

The Impact of Business Incubation on Firm Performance during Post Graduation Period- Turkey Example

Yasin Şehitoğlu

Gazi University, Ankara, Turkey

yasinsehitoglu@gmail.com , Tel: +90 312 837 78 00

Ömer Çağrı Özdemir

Small &Medium Sized Enterprises Development Org. of Turkey, Ankara, Turkey

ocozdemir@gmail.com , Tel: +90 312 595 28 00

Abstract

Business Incubation concept has been attracting substantial attention from policy makers and researchers due to the significance attributed to new business formation and supporting the growth oriented firms as determinants of the economic and social development. This paper focuses on TEKMERs -Technology Business Incubation model of Turkey- as a mechanism that is a vehicle for improving the firm performance. A key assumption that this study tests is whether TEKMERs help growth oriented firms overcome the barriers to growth during post-graduation period via the various kinds of supporting mechanisms provided to them during business incubation. This paper met this research aim through an extensive study of relevant literature and the implementation of descriptive and t-test research. The firm performances on the basis of sales and employment growth of incubated and non-incubated firms during post-graduation period are being compared. The findings from this research provide evidence that incubated firms outperform the non-incubated firms both in the employment and sales growth. This result demonstrates that the services provided by TEKMERs have positive impact on the firm performance during post-graduation period.

Key Words: Business Incubator, Firm Performance, TEKMERs, Turkey, KOSGEB

1. Introduction

Growth oriented firms have been accepted as important sources of economic growth, job creation and prosperity in a society (Thurik&Wenneker 1999). Hence, creating new growth-oriented firms and the supporting existing enterprises to grow have been an explicit policy perspective of many countries over the last two decades (Lalkaka&Abetti 2002).

The growth dynamic of firms has been discussed substantially in the academia; numerous different empirical researches have been conducted in order to identify the wide variety of factors influencing firm growth and many different perspectives have been developed (Davidsson, et. al 2006). From all these perspectives one fact is clear; growth of firm is a complex and multi-dimensional phenomenon (Davidsson, et. al 2006). It is hard to find a comprehensive theory embracing all aspects of firm growth since it is a very broad and complex process with many faces (Bridge, et.al 2003). The business growth issue may alternatively also be addressed from the perspective of barriers to growth literature that assumes a proportion of small firms wish to grow but are prevented from doing so by 'barriers' (Acs and Storey 2004). Storey (1994) suggested that the fundamental barriers can be both 'internal' to the firm such as lack of motivation and also 'external' including government controls and lack of skilled labour. Barber et al (1989) outlined the principal barriers as management and motivation, the sources, and the market opportunities and structure.

The success or failure of new business is often dependent on overcoming of these potential barriers. Hence in order to increase the success rate of these enterprises, policy-makers concentrated their efforts to make the conditions more conducive for entrepreneurs (O'Neal 2005). To realize this aim various mechanisms have been developed all over the world. Among a broad array of mechanisms, programs and incentives, Business Incubation programs, which are being applied not only by developing or poor countries but also industrialized countries (Gupta 2004) has been receiving considerable attention from the policy makers (Allen&Rahman 1985, Grimaldia & Grandi 2005, OECD 1997). They have emerged worldwide as highly effective methods for new business formation, of preventing business failures, and establishing a vibrant entrepreneurship (Bergek&Norrman 2008, Scillitoe&Chakrabarti 2010, Bruneel et al. 2012, Schwartz&Gothner 2009, Udell 1990, Aerts et al. 2007, Allen&Rahman 1985, Grimaldia & Grandi 2005, OECD 1997, Ratinho et al. 2010) and promotion of national and regional economic development (Lalkaka & Abetti 2002). Many governments has been devoting considerable amount of resources to establish and operate business incubators. Local governments and policymakers support business incubation because they assume incubators can generate employment, innovation, and growth by helping new businesses avoid failure (Hackett & Dilts, 2004). Thus, the number of Business Incubators has been rising rapidly around the world as an evidence of the importance attributed to the Business Incubators (Udell 1990, Ratinho 2011, Ratinho&Henriques 2010, OECD 1997, EC 2002, Schwartz&Gothner 2009)

However there are many controversial views and studies on the effectiveness of the incubators (Bollingtoft&Ulhoi 2005). It is largely unknown as to whether incubation really acts as means to overcome the so called the resource deficiencies growth oriented firms face particularly after they are graduated from business incubators (Amezcuca 2010b, Schwartz 2011). Moreover there is no profound evidence on the long-term outcomes of incubation (Chan&Lau 2005, Bruneel et al. 2012, Hackett&Dilts 2008, and Schwartz&Hornych 2008) and their significance in securing business survival and stimulating the growth (Udell 1990).

In spite of these controversial views, Incubators still are considered as highly effective tool for economic growth (Schwartz&Gothner 2009, Phan et al. 2005). In this study the long term impact of Business Incubation on firm performance will be examined.

1.1 Need to examine whether Incubation affects growth in post-incubation period

Most of these research works take the incubation period into account while assessing the performance of Business Incubators while there is a big gap in research about the post-graduation period. There is an increasing attention and acceptance among researchers and policy makers about the significance of post-graduation period for understanding the long term performance of Business Incubation (Schwartz&Hornych 2008). According to one of the recent reports of NBIA post graduate records of the graduated firms should be taken into consideration for assessing the incubators performance Schwartz (2010). Empirical investigation should go beyond the incubation period however there are few studies for post-graduation process (Schwartz&Hornych 2008). Therefore few studies explore post-incubator performance, and yet 'graduation is easy, post-graduation survival may not be' (Schwartz 2010). Schwartz&Hornych (2008) argued that the longer the firm's incubation duration the higher the risk of failure. The main reason for this is the risk of becoming over dependent on the incubator supports. A study of German incubators found a period of high risk confronts graduates within their first three years after graduation where around 20 per cent of graduates do not survive (Schwartz&Gothner 2009). A recent US study has found incubated firms outperform their peers in terms of employment and sales growth, but fail sooner (Amezcuca 2010b). Amezcuca (2010b) argued that incubators do not contribute significantly to the survival of firms. However when the employment figures taken into consideration incubated firms clearly outperforms the non-incubated firms. The average annual employment increase is 3% in incubated firms while it is 0,75% in non-incubated firms. Schwartz (2010) empirical analysis of 371 on-incubator German firms' survival performance there is no significant difference for neither of the firms located in five incubators compared to firms located outside. For three incubators there are even lower chances of survivability for the incubated firms. Thus being located in business incubators does not increase the long term business survival.

