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# Dividend behavior of industrial companies: Sample selection bias revisited*

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## Abstract

*This paper aims to analyze the dividend decisions of industrial companies whose shares were traded in Borsa Istanbul between 2010 and 2019 with Heckman's two-step approach. In many countries like Turkey, official regulations state that equity companies have to take corporate dividend decisions with a two-stage process (whether or not to pay the dividend and dividend amount). Our study differs from previous studies because this is the first study analyzed the Borsa Istanbul sample with the Heckman model for understanding this two-stage dividend decision and averting potential sample selection bias. Results imply firm features influence the two steps of dividend decisions differently.*

*Key words: dividend policy, limited dependent variable, heckman selection model*

*JEL codes: C34, C45, G35*

## 1. Introduction

As a discipline, corporate finance, which aims at maximizing firm value, is built on three principles that we can call the investment principle, the financing principle, and the dividend principle. Among these three principles, which are in close relationship with each other, the dividend principle states that the cash is returned to the shareholders if the firm does not have enough investment to earn the hurdle rate in its investment portfolio (Damodaran, 2015). Since many firm-specific

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and external factors affect corporate dividend decisions in the real world, the dividend principle alone will not be enough to understand corporate dividend decisions.

In his groundbreaking study of understanding corporate dividend decisions, Lintner (1956) achieved significant results by interviewing face-to-face with 28 company executives in the USA. First, managers set target dividend payout ratios during corporate dividend decisions. Second, managers are reluctant to change the dividend payout ratio. However, they tend to increase the dividend payout ratio if they anticipate an increase in future cash flows and profit expectations. Finally, managers think that investors prefer a regular and steady return.

Miller and Modigliani (1961) showed that under the assumption of frictionless capital markets, the dividend policy of a company does not affect the value of that company, and investors are irrelevant to receiving the dividend and obtaining capital gain. In 'perfect capital markets' where capital gains and dividend returns are taxed at the same rate or are not taxed at all, firms that pay fewer dividends offer their investors more capital gains, or vice versa. In this way, the total return to shareholders does not change. For this reason, investors remain irrelevant to dividend payment and capital gain. According to this model, one could conclude that firm value is determined only by the cash flows of firm assets and the return on investments. The irrelevant theory, advanced under assumptions that are unlikely to be observed in the real world, offers two important implications. First, managers who invest in poor projects should not hope to increase firm value by offering high dividends to their shareholders. However, managers with 'white' investment history are forgiven by their shareholders if they fail to pay the amount they can pay as dividends. It may be a clue to the understanding that investors are more optimistic than other investors about the company's accumulated cash (Damodaran, 2015). Second, if companies pay dividends and the market reacts positively to this (the distribution of profits increases the value of the company in the market), this can only be possible if the model's assumptions are violated. The models or theories developed after Miller and Modigliani (1961) were developed by indirectly or explicitly removing or stretching the assumptions in the Miller and Modigliani (1961) model. (Bostancı, 2017).

In Turkey, the Capital Markets Board of Turkey[1] and the Ministry of Trade[2] has issued two significant regulations defining the framework of the dividend distribution decisions of the equity company. The common point in both regulations is that dividend payment decisions must be taken in the general assembly of the company and if the decision is made in this direction, then the dividend payment

[1] 2014 Communıqué on Dıvıdends (II-19.1), Artıcle 4/1, Artıcle 4/2a.

[2] 2012 Communıqué on Dividend Advance (28379), Artıcle 5/1.

rate is determined. These regulations imply that corporate dividend decisions should be examined in two stages. The first step is to decide whether to pay the dividend or not. And the second step is to determine the amount of the dividend. In this study, we use the Heckman (1979) two-stage selection model, which analyzes these two stages of corporate dividend decisions and allows us to understand the differences between two separate decision processes (whether to pay dividends and the amount of the dividend to be paid). Moreover, in the real world, many firms prefer not to pay the dividends. This model could eliminate the possible sample selection bias problem in our analysis.

