



THE EFFECT OF OPERATING EXPENSES ON GROWTH AND PERFORMANCE: AN EMPIRICAL ANALYSIS OF THE PETROLEUM AND CHEMISTRY INDUSTRY IN TURKEY



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ABSTRACT

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The aim of this study is to determine the effect of operating expenses on performance and growth in the petroleum and chemical industry. Operating expenses include research and development (R&D), marketing and administrative expenditures. Determining the distribution of these expenses in this industry an important issue. The data obtained from companies operating in the petroleum and chemical industry were analyzed using two separate models. Within the scope of research, it was determined that R&D expenditure has no significant effect on performance and growth. Marketing expenditure negatively affects performance and has no significant effect on growth. Finally, it was concluded that administrative expenditure has a significant positive effect on both performance and growth. These results indicate that ineffective R&D and marketing expenditures in this industry should be avoided. On the other hand, in terms of management function, it explains that expenditure should be shifted to the areas that will contribute, especially towards the future.

Contribution/Originality: This study contributes to the existing literature by examining the effect of the operating expenses on firm growth and performance. Operating expenses include R&D, marketing and administrative expenditure. The results of the study provide guidance on operating expenses for companies that want to increase their performance and growth.

1. INTRODUCTION

In the petroleum and chemistry industry, which is a sub-sector of the energy market, the level of operating expenses is an important issue. The distribution of operating expenses in this industry is also an issue that should be rectified. Adequate planning is needed to effectively manage operating expenses in the industry in terms of impact on company performance and growth.

Operating expenses, which are evaluated among the investment elements of enterprises, are related to the main activity of the enterprise and are not charged to production costs that comprise R&D, marketing and administrative expenditure. These expenses also include future investment in R&D, marketing (advertising, promotion, etc.) and administrative expenditure (executives fees, etc.) in terms of their contribution to intellectual capital, and are an account group that should be evaluated in detail for businesses. However, some of the items covered by these

expenses are important not only for their effect on the period they are realized, but also for the businesses in terms of being an investment element (Koçan, 2017).

In terms of operating expenses, there are no specific issues regarding the transfer of marketing and management expenditures to financial statements, but there are some issues to be considered in reporting R&D expenditure. According to International Accounting and Financial Reporting Standards, expenditure related to R&D is divided into two stages and transferred to records. In this context, expenditure related to the research phase is reported as an expense and expenditure related to the development phase is reported as capitalization (IAS 38).

The impact of investments, such as R&D, marketing and administrative expenditures on growth should be examined as a whole. There is no general agreement among researchers regarding how to measure firm size, therefore, there are differences in the growth variables used (O'Farrell & Hitchens, 1988). The size of a firm can be measured based on its income, profits or the amount of human and physical capital it employs. Researchers in the field of economics and geography tend to use employment due to the relatively simple measurement and interest of policy makers. In the research conducted in the field of finance, the selected variables used were based on accounting records (Hanvey, Barkham, Gudgin, & Hart, 1996). Zhou and Gerrit (2009) specified three individual determinants on growth—growth motivation, specific skills, and the need for achievement. They also stated that four organizational determinants—firm age, financial performance, extra finance, and preparedness to grow—have had an impact on growth. In contrast, they found that environmental determinants had no effect on firm growth. Mateev and Anastasov (2010) stated that business growth is related to size as well as features such as financial structure and productivity. They also stated that, based on the size of the enterprise, total assets have a direct effect on sales revenue, but the number of employees, R&D investments and other intangible assets do not have much effect on the growth expectations of the enterprise. According to Gupta, Guha, and Krishnaswami (2013), although there have been many studies done to determine the growth stages of a business, there is a lack of data in the literature on how these businesses grow and which factors affect growth. Globally, the characteristics of enterprises are different from each other and they operate in different social economic conditions. For this reason, it is necessary to investigate how internal and external environmental factors affect the growth policy followed by businesses.

