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THE WORKING CAPITAL MANAGEMENT: THE DETERMINANTS AND THE EFFECT ON PROFITABILITY: EVIDENCE FROM PORTUGUESE SMES

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Abstract

Through an empirical analysis, the study objectives pass to evidence the determinants of working capital and conversely, analyze the relationship between this type of management and the SMEs' profitability, as well to find evidence that the Portuguese GDP and different industries influence the management of working capital. The sample considers the period 2009-2011 and consists in 1192 Portuguese SMEs. Controlling for possible problems of unobservable heterogeneity and endogeneity, the results suggest that the capacity to generate internal funds and leverage are the determinants of working capital. The capacity to generate internal funds is negatively related with this type of management, suggesting that companies manage working capital efficiently when they have greater capacity to generate cash flows. Leverage is negatively related with this type of management, suggesting that when firms increase their level of debt, they manage efficiently the working capital, to not increase even more the financial needs. Unlike most previous studies, it was found no relationship between working capital management and the SMEs' profitability, which was confirmed by robustness tests, suggesting that this type of management does not have a significant role in working capital management. The results also suggest that the Portuguese GDP has no influence on the management of working capital, and it was confirmed that this type of management varies between different industries in this study.

Resumo

Através de uma análise empírica, o estudo tem como objectivos evidenciar os determinantes da gestão do fundo de maneio e contrariamente, analisar a relação entre este tipo de gestão e a rendibilidade das PMES, bem como evidenciar se o PIB português e as diferentes indústrias influenciam a gestão do fundo de maneio. A amostra considera o período 2009-2011, sendo constituída por 1192 PMEs portuguesas. Controlando para possíveis problemas de heterogeneidade não observável e de endogeneidade, os resultados obtidos sugerem que a capacidade de gerar fundos internamente e a alavancagem financeira são os determinantes da gestão do fundo de maneio. A capacidade de gerar fundos internamente está negativamente relacionada com este tipo de gestão, sugerindo que as empresas gerem eficientemente o fundo de maneio quando têm maior capacidade de gerar fluxos de caixa. A alavancagem financeira está negativamente relacionada com este tipo de gestão, sugerindo que quando as empresas aumentam a sua dívida, estas gerem eficientemente o fundo de maneio, de forma a não acrescentar mais necessidades de financiamento. Contrariamente à maioria dos estudos anteriores, não foi encontrada relação entre a gestão de fundo de maneio e a rendibilidade das PMEs, que por ventura foi confirmada por testes de robustez, sugerindo que este tipo de gestão não tem um papel significativo na rendibilidade das PMEs portuguesas. Os resultados também sugerem que o PIB português não tem influência na gestão do fundo de maneio, e foi confirmado que este tipo de gestão varia entre as diferentes indústrias neste estudo.

Palavras-chave: Fundo maneio, determinantes, rendibilidade, PMEs.

Classificação JEL: G30, G31.

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List of abbreviations

CCC – Cash Conversion Cycle

EU – European Union

GDP – Gross Domestic Product

GLS – Generalized Least Squares

GMM – Generalized Method of Moments

GOP - Gross Operating Profitability

GVA – Gross Values Added

INE – Instituto Nacional de Estatística

IV – Instrumental Variable

OLS – Ordinary Least Squares

POT – Pecking Order Theory

pp – percentage point

ROA – Return On Assets

SME – Small and Medium Enterprise

TFA – Total Fixed Assets

WCM – Working Capital Management

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1. INTRODUCTION

The present introductory chapter was designed to provide a brief overview of the global research. It introduces the Portuguese small and medium enterprises (SMEs) on its environment and the working capital management (WCM) problematic, as also the motivations for the elaboration of this study. The research objectives and the methodology are proposed, followed by the description of how the research is structured.

1.1. Problem statement and motivation

Nowadays, Portuguese economy lives in an environment of austerity waiting for its long expected economic upturn. The rising competitiveness of companies is key to survive this stage and is crucial for the economic success. The day-to-day economic-financial decisions are now more important, being a critical factor in an economy where the firms access to capital remains difficult.