In this study, we focus on TEKMERs as a mechanism that is a vehicle for the firm development. We build our work on the previous works on business incubation to identify the impact of the TEKMER program in Turkey. We will illustrate theoretical concepts of business incubators and their performances based on the prior empirical researches provide us with the information to understand the critical factors, which influence the business incubation and graduated firms' growth.

A key assumption that this study tests is whether business incubators help new firms overcome the barriers to growth during post-graduation period via the various kinds of supporting mechanisms provided to them during business incubation.

If the incubated firms demonstrate overall higher performance than their unincubated peers during post incubation period than it can be argued that business incubation is truly a valuable service that enhances the survival and performance of (Schwartz 2011). The finding would essentially demonstrate that incubated businesses have developed a superior set of routines, competencies, and structures that allow them to win in the competition for limited resources (Schwartz 2011).

Firm performance can be measured objectively and subjectively. Objective values are measured via absolute performance values; namely, via quantitative data whereas subjective values are measured qualitatively through asking perceptive views about performance with respect to rivals or firm expectations (Dess and Robinson, 1984; Venkatraman and Ramanujam, 1986). In this study, a quantitative performance measurement is performed through using the sales and employment rates obtained from the database of KOSGEB.

This study will contribute to the literature in two ways. First of all it will add some knowledge to the literature on incubator performance (Bergek&Norrman 2008,

Scillitoe&Chakrabarti 2010, Bruneel et al. 2012, Schwartz&Gothner 2009, Aerts et al. 2007, Allen&Rahman 1985, OECD 1997, Ratinho et al. 2010), by focusing on long term impacts on Business incubation including the post-incubation period which is very new. Moreover it will help to develop arguments about the impact of Business Incubation in developing world. It will help to shed light on the issue whether the incubators are successful or not in supporting small businesses and as tools for economic growth.

2. Methodology

Evaluating the impact of business incubation has been a key goal of many researchers (Mian 1997, Udell 1990). However despite the growth in literature on incubation, few studies exist that empirically evaluate the contributions of incubators on post-incubation performance of firms. The main reason for this is difficulties of gathering sufficient longitudinal data to determine whether programs like business incubation work (Amezcuca 2010b). Another problem exists is that there is no settled standard for measuring business incubation success in the literature (Hackett & Dilts 2004).

Various levels of measurement have been suggested for Business Incubation success. Hamdani (2006) proposes three levels of assessment; incubator level, incubatee level and community level. In the same lines Dee at al. (2011) proposes three levels of measurement; tenant level, incubator or program level and surrounding level. Some of the measures used in the literature can be found in the table:

Table 1: Summary of measures used to assess the performance of Incubators (Dee at al. 2011)

Summary of measures used to assess the performance of Incubators		
Tenant Company (Incubatee)	Incubator (Programme)	Surrounding Region/University
Tenant firms' survivability	Incubator space	Contributions to sponsoring university's mission
Tenant firms' sales growth (%)	Incubator occupancy rate	Students/graduates hired by tenants as employees
Tenant firms' employment growth (%)	Graduation rate (graduates per year)	Consulting relationships between university faculty and tenants
Tenant firms' profit growth (%)	New firms created (per year)	Impact on university's prestige/public image
Tenant firms' profitability growth (%)	Cost per job (gross)	Impact on enrolments, donations, property value, equity/royalty income
Tenant firms finance raised	Average length of tenancy	Entrepreneurs originating from the university community
Tenant firms' taxes growth (%)	Average capital investment cost	Entrepreneurs serving as faculty researchers
Tenant firms' export growth (%)	Proportion of revenue from public subsidies	
Tenant firms' number of scientists and engineers	Number of incubator tenants	
Tenant firms' R&D expenditure (\$)	Presence of a complementing research park facility	
Tenant firms number of patents	Share of operational budget supported through internal sources	
Tenant firms number of copyrights	Level of funding received from key donors	
Tenant firms' number of products/services launched per year	Development of incubator in life cycle	

	Ratio of incubator staff: tenants	
	Proportion of management time advising clients	

For this dissertation the impact of the Business Incubation program on the firm performance is proposed to be measured in terms of growth in tenant firms' growth in employment and sales. This study offers a firm-level perspective on the incubation process, rather than an incubator perspective. The large majority of prior incubator/incubation literature has focused on an incubator level of analysis. There is a little firm-level research compared to incubator level analysis (Scillitoe&Chakrabarti 2010). Moreover most of the existing researches focus solely on the incubation period (Amezcuca 2010b). In this dissertation we will go beyond the incubation period and assess the long term growth performance of firms whose projects are graduated from TEKMERs. It has been argued by many policy makers and academicians that the post-graduation period is particularly important to assess the business incubation impact on economy (Amezcuca 2010b). At the end of the research a clear view on whether incubation makes any difference in the long term can be obtained.

2.1 Research Questions

This study is an attempt to find out the long term impacts of TEKMERs on firm performance on the long run including the post-graduation period by comparing the incubated and non-incubated firms' performances. Although there are many benefits of Business Incubators counted in the literature we are going to base our research on analysing the potential long term impacts of TEKMER supports on business performance particularly during post-graduation period.

We will search for the answers of one basic question:

- Incubated businesses' firm performance on the basis of employment growth will outperform their non-incubated counterparts
- Incubated businesses' firm performance on the basis of and sales growth will outperform their non-incubated counterparts

2.2 Research Method

Quantitative research based on analysis of secondary data will be used. There is scarce quantitative empirical research that evaluates the effects of incubation on firm performance mainly because of the lack of data (Amezcuca 2010a). Fortunately in Turkey example KOSGEB's database provide a good basis for assessing the firm performance. In this research we want to compare information extensively between different firm populations. Therefore we think that it is more appropriate to use quantitative methods since one of the main advantages of quantitative methods is precisely the possibility of making comparisons and enabling generalisations (Lobe et. al 2012).

