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The Linkage between Knowledge Intensive Innovation and Export in SMEs: An empirical study based on Turkish manufacturing SMEs

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Bilgi Yoğun İnovasyon ile KOBİlerde İhracat Arasındaki İlişki: Türk İmalat Sanayii Sektöründeki KOBİler Üzerine Bir Ampirik Çalışma

Abstract

The increasing role of SMEs in Turkish export with the share of 60 per cent has deepened the need to better understand which factors and to what extend affect export propensity of SMEs. In this paper, the focus will be on the relationship between exportation and innovation, particularly knowledge-based innovation, as a significant driving factor. The data were retrieved from KOSGEB and the result of the analysis demonstrated a significant relationship. However, the effect of innovation on export in SMEs began decreasing noticeably after the firm reaches a certain level in R&D intensity, which was also observed.

Keywords : Knowledge-based Innovation, Manufacturing SMEs, Export, R&D, Innovation, Turkey.

JEL Classification Codes : M10, M16, Q31.

Özet

Kobilerin Türk ihracatındaki rolü, yüzde altmışlık payları ile, gün geçtikçe artmaktadır ve hangi faktörlerin ne derecede kobilerin ihracat yoğunluklarını arttırdıklarını anlama ihtiyacımızda buna bağlı olarak artmaktadır. Bu çalışma da, ihracat ve onun en önemli itici faktörlerinden birisi olan inovasyon, özelliklede bilgi tabanlı inovasyon, arasındaki olası ilişkiyi incelemek amacı ile yapılmıştır. KOSGEB tarafından hazırlanmış olan raporlardan derlenen, imalatçı kobilere ait toplulaştırılmış ikincil veriler ile gerçekleştirilen analizler sonucu innovasyon ile ihracat yoğunluğu arasında önemli ve pozitif bir ilişki olduğu tespiti yapılmıştır. Ancak, kobilerde inovasyonun ihracata olan bu olumlu etkisinin belirli bir arge seviyesinden sonra önemli derecede azaldığı da gözlemlenmiştir.

Anahtar Sözcükler : Bilgi Tabanlı Yenilik, İmalatçı Kobiler, İhracat, ArGe, Yenilik, Türkiye.

1. Introduction

As the world turns, needs and requirements of individuals, organisations and societies constantly change, and thus the demand for innovation to meet the changing expectations remain incredibly high. Mostly, individuals on their own, organizations by their management and societies by policy-makers have to adopt positive attitude towards the change and develop new strategies in order to survive and keep up with the environment.

The existence of the relationship between innovation and export in small and medium size enterprises (hereafter, SMEs) has been a popular subject in the business literature (Aaby and Slater, 1988: 53-68; Buckley and Casson, 1976; Oviatt and McDougall, 1994: 45-64; Vernon, 1966: 190-207; Yu-Ching, Kuo-Pin and Yu, 2006: 479-81) since SMEs are expected to be more innovative due to their small size which capable them to adapt easily to market changes (Aaby and Slater, 1988: 53-68).

Knowledge-based economy based on innovation may enable SMEs to improve technology use and general productivity (Chesbrough, 2003). Due to the decreasing cost of observation of knowledge since 'knowledge era', SMEs has become enable to produce knowledge intensive products as large firms do (OECD, 2000). Producing knowledge-intensive products/services are likely to provide higher competitive advantage for SMEs. Furthermore, producing specialized product/services, as a result of applying differentiation strategies, could also aid SMEs to reduce transaction cost and consequently create a competitive advantage (Oviatt and McDougall, 1994: 45-64). In fact, obtaining competitive advantage, due to the reasons mentioned earlier, could trigger willingness of SMEs to sell their products/services to abroad. Moreover, studies of Buckley and Casson (1976), and Vernon (1966: 190-207) both underlined the significance of intangible assets used in innovative new products and those product's probability of receiving high demand from abroad, particularly in the products' early and growth stages.

The aim of this study is to review several related theories and researches in the field in order to provide a larger picture of the relationship between export and innovation and importance of knowledge within the relationship, particularly for SMEs. In order to testify the validity of the relationship, the Pearson correlation analysis were applied through using secondary cross-sectional data retrieved from Republic of Turkey Small and Medium Enterprises Development Organization (hereafter, KOSGEB) surveys.