Although there are differing opinions regarding the determination of growth, there are many studies that were determined by an association with sales (Ardishvili, Cardozo, Harmon, & Vadakath, 1998; Barkham, Gudgin, Hart, & Hanvey, 1996; García-Manjón & Romero-Merino, 2012; Hoy, McDougall, & Dsouza, 1992; Notta & Oustapassidis, 2001; Nunes, Serrasqueiro, & Leitão, 2012; Weinzimmer, Nystrom, & Freeman, 1998; Wiklund, 1998). In this study, within the scope of this relationship, the effect of operating expenses on growth was examined. Although it is possible to find studies that have determined the relationship between R&D expenditure and growth, there are almost no studies examining the relationship between marketing and administrative expenditure and growth. In this study, which focuses on filling this gap in the literature, the effect of operating expenses on company performance was also examined.

According to Neely (1999), firm performance can be measured by two types of indicators used by firms, financial and non-financial indicators. Financial indicators include traditional performance measures such as profit, return on investment and sales. These can be measured in figures from the information presented in the company's financial statements. Among the financial indicators used in firms' performance measurement, variables such as cash flow position, inventory turnover and budget versus actual performance are also included (Harif, Hoe, & Ahmad, 2012). In this study, profitability data, which is among the financial indicators, was considered as a performance indicator. In the literature, it is also possible to find many studies in which the profitability data was taken into consideration as the performance variable (Cifci, Doğanay, & Gülşen, 2010; Ciftçi, 2014; Notta & Oustapassidis, 2001; Paton. & Williams, 1999; Ventoura-Neokosmidi, 2005).

This study, which was conducted in order to contribute to the literature on this topic, first discusses the related literature followed by the research, which was conducted on companies that trade in Borsa Istanbul chemical, petroleum, rubber and plastic products sector. The study concludes with results and evaluation.

2. LITERATURE REVIEW AND RESEARCH HYPOTHESES

The effects of R&D expenditure, which are the first of the operating expenses, on a company's performance have been examined across various sectors in different studies. In many studies, R&D expenditure was found to have a positive effect on company performance (Alper & Aydogan, 2016; Doğan & Yıldız, 2013; Dutta, Narasimhan, & Rajiv, 1999; Erdogan & Yamaltdinova, 2019; Freihat & Kanakriyah, 2017; Gün & Yerdelen, 2020; Peterson & Jeong, 2010; Usman, Shaique, Khan, Shaikh, & Baig, 2017), whereas Guo, Wang, and Shou (2004) concluded that there is a negative relationship between R&D expenditure and firm profitability. However, in some studies (Coad & Grassano, 2019) it was concluded that there was no significant relationship between R&D expenditure and firm profitability.

In terms of a growth variable, it has been emphasized in many studies that R&D expenditure has a positive effect on growth (Chung, Eum, & Lee, 2019; Coad & Rao, 2010; Del Monte & Papagni, 2003; Di Cintio, Ghosh, & Grassi, 2017; García-Manjón & Romero-Merino, 2012; Klette & Griliches, 2000). However, in other studies, it was concluded that there was no significant relationship between R&D expenditure and growth (Demirel & Mazzucato, 2012; Demirgüneş & Üçler, 2016; Stam & Wennberg, 2009). It is believed that these differing results are mainly due to sectoral differences. In this respect, while the impact of R&D expenditure on growth in technology-intensive sectors is evident, it is less pronounced in sectors where technology is used less intensively (García-Manjón & Romero-Merino, 2012; Stam & Wennberg, 2009). In this context, we tried to determine the relationship between growth and performance and R&D expenditure in terms of the petroleum and chemistry industry. Based on this, the first hypothesis of the study was developed as follows:

H₁: R&D expenditure has a positive effect on growth and performance.