The methodologies have been used in the literature may be classified under three basic categories (Dee et al. 2011):

Table 2: Review of research Methodologies Used to Assess Incubator Performance (Dee et al. 2011)

Approach	Method	Examples
Control-group concept	Pairing Firms on and off site	Lindelof&Lofsten 2002; Siegel, Westhead et al. 2003; Amezcuca 2010
Benchmarking	Surveys, categorisation, interviews, self-reporting	CSES 2002; UKBI 2009
In situ assessments, before and after	Surveys and case studies	Grimaldi&Grandi 2005; Bergek&Norman 2008, Patten, Warren et al. 2009

In this study the Control group based study which has been frequently used to assess value-added contributions of incubators to firm performance will be used. A sample of firms' performance which was benefited from TEKMERs facilities will be compared with a matched sample of similar non-incubated firms within the context of this research. By comparing the long term performance of graduate firms with the control group of non-incubated firms whether incubation has any impact on firm performance will be examined.

Difficulty in obtaining information on non-incubated control firms is one of the main problems of this kind of research (Amezcuca 2010b). Moreover some of the research works emphasize ensuring a representative sample control group of non-tenant firms and hence accurately comparing like-with-like as a way of assessing additionality (EC 2002). Nevertheless control group research is still most appropriate way of estimating the impact of Business Incubation on firm performance due to the fact that they allow making a comparison between control groups representing what would have happened to tenant businesses in the absence of business incubation (Amezcuca 2010b). A comparison control group will be very important to interpret the results in relationship to the performance of average new businesses that have grown up outside of incubators (Amezcuca 2010b).

Numerous growth measures were used in empirical researches on assessing the firm performance ranging from job creation, increased market share or sales, to growth in revenue, return on investment, or the number of customers of a firm (Amezcuca 2010b).. The firm employment and annual sales growth was generally the most accepted method of measuring growth within these studies (Hackett & Dilts 2004). Performance of firms based on the employment and annual sales growth is one of the stronger measures of firm performance for policymakers (Hackett & Dilts 2004). Hence they will be used as the measures of firm performance like in most of the previous studies (Amezcuca 2010b).

Firm level employment growth (*EGROWTH*) is measured using standard growth rate = (employment year 2) – (employment year 1))/ (employment year 1) (European Commission, 2002). 2005 is taken as the base year and 2010 the current year (Amezcuca 2010a). Since the employment will be calculated on the basis of total working day, the number of part-time employees will also take into consideration as well as the number of full time employees.

Following much of the firm growth literature sales growth will be calculated as the difference between current annuals sales and sales at the base year (Amezcuca 2010a). Thus, sales growth is measured as (volume of sales year 2) – (volume of sales year 1))/ (volume of sales year 1).

Previous studies have indicated that firm size and age influence firm performance Therefore when assessing the performance of incubator firms, it is critical to control for their firm size and age (Amezcuca 2010a). The best way to assess the impact of the business incubation is observing the same firm under incubation and without incubation simultaneously (Amezcuca 2010a). Yet it is obvious that this is impossible. Best we can do is to select the firms that have the similar characteristics as much as possible (Amezcuca 2010a). Thus to identify the valid control group that makes it possible to compare the incubated and non-incubated firms we will need some matching techniques (Amezcuca 2010b). Four important characteristics have been used in previous studies to select the most appropriate control group: firm location, industry affiliation, age of the firm and legal form (Colombo&Delmastro, 2002 Lofsten&Lindelof, 2002). We adopt similar approach for the present study. We will select the control group on the basis of age, location and sector. The age of the firm is computed as the difference between the calendar year at *t* and the birth-year reported by the firm.

In order to facilitate comparison between incubated and non-incubated firms, unpaired" or "independent" T tests will be used. The unpaired, or "independent samples" t-test assesses whether the means of two groups are *statistically* different from each other. It is used when two separate sets of independent and identically distributed samples are obtained, one from each of the two populations being compared. In this case, we have two independent samples and would use the unpaired form of the *t*-test.

2.3 Data Collection

The information about business performance will be gathered from the database of KOSGEB. KOSGEB is the most important and efficient organisation in supporting growth and development of SMEs in Turkey. KOSGEB collects detailed information of SMEs annually. KOSGEB has a longitudinal dataset describing every firm included of over 200.000 SMEs that will provide annual snapshots of businesses. Database includes data on employment and sales figures on an annual basis as well as industry codes, address, founding year. The key advantage of KOSGEB database data sets for this study is that every firm request vast array of supports and grants have to be registered and up-date the information every year. The enterprises willing to benefit from the KOSGEB supports have to be registered in the KOSGEB database and share all updated company data. This enables KOSGEB to have the largest database with up-to-date figures for more than 200.000 companies (www.kosgeb.gov.tr).

This is important in two aspects. Firstly; generally it is very difficult to collect data from small firms (Akcomak&Taymaz 2007), this problem will be overcome by using this database. Secondly; the difficulties associated with control group comparisons with non-incubated ventures in regard to ventures selection criteria will be more or less eliminated. Deriving the businesses from KOSGEB database will prevent from the selection bias can be occurred between comparing the businesses which uses government support and do not use. As Schwartz (2010) correctly claims that using the same database for treatment observations and control observations is an important aspect though often neglected. Nonetheless, the same self-selection bias does affect the control sample, as data from the KOSGEB database were collected through a similar survey. So the selection procedure is unlikely to have biased the comparison between on- and off-incubator firms.