Research about corporate finance tends to give greater attention to long-term financial decisions as capital structure, than the short-term decisions. Thus WCM plays an important role in the firms' day-to-day financial decisions, but the level of attention and relevance is not the same as the traditional long-term financial decisions. This research also attempts to contrary this situation.

With the crescent importance on the day-to-day decisions, the present study focused in the idea of WCM concept that relates the financial decision on the composition of the amount of current assets and what are the sources used to finance such assets. Current assets are all the assets that in the normal course of operations, are suitable to return to the form of cash in a short period of time (less a year), and might be readily to be converted into cash upon need (Raheman and Nasr, 2007).

The research based on working capital is old as the economics is. The working capital problematic might have started with Adam Smith (1776), who introduced the firsts' notions of the working capital importance and since that time, many researchers start exploring the different theories of capital structure on WCM, studying its effect on the profitability and later characterizing its determinants. Recently, the studies began to discuss these topics for the SMEs.

The subject of the problematic of WCM has been reviewed by diverse authors. WCM was analyzed essentially by two points of view, the relationship between WCM and firms' profitability and the determinants of WCM. Many authors have tried to characterize and propose effects for the possible interaction, although the relation is not clear by the sign of the effect or by its existence, or recently by its non-linear relation or not. However, much less attention has been given to the determinants of WCM, and evidence for SMEs is lower, despite that the efficient WCM for this type of firms is particular important. In this study it will be taken into attention these two WCM problematics.

Acknowledged the relevance of SMEs into the Portuguese economy (chapter 2), it is important to study how firms finance their current assets and define what are the determinants that affect the WCM, as its possible influence in the firms profitability. The present research, expects to update the WCM existing literature by incorporating the reality for the Portuguese SMEs into the analysis.

More recently and with the development of new statistical approaches and new instruments, the WCM researches start to control unobservable heterogeneity and endogeneity problems. The purpose of controlling heterogeneity is the chance that the method provides to exclude biases results by the existence of individual effects between individual. When the independent variable is correlated to the error term of the regression, the problem of endogeniety exists and the factors that are supposed to explain the effect of a particular outcome, depend themselves on that outcome (Cameron and Triverdi, 2009).To beware of these problems it was developed proper methodologies to control these issues on the research.

The motivations to elaborate this project are several, but in this paragraph it will be resumed the principal ones. First, the development of a study on working capital field which is related to the importance of SMEs in the Portuguese economy, that might be relevant for the public in order to characterize the WCM determinants of these firms and the relation with profitability, as also characterize it for the different industries and provide a useful relation with the Portuguese GDP. Second to use the last approaches (fixed effects, instrumental variable, non-linear and robustness test methodology) used in the last WCMs empirically researches to give strength to the results. And third, giving an important contribute for a global overview of the working capital literature that was made until today, relating the major tendencies of the WCM and its effects on profitability and on the inverse what are the factors

that determine and relates WCM. Also, it was characterized the environment of the research and what was made empirically until to get the latest results that were made.

1.2. Objectives

Granted the pertinence of studying the WCM and its importance to Portuguese SMEs, the present research attempts to contribute for the existing literature by determining which determinant of working capital measure explains best the WCM and its impact on it, and conversely, if the WCM has any effect on firms' profitability and characterize the possible relation, for a sample of Portuguese SMEs.

Secondly, the research intends to determine and relate the impact of the Portuguese GDP on WCM of the Portuguese SMEs, as external factor that have impact on firms' WCM.

Finally, the third objective passes to explore and evaluate what is the impact of different industries on the WCM for the Portuguese SMEs and how WCM varies across the industries present in the study and between years.

