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Do Subsidies to the Entrepreneurial Investment incentivize Earnings Management? The Norte 2020 case

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Abstract

This study aims to understand if subsidies incentivize companies to manage earnings through discretionary accruals or real activities manipulation. The work sample used includes 190 companies from the northern region of Portugal that obtained investment subsidies between 2014 and 2019, through the Norte 2020.

To analyze the relationship between earnings management and subsidies, the incentives for each stage of the subsidy's process were identified, which led to the identification of four variables of interest: cashflow from operations, discretionary expenses, production costs and total accruals. The methodology adopted was to first calculate the abnormal values of these variables to, then, decompose and understand which part of the abnormal amount results from the subsidy.

Due to the small sample size, it was used an out-of-sample approach to determine the coefficients needed to calculate the abnormal values of the dependent variables previously identified. The abnormal values were, then, regressed, through models that included, the following independent variables: two control variables for dimension and performance of the company and four dummy variables that identified different stages of the process.

The results suggest that companies are not incentivized by subsidies to manage earnings.

Keywords: Earnings management; Subsidies; Investment; Norte 2020; Accruals; Real activities

Resumo

Este estudo tenciona compreender se os subsídios incentivam as empresas a manipular resultados, através de acrescimentos discricionários ou através da manipulação de atividades reais. A amostra de trabalho utilizada inclui 190 empresas da região norte de Portugal que obtiveram os subsídios ao investimento entre 2014 e 2019, através do Norte 2020.

Para analisar a relação entre manipulação de resultados e subsídios foram identificados as várias fases do processo do subsídio, o que levou à identificação de quatro variáveis de interesse: fluxo de caixa operacional, despesas discricionárias, custos de produção e acréscimos totais. A metodologia adotada passou por, primeiro, calcular os valores anormal das variáveis para, depois, decompor e perceber qual parte dos valores anormais resultava da atribuição do subsídio.

Devido à pequena dimensão da amostra, foi utilizada uma técnica de "fora da amostra" para determinar os coeficientes necessários para calcular os valores anormais das variáveis dependentes previamente identificadas. Os valores anormais foram, depois, regredidos, através de modelos que incluíam, como variáveis dependentes: duas variáveis de controlo relativas à dimensão e ao desempenho e quatro variáveis *dummy* que identificavam as diferentes fases do processo.

Os resultados sugerem que os subsídios não incentivam as empresas a manipular resultados.

Palavras-chave: Manipulação de Resultados; Subsídios; Investimento; Norte 2020; Acréscimos; Atividades Reais

Contents

Table of Figures

Table of Annexes

Glossary

EU	European Union
TFEU	Treaty on the Functioning of the European Union
ESI	European Structural and Investment
FA	Financial Autonomy
BIE	Business Innovation and Entrepreneurship
GAAP	Generally Accepted Accounting Principles
SEC	Security Exchange Commission
AAERS	Accounting and Auditing Enforcement Releases
SOX	Sarbanes Oxley Act
DA	Discretionary Accruals
NDA	Non-Discretionary Accruals
PP&E	Plant, Property and Equipment
R&D	Research and Development
PTA	Portuguese Tax Authority
SME	Small and Medium Enterprise
CFO	Cashflow from operations
ST	Selection Threshold
FD	Fulfillment Degree
SABI	Sistema de Análise de Balanços Ibéricos
SIME	Sistema de Incentivos à Modernização Empresarial
QREN	Quadro de Referência Estratégico Nacional
CAE	Código de Atividade Económica

1. Introduction

Subsidies consist in the transfer of funds from the government to microeconomic activities, namely companies (Zhang, An, & Zhong, 2019). As such, they constitute important sources of financing to companies that cannot obtain it other way due to market failures (Horvath & Lang, 2021; Li, Lee, & Wan, 2020; Xiang & Worthington, 2017). This is particularly true for the Portuguese context where companies are mainly small and medium enterprises (SME) and where the capital market is not particularly relevant (Moreira, 2006). In Portugal, an important subsidies programme is the Portugal 2020.

Portugal 2020 is the Partnership Deal for the period of 2014-2020 between Portugal and the European Commission that sets the framework for the application of the European Funds. This comes from the fact that Portugal, as a member of the European Union (EU), benefits from the Treaty on the Functioning of the European Union (TFEU) that establishes that the EU must work towards the economic cohesion of the countries and regions that are part of it.

To help achieve the EU's goal and strategies, the Portugal 2020 establishes, as priorities, the competition and internationalization, the social inclusion and employment, the human capital and the sustainability and the efficiency in the resources' usage. In the northern region of the country, the programme is operationalized through the Norte 2020, which follows the same guidelines as the Portugal 2020 ("Portaria n.º 57-A/2015," 2015; "Portaria n.º 97-A/2015," 2015).

Operationally, in order to implement European strategies, subsidies have conditions to be conceded. Companies must have a minimum financial autonomy and guarantee the required funds to develop the project that will be developed with the subsidy. Additionally, the project must contribute to the development of financial indicators that are important to the European goals.

However, despite these control measures, reports show that, even though Portugal has an high execution of the European subsidies, it has a low index of implementation of the European strategies when compared with other European countries (Stec & Grzebyk, 2018).

That being said, one of the explanatory possibilities to the low index of implementation of European strategies that is raised by Fernandes et al. (2021) is that companies, by not being

able to reach the predefined goals, recur to earnings management to achieve them. This would lead to an high execution as companies would achieve the minimum requirements, but, also, to a low level of real development. In fact, the authors find a link between the success of the project and the probability of the earnings management (Fernandes et al., 2021). Based on other authors' definitions, in this study, "earnings management" will be defined as a legal, but opportunistic, accounting choice and a way to maximize the utility of the manager.

So, this dissertation intends to understand if Norte 2020 subsidies create incentives for companies to manage earnings. In more detail, we want to understand if the incentives spotted in each phase of the subsidy's process leads to earnings management, namely (i) if in the application companies increased their cashflow from operations to obtain the required self-financing; (ii) if subsidized companies managed their costs in order to accomplish the plan presented in the application and (iii) if subsidized companies increased their earnings at the end of the project to reach the pre-defined results.

To do that, we will take a group of companies whose performance deteriorated between 2014 and 2019, that started being subsidized by the Norte 2020 programme between 2014 and 2019, gathered by Silva (2020) and analyze the earnings management that results from them receiving a subsidy.

With the Portugal 2020 and, consequently, Norte 2020 reaching their ends and being replaced by new programmes that will last from 2021 to 2027, this dissertation is particularly important to take conclusions from what was achieved and what could have been achieved. The subject becomes even more relevant considering the economic crisis that the COVID-19 provoked and that the EU is tackling through the transfer, to Portugal, of the largest amount of funds in the shortest period of time since its entrance in the EU. (Fernandes, Laureano, Abrantes, & Laureano, 2021).

As previously referred Fernandes et al. (2021) already approached this topic but there were already other studies focused on previous programmes that studied the relationship between earnings management and subsidies. One example is the evidence that companies managed earnings to be selected to the SIME ("Sistema de Incentivos à Modernização Empresarial") (Pinheiro, 2008). Nevertheless, our study will go further by analyzing the incentives to

earnings management in all stages of the subsidy's process, from the application until the results evaluation.

Besides the previously mentioned studies, the relationship between subsidies and earnings management is not widely discussed. However, earnings management is a vast topic that has attracted a lot of curiosity. As such, we will take conclusions from other contexts and apply them to the Norte 2020 case, considering its particularities.

Overall, our results lead to the conclusion that the Norte 2020's subsidies do not incentivize companies to manage earnings since we did not find evidence of the cashflow being managed to obtain the required self-financing, neither did we find support for the hypothesis of companies increasing their costs during the project or managing their earnings, specially sales, to obtain the intended results.

The structure of the dissertation is as follows. In section 2, it will be done the literature review. The literature review will start with the definition of subsidies and the legal framework that sets the Norte 2020. Then, the "earnings management" concept will be introduced, followed by the description of the incentives that lead to earnings management and of the "practices" adopted by companies to manage earnings. The literature review will end with a section dedicated to the relationship between earnings management and another that elaborates the methodologies described in literature to measure earnings management. Section 3 is where the hypotheses to be tested will be presented. Section 4 exposes the methodology that will be used to test the hypothesis, followed by Section 5, where the data to be used is detailed. Section 6 will show the results of the estimations, including robustness tests. Finally, Section 7 will be for conclusions, with Section 8 and 9 dedicated to References and Annexes, respectively.

2. Literature Review

2.1. Subsidies in the Portuguese context

2.1.1. An introdoctury note

Zhang et al. (2019) provide a simple definition of state subsidies:

> "*State subsidies are a form of policy tool for the government to direct financial resources to the firms or sectors that it supports* (Zhang et al., 2019)"

As a source of financing, its importance cannot be underestimated. It is true that small companies find their primary source of financing in bank loans, since they face obstacles when they are trying to reach financial markets (Moreira, 2006), but, when bank loans are not accessible, either because there is information asymmetry (Freedman & Click, 2006) or because there is a lack of quality of the projects (Horvath & Lang, 2021; Li et al., 2020; Xiang & Worthington, 2017), subsidies appear as an alternative (Horvath & Lang, 2021; Nguyen, Tran, & Do, 2018).

However, despite widely argued (as some authors defend subsidies' positive effects on performance (Li et al., 2020; Nguyen et al., 2018)), there are studies that highlight the crowding out effect of subsidies – i.e. the replacement of the original investment – or the decrease in sales that they provoke (Luo, Yang, Luo, & Liu, 2016).

Both of these factors – the important source of financing that subsidies represent and their impact on performance – are relevant to the earnings management topic since companies might feel compelled to manage earnings to guarantee the financing and (or) to improve their performance.

However, before heading to the motivations that lead companies to manipulate earnings[1], we will, first, introduce the legal framework that involves companies subsidized by European Funds.

[1] "Manage earnings" and "manipulate earnings" are used as synonims during this document.

2.1.2. European subsidies – NORTE 2020

As a member of the European Union (EU), Portugal benefits from the Treaty on the Functioning of the European Union (TFEU). The TFEU establishes that the EU must work towards the cohesion of the countries and regions that are part of it. To achieve that, the EU uses a palette of instruments, including investment funds. These funds are operationalized through five organisms that are part of the European Structural and Investment Funds (ESI Funds). ESI Funds should be implemented in each Member State through programmes that must be previously approved by the European Commission.

The Partnership Deal for the period of 2014-2020 between Portugal and the European Commission sets the framework for the Portuguese programme that is the Portugal 2020. The latter defines the interventions, the investments and the financing priorities needed to accomplish the goals set by the European Union. Considering those priorities, Portugal 2020 splits itself in 4 main themes, namely "Competitivity and internationalization", "Social inclusion and employment", "Human capital", and "Sustainability and efficiency in the resources' usage". Likewise, Norte 2020, the programme that operationalizes Portugal 2020 in the Portuguese northern region, follows the same guidelines.

Within Norte 2020, this study will be focused on the "Competitivity and internationalization" and "Social Inclusion and Employment" that are, in Portugal, legislated in the first section of the first title of the Portaria nº 57-A/2015 and on the Portaria nº 97-A/2015. The first type of investment ("Competitivity and internationalization") focuses on three areas: "Business innovation and entrepreneurship", "Qualification and internationalization of SMEs" and "Innovation and technological development", while the second ("Social Inclusion and Employment") is focused on "Support System to the Entrepreneurship and Employment". As a whole, these areas represent more than 90% of the European funds invested in small and medium enterprises (SME) in the northern region, hence the focus on those.

Now that the area of operation of this study is understood, it becomes mandatory to describe the procedures taken by Norte 2020 to guarantee a good allocation of resources. These procedures will provide a great insight on what are the incentives that companies face, regarding earnings management, to be financed by European funds.

So, the Norte 2020 programme has a limited budget that is applied on the previously referred areas through Calls. These Calls, that are announced periodically and divided by theme, are selection processes for projects that fit in the corresponding theme of the Call. As such, interested companies must submit a plan that details the expenses on which it will incur during the execution of the project and commit to a forecast of qualitative and quantitative objectives to be achieved through the execution of the project. Being that this process[2] goes through different stages (application, project and results evaluation), the following paragraphs will detail what companies face in each of them.

Regarding the application, companies have two issues to address: eligibility and, since there is a limited budget, competition. Both these issues are based on financial information from the pre-project year, that is the year before the start of the project. Nevertheless, the application normally takes place in the same year as the start of the project.

When it comes to eligibility, companies must, primarily, demonstrate that they are able to finance the project, being that at least 25% of the project's eligible costs must be self-financed or financed by other means than the subsidy. As said, these 25% might be achieved through self-financing, which is based on the cashflow from operations of the pre-project year. Companies with less than 1 year of age are required to finance 20% of the expenses through equity. Additionally, each area has extraordinary demands:

- In the areas of "Innovation and entrepreneurship" and "Innovation and technological development" companies should have, in the pre-project year, a minimal financial autonomy ($FA = \frac{Equity}{Assets}$) of 0,2, if they are not SME, or 0,15, if SME.
- In the "Qualification and internationalization of SMEs", if the project is individually done, the financial autonomy required is of, at least, 0,15. However, when there is more than one company involved, they just need to have a positive equity.

