Are We Taking Grants for Granted?

An Empirical Study on the Impact of Government Grants on Firm Performance.

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Abstract

Government grants from Innovation Norway do not help firms in terms of better performance, in fact, the results of this study suggest the opposite. Previous literature has found that government grants have a positive impact on some firm performance metrics. However, there has been inadequate research on the topic, and more distinctly, in a Norwegian context. This paper aims to investigate the relationship between firm performance and government grants. In particular, we ask the following research question: *"What is the impact of government grants on firm performance?"*. In this context, our study accounts for both the treatment and untreated group of those who seek government grants. We examine whether grants are positively linked to performance, as measured by return on assets, return on sales, total debt to asset ratio and total labor productivity. In addition, we investigate whether entrepreneur characteristics such as gender and age impact the performance metrics. Further, firm characteristics, such as industry of operation and firm age, are added as control variables to strengthen the results.

We use multiple regression analysis to examine the relationship between performance and grants. The empirical study is based on five-year financial accounting data from 1,449 firms seeking government grants in 2016. Our study also controls for potential explanatory variables introduced by literature. The results indicate no significant relationship between grants and performance. We also controlled for firm and entrepreneur characteristics, but we found no evidence that government grants significantly impact firm performance.

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This thesis completes the final part of our Master of Science at "Shift Entrepreneurship and Economics - Siviløkonom", where we have had the pleasure of being challenged in both our academic and entrepreneurial journey. Together with three other students, we have received four government grants, wherof three were from Innovation Norway. However, we are not alone - more than NOK 18 billion of Norwegian taxpayers money has been granted to a wide range of new firms from 2016 to 2020 from Innovation Norway ("Hvem har fått tilbud om finansiering fra oss?", 2021).

This sparked an interest in further understanding how firms that receive grants are impacted by it, and how well they perform. We previously wrote a paper with a qualitative approach on how government grants from Innovation Norway affect innovation performance, which led us to wanting to further explore the topic of government grants from a quantitative perspective. Resulting in the topic of this thesis, which is to understand what impact government grants have on the performance of new startup firms.

We would first like to thank our thesis supervisor, Stine Øyna, Associate Professor at the Department of Entrepreneurship and Innovation at UiA School of Business And Law. Since data for this thesis was challenging to obtain, our most considerable and time-consuming challenge was to collect, clean and process all the data we needed. Thanks to Innovation Norway for providing and sharing the necessary data that made this study possible. Furthermore, we would like to thank Tobias Otterbring for his help and advice regarding statistical analysis. Lastly, we would like to thank UiA School of Business And Law for two years of insightful studies with exceptional co-students and professors.

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1 Introduction

The need for entrepreneurs to build financially successful companies is critical for economic growth, and the government has therefore designed policies to support entrepreneurial activities (Bradley & Klein, 2016; Lerner, 1999; Kirzner, 1997). One policy designed to support innovative entrepreneurial activity is public sponsorship in the form of grants. Lerner (1999) argues that policymakers intervene in the process with public grants policies, in part to help private investors distinguish different business models and make the right investment decisions. New ventures use public grants to kickstart technology, commercialization and expand their operations. Government selection of which private companies are most likely to succeed may, in some cases, result in inefficient use of public resources (Jacob & Lefgren, 2011) and the crowding out of viable alternatives (David, Hall & Toole, 2000). A problem that may arise is the difficulty of measuring the effectiveness of these interventions due to spillover effects (Bai, Bernstein, Dev & Lerner, 2021). Moreover, there is a risk that public funding can incentivize unintended behavior such as rent-seeking, whereby firms become skilled in securing grants as opposed to creating real market value (Gustafsson, Tingvall & Halvarsson, 2016)

There has been considerable expenditure by governments each year via grant money. Still, while some researchers have begun to explore the effects of public grants on performance, research in this area remains relatively scarce, especially in terms of their performance (Jourdan & Kivleniece, 2017). Additionally, there is little knowledge about how entrepreneur and firm characteristics impact performance in government supported firms. Questions still remain as to whether public sponsorship is effective at creating financial growth (Bradley, Kim, Klein, McMullen & Wennberg, 2021). As a result, scholars have called for research on the nuances and boundary conditions of public policy interventions in entrepreneurship (Bradley & Klein, 2016; Holmes, Zahra, Hoskisson, DeGhetto & Sutton, 2016). In particular, researchers have sought to offer precise estimations of the effects of various policies and their magnitudes using unique data sources (Bradley et al., 2021).

The objective of this research is to investigate the relationship between those who received public grants and the performance of firms. Additionally the thesis aims to investigate the relationship between entrepreneurial and firm-level characteristics impact on firm performance among grant-seeking firms. Drawing from the preceding introduction, the thesis attempts to answer the following research question:

> **RQ:** *What is the impact of government grants on firm performance?*

Our preceding method to answer the research question is to use quantitative analysis. To elaborate on the aspect, multiple linear regression models are utilized. This thesis focuses on Norwegian startup companies that match the government policy requirements from Innovation Norway, while accounting for the performance in the treatment and untreated group for those seeking public grants. This paper tackles the effectiveness of various policy designs by measuring the performance of entrepreneurial firms after receiving public grants. The context for this paper is Innovation Norway, which is a Norwegian institution developing policies for newly founded firms with the aim of increasing innovation and wealth of the economy. Our data includes financial accounting information from 1,449 Norwegian firms in the period from 2016 to 2020. Firm performance is measured as return on assets (ROA), return on sales (ROS), total debt to assets (TDA) and total labor productivity (TLP).

The results of this study are of interest to government institutions and newly founded firms, and may work as a guideline to further understand whether public grants are beneficial for societal and economic growth. Our results indicate that grant programs have no significant effect on firm performance among new venture firms in Norway. Hence, recipient firms might not utilize public money in accordance with the objectives of policy makers.

2 Theoretical Framework And Existing Literature

The literature concerning publicly supported firms consists of considerable variation in the estimated impact of grants. The literature reflects differences in circumstances between regions, countries, sectors and firms, not to mention differences in the design and delivery of policy, the data quality and the method for analysis utilized in the studies (Brandsma, Kancs & Ciaian, 2013). New and young firms in particular, have an abundance of options, such as deciding their growth strategies, market-entry and the introduction of new products and services, which can ultimately lead to external factors that can cause entrepreneurship to be inefficient (Boadway & Tremblay, 2003).

2.1 Capital Structure and Resource-Based View

2.1.1 Capital Structure

This chapter examines how capital structure works in a startup environment and why funding is important for performance, and thereby understanding which capital sources are available to young firms. Schumpeter (1934, p. 116) defined capital as "[...] nothing but the lever by which the entrepreneur subjects to this control the concrete goods which he needs, nothing but a means of diverting the factors of production to new uses, or of dictating a new direction to production". The lack of capital is considerably relevant in young firms, and is often a consequence of asymmetric information problems (Serrasqueiro & Caetano, 2014). Thereby, the understanding of the determinants of capital structure is important to allow the application of correct measures to encourage the availability of capital to firms, consequently stimulating the growth and development of these firms. A common issue concerning young firms is the lack of capital, according to Myers and Majlu (1984) the lack of capital is often due to asymmetric information problems. The allocated capital will thereby help stimulate the growth and development of the given companies. Hence, capital structure is said to be directly related with the financing decision of the company (Obim, Anake & Awara, 2014).

The theory of the capital structure was presented by Modigliani and Miller (1958). The Modigliani-Miller theorem (MM) states that a company's capital structure is not a factor in its value. Several theories on capital structure exist, such as the trade-off theory, the market timing theory and the pecking order theory. The pecking order theory predicts that firms rank financing sources in the order of internal financing, debt, and equity and can be described as information asymmetry (Myers, 1984; Myers & Majluf, 1984). According to Myers (1984), firms therefore prefer internal financing to an external one. The trade-off theory believes that firms should reach the level of debt that maximizes the advantages of debt tax-shields and minimizes the possibility of bankruptcy (Kraus & Litzenberger 1973; Kim 1978). In addition to that, it is argued that profitable companies are less likely to be debt dependent than less profitable companies are, and that high-growth companies will have a higher debt ratio (Tian & Zeitun, 2007). There are undoubtedly many benefits of using debt in the capital structure of companies. One central benefit of debt financing is the tax deductions of interest rates, and thereby resulting in a lower cost of capital (Krishnan & Moyer, 1997).

2.1.2 Resource-Based View

Business environment can be perceived through four theoretical frameworks: the strategic adaptation perspective, motivation perspective, configuration perspective and the resource-based perspective (Davidsson & Wiklund 2000). Resource based view (RBV) should be studied when the firm's focus is on its available resources, such as the expansion of business activities, financial resources and core competencies to attain and sustain competitive advantage in the same environment, while it also expounds the performance in firms (Nham & Hoang, 2011). A resource is defined as anything that could be “thought of as a strength or weakness of a given firm” and include both tangible and intangible assets which are tied semi permanently to the firm (Wernerfelt, 1984, p. 172). Wernerfelt (1984) states that the composition of resources in a company at a given time affects the perception of management and affects the growth of the company. These homogenous resources are classified by Grant (1991) and include financial resources, physical resources, human resources, technological resources, and reputational organizational resources.

From the standpoint of firm performance, the primary purpose of RBV is to ensure that companies can capitalize on their competitive advantage as a means of defining expected performance results. Hence, firms can define how performance is defined from several perspectives (Yang & Lirn, 2017). However, this requires firms to work towards ensuring that their competitors can not replicate its resources or competency (Huo, Han & Prajogo, 2016). RBV is an effective tool for firms to use their resources and capabilities to make more profit or add more value to the firm on performance. Conversely, RBV has also received some criticism. On one side, it is argued that RBV makes it difficult for companies to find a resource that would be unique for the company (Manroop, Singh, & Ezzedeen, 2014). On the other side, focusing on internal resources can ignore other important predictors which may have an impact on firm performance (Seshadri, 2013). The theory on RBV is important to this study since it can help explain why some firms outperform others and provides insights into an organization's specific resources.

2.2 The Role of Government Grants

There are several options for financing and fundraising for newly founded firms. Lack of capital is considered the main reason for insignificant entrepreneurial activities in Norway, and is considered important for equity among firms in their early stages (Kolvereid & Isaksen, 2006). Fundraising for firms is often distinguished between internal, external and public financing options. Internal sources of financing are when the company is financed by the initiators or close family and friends (Salamzadeh & Kesim, 2015). Internal financing is considered a common source of financing in the early phase as it gives the owners larger shareholdings and consequently more control over the company (Markova & Petkovska-Mircevska, 2009, p. 599). External financing includes raising capital from outside sources. These can be resourceful individuals, venture funds or bank loans. In contrast to internal sources of financing, private investors in Norway take an equity-ownership in a company and the entrepreneur will have to relinquish some control of the company (Grünfeld, Hanse, Grimsby & Eide, 2010, p. 3). The final source of capital is public grant sources. This includes grants, loans and financing schemes from public organizations. Examples of such organizations are the Research Council, Innovation Norway (IN) or SIVA.

Firms prefer to use different sources of financing depending on where they are in the life cycle, and new startup companies lean towards internal and public funding to keep control (Sørheim, 2006, p. 181). This paper tackles the effectiveness of public grants, hence it is important to define the purpose of a government grant. Norwegian institutions and government are developing policies for young firms with an aim to increase innovation and wealth of the economy. These policies are becoming an important part of the regional entrepreneurial ecosystem and daily life of business owners and entrepreneurs. Governmental grant policies can be defined as "[...] measures taken to stimulate entrepreneurship that are aimed at the prestart, the start-up and post-start-up phases of the entrepreneurial process" (Stevenson & Lundström, 2001, p. 23).

The purpose of IN is to be the state's tool for realizing value-creating business development throughout the country ("Oppdragsgiverrapport fra Innovasjon Norge", 2020). IN was established in 2004 after the completion of a merger between *Statens nærings- and distriktsutviklingsfond (SND)*, *Norges Eksportråd*, *Norges Turistråd* and *Statens veiledningskontor*. IN have a goal of triggering business and socio-economically profitable business development. Moreover, one of their intermediate goals is to trigger more vigorous growth firms (Oxford Research, 2021). There are predominant activities which are crucial to realize further economic growth, such as soft funding and public grants. This thesis focuses on grants with limited general equilibrium effects.

Government grants allow the company to acquire more resources, such as hiring more well-educated and experienced employees, purchasing equipment and increasing their testing (Clausen, 2009). Companies aspiring to expand their knowledge base will profit from additional capital in general, as it will allow them to invest in a more extensive stock of capital resources (Dierickx & Cool, 1989). Government grants have a significant impact on a firm's strategic interactions with other enterprises and market participants, and so can alleviate information asymmetry issues that might otherwise affect decisions (Riley, 2001; Ragozzino & Reuer, 2011).

Grants usually come with an objective "of increasing capital or fixed assets and employment, and the results of the grant can help confirm a positive impact on those two indicators" (Dvouletý, Srhoj & Pantea, 2020, p. 14). Government grants can facilitate companies' capability to procure more resources, such as hiring highly-educated employees, purchasing equipment, and increasing their testing (Clausen, 2009). This lays the foundation of the premise of this paper, which is to further investigate how different predictors affect performance in publicly funded firms from a resource-based perspective as a theoretical framework using quantitative analysis.