This research has been conducted in 11 different TEKMERs in 6 different locations of Turkey, which are: Istanbul, Ankara, Izmir, Izmit, Konya, and Trabzon (Table 3) in order to form the incubated sample. The samples were drawn from some of the most industrialized cities of Turkey: Ankara, Izmir, Konya, Kocaeli and Istanbul. Firstly, the graduated firms list is obtained from all KOSGEB TEKMERs between the dates of 2002 and 2008 a starting point for the analysis. The total number of the graduated firms is 349. 115 of them randomly selected from the sample of small firms whose innovative business projects were graduated from the TEKMERs identified above. And then 115 firms are searched from the KOSGEB database. Only 66 of them have proper information (Table 3). Those firms are performing generally in high-tech sectors and relatively high innovative sectors like electronics and high-tech computer services sectors (Table 5).

Table 3: Incubated Firms Sample

City	TEKMER	Selected Firms	Sampled Firms
Istanbul	<ul style="list-style-type: none"> • Bogazici TEKMER • Istanbul TEKMER • ITU TEKMER • YILDIZ TEKMER 	37	25
Ankara	<ul style="list-style-type: none"> • ODTU TEKMER • ANKARA TEKMER • Hacettepe TEKMER 	31	19
Izmit	GEBZE TEKMER	12	7
Izmir	EGE TEKMER	20	5
Konya	SELCUK TEKMER	6	6
Trabzon	KTU TEKMER	9	4
Total		115	66

A sample of non-incubated firms with a similar sector, size and location characteristics was selected to form the off-incubator group. 459 non-incubated firms that are similar to incubated firms on the basis of age and size are identified from the database. 65 of them are selected on a randomly base. Firm-specific data about the sales and employment indicators for both samples are collected using information from KOSGEB database with the some basic information about the firm. These data are also double checked from the web-sites of the selected firms.

Five age classes are considered: less than 10 years, 10-20 years, and more than 20 years (Table 4)

Table 4: Age Classes of Sample Firms

		Incubated	Non-Incubated
Age	<10	28	33
	10-20	26	23
	>20	11	9
Mean Age		12.70	13.35

The distribution of the sample firms of both the incubated and non-incubated by industry and initial size is presented (Table 4). The number of employees in period t is divided into the following three classes: firms with less than 5 employees, firms with 6-10 employees, firms with 11-25 employees, and firms with 26-50 employees.

Table 5: Sectors and Size of the sample firms

	Incubated					Non-Incubated					
	Sectors				Total	Sectors				Total	
	Software /Computer	Electronics	Machine	Others		Software /Computer	Electronics	Machine	Others		
Size of Employment (Number of Employment)	1-5	26	10	4	5	45	31	6	5		42
	6-10	1	2	2		5		6	3	1	12
	11-25	3	2	2		7	2	2	1		5
	26-50	1	1	2	4	8		2	3	3	8
Total		31	15	10		65	33	16	12	4	65

3. Analysis

Firstly the empirical findings of the analysis of TEKMER program's impact on the firm performance will be presented particularly by focusing on post-incubation period. In assessing the firm performance during post incubation period the growth rates for employment and sales figures are measured. Both growth measures are analysed using the data of all incubated and non-incubated firms for which employment/ sales figures were available for the year of 2005 and 2010. Post-graduation employment growth and sales growth is calculated using data from 66 incubated and 67 non-incubated firms.

Descriptive statistics and un-paired t-test analysis are used to perform analysis. As the hypotheses are about testing a difference between two sample groups with regard to one variable, to determine whether there is a statistically significant difference among the growth indicators of incubated and non-incubated enterprises the unpaired, or "independent samples" t-test is used. T-tests were performed in MS Excel.

The significance level that shows how likely a result is due to chance or is good enough to be believed, is taken as .95. This means that the finding has a 95% chance of being true.

Two hypotheses will be tested:

- Null Hypothesis: Incubated businesses' firm performance on the basis of job creation will be identical to their non-incubated counterparts
 - Alternative Hypothesis: Incubated businesses' firm performance on the basis of job creation will be different from their non-incubated counterparts
- And
- Null Hypothesis: Incubated businesses' firm performance on the basis of sales growth will be identical to their non-incubated counterparts
 - Alternative Hypothesis: Incubated businesses' firm performance on the basis of sales growth will be different from their non-incubated counterparts

3.1 Descriptive Statistics

Some descriptive statistics on incubated businesses and their non - incubated peers are presented in table 6.

Table 6: Descriptive Statistics

	Incubated	Non-Incubated
Sales in 2005 (ave)	817505	1678863
Sales in 2010 (ave)	2550278	2828901
Annual sales growth	42.39	13.70
Employment in 2005 (ave)(working days)	2876.18	3011.43
Employment in 2010 (ave)(working days)	5143.62	4851.64
Annual employment growth	15.76	12.22
Average age	12.70	13.55

From the descriptive statistics we can conclude:

- Both the initial volume of sales and amount of employment as the working days is higher for non-incubated firms. When compared it can be seen that the non-incubated firms' average of the sales figures is 1384059.55 TL while it is 941747.42 TL for incubated firms. With regard to the employment figures non-incubated firm's average in the initial year of 2005 is 3011.43 working days while it is 2876.18 working days for the incubated firms.
- In 2010, while the non-incubated firms' average of the sales figures is higher than the incubated ones, the average of the employment figures of incubated firms is higher than the non-incubated ones. The average of the employment is 5143.62 working days for the incubated firms and 4851.64 working days for the non-incubated ones.
- In terms of employment growth over time, incubated firms also outperform their counterparts. Incubated firms increase employment by 15.76% annually in comparison to the control group, which averages 12.22% annual employment growth. Regarding the annual sales growth it is apparent that the incubated firms significantly outperformed the non-incubator peers. The incubator firms' average annual growth is 34.16% while non-incubated firms' is 20.87%.

3.2 Results of Empirical Research

The first hypothesis formulated for this study is that there is a significant difference between incubated and non-incubated firms operating in Turkey with regard to employment growth.

Relevant null hypothesis is that;

- There is no significant difference between incubated and non-incubated firms operating in Turkey with regard to employment growth.

And the alternative hypothesis is that;

- There is significant difference between incubated and non-incubated firms operating in Turkey with regard to employment growth.

In order to perform testing the hypothesis the appropriate statistical technique was Interdependent Sample T Test and the desire level of significance is 0.05 (95% confident level).