There have been studies conducted with a Heckman correction to analyze corporate dividend decisions. Yang et al. (2000) used the Heckman (1979) two-stage selection model in their studies on a sample of 184 non-banking companies traded on the Taiwan Stock Exchange between 1990 and 1998 in order to avoid sample selection bias. By comparing the analysis results with the OLS regression results, they highlighted the differences between the explanatory variables. Kim and Jang (2010), between 1997 and 2006, used the Heckman two-stage model to both eliminate potential sample selection bias and analyze the two-stage nature of corporate dividend decisions in their study of the hospitality company sample in the USA. As a result of the analysis, they found that Heckman correction was not required and stated that there was no significant difference between the explanatory variables when compared with the results of OLS regression analysis. Bradford et al. (2013) analyzed how state-controlling ownership and the ownership through corporate pyramid structures affect dividend policies in their studies on a sample of 12630 companies listed on Chinese stock exchanges from 1999 to 2010. This analysis performed under two assumptions; 1) Tobit regression analysis should be applied to data that censored at zero if corporate dividend decisions should be taken with a one-stage process, 2) the Heckman (1979) two-stage model should be applied to data if corporate dividend decisions should be taken with a two-stage process. In the studies mentioned before, we observe that the Heckman model has been used to avoid the sample selection bias.

In this study, we analyse the corporate dividend decisions of industrial companies listed on Borsa Istanbul between 2010 and 2019. Previous studies can be classified in two groups; in the first group, companies that pay the dividend regularly have been taken into the research sample; Nur (2016), Gholenji (2015), Arsoy and Güreşen (2016), Arsoy (2015), Topaloğlu and Korkmaz (2019), Kendirci (2020), Ersoy and Çetenak (2015), Erdaş (2017) and in the second one there has not been such a distinction; Yıldız et al. (2014), Çelik et al. (2016), Güngör (2012), Yıldız (2012), Kuzucu (2015), Bostancı (2017), Demirgüneş (2015), Al-Najjar and Kılınçarslan (2016). We think that it is a sample selection bias in the first group studies. The underlying intuition for this idea is simple; there are no firms that pay

regular dividends in the real world. Different techniques (OLS regression, Tobit Model, panel data et al) were used in the studies of the second group, and the requirement of a Heckman correction was not considered. Our study differs from previous studies that analyzed the Borsa Istanbul sample because we questioned whether a Heckman correction was needed. In addition, we use a model suitable for corporate dividend decisions, which are required to be made with two-stages process in Turkey. To the best of our knowledge, the Heckman's two-stage model has not been used in the previous studies conducted with the Borsa Istanbul sample. We think that contribution made here has wide applicability.

Our paper proceeds as follows. Section 2 explain the Heckman (1979) two-stages model. The sapmle, data and variables are discussed in Section 3. Section 4 presents the results and we run some additional tests to show our results are robustness. In the last section, we conclude the study.

## 2. Heckman's two-step approach

There are two reasons for using the Heckman two-stage model in our study. First, in the real world, firms may not return cash to their shareholders. Considering that the dividend paid per share cannot have a negative value, most of the observations will be piled (i.e., censored) exactly at zero. Least Squares prediction is generally biased as the dependent variable is limited, so it is recommended to use the Tobit model or the Heckman's (1979) two-stage model to find a solution to this problem (Üçdoğruk et al., 2001). The Tobit model is designed to estimate linear relationships between variables when there is censoring in the dependent variable and if the research problem involves a single-stage process, the use of Tobit is appropriate (Bradford et al., 2013). However, it cannot clarify the two-stage nature of corporate dividend decisions. The second reason we chose the Heckman (1979) selection model is the two-step nature of corporate dividend decisions, as emphasized previously. It allows us to analyze separately whether to pay dividends and how much for each explanatory variable.

The stages of the two-step selection method proposed by Heckman (1979) are as follows (Es, 2014):

In the first stage of Heckman's two-step approach, the selection model is estimated to determine the sample selection bias and the statistical accuracy of the model showing the selection bias. At this stage, the probit regression model is used:

$$yi^* = X_i + \beta_i + \varepsilon_i \ (i = 1,2,3 \ldots . I) \tag{1}$$

$$yi = 1 \ if \ yi^* > 0, \tag{2}$$

$$yi = 0 \; if \; yi^* < 0, \tag{3}$$

where Xi is the vector of explanatory variables for the selection equation, βi is the vector of coefficient parameters for the selection equation and εi is the vector of disturbance terms, i is coefficient indexing observations. yi* is an unobserved latent variable that is continuous and reflects a firm's desire to pay dividends. yi* is the dummy variable of the selection equation. It takes on a value of one if a company pay out dividends or else zero. The probit model, the first step of this process, forecasts how the possible factors of dividends influence the first-step in dividend decision-making (i.e., whether to pay out dividends).