In the "Business innovation and entrepreneurship" area, not only companies face eligibility criteria. Projects' plans face eligibility criteria, as it is demanded that the economical-financial

[2] From this point onward, "process" will be used as the period of time that goes from the pre-project year until the evaluation of the results of the project in the cruise year. It must be noted that it is different from "project", since the latter only involves the time span where the company incurs in expenses to achieve goals, as defined in the application's plan.

viability of the project is assured and that 20% of eligible expenses are financed by equity, as calculated by the formula $\frac{Equity\ of\ the\ project}{Eligible\ expenses}$.

Still concerning the application, but now regarding competition, companies and their corresponding projects' plans are chosen based on the Merit of the Project (MP). The MP is an index composed by several performance points, such as "expected value creation" or "exports intensity". For each criterion, a score is given to the project and the MP is the weighted average of them all. Based on the MP, the company with the highest index will be the first to be granted access to the subsidy, followed by the company with the second highest MP, and so on until the budget ends. The company that receives the subsidy with the lowest MP sets the Selection Threshold (ST), i.e. the ST is the lowest MP of all the chosen companies. This threshold will be important later when the results are evaluated.

During the execution of the project, companies face the obligation of incurring in the expenses that were submitted with the project's plan in the application. These expenses must be backed by accounting, bank records and by invoices (Fernandes & Laureano, 2019).

Finally, results evaluation occurs in the post-project year (the year after the end of the project) and, in the "Business innovation and entrepreneurship" area, also in the cruise year (the second year after the end of the project). These moments are important since they might define whether the subsidy will be refunded, i.e. given back to the management authority that conceded it, or not.

Regardless of the investment area, according to "Orientação de Gestão nº 15", in the post-project year, companies have to calculate the real MP, using the same criteria as they did in the application but now with real data. If that value is below the ST, they have to give back the received funds[3].

If companies, in the area of "Business innovation and entrepreneurship" (BIE) do not give back the received funds in the post-project year because they obtained MP>ST, they might have to do it in the cruise year. This is because, depending on the evaluation of the project's results at the cruise year, this state aid might be (i) a subsidized loan or (ii) an hybrid between a subsidy and a subsidized loan.

[3] This was the legislation enforced in the previous framework - the QREN - and companies are acting with the expectation that it will be the same in Portugal 2020.

This evaluation is based on 3 indicators, being that only 2 of them are financial indicators[4]. The first of these two is the increase in the Gross Value Added (GVA) between the pre-project year and the cruise year and the second is the increase in sales between that same time span. The weight of these indicators on the evaluation varies, and it goes from 25% to 40% for the first indicator and from 15% to 40% to the second. The evaluation is summarized on the equation of the Fulfillment Degree (FD):

$$FD = \sum_{i=1}^{n} \beta_i \frac{I_e}{I_i}$$

Where I*i* is the value of the indicator established during the application, *Ie* is the value of the indicator in the cruise year and β_i is the weight of each indicator.

If the Fulfillment Degree is higher than 100%, the subsidized loan will progressively be "transformed" into a subsidy, being that the subsidy part had a limit of 60% for projects that started until the end of 2018[5]. As an example, the best case scenario for a company subsidized in the BIE area would be to have 40% of the project supported by a subsidized loan and 60% by a subsidy.

In conclusion, this overview of the regulation allowed to grasp what might be the incentives that guide companies and the indicators that might be worth to manipulate in this context. Summing up, during the application, it is worth to pay attention to financial autonomy indicators, while during the execution of the project, costs are under the spotlight and, at the results evaluation, GVA (gross value added) and sales appeared as important indicators to the preservation of the funds.

The next section will provide greater strength to these first signals by identifying the incentives that guide managers regarding earnings management and the main strategies adopted by them.

[4] For the sake of parsimony, the third indicator, that it is not financial will not be detailed as it is not important for this study.

[5] Until April, 2017, this limit was of 50% of the total amount.

2.2. Earnings Management

2.2.1. Definition of earnings management

There are alternative definitions of earning managements, depending on the final goal and whether that behavior is in line with the law or not. Vincent (2001) defines earnings management as an accounting choice and it states the following:

> *"an accounting choice is any decision whose primary purpose is to influence (either in form or substance) the output of the accounting system in a particular way, including not only financial statements published in accordance with GAAP [Generally Accepted Accounting Principles], but also tax returns and regulatory fillings."*.

That being said, earnings management can be seen as an instrument that enhances the transparency of reports and, therefore, takes advantage of the flexibility that accounting allows to signal private information on future cashflows or it can be an opportunistic way to maximize the utility of the management, either by increasing or decreasing the income (P. M. Dechow & Schrand, 2004; Vincent, 2001). Within the opportunistic behavior, earnings management might even arise as a misrepresentation of financial information, which would be illegal and classified as accounting fraud.

In this study, "earnings management" will be defined as a legal, but opportunistic, accounting choice and a way to maximize the utility of the manager. That being said, "accounting choice" will be used as a broader term that includes earnings management but also decisions that enhance the transparency of the reports.

This definition will be better deconstructed and identified if the underlying incentives are disclosed and the following section will provide an insight on those incentives.

2.2.2. Incentives to earnings management

As previously stated, accounting standards leave some space for judgements and managers might use those spaces to serve their own interests (Vincent, 2001). Their actions and tendency to manipulate earnings will be, then, guided by the incentives that they face. Vincent (2001) divides those incentives in 3 categories that result from the existence of imperfect markets: agency costs, information asymmetry and stakeholders' influence.

Starting by agency costs. The relationship between agency costs and earnings management comes from the actions taken to minimize those costs, namely through contracts. In order

to align the interests of agents with opposite goals, contracts include bonuses (when the relationship is between the management and the owner) or bond covenants (when the relationship is between a debtholder and a bank). With that, either the manager is rewarded when it achieves a predefined level for a financial indicator, or the debtholder is punished if it does not accomplish a, once again, predefined level for a financial indicator. The fact that these triggers are, normally, attached to financial indicators, motivates agents (managers or debtholders) to manage earnings when they are not able to achieve the necessary results. For example, evidence suggests that managers manage earnings considering the yearly bonus of the current year and the one they can achieve in the following year. That being said, if, at the end of the year, the targeted financial indicator is almost being reached, then managers will anticipate earnings from the future (through accruals), with the expectation that future earnings will be high enough to compensate the reversal of those accruals. The opposite happens if managers know that the threshold will not be achieved, i.e. they will postpone earnings to facilitate the prosecution of the following year's bonus. Similarly, debtholders also react to debt covenants: as they are closer to violate those covenants, there is a trend to manage earnings upwards and, that way, avoid the violation (P. M. Dechow & Schrand, 2004).

The next category identified by Vincent (2001) is "information asymmetry. In this case, information asymmetry refers to the disparity of knowledge existent between insider parties of the company and outsiders, namely, investors. Considering also the previous category (agency costs), it is expectable that insiders, or managers, might take advantage of this asymmetry to mislead investors' expectations regarding future cashflows and, that way, influencing stock prices upwards. In the end, that benefits them because it increases their compensation or reputation.

Nevertheless, in the Portuguese context, both previous categories – agency costs and information asymmetry – lose preponderance for the following, and corresponding, reasons: (i) the management and the ownership are, many times, concentrated in one person, which makes it impossible to have agency relationships and (ii) the capital market does not hold significant importance in the country, making it that most managers do not act considering how stock prices will react. (Moreira, 2006)

The third category is related with other stakeholders, besides investors and management, and the influence that accounting choices might have on them. In fact, financial information has

a great impact on taxes, on the fulfillment of regulatory obligations and on the wage negotiations between companies and trade unions. As such, managers might use earnings management as a strategy to benefit their own interests. For example, banks, to deliver adequate capital ratios that would not be otherwise achievable, adjust loan loss provisions, loan charge-offs and securities gains and losses, manipulate accruals or adopt voluntary regulator accounting principles. Similarly, managers incur in earnings management with the intention of decreasing tax expenses or to relieve the pressure from trade unions (Zhao, Zhou, Zhao, & Zhou, 2019).

Additionally, in this category, it must be considered the specific Portuguese context. This context (i) is composed mainly by small and medium enterprises (SME), (ii) with a capital market that does not hold significant importance and (iii) with an accounting system legally regulated and aligned with the corporate tax system. Taking this into account, Moreira (2006) states that companies face incentives regarding two stakeholders: the Portuguese Tax Authority and banks.

Regarding the Portuguese Tax Authority (PTA), given the correlation between accounting rules and corporate tax law, companies might feel compelled to minimize taxes by reducing the income through earnings management. This downward incentive is limited and does not lead to negative earnings since reported negative earnings increase the companies' probability of having their accounting audited by the PTA.

Then, with banks, the incentive results from small Portuguese companies having those institutions as the main source of financing. Being that, to obtain loans at reasonable costs, companies must present good historic earnings, companies manage earnings upwards, unlike what happens with taxes. (Moreira, 2006)

Before heading to the analysis of the incentives that are inherent to the Norte 2020 programme, based on the literature review that composed this section, it is important to understand how companies manage earnings. That will allow a full comprehension and connection of the topics discussed thus far.

2.2.3. How Companies can manage earnings

To take advantage of the accounting's "grey" area that allows for the adoption of earnings management strategies, companies use, mainly, accruals.

By definition, accruals are an accounting method used when there is a difference between the realization of the cashflow and the accounting recognition of the transaction. In its essence, accruals are important because they make earnings' analysis more relevant than the cashflows' analysis by providing additional information about the future cashflow behavior (Bu, Zhang, & Wang, 2017). When used with this latter purpose, i.e. to make earnings' analysis more relevant and not to manage earnings, accruals are described as "non-discretionary accruals".

Non-discretionary accruals, despite having a positive purpose, they might be inaccurate. As they try to convey information about future cashflows, its accuracy relies on the quality of the estimations made by the company. The quality depends not only on the company's ability to predict future cashflows but also on the industry's predictability.

The unpredictability attached to accruals leaves a high level of discretion to managers use them as a way to manipulate earnings. In fact, since it is difficult to predict the future, it is also difficult to analyze an accrual and understand whether it has a reasonable value or it reflects the opportunistic behavior from the management through earnings management. Additionally, the fact that accruals are reversible amplifies the untraceable characteristic of the earnings management. In this case, when used to manage earnings, accruals are defined as "discretionary accruals". Naturally, these will be most likely in accounts where the degree of discretion is higher (P. M. Dechow & Dichev, 2002; P. M. Dechow & Schrand, 2004).

Nevertheless, one must not think that discretionary accruals are untraceable. Auditors and regulators are aware of their existence and scrutinize their use. As such, companies recur to other earnings management strategy, namely, real activities manipulation (Roychowdhury, 2006). Lo (2007) defines real activities manipulation as the actions that managers take, to achieve the desired earnings, that are not normally used with the current company's economic situation. Some of the actions adopted are anticipation of sales, changes in shipment schedules or delaying of research and development (R&D) and maintenance expenditures. Companies might also manage earnings by not assuming costs and, instead, capitalizing them as long-term assets or overstating Plant Property and Equipment (PP&E).

Overall, despite these actions having a positive impact on the short term earnings, they might have a negative impact on the future value of the company, by reducing future cashflows (Lo, 2007).

2.3. Subsidies and Earnings Management

Reports show that, despite having an high execution of the European subsidies, Portugal has a low index of implementation of the European strategies when compared with other European countries (Stec & Grzebyk, 2018). One of the explanatory possibilities to this phenomenon that is raised by Fernandes et al. (2021) is whether companies, by not being able to reach the predefined goals, recur to earnings management to achieve them. In fact, the authors find a link between the success of the project and the probability of the earnings management (Fernandes et al., 2021). Additionally, in a previous study, it had already been found that companies that manage their earnings priorly to the beginning of the project, tend to continue to do that during the execution of the project (Fernandes & Laureano, 2019).

Despite not existing a lot of studies that support the relation between subsidies and earnings management, the literature review previously made – namely through the review of the Norte 2020 regulation and the earnings management incentives – allows for some helpful comparisons that provide greater strength to the conclusions from Fernandes et al. (2021).

The relationship between the managing authority[6] and subsidized companies might be comparable to the one existing between banks and debtholders, since subsidies appear as a replacement for financial debt. The difference between both relies on the fact that companies, on the application process for Norte 2020 subsidies, have a clearly defined target regarding financial autonomy. In fact, Pinheiro (2008) approached the question whether companies manipulate earnings to be selected to be subsidized, but within another, and previous, Portuguese framework for European Funds – the SIME – and concluded that there is a positive relationship between subsidies and earnings management in the period that precedes the beginning of the project, meaning that companies are incentivized to manage earnings to be subsidized.

Once projects are approved, it starts an agency relationship between the company and the authority that provides subsidies. To be protected from that, and as explained priorly,

[6] The "managing authority" is the authority responsible for the selection process and for the project's follow up.

subsidized companies face contractual obligations based on the plan provided on the application process. Similarly to what debtholders face regarding debt covenants, subsidized companies, when they are not able to achieve the pre-defined financial indicators, might recur to earnings management as a method to not lose the subsidy.

Despite having literature that backs up the reasoning, this study will only be meaningful if it can quantify the "earnings management". The following section will detail what are the different methodologies adopted to do so.

2.4. How to identify earnings management

Considering that companies manipulate earnings through discretionary accruals and real activities, as it was previously detailed, methodologies to detect both cases will be described.