The results of the independent sample test are given in Table 7.

Table 7: T-test results for employment figures

t-Test: Two-Sample Assuming Unequal Variances		
	<i>Incubated</i>	<i>Non-Incubated</i>
Mean	2.606388051	1.254461874
Variance	18.90309193	7.414306143
Observations	66	67
Hypothesized Mean Difference	0	
df	109	
t Stat	2.145450365	
P(T<=t) one-tail	0.017068206	
t Critical one-tail	1.658953458	
P(T<=t) two-tail	0.034136412	
t Critical two-tail	1.98196749	

Calculated t-value > critical t-value and $p \leq 0.05$.

The T-Test measured whether employment growth as the indicator for firm performance of was significant.. The t-test analysis illustrates that the t-Stat value (2.145450365) exceeded the t-Critical value of 1.98196749. The p-value associated with the t-test is small (< 0.05). There is less than or equal to a 5% probability that we could obtain this result by chance, which is an acceptable level. The means of the two samples are significantly different.

Hence the T-Test result is (2.145450365) which is significant at .05 level. In other words, there is evidence that the means are significantly different at the significance level reported by the p-value. This indicates that there is significant statistical evidence in support of rejecting the null hypothesis and accepting the Alternative Hypothesis: There is a difference in firm performance based on employment growth.

The second hypothesis formulated for this study is that there is a significant difference between incubated and non-incubated firms operating in Turkey with regard to sales growth.

Relevant null hypothesis is that;

- There is no significant difference between incubated and non-incubated firms operating in Turkey with regard to sales growth.

And the alternative hypothesis is that;

- There is significant difference between incubated and non-incubated firms operating in Turkey with regard to sales growth.

In order to perform testing the hypothesis the appropriate statistical technique was Interdependent Sample T Test and the desire level of significance is 0.05 (95% confident level).

The results of the independent sample test are given in Table 8.

Table 8: T-test results for employment figures

t-Test: Two-Sample Assuming Unequal Variances		
	<i>Incubated</i>	<i>Non-Incubated</i>
Mean	135.9442423	1.18538199
Variance	289438.8834	2.53452379
Observations	66	67
Hypothesized Mean Difference	0	
df	65	
t Stat	2.034927716	
P(T<=t) one-tail	0.022970254	
t Critical one-tail	1.668635976	
P(T<=t) two-tail	0.045940508	
t Critical two-tail	1.997137908	

Calculated t-value > critical t-value and $p \leq 0.05$.

The T-Test measured whether sales growth as the indicator for firm performance of was significant. The t-test analysis illustrates that the t-Stat value (2.034927716) exceeded the t-Critical value of 1.997137908. The p-value associated with the t-test is small (< 0.05). There is less than or equal to a 5% probability that we could obtain this result by chance, which is an acceptable level. The means of the two samples are significantly different.

Hence the T-Test result is (2.034927716) which is significant at .05 level. In other words, there is evidence that the means are significantly different at the significance level reported by the p-value. This indicates that there is significant statistical evidence in support of rejecting the null hypothesis and accepting the Alternative Hypothesis: There is a difference in firm performance based on employment growth.

4. Discussion and Conclusion

Despite the difficulty accessing proper data, there has been an increasing interest towards post-incubation impacts of business incubators among researchers (Schwartz 2011). One present study focusing on the USA business incubators presents that “incubation helps new ventures grow faster in terms of employment and sales” although they are expected to fail early firms overcome the liability of newness by securing resources that enable them to grow at a faster rate than had they not been incubated (Amezcuca 2010a). According to Amezcuca (2010a) incubated firms increased their employment growth rate by 6.7 percentage points and overall sales growth rate increases by 2.15 percentage points. Thus, these finding provide evidence that business incubation has positive impact on the firm performances in terms of employment and sales growth and enable firms to develop stronger capacities to compete and grow in the external environment (Amezcuca 2010b). Schwartz (20011) has summarised two prior researches on the business incubation and firm performance after incubation relation. For instance, Steinkühler (1994) finds a positive impact on firm growth of the provision of business assistance during the incubation period and reports significantly higher growth for firms that stayed longer in the incubators in his study where he was investigating performance differences between graduate firms and a control group of firms not located on such facilities (Schwartz 2011). Another one is the Seeger (1997), who focuses on a cross-sectional analysis of 167 successful graduates from 50 German business incubators and technology centres (Schwartz 2011). Seeger (1997) finds that employment and sales of the graduated firms continuously increase in the post-graduation period. Based on survey data of surviving graduates, he presents that regarding employment figures, the annual average growth rate in the post-graduation period is 1.5 employees (Schwartz 2011).

Schwartz's (2011) research that was using long-term micro-level performance data of 324 independent graduate firms from five business incubators also has confirmed these prior results in Germany. According to him the performance levels reveals a positive development with respect to both employment and sales figures (Schwartz 2011).

Although there has been a common assumption that business incubation positively effects firm performance not only during incubation but also after graduation (Schwartz 2011), the empirical researches on the incubated firm performance after graduation are insufficient in Turkey. This study is an attempt to find out the impacts of TEKMERs on firm performance during the post-graduation period by comparing the incubated and non-incubated firms' performances.

We have been searching for the answers of one basic question:

- Incubated businesses' firm performance on the basis of job creation will outperform their non-incubated counterparts
- Incubated businesses' firm performance on the basis of and sales growth will outperform their non-incubated counterparts

The existing results seem to give strong support of the view that business incubation helps firm growth beyond incubation. There may be many determinants which has an impact on this result.

4.1 The Impact of Firm Age and Size

One of the most extensively discussed characteristic of growing firms is the age and the size of the firm. There are two mainstream traditional theories concerning the relationship between age of the firm and growth (Parker 2009). One of them is the Gibrat's law states that the rate of growth of a firm is independent from its initial size (Audretsch et al., 2004). However, there are now many empirical studies rejecting this formulation and providing an inverse relationship between firm age and growth (Parker 2009). Several studies show that younger firms illustrate negative effect of age on firm growth. One of the most cited models is the Jovanovic's model stating that firms can improve their efficiencies by learning and experience over time and improve their performance (Parker 2009). Small firms grow relatively faster than firms that exist for many years since they have to achieve a minimum efficient size (Audretsch et al., 2004).