Since SMEs have the key role in Turkish export, the paper will provide related information on SMEs and exportation from the literature. Afterwards, the focus will be on innovation literature; science and innovation profile of Turkey will be investigated

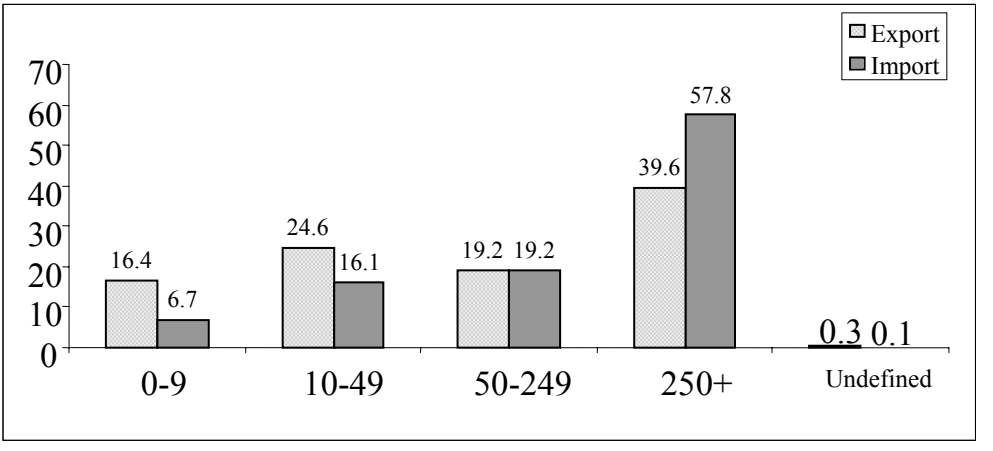
through making comparisons between Turkey and the European Union (hereafter, E.U.) countries. The focus will be directed to 'the knowledge based innovation' activities and to explain how it enables SMEs to increase export propensity in the global market.

2. Literature Review

2.1. Export

Export could be simply defined as a selling process which directly adds economic value into the domestic market. Owing to the fact that, exportation is widely deemed as a key tool for eliminating or reducing of the potential harmful impacts of globalisation (Coskun, 2001: 221-27). From a national perspective, export could be considered as a way of creating employment and a significant contributor to the economic growth and that consequently a vital player enhancing both social and economic welfare of the country. The view is also similar to the country perspective from an exporter firm perspective in terms of creating economic welfare for internal (domestic) environment. The welfare could be achieved through taking advantage of growing foreign market or reducing vulnerability of the firm through diversification of market risk, particularly if the domestic market has a sign of saturation (Ural and Acaravci, 2006, p. 48).

Figure: 1
Foreign Trade, (according to labour size) (%)



Source: Turkstat (2011).

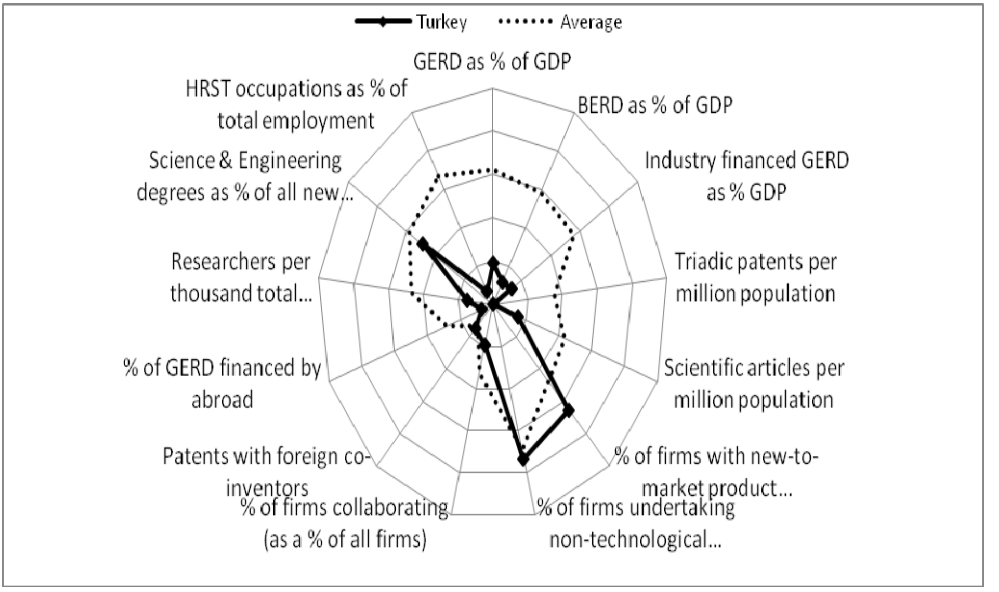
According to the recent foreign trade statistics of Turkstat (2011), SMEs give a significant boost to Turkish export since 60.1% of the total export was constituted by those firms in 2010. According to figure-1 above, the share of micro, small and medium size enterprises in the total export were 16.4%, 24.6% and 19.2% respectively in 2010.

