taken from the Socio-economic Development Index of Cities and Regions in Turkey[13]. The Socio-economic Development Indices of Cities and Regions in Turkey (SEGE) were measured by Turkish Ministry of Development in 2011. This represents the Socio-economic Development Index of the city where the techno-entrepreneur lives. The hypothesis behind this is that the more developed the city where the techno-entrepreneur lives is in terms of socio-economic development, the better technological business plan he will draw and the more likely it will be for him to be supported by the government. Therefore, the expected sign of the city_index was positive.

City_tto is another variable used as an independent variable among the selection equations. This variable took the value of "1" if there was a technology transfer office in the city where the techno-entrepreneur lived. Otherwise, city_tto took the value of "0". Although technology transfer offices (TTOs) are very new in Turkey, the existence of TTOs in the city where the techno-entrepreneur lives may increase the possibility of the techno-entrepreneur's being supported. Due to the fact that one of the mission of TTOs is providing pre-incubation services, the techno-entrepreneur has the possibility to receive assistance, such as in enhancing his business plan, from the TTO in the city where he lives. Therefore, the expected sign of city_tto was positive.

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[13] Detailed information can be reached through "http://www.kalkinma.gov.tr/Lists/Yaynlar/Attachments/548/SEGE-2011.pdf"

Whether techno-entrepreneur has a PhD degree or not is thought to be an explanatory variable on whether or not the techno-entrepreneur is able to get the support. The hypothesis regarding this variable is that the more knowledge an techno-entrepreneur has about his technological business idea, the better technological business plan he/she will draw and the more likely it is for him/her to be supported by the government. Here, holding a PhD degree is used as an indicator of knowledge. Therefore, the expected sign of the PhD variable was positive in the selection equations.

Other variables used to explain the support situation of the techno-entrepreneur is uni_index, which represents the Entrepreneurship an Innovation Index of the university where the techno-entrepreneur graduated from. The Entrepreneurship and Innovation Index of the Universities in Turkey have been measured by TUBITAK each year since 2012. [14] The hypothesis underlying this variable is that the higher the innovativeness of the university from which the entrepreneur or techno-entrepreneur graduated is, the better business idea he/she will draw and the more likely it will be for him/her to be supported by the government. Here, uni_index is used as an indicator of entrepreneurship environment and connections of techno-entrepreneurs. Therefore, the expected sign of the uni_index variable was positive.

The other variable related with the university which the techno-entrepreneur graduated from is uni_technic. This variable took the value of "1" if the techno-entrepreneur had graduated from a technical university which focuses on technical education. Otherwise, the uni_technic variable took a value of "0". The hypothesis behind this variable is that if the techno-entrepreneur had graduated from a technical university, then the technical education which the techno-entrepreneur received in university was better. Therefore, he/she has better technological knowledge and, thus, it is more likely for him/her to draw better technological ideas. Then, the possibility to get support from the 1512 Entrepreneurship Support Program will increase. Therefore, the expected sign of the uni_technic variable was positive.

The last independent variable among the selection equations is uni_tto. Uni_tto took "1" if the university which the techno-entrepreneur graduated from had a TTO.

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[14] Detailed information can be reached through
"https://www.tubitak.gov.tr/tr/kurumsal/politikalar/icerik-girisimci-ve-yenilikci-universite-endeksi"

Otherwise, it took the value of "0". As in the city_tto variable, although TTOs are very new in Turkey, the existence of TTOs in the university which the techno-entrepreneur graduated from may increase the possibility of the techno-entrepreneur's receiving support. Due to the fact that one of the mission of TTOs is providing pre-incubation services, the techno-entrepreneur has the possibility to receive assistance, such as in enhancing his business plan, from the TTO in the city where he lives. Therefore, the expected sign of the uni_tto was positive.

The aforementioned dependent and independent variables used in the selection equations in the quantitative analysis are presented in Table 3.30.

Tablo 3.30. Variables in Selection Equations of Quantitative Analysis

Notation	Definition	Value	Literature Link	Expected Sign
age	The age of techno-entrepreneur when he/she apply to the program	exact value	Ciaverella et al. (2004), Colombo and Grilli (2005)	?
city_index	Socio-economical Development Index of Cities and Regions in Turkey	exact value	Sandberg and Hofer (1988), Gartner et al. (1999), Davidsson and Honig (2003), Chorev and Anderson (2006), Petti and Zhang (2011)	+
city_tto	Technology Transfer Office (TTO) existence in the city where techno-entrepreneur live	yes:1; no:0	Sandberg and Hofer (1988), Gartner et al. (1999), Davidsson and Honig (2003), Petti and Zhang (2011)	+
PhD	Holding PhD degree dummy	yes:1; no:0	Stuart and Abetti (1990), Jo and Lee (1996), Storey and Tether (1998), Arora and Faraone (2003), Oakey (2003), Colombo et al. (2004), Hindle and Yencken (2004), Colombo and Grilli (2005), Bulsara et al. (2009), Tajeddini and Mueller (2009), Okamuro et al. (2011)	+
uni_index	The Entrepreneurship and Innovation Index of the university which techno- entrepreneur has graduated from	exact value	Arore and Faraone (2003), Davidsson and Honig (2003)	+
uni_techni c	Whether the university which techno-entrepreneur has graduated from is a technical university or not	yes:1; no:0	Arore and Faraone (2003), Davidsson and Honig (2003)	+
uni_tto	Technology Transfer Office (TTO) existence in the university which techno- entrepreneur has graduated from	yes:1; no:0	Arore and Faraone (2003), Davidsson and Honig (2003)	+
support	Support dummy (dependent variable)	yes:1; no:0		

The dependent variable of the outcome equations is "sale". Sale took the value of "1" if the techno-entrepreneur had commercialized his/her business idea and had made his/her first sale. Otherwise, it took the value of "0". The reason why "sale" was used as a dependent variable in outcome equations is explained as follows. The target population in this analysis is the alumni of the 1512 Entrepreneurship Support Program. Half of them were 2 year-old NTBFs and the other half were 1.5 year-old NTBFs when the data were collected via the survey. Besides, in terms of the financial perspective, the first year was completed with the capital support of the 1512 Entrepreneurship Support. The other indicators used to measure the performance of NTBFs in literature (such as profitability, growth rate, market share etc.) were not appropriate for 1.5 year-old and 2 year-old NTBFs. Therefore, whether or not NTBF had made their first sale was used as a measure of the "early-stage performance" of NTBFs supported by the government.

The independent variable used in the selection equations to analyze the determinants of the first sale status of NTBFs supported by the government are alphabetically academician, age2, female, ICT, PhD, prior_entre, prior_management, prior_project, team, and working.

Being an academician is used as an independent variable of the outcome equation. The academician variable was given the value of "1" if the techno-entrepreneur was an academician at a university. Otherwise the academician variable was "0". The hypothesis behind using the academician variable as an independent variable of the outcome equation was that academic spin-off firms could perform higher than the other NTBFs as stated in the literature review chapter. Therefore, the expected sign of the academician variable was positive.

The Age2 variable was used as an independent variable in outcome equations. The Age variable refers to the age of the techno-entrepreneur at the point when he/she applied to the 1512 Entrepreneurship Program. Age2 variable is the squared value of the age of the techno-entrepreneur at the point when he/she applied to the Program. The literature about the relationship between age and the early-stage performance is not clear. Some researchers defend that age is positively related with the performance. The hypothesis behind the age variable is that age may positively be related with

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performance if age is used as an indicator of experience since very young techno-entrepreneurs may have less experience than older techno-entrepreneurs. However, counter arguments in literature assert that entrepreneurship requires risk taking characteristics. The trait of being a risk lover decreases when the age increases. In order to separate these conflicting inferences, in the present study age2 was used as an independent variable of outcome equation. The hypothesis behind age2 variable is that the shape of the relationship between age and the early-stage performance of NTBFs supported by the government may be inverse U shaped. Therefore, the expected sign of age2 was positive.

Gender is one of the indicators used in outcome equations. The female variable was given the value of "1" if the techno-entrepreneur was a female and "0" if he was a male. The relationship between gender and the performance of NTBFs is also unclear in literature. Therefore, there was no expectation about the sign of the female variable.

The sectorial difference may also be a determinant of the early-stage performance of NTBFs. Products and services belonging to some specific sectors may be commercialized easier than in other sectors. Since the analysis is for the early-stage performance of NTBFs, sectorial difference is made based on whether or not NTBF operates in ICT. The ICT variable was "1" if the supported NTBFs operate in the ICT sector. Otherwise, it took the value of "0". The hypothesis behind the ICT variable and performance of NTBFs is that if the NTBF operates in the ICT sector, the early-stage performance of NTBF increases. Products and services produced by the ICT sector may be faster and rather easier to commercialize. The rate of business ideas related to ICT in the supported enterprises of the 1512 Support Program is 35%, while the rate of business ideas related to ICT in successful enterprises is 50%. Mostly, at the end of the second phase of the 1512 Entrepreneurship Support Program, NTBFs operating in the ICT sector have the commercial prototype or the final products or services ready for the market. This survey was implemented 2 years after the 2nd phase of the 2nd stage support for techno-entrepreneurs supported via the 2012 Calls; 1.5 years later for the techno-entrepreneurs supported via the 2013 Calls. Thus, operating in the ICT sector was expected to have a positive effect on the performance of NTBFs since 2 years and 1.5 years are quite early for commercialization of the business ideas in comparison

with the other technology areas such as biotechnology, machinery etc. Therefore, the expected sign of the ICT variable was positive.

Although PhD was used as an independent variable in the selection equations, it was also used as an independent variable in outcome equations. PhD is used in the outcome equations as an indicator of knowledge and educational level. In literature, educational level and knowledge are positively related with the performance of NTBFs. The more educated the techno-entrepreneurs are, the better their NTBF performance is. Also, the more knowledge techno-entrepreneur has, the better their NTBF performance is. Therefore, the expected sign of the PhD variable in the outcome equations was positive.

The prior experiences of the techno-entrepreneurs were also used in outcome equations as indicators of the performance of NTBFs. If techno-entrepreneurs had entrepreneurship experience before they were supported by the 1512 Entrepreneurship Support Program, then prior_entre variable took the value of "1"; otherwise it took the value of "0". Similarly, if techno-entrepreneurs had project experience before they were supported by the 1512 Entrepreneurship Support Program, then the prior_project variable took the value of "1"; otherwise it took the value of "0". Again, if techno-entrepreneurs had management and/or marketing experience before they were supported by the 1512 Entrepreneurship Support Program, then the prior_management variable took the value of "1"; otherwise it took the value of "0". Literature on prior experiences maintains that prior experiences have positive effects on the performance of NTBFs. The hypothesis behind the positive relation with the prior experiences and performance of NTBFs is that the more experienced techno-entrepreneurs are, the better the NTBF performs. Therefore, the expected signs of prior_entre, prior_management and prior_project were positive.

Team is another variable was used as an independent variable of outcome equations. In literature, teamwork existence is positively related with the performance of NTBFs. The hypothesis underlying this variable is that NTBFs run with teamwork may perform better than the NTBF run without teamwork. Therefore, the expected sign of the team variable was positive.

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The last independent variable used to explain the determinants of the early-stage performance of NTBFs is working. The working variable was "1" if the techno-entrepreneur dedicated himself/herself to the NTBF supported by the government; otherwise it took "0". Since the 1512 Entrepreneurship Support Program does not impose restrictions upon working in another firm during the support period, some techno-entrepreneurs choose to work in another firm in order to offset the risk of techno-entrepreneurship. However, this risk-averse behavior may decrease the performance of NTBFs. Focusing only on their business idea is very important for techno-entrepreneurs. Some techno-entrepreneurs believe that techno-entrepreneurship is risky and that they should continue working in their better paid job, and that they could do the technologic validation of their business idea in their free times and on weekends. This opinion may be logical in order to decrease the risk of R&D and entrepreneurship. However, if a techno-entrepreneur does not devote enough attention to his/her business idea, the failure probability will increase. Therefore, the expected sign of the working variable was positive.

The aforementioned dependent and independent variables used in the outcome equations in the quantitative analysis are presented in Table 3.31. Table 3.31. Variables Used in Outcome Equations in Qualitative Analysis

Table 3.31. Variables Used in Outcome Equations in Qualitative Analysis

Notation	Definition	Value	Data Source	Survey Question	Literature Link	Expected Sign
academician	Being an academician dummy	yes:1; no:0	Survey	17	Wright et al. (2007)	?
age2	The square of the age of techno-entrepreneur	Age square	TUBITAK Database	-	Ciaverella et al. (2004), Colombo and Grilli (2005)	?
female	Gender dummy	female:1; male:0	TUBITAK Database	-	Sexton and Upton (1990), Ciaverella et al. (2004)	?
ICT	ICT group dummy	yes:1; no:0	TUBITAK Database	-	Sandberg and Hofer (1988), Herron and Robinson (1993), Ciaverella et al. (2004), Okamuro et al. (2011), Petti and Zhang (2011)	+
PhD	Holding PhD degree dummy	yes:1; no:0	TUBITAK Database	-	Stuart and Abetti (1990), Jo and Lee (1996), Storey and Tether (1998), Arora and Faraone (2003), Oakey (2003), Colombo et al. (2004), Hindle and Yencken (2004), Colombo and Grilli (2005), Bulsara et al. (2009), Tajeddini and Mueller (2009), Okamuro et al. (2011)	+
prior_ent re	Prior entrepreneurship experience dummy	yes:1; no:0	Survey	18	Duchesneau and Garner (1990), Stuart and Abetti (1990), Jo and Lee (1996), Kakati (2003), Colombo et al. (2004), Chorev and Anderson (2006), Bulsara et al. (2009), Tajeddini and Mueller (2009), Okamuro et al. (2011)	+
prior_ma nagemen t	Prior management and marketing experience dummy	yes:1; no:0	Survey	21	Duchesneau and Garner (1990), Stuart and Abetti (1990), Jo and Lee (1996), Kakati (2003), Colombo et al. (2004), Chorev and Anderson (2006), Bulsara et al. (2009), Tajeddini and Mueller (2009), Okamuro et al. (2011)	+
prior_pro ject	Prior project experience dummy	yes:1; no:0	Survey	19	Stuart and Abetti (1990), Jo and Lee (1996), Kakati (2003), Colombo et al. (2004), Chorev and Anderson (2006), Bulsara et al. (2009), Tajeddini and Mueller (2009), Okamuro et al. (2011)	+
team	Teamwork dummy	yes:1; no:0	Survey	7	Stuart and Abetti (1987), Thamhain (1990), Oakey (2003), Colombo and Grilli (2005), Chorev and Anderson (2006)	+
working	Working full time on the NTBF dummy	yes:1; no:0	Survey	17	Wright et al. (2007)	+
sale	First sale status dummy (dependent variable)	yes:1; no:0	Survey	10		

Variables presented in the previous table are set as 8 different econometric models using "Probit with Sample Selection Model" Methodology. The econometric models used in this study are represented in Table 3.32. In Table 3.32, the first column represents the number of models. The second column is for the selection equation of the relevant econometric model. The dependent variable of all the selection models was "support", which refers to whether or not the techno-entrepreneurship was supported by TUBITAK. The third column of Table 3.32 represents the outcome equations. The dependent variables of all the outcome equations was "sale", which refers to whether or not the supported techno-entrepreneur had done his/her first sale. The last column represents the athrho values of relevant econometric models. Athrho values show the inverse hyperbolic tangent of rho (ρ) and is used as an indicator of rho in sample selection models. If $\rho = 0$, the sum of the log likelihoods from these two models will equal the log likelihood of the probit model with sample selection; this sum is printed in the iteration log as the comparison log likelihood.[15]

In Model 1, PhD, uni_tto, uni_index, uni_technic, city_tto and city_index variables were used to analyze whether or not the techno-entrepreneur is supported by the 1512 Entrepreneurship Support Program. ICT, PhD, working, team, prior_entre, prior_project, prior_management variables were used to analyze whether or not the NTBF supported by the 1512 Entrepreneurship Support Program had made the first sale. The Athrho value was significantly different from zero and rho equaled 1. Therefore, the two models were significantly dependent of each other.

In Model 2, PhD, uni_index, uni_technic, city_tto, city_index variables were used to analyze whether or not the techno-entrepreneur was supported by the 1512 Entrepreneurship Support Program. ICT, PhD, working, team, prior_entre, prior_project, prior_management variables were used to analyze whether or not the NTBF supported by the 1512 Entrepreneurship Support Program had made the first sale. The Athrho value was significantly different from zero and rho was equal to 1. Therefore, two models were significantly dependent of each other.