Although it is not statistically significant the incubated sample includes smaller and younger firms tend to grow faster than older firms. Therefore, age and size differences may still explain a part of growth differential.

4.2 Selection Bias

Control group studies underlie a strong selection bias making it difficult to distinguish to what extent a tenant company's success can be attributed to incubators services or to the selection process of the incubator (Dee et al. 2012, Amezcua 2010b). Many researchers have addressed the "selection bias" problem which indicates that the entrepreneurs are selected in incubation programs have more resources initially, hold more assets and differ in important unobserved characteristics, such as the entrepreneur's experience, education, and age than average new business owners in the control group (Dee et al. 2012). Moreover they may be more opportunity entrepreneur suggesting that they are following an innovative idea and seeking help from TEKMERs. Technical expertise, market knowledge and managerial experience are essential criteria for incubators to select potential tenants (Aerts et al., 2007). Hence they may be more equipped, motivated, or more connected to business networks than an average firm owners or entrepreneurs.

Another possible bias is “administrative selection” bias (Cheng & Schaeffer 2011). This bias indicates that the selection function performed by business incubators tend to identify and select the most promising businesses, or at least avoids those least likely to succeed to competitive selection or screening processes of many business incubators that (Cheng & Schaeffer 2011). From this standpoint, the selection function performed by business incubators has the beneficial effect of channelling those subsidies to relatively more promising ventures (Cheng & Schaeffer 2011).

4.3 The contribution of fast-growing graduates

Regarding the sales figures, a higher proportion of incubated firms grow compared to non-incubated firms. The majority of the incubated firms nearly 90.9 % have increased their sales while this ratio is 77.6 for non-incubated firms. Only nearly one-tenth of incubated firms experienced a decline in sales in the post-graduation period. Slightly higher than one-tenth of incubated firms experienced a decline in employment while nearly one fifth of non-incubated firms experienced a decrease. The statistics even is better for incubated firms when the employment figures taken into consideration. Regarding the employment figures 80.3% of the incubated firms have increased their employment; whereas this ratio is much lower in the non-incubated sample - 77.6%.

Table 9: Change in Employment

	Incubated		Non-Incubated	
	Frequency	%	Frequency	%
Increased	53	80.3	42	62.7
No change	6	9.1	12	17.9
Decreased	7	10.6	14	19.4
Total	66	100	67	100

Table 10: Change in Sales

	Incubated		Non-Incubated	
	Frequency	%	Frequency	%
Increased	60	90.9	52	77.6
No change	-		1	1.5
Decreased	6	9.1	14	20.9
Total	66	100	67	100

Although the descriptive statistics above illustrates that majority of the both incubated and non-incubated firms experienced growth in sales and employment drawing conclusion might be misleading. There has been a consensus on the fact that high-growth firms that are relatively few in number generate a disproportionately large share of employment growth and majority of firms do not experience considerable growth (OECD 2010b).

Initially Birch (1987) classified firms into three types; high-growth dynamic firms called “Gazelles”, small businesses that stays small as “mice”, and established large slow growers as “elephants” and added that most of the net employment growth are generated by the Gazelles (Henrekson & Johansson 2008). OECD defined the enterprises with average annualised employment or turnover growth greater than 20 per cent per annum, over a three year period as high growth enterprises (OECD 2010b).

Identification of the set of fast growers and assessment of their contribution to overall employment growth will provide a better understanding of the impact of business incubation. Confirming the previous studies on firm growth; the fastest ten growing firms alone provide 35.8 % of total employment and 32.8 % of sales generated in all incubated firms with non-negative growth in the post-graduation period. The situation is really interesting when the non-incubated firms examined. The impact of the 57 firms apart from the top ten performing is negative indeed both regarding the sales and employment figures. This result illustrates that

only few firms exhibit a strong increase in performance while the majority of them do not increase their employment and sales significantly even some of them exhibit negative results. Moreover it is apparent that the discrepancy between incubated firms is less significant when compared to non-incubated ones. Few incubated firms grow strongly while most of them grow moderately, however for most of the non-incubated firms the growth levels are tiny if there is.

4.4 The Impact of Government Subsidies

One of the main reasons for the difference in growth tracks is the fact that on-incubator firms are better attached to both information networks and financial resources. Colomba and Delmastro (2002) show that on-park firms have easier access to public subsidies than the off-incubator ones. Akcomak and Taymaz (2007) also illustrates that the on-incubator firms are more familiar with the government subsidies and supports. There is a vast literature comprising both theoretical and empirical approaches for evaluating the effectiveness of employment subsidies. Koski and Pajarinen (2011) argued that all subsidies relate positively to the employment growth for both start-ups and incumbents. For example during our research we realized that most of the graduates firms are moving to techno-parks where there are many subsidies like, income and employment tax exemptions. Moreover most probably all of these graduated firms that moved to techno-parks benefit from the KOSGEB rent support for the firms moved to techno-parks from TEKMERs.

The results of descriptive statistics and t-test seem to give strong support of the view that business incubation helps firm growth beyond incubation. The incubated firms outperform the non-incubator firms both in the basis of employment and sales growth. However the size and age of the two samples still may have influence on these results although the discrepancy is insignificant. Moreover the selection bias resulting from the fact that the incubated firms were selected on the basis of some performance criteria may influence the results. Nevertheless it is apparent that the incubated firms are more familiar with the government subsidies and supports and the entrepreneurs' or firm owners' financial, technical etc. networks positively effects the firm performance.