2.3 Theoretical Background and Hypothesis Development

2.3.1 Firm Performance

Previous literature has attempted to investigate the relationship between government grants and firm performance. Špička (2018) investigated 550 supported and 550 unsupported firms over a seven year period from 2007 to 2015 in The Czech Republic. The study targeted firms in the food and beverage industry. The study found that there were significant positive effects on fixed assets growth, but insignificant effects on fixed assets to turnover ratio growth. Assets is used to evaluate a company's operating performance in relation to its investments, regardless of whether the investments were financed using other sources such as debt (Stickney, Brown & Wahlen, 2007; Masa'deh, Tayeh, Al-Jarrah & Tarhini, 2015). A firm is considered to be more efficient at exploiting its financial resources if ROA is higher. This led to our first null hypothesis:

> **Hypothesis 1:** *The impact of government grants is positively correlated with return on assets*

Another study in Sweden examined 130 supported and 154 non-supported new firms working on building unique and innovative products and services, where the authors found a positive effect on employment, equity and sales (Söderblom, Samuelsson, Wiklund & Sandberg, 2015). Beņkovskis, Tkačevs and Yashiro. (2018) examined 390 supported and 360 not supported firms. The paper finds positive effects on employment and sales across firms in all sectors. Return on sales is considered to be a good performance indicator, however, criticized for ignoring other important factors such as cash flow (Hennell & Warner, 2001). Nevertheless, ROS is a key type of profit information considered to be important to researchers (Brush & Vanderwerf, 1992). A second null hypothesis was developed:

> **Hypothesis 2:** *The impact of government grants is positively correlated with return on sales*

Consequently, papers written on the topic of small and medium enterprise (SME) financing models in Europe generally agree that subsidized firms can achieve higher growth in output, such as employment and sales growth (Bernini & Pellegrini, 2011; Santos, 2019). However, some studies found that public subsidies had a negative or no effect on turnover and growth in terms of sales (Roper and HewittDundas, 2001; Brachert, Dettmann & Titze, 2018; Špička, 2018). Both labor productivity and total factor productivity (TFP) seem to differ. Santos (2019) concluded that subsidized firms perform worse in terms of productivity growth. TFP decreased in the long run the more subsidies the firms received (Santos, 2019). These studies are not alone in finding negative effects on productivity (Bernini & Pellegrini, 2011; Bernini, Cerqua & Pellegrini, 2017). Further, İmrohoroğlu and Tüzel (2014) find a negative relationship between productivity and firm performance. A study found that productivity of the selected firms increased in the first year after receiving a public subsidy (Bergström, 2000). Cin, Kim and Vonortas (2013) also found positive effects. The authors suggest that government subsidies can raise labor productivity "through promotion of R&D investment" , (Cin et al., 2013, p. 17). Our third null hypothesis are formulated as:

> **Hypothesis 3:** *The impact of government grants is positive correlated with total labor productivity*

A high debt ratio makes it increasingly difficult for businesses to obtain further financing since they are concerned about covering asset debts (Shahfira & Hasanuh, 2021). In simpler terms, a low TDA explains that the company has less debt The study by Shahfira and Hasanuh (2021) found no significance between short-term debt to asset and firm performance. Further, another study found short-term debt to assets to be significantly positive Tian & Zeitun (2007). New and innovative firms tend to have a larger debt to asset ratio (TDA) and that their internal funds are smaller compared to older firms (Coad, Segarra & Teruel, 2013). Firms with high TDA tend to experience higher performance and more growth (Myers, 1977). This provides the foundation for our final hypothesis:

> **Hypothesis 4***: The impact of government grants is positively correlated with total debt to assets*

The effect of grant on performance by existing literature can be illustrated in table 2.1.

Author	Performance Metrics	Results
Špička (2018)	Assets	Positive
Chen (2021)	Assets	Positive
Špička (2018)	Productivity	Insignificant
Bernini et al. (2017)	Productivity	Negative
Santos (2019)	Productivity	Negative
Beņkovskis et al. (2018)	Productivity	Positive
Söderblom et al. (2015)	Productivity	Positive
Söderblom et al. (2015)	Sales	Positive
Beņkovskis et al. (2018)	Sales	Positive
Chen (2021)	Sales	Insignificant
Tian & Zeitun (2007)	Debt	Positive
Shahfira & Hasanuh (2021)	Debt	Insignificant

Table 2.1. Results of Metrics on Firm Performance

As existing literature suggests, there are several factors that might impact firm performance. To account for other variables that might influence the results, and to avoid a false conclusion, this study elucidates for factors such as entrepreneur and firm characteristics which have shown to have an impact on firm performance. On the basis of our hypothesis a proposed conceptual framework was developed. This has been illustrated in figure 1.

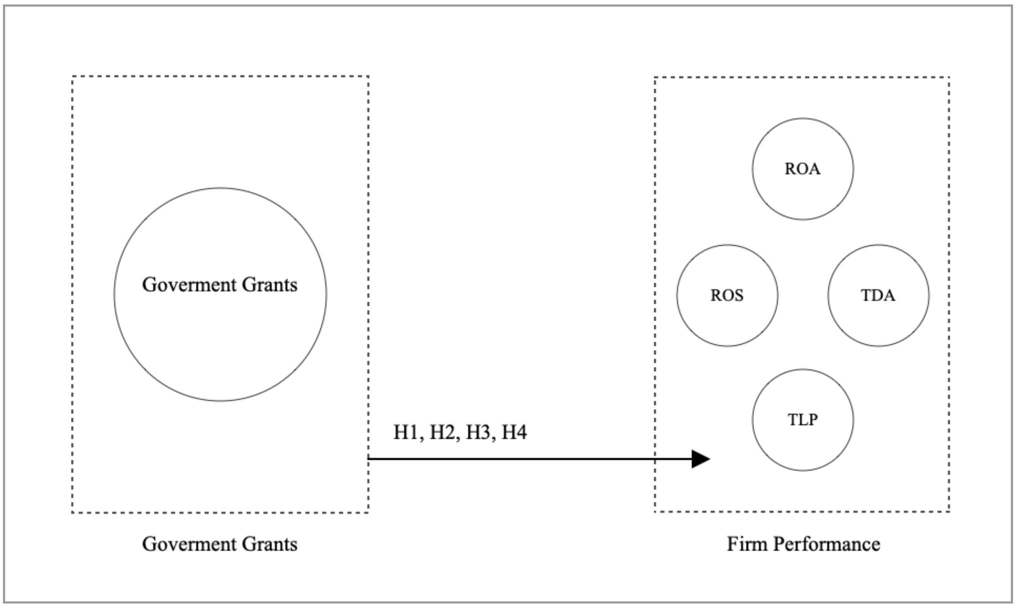

*Figure 1***.** The Proposed Conceptual Framework of the Study.

2.3.2 Entrepreneur Characteristics on Firm Performance

Literature concerning firm performance has found that entrepreneur gender, among others, are potential options for better targeting within small firms (Mole, Hart, Roper & Saal, 2009). However, the relationship between an entrepreneur's characteristics and firm performance is a relatively new area of study (Khan & Vieito, 2013). A study by Erhardt, Werbel and Shrader (2003) found that firms with a higher ratio of females resulted in higher returns on assets, relative to the sector in which they operated in. Srhoj, Škrinjaric, Rada, and Walde (2019a) found that there was a significant financial gap between average granted bank loans among male and female entrepreneurs, and therefore considered government grant schemes as an instrument to reduce the financial gap. The authors found that grants aimed exclusively at female entrepreneurs had a positive effect on firm performance and that such grant schemes' policies outweigh the costs of the funding. Studies investigating effects of gender on firm performance reveal inconclusive results. While some find a positive impact of the proportion of females in top management teams (Smith, Smith & Verner, 2006), others find that gender does not have a significant effect (Mole et al., 2009).

Conversely, Srhoj, Škrinjarić and Radas (2019b) find that younger entrepreneurs are more likely to receive a grant. In addition, previous literature reveals that there is a strong relationship between the age of the entrepreneur and firm performance (Muzenda, 2014;

Machirori & Fatoki, 2013). Age is therefore considered to be highly determinant of firm performance (Woldie, Leighton & Adesua, 2008). Kristiansen, Furuholt and Wahid (2003) revealed that entrepreneurs that succeed tend to be younger of age. Conversely, a research conducted by Kristiansen, Furuholt, and Wahid (2003) records that older entrepreneurs (> 25 years old) were more successful in business. These contradictory results suggest that age should not be overlooked as an important factor when looking at firm performance.

2.3.3 Firm Characteristics on Firm Performance

Young firms are more innovative and dynamic, however, they are more restricted (Bozeman & Rogers, 2001). Therefore, it is suggested that it is not not the firm size, but firm age, that matters for positive effects of grants due to higher financial constraints stemming from the higher informational asymmetry (Bloom, Van Reenen & Williams, 2019). Still, some researchers found that firm size had a positive impact on SMEs when applying for public subsidies (Busom, 2000; Huergo & Trenado, 2010) and that firm age on the contrary generally doesn't have a significant impact (Huergo & Trenado 2010). Industry characteristics are important predictors in determining firm performance (Porter, 1980). On another side, (Short, McKelvie, Ketchen & Chandler, 2009) finds that industries did not have a significant impact on performance. Further, research continues to investigate why firms within the same industries perform differently (Roquebert, Phillips & Westfall, 1996).

Empirical studies show that young and innovative companies have less access to both their tangible and intangible assets. Information asymmetry is more viable in less mature firms as they have higher cost for financing compared to older and mature companies (Carpenter & Petersen, 2002; Bloom et al., 2019). Another critical aspect is that young companies have less workforce and market knowledge (Mas-Tur & Simón Moya, 2015). Such firms may therefore experience challenges just based on being 'new', and the government grants are increasingly important. Besides, the financial constraints on new firms are significantly higher compared to mature firms (Cincera & Veugelers, 2013).

On the basis of existing literature, predictors such as age, gender, firm age and industries are suggested to have an impact on firm performance (Muzenda, 2014; Smith et al., 2006; Bloom et al., 2019; Porter, 1980). In addition to the hypothesis developed, the aspect of grants impact on regional firms was found interesting to address. Innovation Norway has policies that focus on developing the less central regions in Norway, and has conditioned some of their grants to go towards firms operating in more decentralized areas ("Regionale distriktsmidler", 2022). The question on whether regional location of firms have an impact on firm performance was presented as a basis for further research by Dvouletý et al. (2020). Due to the lack of previous literature available on the subject of regional effect, and suggestion by previous research, region is included as an additional control variable.

3 Methodology

Modern research commonly follows one of three approaches: quantitative, qualitative or a mixed method containing both. Qualitative research is "[...] generated from the broad answers to questions in interviews, or from responses to open-ended questions in a questionnaire, or through observation, or from already available information gathered from various sources such as the internet" (Sekeran & Bougie, 2020, p. 2). Quantitative research is "data in the form of numbers as generally gathered through structured questions" or from secondary sources (Sekeran & Bougie, 2020, p. 2). Quantitative research has an explanatory and deductive nature with numbers being collected and utilized to test a theory. Qualitative research on the other hand has an inductive approach with narrative data often used to generate themes and developing theories (Claydon, 2000).

The unique feature of a quantitative research approach is its ability to formally test theories, this is commonly executed through formulating hypotheses and testing them by applying statistical analyses (Watson, 2015). There exist several types of design and analysis procedures in quantitative methods, and 'canonical analysis' is often performed when assessing a "relationship between a set of independent and dependent variables" (Nelson & Zaichkowsky, 1979, p. 325). Our study uses multiple regression in favor of other analysis designs such as ANOVA, because (1) it is considered a more powerful method of statistical analysis and (2) provides a strength of relationship index (Nelson & Zaichkowsky, 1979, pp. 324-325).

This thesis utilizes previous theories and research regarding the relationship between government grants and firm performance to develop quantifiable hypotheses to be tested through statistical analyses. This research emplois empirical analysis and deductive reasoning to answer the stated research question: "what is the impact of government grants on firm performance?”. The empirical models applied in the thesis consist of several forms of linear regression, foremost in the form of multiple linear regression containing several different variables. In addition to the analysis models, some models for validity and robustness have been added, such as multicollinearity, heteroskedasticity and statistical power. The research has been designed to answer the research question as precisely as possible, and therefore the choice of method fell on a quantitative approach.

3.1 Multiple Regression Analysis

Multiple regression helps generalize the relationship between a set of variables, and is often used for empirical analysis in economics and other social sciences. As opposed to single linear regression, where only a single variable is included, a multiple regression has two or more explanatory variables. It is important to take great consideration in the selection process of predictors due to the fact that the “regression coefficients depend upon the different variables, and the order in which they are added to the model” (Field, 2018, p. 398). Multiple regression may provide a more nuanced explanation of the characteristics-performance relationship, by explicitly controlling for factors that simultaneously may affect firm performance.