The second variable of operating expenses is marketing expenditure. The relationship between marketing expenditure and financial performance is one of the main issues discussed in general terms. The main argument for the opinion that marketing expenditure has positive effects on financial performance is the idea that it will increase sales. It is possible to come across many studies that found a positive relationship between these variables (Chen & Waters, 2017; Cifci et al., 2010; Ghorbani, Hajjibadi, & Zaranezhad, 2016; Konak, 2015; Kundu, Kulkarni, & Murthy, 2010; Oztürk & Dülgeroğlu, 2016; Paton. & Williams, 1999; Siong, 2010). According to Haryanto and Retnaningrum (2020), marketing expenditure had a significant effect on the profit margin of sales, return on investment (ROI), and return on equity (ROE). On the contrary, marketing expenditure had no impact on the return on assets (ROA). In contrast, Erickson and Jacobson (1992) emphasized that marketing expenditure does not increase firm value more than other types of investments. Furthermore, Hossain and Islam (2019) found a negative relationship between marketing expenditure and firm performance. Sharpe and Hanson (2018) found that advertising spend significantly reduced the negative impact of negative corporate social performance on overall firm performance. Assaf, Josiassen, Ahn, and Mattila (2017) found that firms with higher CSR (corporate social responsibility) have higher returns from advertising expenditure than firms with lower CSR levels.

In terms of growth variables, it has been determined in some studies that marketing spend has a positive effect on growth. Huang et al. (2019) found that marketing and promotional activities carried out through social media had a positive effect on the growth of a company. In particular, it concluded that the number of tweets related to a company has a high correlation with the sales of that company.

Based on this, the second hypothesis of the research was developed as follows:

H₂: Marketing expenditure has a positive effect on growth and performance.

The third variable of operating expenses is administrative expenditure. Administrative expenditure is an important topic that includes future-oriented investment elements, such as executive fees. In this regard, Cifci et al. (2010) found that these expenditures have a positive effect on performance. On the contrary, as a result of the research conducted by Tuna and Yildiz (2016) on companies operating in the technology sector on the Istanbul Stock Exchange, they concluded that although marketing and R&D expenditures increased firm performance, administrative expenditure decreased.

It can be seen from the literature that the relationship between growth and operating expenses is mostly addressed in terms of R&D. In this context, the impact of marketing and administrative expenditures on growth has not been adequately investigated. In order to fill this gap, the effects of operating expenses on growth and performance as a whole for companies in the petroleum and chemistry industry were examined in this study. The hypothesis developed in this regard is as follows:

H₃: Administrative expenditure has a positive effect on growth and performance.

These hypotheses were tested separately for R&D, marketing and administrative expenditures, and the results are given below.

3. RESEARCH MODEL AND DATA

3.1. Data Description

The aim of the study is to determine the effects of operating expenses, including R&D, marketing and administrative expenditures, on growth and performance in the petroleum and chemistry industry. This impact was investigated on the companies trading in the Borsa Istanbul chemicals, petroleum, rubber and plastic products sector. In the study, R&D, marketing and administrative expenditures, which constitute types of operating expense, were examined separately. In this way, the type of activity expenditure that has the most effect on growth and performance was determined.

R&D, marketing and administrative expenditures were identified as elements in companies within the petroleum and chemistry industry. In order to keep a wide scope, the time series of variables of the companies whose data could be accessed continuously were included in the study. Thirty-two companies were included in the study for which full data for R&D, marketing and administrative expenditures was accessible from 2014 to 2017. This data was obtained from the Public Disclosure Platform.

3.2. Model Framework

The effects of operating expenses on performance and growth for companies operating in the petroleum and chemistry industry were analyzed using a multiple linear regression method. Performance and growth models developed for the research were determined as follows:

$$P_{it} = \beta_0 + \beta_1 RD_{it} + \beta_2 MSD_{it} + \beta_3 GA_{it} \quad (1)$$

For the performance model (equation 1), P represents company performance (net profit), RD represents research and development expenditure, MSD represents marketing expenditure and GA represents administrative expenditure. Annual net profit and loss data for company performance, which is a dependent variable for the model, was taken into consideration. In the literature, there are many studies that also used profitability data as a performance variable (Cifci et al., 2010; Ciftçi, 2014; Notta & Oustapassidis, 2001; Paton. & Williams, 1999; Ventoura-Neokosmidi, 2005).

$$GR_{it} = \beta_0 + \beta_1 \Delta RD_{it} + \beta_2 \Delta MSD_{it} + \beta_3 \Delta GA_{it} \quad (2)$$

For the growth model (equation 2), GR represents growth, RD represents research and development expenditure, MSD represents marketing expenditure and GA represents the annual level of change in administrative expenditure. For the growth data, which is the dependent variable of the model, the annual rate of increase in the sales of each company was taken as the base. It has been emphasized in many studies that sales data

can be used as the growth variable (Ardishvili et al., 1998; Barkham et al., 1996; García-Manjón & Romero-Merino, 2012; Hoy et al., 1992; Notta & Oustapassidis, 2001; Nunes et al., 2012; Weinzimmer et al., 1998; Wiklund, 1998). For the R&D, marketing and administrative expenditures data, which are the independent variables of the model, the annual rates of increase were taken as the consideration.