4.5. Conclusion

Business incubator programs have become a central element of support infrastructure for SME and entrepreneurship. These programs exist widespread worldwide as a popular entrepreneurship policy intended to help new businesses avoid the risks of failure and generate economic growth in worldwide (Amezcuca 2010a). They receive tremendous subsidies from governments and a great deal of government funds is directed to them both in developing and developed countries. However, the researches dealing with whether incubators impact on business performance, economic growth and has benefits to society are not sufficient to draw a clear picture. There is particularly a research gap on the post incubation period although there are some recent researches on USA and Germany (Amezcuca 2010a, Schwartz 2009)

Although there has been a common assumption that business incubation positively effects firm performance not only during incubation but also after graduation (Schwartz 2009), the empirical researches on the incubated firm performance after graduation are insufficient in Turkey. This study is an attempt to find out the impacts of TEKMERs on firm performance during the post-graduation period by comparing the incubated and non-incubated firms' performances.

The results of descriptive statistics and t-test seem to give strong support of the view that business incubation helps firm growth beyond incubation. The incubated firms outperform the non-incubator firms both in the basis of employment and sales growth.

5. Implications

5.1 Implications for Theory

This study will contribute to the literature in two ways. First of all it will add some knowledge to the literature on incubator performance focusing on post-incubation period which is very new (Schwartz 2010, Amezcua 2010b). Moreover it will help to contribute to knowledge on whether Business Incubation matters for firm performance in the developing world. It will help to shed light on the issue whether the incubators are successful or not in supporting small businesses growth.

5.2 Implications for Policy

Although there are some problems about the system, TEKMERs has significant impacts on not only to achieve national objectives such as job creation, growth and regional development but also the start-up's performances (Cansiz 2008, Akcomak 2011). Our research demonstrate that incubated firms seem to display better records both in terms of employment growth, sales growth compared non-incubated firms. Therefore, this policy tool should be developed and improved, in order to maximize the benefits of on-incubators firms.

6. Limitations and Future Research

This research has some limitations. Firstly, the research is basically descriptive in nature and limited to data from single country. Secondly, the size of Turkey's informal sector may impose some limitations to the data used in our research (Andrews et al.2011). Latest economy-wide report by the Turkish Statistics Institute estimated the share of informal economy in gross domestic product is 37.5 %. The share of employees without a written employment contract is 44% in Turkey (Andrews et al.2011).

There are some other studies focusing on developed countries like USA and Germany, however our study is limited to one developing country. In order to make some generalisations it will be interesting to see some similar researches in other developing countries. These researches may broaden the studies to other developing countries and may shed light on the dynamics of business incubation. Moreover future researches may use more sophisticated statistical techniques.

References:

- Abetti, P. A. (2004) 'Government-supported incubators in the Helsinki Region, Finland: infrastructure, results, and best practices', *Journal of Technology Transfer*, 29:19-40.
- Acs Z. and Storey D. (2004) 'Introduction: Entrepreneurship and Economic Development' *Regional Studies*, 38(8): 871-877.
- Adegbite, O. (2001) 'Business incubators and small enterprise development: the Nigerian experience', *Small Business Economics*, 17: 157–166.
- Aernoudt, R. (2004) 'Incubators: tool for entrepreneurship?' *Small Business Economics* 23(2): 127-135.
- Aerts, K., Matthyssens, P. and Vandenbempt, K. (2007) 'Critical role and screening practices of European business incubators', *Technovation*, 27(5): 254-267.
- Akcomak, I. S. (2011) 'Incubators as tool for entrepreneurship promotion in developing economies' in: Szirmai, A, Naude, W. and Goedhuys, M. (eds.), *Entrepreneurship, Innovation and Economic Development*, Oxford University Press, Oxford
- Akcomak, I.S. and Taymaz, E. (2007) 'Assessing the effectiveness of incubators: the case of Turkey' in Venkata Ramani, V. and Bala Krishna, A. V. (eds.), *Business Incubation: An Introduction*, Icfai Books, Icfai University Press: Hyderabad: pp. 234-265.
- Allen, D. N. and Rahman S. (1985) 'Small business incubators: a positive environment for entrepreneurship', *Journal of Small Business Management*, 23(3):12-22.
- Amezcuca, A. S. (2010a) 'Performance analysis of entrepreneurship policy: which business incubators generate the highest levels of economic performance?', *Frontiers of Entrepreneurship Research*, 3(18): Article 1.
- Amezcuca, A. S. (2010b) Boon or boondoggle? Business incubation as entrepreneurship policy, Whitman School of Management, Syracuse University. Available at <http://www.whitman.syr.edu/Pdfs/amezcuca boon or boondoggle.pdf>.
- Andrews, D., A. Caldera Sánchez and Å. Johansson (2011) 'Towards a better understanding of the informal economy', *OECD Economics Department Working Papers*, No. 873, OECD Publishing. <http://dx.doi.org/10.1787/5kgb1mf88x28-en>
- Audretsch, D.B., Klomp, L., Santarelli, E. & Thurik, A.R. (2004) 'Gibrat's law: Are the services different?', *Review of Industrial Organization*, 24: 301–324.
- Barber, J., Metcalfe, J. & Porteous, M. (1989) . *Barriers to Growth in Small Firms*. London: Routledge.
- Bergek, A. and Norrman, C. (2008) 'Incubator best practice: A framework', *Technovation*, 28(1-2), 20-28.