In Model 3, PhD, city_index, uni_index, uni_technic variables were used to analyze whether or not the techno-entrepreneur was supported by the 1512 Entrepreneurship

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[15] http://www.stata.com/manuals13/rheckprobit.pdf

Support Program. ICT, age2, PhD, working, team variables were used to analyze whether or not the NTBF supported by the 1512 Entrepreneurship Support Program had made the first sale. The Athrho value was significantly different from zero and rho was equal to 1. Therefore, the two models were dependent of each other significantly.

In Model 4, PhD, uni_tto, uni_index, uni_technic, city_index variables were used to analyze whether or not the techno-entrepreneur was supported by the 1512 Entrepreneurship Support Program. ICT, PhD, working, team, prior_entre, prior_project, prior_management variables were used to analyze whether or not the NTBF supported by the 1512 Entrepreneurship Support Program had made the first sale. The Athrho value was different from zero and rho was equal to 1 but the athrho value was insignificant. Therefore, we can not reject the null hyphothesis that two models are independent of each other.

In Model 5, PhD, uni_index, uni_technic, city_index variables were used to analyze whether or not the techno-entrepreneur was supported by the 1512 Entrepreneurship Support Program. ICT, PhD, working, prior_entre, prior_project, prior_management variables were used to analyze whether or not the NTBF supported by the 1512 Entrepreneurship Support Program had made the first sale. The Athrho value was different from zero and rho was equal to 1 but the athrho value was insignificant. Therefore, we cannot reject the null hyphothesis that the two models are independent of each other.

In Model 6, PhD, uni_index, uni_technic, city_index variables were used to analyze whether or not the techno-entrepreneur was supported by the 1512 Entrepreneurship Support Program. ICT, female, PhD, team, working, prior_entre, prior_project, prior_management variables were used to analyze whether or not NTBF was supported by the 1512 Entrepreneurship Support Program had made the first sale. The Athrho value was different from zero and rho was equal to 1 but the athrho value was insignificant. Therefore, we cannot reject the null hyphothesis that the two models are independent of each other.

In Model 7, PhD, age, city_tto, city_index variables were used to analyze whether or not the techno-entrepreneur was supported by the 1512 Entrepreneurship Support Program. ICT, PhD, working, academician, team variables were used to analyze

whether or not the NTBF supported by the 1512 Entrepreneurship Support Program had made the first sale. The Athrho and rho values were insignificantly very close to zero. Therefore, we cannot reject the null hyphothesis that the two models are independent of each other.

In Model 8, PhD, uni_index, uni_technic, city_index variables were used to analyze whether or not the techno-entrepreneur was supported by the 1512 Entrepreneurship Support Program. ICT, PhD, working, team, prior_entre, prior_project, prior_management variables were used to analyze whether or not the NTBF supported by the 1512 Entrepreneurship Support Program had made the first sale. The Athrho value was different from zero and rho was equal to 0.999 but the athrho value was insignificant. Therefore, we cannot reject the null hyphothesis that the two models are independent of each other.

The aforementioned econometric models used in the quantitative analysis of this study are represented in Table 3.32.

Table 3.32. Econometric Models used in the Quantitative Analysis

Models	Selection Equation	Outcome Equation	Athrho
Model 1	Dependent variable: support Independent variables: PhD, uni_tto, uni_index, uni_technic, city_tto, city_index	Dependent variable: sale Independent variables: ICT, PhD, working, team, prior_entre, prior_project, prior_management	14.08 ** (rho=1)
Model 2	Dependent variable: support Independent variables: PhD, uni_index, uni_technic, city_tto, city_index	Dependent variable: sale Independent variables: ICT, PhD, working, team, prior_entre, prior_project, prior_management	15.04 *** (rho=1)
Model 3	Dependent variable: support Independent variables: PhD, city_index, uni_index, uni_technic	Dependent variable: sale Independent variables: ICT, age2, PhD, working, team	15.29 *** (rho=1)
Model 4	Dependent variable: support Independent variables: PhD, uni_tto, uni_index, uni_technic, city_index	Dependent variable: sale Independent variables: ICT, PhD, working, team, prior_entre, prior_project, prior_management	12.47 (rho=1)
Model 5	Dependent variable: support Independent variables: PhD, uni_index, uni_technic, city_index	Dependent variable: sale Independent variables: ICT, PhD, working, prior_entre, prior_project, prior_management	11.35 (rho=1)
Model 6	Dependent variable: support Independent variables: PhD, uni_index, uni_technic, city_index	Dependent variable: sale Independent variables: ICT, female, PhD, team, working, prior_entre, prior_project, prior_management	13.55 (rho=1)
Model 7	Dependent variable: support Independent variables: PhD, age, city_tto, city_index	Dependent variable: sale Independent variables: ICT, PhD, working, academician, team	-0.156 (rho=-0.155)
Model 8	Dependent variable: support Independent variables: PhD, uni_index, uni_technic, city_index	Dependent variable: sale Independent variables: ICT, PhD, working, team, prior_entre, prior_project, prior_management	8.464 (rho=0.999)

3.2.2. Qualitative Analysis Methodology

The in-depth interview is one of the favored data collection methodologies used in qualitative research (Legard et al. (2003), Boyce and Neale (2006), Opdenakker (2006), Guion et al. (2011)). The in-depth interview is a qualitative research methodology which aims to search the detailed perspective of interviewees on a particular idea, program or situation via intensive individual interviews with a small number of respondents (Boyce and Neale (2006). The in-depth interview is a tremendous way to plan and evaluate programs since in this methodology, the interviewer is able to explore the respondent's feelings and perspective towards a subject (Guion et al. (2011)).

Generally, in-depth interviews are appropriate when the researcher wants to ask open-ended questions which produce in-depth information from relatively few people as opposed to surveys which are more quantitative and applied to larger numbers of people (Guion et al. (2011)). When the researcher wants detailed information about a person's ideas and behaviors or wants to search new issues in depth, in-depth interviews are suitable (Boyce and Neale (2006)). Therefore, in order to get deeper information to analyze the determinants of the early-stage performance of NTBFs which are established by the 1512 Entrepreneurship Support Program, in-depth interviews are chosen for the qualitative analysis methodology of this study.

Guion et al. (2011) list the key characteristics of in-depth interviews as including open-ended questions, having a semi-structured format, seeking understanding and interpretation and recording responses. They also state that in-depth interviews do not only consist of asking questions, but also include systematical recording and documenting of the responses in order to deduce deeper meaning and understanding. Legard et al. (2003) also list the key features of in-depth interviews as combining structure with flexibility, being interactive in nature, using various probes and other techniques to achieve in-depth answers, creating new knowledge or thoughts and understanding meanings, which implies that the interview data need to be captured in their natural form, which is face-to-face.

The steps of in-depth interviews are defined in different ways. According to Kvale (1996), the steps are thematizing, designing, interviewing, transcribing, analyzing,

verifying and reporting. Boyce and Neale (2006) list the steps as planning, developing instruments, collecting data, analyzing data and disseminating findings. Another classification of the steps involved in-depth interviews belongs to Legard et al. (2003). According to Legard et al. (2003), the steps of in-depth interviews are arrival, the introduction of the research, the beginning of the interview, the interview and the post-interview. Although the classifications are different from each other, the content of the steps are similar. Hence, all these steps are carefully followed in this study.

There are advantages and limitations of the in-depth interview methodology in qualitative research according to Boyce and Neale (2006). The main advantage of in-depth interviews is providing much more detailed information than the other data collection methodologies such as surveys. Contrary to surveys, the second advantage of in-depth interviews is providing a more relaxed atmosphere where respondents may feel more comfortable while having a conversation with the researcher. Despite these advantages, in-depth interviews have some limitations. The first limitation of in-depth interviews is being prone to bias. Responses from community members and program participants may be biased due to their stake in the program. However, this limitation is not valid in the present study since the participants of in-depth interviews are the alumni of the 1512 Entrepreneurship Support Program. They cannot participate in Phase 2 again which they are asked to answer detailed questions via in-depth interviews. The second limitation of in-depth interviews is that it can be time-intensive. This limitation is valid in this study but the time spent on in-depth interviews are in the works. Another limitation is that the interviewer must be appropriately trained in interviewing techniques. This is also valid but not a problem in the present study since the researcher did the interviews herself and she was trained and experienced in holding in-depth interviews. The last limitation about this technique is the findings' being non-generalizable. This limitation is not valid for the current study either since this study analyzed the early-stage determinants of the performance of NTBFs established by a specific public support and there was a very small number of successful alumni of the program. The results that make generalizations based on 8 in-depth interviews out of 36 samples does not contain such a limitation.

Potential sources of information in in-depth interviews are policy makers, project staff, clinic staff, program participants/clients and community members (Boyce and Neale

(2006). In the present study, the sources of information in in-depth interviews were program participants.

In qualitative research, the interviewer is expected to possess some skills to conduct successful in-depth interviews. Guion et al. (2011) list these skills as being open-minded, flexible and responsive, patient, observant and a good listener. According to Legard et al. (2003), the required skills for successful in-depth interviews are the ability of the researcher to listen, having a clear and logical mind and a good memory. All these listed skills are considered carefully in the researcher's mind during the interviews.

Opdenakker (2006) compares four types of in-depth interview techniques, which are face-to-face interviews, telephone interviews, MSN messenger interviews, and e-mail interviews. He states that the face-to-face interview is the dominant interview technique in the field of qualitative research. Shortly, when social cues of the interview are important for the interviewer, when the interviewer has enough time and budget for in-depth interviews and when standardization of the interview is important, the most appropriate in-depth interview method is face-to-face. Therefore, the face-to-face in-depth interview methodology was used in this study.

3.3. Results

In the "Results" section, the quantitative and qualitative analysis results are explained respectively.

3.3.1. Quantitative Analysis Results

Data, methodology and econometric models used in the quantitative analysis have been explained in the previous sections. In this section, the quantitative analysis results of 3 econometric models having a statistically significant rho value different from zero are explained. The results of the econometric models where we cannot reject the null hypothesis that the selection equation and the outcome equation are dependent on each other are given in Appendix 5. The results and average marginal effects of the other five econometric models are presented in Appendix 5 since we cannot reject the null hypothesis that the two models are independent.

3.3.1.1. Estimation Results of Model 1

In Model 1, PhD, uni_tto, uni_index, uni_technic, city_tto and city_index variables were used to analyze whether or not the techno-entrepreneur is supported by the 1512 Entrepreneurship Support Program. ICT, PhD, working, team, prior_entre, prior_project, prior_management variables were used to analyze whether or not the NTBF supported by the 1512 Entrepreneurship Support Program had made the first sale. The athrho value was significantly different from zero and rho was equal to 1. Therefore, the two models are significantly dependent on each other.

Table 3.33. shows the Probit with the Sample Selection Model results obtained from STATA. The first column shows the variables, the second column shows the outcome equation results, the third column shows the selection equation results and the last column shows the athrho value of the model. The stars represent the significance levels of the coefficient of independent variables. Standard errors are shown in parentheses.

According to these results, in the selection equation, while the independent variables PhD, uni_tto, uni_index, uni_technic, and city_tto were statistically significant, the city_index variable was statistically insignificant. Although the expected signs of PhD, uni_index, uni_technic and city_tto variables were compatible with the results, the

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sign of uni_tto and city_index had opposite signs with the expected ones. The reasons behind this result may be that TTOs are very in Turkey and their possible contribution to techno-entrepreneurs in terms of pre-incubation activities may be limited, and the city's level of development may not be a good indicator to explain the external opportunities in the social environment of techno-entrepreneurs.

According to these results, in outcome equation, while independent variables ICT, PhD, working and prior_management variables were statistically significant, independent variables prior_entre, prior_project and team variables were statistically insignificant. Although the expected signs of ICT, PhD, working, prior_entre, prior_project and team were compatible with the econometric model results, the sign of prior_management was opposite to the expected sign. Therefore, in the outcome equation, if NTBFs operated in the ICT sector, were managed by teamwork, had founders holding a PhD degree, had prior entrepreneurship and prior project experiences and worked full-time on the supported firms, it would be more likely for NTBFs to make their first sale. The reason underlying the opposite sign of the prior_management variable than expected may be that techno-entrepreneurs having prior management experience have worked on a corporate big firms and the technics and experience in management of that big firm is not helpful to run management in small start-ups. Even implementing the same technics that the techno-entrepreneur experienced in his previous work in big corporate firms may be misleading in operating small start-ups since the management dynamics of big corporate firms and NTBFs can be different.

Table 3.33. The Estimation Results of Model 1

VARIABLES	(1) sale	(2) support	(3) athrho
ICT	0.374**		
	(0.167)		
PhD	0.571**	0.421***	
	(0.256)	(0.121)	
working	0.546**		
	(0.260)		
prior_entre	0.170		
	(0.245)		
prior_project	0.334		
	(0.352)		
prior_management	-0.336*		
	(0.184)		
team	0.230		
	(0.231)		
uni_tto		-0.372**	
		(0.154)	
uni_index		0.00911***	
		(0.00346)	
uni_technic		0.291**	
		(0.130)	
city_tto		0.386*	
		(0.213)	
city_index		-0.0193	
		(0.0366)	
Constant	-3.254***	-2.316***	14.08**
	(0.442)	(0.214)	(6.195)
Observations	1,424	1,424	1,424

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The average marginal effects of variables in the outcome equation of Model 1 is presented in Figure 3.19. According to these marginal effects, the average marginal effect of operating in the ICT sector is 13%. This means operating in the ICT sector increases the possibility of having made the first sale by 13%. The average marginal effect of the techno-entrepreneur's holding a PhD degree is 20%. This means if the techno-entrepreneur has a PhD degree, the possibility of the first sale increases by 20%. The average marginal effect of full dedication of the techno-entrepreneur on the supported NTBF is 19%. Therefore, the possibility of having made the first sale of the

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NTBF which is managed by techno-entrepreneur working full-time on that NTBF increases by 19%. The average marginal effects of prior entrepreneurship experience and prior project experience of the techno-entrepreneur are 6% and 12%, respectively. So, techno-entrepreneurs who have prior entrepreneurship (prior project) experience have a 6% (12%) more possibility of making the first sale. However, techno-entrepreneurs who have prior management experience have 12% less possibility of making their first sale since the average marginal effect of the prior_management variable is -12%. The last independent variable of Model 1 has an average marginal effect of 8%. Hence, NTBFs run by teamwork have a 8% more possibility of making their first sale.

```
Average marginal effects                          Number of obs    =          76
Model VCE     : OIM

Expression    : Pr(sale=1), predict(pmargin)
dy/dx w.r.t.  : ICT PhD working prior_entre prior_project prior_management team
                uni_tto uni_index uni_technic city_tto city_index


                              Delta-method
                 dy/dx    Std. Err.      z     P>|z|      [95% Conf. Interval]

         ICT   .0129301    .0061439     2.10   0.035      .0008882     .024972
         PhD    .019726    .0109652     1.80   0.072     -.0017654    .0412175
     working   .0188661    .0097817     1.93   0.054     -.0003057    .0380378
 prior_entre   .0058749    .0086735     0.68   0.498     -.0111249    .0228747
prior_project  .0115421    .0121339     0.95   0.341     -.0122398    .0353241
prior_manage~t -.0116042   .0072163    -1.61   0.108     -.0257478    .0025394
        team   .0079489    .0082777     0.96   0.337     -.0082752    .0241729
     uni_tto          0   (omitted)
   uni_index          0   (omitted)
 uni_technic          0   (omitted)
    city_tto          0   (omitted)
  city_index          0   (omitted)
```

Figure 3.19. Average Marginal Effects of Variables of the Outcome Equation in Model 1

The summary of the estimation results of Model 1 is presented in Figure 3.20. Techno-entrepreneurs having a business idea apply to TUBITAK to be supported by the 1512 Entrepreneurship Support Program. In the 1st stage, in order for the determinants to receive approval from TUBITAK are given in the boxes. The percentage numbers represent the marginal effects of relevant influencing factors. Statistical significance

levels are also stated in the boxes with significance stars. In the case of approval from TUBITAK, the techno-entrepreneur establishes the NTBF and takes the 1512 Entrepreneurship Support (grant, trainings and mentoring service). After the support period, the determinants of the early-stage performance are stated in the 2nd group boxes. In the event that NTBFs perform well, NTBFs grow and contribute more to the economy in terms of production capacity, employment etc.