Before heading to the discretionary accruals methodology, it is important to understand what is the "earnings quality" and what is the relationship between "earnings quality" and "earnings management". "Earnings quality" is defined by three characteristics: (i) its relevance to the decision process; (ii) its informativeness on the company's financial performance and (iii) the combination of the importance of the financial performance to the decision and the capacity that the accounting system has to reflect the performance.

Now that "earnings quality" is defined, it becomes obvious that earnings management strategies, as opportunistic behaviors, erode earnings quality. This negative relationship between "earnings management" and "earnings quality" allows the usage of earnings quality proxies to study earnings management because, for example, if the reason for the decrease in earnings quality is earnings management, then, understanding the decrease in earnings quality will provide an insight on the degree of earnings management. (P. Dechow, Ge, & Schrand, 2010)

With that, and now focusing on discretionary accruals methodologies, Dechow et al. (2010) summarize proxies to earnings quality in several groups, being that two of those are related to earnings management: (i) properties of earnings, namely residuals from accruals (or abnormal accruals) and target beating, and (ii) external indicators of earnings misstatements.

The first property of earnings – residuals from accruals (or abnormal accruals) - is a synonym for "discretionary accruals". As such, proxies to measure earnings quality based on residuals

from accruals, are methodologies to quantify "discretionary accruals"[7]. That being said, authors, knowing that discretionary accruals are difficult to quantify for the reasons identified on Section 2.2.3., approached this topic through an indirect point of view.

Through models, they try to obtain non-discretionary accruals (NDA) to, then, by difference to total accruals (TA), quantify discretionary accruals (DA), as per the following equation:

$$(1)\ \text{NDA} = \text{TA} - \text{DA}$$

To model NDA, authors include, as explanatory variables, fundamental drivers of the NDA's behavior.

Originally, the Healy Model tried to achieve this goal but it assumed that the non-discretionary accruals were constant from period to period. From that, relaxing that assumption, the Jones Model appeared and became a reference in the area. That being said, the model is summarized on the following formula (Jones, 1991):

$$(2)\ TA_t = \propto + B_1 \Delta Rev_t + \beta_2 PPE_t + \varepsilon_t$$

Where TA_t is total accruals[8] at the end of year t, scaled by total assets at t-1; ΔRev_t is the difference between revenues in year t and revenues in year t-1, scaled by total assets at t-1; and PPE_t is property, plant and equipment in year t, scaled by total assets at year t-1. ε_t is the abnormal part of the accruals, i.e., the discretionary accruals.

This model is successful at explaining around one quarter of the accruals but it assumes that revenues are non-discretionary because it considers the full variation between periods as an explanatory variable of the normal accruals, which might be deceiving since revenues' accounts are also used to manage earnings (P. M. Dechow, Sloan, & Sweeney, 1995).

To solve this latter issue, it appeared the Modified Jones model, by Dechow et al. (1995) that also has a strong assumption, as it states that all changes in credit sales are Earnings Management, which might be exaggerated:

$$(3)\ TA_t = \propto + \alpha_2(\Delta Rev_t - \Delta Rec_t) + \alpha_3 PPE_t + \varepsilon_t$$

[7] To sum up the synonyms in this section:
- "Residuals from accruals"="Discretionary accruals"="Abnormal accruals"
- "Non-discretionary accruals"="Normal accruals"

[8] Total accruals is the sum of working capital and depreciations.

Here, the ΔRec_t is the net receivables in year t subtracted by net receivables in year t-1 scaled by total assets at t-1 and the remaining variables have the same meaning as in equation (2). Considering ($\propto +\alpha_2(\Delta Rev_t - \Delta Rec_t) + \alpha_3 PPE_t$) as the part that reflects normal accruals (or non-discretionary accruals (NDA)) and ε_t as abnormal, or discretionary, accruals (DA), we obtain, again, equation (1):

$$TA = NDA + DA \Leftrightarrow DA = TA - NDA$$

Kothari et al. (2005) tried to improve the Jones Model and the Modified Jones Model by matching each firm-year observation with another firm-year observation from the same industry and year with the closest Return on Assets from the previous period (ROA_{t-1}) - the "match". This method became known as "performance-match" because it uses the matches between observations to control the performance effects on the discretionary accruals measurement. For the Jones Model, the performance-matched discretionary accruals (PMDA) for firm i in year t are the Jones Model discretionary accruals for year t minus the matched-firm's Jones Model discretionary accruals in year t:

$$(4)\ PMDA_t = DA_{ti} - DA_{tp}$$

Where $PMDA_t$ is the performance-matched discretionary accruals at the end of year t; DA_{ti} is the discretionary accruals from company i at the end of year t and DA_{tp} is the discretionary accruals from company i's match at the end of year t. The same reasoning is applied to the Modified Jones Model.

In its paper, Kothari (2005) did not only present the "performance-match" method. As a comparison term, the author presented another variation to Jones and Modified Jones models that included, separately, the variables of Return on Assets on periods t and t-1 as explanatory variables, as the following equations show:

$$(5)\ TA_t = \propto +B_1 \Delta Rev_t + \beta_2 PPE_t + \beta_3 ROA_t + \varepsilon_t$$

$$(6)\ TA_t = \propto +B_1 \Delta Rev_t + \beta_2 PPE_t + \beta_3 ROA_{t-1} + \varepsilon_t$$

$$(7)\ TA_t = \propto +\alpha_2(\Delta Rev_t - \Delta Rec_t) + \alpha_3 PPE_t + \alpha_4 ROA_t + \varepsilon_t$$

$$(8)\ TA_t = \propto +\alpha_2(\Delta Rev_t - \Delta Rec_t) + \alpha_3 PPE_t + \alpha_4 ROA_{t-1} + \varepsilon_t$$

All the presented models by Kothari (2005) allowed to conclude that performance needs to be considered when measuring discretionary accruals because, if not taken into account, its effects will be, at least, partially "captured" as part of the abnormal accruals, when, in fact,

they are normal. This is because accruals vary with the company's performance evolution, without any connection to earnings management. (Kothari, Leone, & Wasley, 2005)

Later, Dechow and Dichev (2005) went further with an approach that uses present, past and future cashflows to estimate the variation of working capital (ΔWC), that is, by itself, a proxy to accruals. The model is the following:

$$(9)\quad \Delta WC = \alpha + \beta_1 CFO_{t-1} + \beta_2 CFO_t + \beta_3 CFO_{t+1} + \varepsilon_t$$

Once again, the residual (ε_t) is the measurement of the discretionary accruals; CFO_{t-1} is the cashflow from operations at the end of year t-1; CFO_t is the cashflow from operations at the end of year t and CFO_{t+1} is the cashflow from operations at the end of year t+1. (P. Dechow & Ge, 2005)

In the same year as the previous authors, Francis et al. (2005) combine previous models' independent variables to regress the total current accruals (TCA):

$$(10)\quad TCA_t = \alpha + \beta_1 CFO_{t-1} + \beta_2 CFO_t + \beta_3 CFO_{t+1} + \beta_4 \Delta Rev_t + \beta_5 PPE_t + \varepsilon_t$$

Then, the standard deviation of the residual $\sigma(\varepsilon_t)$ is decomposed into an innate component ($\alpha + \lambda_1 Size_t + \lambda_3 \sigma(Rev)_t + \lambda_4 \log(OperCycle)_t + \lambda_5 \mathrm{NegEarn}_t$), that is a reflection of the environment where the company is fitted in, and a discretionary one (v_t), as per the following equation:

$$(11)\quad \sigma(\varepsilon_t) = \alpha + \lambda_1 Size_t + \lambda_3 \sigma(Rev)_t + \lambda_4 \log(OperCycle)_t + \lambda_5 \mathrm{NegEarn}_t + v_t$$

Where $Size_t$ is the logarithm of total assets at the end of year t; $\sigma(Rev)_t$ is the standard deviation of revenues at the end of year t; $\log(OperCycle)_t$ is the logarithm of the operating cycle; $\mathrm{NegEarn}_t$ is the incidence of negative earnings over the past 10 years and v_t is the residual and the accruals' discretionary part. (Francis, LaFond, Olsson, & Schipper, 2005)

The second earnings property identified by Dechow et al. (2010) is the target beating. This property is based on the statistical discovery of unusual clustering in earnings around targets. The most common example of an unusual clustering is the statistically small number of firms with small losses and the statistically high number of companies with small gains. A common

explanation for this "anomaly" is that companies with earnings that are only slightly negative manage earnings so that they are higher than zero. (Burgstahler and Dichev (1997)).

The second group of earnings quality proxies – external indicators of earnings misstatements – relies on (i) SEC (Security Exchange Commision) Accounting and Auditing Enforcement Releases (AAERs), (ii) restatements and (iii) internal control procedure deficiencies reported under the Sarbanes Oxley Act (SOX). These are good proxies for earnings quality since they are indications, from a third-party (including the management in the restatements case), that there are issues with the earnings. As such, the investigation might start "one step closer" to the bottom of the question since it only has to understand whether the misstatements were a result of an intentional action (earnings management) or an unintentional one. However, it might happen that there is a selection bias by the third party that reports the misstatement. (P. Dechow & Ge, 2005)

Ended the part over discretionary accruals, it is time to focus on real activities manipulation through the model presented by Roychowdhury (2006). The author uses its methodology to investigate patterns in cashflow from operations (CFO), discretionary expenses (DISEXP)[9] and production costs (PROD) for firm-year observations with earnings close to zero.

The methodology, through its regressions, identifies the abnormal part of each variable to, then, measure the abnormal amount that results from the real activities manipulation.

First, we will explain how to identify the abnormal values. Starting by the CFO, Dechow et al. (1998) expresses the normal CFO as a linear function of sales (S_t) and change in sales (ΔS_t) in the current period , according to the following equation:

$$CFO_t = \Pi S_t - \delta \Delta S_t \tag{12}$$

Where ΠS_t is the profit, $\delta \Delta S_t$ are the accruals and $\Delta S_t = S_t - S_{t-1}$.

Based on equation (12), Roychowdhurry (2006) applied regression (13) per industry and year:

$$\frac{CFO_t}{A_{t-1}} = \alpha_0 + \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \beta_1 \left(\frac{S_t}{A_{t-1}}\right) + \beta_2 \left(\frac{\Delta S_t}{A_{t-1}}\right) + \varepsilon_t \tag{13}$$

Compared to equation (12), the regression (13) has some changes. The variables are scaled by total assets from t-1 to avoid heteroskedacity issues. Additionally, it includes a scaled

[9] Discretionary expenses are the sum of advertising, research and development (R&D) and selling, general and administrative (SG&A) costs.

intercept ($\alpha_1\left(\frac{1}{A_{t-1}}\right)$) to avoid a spurious correlation between scaled CFO ($\frac{CFO_t}{A_{t-1}}$) and scaled sales ($\frac{S_t}{A_{t-1}}$) due to variation in the scaling variable, total assets (A_{t-1}). It is also added an unscaled intercept to guarantee that the mean abnormal CFO (ε_t) is zero.

The abnormal CFO (abCFO) per firm-year observation is then the difference between the actual CFO and the normal CFO:

$$(14) \qquad abCFO_t = \frac{CFO_t}{A_{t-1}} - (\alpha_0 + \alpha_1\left(\frac{1}{A_{t-1}}\right) + \beta_1\left(\frac{S_t}{A_{t-1}}\right) + \beta_2\left(\frac{\Delta S_t}{A_{t-1}}\right))$$

Please note that the coefficients (α_0, α_1, β_1 and β_2) come from the regression (13) applied to the corresponding industry and year, while the remaining variables are from the firm-year observation.

The same approach will be used for the remaining variables (PROD and DISEXP), being that the following equations are applied per industry and year (similarly to what was done with regression (13))

$$(15) \qquad \frac{PROD_t}{A_{t-1}} = \alpha_0 + \alpha_1\left(\frac{1}{A_{t-1}}\right) + \beta_1\left(\frac{S_t}{A_{t-1}}\right) + \beta_2\left(\frac{\Delta S_t}{A_{t-1}}\right) + \beta_3\left(\frac{\Delta S_{t-1}}{A_{t-1}}\right) + \varepsilon_t$$

$$(16) \qquad \frac{DISEXP_t}{A_{t-1}} = \alpha_0 + \alpha_1\left(\frac{1}{A_{t-1}}\right) + \beta\left(\frac{S_t}{A_{t-1}}\right) + \varepsilon_t$$

Likewise equation (14), the abnormal values for production costs (abPROD) and for discretionary expenses (abDISEXP) are made according to the following equations, correspondingly:

$$(17) \qquad abPROD_t = \frac{PROD_t}{A_{t-1}} - (\alpha_0 + \alpha_1\left(\frac{1}{A_{t-1}}\right) + \beta_1\left(\frac{S_t}{A_{t-1}}\right) + \beta_2\left(\frac{\Delta S_t}{A_{t-1}}\right) + \beta_3\left(\frac{\Delta S_{t-1}}{A_{t-1}}\right))$$

$$(18) \qquad abDISEXP_t = \frac{DISEXP_t}{A_{t-1}} - (\alpha_0 + \alpha_1\left(\frac{1}{A_{t-1}}\right) + \beta\left(\frac{S_t}{A_{t-1}}\right))$$

Then, to test the hypothesis of the earnings management being executed in the years with earnings slightly above zero, the following regression is applied:

$$(19) \qquad Y_t = \alpha + \beta_1(SIZE)_{t-1} + \beta_2(MTB)_{t-1} + \beta_3(Net\ Income)_t + \beta_4(SUSPECT\_NI)_t + \varepsilon_t$$

The independent variable Y_t is the abnormal value of the variables PROD, DISEXP and CFO; $(SIZE)_{t-1}$ is the logarithm of the market value of equity at the beginning of the year; $(MTB)_{t-1}$ is the market-to-book ratio at the beginning of the year and $(SUSPECT\_NI)_t$ is a dummy variable that identifies the firm-year observations that have earnings slightly above zero.

