Analyzing Resource Efficiency Methods in Turkey: The Impact on Production Cost and Sales Volume

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ABSTRACT

    Rapid economic growth along with carelessness related to environmental problems have caused adverse impacts on nature and to civilization as a whole. The effects on nature include temperature changes and increased climactic and environmental disasters. To minimize the negative effects of climate change and reduce future emissions, several governments have announced charges for greenhouse gas emissions. However, these charges present extra operational costs for firms and impact their financial health. This study analyses the impact of offering ecological friendly products and services on the production costs and sales volume of resource-efficient Turkish Small and medium sized enterprises (SMEs) using data from the Flash Eurobarometer 456. The findings reveal that offering "green" products do not increase the sales volume. However, resource efficiency activities can influence SMEs' production costs. This result can help practitioners who are looking for opportunities for cost reductions in manufacturing to apply more resource-efficient mechanisms.

    Key Words: *Small and medium sized enterprises (SMEs), Resource Efficiency Activities, Environmentally friendly products, Green economy*

    JEL Classification: *M11*

Türkiye'de Kaynak Verimliliği Yöntemlerinin Analizi: Üretim Maliyeti ve Satış Hacmine Etkisi

ÖZ

    Hızlı ekonomik büyüme, çevresel sorunlara karşı kayıtsızlıkla birlikte, doğa ve bir bütün olarak medeniyet üzerinde olumsuz etkilere yol açmaktadır. Doğa üzerindeki etkiler arasında sıcaklık değişimleri ile iklimsel ve çevresel felaketler bulunmaktadır. Hükümetler, iklim değişikliğinin olumsuz etkilerini en aza indirmek için sera gazı emisyonunu vergilendireceklerini duyurdu. Ancak bu vergiler şirketler için ekstra maliyet yaratmakta ve finansal sağlıklarını etkilemektedir. Bu çalışma, Flash Eurobarometer 456 verilerini kullanarak, ekoloji dostu ürün ve hizmetler sunmanın, kaynak bakımından verimli Türkiye Küçük ve orta ölçekli işletmeler (KOBİ'ler) üretim maliyetleri ve satış hacmi üzerindeki etkilerini incelemektedir. Bulgular, "Yeşil" ürünler sunma yönelimi, satış hacmini artırmamaktadır. Ancak, kaynak verimliliği faaliyetlerinin, KOBİ'lerin üretim maliyetlerini etkileyebileceğini ortaya koymaktadır. Bu sonuç, üretimde maliyet azaltma fırsatları arayan pratisyenlerin kaynak açısından daha verimli mekanizmalar benimsemelerine yardımcı olabilir.

    Anahtar Kelimeler: *Küçük ve orta ölçekli işletmeler (KOBİ'ler), Kaynak Verimliliği Faaliyetleri, Çevre dostu ürünler, Yeşil ekonomi*

    JEL Sınıflandırması: *M11*

INTRODUCTION

    In recent years, the idea of a green economy has been the main engine of economic development of our society. The principles of a green economy help to

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preserve natural resources while utilizing sustainable energy sources (Pekanov Starčević et al., 2017). Green growth characterizes a form of wealth that focuses on quality, low carbon emissions, and energy saving activities with an emphasis on building value through novel clean innovations, technology and infrastructure, notably in developing economies (Vazquez-Brust et al., 2014; Fernando et al., 2019). Concern related to ecological issues has progressively increased over time (Bonney and Jaber, 2011; Yacob et al., 2019). Green innovation introduced by businesses can help to minimize these concerns by reducing potential ecological damages. These innovations also encourage increased use of renewable sources, protect environmental resources and save energy (Fernando et al., 2019). Renewable energy sources should be applied whenever feasible, and non-renewable sources should be used sparingly to help reduce negative effects as well (Hall et al., 2010). Furthermore, some believe that firms familiar with green methods operate on more sustainable principles, which not only contributes to the sustainability of environmental systems, but also increases people's overall standard of living. This allows the firms to earn money while concurrently having a constructive effect on the broader economy (Croston, 2009; Čekanavičius et al., 2014).