1.3. Methodological approach

In order to conclude the results for the proposed objectives, it was estimated two models in order to investigate respectively the determinants of WCM and the WCM effect on the SMEs' profitability. The models were regressed by the OLS, as indicative model, by fixed effects model, in order to control unobservable heterogeneity, and for last by Instrumental Variable (IV) methodology, using generalized method of moments (GMM) coefficient estimator to control for possible endogeneity problems. The GDP was integrated in the model to relate the possible relation with the dependents variables. Also, the ANOVA (F-test) to test the equality of means, the t-test for the equality of means and descriptive statics for each industry were implemented.

The analysis was conducted using a sample of firms provided by *Informa D&B Portugal* gathered in *SABI* (Iberian Balance Sheets Analysis System). The data contains detailed financial information (balance sheets, income statements, financial ratios) and descriptive information. The final sample contains 1192 Portuguese SMEs, in a total of 3576 firm-year observations for the period 2009-2011.

1.4. Structure

The research contains 4 others chapters besides the present introduction: chapter 2 presents the literature review, where it is suggested an overview of the relevant theories that have been developed to explain WCM and its influence on firm's profitability; in chapter 3 it is presented the formulation of the hypotheses, the characterization of the data sample used, and the methodology applied in the research, the type of analysis conducted and the variables used in order to test the hypotheses proposed; chapter 4 details the results obtained, using essentially descriptive statistics, Pearson correlation analysis, regression analysis for the 2 models (with different methodologies), robustness tests and also the discussion of the results obtained. For the end of the research, chapter 5 describe the major conclusions and contributions of the present empirical study, presenting the limitations faced in the elaboration of the research and for last, a summary of topics for future research are suggested.

2. LITERATURE REVIEW

In this chapter it will be proposed an overview of the relevant theories and approaches that have been developed to explain the WCM and its influence on firm's profitability. Although the literature covers a diversity of authors and theories, this review will first focus on the Working Capital's major base theory and incorporating an overview on firms' capital structure. Going throughout the chapter it will be reviewed the literature linked with the contextualization of SME on its environment, reviewed the relationship with WCM, profitability and SMEs and to finish, the review will focus on the determinants of working capital. Although the literature presents these themes in a variety of contexts, it will be given an overview for the general working capital with a particular focus on the literature for the SMEs context.

2.1. Working Capital Management Overview

The research related with Working Capital goes back to the primordial times of economics. Since the publication of *The Wealth of Nations by* Adam Smith (1776), economists have recognized an important role of working capital on firm's capital structure. Adam Smith made a clear division between "circulating capital" and "fixed capital". His definition for "circulating capital" was similar to today's notion of working capital. Furthermore, Dewing (1941) suggested that the Society of Mines Royal in 1571 divided its capital in "fixed and current capital**"** being a "key" element for the firm. Also, he suggested that the main difference between the two types of capital was the "current's capital**"** liquidity.

Throughout the years the definition and meaning of working capital changed. Preve and Sarria-Allende (2010) summarize two approaches that define the working capital as it is known today. The first approach which they call "*traditional definition of working capital*" is defined by Preve and Sarria-Allende (2010:15) as:

<p align="center">**"Working Capital = Current Assets - Current Liabilities"**</p>

According to Preve and Sarria-Allende (2010:15) "*This traditional definition of working capital shows how much cash (or liquid assets) is available to satisfy the short-term cash requirements imposed by current liabilities*".

The other approach does not incorporate the short-term components and it is defined by Preve and Sarria-Allende (2010:15) as:

"*Working Capital = Capital – Fixed Assets*"

With this approach, Preve and Sarria-Allende (2010:15) suggest that "*Working capital is the amount of capital that is devoted to financing the current assets of the firm*". In this working capital's definition there are no short-term components, but with the incorporation of strategic elements as capital and fixed assets, it was possible to relate to other alternatives meanings and applications for WCM. Preve and Sarria-Allende (2010) also empathizes that working capital is one of the sources of funds to meet the financial needs for operations.