As such, β_4 should allow the identification of earnings management strategies being executed in firm-year observations with earnings slightly above zero when compared with other firm-year observations. It should be also noted that the inclusion of control variables ($(SIZE)_{t-1}$, $(MTB)_{t-1}$ and $(Net\ Income)_t$) allows to control systematic variation resulting from growth opportunities and size (Roychowdhury, 2006).

3. Hypotheses

To present the hypotheses, the stages of the Norte 2020 process must be remembered: application, project and results evaluation.

Starting by the application, and to understand the first hypothesis, one must remember that 25% of the project's costs must be self-financed or financed by other sources that are not the subsidy. If the company opts to self-finance the project, it must have a sufficient pre-project year's cashflow from operations (CFO). With that, and considering the evidence that suggest that companies might manage earnings to obtain financing, the first hypotheses arises:

H1: Subsidized companies manage earnings in the pre-project year in order to obtain the required cashflow from operations (CFO) to self-finance the project.

Once the project starts, companies are obliged to incur in the costs that were presented in the project's plan at the application process. Since companies have a target to reach, that might incentivize them to manage earnings when the target is not achievable. As such, the second hypothesis is the following:

H2: Subsidized companies manipulate costs in order to accomplish the costs in the project's plan.

Finally, there are also requirements that must be fulfilled until the end of the project and that are evaluated at the post-project year and at the cruise year. In the post-project year, companies must guarantee that the real Merit of the Project (MP) is lower than the Selection Threshold (ST). In the cruise year, in the area of the "Business Innovation and Entrepreneurship", companies must achieve additional thresholds, in order to increase their Fulfillment Degree (FD), if they want to partially "transform" their subsidized loan into a subsidy.

Taking into account the agency relationship between the subsidized company and the subsidy's managing authority, where the subsidized company needs the financing to pursue its own goals, it is expectable that they might recur to earnings management strategies to achieve the financial indicators and, therefore, do not lose the financial support provided by the subsidies. With that, the third and final hypothesis comes:

H3: Subsidized companies manipulate earnings to achieve the Selection Threshold or to increase the Fulfillment Degree, upgrading their performance at the post-project and cruise years, respectively.

4. Methodology

Before deciding the most adequate methodology, it is mandatory to understand what are the financial indicators that are more prone to be managed in this context. The literature already provides the most important variables to measure when studying earnings management: cashflow from operations, sales growth and fixed asset structure (Young, 1999). However, if we combine this with the knowledge from the Norte 2020 regulation, it will be a more complete analysis.

From the section about the Norte 2020 programme (Section 2.1.2.) and the relationship between subsidies and earnings management (Section 2.3.), we concluded already (i) that the cashflow from operations (CFO) would have a massive importance on the earnings management at the pre-project year; (ii) that during the project period, the focus must be on costs, namely on discretionary expenses; (iii) and that, at the results evaluation period (post-project year and cruise year), the indicators to analyze are sales and gross value added (GVA).[10] Given its importance on the results evaluation, it should be detailed the composition of the GVA, as not all variables are equally relevant:

$$GVA = SAL + \Delta INV + OWN + OR + SUB - COGS - SES - IT \quad (20)$$

Where SAL are company's sales; ΔINV is the variation of the production's inventory between the current year and the previous one; OWN is work for the entity itself; OR are other revenues; SUB are exploration subsidies; $COGS$ are costs of goods sold; SES supplies and external services and IT are indirect taxes. Amongst these variables, according to non-tabulated results, the ones that are more explanatory of the GVA's behavior are SAL, ΔINV, $COGS$ and SES.

Taking these indicators into consideration, the most adequate model is the one presented by Roychowdhurry (2006). Before going into further detail on why this is the adequate model, it is worth to remember the equations that will be used:

$$(13)\ \frac{CFO_t}{A_{t-1}} = \alpha_0 + \alpha_1\left(\frac{1}{A_{t-1}}\right) + \beta_1\left(\frac{S_t}{A_{t-1}}\right) + \beta_2\left(\frac{\Delta S_t}{A_{t-1}}\right) + \varepsilon_t$$

[10] To know in more detail what are the financial indicators that impact the Merit of the Project please check Annex 1

$$(15') \frac{PROD_t}{A_{t-1}} = \alpha_0 + \alpha_1\left(\frac{1}{A_{t-1}}\right) + \beta_1\left(\frac{S_t}{A_{t-1}}\right) + \beta_2\left(\frac{\Delta S_t}{A_{t-1}}\right) + \beta_3\left(\frac{\Delta S_{t-1}}{A_{t-1}}\right) + \beta_4 IP + \varepsilon_t$$

$$(16) \frac{DISEXP_t}{A_{t-1}} = \alpha_0 + \alpha_1\left(\frac{1}{A_{t-1}}\right) + \beta\left(\frac{S_t}{A_{t-1}}\right) + \varepsilon_t$$

Notice that it will be used equation (15') instead of equation (15) because it suffered a change through the inclusion of IP, that is a variable dummy that is 1 if companies have the obligation to report permanently the inventory to legal entities[11] and 0 otherwise. This legal requirement should evict companies from adopting manipulatory endeavors, hence the inclusion ("Decreto-Lei nº 98/2015," 2015). Additionally, CFO was calculated through the indirect method as companies do not publish the cashflow statement[12] and DISEXP is calculated through the sum of supplies and external services and other operational costs.

Now that the regressions, with a special focus on the dependent variables, are presented, we will return to the explanation of this model's choice. To do that, we will go regression by regression:

- Regression (13), through the variable $\frac{CFO_t}{A_{t-1}}$ as dependent variable, will allow to identify abnormal levels of cashflow from operations at the pre-project year.
  Additionally, it will be helpful when analyzing sales, which is an important indicator in the results evaluation phase of the process. That is because, by having $\frac{S_t}{A_{t-1}}$ and $\frac{\Delta S_t}{A_{t-1}}$ as independent variables, the model controls the sales effect on $\frac{CFO_t}{A_{t-1}}$. As such, for example, if the ε_t>0, it means that, for that level of sales, the $\frac{CFO_t}{A_{t-1}}$ was managed upwards or the sales variables were managed downwards.
  This regression might reflect earnings management made through the offer of pricing discounts or more lenient credit terms.
- Regressions (15') and (16), as they have costs variables as dependent variables, will be important during the project period but also at the results evaluation years because

[11] Companies have the obligation to report permanently the inventory to legal entities when they surpass two of the following three criteria at the end of the fiscal year:

- Total Assets: 350.000€
- Net Revenues: 700.000€
- Average number of employees during the fiscal year: 10.

[12] CFO = EBITDA + Depreciations – Taxes + Δ Current Assets - Δ Current Liabilities

they are part of the GVA composition. Additionally, as $\frac{DISEXP_t}{A_{t-1}}$ variable impacts the CFO, it is worth to analyze it in the pre-project year.

Regression (15') reflects overproduction (or underproduction) endeavors taken by companies to manage earnings while regression (16) reflects earnings management through discretionary expenses.

In addition, the Roychowdhurry's model is helpful as it has different dependent variables and we are using a sample with different companies that might choose different components of earnings to manage (Burgstahler & Dichev, 1997).

Now, despite real activities manipulation impacting earnings management and being a good complementary analysis, accruals are a proxy for earnings management (Lo, 2007). With that, abnormal accruals models will also be applied to the data.

The chosen method is the one presented by Kothari et al. (2005) as it presents a solution to performance-related issues, unlike what happens with the Jones or Modified Jones Models. In fact, it is defended that the models used to estimate abnormal accruals, that do not include performance impact, have a measurement error positively correlated with performance (P. M. Dechow et al., 1995). Additionally, since the data does not include future cashflows for all firm-year observations, it is not possible to adopt models that recur to them. Summing up, the regression to be applied is a variant of regression (5):

$$(5') \quad \frac{TA_t}{A_{t-1}} = \alpha_0 + \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \beta_1 \left(\frac{\Delta S_t}{A_{t-1}}\right) + \beta_2 ROA_t + \varepsilon_t$$

There were some changes in this regression compared to regression (5). Total accruals (TA_t), according to the author is the change in non-cash current assets minus the change in current liabilities excluding the current portion of long-term debt, minus depreciation and amortization, scaled by total assets at t-1. As depreciations and amortizations, in Portugal, are defined through regulation, these variables were not included in the dependent variable. ("Decreto-Lei nº 98/2015," 2015). Consequently, the Property, Plant and Equipment (PPE) variable was not included as explanatory variable because its main goal was to control for non-discretionary depreciations and amortizations.

Now, to complete the Roychowdhurry model, it lacks the application of regression (19). In this case, we will not only apply this to abnormal CFO, PROD and DISEXP but also to abnormal TA.

(19') $Y_t = \alpha_0 + \beta_1 NETPROFIT_t + \beta_2 DIMENSION_t + \beta_3 PP_t + \beta_4 P_t + \beta_5 PPY_t + \beta_6 C_t + \varepsilon_t$

Regression (19') is estimated with Y_t taking the value of the abnormal CFO, abnormal PROD, abnormal DISEXP and abnormal TA at the end of period t. The abnormal variables are calculated using the following equations:

(14) $abCFO_t = \frac{CFO_t}{A_{t-1}} - (\alpha_0 + \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \beta_1 \left(\frac{S_t}{A_{t-1}}\right) + \beta_2 \left(\frac{\Delta S_t}{A_{t-1}}\right))$

(17') $abPROD_t = \frac{PROD_t}{A_{t-1}} - (\alpha_0 + \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \beta_1 \left(\frac{S_t}{A_{t-1}}\right) + \beta_2 \left(\frac{\Delta S_t}{A_{t-1}}\right) + \beta_3 \left(\frac{\Delta S_{t-1}}{A_{t-1}}\right) + \beta_4 IP)$

(18) $abDISEXP_t = \frac{DISEXP_t}{A_{t-1}} - (\alpha_0 + \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \beta \left(\frac{S_t}{A_{t-1}}\right))$

(21) $abTA_t = \frac{TA_t}{A_{t-1}} - (\alpha_0 + \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \beta_1 \left(\frac{\Delta S_t}{A_{t-1}}\right) + \beta_2 ROA_t)$

The coefficients for equations (14), (17'), (18) and (21) come from the equations (13), (15'), (16) and (7) applied to the corresponding industry and year, while the remaining variables are from the firm-year observation.

For this model (Regression (19')), it is worth to go into deeper detail into each of the independent variables, especially taking into consideration that some changes were performed compared to regression (19)

Variables PP_t, P_t, PPY_t and C_t are dummy variables that identify the different stages of the project's process where incentives to manage earnings were identified.

Before going further on the explanation, it should be understood the time units used. The absolute years are the civil years from 2014 to 2019 and the relative years are from N-4 until N+5 and from P+1 until P+3. The relative years will be now explained.

Considering that the year N represents the pre-project year, N-t are the years prior to the pre-project year and N+t are the years during which the project takes place. Then, the years P+t are the ones after the end of the project.

It should be noted that not all companies have the same amount of N+t years: if a company has a project that lasts for 2 years, than the project period will be N+1 and N+2, followed by the post-project year (P+1).

Table 1 clarifies the correspondence between stages of the project, relative years and dummy variables.

Table 1 – Identification of the stages of the project with the corresponding relative years and dummy variables

Stage of the Process	**Non-Process Period**				**Process**								**Non-Process Period**
					Pre-Project Year	**Project**					**Post-Project Year**	**Cruise Year**	
Relative Year	N-4	N-3	N-2	N-1	N	N+1	N+2	N+3	N+4	N+5	P+1	P+2	P+3
Corresponding Dummy Variable	Not applicable				PP_t			P_t			PPY_t	C_t	Not applicable

Returning to the variables definition:

- The variable PP_t is a dummy variable that takes value 1 if the relative year is N (pre-project year), and 0 otherwise. According to H1, its signal must be positive for the dependent variables of the abnormal CFO and abnormal TA and negative for the abnormal DISEXP;
- P_t is a dummy variable that is 1 if the relative year is within the period N+1 until N+5 (project period), and 0 otherwise. According to H2, it should have a negative coefficient for the regression where the abnormal TA is the dependent variable and a positive one for the case of abnormal DISEXP;
- The variable PPY_t takes the form of a dummy variable that is 1 if the relative year of the project is P+1. According to H3, its coefficient should be positive for the abnormal PROD and abnormal TA regressions and negative for the remaining;
- The variable C_t is 1 if the relative year is P+2. According to H3, the coefficient must have the same signal as the PPY_t's one.

The other independent variables - $NETPROFIT_t$ and $DIMENSION_t$ – are control variables that, according to the literature, might influence the dependent variables previously identified.