According to the Heckman (1979) method, the inverse Mill's ratio (λ), a correction factor, is found using the results obtained from the probit regression model. And in the second step, the estimated inverse Mill's ratio λ (IMR) is included in the model as a separate explanatory variable to eliminate the biased estimation of the observations. The probit regression model is estimated for each observation. The obtained standard normal cumulative distribution function (Φ) and the standard normal probability distribution functions (ϕ) are used to calculate the Inverse Mill's Ratio (IMR), namely λ value:

$$\lambda = \frac{\phi\,(Xi\beta i)}{\Phi\,(Xi\beta i)} \tag{4}$$

A statistically significant λ value indicates that the selection bias is an important problem, where λ is insignificant the selection bias is not seen in the result, and the least-squares method estimators can be used. The second step in this model corrects any potential sample selection bias while estimating how the explanatory variables influence the quantity of dividends.

## 3. Methodology

### *3.1. Sample, data and variables*

Analyzes on ISE listed firms have both advantages and downsides. The advantage is the financial data of these companies are easily accessible through the Public Disclosure Platform. Also, since these companies are subject to the audit and regulations of the Capital Market Board, their financial data disclosed to the public are relatively more reliable. The downside is that few companies can be included in the sample. According to the Capital Market Board, the number of publicly-traded companies in Turkey is 509 and the number of companies whose shares traded on the stock exchanges is only 398 by September 2020. Financial institutions whose

corporate dividend decisions are subject to different regulatory provisions from other companies. Therefore, financial institutions were excluded from the sample. Other than financial institutions, industrial companies that can be worked with a larger data set are included in the sample. Therefore, our sample includes industrial companies whose stocks were traded on Borsa Istanbul continuously between 2010 and 2019. Since there were some restrictions on dividend payments of equity companies until 31.12.2020 in Turkey, we restricted the research period to 2012-2019. Table 1 shows the firms included in the sample.

**Table 1**
Sample firms

| | | | | |
|---|---|---|---|---|
| ADEL | BRISA | EGGUB | KRTEK | PINSU |
| AFYON | BURCE | EGPRO | KARTN | PNSUT |
| AKCNS | BURVA | EGSER | KENT | SARKY |
| ATEKS | BUCIM | EPLAS | KERVT | SASA |
| AKSA | CCOLA | EMKEL | KLMSN | SILVR |
| ALCAR | CELHA | EMNIS | KNFRT | SODA |
| ALKA | CEMTS | ERBOS | KONYA | SKTAS |
| ALKIM | CMENT | EREGL | KORDS | SNPAM |
| ANACM | CIMSA | ERSU | KRSTL | TATGD |
| AEFES | DARDL | FMIZP | KUTPO | TOASO |
| ASUZU | DMSAS | FROTO | LUKSK | TRKCM |
| ARCLK | DENCM | FRIGO | MAKTK | TUKAS |
| ARSAN | DERIM | GENTS | MRSHL | TUPRS |
| AYGAZ | DESA | GEREL | MNDRS | PRKAB |
| BAGFS | DEVA | GOODY | MERKO | TTRAK |
| BAKAB | DITAS | GOLTS | TIRE | TBORG |
| BANVT | DOBUR | GUBRF | NUHCM | USAK |
| BTCIM | DGKLB | HEKTS | OLMIP | ULKER |
| BSOKE | DOGUB | HURGZ | OTKAR | VESBE |
| BRMEN | DOKTA | IHEVA | PARSN | VESTL |
| BRSAN | DURDO | IZMDC | PENGD | VKING |
| BFREN | DYOBY | KAPLM | PETKM | YATAS |
| BOSSA | EGEEN | KARSN | PETUN | YUNSA |

*Note*: Each company listed in Borsa Istanbul has its code. To find out which company the codes listed in Table 1 belong to https://www.kap.org.tr/tr/bist-sirketler.

The financial data of the companies that we included sample were obtained from Finnet Electronic Publishing Data Communication Trade and Industry Limited Company. The data used in this study were analyzed in R. The dependent and independent variables preferred in this study are shown in Table 2.