Figure 3.20. The Summary of the Estimation Results of Model 1

3.3.1.2. Estimation Results of Model 2

In Model 2, PhD, uni_index, uni_technic, city_tto, city_index variables were used to analyze whether or not the techno-entrepreneur was supported by the 1512 Entrepreneurship Support Program. ICT, PhD, working, team, prior_entre, prior_project, prior_management variables were used to analyze whether or not the NTBF supported by the 1512 Entrepreneurship Support Program had made the first sale. Although the outcome equation of Model 2 is the same with the one in Model 1, uni_tto variable was removed from the model in Model 2 due to the fact that it was statistically insignificant and it had a different sign than that expected in Model 1. The Athrho value was significantly different from zero and rho was equal to 1. Therefore, the two models are dependent on each other significantly.

Table 3.34. shows the Probit with Sample Selection Model 2 results obtained from STATA. The first column shows the variables, the second column shows the outcome equation results, the third column shows the selection equation results and the last column shows the athrho value of the model. The stars represent the significance levels of the coefficient of independent variables. Standard errors are shown in parentheses.

According to these results, in the selection equation, while PhD, uni_index and uni_technic variables were statistically significant, city_tto and city_index variables were statistically insignificant. Although the expected signs of PhD, uni_index, uni_technic and city_tto variables were compatible with the results, the sign of the city_index variable was opposite to the expected one. The reason behind this result may be that the city_index variable may not be a good indicator to explain the external opportunities within the social environment of the techno-entrepreneurs as in Model 1.

According to these results, in the outcome equation, while ICT, PhD, working variables are statistically significant, prior_entre, prior_project, prior_managment and team variables are statistically insignificant. Although the expected signs of all independent variables except forprior_management are compatible with the econometric model results, the sign of prior_management was opposite to the expected sign. Therefore, in the outcome equation, if NTBFs operated in the ICT sector, were managed by teamwork, had founders holding a PhD degree, had prior entrepreneurship

and prior project experiences and worked full-time on the supported firms, it would be more likely for them to make their first sale. The reason behind the opposite sign of the prior_management variable than expected may be that techno-entrepreneurs having prior management experience have worked on corporate big firms and the technics and experience in management of those big firms is not helpful to run management in small start-ups. Even implementing the same technics that the techno-entrepreneur experienced in his previous work in big corporate firms may be misleading in operating small start-ups since the management dynamics can be different in big corporate firms and NTBFs.

Table 3.34. The Estimation Results of Model 2

VARIABLES	(1) sale	(2) support	(3) athrho
ICT	0.436*** (0.157)		
PhD	0.566** (0.241)	0.398*** (0.120)	
working	0.542** (0.231)		
prior_entre	0.137 (0.249)		
prior_project	0.372 (0.357)		
prior_management	-0.226 (0.187)		
team	0.188 (0.236)		
uni_index		0.00582* (0.00320)	
uni_technic		0.302** (0.123)	
city_tto		0.248 (0.204)	
city_index		-0.0162 (0.0375)	
Constant	-3.324*** (0.454)	-2.317*** (0.214)	15.04*** (1.891)
Observations	1,424	1,424	1,424

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The average marginal effects of variables in the outcome equation of Model 2 is presented in Figure 3.21. According to these marginal effects, the average marginal effect of operating in the ICT sector is 15%. This means operating in the ICT sector increases the possibility of the first sale by 15%. The average marginal effect of techno-entrepreneur's holding a PhD degree is 20%. This means if the techno-entrepreneur has a PhD degree, the possibility of the first sale increases by 20%. The average marginal effect of the techno-entrepreneur's full dedication to the supported NTBF is 19%. Therefore, the possibility of the first sale of the NTBF which is managed by a techno-entrepreneur working full-time in that NTBF increases by 19%. The average marginal effects of prior entrepreneurship experience and prior project experience of the techno-entrepreneur are 5% and 13%, respectively. So, techno-entrepreneurs who have prior entrepreneurship (prior project) experience have a 5% (13%) more possibility to make their first sale. However, techno-entrepreneurs who have prior management experience have an 8% less possibility of making their first sale since the average marginal effect of prior_management variable is -8%. Team, which is the last independent variable of Model 1, has a 7% average marginal effect. Hence, NTBFs run by teamwork have a 7% more possibility to make their first sale.

```
Average marginal effects                              Number of obs   =         76
Model VCE    : OIM

Expression   : Pr(sale=1), predict(pmargin)
dy/dx w.r.t. : ICT PhD working prior_entre prior_project prior_management team
               uni_index uni_technic city_tto city_index

                             Delta-method
                  dy/dx     Std. Err.      z     P>|z|     [95% Conf. Interval]

          ICT   .0149526    .0056961     2.63   0.009     .0037884    .0261169
          PhD   .0193841    .0105531     1.84   0.066    -.0012997    .0400678
      working   .0185582    .0084591     2.19   0.028     .0019787    .0351376
  prior_entre   .0046819    .0087116     0.54   0.591    -.0123925    .0217563
prior_project   .0127511    .0122343     1.04   0.297    -.0112278    .0367299
prior_manage~t  -.0077365   .0064971    -1.19   0.234    -.0204705    .0049976
         team   .0064401    .0082548     0.78   0.435    -.0097391    .0226193
    uni_index          0    (omitted)
   uni_technic         0    (omitted)
     city_tto          0    (omitted)
    city_index         0    (omitted)
```

Figure 3.21. Average Marginal Effects of Variables of the Outcome Equation in Model 2

The summary of the estimation results of Model 2 is presented in Figure 3.22. A techno-entrepreneur with a business idea applies to TUBITAK for the 1512 Entrepreneurship Support Program. In the 1st stage, the determinants in order to take approval from TUBITAK are given in the boxes. The percentage numbers represent the marginal effects of relevant influencing factors. Statistical significance levels are also stated in the boxes with significance stars. In case of approval from TUBITAK, the techno-entrepreneur establishes the NTBF and takes the 1512 Entrepreneurship Support (grant, trainings and mentoring service). After the support period, the determinants of the early-stage performance are stated in the 2nd group boxes. In the event that NTBFs perform well, NTBFs grow and contribute more to the economy in terms of production capacity, employment etc.

Application to 1512 Entrepreneurship Support Program

PhD ***	+		+	University Index *
City TTO	+	1st Stage: Approval to the Support		
City Index	−		+	Technical University **

Establish NTBF

Take 1512 Entrepreneurship Support

PhD 20 % **	+		+	Ent. Experience 5 %
ICT 15 % ***	+	2nd Stage: First Sale	+	Pro. Experience 13 %
Working 19 % **	+			
Teamwork 7 %	+		−	Man. Experience 8 %

Contribution to Economy
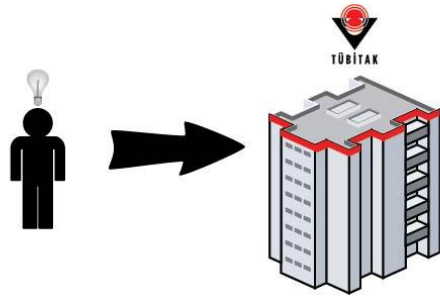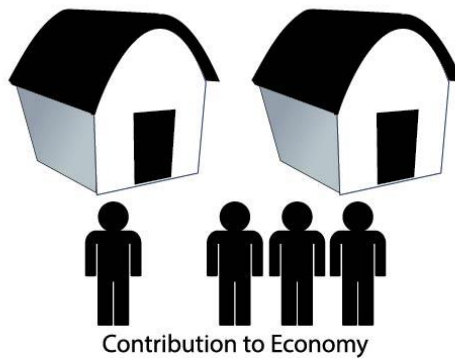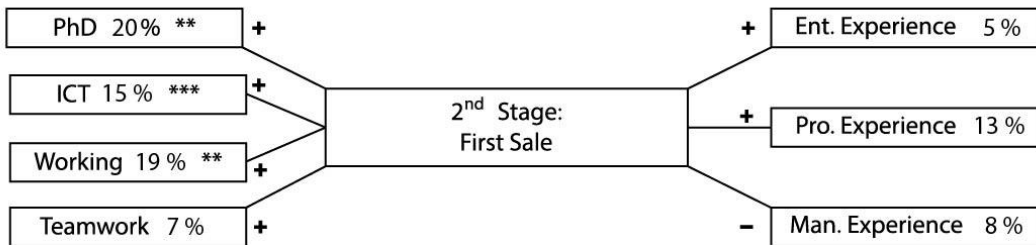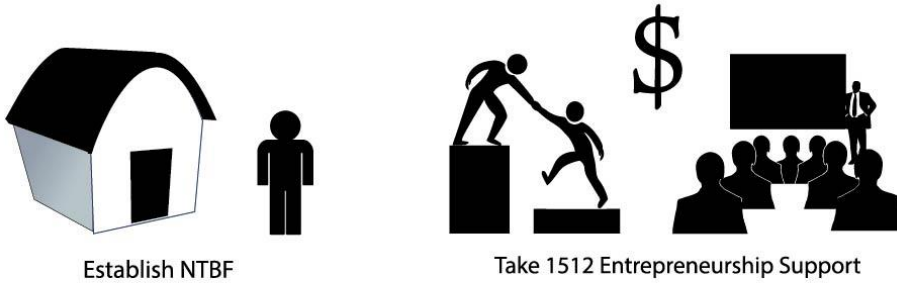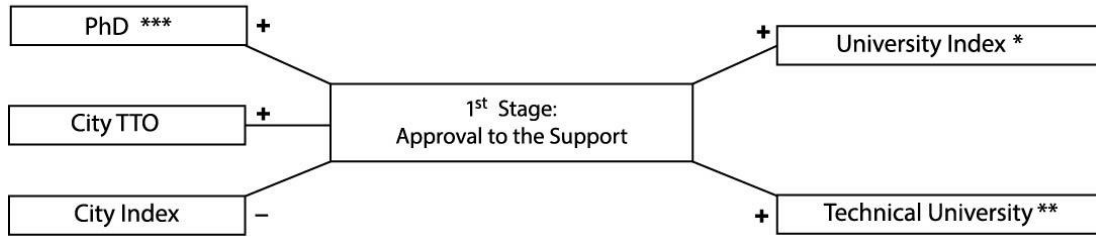
Figure 3.22. The Summary of the Estimation Results of Model 2

3.3.1.3. Estimation Results of Model 3

In Model 3, PhD, uni_index, uni_technic, and city_index variables were used to analyze whether or not the techno-entrepreneur was supported by the 1512 Entrepreneurship Support Program. Since TTOs are very new in Turkey, the city_tto and uni_tto variables were removed from the selection equation in Model 3. ICT, PhD, age2, working and team variables were used to analyze whether NTBF supported by the 1512 Entrepreneurship Support Program had made the first sale. In Model 3, the prior experience of the techno-entrepreneur was removed from the model due to the fact that it was statistically insignificant or the signs of the coefficients were opposite than expected. The Athrho value was significantly different from zero and rho was equal to 1. Therefore, the two models are dependent on each other significantly.

Table 3.35. shows the Probit with Sample Selection Model 3 results obtained from STATA. The first column shows the variables, the second column shows the outcome equation results, the third column shows the selection equation results and the last column shows the athrho value of the model. The stars represent the significance levels of the coefficient of independent variables. Standard errors are shown in parentheses.

According to these results, in the selection equation, while PhD, uni_index and uni_technic variables are statistically significant, the city_index variable is statistically insignificant. The expected signs of all variables are compatible with the results.

According to these results, in the outcome equation, while ICT, PhD and working variables were statistically significant, age2 and team variables were statistically insignificant. However, the signs of all the coefficients were compatible with the expected ones. Therefore, in the outcome equation, if NTBFs operated in the ICT sector, were run by teamwork had founders holding a PhD degree, worked full-time in that NTBF and were middle-aged, then it was more probable for the NTBF to have made its first sale.

Table 3.35. The Estimation Results of Model 3

VARIABLES	(1) sale	(2) support	(3) athrho
ICT	0.498***		
	(0.162)		
age2	9.61e-05		
	(0.000250)		
PhD	0.487**	0.404***	
	(0.240)	(0.120)	
working	0.500**		
	(0.229)		
team	0.162		
	(0.198)		
uni_index		0.00594*	
		(0.00310)	
uni_technic		0.251**	
		(0.128)	
city_index		0.0119	
		(0.0296)	
Constant	-3.153***	-2.172***	15.29***
	(0.426)	(0.184)	(1.670)
Observations	1,424	1,424	1,424

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The average marginal effects of the variables in the outcome equation of Model 3 is presented in Figure 3.23. According to these marginal effects, the average marginal effect of operating in the ICT sector is 17%. This means operating in the ICT sector increases the possibility of the first sale by 17%. The average marginal effect of age2 is 3.21e-06 since it is the squared value of the techno-entrepreneurs' ages. The average marginal effect of the PhD degree of the techno-entrepreneur is 16%. This means if the techno-entrepreneur holds a PhD degree, the possibility of the first sale increases by 16%. The average marginal effect of the techno-entrepreneur's full dedication to the supported NTBF is 17%. Therefore, the possibility of the first sale of the NTBF which is managed by a techno-entrepreneur working full-time in that NTBF increases by 17%. Team, which is the last independent variable of Model 3, has an average marginal effect of 5%. Hence, NTBFs run by teamwork have a 5% more possibility of making their first sale.

```
Average marginal effects                          Number of obs   =        76
Model VCE    : OIM

Expression   : Pr(sale=1), predict(pmargin)
dy/dx w.r.t. : ICT age2 PhD working team uni_index uni_technic city_index

                         Delta-method
               dy/dx     Std. Err.      z     P>|z|     [95% Conf. Interval]

        ICT   .0166698   .0060576     2.75    0.006      .004797    .0285425
       age2   3.21e-06   8.45e-06     0.38    0.704    -.0000133    .0000198
        PhD   .0162806   .0098273     1.66    0.098    -.0029806    .0355418
    working   .0167275   .0083561     2.00    0.045      .0003499   .0331051
       team   .0054214   .0066582     0.81    0.416    -.0076285    .0184713
  uni_index          0   (omitted)
 uni_technic         0   (omitted)
 city_index          0   (omitted)
```

Figure 3.23. Average Marginal Effects of Variables of the Outcome Equation in Model 3

The summary of the estimation results of Model 3 is presented in Figure 3.24. A techno-entrepreneur with a business idea applies to TUBITAK for the 1512 Entrepreneurship Support Program. In the 1st stage, the determinants in order to take approval from TUBITAK are given in the boxes. The percentage numbers represent the marginal effects of relevant influencing factors. The statistical significance levels are also stated in the boxes with significance stars. In the case of approval from TUBITAK, the techno-entrepreneur establishes the NTBF and takes the 1512 Entrepreneurship Support (grant, trainings and mentoring service). After the support period, the determinants of the early-stage performance are stated in the 2nd group of boxes. In the event that NTBFs perform well, NTBFs grow and contribute more to the economy in terms of production capacity, employment etc.