According to Jose *et al.* (1996:33) the focus of literature is essentially "*…from the classic work of Miller and Modigliani (1961) (…) (1958), examines the relationship between investment decisions, finance decisions, and returns to equity owners. Another category of managerial decisions, working capital management, has received less attention…*". Previous literature was essentially developed taking into consideration the long-term management decisions, as capital structure, investments and corporate valuation. Although working capital decisions plays an important role in firms' day-to-day decisions, it did not get the same level of attention and relevance as the classic finance decisions' research from Miller and Modigliani (*e.g.* Smith, 1973; Jose *et al.*, 1996; Shin and Soenen, 1998; García-Teruel and Martínez-Solano, 2007; Baños-Caballero *et al.*, 2010).

The researches for a global and comprehensive view of working capital are scarce, although, for individual components of working capital exist some relevant studies (Etiennot *et al.*, 2012). For instance, there is a large relevant academic literature related with Trade Credit. Meltzer (1960) was one of the pioneers in the Trade Credit field, studying the relationship between monetary conditions and trade credit. Related studies were made and a diversification of theories on Trade credit were developed to explain management decisions to use trade credit (Ferris, 1981; Emery, 1984; Smith, 1987; Lee and Stowe, 1993; Petersen and Rajan, 1997; Cuñat, 2007; Himmelberg *et al.*, 2008) and to "*provide good insights on the usefulness of offering and/or accessing such a credit*" (Etiennot *et al.*, 2012:161). Also, this theme was also studied for different environments, relating the dynamics of trade credit and determining the effect of the operational and financial decisions (Petersen and Rajan, 1997; Love *et al.*, 2007).

As an example of the diversified trade credit findings, is the research of Petersen and Rajan (1997) that found that US SMEs with weak relations with the financial institutions use more trade credit. In the same direction, Wilner (2000) also has shown that suppliers tend to give trade credit to customers, when firms are in distress situations, in order to maintain long-term relations with its clients. Relating monetary conditions, Nilsen (2002) for a sample of US firms, found that when firms that do not have bond ratings, tend to increases its dependence (reliance) on trade credit, during the monetary contractions. For a sample of 37 industries in 43 countries, Fisman and Love (2003) found that countries with undeveloped financial markets substitute informal credit provided by theirs suppliers, which allows higher growth rates. Love *et al.* (2007) found that the worldwide firms increase their trade credit when financial crises appear. Also, Molina and Preve (2009) found that firms tend to increase the use of trade receivables when issues of profitability exists and provide less trade receivables in presence of issues of cash-flow and financial distress problems.

External and internal evidences are another important stream in the WCM field. Zariyawati, *et al.* (2010:190) explained that "*Determinants of Working capital are divided to internal and external factors. Internal factor is focused on firm characteristic specific factors while external factor consists of macroeconomic factors*". An efficient management of working capital needs to take attention to the working capital's internal and external factor, or the both. Previous literature focused essentially in the firm's internal factors (Kieschnick *et al.*, 2006; Chiou *et al.*, 2006). Researches relating WCM with external factors are less predominant. Mills (1996) found a relevant relationship between external factor determinants and working capital. He studied the impact of inflation in the budgeting process. He found that the higher the net working capital the greater will be the impact of the inflation. He also found that inflation influences the firm's behavior. Inflation makes firms attempt to reduce their net working capital, altering their debt/asset ratio using more short-term debt, increasing debt short-term levels comparing to the long-term ones. Lamberson (1995) found evidence that internal and external factor determinants should be taken into consideration in WCM.

2.2. Capital structure overview

Corporate capital structure has been study as interest to researchers, since the publication of *"The cost of capital, corporate finance and the theory of investment"* from Modiagliani and Miller in 1958, (*e.g.* Myers, 2001; Brendea, 2011).