Regarding to previous paragraphs of this section, the vital role played by Turkish SMEs in export has been becoming clearer. However, the fundamental obstacles faced by SMEs in exportation need to be underlined in order to go further to recommend suitable solutions for the SMEs to eliminate those barriers. Broad ranges of studies have been carried out in the business literature related to export barriers of SMEs (Ozkanli, Benek and Akdeve, 2006: 78-90; Madrid-Guijarro, Antonia, Garcia and Van Auken, 2009: 465-88; Demirbas, 2006: 82-88). According to these researches, while lack of appropriate source of finance and lack of skilled human resources are both acknowledged as internal barriers, bureaucratic restrictions and, lack of knowledge of foreign markets are both identified as external barriers to export. Hereafter, the focus of this paper will be on both innovation and knowledge which are necessary to reduce or eliminate export barriers for SMEs.

2.2. Innovation

Innovation in firms refers to planned changes in a firm's activities with a view to improving the firm's performance (OECD, 2005). Schumpeter (1942) indicates the continuous transform in the market place by describing it as “creative destruction” as a consequence of opening new markets and radically changing organisational structures from craft shops to giant firms. Additionally, the author extends the description by arguing “…industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one”. In fact, the change in markets is a continuous unavoidable reality, thus increasing inertia in firms may lead their destructions by time. Even though, Schumpeter (1942) indicates natural ‘selection’ caused by the environment, Hannan and Freeman (1977: 929-64) claimed that the source of inertia mainly based on internal factors such as, constraints of completed and continued investments, constraints on information flow to top management and internal political constraints. According to the adaptive view of Hannan and Freeman, developing fine-grained adaptation may be advantageous for firms to avoid negative outcomes of the change. That is where, innovation is at the heart of the creating solutions for firms in order to survive and prosper in the global markets.

Figure: 2
Science and Innovation Profile of Turkey



Source: OECD, Main Science and Technology Indicators database, May 2010.

'Science and Technology Indicators' developed by OECD could be considered as a reliable measurement instrument to evaluate how countries perform science and technology related fields. The profile of Turkey in 2010, in gross domestic expenditure on research (GERD), business enterprise expenditure on research (BERD), and share of triadic patent families per million populations were all significantly low considering the EU figures in figure-2 above. The reason of such a large scale of gap is probably that due to both lack of financial resources of Turkish SMEs and their inability to understand the importance of R&D for product and service improvement.

For instance, whereas the ratio of R&D expenditures to the GDP (BERD) was 0.05 % in 1990, in 2008 the figure was 0.32 % in Turkey. In spite of the substantial progress of Turkey in the ratio, the figure still lays far behind of the EU average of 1.63 % (figure 2).

Figure: 3
Main Science and Technology Indicators of OECD Member Countries

BERD values	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Turkey	0,05	0,08	0,09	0,08	0,07	0,07	0,09	0,12	0,12	0,18
Total OECD*	**1,54**	**1,48**	**1,44**	**1,39**	**1,35**	**1,37**	**1,40**	**1,43**	**1,45**	**1,49**
BERD values	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	
Turkey	0,16	0,18	0,15	0,11	0,13	0,20	0,21	0,30	0,32	
Total OECD*	**1,52**	**1,54**	**1,49**	**1,49**	**1,47**	**1,50**	**1,55**	**1,58**	**1,63**	

Source : *OECD, Main Science and Technology Indicators database, May 2010.*

On the other hand, percentage of human resources in science and technology is also extremely lower compared to the EU average, however, proportion of science and engineering degrees among all new degrees almost equals to the EU average (figure-3), which indicates increasing importance of the field and that consequently may reduce the gap in the near future.