Application to 1512 Entrepreneurship Support Program

PhD ***	+		+	University Index *
		1st Stage: Approval to the Support		
City Index	+		+	Technical University **

Establish NTBF   Take 1512 Entrepreneurship Support

PhD 16% **	+		+	Teamwork 5%
ICT 17% ***	+	2nd Stage: First Sale		
Working 17% **	+		+	Age^2 ~0%

Contribution to Economy
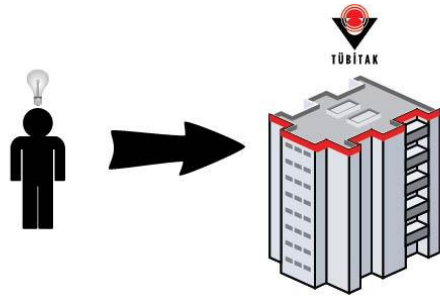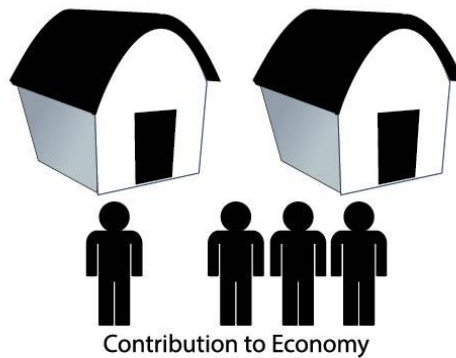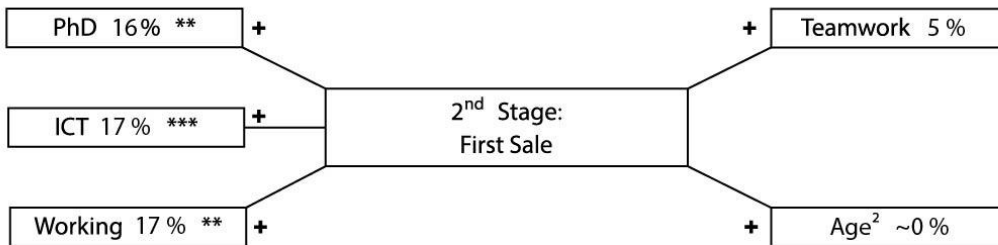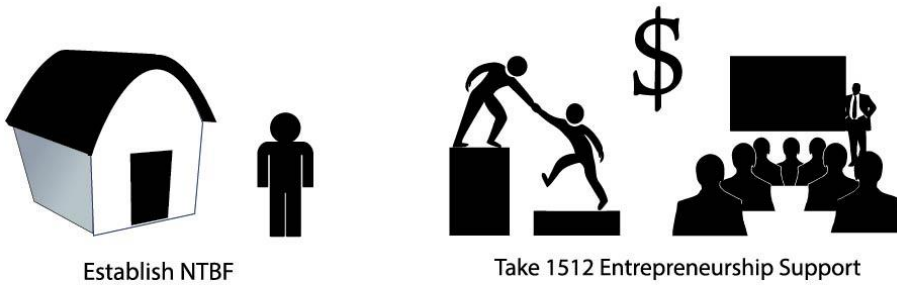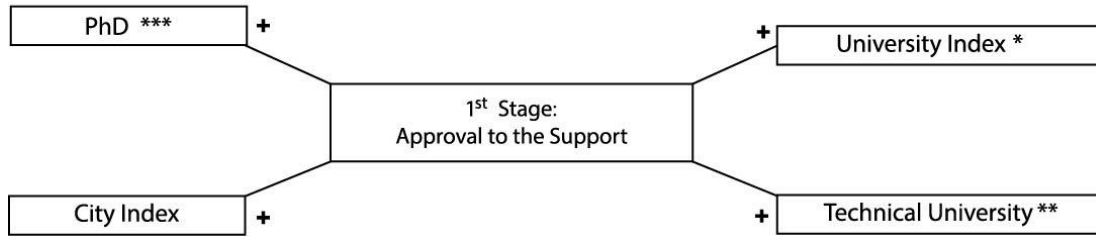
Figure 3.24. The Summary of the Estimation Results of Model 3

3.3.2. Qualitative Analysis Results

The interviews yielded are main key findings. The interviewees who were selected from the TUBITAK's list of successful techno-entrepreneurs emphasize the importance of teamwork, the education of the techno-entrepreneur, the prior project experience of the techno-entrepreneur, the sector that the NTBF operates in, the characteristic features of the techno-entrepreneurs in the early-stage performance of the NTBF. The interviewees are doubtful about whether or not the firm strategy, age and gender are determinants of the early-stage performance of NTBFs. Finally, external factors such as business mentors, independent auditors and venture capitalists are generally found ineffective in the early-stage performance of NTBFs. The key findings of the qualitative analysis are summarized in Table 3.36. Subsequently, detailed information about the key findings of the qualitative analysis are presented in this section.

Table 3.36. Summary of the Qualitative Analysis Results

Determinants of the early-stage performance of NTBFs	Importance
Teamwork	Very effective
Education of the techno-entrepreneur	Very effective
Prior project experience of the techno-entrepreneur	Very effective
Sector that NTBF operates in	Very effective
The characteristic features of the techno-entrepreneur	Very effective
Firm strategy	Debatable
Age of the techno-entrepreneur	Debatable
Gender of the techno-entrepreneur	Debatable
External factors such as business mentors, independent auditors or venture capitalists	Ineffective

In the qualitative analysis results section, all important factors for success according to successful techno-entrepreneurs are presented in order of priority. The most important factor is found to be existence of teamwork. Interviewees laid emphasis on the influential power of teamwork and stated that teamwork was an essential condition for NTBFs to perform higher in the early stages. They also stated that apart from the technical team, the management and marketing teams were also important, but outsourcing these was also an option. Most of the interviewees continued with the original team that had established the NTBF. All interviewed successful techno-entrepreneurs walked with a team during the interviews. The first interview is interesting in illustrating the importance of teamwork existence in the early-stage performance of NTBFs. Within the scope of this study, interview invitations were sent to the techno-entrepreneur who applied to the program and the founder of the NTBF. After the invitation was accepted by the techno-entrepreneur, he came to the interview with his partner who was the co-founder of the NTBF. They answered the questions together. They stated that in the beginning, the team was bigger. The manager team was comprised of 4 co-founders. 2 were responsible for technical subjects and the other 2 were responsible for business development. The 2 co-founders who were responsible for technical subjects had quit their ex-job and dedicated themselves fully to the NTBF. However, the other 2 co-founders who were responsible for business development had not quit their current job and did not contribute to the NTBF much. Therefore, the partnership structure had changed and 2 technical techno-entrepreneurs had to also be interested in business development where they were not professionals. Therefore, even though their firm was able to make the business idea commercialized, they suffered from lack of professional view on business development. They tried to develop themselves with the experiences but they stated that if they had larger a team consisting of both technical and business sides, they would get more jobs, they would win more tenders, they would sell their products at higher prices, shortly they would perform better. Thamhain (1990), Oakey (2003) and Colombo et al. (2005) argue the importance of teamwork in the performance of technological start-ups. Although the coefficient of teamwork is insignificant according to quantitative analysis results, the interview results confirm the current literature about the importance of teamwork in the performance of NTBFs.

The second important inference from the interview results is education. Education is considered both as level of education and type of education such as technical versus managerial/marketing complementing feature. In terms of educational level, all interviewees emphasized that educational level is directly related with the performance of a NTBF. Most of the interviewees held a PhD degree or were a doctorate student. They emphasized the importance of educational level. Even those interviewee holding only a bachelor's degree stated that the minimum educational level for the application should be at the undergraduate level. There is debate over the influence of educational level on the performance of NTBFs in the existing literature. Stuart and Abetti (1990) postulate a negative relation between educational level of the entrepreneur and the performance of new ventures. They indicate that advanced education beyond the bachelor's degree is negatively related to the performance. However, Colombo et al. (2004) summarize their results indicating that the more educated, better-qualified and probably wealthier founders have larger firm size. Their policy recommendation is that the government should intervene in the market and even public support should be given to the firms whose founders have more human capital. In addition, Okamura et al. conclude that educational level, prior innovation output, and prior work experience all affect cooperations positively. The interview results confirm the current literature about positive influence of educational level on the performance of NTBFs. Qualitative analysis results also confirm the quantitative analysis results that NTBFs run by techno-entrepreneurs who hold a PhD degree perform better than those who don't.

Apart from educational level, interviewees agreed that both technical and managerial/marketing education were important for performance. They stated that technical education was a requisite condition although they were aware of the importance of managerial/marketing education/experience. They claimed that if the techno-entrepreneur did not have any managerial/marketing education, he/she should find a team-mate who had experience in that field and who was responsible for the managerial/marketing part of the NTBF. One of the interviewees who was a doctorate student and had long years of working experience said, "I have no management education or management experience and if I did, I might have performed better. However, it is hard for one person to do everything. One can deal with the technical

and R&D aspects but you may neglect the business aspect. It is really difficult to have a finger in every pie. You should find someone professionals of the areas which you are incapable of."

The third emphasis of the interviews is the importance of techno-entrepreneurs' prior project experience in the performance of NTBFs. All of the interviewees believed that techno-entrepreneurs' prior project experience had raised the performance of their NTBF. Okamura et al. (2011) reported that prior project experience has a positive impact on the performance of NTBFs. The conclusions drawn from the interview results about prior project experience supports Okamura et al. (2011). Even if prior project experience is an insignificant determinant according to the quantitative analysis results, all the interviewees lay weight on the role of prior project experience on the performance of NTBFs.

Except for one interviewee, the other interviewees were from the ICT technology group. The business ideas of all the interviewees were related to ICT and their NTBFs were in operation in the ICT sector. They all stated that the sector they operated in had affected their their NTBF's performance positively. There can be two reasons underlying this result. The first one is that because the business idea is related to ICT, it is easy to commercialize it just after the support period. That's why technological validation of business ideas in ICT generally takes a shorter period than it does in other technology groups such as biotechnology and machinery technologies, which require longer laboratory work and require more infrastructure investments. Operating in the ICT sector is also one of the significant determinants of the early-stage performance of NTBFs according to the quantitative analysis results. In econometric models, the coefficient of the ICT variable is always statistically significant and positive. Therefore, the qualitative analysis result related to the sector of the NTBF confirms the quantitative analysis results. One of the interviewees stated that their total revenue was 3 million Turkish Liras and being in ICT sector was one of the most important reasons of this revenue.

Another important inference that can be drawn from the interview results is the influence of characteristic features of the founder of the NTBF. There are many academic studies focusing on the positive influence of some characteristic features of

the founders of the NTBF (Herron and Robinson 1993, Jo and Lee 1996, Gatewood et al 1995, Begley and Boyd 1987 and Ciaverella et al 2004). However, in contrast to the researchers attaching importance to personality characteristics of founders on new ventures' success, there are several researchers claiming that personality characteristics are not powerful enough to explain the performance of the new ventures (Sandberg and Hofer (1988), Gartner et al. (1999), Duchesneau and Garner (1990)). In spite of the debate in the literature, the successful techno-entrepreneurs who were interviewed in the present study believe that the personal characteristics of techno-entrepreneurs have an important influence on the performance of NTBFs. Being determined, go-getter, able to struggle against difficulties, success-oriented, ambitious and self-confident are prominent personal characteristic features according to the findings of the in-depth interviews.

The interviewees were doubtful about whether or not firm strategy, age and gender were determinants of the early-stage performance of NTBFs.

The influence of techno-entrepreneurs' age on the performance of the NTBF is not strong according to the interview results. All interviewees laid emphasis on the belief that although being at a young age is important for a techno-entrepreneur who has some experience in the field, being a new university graduate without any working experience could have a negative influence on the performance of an NTBF. However, according to the interviewees, after having some work experience in the field, the techno-entrepreneurs should commercialize their business ideas before their 40s. Although the quantitative analysis results could not determine the relationship between age and the early-stage performance of NTBFs, the ideal age range was stated to be between 30 and 40 according to the interviewees. Colombo and Grilli (2005) state that the likelihood of survival of new firms and the growth of surviving firms have generally been found to be positively related to the age of founders. Instead of direct positive relation with age and success, we find that the relationship between age and success is inverse U-shaped. The effect of age on the performance of NTBFs was evaluated self-possessively by interviewees. Rather than evaluating the effect of age on the performance of NTBFs separately, the interviewees evaluated age in the perspective of risk-taking, work experience and social responsibilities.

Owing to the fact that the effect of firm strategy on the early-stage performance of NTBFs was analyzed in quantitative analysis, it was also analyzed in qualitative analysis. Although some of the interviewees focused on the belief that in order to be a successful techno-entrepreneur, firm strategy must be formed in the beginning, there was no common thought about the effect of firm strategy on performance. However, one of the interviewees stated that "Make it up as you go along" is one of the dangerous beliefs which push techno-entrepreneurs to failure. Sandberg and Hofer (1988) argue that the influence of industry structure and strategy of the venture is higher than the influence of the personal characteristics and human capital of the entrepreneurship. Chorev and Anderson (2006) also indicate that strategy is one of the critical factors influencing the high-tech venture's performance in Israel.

Additionally, the relationship between the gender of the founder and the performance of the NTBF is a debatable issue according to the interview results. Although all the interviewees were male, some of them stated that being a male had a positive influence on the performance of their NTBF; in contrast to this, some stated that being a female would have a positive influence on performance; the others stated that gender had no influence on the performance of the NTBF. The literature about the effect of gender on success supports the last group. Sexton and Upton (1990) conclude that gender has no effect on the new ventures' performance due to the fact that females have similar traits with males although they have a few strengths and weaknesses. The last issue is the influence of business mentors, independent auditors and venture capitalists on the early-stage performance of NTBFs supported by government. These external factors are mostly found ineffective by interviewees despite some exceptions. One of the exceptions is related to the effect of business mentors. One of the interviewees stated that they were not in accord with their first business mentor who were assigned to them by TUBITAK in the beginning of the support. Then, they applied to TUBITAK to change their business mentor. After the approval of the change, their second business mentor was very helpful to them in terms of business development, marketing strategy, project management etc. They stated that the effect of their business mentor on their high early performance as an NTBF supported by the government was undeniable. The exception regarding external factors belongs to independent auditors. One of the interviewees stated that an independent auditor who was assigned to the project by

TUBITAK rejected to evaluate the project improvements after the visit to the firm with the justification that that the project subject was not related to the interviewee's profession. Therefore, another independent auditor was assigned to the project. As might be estimated, this caused a slight loss of time. However, the techno-entrepreneur did not complain about it. He was so glad to meet the second independent auditor since although leading the project was not the responsibility of the independent auditor, the questions of the independent auditor were very helpful for them to develop the project. They realized the missing points of the projects which they had not paid attention to. They stated that this realization was very helpful for them in terms of the success of the project. The last exception related to the inefficiency of the external factors belongs to one interviewee who took venture capital. He stated that the capital support of the 1512 Entrepreneurship Support Program was not adequate for the fast commercialization of the project. He also stated that due to the fact that one of the venture capitalists had accepted to give enough venture capital, the NTBF was able to penetrate into the market in a short time. He believed that the success of the commercialization of the project depended on this rapid penetration into the market. However, these are only exceptions regarding the effect of external factors on the early-stage performance of NTBFs supported by the government. The majority of the interviewees are not of the same opinion.

Consequently, interviewees agree and give more importance to the influence of teamwork, education, prior project experience, characteristic features of founders and sector or technology group on the performance of NTBF. They cautiously approach to the influence of age and gender of the techno-entrepreneur and firm strategy on the performance of the NTBF. The qualitative results indicate that external factors such as business mentors, independent auditors and venture capitalist are generally found ineffective on the early-stage performance of NTBFs.

CHAPTER 4

POLICY RECOMMENDATIONS AND CONCLUSION

The last chapter of this study is reserved for the policy recommendations and conclusion in light of both quantitative and qualitative analysis results. The first policy recommendations are presented at micro level, at mezzo level and finally at macro level. The micro level policy recommendations are given specific to techno-entrepreneurs and new technology based firms. The mezzo level policy recommendations are given specific to the 1512 Entrepreneurship Support Program run by TUBITAK. Finally, the macro level policy recommendations are given specific to national entrepreneurship policies. Lastly, directions for further research are specified in the final part of this chapter.

4.1. Policy Recommendations

Since the 1512 Entrepreneurship Support Program is one of the tools of encouraging technological entrepreneurship in Turkey, the policy recommendations created by taking into consideration the results of the analysis in the present study gain more importance. To be able to run an efficient public policy in techno-entrepreneurship, public policy makers should take into consideration the policy recommendations which are formed by studying successful case studies and analyzing the influencing factors on NTBF performance. The aim of this section is to present policy recommendations to public policy makers responsible for creating public policies in techno-entrepreneurship in Turkey.

Policy recommendations are made based upon the hypothesis that techno-entrepreneurs would not be able to realize their business ideas in case of no government support. In both the survey and the in-depth interviews, following question was posed to the techno-entrepreneurs: "Could you realize your business idea in case of no government support?". In terms of survey and in-depth interview results, more than half of the techno-entrepreneurs stated that they could not realize their

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business idea if they were not supported by the 1512 Entrepreneurship Support Program.

In the following part of this section, first policy recommendations are presented at the micro level, which are specific to techno-entrepreneurs and new technology based firms. Then, the mezzo level policy recommendations are made specific to the 1512 Entrepreneurship Support Program run by TUBITAK. Finally, the macro level policy recommendations are presented specific to national entrepreneurship policies.

4.1.1. Micro Level Policy Recommendations

Based on the analysis results of the current study, what techno-entrepreneur should do in order to perform at higher level is explained in this part.