The theorem from Modigliani and Miller (1958) states that under perfect and frictionless markets, the firm value stays unaffected regardless of whether the firm's capital consists of equity and/or debt. In other words an unleveraged firm will have the same market value as a leveraged firm. Adding a market imperfection, corporate taxes, Modigliani and Miller (1963) showed that the market value of the firm increases, if firms use as capital debt over equity. This model with corporate taxes states that debt adds benefits to the firms because the corporate tax is treated as deductible expense and this causes a benefit to the firms. This effect is called tax shield effect.

The findings from Modigliani and Miller (1958, 1963) motivated further research related with corporate capital structure. From the following research, emerged the three major theories of capital structure: trade-off theory, pecking-order theory (POT) and agency costs theory.

2.2.1. Trade-off theory

Since Modigliani and Miller (1963) introduced taxes into the model proposed, further research led to the emerging of trade-off theory of capital structure, in which states that it exists a trade-off between the tax benefits of debt and the expected costs of bankruptcy (Kraus and Litzenberger, 1973), where firms should maximize their debt levels as much as they can when seeking an optimal level (Miller, 1988). According to Frank and Goyal (2005) there are two versions of this theory: the statistic and dynamic trade-off theory. The static trade-off theory affirms that firms' optimal capital structure is defined by the trade-off between the tax shield effect and the costs of bankruptcy. The dynamic trade-off theory affirms that the companies seek a target debt ratio and have an adjustment behavior that tries to accomplish.

Probably the first statement about the theory came from empirical evidence from Kraus and Litzenberger (1973), where, as referred above, the researchers found that optimal leverage reflects a trade-off between tax benefits of debt and bankruptcy costs. For the authors, this effect is created because when adding additional leverage this causes an increase in expected bankruptcy costs that could offset the tax effect.

Later and according to Myers (1984), firms that seek the trade off-theory focus in a target debt ratio. These target debt ratio is defined by balancing debt tax shields against bankruptcy costs and the firm moves gradually to this target.

The static trade-off theory of capital structure changes propositions suggest (Modigliani and Miller,1958, 1963; Myers, 2003):

$$V_L = D + E = V_U + VP(tax\ shield) - VP\ (bankrupcy\ costs)$$

Where,

V_L– Market value of the levered firm;

V_U– Market value of the unlevered firm;

VP (tax shield) - Present value of tax shields;

VP (bankrupcy costs) - Present Value of bankruptcy costs.

The preposition above is in accordance with the trade-off findings of Myers (2001) where the author showed that a firm will borrow until the point where the tax shield's marginal value on additional debt is balanced by the costs of increasing bankruptcy probability. Also, Myers (2003) refers that profitable firms use more debt since they are less likely to go bankrupt and they can benefit from the tax advantages of debt.

2.2.2. Pecking order theory (POT)

Pecking-order theory is another major theory of corporate capital structure that was developed by Myers and Majluf (1984) and Myers (1984). The researchers state that companies stay undervalued because firm managers have prior information about new and existing investment opportunities. Being aware of the asymmetric information problem, they discount the firm's new and existing risky securities when stock issues are revealed. Also, they prefer to finance their projects using retained earnings and low risk debt, instead of equity issue.

 According to Myers (1984), the cost of issuing risky debt or equity has greater impact when comparing to the optimal leverage in trade-off theory. He states that firms prefer to finance first by retained earnings, then with riskless debt, then with risky-debt, and finally with equity.

The POT has several empirical implications according to Harris and Raviv (1991). The first and probably the most relevant is that issuing new shares causes the market value of the existing shares to decrease, in accordance with Myers and Majluf (1984), and Myers (2001). The second empirical implication states that firms tend to finance new projects using retaining earnings and low-risk debt. Third, information present in annual reports and profit minimize the undervaluation problem, and finally firms with a small tangibility have higher chances to deal with the problem of information asymmetry.

With the findings above there are important differences in POT and trade-off theory. In trade off-theory, it was found a positive relationship between profitability and debt (Brendea, 2011). However, several empirical studies about POT found a negative relationship between leverage and profitability (Fama and French, 1988) and also confirmed the assumption that firms only issue debt or equity when internal funds are scarce to finance new projects.