- The $NETPROFIT_t$ is a proxy for companies' performance as it might influence the behavior that companies adopt regarding earnings management. It is the difference between the company's net profit at the end of year t and the corresponding industry's average net profit at the end of year t, scaled by total assets of the year t-1. The inclusion of this variable as a control one comes from the regression made by Kothari (2005). Other authors justify the inclusion of this variable as a means to reduce the performance error. In fact, it is defended that the models used to estimate abnormal accruals have a measurement error positively correlated with performance (P. M. Dechow et al., 1995).
- As a proxy of the dimension, it was included the variable $DIMENSION_t$. This is the logarithm of the absolute difference between the company's total assets at the end of year t-1 minus the corresponding industry's average total assets at the end of year t-1.

  Roychowdhury (2006) recognizes that there are potential undesired effect of the dimension and, in order to control them, the author includes, in the model, the logarithm of the market value of equity at the beginning of the year and the market-to-book value. The author justifies this procedure with the intent to control "for systematic variation in abnormal CFO, production costs and discretionary expenses with growth opportunities and size". In the context of this study, it was not possible to use the same variables to control the unwanted effects of dimension because the sample' companies were not listed on the financial market.

Additionally, the model was also applied with fixed effects. For that, and with the intention of controlling time effects, namely cyclic or macroeconomic changes, regression (19') included five dummy-year variables that correspond to the 2014-2019 years. For the sake of parsimony, the inclusion of these variables is not detailed in the regression.

In the Annex 2 there is a list of variables' definitions.

5. Data collection and sample description

In this section, three samples will be introduced: the "work sample", the "large sample" and the "control sample".

Each sample will be better detailed but an introductory note on each sample will be done first. So, the work sample is a group of companies subsidized by the Norte 2020 programme on which earnings management will be studied. As the work sample is small, an "out-of-sample" approach will be used to obtain trustworthy coefficients. Then, as a control sample will also be used in the later sections of this study for robustness tests and to better analyze descriptive statistics, its collection and description will already be made. The control sample will have the same amount of firm-year observations as the work sample because each work sample's firm-year observation will have a "match" (or "pair") based on criteria to be disclosed on Section 5.3.

We will start by explaining the collection process and description of the work sample to, then, better explain the "out-of-sample" approach before introducing the large sample and, finally, the control sample.

5.1. Work Sample

The construction of the work sample had to take two points into consideration.

First, it had, as a starting point, the sample used by Silva (2020), that included 274 companies that were subsidized by the Norte 2020 programme and for which there was financial information available for the period 2014-2019 in SABI ("Sistema de Análise de Balanços Ibéricos"). The decision to use the database used by Silva (2020) was based on the intention to continue the analysis started by the author and provide new insights, from a different point of view on an important matter for the northern Portuguese region. In fact, considering (i) that the literature suggests that a worse performance from companies might lead to higher probabilities of earnings management, especially when companies have extra incentives like subsidies, and (ii) that the thesis from Silva (2020) concluded that a group of companies subsidized by Norte 2020 deteriorated their performance during the period of 2014-2019, there was an opportunity to add value by extending the analysis. (Silva, 2020)

Secondly, as a control sample would be built, it was necessary that a match would be available for each sample's company according to the criteria to be explained on Section 5.3. That

being said, a company for which there was not a match according the defined criteria would not be part of the work sample. We opted to proceed this way from the beginning so that the sample has the same amount of firm-year observations in every test. This should allow for a better results comparability.

So, starting from the 274 companies used by Silva (2020), 81 companies were deleted because it was not possible to find a match according to the criteria defined in section 5.3. Then, as there were some changes to the Norte 2020 list of the subsidized projects, when compared to the one used by Silva (2020), 3 more companies were dropped because they were no longer financed by this programme. The information is detailed in Table 2.

Table 2 – Work sample selection

List of projects approved in Norte 2020	**Remaining Companies**
List of companies used by Silva (2006)	274
After dropping companies for whom could not be obtained a match with the defined criteria	193
After dropping companies no longer listed on the Norte 2020 list[13]	190

As Table 2 shows, the work sample has 190 companies, aligned in time data series that sum up to 1140 firm-year observations. The distribution of these observations through the several stages of the process is listed below.

Table 3 – Number of observations per relative year

Stage of the Process	**Non-Process Period**				**Process**								**Non-Process Period**
					Pre-Project Year	**Project**					**Post-Project Year**	**Cruise Year**	
Relative Year	N-4	N-3	N-2	N-1	N	N+1	N+2	N+3	N+4	N+5	P+1	P+2	P+3
Number of observations	14	56	84	131	190	190	172	103	40	4	92	45	19

To be selected to the work sample, Silva (2020) only used companies that had the pre-project year (N) and the first year of the project (N+1) between 2014 and 2019, which is why relative

[13] The list of projects approved through the Norte 2020 programme was downloaded on https://www.norte2020.pt/programa/projetos-lista, that contains information updated on the 30th of June of 2021

years N and N+1 have the maximum number of observations (190). That also explains the discrepancy of observations between different process stages. In fact, as the time distance from N and N+1 increases, it becomes less likely that there are companies in the work sample that have that relative year between 2014 and 2019. For example, if a company's project starts in 2015 and it has a duration of 4 years, the firm-year observations of this company will not include the cruise year (P+2) because there is the following correspondence between absolute and relative years:

- 2014 is the pre-project year (relative year N);
- From 2015 until 2018, the project takes place (relative years N+1 until N+4);
- 2019 is the post-project year (relative year P+1).

Additionally, it is noticeable that between N+1 and N+5, the number of observations decreases. That is because the project might have different durations. If the company's project is of 3 years, for example, than the company will have firm-year observations in N+1, N+2 and N+3, followed by the P+1 (the post-project year). Of course that this would only happen if all those years would be comprehended between 2014 and 2019.

In this sample, we analyzed the correlation matrix of the variables from regression (19') and we concluded that, overall, there are not expressive or unexpected correlations between dependent variables. Despite not being unexpected because, usually, the period 2014-2019 captures both the pre-project year and the project period, variables P and PP have the highest correlation coefficient, being 0,4017. That should not, however, raise multicollinearity problems.

Now, this small sample imposed some limitations on the application of the methodology. According to Roychowdhurry, to calculate the coefficients from regressions (13), (15) and (16), the minimum number of observations per industry and year is 15. As it can be seen in Annex 3, neither group of industry/year in the work sample reaches that number of observations. Because of that, the strategy adopted was to, at first, apply regressions (13), (15') and (17) on the large sample to obtain "normal" trustworthy coefficients per industry and year, in a way that is known as the "out of sample" technique, where such coefficients are obtained with a sample different from the one (the work sample) they are applied to. Moreover, the companies in that sample are selected to be non-subsidized, allowing coefficients that are not biased by the effect of subsidies. This way, it is possible to measure

such an effect when applying the estimates coefficients to a sample of subsidized companies. We will now go in detail on how the large sample was obtained.

5.2. Large Sample

To obtain the intended dataset, the financial information was extracted from database "Sistema de Análise de Balanços Ibéricos" (SABI) for companies that had the same CAE ("Código de Atividade Económica") at three digits as the companies from the work sample, according to Annex 3, from 2014 to 2019. From a total of 2.587.830 firm-year observations, the sample ended up being reduced to 1.024.190 firm-year observations after dropping observations with missing data. Finally, since the goal of this large sample is to obtain the normal coefficients for non-subsidized companies, firms that were, at some point, subsidized by the Portugal 2020 programme were dropped, resulting in a list of 983.596 firm-year observations. From this, it resulted the distribution that is reflected on the Table 4.

Table 4 – Large Sample Selection

List of companies with the same CAE as the sample's companies	**Remaining Companies**
Companies with the same CAE at three digits as the sample's companies	2.578.830
After dropping companies missing financial information for the period	1.024.190
After dropping companies subsidized by Portugal 2020	983.596

As there were some obvious outliers in the various variables that resulted from the existence of observations with small values of total assets, both dependent and independent variables were winsorized at 1% at both ends of the spectrum (maximum and minimum values), similarly to what was done by Kothari (2005).

5.3. Control Sample

The control sample, despite not being used in the presented methodology will be helpful in different moments of the Results chapter (Chapter 6), namely when analyzing descriptive statistics and when performing robustness tests.

The procedure adopted to gather this control sample was similar to the one presented by Kothari (2005): the "performance-match". Kothari (2005) matched companies based on the Return on Assets (ROA) of the previous year, i.e. according to this methodology, companies from the work sample would be matched with another company from the same industry and year with the closest Return on Assets (ROA) from the previous year.

That being said, in this case, considering the information from the first absolute year (2014), each company from the work sample was matched with a company from the same three-digit "Código de Atividade Económica" (CAE) with sales that were within the range of 10 percentual points. The chosen financial indicator was "sales" instead of the ROA because of the importance of "sales" in the Norte 2020's results evaluation of the process. Additionally, using another criteria to match companies (like ROA or total assets), using the range of 10 percentual points, would lead to an even smaller work sample. This match will be referred as "sales-match".

Similarly to the procedure executed for the work sample, the matches' financial information was downloaded from the database SABI. Table 5 summarizes the descriptive statistics for the Sales variable and it shows the result of the test of means' equality for the 2014 year between groups:

Table 5 – Descriptive statistics for the sales variable

Variable "Sales"	**Observations**	**Mean**	**Median**	**Standard Deviation**
(1) Sample	190	1532,40	823,79	1957,16
(2) Control	190	1528,48	832,76	1937,25
Total	380	1530,44	826,92	1944,66
t test = -0,0196 for the mean; Pr(|T| > |t|) = 0.9843				

Notes:
The presented values are in thousand Euros
The significance level (*p-value*) corresponds to bi-directional tests

From the analysis, it cannot be rejected the null hypothesis of means' equality ($p < 0,05$) so we conclude that the companies have identical levels of sales. Additionally, and despite not making a performance match per year, non-tabulated values of the Return on Assets' (ROA) mean of both groups show that those values are similar between groups in every year from 2014 to 2019.

6. Results

6.1. Descriptive Statistics

The main variables' mean, for the work and control samples, in the different stages of the process, is summarized on Table 6. The inclusion of the pre-project period (before the process starts) allows to have a benchmark on how were the financial indicators before the process started. Similarly, the inclusion of the control sample allows to have a comparison for each stage of the process.

Table 6 – Key variables' mean for work and control samples

Variable	Sample	Stage of the Project				
		Pre-project period (non-process)	Pre-project year	Project	Post-project year	Cruise year
NETPROFIT	**Work Sample**	49,76	82,19	110,25	168,07	105,22
	Control Sample	40,55	46,46	66,56	59,30	73,18
GVA	**Work Sample**	434,53	568,67	723,45	954,22	912,34
	Control Sample	429,34	485,72	542,04	558,76	693,13
CFO	**Work Sample**	208,74	323,19	402,99	603,96	425,19
	Control Sample	186,59	179,93	235,47	200,41	333,98
SALES	**Work Sample**	1369,69	1753,10	2241,55	3163,01	3014,29
	Control Sample	1296,30	1643,12	1808,87	1914,87	2374,07

Notes:
Values are in thousand Euros
The variables correspond to the following financial indicators: NETPROFIT is net profit; GVA is the gross value added; ASSETS is total assets; CFO is the cashflow from operations; SALES is sales.

The evolution of the GVA (Gross Value Added) and SALES in work sample companies is positive during the analyzed period, reaching the highest amounts at the post-project year (P+1) and at cruise year (P+2). This is reinforced by the fact that, during the process, the positive difference between the work sample and the control sample grows larger, reaching, once again, the highest amounts in the post-project and cruise years. Additionally, it should be also noted that, at the pre-project period the difference of these samples' variables (GVA and SALES) is close to zero. These trends are in line with H3, that states that companies manage earnings in the post-project and cruise years to have a better results evaluation.

The GVA and SALES' behaviors are similar because, despite the GVA including other variables, SALES is the variable that more contributes to the evolution of the GVA, according to non-tabulated results.

Following on to another hypothesis, H1 states that companies manage the CFO (cashflow from operations) to obtain the necessary self-financing to be eligible to obtain the subsidy. When we analyze the CFO in the work sample, it only shows a positive evolution along the process, which does not suit the expectations created by H1. Likewise, the difference between the work sample and the control sample also increases progressively, instead of reaching a peak at the pre-project year.

Nevertheless, if these values are analyzed as a percentage of sales, the behavior is quite distinct. Through non-tabulated results, it is possible to observe that, in the pre-project period, the work sample's CFO is 15,24% of sales, while the control group's CFO is 14,39% of sales. The gap increases largely in the pre-project year which would be in line with H1, since companies face bigger incentives to increase the CFO in order to guarantee the financing. In fact, in the pre-project year, the work sample's CFO represents 18,44% of sales, and the relative weight of CFO in sales in the control sample decreases to 10,97%. When the process is finishing and the incentives cease, in the cruise year, the relative difference decreases to only 0,00038 percentual points.

In order to understand if the previous mean analysis were relevant, the variables' means were compared and analyzed their equality.[14]

Those results can be observed at Table 7. In this table, besides the dependent variables of the regressions (13), (15'), (16) and (7'), the GVA was also included.

[14] This kind of analysis requires that data follows a normal distribution (check Annex 4 for results). When the normality hypothesis is observed, the t-test is the most suited one to verify the equality, whilst when that hypothesis is not accepted, the Mann-Whitney U test should be also analyzed. It was concluded that the normality hypothesis was confirmed for all stages of the process.