The Turkish SMEs could be considered as export 'engines' of the country's economy since they account for proximately 60 per cent of the total country export. However, 'the engine' do not work as efficient as the EU engines according to the conspicuous innovation gap between them, which makes it compulsory for policy makers to find a way to make the Turkish engine worked more efficiently in a sustainable and cost effective way. In fact, emergence of knowledge had been one of the most significant sources of competitive advantage merely for giant firms, however, until the *'knowledge era'*.

2.3. The Increasing Importance of Knowledge and Its Place in Innovation

Freel (2000b) argued that knowledge is primarily considered as a significant function of accumulated R&D expenditures and gathering the knowledge for R&D through limited internal resources of SMEs constrains the ability of the firms to engage in innovation. Therefore, the role played by external resources, such as innovation networks, in contributing to technology and knowledge has progressively taken more consideration in the polity and the academy. The purpose of this tendency is to guide the innovation process of SMEs through encouraging them to use innovation networks under the concept of '*learning by interacting*', and consequently being able to gain access to sophisticated technology and technical proficiency (cited in Freel, 2005: 123-34).

The period beginning with 1970s is named as 'knowledge era' or 'information age' due to the incredibly increasing ability of individuals for freely reaching, manipulating and disseminating information, particularly through computer networks (Kluver, 2000). Since the latest stage in the global restructuring is named as *'knowledge era' or 'information age'*, the term open innovation which means benefitting from both internal and external sources (Chesbrough, 2003) and knowledge-based economy increasingly becomes crucial for SMEs to improve technology use and general productivity. The term, knowledge-based economy, refers to the meaning of creating economic welfare through having quality human capital used knowledge as a tool to innovate (OECD, 1996). Observation of knowledge used to be costly for SMEs before the *'knowledge era'* hence SMEs used to be less likely produce knowledge intensive products, however due to several fundamental reasons the conditions have changed in a positive way for SMEs (OECD, 2000) such as; the cost of communication and acquiring knowledge lower, fluidity nature of knowledge demolishes entry barriers.

In fact, knowledge intensive products/services are increasingly become significant sources for competitive advantage not only for large firms but also SMEs as well, since those products extensively accelerate new product and service creation.

Knowledge conversion which is an interaction between tacit and explicit knowledge is the way of creating and expanding knowledge (Frybourg, 1997: 218-19). According to M. Monaka (cited in Frybourg, 1997: 218-19) knowledge conversion could be divided into four categories as follow.

1. *Socialization (tacit to tacit):* the relationship between an apprentices and his master in which the knowledge observation could be implemented through imitation and practice.
2. *Externalization (tacit to explicit):* conceptualization of an image or though by writing or verbal expressions.
3. *Combination (explicit to explicit):* meetings, telephone or internet based communications. This is reconfiguration of existing explicit knowledge into a new form such as the knowledge creation in formal education.
4. *Internalization (explicit to tacit):* '*learning by interacting'*. This could be considered as R&D, the latest stage reached through experiencing the all previous conversions and internalized them into individuals' tacit knowledge. Consequently, the knowledge may end up being transformed into valuable assets at the end, which may create a competitive advantage for the firm, thus international operations of the firm could be more easily expanded according to this approach. In the following section, the potential of knowledge intensive product and services in promoting export

involvement of the firm will be discussed in order to provide a final picture that illustrates the link between the concepts of both innovation and exportation.

2.4. Technology Level of the Firm and Exportation

The international New Venture theory indicates products with intensive research and development inputs positively increases the firm engaging in international trade. This is due to declining transaction costs which achieved through producing specialized products or services likely to create a competitive advantage, hence lead to an accelerate effect for exportation (Oviatt and McDougall, 1994: 45–64).

As stated earlier in the paper, the knowledge era we are currently living in forces the firms to keep up with the tremendously changing and transforming competition conditions ever than before. Innovation, therefore, becomes increasingly vital for the firms in several different industries in order to stay competitive, which in turn makes the field interesting for researches and several numbers of studies carried out with the purpose of examining the relationship between R&D intensity and export performance of the firm (Buckley and Casson, 1976; Vernon, 1966: 190-207; Yu-Ching, Kuo-Pin and Yu, 2006: 479-81). Additionally, Buckley and Casson (1976) indicates in International New Venture theory a positive influence of incremental intensity of intangible assets on export intensity of the firm due to increasing willingness of the firm to achieve reasonable returns on export related investments. In fact, Vernon (1966: 190-207) in the Product Life Cycle theory stresses the high exportation potential of innovative new products; since demand for those products is expected to be higher and higher proportion of sales could be expected from those products particularly in their early and growth stages compared to mature products in the same or similar class.