First of all, since the 1512 Entrepreneurship Support Program supports technological entrepreneurship activities, the technological knowledge level of the techno-entrepreneur is obviously one of the important determinants of the early-stage performance of NTBFs. Therefore, developing the human capital and technical knowledge level of the techno-entrepreneur is essential for success. For example, holding a PhD degree increases the commercialization of the business idea by 20% (in Model 1&2) and 16% (in Model 3).

Secondly, since the 1512 Entrepreneurship Support Program does not impose restrictions on working in another firm during the support period, some techno-entrepreneurs choose to work in another firm in order to offset the risk of techno-entrepreneurship. However, this risk-averse behavior decreases the early-stage performance of NTBFs. Focusing only on their business idea is very important for techno-entrepreneurs. Some techno-entrepreneurs believe that techno-entrepreneurship is risky and that they should continue with their better paid job, and that they could do technologic validation of their business idea in their free times and on weekends. This opinion may be logical in order to decrease the risk of R&D and entrepreneurship. However, if a techno-entrepreneur does not devote enough attention to his/her business idea, the failure probability will increase. According to the quantitative analysis results, full dedication to their business ideas increases the commercialization probability by 19% (in Model 1&2) and 17% (in Model 3).

Additionally, according to the results of the in-depth interviews, the co-founders who do not work full time in the NTBF cannot devote enough importance and dedication to NTBF. This result risks the early performance of NTBFs.

The other important recommendation for techno-entrepreneurs who want to apply for government techno-entrepreneur support is to establish a team. Taking the analysis results into consideration, it can be claimed that teamwork is highly essential to increase the early-stage performance of NTBFs.

Prior project experience of techno-entrepreneurs is one of the determinants of the early-stage performance of NTBFs according to the qualitative analysis results. Techno-entrepreneurs who want to apply for the 1512 Entrepreneurship Support Program just after their graduation from university should keep in mind that successful techno-entrepreneurs strongly recommend having project and work experience before applying for the 1512 Entrepreneurship Support.

In-depth interviews also included the question, "What would you recommend to the techno-entrepreneurs who have a technological business idea and want to apply for government supports?". As previously stated, the interviewees in the present study were chosen from TUBITAK's Successful Techno-entrepreneurs Lists. The answers given by these interviewees who were selected as "successful techno-entrepreneurs" by TUBITAK are summarized as follows:

- Do not only concentrate on technical issues. Running a business also requires having information about financial and managerial issues. If you are not able to do this, find a partner who has experience in financial and managerial issues.
- Do not start by yourself. Give importance to teamwork. While choosing your team, devote specific attention to the short, medium and long term strategies in the agreement. For example, after 5 years, one partner may want to enter foreign markets, while the other does not. Write and agree about your firm strategies.
- Be aware of the fact that there are more support mechanisms and opportunities for entrepreneurs than there were in the past. Benefit from those opportunities as much as possible.

- Do not start without experience. Mature in the market before you start your own business.

- Do not try to base your business idea on what you enjoy/know. Realize business ideas which the market really needs.

4.1.2. Mezzo Level Policy Recommendations

As stated previously, the aim of the present study was to reveal the determinants of the early-stage performance of NTBFs supported by the Turkish government. As it can be understood from the word *techno*-entrepreneurship, the support is related to technological innovation and requires technological knowhow and background. That's why the analysis results which show that holding a PhD degree is an important determinant of the performance of NTBFs is not surprising. In terms of both qualitative and quantitative analysis results, the more-educated techno-entrepreneurs are, the better performance their NTBFs will be. According to econometric models, holding a PhD degree increases the early-stage performance of NTBF by 20% (Model 1&2) and 16% (Model 3), which are statistically significant results. Therefore, the first mezzo level policy recommendation to public policy makers is to support more techno-entrepreneurs holding a PhD degree and who possibly have a better early-stage performance in the techno-entrepreneurship environment.

The second policy recommendation at the mezzo level is to support more business plans from ICT technologies, the sale possibilities of which are higher than it is in other technology groups. Techno-entrepreneurs who run business plans in ICT technologies have a higher possibility to sell their product/service easily and have a higher level of early-stage performance. According to the quantitative analysis results, techno-entrepreneurs who have products/services related to the ICT technology group have a higher possibility (13% in Model 1; 15% in Model 2; 17% in Model 3) to commercialize their products and services. Even though the project output may not be easily commercialized, those techno-entrepreneurs have a higher possibility to do additional projects and businesses which can easily be realized according to respondents of in-depth interviews. These extra businesses also increase the early-stage performance of NTBFs.

Full dedication to techno-entrepreneurship is an important determinant of the early-stage performance of NTBFs. If techno-entrepreneurs work full-time in NTBFs and commit themselves to their own business idea, the possibility of the first sale will increase by 19% according to Model 1 & 2, and by 17% according to Model 3. Therefore, the government should only support techno-entrepreneurs who fully dedicate themselves to their business ideas. Techno-entrepreneurs who continue with their former business and work in the NTBF on part-time basis should not be supported by the government. Additionally, the importance of the dedication of all the co-founders is mentioned as a determinant of the early-stage performance in the qualitative analysis. The case explained in the qualitative analysis results show that all co-founders should dedicate themselves to the business idea run in NTBF. According to one of the in-depth interviewees, in case of partial dedication of the co-founders, ownership is not developed and the performance of NTBF are on the danger list.

The other key finding of the study is the importance of teamwork existence in the performance of the NTBF. If there is teamwork, the possibility of sales increases. Although in the quantitative analysis the coefficient of teamwork was statistically insignificant, its sign was positive, and the qualitative analysis results confirm this key finding. Therefore, the government should support business ideas which involve teamwork.

Prior project experience of the techno-entrepreneur is another important determinant of the performance of an NTBF since almost all interviewees emphasized this result. Although in quantitative analysis, the coefficient of prior experiences of techno-entrepreneurs was statistically insignificant, the sign of prior project experience was positive, and the qualitative analysis results confirm this key finding. Therefore, the government should support techno-entrepreneurs who have prior project experience. The newly graduated techno-entrepreneurs who have no prior project experience should not be supported by the 1512 Entrepreneurship Support Program.

Personal characteristics of the founder of the NTBF is another influencing factor. Almost all the techno-entrepreneurs with whom in-depth interviews were held were success-oriented, ambitious, and self-confident. Therefore, the evaluation panels in the 1512 Entrepreneurship Support Program should not only make evaluations through

paper work. The evaluators of the 1512 Entrepreneurship Support Program should examine whether or not the characteristics of the business idea owner is eligible to be a successful techno-entrepreneur. The evaluation panel should include psychologists or human resource specialists to analyze the personal characteristics of the business idea owner.

Although the age of the techno-entrepreneurs was not found statistically insignificant to be a determinant of the early-stage performance of NTBFs, qualitative analysis results show that if the techno-entrepreneur is too young or too old, the possibility to commercialize his/her business idea will decrease. While younger techno-entrepreneurs have a desire and enthusiasm to start a business idea but not enough working experience, older techno-entrepreneurs have sufficient working experience but not enough enthusiasm to keep the business idea in process. Therefore, the government should support techno-entrepreneurs who have enough working experience but has not lost his/her enthusiasm as an innovator entrepreneur.

Apart from the analysis results, both in the survey and the in-depth interviews, another question was asked: "What would you change if you designed the 1512 Entrepreneurship Support Program?" The recommendations collected from the survey and the in-depth interview results are summarized as follows:

- I would increase the communication between TUBITAK and NTBF.
- I would support fewer techno-entrepreneurs with longer support duration and a higher amount of support in order to attribute more interested in the techno-entrepreneurs.
- I would express that running a technical project as a NTBF cannot be done only with government support, you must also invest your own money. I would also promote techno-entrepreneurs to find venture capital as much as the amount of the government support.
- I would increase the mentorship support in the first phase of the program.
- I would decrease the bureaucracy and be more flexible regarding project alterations.
- I would provide more trainings in marketing and sale.
- I would create a common platform for the advertisement of projects.

- Apart from the project officer in TUBITAK, I would give a mission to another officer to be responsible for tracking NTBF in terms of financial issues such as accounting, tax, resource management etc.

- I would be more active in advertising the project outputs and venture capitalist interviews.

- I would try to ensure techno-entrepreneurs to see the market potential of their business idea output.

- I would not make the establishment of the NTBF obligatory. After technical validation studies are completed, I would make the establishment of the NTBF obligatory for techno-entrepreneurs who have a successful prototype. Then, I would give support for the commercialization process of these prototypes.

- I would not provide all the project equipment for each techno-entrepreneur. I would give equipment support to some laboratories in campuses and ensure that techno-entrepreneurs have similar business ideas to benefit from those laboratories.

- I would assign more than one business mentor for different professions.

- I would assign more than one independent auditor in the event that the project subject requires more than one technical profession.

- I would develop a more comprehensive support program integrating more members of the entrepreneurship ecosystem.

4.1.3. Macro Level Policy Recommendations

The most comprehensive support program regarding techno-entrepreneurship in Turkey is the 1512 Entrepreneurship Support Program as it is stated in Chapter 2. Therefore, it is one of the major public policy tools of techno-entrepreneurship in Turkey. Although it is the most comprehensive support program, there is an important policy lack in the 1512 Entrepreneurship Support Program at the macro level. Supporting techno-entrepreneurship should not only entail supporting the technical issues in the project. Techno-entrepreneurship should be supported in a different way from the other R&D support mechanisms since it includes the aspects of both "*entrepreneurship*" and "*techno*". There should be support in the marketing and sales process of the product output because non-commercialized project outputs mean a waste of public funds allocated to the technical validation of the projects. Additionally,

in case of no commercialization support mechanism, in addition to the waste of public funds allocated to the technical validation of techno-entrepreneurship projects, costs of techno-entrepreneurs and costs of public officers responsible for operating these programs are also wasted. This policy recommendation is not specific to the 1512 Entrepreneurship Support Program. It is a general criticism for the entire techno-entrepreneurship support ecosystem of Turkey.

An additional question asked to the interviewees was "What do you think about the entrepreneurship environment of Turkey?" The opinions and recommendations collected from the in-depth interview results are summarized as follows:

- Although at the macro level the government is very active in the Turkish Entrepreneurship Ecosystem, other members in the ecosystem are not active enough. They should be more participative. In addition, the government's participation in the ecosystem should continue until other members integrate into the ecosystem sufficiently.
- More than one government agency supports almost the same activities with almost the same support mechanism collaterally. They should be integrated with each other and techno-entrepreneurship supports should be given by the same government agency.
- There should be more support for NTBFs which try to leap from micro-size to small size start ups.

Lastly, except from aforementioned recommendations, the opinions of public officers who are responsible for operating techno-entrepreneurship support mechanisms in TUBITAK are asked. Although the support mechanisms for techno-entrepreneurship have been changing since they started, the major change was made in 2015. The first major change entailed the integration of technology transfer offices, techno city management firms of universities and other private sector firms which have entrepreneurship support experiences in the system. They have been chosen as implementing agencies in the first phase of the program. Their responsibilities are to collect technological business ideas, choose the eligible ones, and provide trainings and mentorship supports in the first phase of the program. With the help of these supports, the commercialization possibility, market potential and firm strategies are

determined at the initial stage. By means of these changes, the program coordinator office expects to increase the quality of business plans, the survival possibility of NTBFs by increasing the market potential and expanding the area of influence of the program geographically. As it will be mentioned in the following section in detail, the impact of these changes should be evaluated in further research studies.

For more precise expression, the aforementioned policy recommendations at micro, mezzo and macro levels are summarized in Table 4.1. The first column of the table shows the level of recommendations and the second column shows the recommendations given for each level briefly.

Table 4.1. Summary of Policy Recommendations

Summary of Policy Recommendations		Policy Tools
Recommendations for techno-entrepreneurs and NTBFs (Micro level recommendations)	• Increase your level of technological knowledge • Work full-time in the NTBF which is established with government support / Quit your other business when you establish the NTBF which is established for the commercialization of your business idea • Establish a team • Gain project and working experience before applying for the support	Change the application conditions of current support mechanisms such as allowing only teamwork, experienced techno-entrepreneurs, full-time dedicated techno-entrepreneurs to apply for the program.
Recommendations for the 1512 Entrepreneurship Support Program (Mezzo level recommendations)	• Support more techno-entrepreneurs holding a PhD degree • Support more business plans originating from ICT technologies • Support only techno-entrepreneurs who fully dedicate themselves to their business ideas • Support business ideas which involve teamwork • Do not support the newly graduated techno-entrepreneurs who have no prior project and working experience	Change the evaluation processes of current support mechanisms such as supporting only teamwork, full-time dedication, more educated and more experienced techno-entrepreneurs, business ideas related to ICT and etc.
Recommendations for national techno-entrepreneurship environment (Macro level recommendations)	• Support the commercialization processes of the technological projects of NTBFs in addition to technical validation processes. • Support the more active players in the techno-entrepreneurship ecosystem	Change the logic or dialectic of the current support mechanisms and environment such that push techno-entrepreneurs to think about their business idea in terms of commercialization such as changing the policy environment and active players in the environment via seminars, trainings, policy regulations (the law no. 5746) etc.

4.2. Conclusion

    4.2.1.   Directions for Further Research

When the data were collected, 6 months (12 months) had passed after half of the target group (the other half of the target group) had completed their project supported by the 1512 Entrepreneurship Support Program. These were the first alumni of the 1512 Entrepreneurship Support Program. Therefore, this analysis could only analyze the determinants of the "early-stage" performance of NTBFs. Further research may include other performance indicators used in the literature after a period of 3 or more years from the date on which the support was received.

Besides, the 1512 Entrepreneurship Support Program has a continuous process and opens a new call every year. The legislation, regulation, name, the roles of other players in the entrepreneurship environment and running processes of the 1512 Entrepreneurship Support Program has been changing every year. The government officials who are responsible for the operation of the 1512 Entrepreneurship Support Program have changed these processes and rules in the expectation of a higher performance of the NTBFs supported by this program. Therefore, the results of these changes should be evaluated by enlarging the data group to include the alumni of the other calls of the Program in further studies.

The present study is not an impact analysis of the 1512 Entrepreneurship Support Program. If researchers want to evaluate the impact of the 1512 Entrepreneurship Support Program, then their research question should be "What would happen if these NTBFs were not supported by government?" In this case, researchers would have to use a control group of NTBFs established in the same conditions (same sector, same year, same city) but without government support. Then, further research on the impact assessment of the 1512 Entrepreneurship Support Program could compare the two groups (control group and Program alumnis) in terms of performance indicators such as growth, sales, market shares etc.