Table 7 – Tests of equality of means between work and control samples

Variable	Stage of the Process									
	Pre-project period (non-process)		Pre-project year		Project		Post-project year		Cruise year	
	Difference	P-value	Difference	P-value	Difference	P-value	Difference	P-value	Difference	P-value
GVA	5,19	0,93	82,95	0,27	181,40	0	395,46	0,01	219,21	0,26
SALES	73,38	0,62	109,98	0,62	432,68	0,02	1248,14	0,07	640,22	0,29
CFO	22,15	0,61	143,27	0,02	167,52	0	403,55	0	91,21	0,46
DISEXP	38,08	0,34	65,02	0,27	223,58	0	631,45	0,11	169,52	0,21
PROD	42,54	0,62	14,03	0,92	77,87	0,42	379,82	0,15	313,25	0,39
TA	10,15	0,59	66,65	0,02	9,10	0,68	102,23	0,12	3,72	0,95

Notes:

The "Difference" corresponds to the difference between the work sample and control sample's variable means.

All values, except p-value, are in thousand euros.

The p-value is the lowest probability to reject the null hypothesis of equality. The p-value results from bi-directional tests.

It was also performed a Mann-Whitney test to check the difference of medians between both samples that lead to the same results.

The variables correspond to the following financial indicators: GVA is the gross value added; SALES is sales; CFO is the cashflow from operations; DISEXP are discretionary expenses; PROD are production costs and TA are total accruals

In Table 7 most variables have a similar behavior, so it is interesting to start with the one that is slightly different, the CFO (cashflow from operations). Through the p-value on the pre-project period, it is possible to conclude that, in that period, the difference is not statistically significant. However, in the pre-project year, and in line with H1, the gap between both samples increases positively and it becomes statistically different for a level of significance of 5%.

Despite not existing any hypothesis regarding the expectations for the CFO in other stages of the project, the difference remains statistically relevant until the cruise year.

Regarding the remaining variables, and making an overall analysis, there are no indicators of earnings management in the pre-project period, since the mean difference between both samples (work and control sample) is not statistically relevant. Then, in the pre-project year, only the TA difference is statistically relevant for a level of significancy of 5%, which is coherent with H1.

Then, once the project starts, in the project period, the scenario becomes radically different, being that PROD and TA are the only exceptions as the difference of means are not statistically relevant. Regarding the remaining differences, they are statistically relevant with a significance of 1%, except for the SALES' difference of means, that is only relevant for a significance of 5%. From those variables (GVA, SALES, CFO and DISEXP), it is worth to highlight the statistically relevant difference between the work sample and the control sample regarding DISEXP (discretionary expenses) as it goes in line with H2. According to H2, companies manage their costs in the project period positively so that they are able to accomplish the costs defined on the project's plan, presented on the application.

In the post-project year, only the variables GVA, SALES and CFO present differences between work and control samples that are statistically relevant. Except for CFO, for which there are not any expectations at the post-project year, the statistical relevance in the other two variables (GVA and SALES) is in line with H3. In fact, H3 states that companies increase their earnings in post-project and cruise years to increase their results that are evaluated by the GVA and SALES.

Additionally, if we analyze the relation between SALES and DISEXP, it is noticeable that both variables increased at the same rate during the project period but, once the post-project year is reached, SALES increase more than proportionately, compared to DISEXP.

Overall, H1, H2 and H3 seem to be confirmed by this early analysis based on descriptive statistics, being that H3 would only be true for the post-project year, and not for the cruise year. Nevertheless, the following sections will provide a more in-depth analysis of the hypothesis.

6.2. Estimation Results

In this section, the results from the application of regression (19') to the work sample will be presented.

Table 8 summarizes the results from regression (19') with Model I with abCFO as dependent variable, Model II with abDISEXP, Model III with abPROD and Model IV with abTA. These models were calculated using fixed time effects since random effects were also used and the results pointed towards the same conclusions. Additionally, the lower p-values and higher coefficients of determination provided greater robustness to fixed effects models. In fact, throughout the following sections, models with fixed effects will always be presented because models with random effects were also executed and lead to the same conclusions.

Table 8 – Results from regression (19') applied to the work sample

Independent Variables	Dependent variables			
	abCFO	**abDISEXP**	**abPROD**	**abTA**
	Model I	Model II	Model III	Model IV
NETPROFIT	-0,13***	1,27**	-0,42***	-0,60***
DIMENSION	-0,01*	0,01	-0,02**	-0,02***
PP	0,06*	-0,03	-0,03	0,02
P	0,04	-0,04	-0,04	0,04
PPY	0,08*	-0,13	-0,01	0,06
C	0,07	-0,15	-0,02	0,05
Constant	0,08	0,15*	0,20***	0,05
N	1140	1140	1140	1140
p-value	0,00	0,00	0,00	0,00
R^2	0,05	0,58	0,22	0,48

The dependent variables of these regressions are abCFO (abnormal cashflow from operations), abDISEXP (abnormal discretionary expenses), abPROD (abnormal productions costs) and abTA (abnormal total accruals).

The definition of the variables may be found on Annex 2.

*, ** and *** identify the level of statistical significancy of less than 10%, 5% and 1%, respectively.

All the models presented are statistically significant (p-value < 0,01) but their explanatory power diverges depending on the dependent variable. Model I has a low explanatory power of the abCFO but the remaining models have R^2 above the 20% threshold.

PP's coefficients on Models I, II and IV are the ones to analyze to test H1. H1 states that companies increase their CFO (cashflow from operations) in the pre-project year to be able to obtain the necessary self-financing in the application process. To be in line with H1, PP's coefficients must be positive on Models I and IV and negative on Model II. Regarding the signs of the PP's coefficients in these three models, only in Model I is that coefficient statistically significant at a 10% level of significancy and with a sign according to the expectation created by H1. This makes sense because H1 hypothesizes the increase in CFO in the pre-project year and Model I has abCFO as dependent variable.

Concerning the variable P, its coefficients on Models II and IV test H2, that is related with companies managing earnings during the project to achieve the costs defined on the project's plan, at the application. So, in Model II, the coefficient should be positive and, in Model IV, it should be negative to go according to the expectations that support H2. According to Table 8, none of the coefficients are statistically significant.

Finally, PPY and C's coefficients in all Models are important to test the final hypothesis, H3. According to H3, the coefficients should be negative in Models I and Model II and positive in Models III and IV. H3 stated that companies improve their performance in the post-project and cruise years to improve their GVA (Gross Value Added) and sales.

Only the PPY's coefficient in Model I is statistically significant for a level of 10% of significancy, which goes against H3.

Summing up, PP's coefficient in Model I seems to be according to H1, being exactly the coefficient by which the hypothesis had most chances to be supported by. However, H2 cannot be confirmed because P coefficients in Models II and IV are not statistically significant and H3 appears to be dismissed because of the PPY's coefficient negative signal with a level of significancy of 10%.

In the following section, we present additional analysis in order to confirm the results presented thus far.

6.3. Robustness Tests

6.3.1. Sales-match methodology

In the Methodology section (Chapter 4), it was presented the performance-match methodology, presented by Kothari (2005). Then, in Section "5.3. – Control Sample", it was already made an introduction on the robustness test that would be performed and how the control sample was gathered. The usage of this model as a robustness test should allow a relaxation of the assumption that earnings management and performance are linearly correlated.

Nevertheless, before presenting the results, we will better explain the methodology to be used in this section.

Even though the performance-match methodology presented by Kothari (2005) only used the TA (total accruals) as dependent variable, we used the sales-match methodology and applied it to the other variables being studied: CFO (cashflow from operations), DISEXP (discretionary expenses) and PROD (production costs).

The methodology used in this section is similar to the one used in the Section 6.2. and presented on Section 4. As so, abnormal variables (abCFO, abDISEXP, abPROD and abTA) are now calculated not only for the work sample, but also for the control sample, using the same procedure as in the previous section.

Then, instead of using the abnormal variables as dependent variables of regression (19'), it will be used sales-matched variables. The new adaptation of regression (19) is the following:

$$(19'') \quad X_t = \alpha_0 + \beta_1 NETPROFIT_t + \beta_2 DIMENSION_t + \beta_3 PP_t + \beta_4 P_t + \beta_5 PPY_t + \beta_6 C_t + \varepsilon_t$$

Where X_t is the sales-matched abnormal variables (SMabCFO, SMabDISEXP, SMabPROD and SMabTA) at the end of year t and the remaining variables are the same as in regression (19'). It is worth to detail how the sales-matched abnormal variables are calculated, using SMabCFO as an example:

$$SMabCFO_t = abCFO_{ti} - abCFO_{tp}$$

Where $SMabCFO_t$ is the sales-matched abnormal cashflow at the end of year t; $abCFO_{ti}$ is company i's abnormal cashflow at the end of year t and $abCFO_{tp}$ is company i match's abnormal cashflow at the end of year t.

As it happened in the previous models, the four regressions executed (one per each of the sales-matched variables) are adequately suited to the data, as they have p-values inferior to 0,05. Now, the coefficient of determination is low for the SMabCFO's model, but it goes above 0,15 for the remaining.

Regarding the results, it is important to remember that the variables that must be analyzed to confirm the hypotheses are PP, P, PPY and C. The main takeout, compared to the results presented in the previous section is that none of the variables of interest (PP, P, PPY and C) has statistically significant coefficients, not even for a level of significancy of 10%.

So, Model I had the PP's coefficient positive and statistically significant, in line with H1. H1 stated that companies managed earnings to increase the CFO in the pre-project year and, despite the support from Model I, that does not happen with the results from regression (19") with the SMabCFO as dependent variable because the PP's coefficient is not statistically significant.

H2, that stated that companies managed their costs to achieve the costs defined on the project's plan, was not confirmed in the previous section because the P's coefficients on Models II and IV were not statistically relevant. In the regression (19") with the dependent variables PMabDISEXP and PMabTA, the P's coefficients remain non-statistically relevant.

Finally, H3 had been dismissed in the previous section because nothing lead to the conclusion that companies managed earnings to have a better outcome from the project's results evaluation. Regression (19"), by not having any PPY's coefficient statistically relevant, regardless of the dependent variable used, does not confirm H3 either.

In conclusion, while H1 was still confirmed in the previous section, now neither hypothesis can be confirmed. The following section should provide additional details on these analysis, strengthening the conclusions.

6.3.2. Sales-match methodology considering duration

We continue the robustness tests by using the same regression as in the previous section (19") but now the work sample is divided in two subsamples ("High" and "Low"), according to the duration of the project period. The subsample "High" integrates companies project's duration above the median (second quartile), and the subsample "Low" has firm observations below that threshold, i.e. below the median.

The choice to divide the sample according to duration derives from the high correlation between duration of the project and subsidy's amount. With that, it might be that companies that receive higher subsidies are more prone to manipulate earnings as the "reward" is higher. Table 9 summarizes the results:

Table 9 – Results from regression (19'') applied to the work sample divided by duration of the project

Independent Variables	Dependent Variables							
	SMabCFO		SMabCOGS		SMabPROD		SMabTA	
	Model V		Model VI		Model VII		Model VIII	
	High	Low	High	Low	High	Low	High	Low
NETPROFIT	-0,24***	0,21**	1,60***	-0,02	-0,54***	0,07	-0,78***	0,07***
DIMENSION	0,02	0,00	-0,03*	-0,02	-0,01	-0,03*	-0,01	0,00
PP	0,00	0,11	0,03	0,05	-0,01	-0,05	0,00	-0,01
P	-0,05	0,07	0,09	0,05	0,01	-0,09	-0,03	-0,03
PPY	-0,06	0,13	0,10	0,10	0,09	-0,21**	-0,02	-0,01
C	-0,07	0,09	0,14	0,03	0,01	-0,19*	-0,11	-0,02
Constant	-0,08	-0,04	0,35***	0,07	0,00	0,28***	0,05	-0,02
N	588	552	588	552	588	552	588	552
p-value	0,00	0,52	0,00	0,93	0,00	0,26	0,00	0,04
R^2	0,12	0,02	0,72	0,01	0,31	0,02	0,70	0,04

The dependent variables of these regressions are SMabCFO (sales-matched abnormal CFO), SMabDISEXP (sales-matched abnormal discretionary expenses), SMabPROD (sales-matched abnormal production costs) and SMabTA (sales-matched abnormal total accruals). The definition of the variables may be found on Annex 2.

Tittle "High" identifies regressions for the subsample with companies with the projects' duration above the median and "Low" identifies regressions for the subsample with companies with the projects' duration below the median.

*, ** and *** identify the level of statistical significancy of 10%, 5% and 1%, respectively. The significance level (*p-value*) corresponds to bi-directional tests.

Models seem to be better suited to the "High" subsample as that they are all statistically relevant for a level of significancy of 1% and have higher R^2.

Looking at the PP, P, PPY and C's coefficients, almost all of them are not relevant statistically, which is coherent with the previous section. Actually, among these variables, only the PPY's coefficient in Model VII, for the "Low" subsample, is statistically relevant but its signal is opposite to what was expected according to H3, because SMabPROD was supposed to increase in the post-project year to increase company's GVA (Gross Value Added) and, consequently, improve the project's results.

Overall, this analysis, despite providing greater in-depth information, it only confirms previous conclusions, i.e. that neither hypothesis can be confirmed.

6.3.3. Alternative model to compare work and control samples

Until now, the robustness tests lead to the rejection of all the hypotheses. However, before concluding, it was important to understand if the variables of interest (abCFO, abPROD, abDISEXP and abTA) had different behaviors in the work sample and in the control sample and, if so, if those differences happened during the process.