According to the literature reviewed so far, the following hypotheses were developed to demonstrate the relationship between R&D intensity and export involvement of Turkish manufacturing SMEs.

Hypothesis 1: There is a positive relationship between the R&D intensity and export propensity of the firm.

Hypothesis 2: There is a significant difference in the export propensity of the firm with different R&D intensities.

3. Methodology

3.1. Research Context

Over the last decade, globalization with the accompanying open borders combined with accelerating business innovation and diffusion appreciably restructured market conditions, and consequently the increasing competition mercilessly eliminates particularly weak exporting SMEs. The high competition has experienced by Turkish SMEs particularly since the restriction lifted due to trade liberalisation policies in 1980s. Additionally, Turkey became a member of World Trade Organisation (WTO) in 1995. In the following year, in 1996, the country lifted all types of custom duties on EU countries, due to the free trade agreement between Turkey and E.U. (Kazgan, 2002, p.419). Consequently, the market structure of Turkey has transformed into a more open market which internationally integrated to the global markets. The changing market conditions have lead to various threats and opportunities for local firms, particularly for the Turkish SMEs.

Small and medium size enterprises (SMEs) account for 99 per cent of all industrial firms and 78 per cent for the total employment in Turkey. The definition of SME is described as a firm employs less than 250 employees has less than 25 million Turkish Liras of annual turnover (KOSGEB, 2011). Additionally, SMEs are divided into three categories according to average size of the establishment in terms of number of employees. Micro enterprises are firms with up to 10 employees; small firms that have less than 50 employees and lastly medium firms are those which have less than 250 workers (European Commission, 2003).

The nature of data belongs to this research is secondary data retrieved from KOSGEB (Small and Medium Enterprises Development Organization) city reports. The data is arranged in a table in the Appendix. The survey research will be based on our 'cross-sectional' research design. Due to the nature of our non-experimental research design, hence generalizations about the total population from this sample will also be limited.

Firms within the reports operate in manufacturing industry and in twenty-three different sectors based on two-digit industry codes. Due to the number of the city reports held in KOSGEB database is limited to thirty-eight, our sample size is determined regarding to this number. Consequently, the whole thirty-eight reports will be taken into consideration in the data analysis. Even though the whole reports are considered as a case in our analysis, the limited sample size is another limitation to internal validity of the study.

The data will be divided into two categories in which dependent and independent variables will be presented. Through applying Pearson correlation analysis the purpose of examining the relationship between those dependent and independent variables will be accomplished. Furthermore, analysis of variance (ANOVA) analysis will be undertaken with the purpose of evaluating variance differences in export rates of clustered SMEs.

3.2. Variables

3.2.1. Dependent Variable

Export Rate. Since the aim of this paper is to analyze whether or not there is a meaningful influencing relationship between innovation activities (here is Research and Development, R&D) and export propensity of Turkish SMEs, the dependent variable is identified as export rate (percentage of the firms exported at least once in the year 2005). In particular, our aim of generating this dependent variable is to evaluate how innovation activities of the firm are in accounting for differences in the export propensity of the SMEs.

3.2.2 Independent Variable

R&D intensity. The variable is measured by the percentage of the firms have registered trademarks and/or patents. Patent and trademark applications include both registered at both Turkish Patent Institute (TPI) and European Patent Organisation (EPO). There are several criticisms about the reliability of using number of patent applications as an instrument to measure R&D intensity. This is mainly due to intention to granting patents among firms in different sectors may vary thus not all inventions are registered. These reservations may occur due to application costs, required bureaucratic procedures and most frequently secrecy (Cohen, Nelson and Walsh, 2000). Furthermore, Hagedoorn and Cloodt (2003: 1365-79) takes attention to the identical weight given to all patents, hence treating same to long-term developed significant patents as well as run-of-the-mill patents in terms of R&D intensity. Notwithstanding these concerns, number of patent or trademark applications is a widely applied instrument to measure R&D intensity in the literature (Griliches, 1986: 141).