**Table 2**
Variables and Measurements

| Dependent Variables | Notation | Description |
|---|---|---|
| Cash Dividend Per Share | $DPS_{t+1}$ | $\frac{\text{Cash Dividend}}{\text{Paid-in Capital}}$ |
| Dividend Payment | DP | 1 if a firm-year figures' DP > 0,<br>0 if a firm-year figures' DP = 0. |
| **Independent Variables** | **Notation** | **Description** |
| Liquidity:<br>Quick Ratio | QR | Current Assets-(Inventories+Prepaid Expenses for Next Months + Other Current Assets)/Short Term Liabilities |
| Debt:<br>Leverage Ratio | LR | (Short Term Liabilities + Long Term Liabilities)/ Total Assets |
| Short Term Bank Loans | BL | (Short Term Bank Loans + Principal Installments and Interests of Long Term Loans) / Short Term Liabilities |
| Effectiveness: | AT | Net Sales / Total Assets |
| Profitability:<br>Operating Profitably | OP | (Profit Before Tax + Financing Expenses)/ Total Liabilities and Equity |
| Cost of Sales | CS | Cost of Sales / Net Sales |
| Investment Opportunities:<br>Market to Book Value Ratio | MBV | Market Value of Firm / Book Value of Equity |

## 4. Results

Table 3 shows the descriptive statistics of the dependent and independent variables in this study. It can be said that the number of companies paying dividends increased until 2015 and gradually decreased after this date. During the research period, it is observed that firms paid an average of 0,57 TL cash dividends to their

shareholders. When we ignored stocks and other current assets, it is seen that companies could have easily afforded their short-term liabilities. Turkey has a bank-oriented financial system. Therefore, attention must be paid to the debt level of companies, especially their short-term financial liabilities. The companies that we included in the sample have worked with an average of % 55 leverage. The ratio of bank loans within short-term liabilities is % 25 on average. Firms made net sales by around % 95 of their assets in this period. When we exclude financial expenses, the firms made a profit of around % 20 of their total assets. % 78 of its net sales consisted of the cost of sales.

**Table 3**
Descriptive Statistics

| | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** |
|---|---|---|---|---|---|---|---|---|---|---|
| **DP** | | | | | | | | | | |
| **Frequency of 1** | 50 | 57 | 58 | 53 | 55 | 61 | 59 | 57 | 53 | 51 |
| **Frequency of 0** | 65 | 58 | 57 | 62 | 60 | 54 | 56 | 58 | 62 | 64 |
| **Total Frequency** | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 |

| **Variable** | N | Minimum | Maximum | Mean | Std.Deviation |
|---|---|---|---|---|---|
| **$DPS_{t+1}$** | 1150 | 0 | 49,49 | 0,5756 | 2,29065 |
| **QR** | 1150 | 0,07 | 16,67 | 1,457 | 1,45617 |
| **LR** | 1150 | 0,03 | 8,67 | 0,5483 | 0,50144 |
| **BL** | 1150 | 0 | 0,97 | 0,2515 | 0,23947 |
| **AT** | 1150 | 0,03 | 4,38 | 0,9433 | 0,47497 |
| **OP** | 1150 | -8,54 | 4,44 | 0,2092 | 0,44826 |
| **CS** | 1150 | 0,43 | 1,09 | 0,787 | 0,10851 |
| **MBV** | 1150 | -39,31 | 74,6 | 2,0021 | 4,37155 |

*Note*: DPSt+1 represents the quantity of dividends in t+1 period; DP (1 if a company pay out dividends and 0 or else) represents the dividend payment; QR (quick ratio) represents liquidty; LR (leverage ratio) and BL (short term bank loans) represents debt; AT (assets turnover ratio) represents effectiveness; OP (operating profitably) represents profitability; CS represents cost of sales; MBV (market to book value ratio) represents investment opportunities.

One of the basic assumptions of multivariate statistical techniques is that there is no multicollinearity between explanatory variables. To understand whether this assumption is valid, the correlation coefficients between the variables are checked. Table 4 shows the Pearson correlation coefficients for the variables. QR is negatively related to leverage variables (LR-BL) and CS, consistent with our expectations. It is also seen that the correlation coefficients between the variables are low. It appears that the maximum correlation is between the LR variable and the QR variable (-0.3351).

**Table 4**
Correlation Matrix

| Variables | QR | LR | BL | AT | OP | CS | MBV |
|---|---|---|---|---|---|---|---|
| QR | 1 | | | | | | |
| LR | -0.3351 | 1 | | | | | |
| BL | -0.2563 | 0.0971 | 1 | | | | |
| AT | -0.072 | 0.251 | -0.0313 | 1 | | | |
| OP | 0.04 | -0.0809 | -0.0189 | 0.1008 | 1 | | |
| CS | -0.0581 | -0.069 | 0.1134 | 0.1408 | -0.1429 | 1 | |
| MBV | 0.0461 | -0.0135 | -0.0336 | 0.0344 | 0.2887 | -0.008 | 1 |

*Note*: QR (quick ratio) represents liquidty; LR (leverage ratio) and BL (short term bank loans) represents debt; AT (assets turnover ratio) represents effectiveness; OP (operating profitably) represents profitability; CS represents cost of sales; MBV (market to book value ratio) represents investment opportunities.