Most large organizations have already adjusted their production to use greener practices and take advantage of these developments, but many Small and Medium Sized Enterprises (SMEs) are still making the conversion (Pekanov Starčević et al., 2017). The European Union (EU) defines SMEs as companies having fewer than 250 employees and sales below EUR 50 million, and small businesses as those with fewer than 50 employees and sales under EUR 10 million (OECD, 2018). Large firms typically adopt green practices faster than SMEs because of greater access to the necessary resources and infrastructure (Lin and Ho, 2010). For SMEs, a green transition provides an imporant business option, as these enterprises become a significant supplier of environmentally friendly products and services (OECD, 2018).

The flexibility of SMEs helps them to provide green innovative products and services (Pekanov Starčević et al., 2017). In addition, it can be beneficial to invest in the development of green technology (Chen et al., 2006). A green company is one that is devoted to environmental practices such as sustainable operations, focuses on ecologically friendly resources, and attempts to mitigate the harmful impacts of its actions on the environment (Čekanavičius et al., 2014). Thus, it is claimed that the use of environment-friendly sustainable resources and social accountability are two important elements for an organization to be considered a green business (Čekanavičius et al., 2014). A green business model can support SMEs in achieving better performance in competitive markets (European Parliament, 2015). It will be easier for SMEs to utilize green innovation once they realize the comparative ease of learning and adopting these new approaches (Weng and Lin, 2011).

Small and Medium Enterprises (SMEs) are the foundation of economies as they provide many jobs and contribute to overall economic growth. SMEs also

comprise the largest portion of existing businesses in most emerging countries (Saleh and Ndubisi, 2006; Yacob et al., 2019). Turkey is one of these emerging nations whose economic growth depends on SMEs. Currently, there is a lack of research on the effect of applying green business strategies on the performance of Turkish SMEs, particularly regarding the effect of efforts towards resource efficiency on production costs. To address this, our study analyzes Turkish SMEs, focusing on the relationship between different stages of resource efficiency activities, production costs, and sales volumes, with an emphasis on green business practices. Offering ecologically friendly products and services provides new opportunities for Turkish SMEs. However, the impact of ecologically friendly products on Turkish SMEs' production costs, sales, and business outcomes has not been sufficiently analyzed.

Specifically, this study utilizes Flash Euro-barometer 456 data to examine the effect of Turkish SMEs to "go green". This paper extends the study of Pekanov Starčević et al. (2017), which discovered that the relationship between resource efficient activities and green initiatives predicts turnover in Croatia by applying a ANOVA and chi-square statistical methods. This study extends that work to a summary of eco-friendly business in Turkey by applying the latest Eurobarometer information on resource efficiency practices and offering green products, including the 148 Turkish SMEs identified in that dataset. The results of the analysis display a combination of significant and non-significant relations.

The study is organized as follows: The first part discusses the significance of the research. Section 1 focuses on ecological friendly practices in SME's and derives hypotheses regarding businesses movement toward green and resource-efficient practices and the influence of these practices on production cost and turnover. Section 2 covers the data, basis, and methodology of this study. Section 3 presents the data analysis and outcomes, while last part offers conclusions based on the findings and inferences and provides suggestions for further research in this field.

I. RESEARCH HYPOTHESIS

The world is faced with the challenging issue of ongoing deterioration of the global ecosystem (Pekanov Starčević et al., 2017). Assets such as materials and energy are not optimally utilized, leading to extreme increases in waste generation (Jacobs, 2012). During the last few decades, businesses have played a critical role in the arenas of environmental resource and energy conservation. In this context, green business is a relatively new approach, one which is interpreted in different ways by various people and companies (Kabiraj et al., 2010).

Firms attempt to address these environmental concerns by focusing on a greener approach to business. Taking steps towards ecological friendliness is important to firms since their business relies on the effective utilization of technological innovations and resources (Pekanov Starčević et al. (2017). To realize green growth, it is necessary to invest in new, green products (Kunapatarawong and Martínez-Ros, 2016; Fernando et al., 2019).

The broad focus of environmentally friendly products and services is to reduce ecological risks, including deterioration of resources and generation of pollution. Embracing clean technologies will lead to greener growth of our economy and the preservation of the ecosystem. Green development influences the framework of production, since it is responsible for ecological protection and involves resource-sparing products and processes (Machiba, 2011; Pekanov Starčević, 2017; Zsyman et al., 2012). Besides offering ecologically friendly products, firms can also introduce green services. Since green services are intangible, they are less destructive to nature than the production of tangible goods (Pekanov Starčević et al., 2017).