3.3. Test and Techniques Used in Analysis

3.3.1. Pearson Correlation Analysis

The Pearson correlation analysis as a statistical technique is used to measure how strongly pairs of variables (here, x and y) related in the linear association. The following formula is a convenient way of calculating sample correlations (Jones, 2012).

$$r_{xy} = \frac{\sum x_i y_i - n\bar{x}\bar{y}}{n s_x s_y} = \frac{n\sum x_i y_i - \sum x_i \sum y_i}{\sqrt{n\sum x_i^2 - (\sum x_i)^2}\ \sqrt{n\sum y_i^2 - (\sum y_i)^2}}.$$

Correlation coefficient (r) as a statistical indicator could have values from -1 to +1 hence indicates negative or positive correlation respectively. In positive correlation there is direct ratio between pairs and while a pair raises the other rises as well. In negative correlation, indirect ratio exists between pairs, therefore while a pair increases the other decreases, reverse is also true. However, if the 'r' value is close to *zero*, it means the pair is uncorrelated. Lastly, if the 'r' value equals exactly -1 or +1 an exceptional situation occurs and the correlation is named as *perfect correlation*.

Apart from the mathematical expression above, the correlation coefficient could also be calculated through software programs such as SPSS, SAS and Microsoft Excel 2007. For instance, CORREL function in Microsoft Excel effortlessly calculates the product moment correlation coefficient. The result value of any of the mentioned software data analysis will provide a clear evaluation figure to test the formulated hypothesis, if the 'r' value is high enough than hypothesis is accepted as it is (Rummel, 1976).

3.3.2. Analysis of Variance Analysis

In order to complete Analysis of variance (Anova) analysis, we firstly need to create at least three groups from our dataset. Therefore, clustering methods will be used with the purpose of grouping cases based on their similarities. Hierarchical clustering methods will be put into practice in order to create several number of sub-groups. The fundamental reason of using hierarchical clustering in our study is its convenience for small data sets. Additionally, in hierarchical clustering number of clusters do not have to be known as a priori (Härdle and Simar, 2002).

Ward's hierarchical clustering methods will be implemented to form hierarchical groups since it provides resulting groups as homogenous as possible (Ward, 1963: 236-44). The method at the beginning contains *N* number of clusters, each containing one case. The second step is to select two of these *N* subsets in which two of them have maximal value

for the functional relation or objective function that reflects criterion of choice. This steps repeats itself until one group remains. The distinguish between Ward's method and the rest of the linkage methods is that the total within-cluster sum of squares (SSE) is computed to determine the next two group to be merged instead of putting together groups with smallest distance. In brief, it merges groups that does not increase the heterogeneity drastically (Härdle and Simar, 2002, p.312).

$$SSE = \sum_{i=1}^{K} \sum_{j=1}^{n_i} (\mathbf{y}_{ij} - \bar{\mathbf{y}}_{i\cdot})^2$$

At each merging stage, the total within-cluster variance minimized due to decreasing distance between remaining groups. In SSE, **y**ij represents j*th* case in the i*th* cluster while ni represents the number of objects in the i*th* cluster (Ferreira and Hitchcock, 2009: 1925-49).

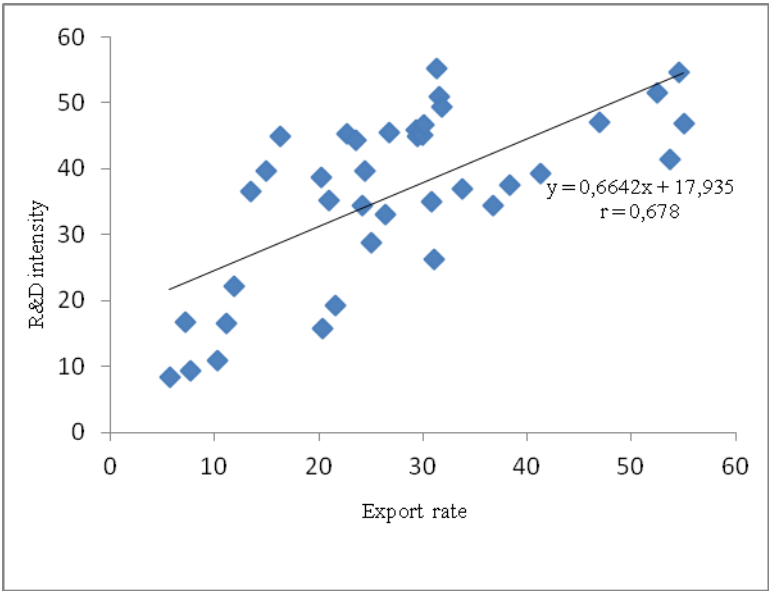
After completing the clustering part, homogeneity of variances will be tested through Levene method in SPSS 15.0. Meanwhile, the limited inter-item similarity among merged clusters is likely to result in meaningful variance differences in One-Way Anova analyze in SPSS 15.0. Therefore, focusing on variance values of the limited number of clusters may be helpful for us to explain the possible reasons behind the relationship between the dependent variable (*Export rate*) and the independent variable (*R&D intensity*).