In this study, it is used the time series data. In empirical studies with time series, the data are assumed to be "stationary". However, most of the time series is not stationary. For the relationships between the variables to be meaningful, the time series we use must be stationary. Otherwise, although there are no significant relationships between the two variables, it could appear as if there is a relationship between them (a high $R^2$ value), which is called the "spurious regression". The reason for this situation is that both time series have a strong 'trend'. Augmented Dickey-Fuller (ADF) test is frequently used in the literature. Therefore, we run the ADF test to check the stationarity assumption. The hypotheses of ADF test are established as follows:

$H_0$: There is a unit root in the series.

$H_1$: There is no unit root in the series.

The absolute value of the ADF test statistic is compared with the absolute values of the critical values at % 1, % 5, and % 10 significance levels.

$H_0$ is rejected, if |t-Statistic| > |Critical Values|

$H_0$ is accepted, if |t-Statistic| < |Critical Values|

Table 5 presents ADF test results. According to the ADF test results, the $H_0$ hypothesis is rejected because it is |t-Statistic| > |Critical Values| at % 1, % 5, and % 10 significance levels.

**Table 5**
Results of The Unit Root Test

| | t-Statistics | Prob. | | t-Statistics | Prob. |
|---|---|---|---|---|---|
| $DPS_{t+1}$ | -24.4171 | 0.000 | QR | -23.1308 | 0.000 |
| 1% | -3.43 | | 1% | -3.43 | |
| 5% | -2.86 | | 5% | -2.86 | |
| 10% | -2.57 | | 10% | -2.57 | |
| | t-Statistics | Prob. | | t-Statistics | Prob. |
| AT | -27.0859 | 0.000 | OP | -21.4529 | 0.000 |
| 1% | -3.43 | | 1% | -3.43 | |
| 5% | -2.86 | | 5% | -2.86 | |
| 10% | -2.57 | | 10% | -2.57 | |
| | t-Statistics | Prob. | | t-Statistics | Prob. |
| LR | -24.9849 | 0.000 | BL | -22.5483 | 0.000 |
| 0.01 | -3.43 | | 1% | -3.43 | |
| 0.05 | -2.86 | | 5% | -2.86 | |
| 10% | -2.57 | | 10% | -2.57 | |
| | t-Statistics | Prob. | | t-Statistics | Prob. |
| CS | -23.127 | 0.000 | MBV | -24.6905 | 0.000 |
| 1% | -3.43 | | 1% | -3.43 | |
| 5% | -2.86 | | 5% | -2.86 | |
| 10% | -2.57 | | 10% | -2.57 | |

*Note:* DPSt+1 represents the quantity of dividends in t+1 period; QR (quick ratio) represents liquidty; LR (leverage ratio) and BL (short term bank loans) represents debt; AT (assets turnover ratio) represents effectiveness; OP (operating profitably) represents profitability; CS represents cost of sales; MBV (market to book value ratio) represents investment opportunities.

*4.1. Heckman two-stage model*

Probit analysis was first performed in the Heckman two-stage model. In Probit analysis, factors affecting the probability of dividend payment of companies included in the sample were estimated. Therefore, the dependent variable of the Probit model (DP) was included in the model as 1 (if the firm paid dividends) and as 0 (if the firm didn't pay dividends). In the second stage of the Heckman model as the dependent variable (the amount of the dividend paid) and as the target variable of artificial neural networks, cash dividend paid per share figures in the t + 1 period was used. As determining the dependent variable, stock dividend and buyback were neglected. In this study, were focused on cash dividend data paid to shareholders only.