Implementing green practices is a voluntary act for most SMEs. Many SMEs invest in eco-friendly and energy efficient processes. For that investment to succeed, they need dependable partners for finance and adaptable rules and regulations from the government. However, they face certain difficulties in getting funding from banks, as many are unwilling to invest in such projects (OECD, 2018). Ecological concerns have an impact on cost and revenue of a firm, and thus, on the firm's business outcome (Schaltegger and Synnestvedt, 2002; Molina-Azorin et al., 2009).

Cost-efficient companies are currently using more resource-efficient tools than companies that are not focusing on cost leadership (Delmas and Pekovic, 2015). Applying ecologically friendly tools, methods and strategies depends on the environmental situation of the SME's nation, its degree of ecological consciousness and development, and on the benefits to the organization (Pekanov Starčević et al., 2017). Related to this, strong competition and increased energy costs have accelerated the adoption of green thinking (Kabiraj et al., 2010). One benefit of environment-friendly products is their minimal production costs due to efficient energy usage (Olson, 2013).

Governments can employ several financial tools, such as taxes related to ecologically unfriendly practices, to encourage SMEs to put more effort in improving their resource usage productivity and decreasing their manufacturing costs. SMEs contribute a large portion of a nation's pollution, and are clearly responsible for adverse effects on nature (Parker et al., 2009; Yacob et al., 2019). Therefore, SMEs are currently on the radar of scholars and governments (Gadenne et al., 2009) with the goal of helping these companies to minimize their ecological footprints through introducing regulations, programs and tools (Yacob et al., 2019).

Green manufacturing practices concentrate on the utilization of ecologically friendly products, packing and raw materials, as well as distribution and reuse of the product after an appropriate duration. It utilizes processing methods that conserve resources and are not harmful to the environment. These methods involve protecting nature by avoiding the production of waste, increasing recycling efforts, and following regulations and managing emissions (Neves et al., 2014; Jabbour et al., 2015; Yacob et al., 2019).

In today's evolving landscape, manufacturers who still follow the non-green path are subject to higher charges in tax penalties, pollution licenses, or other

payments under regulations created by the governing authorities (Pekanov Starčević et al., 2017). However, the costs of environmentally friendly production are currently higher than conventional production, since new production systems and technologies must be developed and adapted to meet the additional requirement of environmental friendliness (Pekanov Starčević et al., 2017). In this situation, the additional costs are taken on by customers who are eager to use more money for eco-friendly goods or services (Stefan and Paul, 2008).

While some studies have explored the effects of green practices and policies on large companies (e.g. Yacob et al., 2019), few studies have analyzed small and medium sized enterprises and their relations to ecological challenges, and none have focused on Turkish SMEs.

To fill that gap, the following hypotheses have been developed after evaluating past studies:

H1: Turkish SMEs using resource efficiency activities display better production cost efficiency.

H2: Turkish SMEs using resource efficiency activities provide more green-related products or services.

H3: Turkish SMEs offering green-related products or services generate a higher sales volume.
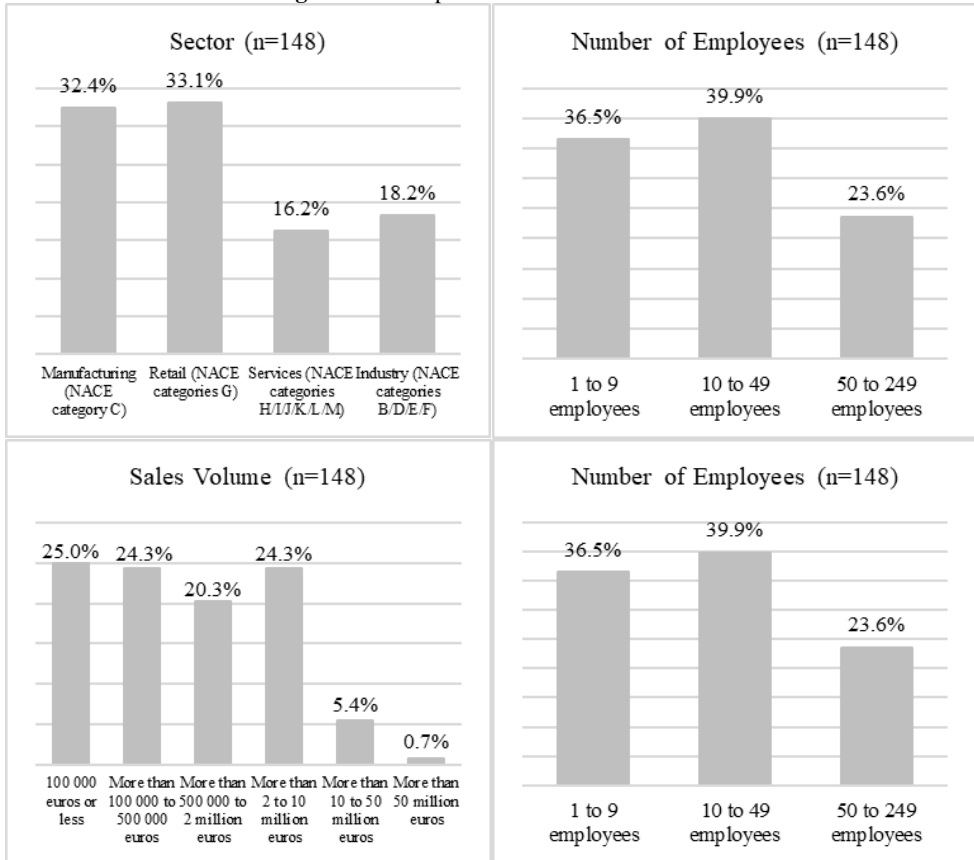
II. DATA AND METHODOLOGY