We can make ceteris paribus interpretations of the estimated coefficients. In our study, this means that we can infer what partial affect our key variables have on firm performance. In a simple regression, additional explanatory variables are allocated in the error term. For instance, if we include gender as the only explanatory variable in a regression, we would have to assume that other factors like industries and firm age are uncorrelated with firm performance for the regression to yield unbiased estimates, which is a tenuous assumption. Multiple regression can help us provide a stronger and more nuanced explanation of the relationship between gender and performance, by controlling for factors that simultaneously may affect firm performance. In traditional simple regression, the additional explanatory variables are regarded as an error term.

3.2 Regression Models

The following section will highlight and explain the regression models utilized in the empirical analysis. Firstly an explanation of the core structure of the models are highlighted. Secondly an explanation of the six regression models applied for the analysis. The regression models conducted follows a stepwise process, which is to say the first model is of a simpler nature, and more and more control variables were added to the regression for each model, and hence enabling the results to highlight parameter estimates for explanatory variables that are of interest for the results. The core multiple regression model used for empirical analysis can be written as follows (Jobson, 1991):

$$Y = \beta_0 + \beta_1 X_1 + \dots + \beta_n X_n + \varepsilon$$

In multiple regression the Y explained the predicted value of the dependent variables. The dependent variables are tested for each model, but for simplicity and clarity they are all presented as Y (firm performance) in our models. Further, the β_0 explains the value of Y when all other predictors are set to 0, and $\beta_1 X_1$ is the independent variables where β_1 is the regression coefficient of the first independent variable (X_1). Finally, ε is the model error which tells us how much variation there is in the estimate of Y.

Model 1: grants

$$Y\ (Firm\ Performance) = \beta_0 + \beta_1 X_1\ (Grants) + \varepsilon$$

Model 2: controlling for age

$$Y\ (Firm\ Performance) = \beta_0 + \beta_1 X_1\ (Grants) + \beta_2 X_2\ (Age) + \varepsilon$$

Model 3: controlling for age and gender

$$Y\ (Firm\ Performance) = \beta_0 + \beta_1 X_1\ (Grants) + \beta_2 X_2\ (Age) + \beta_3 X_3\ (Gender)$$

Model 4: controlling for age, gender and firm age

$$Y\ (Firm\ Performance) = \beta_0 + \beta_1 X_1\ (Grants) + \beta_2 X_2\ (Age) + \beta_3 X_3\ (Gender) + \beta_4 X_4\ (Firm\ Age) + \varepsilon$$

Model 5: controlling for age, gender, firm age and industries

$$Y\ (Firm\ Performance) = \beta_0 + \beta_1 X_1\ (Grants) + \beta_2 X_2\ (Age) + \beta_3 X_3\ (Gender)$$

$$+ \beta_4 X_4\ (Firm\ Age) + \beta_5 X_5\ (Industries)\ +\ \varepsilon$$

Model 6: controlling for regions

$$Y\ (Firm\ Performance)\ =\ \beta_0 + \beta_1 X_1\ (Grants)\ +\ \beta_2 X_2\ (Region)\ +\ \varepsilon$$

In model 6 we exclude the other control variables present in previous models, because there is not sufficient litterature to indicate that different regions in Norway should impact firm performance. Our statistical analysis utilizes a fiscal measure of profitability, return on assets, which is beneficial in measuring firm efficiency. We are also looking at return on sales, which helps in understanding how public grants have impacted their sales, as this often is a large proportion of the policies by institutions. Finally, we investigate coherent performance measurements such as total debt to assets and total labor productivity. In literature on economics and finance the total factor productivity is often used as a tool for measurement, but unfortunately this data was not available.

3.3 Data

3.3.1 Data Selection and Collection

Innovation Norway has some specific policies for which companies qualify for their grants. There are three crucial criteria that covers all of Innovation Norway's grants ("Tilskudd til kommersialisering", 2022) which are:

1. The company must be registered in Brønnøysundsregisteret (a register containing all Norwegian companies and organizations).
2. The company can not have any record of non-payment.
3. The company must fulfill the minimum demand for business practices as well as being able to document guidelines for ethics and social responsibility.

Other policies are specific to the different grants Innovation Norway supplies. The firms investigated in this research have received start-up-specific early stage grants, where the five requirements are as follows (1) The firms can not be older than five years old; (2) Companies younger than three years are prioritized; (3) The entrepreneur and or the company must represent a business idea that contributes to something substantially new in the market; (4)

The project must be innovative and have a substantial potential for growth, mostly measured by their potential for success in an international market; (5) The company must have registered a positive company equity at the time of applying ("Bli kjent med våre finansieringsordninger for oppstartsbedrifter", 2021). Each year Innovation Norway conducts a study called "kundeundersøkelsen" which is based on how firms have responded to the survey. This study can also be used to validate this data. However, an issue that arises is that this survey is based on the participants perception of the grant impact - and not accurate financial data (Oxford Research, 2021, p.12).

Innovation Norway has a publicly available dataset of beneficiaries of their different grant schemes on their website ("Hvem har fått tilbud om finansiering fra oss?", 2021). The data is made available and downloaded in Excel format, making it easy to access relevant data for this paper. However, the data on those who applied for public grants, but got rejected, is not available to the general public. To access this information, a formal request was sent to the legal department of Innovation Norway. Thereafter, we received a complete list of those who have applied for government grants. The data had to be separated into those who applied and received grants and those who applied and got rejected. As this thesis focuses on young firms, we followed the policy of Innovation Norway, which states that companies who apply for grants must be younger than five years.

Combined with that we needed access to the latest public financial year which at the start of this study was 2020. In order to study the companies over a five year period we only selected companies established no older than 2013 and analyzed all firms after receiving grants for 2016. We used a publicly available website to access the financial numbers of all firms including 2016, 2017, 2018, 2019 and 2020 to analyze how firms perform. The financial data for the five-year period was added manually to 2,246 firms, including 998 for the untreated group and 1,248 for the treatment group. The untreated group is firms who applied and got rejected, while the treatment group is firms that applied for and received public grants.

To find information on firm and entrepreneur characteristics, we used a public website named "proff.no". Proff.no is a database service provider for Norwegian businesses, the platform supplies in-depth information about Norwegian businesses, and is most commonly used as a basis for decision making, when professional actors look for suppliers or new partners ("Proff - the business finder", 2022). The platform allows users to search for business and personal data from all active companies in Norway, containing full accounting data as well as key economic metrics, and administrative information ("Proff - the business finder", 2022). Applying the data from Innovation Norway containing the companies that applied for grants, enables us to create a vast set of data for analysis.

Our initial sample included 12,757 rejected firms between 2015 up until 2021, and 7,512 granted firms in the same time frame. The initial sample was provided to us by Innovation Norway after an extensive application process. We started building the data set by removing all sole proprietorship companies (ENK). The choice of removing all ENK's was based on the availability of accounting data, a large percentage of ENK's are not required to hand in a full annual account, which results in their accounting data not being published for the general public ("Bokføringsplikt", 2021). The removal of the ENK's resulted in a reduction of aprocamently 35% of the total sample from Innovation Norway, now including only stock companies (AS). From there we only included young firms in Norway with financial data from and including 2016 to 2020. One observation is equivalent to all relevant data points on one firm for one fiscal year. The data collection for this thesis was collected and composed in the time period January through March 2022.

Table 3.1 outlines the selection criteria applied for arriving at our final sample. Innovation Norway recommends that firms no older than three years of establishment should receive grants with an absolute limit of five years. Our study therefore focuses on companies established no earlier than 2013 as a lower limit. We also chose to exclude companies that applied for grants later than 2016. This selection was based on the security of data availability across all accounting years (Saunders, Lewis, & Thornhill, 2009). Similarly, there is no accounting data available on firms after 2020. This left us with accounting data from a five-year period (2016 to 2020). Given the available data, it left us with a total observation of 2,246 companies.

3.3.2 Data Filtering

After data selection was completed, the composed dataset contained observations of 2,246 of Norwegian firms, but further filtering was still needed to shape the data into an anapt dataset for analysis. This has been illustrated in table 3.1.

	Removed obs.	*Remaining obs.*
Original observation in dataset		2,246
(1) Remove firms acquired and merged	86	2,160
(2) Remove inactive firms	501	1,659
(3) Remove firms with zero or negative turnover	111	1,548
(4) Old firms (> 9 years old)	7	1,541
(5) Remove performance outliers	92	1,449
Final sample size		1,449

Table 3.1. Sample Data Filtering

Step one in the filtering process was removing all firms that had been merged or acquired due to the lack of accounting data available for observation. In step two, we removed all inactive and bankrupt companies for the same reason as in step one of the filtering. This resulted in the removal of 582 companies in total from step one and two. In step three, we remove firms with zero or negative turnover because they are of little economic relevance (Che & Langli, 2015). Step four was removing companies older than nine years old, these were meant to have been excluded from the beginning but we found a total of seven companies older than nine years that had made their way into the dataset. In step five, we removed the statistical outliers. To discover the outliers for an observation we calculated a Z-score by taking the raw measurement, subtracting the mean, and dividing by the standard deviation. The mathematical formula is as follows:

$$Z = \frac{X - \mu}{\sigma}$$

The rule of thumb for cut-off values for outliers are observations with a Z-score value greater than three or negative three for the outcome variable (Osborne & Overbay, 2004, p. 3). Removing the 75 observations we have, with a Z-score outside the parameters we are left with a final sample of 1,449 companies. Considering the remaining dataset consistent of 1,449 companies, reducing it further by removing missing values would reduce the statistical power of our analysis considerably (Kang, 2013). However, SPSS deals with missing values and we therefore do not need to remove these.

3.3.3 Statistical Validity Tests

Multicollinearity

Multicollinearity accounts for the degree of correlation between predictors, and if such 'perfect collinearity' exists, it will be difficult to obtain estimates of the coefficients "because there are an infinite number of combinations of coefficients that would work equally well" (Field, 2018, p. 401). Hence, multicollinearity will make it difficult to assess the individual importance of a predictor. In this paper, the degree of correlation between the independent variables and between the dependent variables is checked. This can be done using a correlation matrix (see appendix C1) for the dependent predictors. We identify any correlation above .75 or below –.75 as an indication of multicollinearity (Sweet & Grace-Martin, 2003). The highest correlation was between TDA and ROA at -.54. In terms of correlation between the independent variables, the variance inflation factor (VIF) is utilized. If VIF is greater than ten or tolerance below 0.1, then a serious problem is identified (Field, 2018, p. 402). Analyzing each variable's correlation, we find that there doesn't exist multicollinearity among the predictors used in our regressions.

Heteroskedasticity

The presence of heteroscedasticity can affect standard errors, resulting in misleading statistical inference associated with the parameter estimates in the model (Field, 2018, p. 239). If heteroskedasticity is present, our significant tests and confidence intervals will be biased as they are computed using standard error (Field, 2018, p. 239). In accordance with Wilcox (2010), the confidence intervals can be wildly inaccurate when homogeneity cannot be assumed. The presence of heteroscedasticity can violate the statistical test of significance in our multiple regression model, which in turn makes us draw wrong conclusions (Brooks, 2014; Field, 2018). We ran the White test for testing heteroscedasticity. The null hypothesis in this test is that of homoscedasticity. If chi-square is significant then that indicates evidence of heteroscedasticity, however, we found some evidence of heteroskedasticity. The nature and significance of the results, as reported in our main analyses, did not change significantly, thereby indicating robustness of our findings. The overall model did not indicate any heteroskedasticity. These results are presented in appendix D5.

Statistical power

Statistical power in simplified terms means figuring out the statistical strength of the data, the probability of failing to reject a null hypothesis that is false (Bolker, 2008, p. 10). It can help predict the probability of an outcome being correctly assessed and replicated. Statistical power is an exploitation of a mathematical relationship among four variables: Power, alpha (α), sample size (N) and effect size (ES). Any three values fixed can determine the fourth (Cohen, 1992, p. 98) In this case the value to be determined is the power the data possesses. The statistical power analysis was conducted by using Cohen´s r =0,10, a two-tailed α =0,05 and the sample size of 1,449 observations, indicating a statistical power of 96,82%, meaning any null hypothesis can be discarded with 96,82% certainty.

3.3.4 Description of Variables

In this section, the variables utilized to complete the analysis and construct our models are highlighted. Furthermore, the reasoning behind the choices in light of existing research, theory and data in the field is presented. Our independent variable is grant, while our dependent variables are the average performance metrics of ROA, ROS, TDA and TLP ranging from 2016 through 2020. We also control for entrepreneur-level data (gender and age) and firm-level data (firm age and industries).

Measures of firm performance differ in existing literature, as there are no considerable measures of performance that is superior to another. Hence, our choice of performance measures rely upon the purpose for this study and the stakeholders who are supposed to engage in our results. Our aim is to investigate if treated firms have better performance than their peers, and therefore give valuable information to firms seeking grants and government schemes to potentially improve their policies. Our primary measures of firm performance consists of the metrics ROA, ROS, TDA and TLP because these are widely accepted indicators of a firm's performance (Gentry & Shen, 2010, p. 514; Tian & Zeitun, 2007; Shahfira & Hasanuh, 2021).