4. Analysis of Export Propensity and R&D Intensity and Discussion

Distribution testes were completed in SPSS 15.0, prior to conducting correlation and Anova analysis. According to the results, our sample data was normally distributed allowing for the use of both correlation and Anova testing.

With the purpose of testifying either or not there could be a meaningful relationship between R&D intensity and export propensity of the firm, the collected data were aggregated for the Pearson correlation analysis. The hypothesis results demonstrated a momentous association between the factor pairs with a high correlation coefficient, r xy, result (0.671, $p < 0.05$).

Figure: 4
Export Propensity – R&D Intensity



As it could be observed from the output of the linear regression above in the figure-4, firms with higher registered trademarks and/or patents percentages are more likely to be involving with export activities. According to the results, Hypothesis 1 was accepted; hence the R&D intensity was identified as a driver of export involvement of the firm.

> *Hypothesis 1:* There is a positive relationship between the R&D intensity and export propensity of the firm.

All the 38 cases were assigned to 3 final groups regarding to their R&D intensities (VAR00003 in figure 4). The number of groups were determined according to dendrogram using Ward method in which rescaled distance was lower than five. The results of Levene method verify the homogeneity of variances between each of the three groups (0.651, $p<0.05$). The results presented in figure 4, indicate a conspicuous difference in variance between the first and the second groups (0.013, $p<0.05$), and the first and the third groups (0.001, $p<0.05$). Since significant difference was identified among the groups, hypothesis 2 was accepted. The sharp difference in variances of these groups could be explained by that a limited increase in R&D intensity at lower level has a significant effect on the dependent variable export rate (VAR00001 in figure 4). This is to say that,

same level of increase in R&D intensity of the firms in group-1 (firms with low level of R&D) are likely to have higher potential to achieve higher growth rate in export, compared to the firms in group-2 and group-3.

Hypothesis 2: There is a significant difference in the export propensity of the firm with different R&D intensities.

Figure: 5
Test of Anova Results

(I) R&D	*(J) R&D*	*Mean Difference (I-J)*	*Std. Error*	*Sig.*	*95% Confidence Interval*	
					Upper Bound	*Lower Bound*
1.00	*2.00*	*-14.00008(*)*	*4.67018*	*.013*	*-25.4293*	*-2.5708*
	3.00	*-18.95767(*)*	*4.53280*	*.001*	*-30.0507*	*-7.8647*
2.00	*1.00*	*14.00008(*)*	*4.67018*	*.013*	*2.5708*	*25.4293*
	3.00	*-4.95759*	*4.20730*	*.474*	*-15.2540*	*5.3388*
3.00	*1.00*	*18.95767(*)*	*4.53280*	*.001*	*7.8647*	*30.0507*
	2.00	*4.95759*	*4.20730*	*.474*	*-5.3388*	*15.2540*

** The mean difference is significant at the .05 level.*

On the contrary, the results illustrated above did not show a significant differences between the groups 2 and 3 (0.474, $p<0.05$). This is due to the fact that, the effect of R&D on export begins decreasing incrementally even though R&D intensity of the firm continue to growth. It could be stated that the R&D intensity strongly determines the export rate until a certain level, after which significance of R&D in accelerating export reduces gradually. Overall, the significance of R&D for export growth is supported and decreasing influence of it is also pointed out through both Pearson and ANNOVA analysis above.