2.2.3. Agency costs theory

Previous corporate capital structure theories are based on the assumption that the managers are perfectly aligned with shareholders and managers will act in the best interest of the firm's shareholders (Brendea, 2011). Jensen and Meckling (1976:308) stated that "*If both parties to the relationship are utility maximizers, there is a good reason to believe that the agent will not always act in the best interests of the principal*". Jensen and Meckling (1976) suggested that with the appropriate incentives, the shareholders can limit the divergences, but never at a zero cost. Also, the authors defined as agency costs the sum of shareholders monitoring expenses, the managers bonding expenses and the residual loss.

Since these managers' interests are not aligned with the shareholders', managers tend to waste free cash flows in bad investments, according to Jensen and Meckling (1976). To control this agency costs between the two parties, firms tend to increase their debt levels with the objective of controlling the investment opportunities (Jensen, 1986; Stulz, 1990). This suggests that higher debt ratio levels tend to increase the firms' profitability.

It exists also the underinvestment or asset substitution problems when, according to Jensen and Mecklin (1976) and Myers (1977), debt is risky and stockholder-debtholder agency problems lead to an effect, where firms with a higher level of investments have less levels of debt. Then, Jensen and Meckling (1976) identified two major types of conflict: conflicts between shareholders and managers (benefits of debt financing) and conflicts between

debtholders and shareholders (agency costs of debt financing). The balancing of debt financing against agency cost conflicts creates an optimal capital structure, similar to the trade-off theory findings. There are several researches that found relevant results, which support the agency cost hypothesis. These models suggested that the debt ratio is positive correlated with firm's value (*e.g.* Hirschleifer and Thakor, 1992; Harris and Raviv, 1990; Stulz, 1990), the probability of default (Harris and Raviv, 1990), free cash flow (Stulz, 1990) and the importance of managerial reputation (Hirschleifer and Thakor, 1992).

2.3. SMEs current context

With the economic development and the European growing awareness of the SMEs, on 6th May of 2003, the European Comission updated a new version of the definition of SMEs. This new version had the objective to be more suitable to the different categories of SMEs and improve the various types of relationships between companies, according to Commission Recommendation 2003/361/EC. Also, the recommendation states that this new definition aimed the promotion of innovation and partnership, while genuinely tend to support firms that required and need assistance. In Portugal it was defined in Decreto-Lei nr 372/2007 the SMEs definition according to European Comission recommendation. The new threshold that defines SMEs is reported below in Table 1.

Table 1: The New SME's Threshold

Enterprise Category	Headcount: Annual Work Unit	Annual Turnover	Anual Balance Sheet Total
Medium-sized	< 250	≤ € 50 million	≤ € 43 million
Small	<50	≤ € 10 million	≤ € 10 million
Micro	<10	≤ € 2 million	≤ € 2 million

Source: European *Commission* (2003)

According to INE (2012:27) from *Statistical Yearbook of Portugal 2011, "the production structure continued to be largely determined by the relative importance of small and medium-sized enterprises"*. According to the statement, SMEs represent a major influence in Portuguese economy and this fact can be detected by the most recent statistics from INE (2013) in *Enterprises in Portugal 2011*. According to the publication, there were 1,135,537 SMEs in 2011, corresponding to 99.9% of the total companies and 77.35% of the total jobs in Portugal as it is described below in Table 2.

Table 2: Enterprises, Employment and GVA in Portugal and Europe

SMEs	Portugal, 2011	Europe, 2012 (estimation)
Enterprises		
Number	1,135,537	20,727,627
%	99.9%	99.8%
Employment		
Number	2,978,383	87,477,311
%	77.3%	67.4%
Gross Value Added (GVA)		
EUR million	208,202	3,587,540
%	53.4%	58.1%

Source: INE (2013) and European Commission (2012)

Table 2 provides statistical evidence between Portugal and Europe. As it can be seen, Portugal and Europe represent similar results in the SMEs statistical above. Although in Portugal, SMEs represent a more important role on employment, providing about 77 % of the jobs (more than 10 percentage points (pp) than in Europe), but the GVA represents a less role comparing to Europe (less than 5 pp).