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APPENDICES

Appendix A

Table A.1. All Applicants in terms of Regional Distribution (in detail)

City / Call Year	2012	2012 (%)	2013	2013 (%)	TOTAL	TOTAL (%)
Adana	16	2%	78	6%	94	5%
Adıyaman	0	0%	1	0%	1	0%
Afyon	1	0%	1	0%	2	0%
Aksaray	1	0%	0	0%	1	0%
Amasya	1	0%	3	0%	4	0%
Ankara	248	33%	311	25%	559	28%
Antalya	12	2%	13	1%	25	1%
Aydın	0	0%	3	0%	3	0%
Balıkesir	3	0%	4	0%	7	0%
Bartın	0	0%	1	0%	1	0%
Bilecik	1	0%	0	0%	1	0%
Bingöl	1	0%	2	0%	3	0%
Bolu	1	0%	1	0%	2	0%
Burdur	0	0%	1	0%	1	0%
Bursa	10	1%	23	2%	33	2%
Çanakkale	1	0%	1	0%	2	0%
Çorum	3	0%	2	0%	5	0%
Denizli	1	0%	15	1%	16	1%
Diyarbakır	1	0%	2	0%	3	0%
Düzce	0	0%	1	0%	1	0%
Edirne	2	0%	1	0%	3	0%
Elazığ	10	1%	13	1%	23	1%
Erzincan	0	0%	1	0%	1	0%
Erzurum	1	0%	6	0%	7	0%
Eskişehir	23	3%	19	2%	42	2%
Gaziantep	1	0%	11	1%	12	1%
Giresun	2	0%	1	0%	3	0%
Gümüşhane	1	0%	2	0%	3	0%
Hatay	2	0%	4	0%	6	0%
Iğdır	1	0%	0	0%	1	0%
Isparta	11	1%	10	1%	21	1%

İstanbul	245	33%	425	35%	670	**34%**
İzmir	40	5%	68	6%	108	**5%**
Kahramanmaraş	1	0%	5	0%	6	**0%**
Karabük	4	1%	2	0%	6	**0%**
Karaman	4	1%	3	0%	7	**0%**
Kars	0	0%	2	0%	2	**0%**
Kayseri	8	1%	30	2%	38	**2%**
Kırıkkale	0	0%	2	0%	2	**0%**
Kırklareli	0	0%	1	0%	1	**0%**
Kırşehir	0	0%	2	0%	2	**0%**
Kocaeli	20	3%	32	3%	52	**3%**
Konya	18	2%	28	2%	46	**2%**
Kütahya	0	0%	10	1%	10	**1%**
Malatya	2	0%	6	0%	8	**0%**
Manisa	2	0%	4	0%	6	**0%**
Mersin	7	1%	3	0%	10	**1%**
Muğla	4	1%	1	0%	5	**0%**
Muş	0	0%	3	0%	3	**0%**
Nevşehir	4	1%	3	0%	7	**0%**
Niğde	3	0%	3	0%	6	**0%**
Ordu	1	0%	1	0%	2	**0%**
Osmaniye	2	0%	3	0%	5	**0%**
Rize	0	0%	2	0%	2	**0%**
Sakarya	2	0%	14	1%	16	**1%**
Samsun	3	0%	6	0%	9	**0%**
Siirt	1	0%	1	0%	2	**0%**
Sinop	0	0%	1	0%	1	**0%**
Sivas	2	0%	0	0%	2	**0%**
Şanlıurfa	1	0%	0	0%	1	**0%**
Şırnak	0	0%	2	0%	2	**0%**
Tekirdağ	5	1%	3	0%	8	**0%**
Tokat	3	0%	8	1%	11	**1%**
Trabzon	7	1%	11	1%	18	**1%**
Tunceli	0	0%	2	0%	2	**0%**
Yalova	0	0%	1	0%	1	**0%**
Yozgat	1	0%	1	0%	2	**0%**
Toplam	**745**	**100%**	**1220**	**100%**	**1965**	**100%**

Appendix B

Table A.2. Supported Applicants in terms of Regional Distribution (in detail)

City / Call Year	2012	2012 (%)	2013	2013 (%)	TOTAL	TOTAL (%)
Adana	3	3%	8	6%	11	**5%**
Ankara	40	36%	35	28%	75	**32%**
Antalya	2	2%	4	3%	6	**3%**
Bursa	2	2%	1	1%	3	**1%**
Denizli	0	0%	2	2%	2	**1%**
Elazığ	1	1%	2	2%	3	**1%**
Eskişehir	6	5%	5	4%	11	**5%**
Iğdır	1	1%	0	0%	1	**0%**
Isparta	1	1%	2	2%	3	**1%**
İstanbul	41	37%	42	33%	83	**35%**
İzmir	4	4%	10	8%	14	**6%**
Kahramanmaraş	0	0%	1	1%	1	**0%**
Karaman	0	0%	1	1%	1	**0%**
Kars	0	0%	1	1%	1	**0%**
Kayseri	0	0%	4	3%	4	**2%**
Kocaeli	3	3%	5	4%	8	**3%**
Konya	2	2%	1	1%	3	**1%**
Kütahya	0	0%	1	1%	1	**0%**
Muğla	1	1%	0	0%	1	**0%**
Nevşehir	1	1%	0	0%	1	**0%**
Niğde	1	1%	0	0%	1	**0%**
Sivas	1	1%	0	0%	1	**0%**
Tekirdağ	1	1%	0	0%	1	**0%**
Trabzon	1	1%	1	1%	2	**1%**
Toplam	**112**	**100%**	**126**	**100%**	**238**	**100%**

Appendix C

Evaluation Form of experts in the Entrepreneurship Support Group

Girişimci Değerlendirme Formu

Proje No:	
Proje Adı:	
Girişimci Adı:	
İzleyici Adı:	
İş Rehberi Adı:	

1- 2.aşama teknik faaaliyetleri planlandığı gibi yerine getirildi mi?

☐ İzleyici başarısız bulmuş ☐ İzleyici başarılı bulmuş ☐ İzleyici fevkalade bulmuş

☐ İş rehberi başarısız bulmuş ☐ İş rehberi başarılı bulmuş ☐ İş rehberi fevkalade bulmuş

Notlar

2- Potansiyel müşteriler ile görüşme yapıldı mı? Proje konusu çıktısının satışı yapılmış mı?

☐ Satılabilir ürün var

☐ Satmaya niyeti var

☐ İlan/reklam etmiş mi

☐ Müşteri ile konuşmuş

☐ Müşteri ile 2den fazla konuşmuş

☐ Sipariş almış

☐ Fatura kesmiş

☐ Daha fazla müşteri ile görüşmüş

☐ TUBİTAK desteğine ihtiyacı var

Notlar

3- Yatırımcı ile görüşülüyor mu, alınmış bir yatırım var mı? 3. Aşamaya ihtiyacı var mı?

☐ Yatırımcı ile görüşülmemiş

☐ Bir yatırımcı ile görüşülmüş

☐ Birden fazla yatırımcı ile görüşülmüş

☐ Potansiyeli yok

☐ Görüşmeler devam ediyor

☐ Yatırımcı bulunmuş

☐ TUBİTAK desteğine ihtiyacı var

☐ 3. Aşamaya başvuru yok

☐ 3. Aşamaya başvuru var

Notlar

4- Diğer Notlar

Appendix D

Survey Questions

Bu formu düzenle

1512 Girişimcilik Aşamalı Destek Programı Etki Analizi Tez Çalışması

Değerli Girişimciler,

Bu anket, "Türkiye'de Devlet Desteği Alan Teknogirişimcilerin Başarılarını Etkileyen Faktörler" isimli yüksek lisans tez çalışması kapsamında gerçekleştirilmektedir. Bu ankette vereceğiniz bilgilerin hepsi kesinlikle gizli tutulacak ve ankete verilen tüm diğer cevaplarla birlikte değerlendirilecektir. Soruları eksiksiz doldurmanız değerlendirme açısından önem arz etmektedir. Zaman ayırdığınız için teşekkürler.

* Gerekli

Proje Numaranız *

Proje numaranız 7 hanelidir ve 21***** ile başlar.

Cinsiyetiniz *

◯ Kadın
◯ Erkek

Yaşınız *

Desteği aldığınız zamanki eğitim durumunuz *

Bu soruyu şimdiki eğitim durumunuza göre değil, desteği aldığınız dönemde tamamlanmış olan eğitiminize göre yanıtlayınız.

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○ Lisans Öğrencisi
○ Lisans mezunu
○ Yüksek Lisans Öğrencisi
○ Yüksek Lisans Mezunu
○ Doktora Öğrencisi
○ Doktora Mezunu

Ailenizde girişimci var mı? *

○ Evet
○ Hayır

Eğitim gördüğünüz alan ile iş @krinizin bağlantısı aşağıdaki seçeneklerden hangisine uymaktadır? *

Lütfen yalnızca bir seçeneği işaretleyiniz.

○ İlgisiz
○ Biraz ilgili
○ Çok ilgili
○ Birebir uzmanlık alanım

Projeyi tek başınıza mı bir ekip ile birlikte mi yürütüyorsunuz? *

○ Tek başıma
○ Ekip ile

Ekip ile birlikte yürütüyorsanız ekibin toplam iş tecrübesi kaç yıllık?

Projeyi tek başınıza yürütüyorsanız lütfen bu soruya cevap vermeyiniz.

[   ]

Ekip ile birlikte yürütüyorsanız bu ekiple daha önce bir ortak proje yürüttünüz mü?

Projeyi tek başınıza yürütüyorsanız lütfen bu soruya cevap vermeyiniz.

○ Evet
○ Hayır

Firmanın satış durumu aşağıdaki seçeneklerden hangilerine uygundur? *

○ Satışa yönelik bir gelişme yok
○ Müşterilerle görüşülmeye başlandı ancak henüz satış gerçekleşmedi

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○ Geliştirmek için destek aldığımız ürün/hizmete yönelik satış yapıldı
○ Başka ürün/hizmete yönelik satış yapıldı

Müşteri ile görüştüyseniz müşteri talepleri doğrultusunda projenizde değişiklik yaptınız mı?

Müşteri görüşmeleri gerçekleşmediyse lütfen bu soruyu boş bırakınız

○ Evet
○ Hayır

Firmanın yatırım durumu aşağıdaki seçeneklerden hangilerine uygundur? *

○ Yatırıma yönelik bir gelişme yok
○ Firmanın şimdilik yatırım ihtiyacı yok
○ Firmanın yatırım ihtiyacı var ancak henüz hiç yatırımcı ile görüşülmedi
○ Yatırımcı ile görüşüldü ancak henüz yatırım alınmadı
○ Yatırım alındı

Firmanız nerede faaliyet gösteriyor? *

○ Teknokent
○ Teknokent dışında bulunan bir kuluçka merkezi
○ Organize Sanayi Bölgesi
○ Home ofis
○ Diğer: [_____]

Firmanın Ar-Ge personeli istihdam sayısını yazınız. *

[_____]

Firmanın İdari personel istihdam sayısını yazınız. *

[_____]

Firmanın Yardımcı personel istihdam sayısını yazınız. *

[_____]

Proje destek tarihleri içinde çalışma durumunuza uygun olan seçeneği işaretleyiniz. *

Bu soruyu şimdiki çalışma durumunuza göre değil, destek tarihleri içindeki çalışma durumunuza göre

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yanıtlayınız.

○ Sadece bu şirkette çalışıyordum

○ Başka bir şirkette tam zamanlı çalışıyordum

○ Başka bir şirkette yarı zamanlı, bu şirkette yarı zamanlı çalışıyordum

○ Akademisyen olduğum için üniversitenin izin verdiği zaman aralığında bu şirkette geri kalan zamanda üniversitede çalışıyorum

○ Projede hiç çalışmadım, işi çalışanlara yaptırıyorum; ben Ykir sahibi ve yöneticiyim

Daha önce girişimcilik deneyiminiz oldu mu? *

○ Evet

○ Hayır

Daha önce proje deneyiminiz oldu mu? *

○ Evet

○ Hayır

Daha önce proje deneyiminiz oldu ise proje hangi kurumdan alınan destek ile yürütüldü?

○ TÜBİTAK

○ KOSGEB

○ AB

○ Kalkınma Ajansı

○ Diğer

Teknik donanım haricinde pazarlama ve satışa yönelik bir eğitim aldınız mı ya da bu alanda bir deneyiminiz var mı? *

○ Evet

○ Hayır

Programın 3.aşamasına başvurunuz varsa lütfen uygun seçeneği işaretleyiniz.

Lütfen yalnızca bir seçenek işaretleyiniz.

○ Başvuru aşamasında

○ Değerlendirme aşamasında

○ Destek kararı çıktı

○ Desteklenmeme kararı çıktı

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○ Proje yürütülüyor
○ Proje başarıyla tamamlandı
○ Proje başarısız oldu./ yürürlükten kaldırıldı

Diğer kamu desteklerine başvurunuz varsa uygun seçeneği işaretleyiniz.

Lütfen yalnızca bir seçenek işaretleyiniz.

○ Başvuru aşamasında
○ Değerlendirme aşamasında
○ Destek kararı çıktı
○ Desteklenmeme kararı çıktı
○ Proje yürütülüyor
○ Proje başarıyla tamamlandı
○ Proje başarısız oldu./ yürürlükten kaldırıldı

Bu destek olmasaydı projenizi yürütecek miydiniz? *

○ Evet
○ Hayır

Evet ise; desteğin olmadığı durumda size uygun olan seçenekleri işaretleyiniz.

Bir önceki soruya "Hayır" cevabı verdiyseniz lütfen bu soruyu yanıtlamayınız.

○ Proje bütçesinin büyüklüğü aynı kalırdı
○ Proje bütçesinin büyüklüğü daha küçük olurdu
○ Proje bütçesinin büyüklüğü daha büyük olurdu
○ Proje süresi aynı kalırdı
○ Proje süresi daha kısa olurdu
○ Proje süresi daha uzun olurdu
○ Projemi kendi kaynaklarımla yapmaya devam ederdim
○ Projemi hayata geçirebilmek için başka kamu kaynaklarına başvururdum
○ Projemi hayata geçirebilmek için yatırımcı/ortak bulurdum
○ Projemi şirket kurmadan hayata geçirirdim. Fikrimin başarılı olduğunu gördükten sonra şirket kurardım

Bu desteği siz verseydiniz desteğin tasarımı nasıl olurdu? *

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Son olarak eklemek istediğiniz görüşler/öneriler nelerdir? *

Gönder

Google Formlar üzerinden asla şifre göndermeyin.

%100: Başarıyla tamamladınız.

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Kötüye Kullanımı Bildirme - Hizmet Şartları - Diğer Şartlar

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Appendix E

The results of the econometric models where we cannot reject the null hypothesis that the selection equation and the outcome equation are dependent on each other

Table A. 3. The estimation results of Model 4

VARIABLES	(1) sale	(2) support	(3) athrho
ICT	0.388**		
	(0.162)		
PhD	0.546**	0.415***	
	(0.245)	(0.121)	
working	0.562**		
	(0.242)		
prior_entre	0.0858		
	(0.235)		
prior_project	0.340		
	(0.351)		
prior_management	-0.328*		
	(0.180)		
team	0.176		
	(0.227)		
uni_tto		-0.299**	
		(0.150)	
uni_index		0.00963***	
		(0.00343)	
uni_technic		0.263**	
		(0.128)	
city_index		0.0134	
		(0.0315)	
Constant	-3.212***	-2.150***	11.60
	(0.436)	(0.190)	(21.21)
Observations	1,424	1,424	1,424

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.4. The estimation results of Model 5

VARIABLES	(1) sale	(2) support	(3) athrho
ICT	0.420***		
	(0.154)		
PhD	0.574**	0.398***	
	(0.235)	(0.120)	
working	0.588***		
	(0.217)		
prior_entre	0.0312		
	(0.216)		
prior_project	0.358		
	(0.359)		
prior_management	-0.265		
	(0.183)		
uni_index		0.00681**	
		(0.00312)	
uni_technic		0.266**	
		(0.121)	
city_index		0.00851	
		(0.0320)	
Constant	-3.167***	-2.215***	12.74
	(0.413)	(0.188)	(41.79)
Observations	1,424	1,424	1,424

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A. 5. The estimation results of Model 6

VARIABLES	(1) sale	(2) support	(3) athrho
ICT	0.385**		
	(0.188)		
female	0.393**		
	(0.158)		
PhD	0.568**	0.399***	
	(0.265)	(0.120)	
working	0.512**		
	(0.243)		
prior_entre	0.0620		
	(0.276)		
prior_project	0.346		
	(0.362)		
prior_management	-0.269		
	(0.192)		
team	0.332		
	(0.261)		
city_index		0.0154	
		(0.0319)	
uni_index		0.00667**	
		(0.00317)	
uni_technic		0.249*	
		(0.127)	
Constant	-3.433***	-2.223***	15.24***
	(0.491)	(0.191)	(1.860)
Observations	1,424	1,424	1,424

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A. 6. The estimation results of Model 7

VARIABLES	(1) sale	(2) support	(3) athrho
ICT	0.940**		
	(0.407)		
PhD	-0.240	0.484***	
	(0.755)	(0.112)	
working	1.257**		
	(0.604)		
academician	1.093*		
	(0.652)		
team	0.110		
	(0.381)		
age		0.0293***	
		(0.0107)	
city_tto		0.341*	
		(0.201)	
city_index		0.0202	
		(0.0363)	
Constant	-1.899	-3.091***	-0.156
	(3.310)	(0.386)	(1.363)
Observations	1,821	1,821	1,821

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A. 7. The estimation results of Model 8

VARIABLES	(1) sale	(2) support	(3) athrho
ICT	0.421**		
	(0.188)		
PhD	0.571**	0.398***	
	(0.253)	(0.120)	
working	0.544**		
	(0.233)		
prior_entre	0.109		
	(0.261)		
prior_project	0.358		
	(0.356)		
prior_management	-0.242		
	(0.194)		
team	0.158		
	(0.234)		
uni_index		0.00650**	
		(0.00316)	
uni_technic		0.276**	
		(0.127)	
city_index		0.00752	
		(0.0323)	
Constant	-3.281***	-2.198***	8.464
	(0.450)	(0.188)	(3,197)
Observations	1,424	1,424	1,424

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix F. TURKISH SUMMARY/TÜRKÇE ÖZET

Teknogirişimcilik son yıllarda bir çok alanda ve ülkede öne çıkan ve devletler tarafından desteklenen bir olgudur. Türkiye'de de teknogirişimcilik bir çok destekleme mekanizması ile devlet tarafından desteklenmektedir. Türkiye'de devlet tarafından desteklenen yeni kurulan teknogirişim firmalarının erken aşama performanslarını değerlendiren bir akademik çalışma maalesef literatürde bulunmamaktadır. Bu sebeple bu çalışmada Türkiye'de devlet desteği ile kurulan teknoloji tabanlı başlangıç firmalarının erken aşama performansları analiz edilmektedir.