The probit test estimates the effects of company features on the decision to pay dividends (i.e the odds of paying out dividends). The probit model created for this purpose is as follows:

$$* \mathrm{DPi,t+1} = \vartheta + \theta 1 \mathrm{QRi,t} + \theta 2 \mathrm{LR\,i,t} + \theta 3 \mathrm{AT\,i,t} + \theta 4 \mathrm{OP\,i,t} + \theta 5 \mathrm{MBV\,i,t} + \varepsilon \mathrm{i,t} \quad (5)$$

$$\mathrm{DPi,t+1} = 1, \mathrm{if} * \mathrm{DPi,t+1} > 0 \quad (6)$$

$$0, \mathrm{if}\ {}^{*}\mathrm{DP}_{i,t+1} \leq 0 \quad (7)$$

where $DP_{i,t+1}$ is the probability of the i firm paying cash dividends in the t + 1 period. QR is the quick ratio as a 'liquidity' indicator, LR is the leverage ratio as an indicator of 'debt', AT is the assets turnover ratio as an indicator of 'effectiveness', OP is the operating profitably as an indicator of 'profitability' and MBV is the market to book value ratio as an indicator of 'investment opportunities' in t period. Hypotheses for the explanatory variables used in the model are as follows:

$H_{1a}$ = The payment probability of dividends is positively related to liquidity.

$H_{2a}$ = The payment probability of dividends is negatively related to debt.

$H_{3a}$ = The payment probability of dividends is positively related to effectiveness.

$H_{4a}$ = The payment probability of dividends is positively related to profitability.

$H_{5a}$ = The payment probability of dividends is negatively related to investment opportunities.

**Table 6**
Results of The Probit Analysis.

| Variables | Coefficient | Std. Error | Prob. |
|---|---|---|---|
| QR | 0.02367 | 0.03777 | 0.5308 |
| LR | -2.56124*** | 0.26117 | 0.0000 |
| AT | 0.60593*** | 0.09716 | 0.0000 |
| OP | 1.29771*** | 0.19179 | 0.0000 |
| MBV | -0.05794*** | 0.01703 | 0.0000 |
| Constant | 0.44621** | 0.17465 | 0.0106 |
| Wald Chi-square (5)*** | 37.83*** | | 0.0000 |
| Log likelihood | -659.484 | | |
| p-Value | | | 0.0000 |

*Notes:* QR (quick ratio) represents liquidty; LR (leverage ratio) represents debt; AT (assets turnover ratio) represents effectiveness; OP (operating profitably) indicates profitability; MBV (market to book value ratio) indicates investment opportunities.

* p<0,10

** p<0,05

*** p<0,01

Table 6 shows the results of first-stage probit regression estimation. The Probit model is significant at the % 1 significance level. Except for QR, other independent variables have a statistically significant effect on probability of the dividend payment. We measure the QR by subtracting inventories from current assets. Inventories are an important factor in the balance sheet of manufacturing companies. As hypothesis $H_{3a}$, $H_{4a}$ predict, effectiveness, and profitability of a company are positively and significantly interrelated to the dividend payment. In other words, industrial companies with higher effectiveness, and profitability are more likely to pay cash dividends to their shareholders. The test results are consistent with the results of Bradford et al. (2013), Çelik et al. (2016), and Al-Najjar and Kılınçarslan (2016). Moreover, as hypothesis $H_{2a}$, and $H_{5a}$ predict, debt and investment opportunities of a firm are negatively and significantly interrelated to the dividend payment. Namely, industrial companies with less debt and investment opportunities are more likely to pay cash dividends to their shareholders. The test results are consistent with the results of Al-Najjar and Kılınçarslan (2016). However, Kim and Jong (2010) found a statistically positive and significant relationship between investment opportunities and payment of dividends.

In the second stage, the amount of dividend paid will be analyzed by the Heckman selection model. The model is shown by the equation (8):

$$DPSi,t+1 = \gamma + \delta 1QRi,t + \delta 2BLi,t + \delta 3ATi,t + \delta 4OPi,t + \delta 5CSi,t + \varepsilon i,t \quad (8)$$

where $DPS_{i,t+1}$ is the amount of cash dividend paid by the i firm per share in the t + 1 period, Respectively, QR, BL, AT, OP and CS represent the quick ratio as 'liquidity' indicator, the short term bank loans as an indicator of 'debt', the assets turnover ratio as an indicator of 'effectiveness', the operating profitably as an indicator of 'profitability' and the cost of sales. Hypotheses for the explanatory variables used in the model are as follows:

$H_{1b}$= The amount of dividends is positively related to liquidity.

$H_{2b}$= The amount of dividends is negatively related to debt.

$H_{3b}$= The amount of dividends is positively related to effectiveness.

$H_{4b}$= The amount of dividends is positively related to profitability.

$H_{5b}$= The amount of dividends is negatively related to the cost of sales.