After understanding the outcome variable, our independent variable should be defined. Our independent variable is based on the treatment and untreated group. Our data sample includes all firms that have applied for public funding. The dichotomous variable is therefore 0 for those who applied, but got rejected, and 1 for those who received grants. We can then further understand how this variable affects the firm performance of the selected groups.

Firm and entrepreneur characteristics are used as control variables. At firm-level, we include firm age and industries. At entrepreneur-level, we include age and gender. Entrepreneur-level characteristics are used as a control variable as research finds that these might impact the performance of a firm. Firstly, age is defined as a scale variable in our dataset. Gender is dummy coded as an ordinal variable with females coded as 0 and males coded as 1. The firm characteristics are firm age and industries. Firm age is calculated by subtracting the year of establishment from the current year, and coded as a scale variable in the dataset. Further, we also dummy coded industries to get a correct and nuanced picture of the potential relevance of these factors. Likewise, we test for geographical regions which also are coded as a dummy variable.

3.4 Measuring Performance

There is no universal way of defining how to measure firm performance (Herciu & Șerban, 2018). On one hand, Richard, Devinney, Yip and Johnson (2009) states that "[...] performance encompasses three specific areas of firm outcomes: (a) performance (profits, return on assets, return on sales.); (b) product market performance (sales, market share); and (c) shareholder return (total shareholder return, economic value added)". On another hand, Bharadwaj (2000) emphasized that "the resource-based view of the firm attributes superior performance to organizational resources". Furthermore, an overview on important factors that are significant predictors of firm performance according to an extensive literature research, has been illustrated in appendix A1. As metrics for performance we consider ROS, ROA, TDA and TLP as these are the most commonly used metrics for measuring performance in the literature of firm performance.

ROA is a metric that assesses a company's profitability in terms of its total assets (Stickney, 1996). This ratio compares a company's net income to the capital it has invested in assets, to determine how well it is operating. ROS is a ratio which calculates the firm's profit margin and how the firm is taking advantage of its resources to increase revenue, providing creditors and potential investors with information about the company's operations. ROS therefore helps to illustrate how successful the management is in generating profits from its sales (Tho, Dung & Huyen, 2021). TDA is another ratio metric that can help with understanding firm performance (Shahfira & Hasanuh, 2021). Tho et al. (2021, p. 11) states that a good way of evaluating a firm's performance based on historical data is to apply accounting indicators to “comprehensively understand what and how companies have done”. In addition, the relationship between firm performance and labor productivity has been explored by several research papers (Bøler et al., 2015; Liu et al., 2021). Studies find that labor productivity leads to increased revenues (Anderson et al., 1997; Farnham & Hutchinson, 2011). Table A2 in the appendix accounts for how the different performance metrics are calculated.

Moreover, governmental institutions often consider TLP as an important factor when assessing the success rate of public grants (Francis, 2020). All these measurements of performance can help indicate how treated firms perform compared to non-treated firms relative to performance. This paper makes several contributions to the literature. It is one of the first to evaluate public funding of young firms in Norway. The effectiveness of public funds in supporting entrepreneurship is essential not only for policy-making that supports these economies’ convergence, but also for European institutions - while also being valuable to companies seeking public funds. Second, our study discusses specific challenges and institutional weaknesses that have not been addressed before. The theory outlined here suggests that the rationale for public support for entrepreneurs might be based not only on the positive value added by entrepreneurs, but also the different market types of inefficiency.

3.5 Descriptive statistics

3.5.1 Firm Performance

The final sample consisted of 562 non-granted companies, and 887 granted firm observations. This resulted in a total of 1,449 firm observations after completing all necessary filtering to our dataset, that we gathered from IN and proff.no. Firm age has a time span of four years (2013 through 2016). Hence, firms are not older than four years when applying for grants based on the policies from IN. The time horizon of our analysis is five years of financial accounting data (2016 through 2020). Table B3 in the appendix highlights the summary of statistics for the dependent variables related to the granted firms. The mean ROA is -0.19, mean ROS is -0.88, TDA has a mean of 0.98 and TLP has a mean value of 627.73 in the observed sample. Similar to the dependent variables related to rejected firms, the mean value of the granted firms are closest to the 50th percentile (P50), which indicates fewer extreme outliers.

Table B4 in the appendix highlights the summary of statistics for the dependent variables related to the rejected companies. The mean TDA of the observation in the sample is 1.07, the mean TLP is 562.55, mean ROA is -0.19, and the mean ROS is -1.10. We see that the mean is closer to the 50th percentile (P50) indicating that there are few significant outliers.

3.5.2 Control variables

Observation Count - Gender	*Freq.*	*% of total*	*% Cum.*
Female			
Rejected	112	45.2	45.2
Granted	136	54.7	100.0
Male			
Rejected	450	37.5	37.5
Granted	751	62.5	100.0
Total N of observations	1,449		100%

Table 3.2. Descriptives of Entrepreneur Characteristics

In table 3.2 and in figure 2 we explore the distribution between female and male grant applicants. There were a total of 248 female applicants where 45,2% got rejected. 1 201 male applicants 37,4% got rejected. The figure indicates a clear difference in the amount of female applicants compared to male with 953 fewer total applicants and the percentage of grants grantet might signal a skewed distribution of grants between genders.

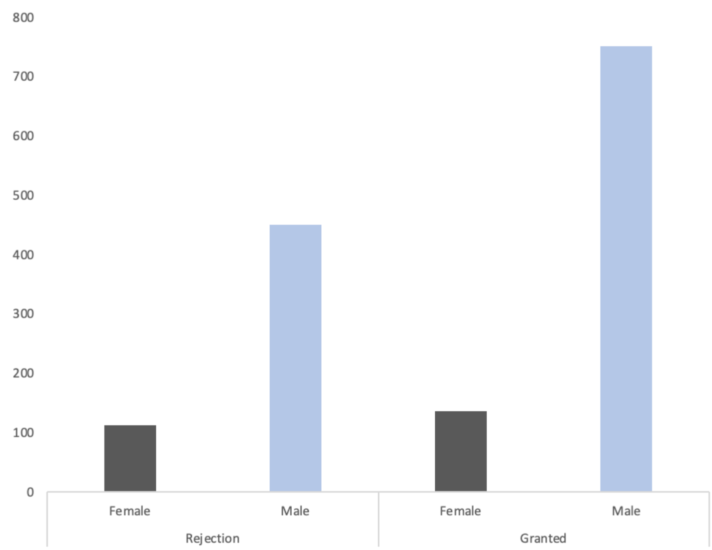

Figure 2. Distribution of Gender

In our constructed data set, we have classified the firms under 10 different industry labels. Table 3.3 below shows how the firms are distributed within the different industries for both granted and non-granted companies.

Observation count per industry	*Freq.*	*% of total*	*% Cum.*
Telecom/IT/Tech	344	23.7	23.7
Manufacturing	163	11.2	35.0
Consulting/R&D	492	34.9	68.9
Commerce	105	7.2	76.2
Aquaculture	40	2.8	79.0
Health	27	1.9	80.8
Construction	29	2.0	82.2
Education	49	3.4	86.2
Agriculture	13	0.9	87.1
Other	187	12.9	100.0
Total N of observations	1449		100%

Table 3.3. Descriptive of Industry Characteristics

The distribution between the different industries among granted and non-granted firms show no extreme discrepancies. As illustrated in table 3.3, the three most represented industries in our data are “consulting/R&D” (492), “telecom/IT/tech” (344) and “others” (187). “Others” are a collection of companies that do not fit within the characteristics of any of the other industries. For the most part “others” are composed of culture related businesses and real estate management. Within these three industries there were 197 rejected and 344 accepted applications, for “consulting/R&D” companies, there were 123 rejected and 235 accepted companies in the “telecom/IT/tech” bracket. Lastly, in the “other” sector there were 136 rejected and 66 accepted companies.

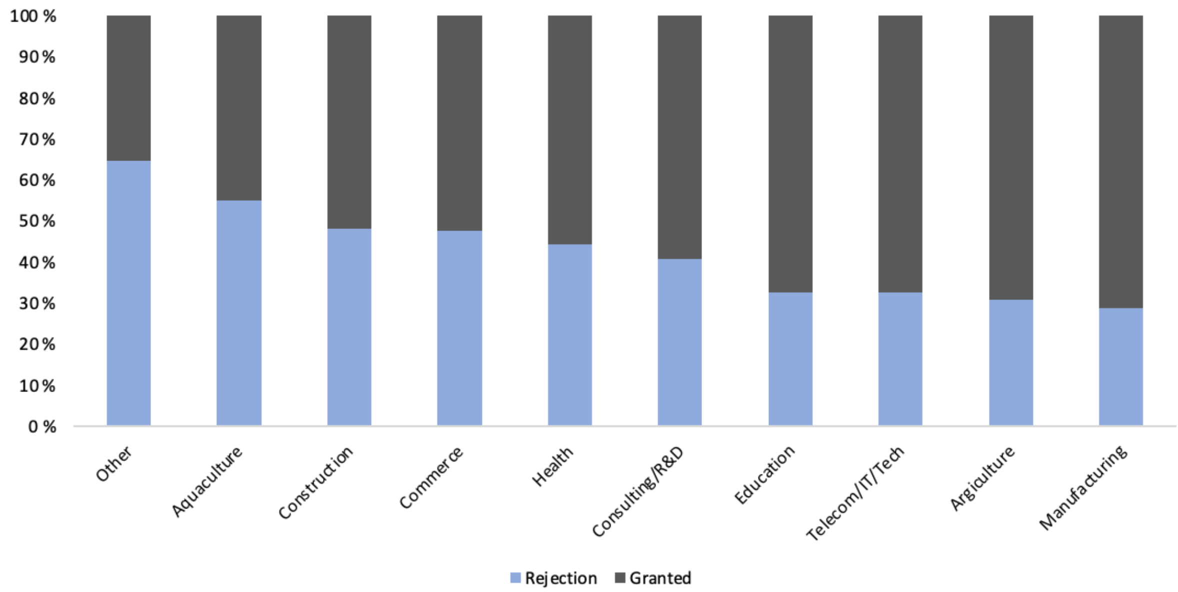

Figure 3. Distribution of Industries

Figure 3 illustrates the distribution of grants for each of the ten industrie variables in the observation. The y-axis shows the percentage of distributions and the x-axis projects the different industries. The gray bars show grantet firms and blue shows the amount of rejected firms. There is a cogent difference in the success rate of the different industries, with manufacturing seeing the highest success rate of 71% grantet applications and the ¨other¨ category seeing the least success with a rate of 35%. Figure 3 also shows that IN is fairly consistent with backing their focus industries, with technology, manufacturing and the education sector seeing a high acceptance rate ("Hvem har fått tilbud om finansiering fra oss?", 2021). As we can see from figure B2 in the appendix, the three most represented regions in our data are "Oslo" (263), "Rogaland" (209) and "Viken" (193). The least represented region is "Møre and Romsdal" (66), "Nordland" (61) and "Svalbard" (7).

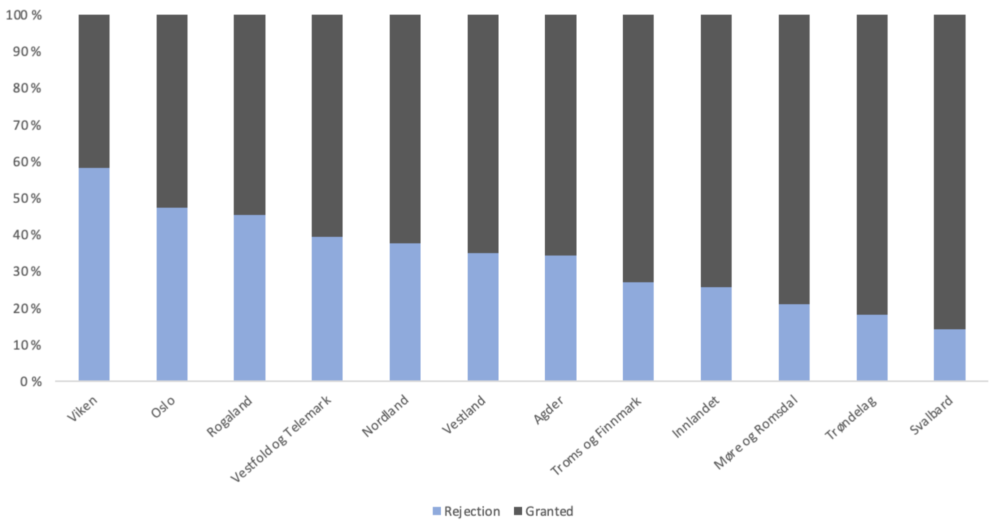

Figure 4. Distribution of Regions

Figure 4 illustrates the distribution of grants in relation to regional location. The x-axis exhibits the grant percentage, the y-axis shows which region each bar relates to. Blue showcases the rejections and vice versa for gray. The region with the most favorable result is "Svalbard" with a grant rate of 85,71%, the selection is though miniscule at only seven observed firms, and therefore might not be of significance. Among the regions with a significant number of observations "Trøndelag" is the most successful at a rate of 82% and "Viken" is the least successful at only 42% applications granted.