- Birch, D.L. (1987). *Job Creation in America: How our Smallest Companies Put the Most People to Work*. New York: Free Press.
- Bollingtoft, A. and Ulhoi, J. P. (2005) 'The networked business incubator-leveraging entrepreneurial agency?', *Journal of Business Venturing*, 20 (2): 265-290.
- Bridge S., O'Neill K. and Cromie S. (2003) *Understanding Enterprise, Entrepreneurship and Small Business* (2nd ed.) Hampshire, UK: Palgrave Macmillan
- Bruneel, J., Ratinho, T., Clarysse, B. and Groen, A. (2012) 'The evolution of business incubators: comparing demand and supply of business incubation services across different incubator generations.' *Technovation*, 32 (2): 110-121.
- Cansiz, M. (2008) *Türkiye'de KOBİler ve KOSGEB, DPT Uzmanlık Tezi*, Ankara: DPT
- Chan K.F. and Lau T. (2005) 'Technology incubator programs in the science park: the good, the bad and the ugly', *Technovation*, 25(10): 1215–1228.
- Cheng S. and Schaeffer P. V. (2011) 'Evaluation without bias: a methodological perspective on performance measures for business incubators', *Région et développement*, 33: 211-225
- Colombo, M. G. and Delmastro, M. (2002) 'How effective are technology business incubators: evidence from Italy', *Research Policy*, 31: 1103-1122
- Davidsson P., Delmar F and Wiklund J. (2006) *Entrepreneurship and Growth of Firms* Cheltenham, UK: Edward Elgar
- Dee N. J., Livesey F., Gill D. and Minshall T. (2011) *Incubation for Growth: A review of the impact of business incubation on new ventures with high growth*, Nesta Report
- Dess, G. and Robinson, R.,(1984). *Measuring Organizational Performance in the Absence of Objective Measures: The Case of Privately-held Firm and Conglomerate Business Unit*. *Strategic Management Journal*. Vol.5. s.265-273.
- European Commission (2002) *Benchmarking of business incubators*, European Commission, Enterprise Directorate General, Brussels.
- Grimaldia, R., Grandia A. (2005) 'Business incubators and new venture creation: an assessment of incubating models', *Technovation*, 25(2): 111–121
- Gupta, A. (2004) *Promoting Business and Technology Incubation for Improved Competitiveness of Small and Medium-Sized Industries through Technological Developments: Indian Experience*, New York: United Nations Publications
- Hackett, S.M. and Dilts, D.M. (2004) 'A systematic review of business incubation research', *Journal of Technology Transfer*, 29: 55-82.

- Hamdani, D. (2006) 'Working paper on conceptualizing and measuring business incubation', Science, Innovation and Electronic Information Division (SIEID) Working Paper
- Henrekson M. and Johansson D. (2008) 'Gazelles as job creators – a survey and interpretation of the evidence', IFN Working Paper, No. 733 http://ec.europa.eu/enterprise/policies/sme/facts-figures/analysis/eurobarometer/fl283_en.pdf
- Koski H. and Pajarinen M. (2011) 'The role of business subsidies in job-creation start-ups, gazelles and incumbents', Discussion Papers 1246, The Research Institute of the Finnish Economy.
- Lalkaka, R. (2000) 'Assessing the performance and sustainability of technology business incubators', Paper presented to New Economy & Entrepreneurial Business Creation in Mediterranean Countries (International Centre for Science & High Technology, International Centre for Theoretical Physics, and Third World Academy of Sciences), Trieste, Italy.
- Lalkaka, R. and Abetti P. (2002) 'Business Incubation and Enterprise Support Systems in Restructuring Countries', *Creativity and Innovation Management*, 8(3):197-209
- Löfsten, H. and Lindelof, P. (2002) 'Growth, management and financing of new technology-based firms – assessing value-added contributions of firms located on and off Science Parks', *Omega*, 30: 143-154.
- Lobe, B., Livingstone S., Olafsson K. and Alberto Simões J. (2008) 'Best practice research guide: how to research children and online technologies in comparative perspective', EU Kids Online, Deliverable D4.2. EU Kids Online Network, London, UK. ISBN 9780853283546
- Mian, S. A. (1997) 'Assessing and managing the university technology business incubator: an integrative framework', *Journal of Business Venturing*, 12: 251-285.
- Mittelstadt, A. and Cerri F. (2008) 'Fostering Entrepreneurship for Innovation', OECD STI Working Paper, Paris
- O'Neal, T. (2005) 'Evolving a Successful University-Based Incubator: Lessons Learned From the UCF Technology Incubator', *University of Central Florida Engineering Management Journal*, 17(3): 11-26
- OECD (1997) *Technology Incubators: Nurturing Small Firms*, Paris: OECD
- OECD (2010b) *High-Growth Enterprises: What governments can do to make a difference*, Paris: OECD
- Parker S.C. (2009) *The Economics of Entrepreneurship*, Cambridge, UK: Cambridge University Press.

- Phan, P., Siegel, D. & Wright, M. (2005). Science parks and incubators: observations, synthesis and future research, *Journal of Business Venturing* 20, 165–182.
- Ratinho, T. (2011) Are they helping? An examination of business incubators' impact on tenant firms, PhD thesis, <http://dx.doi.org/10.3990/1.9789036532631>.
- Ratinho, T. and Henriques, E. (2010) 'The role of science parks and business incubators in converging countries: The Portuguese case', *Technovation*, 30 (4):278–290
- Ratinho, T., Harms, R. and Groen, A. (2010) 'Are business incubators helping? the role of Business Incubators in facilitating tenants' development', Paper present at the Academy of Management Annual Meeting, Montréal, Québec, Canada, August 6-11, 2010
- Schwartz, M. (2010) 'Beyond incubation: an analysis of firm survival and exit dynamics in the post-graduation period', *Journal of Technology Transfer* 34: 403-421.
- Schwartz M. (2011) 'Incubating an Illusion? Long-Term Incubator Firm Performance after Graduation', *Growth and Change*, 42(4):491-516
- Schwartz, M. and Gothner M. (2009) 'A novel approach to incubator evaluations: the promethee outranking procedures', *IWH Discussion Papers* 1, Halle Institute for Economic Research.
- Schwartz, M. and Hornych, C. (2008) 'Specialization as strategy for business incubators: An assessment of the Central German Multimedia Center', *Technovation*, 28 (7):436-449
- Scillitoe, J.L. and Chakrabarti, A.K. (2010) 'The role of incubator interactions in assisting new ventures', *Technovation*, 30(3):155-167
- Storey, D. (1994) 'Understanding the Small Business Sector', London: Routledge.
- Thurik, A. R. and S. Wennekers (1999), *Linking Entrepreneurship and Economic Growth*,
Small Business Economics, Vol.13, pp.27-55
- Udell, G. G. (1990) 'Are business incubators really creating new jobs by creating new businesses and new products', *Journal of Product Innovation Management*, 7: 108–122
- Venkatraman, N. and Ramanujam, V. (1986). Measurement of Business Performance in Strategic Research: A Comparison of Approaches. *Academy of Management Review*, 11(4), 801-811.