The Flash Eurobarometer is a survey approach that frequently gathers information from inhabitants among EU associates and further candidates; the European Commission gather data from EU companies, and the official reports are disclosed on their website. In addition to the 28 member states of the European Union, data for the Flash Eurobarometer 456 were also collected from Albania, Iceland, the Former Yugoslavian Republic of North Macedonia, Moldova, Montenegro, Norway, Serbia, Turkey and the USA, for a total of 15019 respondents (European Commission, 2018). The population includes all companies with at least one employee. Computer Assisted Telephone Interviews were used to collect the data in September 2017. After adjusting the data to the needs of this study, data from 148 Turkish SMEs were examined.

The aim of this research is to analyze Turkish SMEs' activities related to increased resource efficiency and offering eco-friendly products. Figure 1 shows the summary of descriptive analysis of the data: 33.1% of the SMES are part of the retail sector and 32.4% of the SME belong to the manufacturing sector, followed by the industrial (18.2%) and service sectors (16.2%). The number of employees of SMEs ranges are as follows: 1-9 employees (36.5%); 10–49 employees (39.9%) and 50–249 employees (23.6%). The typical sales of the analyzed companies are as follows: 100 000 euros or less (25.0%), 100 000 to 500 000 euros (24.3%), 500 000 to 2 million euros (20.3%), 2 to 10 million euros (24.3%), 0 to 50 million euros (5.4%), and more than 50 million euros (0.7%). Out of all Turkish SMEs, 10.1% are currently offering ecologically friendly products, 16.9% are considering offering eco-friendly products or services within next two years, and 73.0% have no intention to offer environmentally friendly products.

We used the statistical software IBM SPSS 25.0 (IBM SPSS, 2017) to apply the methodology of Pekanov Starčević et al. (2017). Two statistical approaches were used to assess the hypotheses. First, a one-way ANOVA was used to assess dissimilarities in the intensity of making activities to be more resource efficient and a reduction in SMEs' production costs (H1). Second, for H2 a chi-square significant test was applied to analyze the interdependency among being resource efficient and providing environment-friendly products and services. Furthermore, the chi-square test statistical method was also applied to examine hypothesis H3.

Figure 1. Descriptive data for Turkish SMEs

III. RESULTS

The first step of our analysis was to identify relevant companies for our research objectives. As previously discussed, data on manufacturers in Turkey were chosen from the Eurobarometer database. The second step was to organize the companies based on their actions toward increased resource efficiency; the SMEs were analyzed regarding both their current efforts and their intended actions. Figure 2 shows the frequency of certain resource efficiency efforts and intended actions regarding planned efforts toward resource efficiency.