5 Analysis and Results

5.1 Grants Impact on Performance

A multiple linear regression was calculated to predict ROA based on grants. A significant regression equation was not found F(1, 1424) = .057, $p > .05$, with an $R^2 adj$ of .000. ROA decreased -.006 (-0.6%) for each one-unit increase in grants. Grants (β = -.006, t = -.239, p = .811) are not significant predictors of ROA. Next, ROS were predicted based on grants. A significant regression equation was not found F(1, 1448) = 1.562, $p > .05$, with an $R^2 adj$ of .000. ROS increased by .217 (21.7%) for each one-unit increase in grants. However, grants (β = .217, t = 1.250, p = .212) are not significant predictors of ROS. Similarly, TDA was predicted based on grants. A significant regression equation was not found F(1, 1441) =

2.147, p > .05, with an R^2adj of .001. TDA decreased -.089 (8.9%) for each one-unit increase in grants. Grants (β = -.039, t = -1.465, p = .143) are not significant predictors of TDA. Further, TLP were predicted based on grants. A significant regression equation was not found F(1, 778) = 2.426, p > .05, with an R^2adj of .003. TLP increased 65.178 for each one-unit increase in grants. Grants (β = .056, t = 1.558, p = .120) are not significant predictors of TLP. The results have been illustrated in table 5.1 below.

	ROA			ROS			TDA			TLP		
Variable	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β
Grant	-.006	.027	-.006	.217	.174	.033	-.089	.061	-.039	65.178	41.847	.056
R2		.000			.000			.001			.003	
N		1,424			1,448			1,441			778	

**p < .05*
***p < .01*

Table 5.1. Relationship between ROA and Grants.

5.2 Grants Impact on Performance with Control Variables

For model 2 we predict ROA based on grants when controlling for age. A multiple linear regression was fitted to explain ROA based on grants when controlling for entrepreneur age. The model suggests that R^2adj = .001 explains 0.1% of the variance on ROA, but it is not significantly useful in explaining ROA, F(2, 1424) = 1.811, p > .05. With a one-unit increase in grants, the ROA decreased by -.006, which was found to not have not a significant impact on ROA (β = -.006, t = -.214, p = .831*)*. Likewise, ROA decreased by -.002 with a one-unit change in age, which was found to not have a significant effect on ROA (β = -.001, t = -1.824, p = .059). Second, a multiple linear regression was fitted to explain ROS based on grants when controlling for entrepreneur age. The model suggests that R^2adj = .003 explains 0.3% of the variance on ROS, and it is significantly useful in explaining ROA, F(2, 1448) = 3.171, p < .05. With a one-unit increase in grants, ROS increased by .221, which was found to not have not a significant impact on ROS (β = -.033, t = 1.271, p = .204*)*. Likewise, ROS decreased by -.017 with a one-unit change in age, which was found to have a significant effect on ROS (β = -.057, t = -2.185, p = .029).

Third, a multiple linear regression was fitted to explain TDA based on grants when controlling for entrepreneur age. The model suggests that $R^2 adj$ = .003 explains 0.3% of the variance on TDA, and it is significantly useful in explaining TDA, F(2, 1441) = 3.350, p < .05. With a one-unit increase in grants, TDA decreased by -.090, which was found to not have not a significant impact on TDA (β = -.039, t = -1.489, p = .137). Moreover, TDA increased by .006 with a one-unit change in age, which was found to have a significant effect on ROS (β = .056, t = 2.133, p = .033). Finally, a multiple linear regression was fitted to explain TLP based on grants when controlling for entrepreneur age. The model suggests that $R^2 adj$ = .012 explains 1.2% of the variance on TLP, and it is significantly useful in explaining TLP, F(2, 778) = 4.895, p < .01. With a one-unit increase in grants, TLP increased by 60.894, which was found to not have not a significant impact on TLP (β = .052, t = 1.460, p = .145). Moreover, TLP increased by 5.180 with a one-unit change in age, which was found to have a significant effect on TLP (β = .097, t = 2.710, p = .007).

	ROA			ROS			TDA			TLP		
Variable	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β
Grant	-.006	.027	-.006	.221	.174	.033	-.090	.060	-.039	60.894	41.707	.052
Age	-.002	.001	-.050	-.17	.008	-.057*	.006	.003	.056*	4.180	1.911	.097**
R2		.001			.003			.003			.012	
N		1,424			1,448			1,441			778	

**p < .05*
***p < .01*

Table 5.2. Firm Performance of Grants with Control Variables.

For model 3 we predict ROA based on grants when controlling for age and gender. A multiple linear regression was calculated to predict ROA based on grants, age and gender. A significant regression equation was not found F(3, 1424) = 1.216, p > .05, with an $R^2 adj$ = .000. ROA decreased -.011 (-1.1%) for each one-unit increase in grants, and -.002 (-0.2%) for each one-unit change in age. Similarly, ROA also decreased -.006 (-0.6%) for each one-unit increase in gender. Neither grant (β = -.006, t = -.204, p = .839), age (β = -.050, t = -1.859, p = .063) or gender (β = -.004, t = -.167, p = .867) were significant predictors of ROA. Next, ROS were predicted based on grants when controlling for age and gender. A significant regression equation was found F(3, 1448) = 2.991, p < .05, with an R^2adj = .004. ROS increased by .237 (23.7%) for each one-unit increase in grants. Conversely, ROS decreased by -.015 (-1.5%) for each one-unit change in age and -.366 (-36.6%) for each one-unit change in gender. Neither grant (β = .237, t = 1.364, p = .173) or gender (β = -.366, t = -1.620, p = .106) were significant predictors of ROS. However, age (β = -.015, t = -2.003, p = .045) is a significant predictor of ROS.

Similarly, TDA was predicted based on grants, age and gender. A significant regression equation was found F(3, 1441) = 3.571, p < .05, with an R^2adj = .005. TDA decreased by -.083 (-8.3%) for each one-unit increase in grants. Conversely, TDA decreased by -.006 (-0.6%) for each one-unit change in age and -.157 (-15.7%) for each one-unit change in gender. Grant (β = -.036, t = -1.373, p = .170) is not a significant predictor of TDA. However, age (β = -.015, t = -2.003, p = .020) and gender (β = -.053, t = -2.000, p = .046) are significant predictors of TDA. Further, TLP were predicted based on grant when controlling for age and gender. A significant regression equation was found F(3, 778) = 3.305, p < .05, with an R^2adj = .009. TLP increased by 59.921 for each one-unit increase in grants, 5.126 for each unit change in age and 19.184 for each one-unit change in gender. Grant (β = .051, t = 1.433, p = .152) and gender (β = .013, t = .366, p = .715) are not a significant predictor of TLP. However, age (β = .096, t = 2.673, p = .008) is a significant predictor of TLP.

	ROA			ROS			TDA			TLP		
Variable	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β
Grant	-.006	.027	-.006	.237	.174	.036	-.083	.061	-.036	59.921	41.815	.051
Age	-.002	.001	-.050	-.015	.008	-.053*	.006	.003	.062*	5.126	1.918	.096**
Gender	-.006	.036	-.004	-.366	.226	-.043	-.157	.079	-.053*	19.184	52.423	.013
R2		.000			.004			.005			.009	
N		1,424			1,448			1,441			778	

$*p < .05$

$**p < .01$

Table 5.3. Firm Performance of Grants with Control Variables.

For model 4 we predict ROA based on grants when controlling for age, gender and firm age. A multiple linear regression was calculated to predict ROA based on grants, age, gender and firm age. A significant regression equation was found F(4, 1424) = 3.984, $p < .01$, with an $R^2 adj$ of .008. ROA decreased -.011 (-1.1%) for each one-unit increase in grants, and -.002 (-0.2%) for each one-unit change in age. Similarly, ROA also decreased -.004 (-0.4%) for each one-unit increase in gender. However, ROA increased with .046 (4.6%) for each one-unit change in firm age. Neither grant (β = -.011, t = -.398, p = .691) or gender (β = -.003, t = -.115, p = .908) were significant predictors of ROA. However, firm age (β = .093, t = 3.501, p < .001) and age (β = -.052, t = -1.974, p = .049) are significant predictors of ROA.

Next, ROS were predicted based on grants when controlling for age, gender and firm age. A significant regression equation was not found F(4, 1448) = 2.266, p > .05, with an $R^2 adj$ of .003. ROS increased .241 (24.1%) for each one-unit increase in grants, but decreased -.015 (-1.5%) for each one-unit change in age. Similarly, ROS also decreased -.367 (-36.7%) for each one-unit increase in gender and ROS decreased with -.026 (2.6%) for each one-unit change in firm age. Age (β = -.054, t = -1.993, p = .046) is a significant predictor of ROS. However, firm age (β = .008, t = -.313, p = .754), gender (β = -.043, t = -1.620, p = .105) and grants (β = .036, t = 1.383, p = .167) are not significant predictors of ROS.

Similarly, TDA was predicted based on grants, age, gender and firm age. A significant regression equation was found F(4, 1441) = 2.745, p < .05, with an $R^2 adj$ of .003. TDA decreased -.085 (-8.5%) for each one-unit increase in grants, but increased -.006 (0.6%) for each one-unit change in age. Similarly, TDA also decreased -.157 (-15.7%) for each one-unit increase in gender, but TDA increased with .015 (1.5%) for each one-unit change in firm age. Age (β = .061, t = 2.320, p = .020) and gender (β = -.053, t = -1.998, p = .046) are significant predictors of TDA. However, firm age (β = .014, t = .523, p = .601 and grants (β = -.037, t = -1.408, p = .159) are not significant predictors of TDA.

Further, TLP were predicted based on grant when controlling for age, gender and firm age. Similarly, TLP was predicted based on grants, age, gender and firm age. A significant regression equation was found $F(4, 778) = 16.194$, $p < .01$, with an $R^2 adj$ of .072. TLP increased across all predictors, with 19.057 increase in productivity for each one-unit increase in grants, 4.908 increase in productivity for each one-unit change in age. Similarly, TLP also had a 23.994 increase in productivity for each one-unit increase in gender, and TLP increased with 139.178 for each one-unit change in firm age. Age (β = .092, t = 2.645, $p = .008$) and firm age (β = .257, t = 7.361, $p < .001$) are significant predictors of TLP. However, gender (β = .016, t = .473, $p = .636$) and grants (β = .016, t = .467, $p = .641$) are not significant predictors of TLP.

	ROA			ROS			TDA			TLP		
Variable	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β
Grant	-.011	.027	-.011	.241	.174	.036	-.085	.061	-.037	19.057	40.829	.016
Age	-.002	.001	-.052*	-.015	.008	-.053*	.006	.003	.061*	4.908	1.855	.092**
Gender	-.004	.035	-.003	-.367	.226	-.043	-.157	.079	-0.53*	23.994	50.716	.016
Firm age	.046	.013	.093**	-.026	.083	-.008**	.015	.029	.014**	139.178	18.908	.257*
R2		.008			.003			.005			.072	
N		1,424			1,448			1,441			778	

**p < .05*
***p < .01*

Table 5.4. Firm Performance of Grants with Control Variables.

For model 5 we predict ROA based on grants when controlling for age, gender, firm age and dummy industries. There was not much significant change in the model after adding industries. Hence, only grant is reported and a complete overview of industry effects can be found in appendix E. A multiple linear regression was calculated to predict ROA based on grants, age, gender and dummy industries. A significant regression equation was found F(13, 1424) = 2.105, $p < .05$, with an $R^2 adj$ of .010. ROA decreased -.002 (0.2%) for each one-unit increase in grant. However, grant (β = -.002, t = -.062, $p = .950$) is not a significant predictor of the outcome variable. Next, ROS were predicted based on grants when controlling for age, gender, firm age and dummy industries. A significant regression equation was not found F(13, 1448) = 1.1572, $p > .05$, with an R^2adj of .005. ROS increased by .313 (31.3%) for each one-unit increase in grant. However, grant (β = .047, t = 1.746, p = .081) is not a significant predictor of the outcome variable.

Similarly, TDA was predicted based on grants, age, gender and firm age and dummy industries. A significant regression equation was not found F(13, 1441) = 1.392, $p > .05$, with an R^2adj of .004. TDA decreased -.106 (10.6%) for each one-unit increase in grant. However, grant (β = -.044, t = -1.627, p = .104) is not a significant predictor of the outcome variable. Further, TLP were predicted based on grants when controlling for age, gender and firm age and dummy industries. A significant regression equation was found F(13, 778) = 6.894, $p < .01$, with an R^2adj of .090. TLP increased by 21.911 for each one-unit increase in grant. However, grant (β = .019, t = .522, p = .602) is not a significant predictor of the outcome variable.

Table 5.5. Firm Performance of Grants with Control Variables.