Due to data restrictions, simple ordinary least squares (OLS) was used in this study instead of panel techniques, such as fixed or random effect models. Stam and Wennberg (2009) also analyzed the effect of R&D on firm growth with OLS regression techniques due to data restrictions. OLS is used to estimate the coefficients of the multivariate linear regression equation (Yurtcu, 2005). Due to its robustness in mathematical calculations, OLS is one of the most suitable estimation methods, and OLS estimators are widely preferred in data analysis and econometrics applications (Alma & Vupa, 2008).

4. RESULTS

In the petroleum and chemistry industry, determining the impact of R&D, marketing and administrative expenditures on company performance and growth is important in terms of determining the effectiveness of these expenditures. The sum of the operating expenses incurred in the industry from 2014 to 2017 is given in Table 1.

Table 1. Operating expenses.

YEAR	R&D	MSD	GA	TOTAL
2014	78.277.155	1.429.343.419	1.328.583.234	2.836.203.808
2015	93.568.336	1.596.999.687	1.523.778.244	3.214.346.267
2016	100.640.554	1.876.699.929	1.786.284.644	3.763.625.127
2017	102.537.408	2.190.492.647	2.084.893.152	4.377.923.207
Total	375.023.453	7.093.535.682	6.723.539.274	14.192.098.409

R&D was the lowest expenditure type for each year in the industry. However, the highest expenditure type for each year was MSD. Expenditure types increased in annual terms; R&D increased by 19.5% in 2015, 7.6% in 2016 and 1.9% in 2017. MSD increased by 11.7% in 2015, 17.5% in 2016 and 16.7% in 2017. GA increased by 14.7% in 2015, 17.2% in 2016 and 16.7% in 2017. The highest rate of increase was in 2015 for R&D, and for MSD and GA in 2016. The annual distribution of operating expenses is shown in Table 2.

Table 2. Operating expenses (%).

YEAR	R&D	MSD	GA	TOTAL
2014	0.028	0.504	0.468	1.000
2015	0.029	0.497	0.474	1.000
2016	0.027	0.499	0.474	1.000
2017	0.023	0.501	0.476	1.000

As can be seen from Table 2, MSD was the highest operating expense for each year, and the lowest item was R&D expenditure, which was observed to be at very low levels. The sum of the sales and profits incurred in the industry from 2014 to 2017 is given in Table 3.

Table 3. Sales & profits.

YEAR	Sum (Sales)	Mean (Sales)	Sum (Profits)	Mean (Profits)
2014	64.692.701.924	98.256.863	3.144.219.609	2.021.646.935
2015	62.448.980.895	164.019.055	5.248.609.766	1.951.530.653
2016	61.682.967.967	128.616.728	4.115.735.296	1.927.592.749
2017	89.538.781.201	235.726.498	7.543.247.926	2.798.086.913
Total	278.363.431.987	626.619.144	20.051.812.597	8.698.857.250

The highest sales level in the sector was reached in 2017. Likewise, the highest level of profitability was also realized in 2017. When the growth rates of sales are examined, it indicates that there was a contraction of 3.4% in 2015 and 1.2% in 2016. However, in 2017, the sector experienced a growth rate of 45.2%. In terms of profitability, there was a 66.9% increase in 2015, a decrease of 21.6% in 2016 and an increase of 83.3% in 2017 compared to the previous year. Annual sales and the percentage distribution of profitability are shown in Table 4.

Table 4. Sales & Profits (%).

YEAR	Sales	Profits
2014	0.232	0.157
2015	0.224	0.262
2016	0.222	0.205
2017	0.322	0.376
Total	1.000	1.000

As we can see from Table 4, sales were the lowest in 2016, the lowest year in terms of profitability is 2014, and the year in which profitability and sales were highest was 2017. The findings of the performance and growth models, which were formed within the scope of the research, are shown in Table 5 and Table 6.