As shown in Figure 2, SMEs are heavily focusing on saving materials (83%) and minimizing waste (79.1%). The use of renewable energy is currently the least common step taken to improve resource efficiency. The comparison between current actions and planned actions within 2 years do not display significant differences. For the most part, the number of companies planning to adopt a given strategy is higher than the number currently undertaking it. The two exceptions are strategies to save water (65% current, 64% future plans) and to save materials (83% current, 79% future plans).
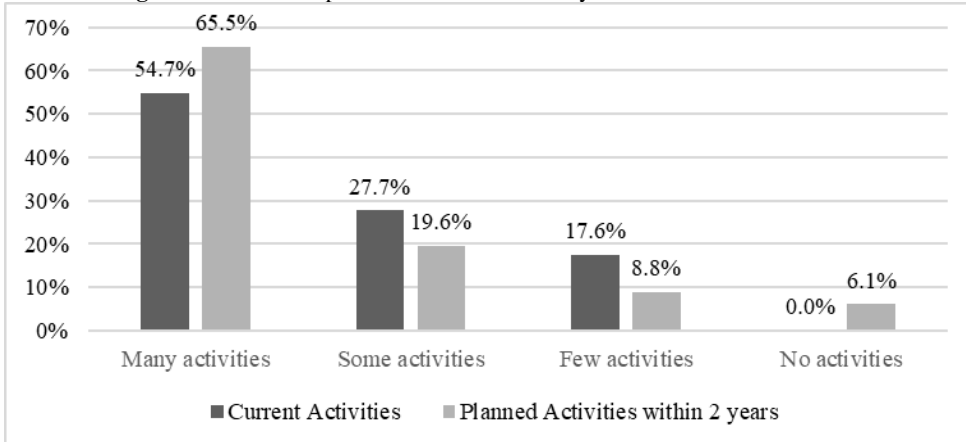
Figure 2. Detailed resource efficiency activities for Turkish SMEs
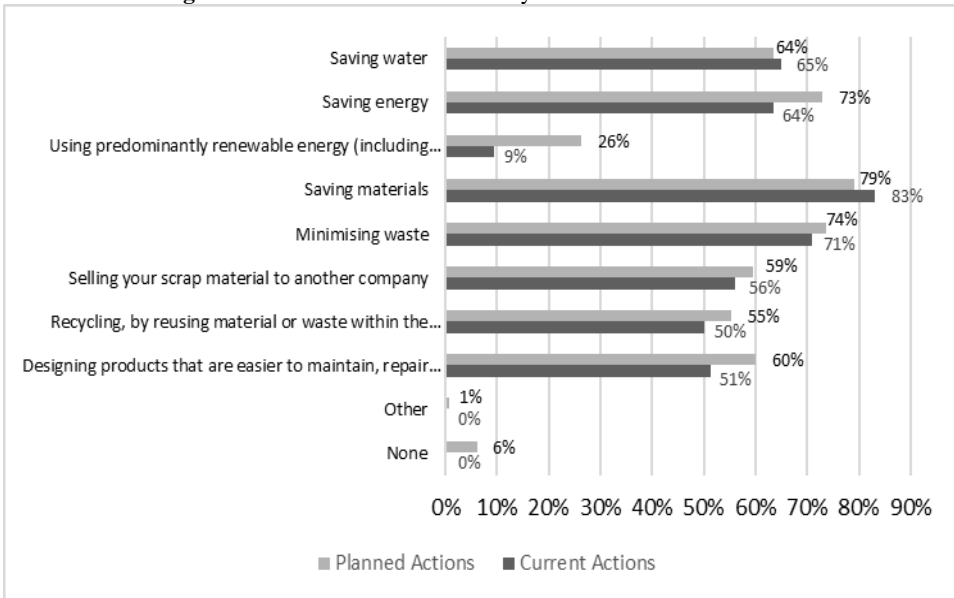
Source: Own elaboration based on Flash Eurobarometer 456 dataset (European Commission, 2018)

Manufacturers that are currently implementing resource efficient activities can be described as environmentally friendly companies. A new variable was generated based on the answer frequency regarding activities aimed at becoming a more environmentally friendly company. Manufacturers that chose one or two out of the nine activities (Figure 2) are grouped as "Few activities," those with three or four answers as "Some activities," and those with five or more environmentally friendly activities as "Many activities." SMEs that did not choose any activities are included in the "No activities" category (Figure 3).

Figure 3. Current vs. planned resource efficiency activities for Turkish SMEs

Source: Own elaboration from Flash Eurobarometer 456 dataset (European Commission, 2018)

In general, more than half of the studied Turkish SMEs report having taken many actions to improve resource efficiency (55%) and intend to increase their activities to achieve a higher level of resource efficiency over the next two years (66%). Less than half (46%) are currently taking some (28%), few (18%) or no actions (0%) toward resource efficiency. This will also have decreased in total to 35% (some (20%), few (19%) or no actions (6%)) over the next two years.