	ROA			ROS			TDA			TLP		
	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β
Grant	-.002	.028	-.002	.313	.179	.047	-.102	.063	-.044	21.911	41.994	.019
Age	-.003	.001	-.060**	-0.17	.008	-.060*	.006	.003	.058*	3.747	1.876	.070*
Gender	.002	.035	.002	-.315	.228	-.037	-.161	.079	-.054*	39.066	51.312	.027
Firm age	.047	.013	.096**	-.020	.083	-.006	.011	.029	.010	134.137	18.982	.247
Dummy industries		Yes			Yes			Yes			Yes	
R2		.010			.005			.004			.090	
N		1,424			1,448			1,441			778	

**p < .05*
***p < .01*

5.3 Grants Impact on Performance with Regions

A multiple regression analysis was also used to test for different regions in our final model, where Oslo is considered as the reference category. In terms of region, the model suggests that R^2adj = .027 explains only 2.7% of the variance on ROA, and that the impact of firm characteristics is not impacting ROA collectively with F(12, 1424) = 3.236, p = .001. Looking at the unique contribution of the predictors, the results in table E5 shows that Innlandet (β = .072, t = 2.487, p = .013), Agder (β = .104, t = 3.541, p = .001), Trøndelag (β = .078, t = 2.485, p = .013), Nordland (β = .087, t = 3.060, p = .002) and Troms and Finnmark (β = .104, t = 3.458, p = .001) were significant predictors of ROA. Next, for ROS the model suggests that $R^2 adj$ = .015 explains 1.5% of the variance on ROS, and that the impact of firm characteristics is not impacting firm performance collectively with F(12, 1448) = 1.867, p = .034. Moreover, looking at the unique contribution of the predictors, the results in table E6 shows that Troms and Finnmark (β = .104, t = 3.458, p = .034) were significant predictors of ROS.

In terms of region, the model suggests that $R^2 adj$ = .011 explains only 1.1% of the variance on TDA, and that the impact of firm characteristics is not impacting firm performance collectively with F(12, 1441) = 1.332, p = .193. Moreover, looking at the unique contribution of the predictors, the results in table E7 shows that Viken (β = .074, t = 2.295, p = .022) were significant predictors of TDA. Finally, we look at TLP. The model suggests that $R^2 adj$ = .028 explains only 2.8% of the variance on TLP, and that the impact of firm characteristics is impacting firm performance collectively with F(12, 778) = 1.836, p = .039. Moreover, looking at the unique contribution of the predictors, the results in table E8 shows that Vestfold and Telemark (β = .101, t = 2.529, p = .012), Rogaland (β = .107, t = 2.419, p = .016), Trøndelag (β = .115, t = 2.635, p = .009), Nordland (β = .104, t = 2.684, p = .007) and Troms and Finnmark (β = .118, t = 2.881, p = .004) were significant predictors of TLP. Thus, different regions are significant predictors of firm performance, however, grants are not changing based on this.

5.4 Summary of Results

Hypothesis 1:	The impact of government grants is positively correlated with return on assets	Not supported
Hypothesis 2:	The impact of government grants is positively correlated with return on sales	Not supported
Hypothesis 3:	The impact of government grants is positively correlated with total labor productivity	Not supported
Hypothesis 4:	The impact of government grants is positively correlated with total debt to assets	Not supported

Table 5.6. Summary of Results.

According to our results H1, H2, H3 and H4 can not be supported since no significance was found. However, we found the effect of government grants to be positive on ROS/TLP and negative on ROA/TDA. We also controlled for entrepreneur and firm characteristics, which did have a direct and significant impact on firm performance, however no significant change was found on grants as the models utilized are not parsimonious. None of our hypotheses can therefore be supported, but our control variables seem to have a direct impact on firm performance. Most noticeably, female-led firms had higher TDA and younger entrepreneurs had better performance in terms of ROA and ROS.

6 Discussion

This thesis aims to answer the research question "*what is the impact of government grants on firm performance?*". An increasing number of authors have begun to explore the effects of public grants on performance of firms (Jourdan & Kivleniece, 2017; Špička, 2018; Söderblom et al., 2015; Bergström, 2000). However, research in this area still remains relatively scarce. First, few studies have examined the effect of firm performance among grant-seeking firms. Previous studies have mostly used a random selection of companies as an untreated group (Busu, Caraiani, Hadad, Incze & Vargas, 2021). Second, there has been little research on the effect of grants in a Norwegian context. This is of interest since insufficient capital is considered as an important factor for insignificant entrepreneurial activities in Norway (Kolvereid & Isaksen, 2006). In addition, our results can contribute to both policy makers and grant-seeking firms. On one hand, this study provides policy makers guidance on whom, among entrepreneurs and firms, creates the most economic value and growth. On another hand, firms who seek grants are provided insights regarding the potential benefit of applying for such grants and the total effect grants have on performance.

The results from the initial empirical analysis suggest that government grants do not have a statistically significant impact on the performance of firms. Government grants aim to positively increase performance indicators such as fixed assets and employment, and thus helps firms facilitate the acquisition of more highly-educated employees, equipment and other tangible and intangible resources (Dvouletý et al., 2020, p. 14). However, our initial results show no significant correlation between how firms perform financially, regardless of receiving grants or not. One possible explanation for the lack of performance among granted firms can be the rent seeking principal presented by Gustafsson, Tingvall and Halvarsson (2016) where companies have become skilled at seeking grants and used it as their value creation rather than creating actual market value, and therefore reducing the numbers of grants available to companies with innovative and value creating intentions.

Another possible explanation could be that untreated firms may have received funding from other financing sources (i.e. venture funds or bank loans), thus reducing the need for public funding. In accordance with RBV, firms might also possess other resources that competitors can not replicate (Wernerfelt, 1984; Huo et al., 2016). For instance, firms who have one highly experienced and talented individual with a large network might have outperformed their peers regardless of receiving more funding in terms of public grants. However, firms should be aware that focusing too much on internal resources can ignore other important factors that impact performance (Seshadri, 2013). We find that grants positively impact ROS, which is contradicting Brachert et al. (2018) findings that suggest grants have a negative effect on sales. Conversely, other findings suggest that ROS has a positive effect on sales (Söderblom et al., 2015). An explanation for this can be that these researches are different design approaches, and thus different results.

The study also accounts for control variables to further investigate other explanatory factors. When controlling for external factors such as firm-characteristics we find several predictors of statistical significance on our outcome variable. For instance, one result suggests that grants alone do not impact the TLP of firms. This is in accordance with previous literature on the subject (Santos, 2019; Bernini and Pellegrini, 2011; Bernini et al., 2017). It is suggested by papers to investigate if the effects of public grants heterogeneous across industries and in which industries firms react better and in which worse (Dvouletý et al., 2020). This is an important aspect as previous papers find that there is an indifference in the industry-level and geographical region whereof the firm operates in. Our results suggest that “health”, “construction” and “telecom/IT/tech” are significantly impacting TLP. These are also industries that employ a high amount of people in general ("Norsk næringsliv", 2022). The performance of treatment firms in different industries was not significant, but geographical regions of the firms seemed to play a vital role. Firms operating in northern regions of Norway tend to benefit more from grants in terms of performance. An explanation for this could be that policy makers prioritize decentralized regions, and that these applications are being treated locally compared to most IN-applications that are being treated centrally (“Regionale distriktsmidler”, 2022).

Further, we controlled for entrepreneur characteristics including age and gender. We find that age does have a statistically significant impact on TLP and TDA, but not on the other performance metrics. This partly supports previous literature that there is a strong correlation between age and firm performance (Muzenda, 2014; Machirori & Fatoki, 2013). Erhardt, Werbel and Shrader (2003) also found that firms with a higher ratio of females resulted in higher returns on assets. Similarly, our results suggest that female-led companies have significantly higher debt to asset ratio compared to males. Financing firms with the help of debt, without going bankrupt can help firms perform better (Kraus & Litzenberger 1973; Kim 1978). Higher debt can help reduce information asymmetry, which is more viable in less mature firms as they have higher cost of financing (Carpenter & Petersen, 2002; Bloom et al., 2019). This is not in accordance with our findings that suggest that more mature firms have higher debt. In terms of entrepreneur age, we find that younger entrepreneurs tend to do significantly better in terms of sales and return on assets. This differs from Kristiansen et al. (2003) who found that older entrepreneurs are more successful in business. One should mention that government grants did not impact how well young people perform in terms of ROS and ROA.

The descriptives provide some indications on how Innovation Norway operates. The data shows that Innovation Norway mostly operates in accordance with their own guidelines and focus area (“Bli kjent med våre finansieringsordninger for oppstartbedrifter”, 2021). The prioritization of female entrepreneurs might strengthen the value of grants. Our results find that females have significantly better results when it comes to TDA, and a positive, but insignificant impact on ROS. There is a possibility that there is a bias present among the distributors of grants within Innovation Norway regarding which companies are selected. This bias might lead the distributors to disregard the formal guidelines and requirements for grants, and thereby skew the implications of the results slightly. Since the companies selected for analysis have already been granted or rejected prior to this study it has not been possible to prevent or adjust the research accordingly.

In sum, we find that several variables affect firm performance in line with existing literature. On ROA and TDA we find that grants have a negative effect, but for ROS and TLP we find that they have a positive effect. None of our hypotheses can be supported as the results are not significant. This can be explained by several of the factors that have been discussed. Nevertheless, our results can be of value to both policy makers and grant-seeking firms as our results show that certain predictors might impact how well firms will perform.

6.1 Limitations

Through the duration of our research and the process of writing the thesis, we have discussed and discovered some potential limitations regarding our research. These limitations are important to discuss as a tool to provide a better understanding of the results, and the certainty of the conclusions by discovering possible drawbacks. Addressing the most prominent limitations and possible drawbacks will also help with understanding the implications of the research, as well as provide a foundation for further research. First, our dataset is relatively solid within the chosen context and time frame. The data represents Norwegian companies that applied for funding in 2016. With market conditions and Innovation Norway changing relatively rapidly, we would recommend the readers to practice caution when extending the results to other nations and or market conditions, as well as uncritically extending them towards the current situation, without considering the contextual changes surrounding the research. When conducting the data collection and sampling we had to make a lot of decisions regarding what data was most beneficial to collect.

Second, the data available through proff.no that we used did not contain the necessary accounting numbers for us to calculate the TFP. We have identified this as a limitation of our research as it is particularly featured in previous research as an important indicator for performance. To reduce the limitation of a lack of TFP we substituted it with TLP, which is widely recognised as an alternative measure for TFP (Bøler et al., 2015). A specific limitation related to TLP is the fact that only 779 firms had registered any amount of employees. This significantly impacts the outcome of the analysis as well as the statistical power. We were not able to secure the employee data for each accounting year. This makes it impossible to analyze the yearly increase of employees as well as yearly TLP growth, which would have been more in line with previous research (Santos, 2019; Van Beveren, 2012).

Third, firm value is not always reflected by accounting measures such as ROA, ROS or TDA. Other measurements of firm performance should be explored. Continuously, we had to remove firms where our measures were unavailable. For instance, this resulted in removal of a considerable amount of firms which might have affected the statistical significance of our analysis and caused distorted results. Nevertheless, removal of these was necessary because we had no way of analyzing this due to no accounting data available by law. Although we recognize that this thesis has its limitations, our results still yield valuable contributions to existing literature.

6.2 Implications for Further Research

During the process of writing the thesis, we have encountered and discussed potential extensions to our approach, as well as alternative approaches. This resulted in implications and suggestions for further research. Implication for firms and Innovation Norway has been illustrated in table 6.1 based on our results and discussion.

Implication for Further Research	
Implications for IN	(1) Focus more on characteristics of the entrepreneurs behind the firms seeking grants as these are decisive for firm performance (i.e. encourage more females to apply for grants)
	(2) Avoid rent-seeking firms, they might be skilled at writing applications as a primary source of revenue rather than focusing on creating real market value
	(2) Quantify the customer survey of recipients so that one can correctly measure the effect of the support and prioritize recipients accordingly to better understand the impact of the support they receive (i. e. productivity rate, as Francis (2020) state that this is important for policy makers when

Implication for Further Research	
	assessing the effect of grants)
Implication for firms	(1) Firms should consider which other capital resources that are available since grants can be perceived as time-consuming and not of significant importance to firm performance, as our results indicate.
	(2) Focus more on their capital structure and not necessarily rely on grants as a primary source of funding. Firms should consider it as an addition to other available capital resources.

Table 6.1. Implications for Further Research.

In terms of further research, we have outlined three suggestions that can be of interest. First, future research should explore data from multiple government grant parties such as The Research Council or SIVA. This will give a more correct outlook on the effect of grants as more biases are potentially eliminated. Second, the long-term effect of grants should be further investigated. This study looks at the average accounting data from five consecutive years, and future studies should also account for the period before receiving a grant as a reference point. Similarly, different performance measures such as TFP should be explored. Third, alternative financing methods made available for both treated and untreated firms should be researched. On one hand, the signaling effect of receiving grants could provide firms with a better chance of attracting investments (Link & Scott, 2010). On another side, untreated firms might seek financing from other sources which could, as briefly mentioned, explain why grants don't impact the performance of firms significantly. As such, further research could contribute to understanding why there are no significant differences between treated and untreated groups on firm performance.

7 Conclusion

The aim of this study is to examine the impact of grants on performance for Norwegian firms seeking grants. The research question was formulated as "*what is the impact of government grants on firm performance?*". Our empirical analysis was based on financial accounting data of 1,449 companies from 2016 to 2020. The performance metric indicators were return on assets, return on sales, total debt to assets and total labor productivity. We find no significant impact of government grants on debt and labor productivity. However, there are indications of a negative trend on firm performance on the treated firms. On the contrary, grants have a positive impact on sales and assets, although it is not statistically significant. Conclusively, our results show no significant impact of government grants on firm performance.