**Table 7**

Results of the truncated regression

| Variables | Coefficient | Std. Error | Prob. |
|---|---|---|---|
| QR | 0.1177 | 0.1018 | 0.2481 |
| BL | -2.2491*** | 0.6009 | 0.0002 |
| AT | 0.3216 | 0.3768 | 0.3936 |
| OP | 2.3837*** | 0.7062 | 0.0007 |
| CS | -3.0226 ** | 1.4731 | 0.0406 |
| Constant | 3.3523*** | 1.2540 | 0.0077 |
| IMR (λ) | -0.7718 | 0.5479 | 0.1595 |
| N | 1150 | | |
| Censored Obs | 596 | | |
| Uncensored Obs | 554 | | |
| p-Value | | | 0.0000 |
| Adjusted $R^2$ | 0.07764 | | |

*Notes:* QR (quick ratio) represents liquidty; BL (short term bank loans) represents debt; AT (assets turnover ratio) represents effectiveness; OP (operating profitably) represents profitability; CS represents cost of sales.

* p<0,10

** p<0,05

*** p<0,01

Table 7 indicates the results of the second-stage regression analysis. p-value indicates that the model is significant at the % 1 significance level. As mentioned earlier, IMR is a correction factor obtained from the probit regression model. In the second step, IMR is added to the model as a separate explanatory variable to eliminate the biased estimation of the observations. A statistically significant IMR indicates that the selection bias is an important problem, where IMR is insignificant the selection bias is not seen in the result, and the OLS regression method can be used. Tablo 7 presents that the p-value of IMR is not significant at 1%, 5%, and 10% significance levels, which means that there is no serious sample selection bias in the estimation.

According to the results of the model, the quantity of dividends is positively interrelated to the operating profitably. Therefore, $H_{4b}$ hypothesis is accepted. The results are consistent with the results of Yıldız et al. (2014), Yıldız (2012), Ersoy and Çetenek (2015), and Demirgüneş (2015). Moreover, Topaloğlu and Korkmaz (2019) found the quick ratio statistically positive but insignificant. While the AT variable increases the probability of paying dividends, we cannot associate it with the dividend amount. Also, the amount of dividends is negatively related to the short term bank loans and the cost of sales. Thus, $H_{2b}$, $H_{5b}$, hypotheses are accepted. Kendirci (2020) used the ratio of financial liabilities to total liabilities as an indicator of debt and found a statistically negative but insignificant relationship between the amount of dividend and debt.

### *4.2. Alternative estimation techniques*

To confirm the robustness of our results, we re-estimate our results with two different estimation techniques. In truncated regression analsis, we find an insignificant IMR value. If IMR is not significant, OLS regression results remain similar that of truncated regression. In addition, Tobit model is also recommended to limited dependent variables analysis. Therefore, we run tobit model and OLS regression in this study. Our robustness tests results are shown in Table 8. The regression results show low statistical significance for the main variables in several instances; however, results generally conform to those submitted earlier.

**Table 8**
Results of the robustness tests

| | Tobit Model | | | | OLS Regression | | |
|---|---|---|---|---|---|---|---|
| Variables | Coefficient | Std. Error | Prob. | Variables | Coefficient | Std. Error | Prob. |
| QR | 0.5508*** | 0.07824 | 0.0000 | QR | 0.2263*** | 0.04691 | 0.0000 |
| BL | -1.6151*** | 0.51691 | 0.0000 | BL | -0.9165*** | 0.28609 | 0.0013 |
| AT | 1.1945*** | 0.25267 | 0.0017 | AT | 0.4734*** | 0.14156 | 0.0000 |
| OP | 2.0042*** | 0.36779 | 0.0000 | OP | 0.3372** | 0.14945 | 0.0242 |
| CS | -3.7923*** | 1.13349 | 0.0000 | CS | -1.3947** | 0.62437 | 0.0256 |
| Constant | -0.20069 | 0.89642 | 0.82285 | Constant | 1.0568** | 0.50515 | 0.0366 |
| N | 1150 | | | N | 1150 | | |
| Left-censored | 596 | | | Adjusted R2 | 0.05399 | | |
| Uncensored | 554 | | | p-Value | | | 0.000 |
| Log likelihood | -1758.299 | | | | | | |
| AIC | 3530.598 | | | | | | |

*Notes*: QR (quick ratio) represents liquidty; BL (short term bank loans) represents debt; AT (assets turnover ratio) represents effectiveness; OP (operating profitably) represents profitability; CS represents cost of sales.
* p<0,10
** p<0,05
*** p<0,01