These results show that Turkish SMEs are aware of the benefits of improved efficiency and conservation. To examine hypothesis H1, a one-way ANOVA was applied to the three categories of resource efficiency activities to determine any differences between the groups relative to production costs; the results are presented in Table 1 and Table 2.

Table 1. Descriptive Statistics

Resource Efficiency	N	Mean (M)	Std. Dev. (SD)	Std. Error
Many activities	81	3.25	1.299	0.144
Some activities	41	2.80	1.327	0.207
Few activities	26	2.81	1.327	0.260
Total	148	3.05	1.321	0.109

Table 2. One-Way Analysis of Variance (ANOVA)

ANOVA (Production Cost)	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.130	2	3.565	2.071	0.130
Within Groups	249.539	145	1.721		
Total	256.669	147			

A one-way ANOVA was also conducted to measure the impacts of resource efficient activities on production costs. ANOVA is a specialized mathematical-statistical approach that enables the determination of the significance of the difference between three or more arithmetic means. Therefore, it is possible to examine the effect of one or more variables on the variability of a tested variable (Tabachnick and Fidell, 2007). Furthermore, ANOVA is described as a statistical approach that makes use of the F ratio to ascertain if an independent variable has a statistically significant influence on a dependent variable (Picardi and Masick,

2014). As described above, resource efficient activities were separated into three groups determining the means and standard deviation for each activity (Table 1): "few activities" (M = 2.81, SD = 1.327), "some activities" (M = 2.81, SD = 1.327), and "many activities" (M = 3.25, SD = 1.299). Since the dataset is small (n=148), the examination of the significance of the means (p threshold) was relatively generous. The results in Table 2 slightly show that there is no significant difference in production cost for the different categories of resource efficiency activity (F(2, 145) = 2.071, p = 0.130).

However, a post-hoc comparison of Least Significant Difference (LSD) reveals a low level of a significant difference between observed categories regarding the production costs (Table 3). There exists a difference of medium significance (p < 0.1) between the categories "many activities" and "some activities" (p=0.081). Therefore, hypothesis H1 partially significant, leading to the argument that implementing many resource efficient activities in SMEs can lead to a reduction of production costs.

Table 3. Post Hoc Test LSD (Production Cost- Resource Efficiency)

Resource Efficiency Comparison		Mean Difference	Std. Error	Sig.
Many actions	Some actions	0.442	0.251	0.081
	Few actions	0.439	0.296	0.140
Some actions	Many actions	-0.442	0.251	0.081
	Few actions	-0.003	0.329	0.993
Few actions	Many actions	-0.439	0.296	0.140
	Some actions	0.003	0.329	0.993

Table 4 illustrates the results of a nonparametric chi-square analysis to examine Hypothesis 2, which shows the relationship between SMEs that conduct resource efficient activities and offer more ecological friendly products and services. The "Total" column for each row represents the sum of relationship between the two variables.

Table 4. Non-Parametric Chi-Square Test (Ecologically Friendly Products - Resource Efficiency)

Offering ecologically friendly products or services		Conducting resource efficiency activities			Total
		Many activities	Some activities	Few activities	
Yes	Count (%)	10 (67.7%)	2 (13.3%)	3 (20.0%)	15 (100%)
	Expected Count (%)	8.2 (54.7 %)	4.2 (27.7 %)	2.6 (17.6 %)	15.0
No, but planning to do so in the next 2 years	Count (%)	18 (72.0%)	5 (20.0%)	2 (8.0%)	25 (100%)
	Expected Count (%)	13.7 (54.7 %)	6.9 (27.7 %)	4.4 (17.6 %)	25.0 (100%)
No, and not planning to do so	Count (%)	53 (49.1%)	34 (31.5%)	21 (19.4%)	108 (100%)
	Expected Count (%)	59.1 (54.7 %)	29.9 (27.7 %)	19.0 (17.6 %)	108.0 (100%)
Total	Count (%)	81 (55.7 %)	41 (27.7 %)	26 (17.6 %)	148 (100 %)
	Expected Count (%)	81.0 (54.7 %)	41.0 (27.7 %)	26.0 (17.6 %)	148.0 (100%)
	$\chi 2 = 6.164$, df = 4, p = 0.187				