Our research helps fill some gaps in the existing literature on public grants. We help confirm some results from prior research, as well as strengthen them by supplementing additional control variables previously not accounted for such as entrepreneur and firm characteristics. The impact of grants in different regions have not been accounted for in previous research. We find no significant effect on firm performance when controlling for regions. Nonetheless, regions are statistically significantly correlated to firm performance, and therefore we suggest incorporating regions as control variables in future studies.

The results of this thesis is interesting as it contributes to discovering the value of resources distributed by Innovation Norway. It is of critical importance to investigate the effect of the financial measures taken to better understand whether or not the resources are put to good use. Our result can also be of interest for entrepreneurs considering public grants, as the results indicate little to no benefit towards firm performance, therefore it might be more beneficial to focus on creating a solid business case for other forms of investments, rather than relying solely on grants.

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9 Appendix

Appendix A - Performance Metrics

Table A1: Literature on Performance Metrics

Literature on Performance Metrics	
Dess & Robinson Jr (1984)	Return on Assets (ROA)
Bharadwaj (2000)	Return on Assets (ROA)
Hennell & Warner (2001)	Return on Sales (ROS)
Brush & Vanderwerf (1992)	Return on Sales (ROS)
Shahfira & Hasanuh (2021)	Total Debt to Assets (TDA)
Tian & Zeitun (2007)	Total Debt to Assets (TDA)
Bøler et al. (2015)	Total Labor Productivity (TLP)
Liu et al. (2021)	Total Labor Productivity (TLP)

Table A2: Calculation of Performance Metrics

Calculation of Performance		
ROA	Return on asset = net income / total assets	Bharadwaj, A. (2000).
ROS	Return on sales = operating profits / net revenue	Hennell & Warner (2001)
TDA	Total debt ratio = total debt / total assets	Burja (2011)
TLP	Total labor productivity = revenue / employee	(Nguyen, Nguyen, Ngo & Nguyen, 2019)

Appendix B - Descriptive Statistics

Table B1: Industry Observation

	Freq.	*% of total*	*% Cum.*
Telecom/IT/Tech	344	23.7	23.7
Manufacturing	163	11.2	35.0
Consulting/R&D	492	34.9	68.9
Commerce	105	7.2	76.2
Aquaculture	40	2.8	79.0
Health	27	1.9	80.8
Construction	29	2.0	82.2
Education	49	3.4	86.2
Agriculture	13	0.9	87.1
Other	187	12.9	100.0
Total N of observations	1449		100%

Table B2: Region Observation

	Freq.	*% of total*	*% Cum.*
Viken	194	13.4	13.4
Oslo	263	18.2	31.5
Innlandet	70	4.8	36.4
Vestfold og Telemark	81	5.6	42.0
Agder	90	6.2	48.2
Rogaland	209	14.4	62.6
Vestlandet	157	10.8	73.4
Møre og Romsdal	66	4.6	78.0
Trøndelag	148	10.2	88.2
Nordland	61	4.2	92.4
Troms og Finnmark	103	7.1	99.5
Svalbard	7	0.5	100.0
Total N of observations	1,449		100%

Table B3: Firm Performance in Granted Firms

	Mean	*SD*	*P10*	*P50*	*P90*	*Min.*	*Max.*
ROA	-0.19	0.45	-0.66	-0.08	0.13	-3.62	2.89
ROS	-0.88	2.73	-2.21	-0.11	0.11	-24.73	14.24
TDA	0.98	1.00	0.25	0.75	1.82	-3.68	8.51
TLP	627.73	569.35	80.88	437.70	1497.77	0.00	2790.00

Table B4: Firm Performance in Rejected Firms

	Mean	*SD*	*P10*	*P50*	*P90*	*Min.*	*Max.*
ROA	-0.19	0.56	-0.7591	-0.05	0.21	-3,65	2.89
ROS	-1.10	3.87	-2.47	-0.04	0.16	-32.00	8.02
TDA	1.07	1.28	0.13	0.74	2.40	-2.13	8.51
TLP	562.55	571.20	41.34	378.80	1392.75	0.00	2751.6

Appendix C - Correlation Matrix

Table C1: Correlation Matrix for All Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1) ROA	1,00																	
(2) ROS	.31**	1,00																
(3) TDA	-.54**	-.11**	1,00															
(4) TLP	.26**	.24**	-.05	1,00														
(5) Grant	-.01	.03	-.04	.06	1,00													
(6) Age	-.05	-.06*	.06*	.10**	.01	1,00												
(7) Gender	-.01	-.05	-.05	.02	.06*	.11**	1,00											
(8) Firm age	.09**	-.01	.01	.26**	.07**	.03	,00	1,00										
(9) Telecom/IT/Tech	-.05*	-.05	-.02	-.11**	.07**	-.14**	.08**	,00	1,00									
(10) Manufacturing	-.04	-.02	.04	.10**	.07**	.06*	-.04	.06*	-.20**	1,00								
(11) Consulting	.02	,00	.01	.03	.08**	.07**	.02	-.02	-.40**	-.26**	1,00							
(12) Commerce	.01	.01	.03	.04	-.05	-.01	-.02	.05*	-.16**	-.10**	-.20**	1,00						
(13) Aquaculture	.00	-.01	.02	-.03	-.06*	.01	,00	-.04	-.09**	-.06*	-.12**	-.05	1,00					

(14) Health	.00	,00	-.02	-.07*	-.02	.02	-.02	,00	-.08**	-.05	-.10**	-.04	-.02	1,00				
(15) Construction	.02	.04	.01	.10**	-.03	.05	.04	.02	-.08**	-.05	-.10**	-.04	-.02	-.02	1,00			
(16) Education	.04	.04	-.02	,00	.02	-.01	-.07*	-.04	-.10**	-.07*	-.13**	-.05*	-.03	-.03	-.03	1,00		
(17) Agriculture	.01	.02	-.02	-.01	.02	.01	-.05*	,00	-.05*	-.03	-.07**	-.03	-.02	-.01	-.01	-.02	1,00	
(18) Other	.03	.03	-.03	-.04	-.20**	-.01	-.03	-.03	-.21**	-.14**	-.28**	-.11**	-.06*	-.05*	-.06*	-.07**	-.037	1,00

Table C2: Partial Correlation Matrix

		(1)	(2)	(3)	(4)	(5)
(1)	ROA	1.00				
(2)	ROS	0,31	1,00			
(3)	TDA	-0,51	0,02	1,00		
(4)	TLP	0,23	0,25	-0,09	1,00	
(5)	Grant	0,02	0,02	-0,08	0,01	1,00

Control Variables: Gender & Age & Firm Age & Telecom/IT/Tech & Manufacturing & Consulting & Commerce & Aquaculture & Health & Construction & Education & Argicultur & Other

Table C2: Correlation Matrix for All Models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
(1) Grant	1.00																									
(2) Age	.01	1.00																								
(3) Gender	.06*	.11**	1.00																							
(4) Firm age	.07**	.03	.00	1.00																						
(5) Viken	.16**	.03	.02	-.01	1.00																					
(6) Oslo	.08**	-.18**	-.08**	-,06*	-.19**	1.00																				
(7) Innlandet	.06*	.03	.00	.05	-.09**	-.11**	1.00																			
(8) Vestlandet	.00	.04	.00	.06*	-.10**	-.11**	-.05*	1.00																		
(9) Agder	.02	.01	.01	-.06*	-.10**	-.12**	-.06*	-.06*	1.00																	
(10) Rogaland	-.06*	.07**	.01	-.04	-.16**	-.19**	-.09**	-.10**	-.11**	1.00																
(11) Vestlandet	.03	.00	-.02	.02	.,14**	-.16**	-.08**	-.08**	-.09**	-.14**	1.00															
(12) Møre and Romsdal	.08**	.01	.06*	-.01	-.09**	-.10**	-.05	-.05*	.06*	-.09**	-.08**	1.00														
(13) Trondheim	.14**	-.01	.06*	.03	-.13**	-.16**	-.08**	-.08**	-.09**	-.14**	-.12**	-.07**	1.00													
(14) Nordland	.00	.05	.00	.01	-.08**	-.10**	-.05	-.05	-.05*	-.09**	-.07**	-.05	-.07**	1.00												
(15) Troms and Finnmark	.07*	.04	-.05*	.07**	-.11**	-.13**	.06*	-.07*	-.07**	-.11**	-.10**	.06*	-.09**	-.06*	1.00											

(16) Svalbard	0.04	.02	.03	-0.03	-.03	-.03	-.02	-.02	-.02	-.03	-.02	-.02	-.02	-.01	-.02	1.00										
(17) Telecom/IT/Tech	.07**	-.14**	.08**	.00	.01	.17**	.00	-.04	-.06*	.01	.01	-.06*	-.02	-.08**	-.07**	-.02	1.00									
(18) Manufacturing	.07**	.06*	-.04	.06*	-.01	-.13**	.11**	.01	.00	.01	-.03	.01	.06*	.06*	-.01	.04	-.20**	1.00								
(19) Consulting	.08**	.07**	.02	-.02	.04	-.07**	-.05	.03	.06*	.04	.00	.03	.02	-.02	-.08**	-.01	-.40**	-.26**	1.00							
(20) Commerce	-.05	-.01	-.02	.05*	-.01	.02	-.04	.02	.02	.02	-.02	.03	-.02	-.01	-.02	-.02	-.16**	-.10**	-.20**	1.00						
(21) Aquaculture	-.06*	.01	.00	-.04	-.02	-.07**	-.02	-.02	.03	-.06*	.02	.06*	.03	.11**	.02	-.01	-.09**	-.06*	-.12**	-.05	1.00					
(22) Health	-.02	.02	-.02	.00	-.01	.00	-.01	-.01	.01	.02	.00	-.03	.02	-.03	.02	-.01	-.08**	-.05	-.10**	-.04	-.02	1.00				
(23) Construction	-.03	.05	.04	.02	.00	-.05*	-.01	.03	-.02	.03	.01	-.01	-.05	.07**	.04	-.01	-.08**	-.05	-.10**	-.04	-.02	-.02	1.00			
(24) Education	.02	-.01	-.07*	-.04	-.05	.02	-.01	.00	-.02	-.03	.02	.07**	0.03	.00	.04	.04	-.10**	-.07*	-.13**	-.05*	-0.03	-.03	-.03	1.00		
(25) Agriculture	.02	.01	-.05*	0.00	-.04	-.01	-.02	.01	.01	.00	.01	-.02	-.01	.02	.06*	-.01	-.05*	-.03	-.07**	-.03	-.02	-.01	-.01	-.02	1.00	
(26) Other	-.20**	-.01	-.03	-.03	-.01	.03	.02	-.03	-.01	-.06*	-.01	-.03	-.03	.00	.16**	.00	-.21**	-.14**	-.28**	-.11**	-.06*	-.05*	-.06*	-.07**	-.04	1.00

Appendix D - Robustness Standard Error

Table D1: ROA, Robustness Test

Parameter Estimates with Robust Standard Errors

Dependent Variable: ROA

Parameter	B	Robust Std. Error[a]	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	-,356	,107	-3,325	,001	-,567	-,146
GRANT	-,002	,030	-,058	,954	-,060	,057
GENDER	,002	,034	,073	,942	-,064	,069
AGE	-,003	,001	-2,234	,026	-,005	,000
FIRM_AGE	,047	,011	4,130	,000	,025	,070
TELE_IT	-,094	,049	-1,915	,056	-,190	,002
MANU	-,093	,062	-1,499	,134	-,215	,029
CONS	-,018	,045	-,397	,691	-,106	,070
ECOM	-,033	,046	-,704	,482	-,123	,058
AQUA	-,015	,053	-,286	,775	-,120	,089
HEALTH	-,057	,079	-,714	,475	-,212	,099
CONSTR	,042	,078	,534	,594	-,112	,196
EDUC	,072	,066	1,101	,271	-,056	,201
ARGO	,009	,080	,109	,914	-,148	,166
OTHER	0[b]	.	.	.	.	.

Table D2: ROS, Robustness Test

Parameter Estimates with Robust Standard Errors

Dependent Variable: ROS

Parameter	B	Robust Std. Error[a]	t	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Intercept	,393	,655	,599	,549	-,893	1,679
GRANT	,313	,218	1,436	,151	-,115	,741
GENDER	-,315	,206	-1,525	,127	-,720	,090
AGE	-,017	,006	-2,772	,006	-,030	-,005
FIRM_AGE	-,020	,073	-,279	,780	-,163	,123
TELE_IT	-,636	,316	-2,015	,044	-1,255	-,017
MANU	-,520	,382	-1,362	,174	-1,269	,229
CONS	-,278	,303	-,917	,359	-,874	,317
ECOM	-,135	,356	-,378	,705	-,833	,564
AQUA	-,374	,436	-,858	,391	-1,228	,481
HEALTH	-,204	,523	-,389	,697	-1,230	,823
CONSTR	,622	,255	2,437	,015	,121	1,123
EDUC	,386	,277	1,392	,164	-,158	,930
ARGO	,364	,283	1,287	,198	-,191	,920
OTHER	0[b]	.	.	.	.	.