## 5. Conclusion

This study aims to examine the dividend behavior of industrial companies listed on Borsa Istanbul between 2010 and 2019 and to estimate the amount of dividend paid. It is observed that % 48 of the companies included in the sample returned cash to their shareholders. Since other companies do not return cash to their shareholders (missing values) and the two-stage nature of corporate dividend decisions (whether dividends are paid, the amount of dividends), the Heckman selection model is considered to be the appropriate testing technique for this analysis. In the two-stage selection model, it has been observed that the liquidity variable has a statistically insignificant and positive relationship with both the probability of payment and the amount of dividend. A statistically negative and significant relationship was found between the leverage ratio of firms and the probability of paying dividends. Besides, a statistically negative and significant relationship was found between short-term bank loans and the amount of dividend. A dollar that the firm pays its shareholders means a dollar that is not available to its creditors. For this reason, creditors could impose special provisions in debt contracts that limit the payments of dividends to firms (Black, 1976). For industrial

companies, firms with lower leverage are more likely to return cash to their shareholders. Also, companies with one unit less debt to financial institutions within their short-term liabilities paid 2.2491 unit more cash dividends per share. A statistically positive and significant relationship was found between the effective use of assets of firms and the probability of paying dividends. However, there is a statistically positive but insignificant relationship between effectiveness and the dividend amount. We interpret this result as the sales revenue alone could not be sufficient to determine the dividend amount.

Under simplified assumptions, more profitable firms can be considered to have lower financial distress costs and higher cash flows. If this proposition is valid, a positive relationship must be expected between the profit and the probability of paying dividends and the amount of dividend. In the pecking order theory modeled based on asymmetric information, it is stated that the primary preferred source for financing investments is retained earnings. The next choice is debt and the last preferred source is equity. It must be emphasized that this ranking can change with the information asymmetry in the market. Assuming that the more profitable firms have more retained earnings, they will not need to engage in costly transactions such as borrowing to return cash dividends to their shareholders (Myers, 1984). The interest rate to be paid in loan contracts varies according to the credit rating of each company. A firm that provides a relatively low-cost resource could appear more profitable than firms that have access to external resources with higher costs. In reality, the less profitable firm may have used its resources more efficiently (Akgüç, 2017). A unit increase in the profit rate of the industrial company increases the amount of cash to be returned to shareholders by 2.3837 units. Industrial (manufacturing) companies have stocks of raw materials, semi-finished products, and finished goods, which are generally at high levels. Therefore, the cost of sales is the main expenditure for these companies.

Businesses that can manage their costs related to their main areas of activity are expected to return higher cash to their shareholders. Test results also confirm this. A unit increase in the cost of sales reduced the cash dividend paid per share by 3.0226 units. In empirical tests Gholenji (2015) and Kuzucu (2015), a negative relationship was seen between the ratio of market value to book value, which is used as an indicator of investment opportunities, and the probability of cash dividend payment per share. There is a statistically significant and negative relationship between the probability of manufacturing industrial companies returning cash to their shareholders and investment opportunities. This result also coincides with the finding that firms with higher growth and investment tend to pay lower amounts of dividends (Fama and French, 2001).

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# Özet

## Sanayi şirketlerinin temettü davranışı: Örneklem seçim yanlılığının yeniden incelenmesi

Bu çalışma, 2010-2019 yılları arasında Borsa İstanbul'da işlem gören sanayi şirketlerinin temettü kararlarını Heckman'ın iki aşamalı yaklaşımıyla incelemeyi amaçlamaktadır. Türkiye gibi birçok ülkede, resmi düzenlemeler, sermaye şirketlerinin kurumsal temettü kararlarını iki aşamalı bir süreçle (temettü dağıtma kararı ve ödenecek temettü tutarını belirleme) alması gerektiğini belirtmektedir. Çalışmamız, bu iki aşamalı temettü kararını anlamak ve olası örneklem seçim yanlılığını ortadan kaldırmak için Borsa İstanbul örneklemini Heckman modeli ile analiz eden ilk çalışma olması nedeniyle önceki çalışmalardan farklılık göstermektedir. Sonuçlar, firma özelliklerinin temettü kararlarının iki adımını farklı şekilde etkilediğini göstermektedir.

*Anahtar kelimeler*: Temettü politikası, sınırlı bağımlı değişken, heckman seçim modeli

*JEL kodları*: C34, C45, G35