Bu yüksek lisans tezi, Türkiye'de devlet desteği ile kurulan teknoloji tabanlı başlangıç firmalarının erken aşama performansını etkileyen faktörleri analiz etmeyi ve mevcut destek mekanizmalarını iyileştirme için politika önerileri geliştirmeyi amaçlamaktadır.

Bu çalışmanın literatüre temel katkısı Türkiye'de devlet desteği ile kurulan teknoloji tabanlı başlangıç firmalarının erken aşama performansını etkileyen faktörleri analiz eden ilk çalışma olmasıdır. Literatürde teknoloji tabanlı başlangıç firmalarının performansını etkileyen faktörleri analiz eden çeşitli ülke örneklerine rastlamak mümkündür. Oysaki bir çok mekanizma ile teknogirişimciliği devlet eliyle destekleyen Türkiye'de böyle bir akademik çalışmaya rastlanmamıştır. Literatürdeki bu eksiklik bu çalışmanın çıkış sebebidir. Literatürde var olan diğer çalışmalarda teknoloji tabanlı başlangıç firmalarının performansını etkileyen bir çok faktör bulunmuştur. Bu çalışmanın literatür taraması bölümünde literatür üçe ayrılmıştır. İlk önce yeni kurulan başlangıç firmalarının performansını etkileyen faktörlere ilişkin çalışmalara yer verilmiş, sonrasında ise teknoloji tabanlı başlangıç firmaları özelinde performans faktörlerine bakılmıştır. Son olarak ise çeşitli ülkelerdeki teknogirişimcilik desteklerinin etki analizlerini yapan çalışmalara yer verilmiştir. Yeni kurulan başlangıç firmalarında performansı etkileyen faktörleri inceleyen çalışmalar Tablo A.8'de özetlenmiştir. Tablo A.8'den de anlaşılabileceği gibi başlangıç firmasının kurucusunun kişilik özellikleri kronolojik sırasıyla Begley ve Bond (1987), Herron ve Robinson (1993), Gatewood ve diğerleri (1995), Jo ve Lee (1996) ve Ciaverella ve diğerleri (2004) çalışmalarında başarıda etkili bir faktör olarak öne çıkmıştır. Buna karşın yine kronolojik sırasıyla Sandberg ve Hofer (1988), Gartner ve diğerleri (1999)

ve Duchesneau ve Garner (1990) çalışmalarında kurucunun kişilik özellikleri başlangıç firmalarının başarılarında etkili bulunmamıştır. Kurucunun kişilik özellikleri haricinde firma stratejisi ve endüstri yapısı da yeni kurulan başlangıç firmalarında performansı etkileyen faktörler arasında görülmüştür. Sexton ve Upton (1990) ve Duchesneau ve Garner (1990) bu çalışmalara örnek olarak gösterilebilir.

Tablo A.8. Başlangıç Firmalarında Başarı Faktörleri Literatür Özeti

Başlangıç Firmalarında Başarı Faktörleri	Kurucunun kişilik özellikleri	Güçlü	Begley ve Bond (1987)
			Herron ve Robinson (1993)
			Gatewood ve diğerleri (1995)
			Jo ve Lee (1996)
			Ciaverella ve diğerleri (2004)
		Güçlü değil	Sandberg ve Hofer (1988)
			Gartner ve diğerleri (1999)
			Duchesneau ve Garner (1990)
	Firma Stratejisi ve Endüstri Yapısı		Sexton ve Upton (1990)
			Duchesneau ve Garner (1990)

Teknoloji tabanlı başlangıç firmalarında performansı etkileyen faktörleri inceleyen çalışmalar ise Tablo A.9.'da özetlenmiştir. Tablo A.9'dan da anlaşılabileceği gibi kurucunun kişilik özellikleri yine başarı üzerinde tartışmalı bir faktör olarak öne çıkmaktadır. Kurucunun kişilik özelliklerini başarıda önemli bir faktör olarak gösteren çalışmalara örnek göstermek gerekirse, kronolojik olarak Stuart ve Abetti (1987), Colombo ve diğerleri (2004), Bulsara ve diğerleri (2009), Tajeddini ve Mueller (2009) ve Okamura ve diğerleri (2011) örnek verilebilir. Buna karşın Stuart ve Abetti (1990) ve Kakati (2003) ise kurucunun kişilik özelliklerinin teknoloji tabanlı başlangıç firmalarının başarısında etkili olmadığını savunmaktadır. Kurucunun kişilik özellikleri

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haricinde takımın beşeri sermayesinin önemini dile getiren çalışma ise Wright ve diğerleri (2007)'dir. Beşeri sermaye haricinde sosyal sermayenin önemini vurgulayan çalışma ise Davidsson ve Honig (2003)'tür. Takım çalışmasının önemini vurgulayan çalışmalar ise yine kronolojik olarak Thamhain (1990), Oakey (2003) ve Colombo ve diğerleri (2005)'tir. Bilgi girdisinin başarıda etkili olduğunu savunan çalışmalar ise kronolojik olarak Oakey (2003), Colombo ve Grilli (2005) ve Hindle ve Yencken (2004)'tür. Eğitim ise yine tartışmalı bir faktördür. Stuart ve Abetti (1990)'un eğitimin güçlü bir faktör olmadığını savunmasına rağmen, Arora ve Faraone (2003) ise eğitimin güçlü bir faktör olduğunu savunmaktadırlar. Son olarak Chorev ve Anderson (2006) İsrail için; Petti ve Zhang (2011) ise Çin için tekno-girişimciliğin analiz edildiği ülke örnekleri çalışmalarıdır.

Tablo A.9. Teknoloji Tabanlı Başlangıç Firmalarında Başarı Faktörleri Literatür Özeti

Teknoloji tabanlı başlangıç firmalarında başarı faktörleri	Kurucunun kişilik özellikleri	Güçlü değil	Stuart ve Abetti (1990)
			Kakati (2003)
		Güçlü	Stuart ve Abetti (1987)
			Colombo ve diğerleri (2004)
			Bulsara ve diğerleri (2009)
			Tajeddini ve Mueller (2009)
			Okamuro ve diğerleri (2011)
	Takımın Beşeri Sermayesi		Wright ve diğerleri (2007)
	Sosyal Sermaye		Davidsson ve Honig (2003)
	Takım çalışması		Thamhain (1990)
			Oakey (2003)
			Colombo ve diğerleri (2005)
	Bilgi Girdisi		Oakey (2003)
			Colombo ve Grilli (2005)
			Hindle ve Yencken (2004)
	Ülke Örnekleri		Chorev ve Anderson (2006)
			Petti ve Zhang (2011)
	Eğitim	Güçlü	Arora ve Faraone (2003)
		Güçlü değil	Stuart ve Abetti (1990)

Son olarak teknogirişimcilik desteklerinin etki analizini yapan çalışmalar ise Tablo A.10.'da özetlenmiştir. Buna göre SEMATECH ve SBIR programlarının etki analizini yapan çalışma Klette ve diğerleri (2000) iken, İtalya'daki 44. Kanun'un etki analizini yapan Del Monte ve Scalera (2001)'dir. SBIR programının etki analizini yapan bir başka çalışma ise Kropp ve Zolin (2005)'tir. Son olarak Avrupa Birliği'ndeki uygulamaları analiz eden Revest ve Sapio (2010)'dur.

Tablo A.10. Etki Analizi Çalışmaları Literatür Özeti

Etki Analizi Çalışmaları	Klette ve diğerleri (2000)	SEMATECH ve SBIR
	Del Monte ve Scalera (2001)	İtalya'daki 44. Kanun
	Kropp ve Zolin (2005)	SBIR
	Revest ve Sapio (2010)	Avrupa Birliği

Bu tez çalışması çerçevesinde Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TÜBİTAK) tarafından 2012 yılından beri yürütülen 1512 Girişimcilik Destek Programı seçilmiştir. Toplumumuzun yaşam kalitesinin artmasına ve ülkemizin sürdürülebilir gelişmesine hizmet eden, bilim ve teknoloji alanlarında yenilikçi, yönlendirici, katılımcı ve paylaşımcı bir kurum olma vizyonunu benimseyen TÜBİTAK, akademik ve endüstriyel araştırma geliştirme çalışmalarını ve yenilikleri desteklemek, ulusal öncelikler doğrultusunda Araştırma-Teknoloji-Geliştirme çalışması yürüten Ar-Ge enstitülerini işletme işlevlerinin yanı sıra, ülkemizin Bilim ve Teknoloji politikalarını belirlemekte ve toplumun her kesiminde bu farkındalığı artırmak üzere kitaplar ve dergiler yayınlamaktadır. Bilim insanlarının yurt içi ve yurt dışı akademik faaliyetleri burs ve ödüller ile desteklenmekte, özendirilmekte, üniversitelerimizin, kamu kurumlarımızın ve sanayimizin projeleri fonlanarak, ülkemizin rekabet gücünün artırılması hedeflenmektedir. TÜBİTAK tarafından yürütülen 1512 Girişimcilik Destek Programı'nın 2012 yılı yönetmeliğindeki adı 1512 Bireysel Girişimcilik Destek Programı iken 2013 yılında programın adı 1512

Girişimcilik Aşamalı Destek Programı olarak değiştirilmiştir. 2015 yılında ise programın adı 1512 Teknogirişim Sermaye Destek Programı olarak değiştirilmiştir. Bu sebeple bu analiz çerçevesinde programın adı 1512 Girişimcilik Destek Programı olarak kullanılmış ve 3 isim altında geçerli olan bu program kastedilmiştir.

1512 Girişimcilik Destek Programı 4 aşamadan oluşan bir programdır. Programın birinci aşamasında herhangi bir üniversitenin 4 yıllık örgün eğitim veren bir programından mezun olan teknogirişimcilerin teknoloji tabanlı iş fikirleri bir çağrı ile online olarak toplanır. Yapılan panel değerlendirmesi sonucunda uygun bulunan iş fikirlerinden eğitim ve iş rehberliği hizmetleri sonucunda bir iş planı yazmaları beklenir. İş planının TÜBİTAK'a iletilmesi ile 2. Aşama başlar. 2. Aşamada yapılan panel değerlendirmesi sonucunda uygun bulunan iş planları sahipleri belirtilen süre içerisinde sermaye şirketi kurmaları halinde, sermaye şirketlerine teknogirişimcinin teknoloji tabanlı iş planlarını en fazla on iki ay içerisinde hayata geçirmeleri için 100.000 TL'ye kadar sermaye desteği hibe olarak geri ödemesiz şekilde aktarılır. Bunun yanında en fazla on iki ay boyunca ücreti TÜBİTAK tarafından ödenen iş rehberleri teknoloji tabanlı başlangıç firmalarına atanır. 2. aşama sonunda ticarileşebilir bir prototip ortaya çıkaramayan firmalar için 3. aşamada projenin ilerletilebilmesi için 550.000 TL'ye kadar %75 oranla hibe destek sağlanır. 4. aşamada ise projenin ticarileşebilmesi için proje pazarları ve yatırımcı etkinlikleri düzenlenir.

Teknoloji tabanlı yeni firmaların erken aşama performansını etkileyen faktörleri analiz edebilmek amacıyla üç farklı kaynaktan veri toplanmıştır. Bu kaynaklar TÜBİTAK Veritabanı, anketler ve yüz yüze mülakatlardır. TÜBİTAK Veritabanında toplanan veriler kısıtlı olduğundan 1512 Girişimcilik Destek Programı'ndan destek alan teknogirişimcilere yönelik bir anket hazırlanmıştır. Hazırlanan anket online bir anket uygulama programına yüklenmiş ve programın ilk iki yılkı çağrılarında destek alan 238 teknogirişimciye TÜBİTAK Veritabanında kayıtlı güncel e-posta adreslerine gönderilmiştir. En fazla on beş dakikada online olarak doldurulabilen anketler yirmi beşi çoktan seçmeli, ikisi açık uçlu olmak üzere toplam yirmi yedi soru içermektedir. 238 teknogirişimciden 95'i ankete cevap vermiştir. Böylece anketin cevaplanma oranı %40 olmuştur. Ancak daha detaylı analiz yapabilmek için daha detaylı veriye ihtiyaç duyulmuştur. Bu sebeple de 1512 Girişimcilik Destek Programı'nın ilk iki yılkı çağrısında destek alan ve TÜBİTAK değerlendirmeleri sonucunda başarılı bulunan 36

firmaya yönelik yüz yüze mülakat soruları hazırlanmıştır. 36 başarılı girişimciden 8'i yüz yüze mülakatları kabul etmiştir. Böylece yüz yüze mülakatların cevaplanma oranı %22 olmuştur. Yirmi açık-uçlu sorudan oluşan mülakatlar yarım saat ile üç saat arasında sürmüştür.

Üç veri kaynağından toplanan veriler hem nicel hem de nitel analiz yöntemleri ile analiz edilmiştir. TÜBİTAK Veritabanı ve anketler yoluyla toplanan veriler Probit ile Örneklem Seçimi yöntemi ile nicel olarak analiz edilmiştir. Yüz yüze mülakat yöntemi ile toplanan veriler ise derinlemesine mülakat yöntemi ile nicel analiz sonuçlarını doğrulamak için nitel olarak analiz edilmiştir.

Nicel analizde Probit ile Örneklem Seçimi yönteminin kullanılmasının sebebi destek alan teknogirişimciler analiz edilirken seçim yanlılığı olabileceğinden seçim yanlılığı sorunundan kurtulabilmek için örneklem seçimi yapılmış ve iki aşamalı metot kullanılmıştır. İki aşamalı metotlar içerisinden Probit ile Örneklem Seçimi yönteminin seçilmesinin sebebi ise iki aşama da kullanılan bağımlı değişkenlerin ikili değişken olmasıdır. Nicel analizin birinci aşamasında programa başvuran tüm girişimcilerin verileri analiz edilmiş ve programdan destek alma olasılıklarına etki eden faktörler analiz edilmiştir. Bu modelde birinci aşamada bağımlı değişken teknogirişimcinin 1512 Girişimcilik Destek Programı'ndan destek alma durumudur. Destek alma durumu ikili değişkendir. Nicel analizin ikinci aşamasında ise programdan destek alan teknoloji tabanlı başlangıç firmalarının erken aşama performanslarına etki eden faktörler analiz edilmiştir. Böylece bir teknogirişimcinin 1512 Girişimcilik Destek Programı'ndan destek almasına sebep olan bir faktör, teknogirişimcinin kuracağı teknoloji tabanlı başlangıç firmasının erken aşama performansına etki eden bir faktör gibi görünmeyecek ve seçim yanlılığı ortadan kalkmış olacaktır. İkinci modelde bağımlı değişken olarak teknoloji tabanlı başlangıç firmasının ilk satışını gerçekleştirip gerçekleştirmediği yani teknogirişimcinin teknoloji tabanlı iş fikrini ticarileştirip ticarileştiremediği durumudur. Dolayısıyla ikinci modelde de bağımlı değişken ikili değişken şeklindedir. Teknogirişimcinin 1512 Girişimcilik Aşamalı Destek Programı'ndan destek alma durumu ve teknogirişimcinin kurduğu teknoloji tabanlı başlangıç firmasının satış gerçekleştirme durumu ikili değişkenler olduğundan Probit ile Örneklem Seçimi yöntemi nicel analiz yöntemi olarak bu çalışmada seçilmiştir.