To understand if there are actually differences between samples, both of them (work and control samples) were gathered into one sample (the "alternative sample") and the methodology adopted was very similar to the one used in Section 6.2. and explained on Section 4. So, after obtaining the abnormal values for the variables of interest, instead of applying the regression (19'), the following regression was used:

$$(19'') \; Y_t = \alpha_0 + \beta_1 SUBSIDY + \beta_2 NETPROFIT_t + \beta_3 DIMENSION_t + \beta_4 PP_t + \beta_5 P_t + \beta_6 PPY_t + \beta_7 C_t + \varepsilon_t$$

Where Y_t can take the form of abCFO, abPROD, abDISEXP and abTA as it did in regression (19'). Similarly, all the other variables, except for $SUBSIDY$, had the same meaning as they did in regression (19'). $SUBSIDY$ is a dummy variable that is 1 if the company was subsidized by the Norte 2020 programme or 0 if it was not subsidized. It is expected that the $SUBSIDY$'s coefficients are statistically significant if the dependent variables are different between the control and work sample.

The results revealed that the $SUBSIDY$ was statistically relevant for a 10% level of significancy when the dependent variable was abCFO and abDISEXP. As such, we decided

to go further and check if the samples (work and control samples) had different behaviors in different the stages of the process through the inclusion of multiplicative variables. So, instead of the regression (19'''), the following one was applied:

$$(19'''') \; Y_t = \alpha_0 + \beta_1 SUBSIDY + \beta_2 NETPROFIT_t + \beta_3 DIMENSION_t + \beta_4 PP_t + \beta_5 P_t + \beta_6 PPY_t + \beta_7 C_t + \beta_8 PP_t * SUBSIDY + \beta_9 P_t * SUBSIDY + \beta_{10} PPY_t * SUBSIDY + \beta_{11} C_t * SUBSIDY + \varepsilon_t$$

Then, Wald tests will be performed for the following pairs of coefficients:

- β_1 and β_8: expectations regarding the signal are the same as the PP_t's coefficient, as presented in Section 4. So, according to H1, $\beta_1 + \beta_8$ should be positive for the dependent variables abCFO and abTA and negative for abDISEXP;
- β_1 and β_9: expectations regarding the signal are the same as the P_t's coefficient, as presented in Section 4, i.e., according to H2, $\beta_1 + \beta_9$ should be negative when Y_t is abTA and positive when it is abDISEXP;
- β_1 and β_{10}: expectations regarding the signal are the same as the PPY_t's coefficient, as presented in Section 4. According to H3, $\beta_1 + \beta_{10}$ should be positive when the regression has abPROD as dependent variable and negative for the other dependent variables;
- β_1 and β_{11}: expectations regarding the signal are the same as the C_t's coefficient, as presented in Section 4, i.e. according to H3 $\beta_1 + \beta_{11}$ should have the same signal as $\beta_1 + \beta_{10}$.

On Table 10 are displayed the results:

Table 10 – Results from regression (19'''')

Independent Variables	Dependent variables			
	abCFO	**abDISEXP**	**abPROD**	**abTA**
	Model IX	**Model X**	**Model XI**	**Model XII**
SUBSIDY	-0,01	0,10**	0,02	-0,02
NETPROFIT	-0,06***	0,96***	-0,31***	-0,46***
DIMENSION	-0,01**	0,02***	-0,01**	-0,02***
PP	-0,01	-0,01	-0,01	-0,01
P	-0,01	-0,01	-0,04	0,01
PPY	-0,01	-0,06	-0,02	-0,02
C	0,01	-0,02	-0,04	-0,01
SUBSIDY*PP	0,07	-0,04	-0,01	0,04
SUBSIDY*P	0,05	-0,06	-0,01	0,03
SUBSIDY*PPY	0,08	-0,09	-0,03	0,06
SUBSIDY*C	0,02	-0,15	-0,04	0,04
Constant	0,12	-0,09*	0,11***	0,11***
Wald Test				
$\beta_1 + \beta_8$	0,06	0,06	0,01	0,02
$\beta_1 + \beta_9$	0,04	0,04	0,01	0,02
$\beta_1 + \beta_{10}$	0,06	0,01	-0,01	0,04
$\beta_1 + \beta_{11}$	0,01	-0,05	-0,02	0,02
N	2280	2280	2280	2280
p-value	0,09	0,00	0,00	0,00
R^2	0,01	0,39	0,11	0,20

The definition of the variables may be found on Annex 2.

The values presented on the Wald Test part are the sum of the coefficients

*, ** and *** identify the level of statistical significancy of 10%, 5% and 1%, respectively.

The significance level (*p-value*) corresponds to bi-directional tests.

Once again, and for the last time, the Wald Tests performed lead to the same conclusions as the other robustness tests. As none of the coefficients sum was statistically significant, not even at a 10% level of significancy, all the hypothesis are rejected.

***

Overall, despite the early signs provided by the descriptive statistics analysis and by the first methodology adopted, the robustness tests lead to the conclusion that all the hypothesis should be rejected.

7. Conclusion

In this dissertation, we studied the existence of earnings management practices from companies that were subsidized by the Norte 2020.

Considering the stages of the process, several incentives that could lead companies to manage earnings were identified. In fact, companies could be incentivized to manage several financial indicators either (i) to obtain the subsidy, by fulfilling the minimum requirements and being better than the competition or (ii) to retain the subsidy, by achieving the results that were pre-defined in the application.

However, the results lead to the conclusion that companies did not manage earnings in any of the stages of the process, identified by the pre-project year, project period, post-project year and cruise year. In fact, the results indicate that there are not earnings management through discretionary accruals nor through real activities manipulation.

The fact that this dissertation studies the several stages of the subsidy process is an increment to the literature in this area that is, by itself, scarce. Additionally, as the conclusions go against the expectations and the literature, it allows to add a new perspective to the relationship between earnings management and subsidies.

Besides the scientific community, this dissertation might also be particularly helpful for legislators and institutions that manage state subsidies. Its usefulness will be higher if complemented with previous studies that focus on the relationship between earnings management and subsidies because it will allow to understand if the changes made from one programme to another had the expected consequences.

Nevertheless, this study had some limitations, namely the size of the used sample. This implies that the results cannot be generalized to the Portugal 2020. Moreover, the usage of a sample with companies that received different types of subsidies does not allow to understand the individual effect of each type of subsidy on earnings management.

Additionally, since the period of 2014-2019 is so recent, we could not use a methodology that would take advantage of the information provided by future financial indicators, namely cashflows from operations.

In addition, there are limitations that are inherent to the chosen methodology because, despite being supported on the literature and on the Norte 2020 regulation, it is subjected to

the omission of relevant variables. However, the robustness tests should overcome this limitation.

The last limitation comes from the regulatory uncertainty associated with the end of the project and the results evaluation. Even though companies are acting according to what was defined in the previous programme – the QREN ("Quadro de Referência Estratégico Nacional") – the lack of legislation in the Norte 2020 regarding the results evaluation makes the incentives for earnings management less robust, in this phase of the subsidy.

In the future, to complement the analysis done in this dissertation, it is important to use a broader sample and take advantage of the future financial information that companies will provide. It would also be important to analyze other financial indicators that are used in the results evaluation and that might represent a more enticing incentive for companies to manage results.

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9. Annexes

Annex 1 – Merit of the Project Indicators per Call

Each line has a Call and the financial indicators that contribute to the Merit of the Project. All the Calls are grouped by the area of the Call ("Support System to the Entrepreneurship and Employment", "Qualification of SMEs", "Internationalization of SMEs, Internationalization of SMEs", "Innovation and Technological Development" and "Business Innovation and Entrepreneurship"

Call	Weight	Criteria	Merit of the Project				
			5	4	3	2	1
Support System to the Entrepreneurship and Employment							
NORTE-M8-2018-32	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
NORTE-M8-2018-33	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
	10%	Financial Autonomy (Pre-project)	>=35%	>=30%	>=25%	>=20%	>=15%
NORTE-M8-2018-30	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
NORTE-M8-2018-29	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
	5%	Financial Autonomy (Pre-project)	>=30%	>=20%	>=10%	>=5%	<5%
	5%	Value Creation	>=2	>=1,25	>=0,75	>=0,5	<0,5
NORTE-M8-2018-25	13%	Financing through equity	>=50%		>=15%		<15%
	13%	Financial Autonomy (Pre-project)	>=30%		>=20%		>=15%
	12%	Value Creation	>=1,25		>=0,75		<0,75
NORTE-M8-2018-24	13%	Financing through equity	>=50%		>=15%		<15%
	13%	Financial Autonomy (Pre-project)	>=30%		>=20%		>=15%
	12%	Value Creation	>=1,25		>=0,75		<0,75
NORTE-M7-2018-05	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
	10%	Gross Value Added	>=0,5		>=0,25		<0,25
NORTE-M8-2018-06	5%	Private investment covered by equity	>=50%	>=30%	>=20%	>0%	0%
NORTE-M7-2017-13	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0%
NORTE-M7-2017-14	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0%
NORTE-M8-2017-15	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0%
NORTE-M8-2017-17	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0%
M8-2017-18	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
	5%	Gross Value Added	>=0,5		>=0,25		<0,25
M8-2017-16	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
M8-2017-34	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
M8-2017-19	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
M8-2017-20	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
M8-2017-21	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
	5%	Financial Autonomy (Pre-project)	>=30%	>=20%	>=10%	>=5%	<5%
	8%	IRR	>20	>15	>10	>5	>0
M8-2017-22	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
M8-2017-12	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0

	5%	Financial Autonomy (Pre-project)	>=30%	>=20%	>=10%	>=5%	<5%
	5%	Value Creation	>=2	>=1,25	>=0,75	>=0,5	<0,5
M8-2017-11	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
	5%	Financial Autonomy (Pre-project)	>=30%	>=20%	>=10%	>=5%	<5%
	5%	Value Creation	>=2	>=1,25	>=0,75	>=0,5	<0,5
M8-2017-23	6%	Financial Autonomy (Pre-project)	>=25%	>=20%	>=10%	>=5%	<5%
	10%	Gross Value Added	>=0,5		>=0,25		<0,25
M8-2017-31	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
M8-2017-28	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
	5%	Gross Value Added	>=0,5		>=0,25		<0,25
M8-2017-29	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
	5%	Value Creation	>=2	>=1,25	>=0,75	>=0,5	<0,5
M8-2017-30	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
	5%	Value Creation	>=2	>=1,25	>=0,75	>=0,5	<0,5
M8-2017-33	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
	5%	Gross Value Added	>=0,5		>=0,25		<0,25
M8-2017-35	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
M8-2017-36	10%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
M8-2017-37	10%	Financing through equity	>=50%		>=10%		<10%
M8-2017-38	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
M8-2017-39	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
M8-2017-27	5%	Financing through equity	>=50%	>=20%	>=10%	>0%	0
	3%	Gross Value Added	>=0,5		>=0,25		<0,25

Qualification of SMEs			
Norte 53-2020-01	Nothing relevant		
06/SI/2019	Nothing relevant		
01/SI/2020	20%	Exports Intensity Post-Project	See table A.1
NORTE-59-2018-42	Nothing relevant		
32/SI/2018	20%	Exports Intensity Post-Project	See table A.1
	Increase in the Merit (9%)	Index regarding value creation	See table A.2
26/SI/2018	20%	Exports Intensity Post-Project	See table A.1
	Increase in the Merit (9%)	Index regarding value creation	See table A.2
59-2015-11	7%	R&D Intensity	See table A.3
	16%	Yearly average growth of expenses in R&D	See table A.4
05/SI/2015	10%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2
NORTE-53-2015-08	Nothing relevant		
NORTE-53-2015-06	Nothing relevant		
18/SI/2015	20%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2
23/SI/2015	20%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2
NORTE-53-2015-20	Nothing relevant		
53-2016-07	Nothing relevant		
SI-53-2016	20%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2

18/SI/2016	20%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2
12/SI/2017	20%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2
Internationalization of SMEs			
Norte-52-2020-05	Nothing relevant		
Norte 52-2020-02	Nothing relevant		
NORTE - 52 - 2019 - 14	Nothing relevant		
25/SI/2018	Nothing relevant		
27/SI/2018	20%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2
NORTE-52-2018-28	Nothing relevant		
NORTE-52-2018-26	Nothing relevant		
03/SAICT/2017	Nothing relevant		
24/SI/2017	Nothing relevant		
06/SI/2015	10%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2
NORTE-52-2015-2017	Nothing relevant		
NORTE-52-2015-05	Nothing relevant		
19/SI/2015	20%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2
22/SI/2015	20%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2
NORTE-52-2015-19	Nothing relevant		
52-2016-05	Nothing relevant		
04/SI/2016	20%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2
17/SI/2016	20%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2
11/SI/2017	20%	Exports Intensity Post-Project	See tables A.5 and A.6
	9%	Index regarding value creation	See table A.2
52-2017-10	Nothing relevant		
Innovation and Technological Development			
04/SI/2020	4%	Increase of the investment in R&D	See table A.7
03/SI/2020	8%	Increase of the investment in R&D	See table A.7
04/SI/2019	7%	Increase of the investment in R&D	See table A.7
01/SI/2019	20%	Increase of the investment in R&D	See table A.7
34/SI/2018	4%	Increase of the investment in R&D	See table A.7
30/SI/2018	20%	Increase of the investment in R&D	See table A.7
26/SI/2016	3%	Increase of the investment in R&D	See table A.7
25/SI/2017	3%	Increase of the investment in R&D	See table A.7
32/SI/2015	4%	Increase of the investment in R&D	See table A.7
33/SI/2015	4%	Increase of the investment in R&D	See table A.7
23/SI/2017	20%	Increase of the investment in R&D	See table A.7
24/SI/2017	6%	Increase of the investment in R&D	See table A.7