Table D3: TDA, Robustness Test

Parameter Estimates with Robust Standard Errors

Dependent Variable: TDA

Parameter	B	Robust Std. Error[a]	t	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Intercept	,723	,252	2,865	,004	,228	1,217
GRANT	-,102	,067	-1,512	,131	-,234	,030
GENDER	-,161	,093	-1,731	,084	-,343	,021
AGE	,006	,003	1,923	,055	,000	,012
FIRM_AGE	,011	,028	,388	,698	-,045	,067
TELE_IT	,106	,097	1,090	,276	-,085	,297
MANU	,235	,117	2,013	,044	,006	,464
CONS	,143	,092	1,543	,123	-,039	,324
ECOM	,232	,122	1,900	,058	-,007	,472
AQUA	,220	,189	1,164	,244	-,151	,591
HEALTH	-,072	,161	-,449	,654	-,387	,243
CONSTR	,182	,203	,898	,369	-,216	,580
EDUC	,007	,143	,046	,963	-,273	,287
ARGO	-,084	,214	-,391	,696	-,503	,336
OTHER	0[b]	.	.	.	.	.

Table D4: TLP, Robustness Test

Parameter Estimates with Robust Standard Errors

Dependent Variable: TLP

Parameter	B	Robust Std. Error[a]	t	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Intercept	-595,286	170,722	-3,487	,001	-930,425	-260,146
GRANT	21,911	41,223	,532	,595	-59,012	102,834
GENDER	39,066	53,070	,736	,462	-65,115	143,247
AGE	3,747	1,769	2,118	,034	,274	7,220
FIRM_AGE	134,137	20,488	6,547	,000	93,917	174,356
TELE_IT	-69,288	66,351	-1,044	,297	-199,539	60,963
MANU	134,211	79,899	1,680	,093	-22,636	291,058
CONS	63,032	62,153	1,014	,311	-58,978	185,042
ECOM	96,408	90,792	1,062	,289	-81,822	274,638
AQUA	2,448	135,643	,018	,986	-263,829	268,724
HEALTH	-285,062	120,197	-2,372	,018	-521,017	-49,107
CONSTR	423,658	265,854	1,594	,111	-98,231	945,548
EDUC	82,073	131,607	,624	,533	-176,280	340,427
ARGO	-144,201	450,733	-,320	,749	-1029,021	740,619
OTHER	0[b]	.	.	.	.	.

Table D5: Test for Heteroskedasticity

Tests for Heteroskedasticity

White Test for Heteroskedasticity[a,b,c]

Chi-Square	df	Sig.
65,003	57	,218

a. Dependent variable: TDA

b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.

Tests for Heteroskedasticity

White Test for Heteroskedasticity[a,b,c]

Chi-Square	df	Sig.
61,129	57	,330

a. Dependent variable: ROS

b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.

Tests for Heteroskedasticity

White Test for Heteroskedasticity[a,b,c]

Chi-Square	df	Sig.
67,426	54	,104

a. Dependent variable: TLP

b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.

Tests for Heteroskedasticity

White Test for Heteroskedasticity[a,b,c]

Chi-Square	df	Sig.
53,047	57	,624

a. Dependent variable: ROA

b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.

Appendix E - Regression Models

Table E1: Relationship between ROA and Industry Characteristics

	B	*SE B*	*β*	*t*	*p*
Constant	-0.179 (-0.236, -0.121)	0.029		-6.099	.000
Grant	0.003 (-0.052, 0.058)	0.028	0.003	0.108	.914
Telecom/IT/Tech	- 0.065 (-0.134, 0.004)	0.035	- 0.056	- 1.860	.063
Manufacturing	- 0.069 (-0.158, 0.019)	0.045	- 0.044	- 1.541	.124
Commerce	0.000 (-0.106, 0.105)	0.054	0.000	- 0.008	.993
Aquaculture	0.008 (-0.168, 0.152)	0.082	- 0.003	- 0.097	.923
Healthcare	- 0.030 (-0.229, 0.169)	0.102	- 0.008	- 0.293	.769
Construction	0.061 (-0.125, 0.246)	0.095	0.017	0.640	.523
Education	0.087 (-0.063, 0.237)	0.076	0.034	1.135	.256
Agriculture	0.029 (-0.224, 0.302)	0.139	0.006	0.210	.834
Other	0.023 (-0.064, 0.109)	0.044	0.015	0.518	.605

Table E2: Relationship between ROS and Industry Characteristics

	B	*SE B*	*β*	*t*	*p*
Constant	-1.148 (-1.516, -0.779)	0.188		-6.108	.000
Grant	0.003 (-0.058, 0.644)	0.179	0.044	1.637	.102
Telecom/IT/Tech	- 0.065 (-0.747, 0.141)	0.226	- 0.040	- 1.338	.181
Manufacturing	- 0.069 (-0.814, 0.329)	0.291	- 0.024	- 0.831	.406
Commerce	0.000 (-0.509, 0.845)	0.347	0.014	0.497	.619
Aquaculture	0.008 (-1.129, 0.995)	0.531	- 0.004	- 0.164	.870

Healthcare	- 0.030 (-1.161, 0.339)	0.637	0.004	0.140	.888
Construction	0.061 (-0.390, 2.028)	0.616	0.036	1.329	.184
Education	0.087 (-0.204, 1.690)	0.483	0.042	1.539	.124
Agriculture	0.029 (-1.056, 2.496)	0.905	0.021	0.796	.426
Other	0.023 (-0.242, 0.866)	0.282	0.032	1.104	.270

Table E3: Relationship between TDA and Industry Characteristics

	B	*SE B*	*β*	*t*	*p*
Constant	1.101 (0.972, 1.229)	0.066		-16.800	.000
Grant	-0.105 (-0.228, 0.017)	0.062	-0.046	-1.689	.091
Telecom/IT/Tech	- 0.065 (-0.220, 0.090)	0.079	- 0.025	- 0.825	.409
Manufacturing	0.108 (-0.092, 0.308)	0.102	0.030	1.061	.289
Commerce	0.091 (-0.147, 0.329)	0.121	0.021	0.749	.454
Aquaculture	0.076 (-0.286, 0.438)	0.185	0.011	0.441	.681
Healthcare	- 0.204 (-0.638, 0.231)	0.222	-0.025	-0.919	.358
Construction	0.042 (-0.378, 0.462)	0.214	0.005	0.197	.884
Education	-0.124 (-0.453, 0.205)	0.168	-0.020	-0.737	.461
Agriculture	-0.191 (-0.809, 0.426)	0.315	-0.016	-0.608	.543
Other	-0.145 (-0.338, 0.048)	0.098	-0.043	-1.473	.141

Table E4: Relationship between TLP and Industry Characteristics

	B	*SE B*	*β*	*t*	*p*

Constant	581.392 (492.997, 669.787)	45.029		12.911	.000
Grant	66.644 (-17.587, 150.874)	42.908	0.057	1.553	.121
Telecom/IT/Tech	-131.834 (-237.049, -26.620)	53.597	-0.100	-2.46	.014
Manufacturing	119.407 (-9.521, 248.334)	65.677	0.071	1.818	.069
Commerce	74.592 (-86.764, 235.949)	82.197	0.034	0.907	.364
Aquaculture	-98.943 (-330.795, 132.910)	118.108	-0.031	-0.838	.402
Healthcare	-341.265 (-667.490, -15.041)	166.182	-0.074	-2.054	.040
Construction	432.651 (128.947, 736.354)	154.709	0.101	2.797	.005
Education	-26.520 (-257.897, 204.857)	117.866	-0.008	-0.225	.822
Agriculture	-118.113 (-759.437, 523.211)	326.697	-0.013	-0.362	.718
Other	-56.405 (-195.473, 82.663)	70.842	-0.031	-0.796	.426

Table E5: Relationship between ROA and Region

Table 1.1	*B*	*SE B*	*β*	*t*	*p*
Constant	-0.250 (-0.317, -0.183)	0.034		-7.336	0.000
Grant	-0.039 (-0.093, 0.016)	0.028	-0.038	- 1.399	0.162
Viken	- 0.042 (-0.135, 0.050)	0.047	-0.029	- 0.897	0.370
Innlandet	0.165 (0.035, 0.295)	0.066	0.072	2.487	0.013
Vestfold and Telemark	0.083 (-0.041, 0.206)	0.063	0.038	1.317	0.188
Agder	0.216 (0.096, 0.335)	0.061	0.104	3.541	0.000
Rogaland	0.067 (-0.023, 0.157)	0.046	0.048	1.467	0.143
Vestlandet	0.084 (-0.014, 0.182)	0.050	0.053	1.688	0.092

Møre og Romsdal	0.069 (-0.065, 0.202)	0.068	0.029	1.010	0.313
Trøndelag	0.128 (0.027, 0.229)	0.051	0.078	2.485	0.013
Nordland	0.215 (0.077, 0.353)	0.070	0.087	3.060	0.002
Troms and Finnmark	0.199 (0.86, 0.312)	0.058	0.104	3.458	0.001
Svalbard	0.237 (-0.161, 0.635)	0.203	0.031	1.170	0.242

Table E6: Relationship between ROS and Region

	B	*SE B*	*β*	*t*	*p*
Constant	-1.252 (-1.682, -0.821)	0.219		-5.708	0.000
Grant	0.104 (-0.247, 0.455)	0.179	0.016	0.580	0.562
Viken	- 0.042 (-0.972, 0.224)	0.305	-0.040	- 1.228	0.220
Innlandet	0.165 (-0.148, 1.554)	0.434	0.047	1.620	0.106
Vestfold and Telemark	0.083 (-0.220, 1.384)	0.409	0.041	1.424	0.155
Agder	0.216 (-0.423, 1.120)	0.393	0.025	0.886	0.376
Rogaland	0.067 (-0.494, 0.647)	0.298	0.010	0.302	0.763
Vestlandet	0.084 (-0.052, 1.222)	0.325	0.056	1.801	0.072
Møre og Romsdal	0.069 (-1.249, 0.496)	0.445	-0.024	-0.846	0.398
Trøndelag	0.128 (-0.399, 0.913)	0.334	0.024	0.770	0.442
Nordland	0.215 (-0.060, 1.733)	0.457	0.052	1.831	0.067
Troms and Finnmark	0.199 (0.062, 1.534)	0.375	0.064	2.126	0.034
Svalbard	0.237 (-1.419, 3.415)	1.232	0.021	0.810	0.418

Table E7: Relationship between TDA and Region

	B	*SE B*	*β*	*t*	*p*
Constant	0.962 (0.812, 1.112)	0.077		12.572	.000
Grant	-0.060 (-0.183, 0.062)	0.062	-0.026	-0.966	.334
Viken	0.244 (0.035, 0.453)	0.106	0.074	2.295	.022
Innlandet	-0.002 (-0.298, 0.294)	0.151	0.000	-0.013	.990
Vestfold and Telemark	0.217 (-0.063, 0.498)	0.143	0.044	1.519	.129
Agder	0.148 (-0.121, 0.416)	0.137	0.032	1.078	.281
Rogaland	0.188 (-0.016, 0.392)	0.104	0.059	1.881	.070
Vestlandet	0.052 (-0.052, 0.275)	0.113	0.014	0.461	.645
Møre og Romsdal	0.214 (-0.089, 0.518)	0.155	0.040	1.384	.167
Trøndelag	-0.024 (-0.254, 0.205)	0.117	-0.007	-0.207	.836
Nordland	-0.091 (-0.404, 0.221)	0.159	-0.016	-0.575	.566
Troms and Finnmark	-0.017 (-0.273, 0.240)	0.131	-0.004	-0.127	.899
Svalbard	-0.140 (-0.981, 0.701)	0.429	-0.009	-0.326	.744

Table E8: Relationship between TLP and Region

Table 1.1	*B*	*SE B*	*β*	*t*	*p*

Constant	435.313				
	(331.406, 539.221)	52.931		8.224	0.000
Grant	45.319				
	(-39.684, 130.323)	43.301	0.039	1.047	0.296
Viken	136.682				
	(-9.110, 282.475)	74.268	0.081	1.840	0.066
Innlandet	167.534.				
	(-29.596, 364.664)	100.419	0.066	1.668	0.096
Vestfold and Telemark	246.176				
	(55.053, 437.299)	97.36	0.101	2.529	0.012
Agder	22.109				
	(-173.993, 218.212)	99.896	0.009	0.221	0.825
Rogaland	175.895				
	(-0.016, 318.658)	72.725	0.107	2.419	0.016
Vestlandet	102.020				
	(-24.443, 274.209)	76.068	0.071	1.642	0.101
Møre og Romsdal	208.563				
	(-126.456, 330.497)	116.388	0.034	0.877	0.381
Trøndelag	291.413				
	(53.190, 363.936)	79.148	0.115	2.635	0.009
Nordland	257.832				
	(78.278, 504.548)	108.573	0.104	2.684	0.007
Troms and Finnmark	-273.923				
	(82.160, 433.503)	89.488	0.118	2.881	0.004
Svalbard	-273.923				
	(-1066.555, 518.709)	403.772	-0.024	-0.678	0.498