Nicel analizde çıktı denkleminde (outcome equation) bağımlı değişken olarak teknogirişimcinin programa başvuruda bulunduğu teknoloji tabanlı iş fikrinin ticarileşmesi yani satışının gerçekleşmiş olması durumunun kullanılmasının çeşitli sebepleri vardır. Literatürde kullanılan büyüme, karlılık, 5 yıl hayatta kalma, 8 yıl hayatta kalma gibi değişkenler 1512 Girişimcilik Destek Programı mezunları için kullanılabilir göstergeler değildir çünkü 1512 Girişimcilik Destek Programı 2012 yılında bir çağrı ile başlatılmış ve ilk mezunlarının firmaları anketin yapıldığı tarihte 2 yaşında iken 2.yıl çağrısı mezunları 1,5 yıllık firmalardır. Zaten bu sürenin ilk 1 yılı destekle geçmektedir. Dolayısıyla destek sonrasına ait büyüme, karlılık, 5 yıl hayatta kalma, 8 yıl hayatta kalma gibi değişkenler uygun değildir. Bu sebeple erken aşama performans göstergesi olarak teknogirişimcinin programa başvuruda bulunduğu teknoloji tabanlı iş fikrinin ticarileşip ticarileşmediği durumu bağımlı değişken olarak kullanılmıştır. Bu noktada ankette sorulan satış durumu sorusuna "Programa başvuruda bulunduğum iş fikri çıktısı ile ilgili satış gerçekleşti." Seçeneğini seçen teknogirişimcilerin nicel analizde çıktı denkleminde bağımlı değişkenleri 1 değerini alırken diğer seçenekleri işaretleyen teknogirişimcilerde bu değişken 0 değerini almıştır.

Nicel analiz yöntemi teknoloji tabanlı başlangıç firmalarının erken aşama performanslarını etkileyen tüm olası faktörleri incelemek için vaka özelinde yeterli olmadığından nitel analiz yönteminde de derinlemesine mülakat yöntemi seçilmiştir. Derinlemesine mülakat yöntemi ile TÜBİTAK Uzman Değerlendirmesi sonucunda başarılı bulunan teknoloji tabanlı başlangıç firmalarının başarılarına etki eden olası faktörler detaylı bir biçimde vaka özelinde analiz edilmiştir.

Nicel analiz sonuçlarına göre, birinci ekonometrik modelde aşağıda sıralanan sonuçlar öne çıkmıştır:

Birinci ekonometrik modelin çıktı denkleminde, firmanın bilişim teknolojilerinde faaliyet göstermek, kurucunun doktora derecesine sahip olması, kurucunun sadece teknoloji odaklı başlangıç firmasında tam zamanlı olarak çalışıp çalışmadığı ve kurucunun daha önce yöneticilik ve satış deneyimi olması değişkenleri istatistiksel olarak anlamlı çıkmıştır. Firmanın bilişim teknolojilerinde faaliyet göstermesi, kurucunun doktora derecesine sahip olması, kurucunun sadece teknoloji odaklı başlangıç firmasında tam zamanlı olarak çalışıp çalışmadığı, kurucunun daha önce

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girişimcilik deneyimi olup olmaması, kurucunun daha önce proje deneyimi olup olmaması ve takım çalışması olup olmaması değişkenlerinin işaretleri beklendiği gibi çıkarken, kurucunun daha önce yöneticilik deneyimi olup olmaması değişkenin işareti beklenen aksine negatif çıkmıştır. Böylece, çıktı denkleminde, eğer firma bilişim teknolojilerinde faaliyet gösteriyorsa, takım çalışması ile yürütülüyorsa, kurucusunun doktora derecesi, geçmiş girişimcilik ve proje deneyimi varsa ve kurucusu tam zamanlı olarak devlet desteği ile kurulan teknoloji tabanlı başlangıç firmasında çalışıyorsa, bu firmanın iş fikrini ticarileştirme olasılığı diğer firmalara göre daha fazladır. Kurucunun daha önceki yöneticilik ve satış deneyiminin beklenen işareti ile ekonometrik analiz sonucunda çıkan işaretin farkı olmasının sebebi, teknogirişimcinin daha önce çalıştığı kurumsal büyük firmadaki yöneticilik tekniklerinin, başlangıç firmaları için geçerli olmaması olabilir. Büyük kurumsal firmalar ile teknoloji tabanlı başlangıç firmalarının dinamiklerinin farklı olması sebebiyle, aynı teknikler uygulansa bile teknogirişimcinin daha önce çalıştığı kurumsal büyük firmadaki yönetim ve satış teknikleri teknoloji tabanlı başlangıç firması için yanlış olabilir. Analiz sonucunda ortalama marjinal etkilere bakıldığında ise firmanın bilişim sektöründe faaliyet göstermesinin satış üzerindeki marjinal etkisi %13 görülmektedir. Yani firma eğer bilişim sektöründe faaliyet gösteriyorsa satış yapma olasılığı diğer firmalara göre %13 daha fazladır. Kurucunun doktora derecesine sahip olmasının ortalama marjinal etkisi ise %20'dir. Bir başka deyişle, eğer firma kurucusu olan teknogirişimcinin doktora derecesi varsa satış yapma olasılığı %20 artmaktadır. Zamanının tamamını teknoloji tabanlı başlangıç firmasında çalışmak üzere harcayan teknogirişimcilerin satış yapma olasılığı ise diğer firmalara göre %19 daha fazladır. Girişimcinin daha önce girişimcilik deneyimi olmasının satış üzerindeki ortalama marjinal etkisi ise %6'dır. Yani daha önce girişimcilik deneyimi olan teknogirişimcilerin fikrini ticarileştirme olasılığı diğer teknogirişimcilere göre %6 daha fazladır. Teknogirişimcinin daha önce proje deneyimine sahip olmasının satış üzerindeki ortalama marjinal etkisi ise %12'dir. Bu sebeple, daha önce proje deneyimi olan teknogirişimcilerin iş fikrini ticarileştirme olasılığı diğer teknogirişimcilere göre %12 daha fazladır. Fakat, teknogirişimcinin daha önceki yöneticilik ve satış deneyimine sahip olmasının satış üzerindeki ortalama marjinal etkisi -%12'dir. Bir başka deyişle, daha önce yöneticilik deneyimi olan teknogirişimcilerin iş fikrini ticarileştirme olasılığı diğer teknogirişimcilere göre %12 daha azdır. Son olarak, teknoloji tabanlı başlangıç firmasında takım çalışması olup

olmamasının satış üzerindeki marjinal etkisi ise %8'dir. Yani takım çalışmasına imkan sağlayan bir teknoloji tabanlı başlangıç firmasının satış yapma olasılığı diğer firmalara göre %8 daha fazladır.

Nicel analiz sonuçlarına göre, ikinci ekonometrik modelde aşağıda sıralanan sonuçlar öne çıkmıştır:

İkinci ekonometrik modelin çıktı denkleminde, firmanın bilişim teknolojilerinde faaliyet göstermek, kurucunun doktora derecesine sahip olması, kurucunun sadece teknoloji odaklı başlangıç firmasında tam zamanlı olarak çalışıp çalışmadığı ve kurucunun daha önce yöneticilik ve satış deneyimi olması değişkenleri istatistiksel olarak anlamlı çıkmıştır. Firmanın bilişim teknolojilerinde faaliyet göstermesi, kurucunun doktora derecesine sahip olması, kurucunun sadece teknoloji odaklı başlangıç firmasında tam zamanlı olarak çalışıp çalışmadığı, kurucunun daha önce girişimcilik deneyimi olup olmaması, kurucunun daha önce proje deneyimi olup olmaması ve takım çalışması olup olmaması değişkenlerinin işaretleri beklendiği gibi çıkarken, kurucunun daha önce yöneticilik deneyimi olup olmaması değişkenin işareti beklenen aksine negatif çıkmıştır. Böylece, çıktı denkleminde, eğer firma bilişim teknolojilerinde faaliyet gösteriyorsa, takım çalışması ile yürütülüyorsa, kurucusunun doktora derecesi, geçmiş girişimcilik ve proje deneyimi varsa ve kurucusu tam zamanlı olarak devlet desteği ile kurulan teknoloji tabanlı başlangıç firmasında çalışıyorsa, bu firmanın iş fikrini ticarileştirme olasılığı diğer firmalara göre daha fazladır. Kurucunun daha önceki yöneticilik ve satış deneyiminin beklenen işareti ile ekonometrik analiz sonucunda çıkan işaretin farkı olmasının sebebi, teknogirişimcinin daha önce çalıştığı kurumsal büyük firmadaki yöneticilik tekniklerinin, başlangıç firmaları için geçerli olmaması olabilir. Büyük kurumsal firmalar ile teknoloji tabanlı başlangıç firmalarının dinamiklerinin farklı olması sebebiyle, aynı teknikler uygulansa bile teknogirişimcinin daha önce çalıştığı kurumsal büyük firmadaki yönetim ve satış teknikleri teknoloji tabanlı başlangıç firması için yanlış olabilir. Analiz sonucunda ortalama marjinal etkilere bakıldığında ise firmanın bilişim sektöründe faaliyet göstermesinin satış üzerindeki marjinal etkisi %15 görülmektedir. Yani firma eğer bilişim sektöründe faaliyet gösteriyorsa satış yapma olasılığı diğer firmalara göre %15 daha fazladır. Kurucunun doktora derecesine sahip olmasının ortalama marjinal etkisi ise %20'dir. Bir başka deyişle, eğer firma kurucusu olan teknogirişimcinin doktora derecesi varsa

satış yapma olasılığı %20 artmaktadır. Zamanının tamamını teknoloji tabanlı başlangıç firmasında çalışmak üzere harcayan teknogirişimcilerin satış yapma olasılığı ise diğer firmalara göre %19 daha fazladır. Girişimcinin daha önce girişimcilik deneyimi olmasının satış üzerindeki ortalama marjinal etkisi ise %5'tir. Yani daha önce girişimcilik deneyimi olan teknogirişimcilerin fikrini ticarileştirme olasılığı diğer teknogirişimcilere göre %5 daha fazladır. Teknogirişimcinin daha önce proje deneyimine sahip olmasının satış üzerindeki ortalama marjinal etkisi ise %13'tür. Bu sebeple, daha önce proje deneyimi olan teknogirişimcilerin iş fikrini ticarileştirme olasılığı diğer teknogirişimcilere göre %13 daha fazladır. Fakat, teknogirişimcinin daha önceki yöneticilik ve satış deneyimine sahip olmasının satış üzerindeki ortalama marjinal etkisi -%8'dir. Bir başka deyişle, daha önce yöneticilik deneyimi olan teknogirişimcilerin iş fikrini ticarileştirme olasılığı diğer teknogirişimcilere göre %8 daha azdır. Son olarak, teknoloji tabanlı başlangıç firmasında takım çalışması olup olmamasının satış üzerindeki marjinal etkisi ise %7'dir. Yani takım çalışmasına imkan sağlayan bir teknoloji tabanlı başlangıç firmasının satış yapma olasılığı diğer firmalara göre %7 daha fazladır.

Nicel analiz sonuçlarına göre, üçüncü ekonometrik modelde aşağıda sıralanan sonuçlar öne çıkmıştır:

Üçüncü ekonometrik modelin çıktı denkleminde, firmanın bilişim sektöründe faaliyet gösterip göstermediği, kurucusunun doktora derecesine sahip olup olmadığı ve kurucusunun tam zamanlı olarak teknoloji tabanlı başlangıç firmasında çalışıp çalışmadığı değişkenleri istatistiksel olarak anlamlı iken, teknogirişimcinin yaşının karesi ve teknoloji tabanlı başlangıç firmasında takım çalışması yapılıp yapılmadığı değişkenleri istatistiksel olarak anlamsız çıkmıştır. Fakat tüm değişkenlerin işaretleri beklenenle uyumlu şekilde çıkmıştır. Böylece, çıktı denkleminde, eğer teknoloji tabanlı başlangıç firması bilişim sektöründe faaliyet gösteriyorsa, takım çalışmasına imkan sağlıyorsa, kurucusu doktora derecesine sahipse, kurucusu zamanın tamamını teknoloji tabanlı başlangıç firmasında çalışarak geçiriyorsa ve kurucusu orta yaşlarda ise bu firmanın satış yapma olasılığı diğer firmalara göre daha yüksektir. Analiz sonucunda ortalama marjinal etkilere bakıldığında ise, firmanın bilişim sektöründe faaliyet göstermesinin satış üzerindeki marjinal etkisi %17'dir. Bir başka deyişle, teknoloji tabanlı başlangıç firması bilişim sektöründe faaliyet gösteriyorsa satış yapma

olasılığı diğer firmalara göre %17 daha fazladır. Teknogirişimcinin yaşının karesi değişkenin ortalama marjinal etkisi 3.21e-06'dır. Teknogirişimcinin doktora derecesine sahip olmasının teknoloji tabanlı iş fikrinin ticarileşmesi üzerindeki ortalama marjinal etkisi %16'dır. Yani, eğer teknogirişimci doktora derecesine sahipse, iş fikrini ticarileştirme olasılığı diğer teknogirişimcilerden %16 daha fazladır. Teknogirişimcinin tüm zamanı teknoloji tabanlı başlangıç firmasına ayırması yani yarı zamanlı ya da tam zamanlı olarak başka bir iş yerinde çalışmadan sadece teknoloji tabanlı başlangıç firmasında çalışmasının iş fikrinin ticarileşme olasılığı üzerindeki ortalama marjinal etkisi %17'dir. Bir başka deyişle, tam zamanlı olarak teknoloji tabanlı başlangıç firmasında çalışan başka bir yerde çalışmayan teknogirişimcilerin teknoloji tabanlı iş fikrini ticarileştirme olasılığı diğer teknogirişimcilere göre %17 daha fazladır. Son olarak üçüncü ekonometrik modeldeki son bağımsız değişken olan takım çalışması değişkenin ortalama marjinal etkisi ise %5'tir. Yani, teknoloji tabanlı başlangıç firmasında takım çalışmasına yer veriliyorsa bu firmanın satış yapma olasılığı diğer firmalara göre %5 daha fazladır.

Nitel analiz sonuçlarına göre teknoloji tabanlı başlangıç firmasında takım çalışmasına yer verilmesi performansı artıran faktörler arasındadır. Bunun haricinde teknogirişimcinin eğitim durumu ve aldığı eğitimin çeşitliliği (teknik eğitim yanında ticarileşmeye ve yönetime yönelik eğitimler alması) da firma performansını artıran faktörlerden biridir. Ayrıca teknogirişimcinin daha önceden proje deneyimine sahip olması da bir diğer önemli faktördür. Teknoloji tabanlı başlangıç firmasının faaliyet gösterdiği sektör de erken aşama performansı etkileyen bir faktör olarak görülmektedir. Son olarak teknogirişimcinin kişilik özellikleri de erken aşama performansı etkileyen faktörlerden biridir. Ancak, firma stratejisi, teknogirişimcinin yaşı ve cinsiyeti derinlemesine mülakat sonuçlarına göre performansı etkileyen faktörler arasında sayılamamaktadır. İş rehberleri, bağımsız izleyiciler ve melek yatırımcılar gibi dış faktörler teknoloji tabanlı başlangıç firmalarının erken aşama performanslarında etkili olmayan faktörler olarak ortaya çıkmıştır. Bu çalışmada erken aşama performans analiz edildiğinden dış faktörlerin etkileri daha az çıkmış olabilir.

Özetle, analiz sonuçlarına göre, teknogirişimcinin eğitim düzeyi, tam zamanlı olarak teknoloji tabanlı yeni firmada çalışması, daha önceki deneyimleri ve karakteristik özellikleri ile iş fikrinin teknoloji alanı ve takım çalışması yapılması teknoloji tabanlı

yeni firmaların erken performansını etkileyen faktörlerdir. Teknogirişimcinin yaşı ve cinsiyeti ile firma stratejisi ve iş rehberi, izleyici, risk sermayedarı gibi dış faktörlerin teknoloji tabanlı yeni firmaların erken performansı üzerinde etkileri daha azdır.

Appendix G. TEZ FOTOKOPİSİ İZİN FORMU

<u>**ENSTİTÜ**</u>

Fen Bilimleri Enstitüsü	☐
Sosyal Bilimler Enstitüsü	■
Uygulamalı Matematik Enstitüsü	☐
Enformatik Enstitüsü	☐
Deniz Bilimleri Enstitüsü	☐

<u>**YAZARIN**</u>

Soyadı : Turan
Adı   : Damla
Bölümü : İktisat

<u>**TEZİN ADI**</u> (İngilizce) : Determinants of Early Performance of New
Technology-Based Firms Spported by Government: Turkish Case

<u>**TEZİN TÜRÜ**</u> : Yüksek Lisans ■   Doktora ☐

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. ■

2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir
    bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. ☐

3. Tezimden bir bir (1) yıl süreyle fotokopi alınamaz. ☐

<u>**TEZİN KÜTÜPHANEYE TESLİM TARİHİ**</u>:

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