29/SI/2017	6%	Increase of the investment in R&D	See table A.7
30/SI/2017	6%	Increase of the investment in R&D	See table A.7
31/SI/2017	3%	Increase of the investment in R&D	See table A.7
01/SI/2018	4%	Increase of the investment in R&D	See table A.7
17/SI/2015	20%	Increase of the investment in R&D	See table A.7
31/SI/2015	4%	Increase of the investment in R&D	See table A.7
SI-47-2016-10	12%	Increase of the investment in R&D	See table A.7
03/SI/2017	3%	Increase of the investment in R&D	See table A.7
04/SI/2017	4%	Increase of the investment in R&D	See table A.7
05/SI/2017	4%	Increase of the investment in R&D	See table A.7
		Business Innovation and Entrepreneurship	
31/SI/2018	10%	Exports Intensity Post-Project	See tables A.5 and A.6
	10%	V Index = GVA post-project/GVP post-project	See table A.8
	15%	Index regarding value creation	See table A.9
06/SI/2017	8%	Exports Intensity Post-Project	See tables A.5 and A.6
	6%	P1 = ((GVA Post-project/HR post-project)-(GVA pre-project/HR pre-project))/(GVA post-project/HR pre projeto) P2 = GVA post-project/HR post-project	See tables A.10 and A.11
	10%	Index regarding value creation	See table A.9
26/SI/2017	10%	Exports Intensity Post-Project	See tables A.5 and A.6
	10%	V Index = GVA post-project/GVP post-project	See table A.8
27/SI/2017	10%	Exports Intensity Post-Project	See tables A.5 and A.6
	10%	V Index = GVA post-project/GVP post-project	See table A.8
04/SI/2018	10%	Exports Intensity Post-Project	See tables A.5 and A.6
	10%	V Index = GVA post-project/GVP post-project	See table A.8
03/SI/2015	8%	Exports Intensity Post-Project	See tables A.5 and A.6
	8%	V Index = GVA post-project/GVP post-project	See table A.8
25/SI/2015	10%	Exports Intensity Post-Project	See tables A.5 and A.6
	10%	V Index = GVA post-project/GVP post-project	See table A.8
01/SI/2015	8%	Exports Intensity Post-Project	See tables A.5 and A.6
	8%	V Index = GVA post-project/GVP post-project	See table A.8
	6%	P1 = ((GVA Post-project/HR post-project)-(GVA pre-project/HR pre-project))/(GVA post-project/HR pre projeto) P2 = GVA post-project/HR post-project	See tables A.10 and A.11
SI-53-2016-01	10%	Exports Intensity Post-Project	See tables A.5 and A.6
	10%	V Index = GVA post-project/GVP post-project	See table A.8
19/SI/2016	10%	Exports Intensity Post-Project	See tables A.5 and A.6
	10%	V Index = GVA post-project/GVP post-project	See table A.8
12/SI/2016	10%	Exports Intensity Post-Project	See tables A.5 and A.6
	10%	V Index = GVA post-project/GVP post-project	See table A.8
07/SI/2017	10%	Exports Intensity Post-Project	See tables A.5 and A.6
	10%	V Index = GVA post-project/GVP post-project	See table A.8
08/SI/2017	10%	Exports Intensity Post-Project	See tables A.5 and A.6
	10%	V Index = GVA post-project/GVP post-project	See table A.8
	10%	Index regarding value creation	See table A.12

Table A.1 – Intensity of the exportations post-project

		Qualification of international markets		
		Weak	Average	Strong
Intensity of the exportations post-project	15%<IE<25%	1	1,5	2
	25%<IE<35%	1	1,5	2
	35%<IE<65%	1	1,5	2
	IE>65%	1	1,5	2

Tables A.2 – Index regarding value creation

	Index	
	Index>=1,2	1<Index<1,2
Increase in the Merit of the Project	1	0,5

Table A.3 – R&D Intensity

	% of sales from new products in total sales		
R&D Intensity	Below 10%	Between 10% and 13%	More than 13%
Below 5%	1	2	3
Between 5% and 10%	2	3	4
Bigger than 10%	3	4	5

Table A.4 – Growth of the expenses in R&D compared to predicted GVA for the next 5 years

	Average yearly growth		
Growth of the expense in R&D compared to GVA in the next 5 years	Below 5%	Between 5% and 10%	More than 10%
Below 5%	1	2	3
Between 5% and 10%	2	3	4
Bigger than 10%	3	4	5

Table A.5 – Intensity of the exportations post-project for tourism companies

			Qualification of international markets		
	Existing companies	New companies	Weak	Average	Strong
Intensity of the exportations post-project	IE<20%	IE<15%	1	1,5	2
	20%<IE<30%	15%<IE<20%	2,5	3	3,5
	30%<IE<40%	20%<IE<25%	3	3,5	4
	IE>40%	IE>25%	3,5	4	5

Table A.6 – Intensity of the exportations post-project for non-tourism companies

		Qualification of international markets		
		Weak	Average	Strong
Intensity of the exportations post-project	IE<15%	1	1,5	2
	15%<IE<35%	2,5	3	3,5
	35%<IE<65%	3	3,5	4
	IE>65%	3,5	4	5

Table A.7 – Increase in R&D expenses

		P Index		
	Micro or small companies	P<0,8%	0,8%<P<1%	P>1%
	Medium or Non SME Companies	P<1,8%	1,8%<P<2%	P>2%
Increase in R&D between pre-project and post-project	No	2	3	4
	Yes	3	4	5
Companies without expenses in R&D pre-project		2	3	5

Table A.8 – Level of value added

			Positiong in the value chain and competitive advantages post-project		
	Industry	Other sectors	Weak	Average	Strong
Level of value added	V<20%	V<20%	1	1,5	2
	20%<V<30%	40%<V<50%	2,5	3	3,5
	30%<V<40%	50%<V<60%	3	3,5	4
	V>40%	V>60%	3,5	4	5

Table A.10 – Variations of productivity between pre-project and post-project for existing companies with positive GVA

		Qualification of international markets		
	Big companies	P2<50m€	50m€<P2>75m€	P2>75m€
Variation of productivity between pre and post-project	P1<25%	1	1,5	2
	25%<P1<50%	2,5	3	3,5
	P1>50%	3	3,5	4
	IE>65%	3,5	4	5

Table A.11 – Score for companies with negative pre-project GVA and Companies with less than 3 years

	GVA/HR costs on post-project		
	P2<50m€	50m€<P2>75m€	P2>75m€
Score	1	3	4,5

Table A.12

		Net Job Creation			
Big Enterprises		<=0	1 to 9	10 to 19	>=20
Medium Enterprises		<=0	1 to 4	5 to 9	>=10
Micro and Small Enterprises		<=0	1 to 2	3 to 5	>=6
Unbalance of the job market in the region	Light	1	2	3	4
	Moderate	1	2,5	3,5	4,5
	Severe	1	3	4	5

	Index	
	Index>=1,5	**1<Index<1,5**
Increase in the Merit of the Project	1	0,5

Annex 2 – Variables Definition

Variable	Symbol	Definition
Cashflow from operations	CFO_t	CFO at the end of year t
Cashflow from operations t-1	CFO_{t-1}	CFO at the end of year t-1
Cashflow from operations t+1	CFO_{t+1}	CFO at the end of year t+1
Total Assets	A_{t-1}	Total assets at the end of year t-1
Sales	S_t	Sales at the end of year t
Variation of Sales	ΔS_t	S_t-S_{t-1}
Production Costs	$PROD_t$	Sum of variation of inventory and costs of goods sold at the end of year t
Variation of Sales in t-1	ΔS_t-1	S_{t-1}-S_{t-2}
Discretionary Expenses	$DISEXP_t$	Sum of supplies and external services and other operational costs at the end of year t
Permanent Inventory	IP_t	Variable dummy that is 1 if companies have the obligation to report permanently the inventory to legal entities and 0 otherwise
Total Accruals	TA_t	Change in non-cash current assets minus the change in current liabilities excluding the current portion of long-term debt
Net Profit	$NETPROFIT_t$	Difference between the company's net profit at the end of year t and the corresponding industry's average net profit at the end of year t, scaled by total assets of the year t-1
Dimension	$DIMENSION_t$	Logarithm of the absolute difference between the company's total assets at the end of year t-1 minus the corresponding industry's average total assets at the end of year t-1
Pre-project year	PP_t	Dummy variable that is 1 if the relative year of the project is N and 0 otherwise
Project period	P_t	Dummy variable that is 1 if the relative year of the project is within the period N+1 until N+5 and 0 otherwise
Post-project year	PPY_t	Dummy variable that is 1 if the relative year of the project is P+1 and 0 otherwise
Cruise year	C_t	Dummy variable that is 1 if the relative year of the project is P+2 and 0 otherwise
Subsidy	SUBSIDY	Dummy variable that is 1 if the company was subsidized by Norte 2020 and 0 otherwise
Return on Assets	ROA_t	Return on Assets at the end of year t
Return on Assets in t-1	ROA_{t-1}	Return on Assets at the end of year t-1

Annex 3 – Distribution of samples per sector of activity (CAE at 3 digits)

CAE (3 digits)	Work Sample (nr. of firm-year observations)	Large Sample (nr. of firm-year observations)
81	12	3104
105	6	1186
107	6	14656
110	42	4058
131	6	376
133	6	1308
139	72	5763
141	42	16162
143	12	1482
152	24	7896
162	54	9227
172	6	1517
181	18	8043
201	6	608
204	12	729
221	6	469
222	18	3374
231	18	1270
237	24	5204
239	6	287
245	6	408
251	24	14215
252	6	334
256	6	5208
257	30	3660
259	6	4238
265	6	214
282	12	1885
289	30	1896
293	12	905
310	48	9348
321	6	1634
329	12	1680
331	18	8243
332	6	1711
383	12	1859

412	18	95086
429	6	7248
432	36	32621
452	12	32565
453	6	12996
461	12	14714
463	18	28460
465	18	4706
466	18	19546
467	48	28233
469	36	16042
471	6	23906
474	6	10270
475	12	41313
476	12	15188
477	30	82801
494	18	34670
522	6	8078
551	12	14193
552	6	15098
561	6	68676
562	6	2355
591	6	5091
620	30	22954
692	12	47431
702	12	45377
711	18	34072
712	12	2319
741	12	5207
743	18	1110
812	6	6570
829	12	18783
869	6	28085
900	6	5836
932	6	7839

Annex 4 – Tests of normality

Variable	Group	Pre-project		Pre-project year		Project		Post-project year		Cruise			
		Shapiro-Wilk		*Shapiro-Wilk*		*Shapiro-Wilk*		*Shapiro-Wilk*		*Kolmogorov-Smirnov*		*Shapiro-Wilk*	
		Statistic	**P-value**	**Statistic**	**P-value**	**Statistic**	**P-value**	**Statistic**	**P-value**	**Statistic**	**P-value**	**Statistic**	**P-value**
GVA	Work Sample	10,325	0,0000	8,731	0,0000	11,007	0,0000	7,279	0,0000	15,41	0,0005	4,472	0,0000
	Control Sample	10,992	0,0000	9,189	0,0000	11,778	0,0000	5,805	0,0000	8,65	0,0132	4,038	0,0000
SALES	Work Sample	9,675	0,0000	8,22	0,0000	11,846	0,0000	8,608	0,0000	10,86	0,0044	4,788	0,0000
	Control Sample	9,823	0,0000	8,887	0,0000	11,495	0,0000	6,354	0,0000	26,13	0,0000	4,842	0,0000
CFO	Work Sample	10,509	0,0000	8,863	0,0000	11,13	0,0000	7,251	0,0000	11,05	0,0040	4,521	0,0000
	Control Sample	9,888	0,0000	9,267	0,0000	11,443	0,0000	7,12	0,0000	33,64	0,0000	5,612	0,0000
DISEXP	Work Sample	10,028	0,0000	8,754	0,0000	13,072	0,0000	9,113	0,0000	13,8	0,0010	5,122	0,0000
	Control Sample	10,615	0,0000	9,611	0,0000	12,553	0,0000	7,113	0,0000	12,93	0,0016	4,622	0,0000
PROD	Work Sample	9,552	0,0000	8,422	0,0000	11,336	0,0000	7,253	0,0000	10,11	0,0064	4,438	0,0000
	Control Sample	10,186	0,0000	9,301	0,0000	11,549	0,0000	7,176	0,0000	31,29	0,0000	5,542	0,0000
TA	Work Sample	9,103	0,0000	7,286	0,0000	11,623	0,0000	7,757	0,0000	3,89	0,0005	13,32	0,0013
	Control Sample	8,957	0,0000	9,529	0,0000	11,05	0,0000	7,436	0,0000	3,833	0,0006	13,55	0,0011
Observations	Work Sample	284		190		509		92		45			
	Control Sample	284		190		509		92		45			

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