Chi-square ($\chi 2$) test is applied to examine categorical datasets. A cross table with rows and columns is constructed, and the actual and anticipated

frequencies (number of actions) in each cell are compared. It examines whether observed frequencies in one or more categories correspond to predicted frequencies. The chi-square test discloses that, among Turkish SMEs, there is a no significant correlation ($p < 0.2$) between the highest rate of resource efficiency actions and offering ecologically friendly products and services ($\chi2 = 6.164$, df = 4, $p = 0.187$). Turkish SMEs that are currently offering or are considering offering ecologically friendly products or services within two years are implementing more resource efficient activities (67% and 72%, respectively) than those that are not offering, or are planning to offer them (48%). Because of these relationships between activities toward resource efficient activities and offering ecologically friendly products and services, hypothesis H2 can be rejected.

Table 5. Non-Parametric Chi-Square Test (Sales Volume - Ecological Products)

Sales volume last year?		Ecological friendly products or services		
		Yes	No	Total
100 000 euros or less	Count (%)	3 (8.1%)	34 (91.9%)	37 (100.0%)
	Expected Count (%)	3.8 (10.1%)	33.3 (89.9%)	37.0 (100.0%)
More than 100 000 to 500 000 euros	Count (%)	3 (8.3%)	33 (91.7%)	36 (100.0%)
	Expected Count (%)	3.6 (10.1%)	32.4 (89.9%)	36.0 (100.0%)
More than 500 000 to 2 million euros	Count (%)	6 (20.0%)	24 (80.0%)	30 (100.0%)
	Expected Count (%)	3.0 (10.1%)	27.0 (89.9%)	30.0 (100.0%)
More than 2 to 10 million euros	Count (%)	3 (8.3%)	33 (91.7%)	36 (100.0%)
	Expected Count (%)	3.6 (10.1%)	32.4 (89.9%)	36.0 (100.0%)
More than 10 to 50 million euros	Count (%)	0 0 (0.0%)	8 (100 %)	8 (100 %)
	Expected Count (%)	0.8 (10.1%)	7.2 (89.9%)	8.0 (100.0%)
More than 50 million euros	Count (%)	0 (0.0%)	1 (100.0%)	1 (100.0%)
	Expected Count (%)	0.1 (10.1%)	0.9 (89.9%)	1.0 (100.0%)
Total	Count (%)	15 (10.1%)	133 (89.9%)	148 (100.0%)
	Expected Count (%)	15.0 (10.1%)	133.0 (89.9%)	148.0 (100.0%)
		$\chi2 = 4.644$; df = 5; $p = .461$		

Table 5 shows the results of a nonparametric chi-square analysis to examine Hypothesis, which shows the relationship between SMEs that offers green-related products or services and sales volume. To evaluate hypothesis H3, SMEs offering ecological friendly products were grouped into two categories: "Yes" for those currently offering them, and "No" for all others. The chi-square approach revealed that there is no interdependency between SME sales volume and the rate of offering ecological friendly products ($\chi2 = 4.644$; df = 5; $p = .461$). It can be concluding that, currently, offering ecologically friendly products or services is not leading to increased sales volume.

CONCLUSION

Concern regarding the ecological impacts of products and services has continually increased in recent years. Practical implications are established in this research, which shows that most Turkish SME managers have little motivation regarding movement toward the adoption of ecologically friendly products and services. However, taking actions to increase resource efficiency actions can partially lead to minimizing production costs. However, the hypothesis that companies who offer green products generate more sales than those who do not was not supported by the data used in this analysis.

Regardless, it is recommended that Turkish SMEs increase their awareness of environmentally friendly products and services. These approaches can provide a competitive advantage, since they are unique and difficult for competitors to copy. As such, green initiatives can help SMEs increase their market share. Future research should focus on assessing sales based on a metric variable of profits to better assess performance. Simulating the cost efficiency of activities intended to increase resource efficiency could increase companies' motivation regarding green activities and may provide motivation to offer more ecologically friendly products and services.

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Makalenin tüm süreçlerinde Yönetim ve Ekonomi Dergisi'nin araştırma ve yayın etiği ilkelerine uygun olarak hareket edilmiştir.
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Çıkar Beyanı
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