Creating knowledge through knowledge conversion could be considered as a way of creating value which has the potential to become a valuable asset and thus a source of competitive advantage. The asset could be created through converting explicit knowledge into tacit knowledge by contribution of both technological effort and quality human capital. More precisely, the accumulated research and development activities may possibly lead an improvement in internal practical experience which allows the firm to utilize international know-how and consequently obtain an international objective (Yu-Ching et al., 2006: 479-81). Furthermore, developing knowledge-intensive assets through R&D programs and utilizing international know-how could also be considered as a sign of willingness to engage in export (Wang, Hsu and Fang, 2008: 1388-95). In addition, as mentioned earlier in the paper Buckley and Casson (1976) also argued the issue and indicated the significant correlation between incremental knowledge intensive assets and intention to go abroad in order to secure reasonable returns on investments.

Moreover, the findings support the Product Life Cycle theory of Vernon (1966: 190-207) which claims that R&D implications likely to generate export due to the competitive advantage achieved by launching the innovation. Besides, the International New Venture theory is also supported by the findings; knowledge intensive products or services provide a unique advantage through declining transaction cost and specialization, and therefore, accelerate international trade involvement of the firms in the long term (Oviatt and McDougall, 1994: 45-64).

5. Conclusion

The present paper assessed whether and to what extend there is a significant relationship between export engagement of SMEs and innovation. The results indicated a significant relationship between export propensity (the dependent variable) and R&D intensity of the firm (the independent variable). Additionally, significance of acquiring required information to achieve knowledge conversion through internalization (explicit to tacit) is becoming increasingly crucial for SMEs. Since the cost of communication and acquiring knowledge lower by time and the changing nature of knowledge both enable SMEs to demolish export barriers.

Parenthetically, R&D, although having positive marginal effects, should also not be considered as the only tool to facilitate export rate of the firm. This is due to the fact that the effect of R&D on export begins decreasing noticeably after the firm reaches a certain level in R&D intensity through having several number of registered trademarks and/or patents. Thus, cost of R&D investment may exceed the potential investment return.

In a concise manner, a better understanding of the potential role that knowledge-based innovation plays in export engagement of the firm could, consequently, help managers to make more effective decisions in the design of production, marketing and distribution policies regarding to export. In addition, it could also be useful for both policy makers and academicians too in developing sophisticated approaches related to the subject.

Limitations

The cross-sectional nature of the study may not allow researchers to delve into the issues of causality. The limitations occur due to the outcome and exposures were assessed at the same time. Therefore, longitudinal studies could be conducted to determine the roots of the causality. Apart from that, the sample size was limited to thirty-eight due to the limited number of cities (eighty-one) located in the whole country, which also decreased the generalizability of the findings.

Appendices

Appendix: I
Dependent and Independent Variables

	City Name	Export Rate (Dependent Variable)	R&D Intensity (Independent Variable)
1	Van	5.70	8.47
2	Rize	7.24	16.66
3	Yalova	7.66	9.46
4	Hatay	10.25	10.96
5	Balikesir	11.08	16.52
6	Diyarbakir	11.86	22.27
7	Canakkale	13.52	36.52
8	Amasya	14.91	39.62
9	Tokat	16.34	45.00
10	Nevsehir	20.27	38.64
11	Ordu	20.37	15.76
12	Zonguldak	20.99	35.14
13	Usak	21.56	19.20
14	Antalya	22.72	45.29
15	Corum	23.58	44.26
16	Eskisehir	24.14	34.52
17	Manisa	24.38	39.73
18	Adana	25.00	28.76
19	GaziAntep	26.40	32.98
20	Trabzon	26.71	45.51
21	Aydin	29.34	45.86
22	Kutahya	29.47	45.00
23	Malatya	29.92	45.06
24	Konya	30.06	46.72
25	Kayseri	30.76	34.98
26	Bursa	31.01	26.21
27	Samsun	31.26	55.16
28	Sivas	31.62	50.88
29	Afyon	31.76	49.36
30	Icel	33.73	36.97
31	Ankara	36.78	34.37
32	K.Maras	38.34	37.50
33	Denizli	41.32	39.36
34	Tekirdag	47.00	46.98
35	Izmir	52.53	51.58
36	Kocaeli	53.71	41.37
37	Sakarya	54.62	54.70
38	Istanbul	55.03	46.92

Source: KOSGEB (2005).

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