Table 5. Analysis of performance model.

Variables	β	t	p
R&D	6.065	1.233	0.228
MSD	-1.172	-3.445	0.002 ***
GA	3.835	16.185	0.000 ***
Constant	11029967.57	0.412	0.683
R = 0.975; R ² = 0.950; F = 177.332; Sig. F = 0.000; Durbin-Watson = 1.899			
*** p < 0.01; ** p < 0.05; * p < 0.10.			

The Durbin-Watson statistical value was found to be 1.899 for the model. This value indicates that there is no autocorrelation problem in the model. Similarly, a Sig. F value less than 0.05 indicates that the regression equation is significant as a whole. The results obtained from the regression analysis for the performance model show an increase of 1% in administrative expenditure and an increase in company performance by 3.835%. On the other hand, an increase of 1% in marketing expenditure reduced the company performance by 1.172%. From this point of view, there was a significant and positive effect between company performance and administrative expenditure, while there was a significant but negative effect between performance and marketing expenditure. However, R&D expenditure had no significant effect on company performance.

Table 6. Analysis of growth model.

Variables	β	t	p
R&D	0.048	1.004	0.324
MSD	0.038	1.373	0.181
GA	0.411	4.058	0.000 ***
Constant	0.107	5.347	0.000 ***
R = 0.671; R ² = 0.450; F = 7.642; Sig. F = 0.001; Durbin-Watson = 2.082			
*** p < 0.01; ** p < 0.05; * p < 0.10			

The Durbin-Watson statistical value was found to be 2.082 for the growth model. This value indicates that there is no autocorrelation problem in the model. Similarly, a Sig. F value less than 0.05 indicates that the regression equation is significant as a whole. According to the results obtained in the regression analysis for the growth model, an increase of 1% in the level of change in administrative expenditure increased the growth by

0.411%. This shows that there was a significant and positive effect between growth and administrative expenditure. On the other hand, there was no significant relationship between growth and the level of change in either R&D or marketing expenditures.

5. DISCUSSION AND CONCLUDING REMARKS

In this study, which was conducted in order to determine the impact of R&D, marketing and administrative expenditures on the performance and growth in the petroleum and chemistry industry, data has been obtained from a sectoral point of view. The data gathered contains significant explanatory information for companies operating in the sector. The impact of these expenditures, which are investment-grade and high-volume, on performance and growth is important in terms of calculating the return on investment, because knowing how much the expenditures will contribute to the company will give managers the opportunity to discontinue ineffective expenditures.

In light of the data of companies operating in the petroleum and chemistry industry, it was determined that R&D expenditure, the first of the operating expenses, has no significant effect on performance and growth. This conclusion has also been reached by Ciftçi (2014) and Coad and Grassano (2019) in terms of performance. In terms of growth, a similar result was found by Stam and Wennberg (2009), Demirel and Mazzucato (2012) and Demirgüneş and Üçler (2016). It should be noted that the petroleum and chemistry sector is not a technology-intensive sector like IT (information technology). This result supports the finding that the effect of R&D expenditure on growth is prominent in technology-intensive sectors and less prominent in sectors where the technology is not widely utilized (García-Manjón & Romero-Merino, 2012; Stam & Wennberg, 2009).

It was also determined that marketing expenditure negatively affects company performance and has no significant effect on growth, and this result is also supported by the findings of Hossain and Islam (2019). In the aforementioned study, it was determined that marketing expenditure has a negative effect on company performance.

Finally, it was determined that administrative expenditure has a significant positive effect on both performance and growth. This result, obtained for the performance aspect, supports the findings by Cifci et al. (2010), and results obtained by Ciftçi (2014) for large-scale enterprises.

These findings obtained from the study are important for company executives and policy makers operating in the petroleum and chemistry industry. The results reveal that unnecessary and ineffective R&D and marketing expenditures should be avoided. On the other hand, in terms of management function, it explains that expenditures should be shifted to the areas that will contribute to intellectual capital, and especially towards future prosperity.

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