According to previous studies (*e.g.* Whited, 1992; Fazzari and Petersen, 1993; Audretsch and Elston, 1997), SMEs managers are subject to several significant constraints when they finance their firms and have important difficulties in obtaining funds in the long-term capital markets (Walker, 1989; Petersen and Rajan, 1997). With equity issuing strongly limited, the major source of external funds are the banks (Carbó-Valverde *et al.,* 2009; Jiaobing and Yuanyi, 2011). The situation mentioned above is confirmed by Bijlsma and Zwart (2013), where the authors state that in the euro area the economy's financing is controlled by banks (80 %) and capital markets (20%).

Since SMEs are more dependent on banks and have limitations when accessing financial markets, according to Coeuré (2013) SMEs financial health tends to be lower and deteriorates faster, since in conditions of financial stress, banks tend to reduce their lending to the SMES before reducing to larger companies and Governments, caused by the strong bank deleveraging needs and high risk aversion.

According to Rodrigues *et al.* (2006), there might be major differences of long and short-term debt in small firms. Long-term debt is strongly conditioned by the seeking of the tradeoff of the tax effect and bankruptcy costs, and on the other hand, short-term debt is affected by growth and negatively associated with cash flow. These may suggest that SMEs tend to finance their growth with short-term debt, and if the amounts of short-term debt are not enough, the firms tend to increase long-term debt in order fulfill their needs. Also, Rodrigues

et al. (2006) found that there are also major differences between distressed and non-distressed firms. Authors affirmed that small distressed firms seem to be total disoriented when are doing their financial structure decisions, they do not follow any pattern of debt adjustment policy and they lack the capacity to react in a distress financial situation.

Previous empirical studies, namely Voulgaris *et al.* (2004) and Kuo *et al.* (2012) found that SMEs tend to use short-term debt instead of long-term. These findings are according to the statistics of INE (2012) where is stated that the short-term debt represent more than half of the total liabilities. These statements reveal the importance of an efficient WCM (Peel and Wilson, 1996 and Peel *et al.*, 2000). Also, along with this line of findings, there are some suggestions that working capital is crucial to the growth and survival of SMEs (Grablowsky, 1984; Kargar and Blumenthal, 1994).

2.4. Working capital management and profitability evidence

WCM and its influence in profitability has been widely reviewed. Several studies have recognized the effect of managing the working capital into the corporate performance. The importance of how working is managed and what managers need to take into account for the firms' profitability will be summarized in the next lines that enclose relevant research regarding the relation between WCM and profitability.

The first findings that relate efficiency on WCM with corporate performance were probably by Jose *et al.* (1996). They researched the effect of "*long run equilibrium measures of working capital management efficiency*" with the firm's profitability. During the period 1974-1993, for a sample of US firms, the authors used correlation analysis, nonparametric data analysis and multiple regression approaches to examine the effect of WCM. They found that a more aggressive WCM is associated with a higher firm performance. These findings represented a new contribution for the working capital literature in that time. Relating working capital and firm's profitability, they proved that the effect of following aggressive working capital policies can improve the firm's profitability, suggesting, that a decrease in the investment on working capital will probably lead the firm to a better performance.

Shin and Soenen (1998) in their paper they used Net Trade Cycle[1] to check the efficiency of managing the firm's working capital. Using a sample of 58,985 US listed companies for the

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[1] Net Trade Cycle is the number of "days' sales" that the company has to finance its working capital. Net Trade Cycle = (inventory + accounts receivable - accounts payable) *365/sales (Shin and Soenen, 1998).

period 1974-1994 they found a strong negative relation between net trade cycle and its profitability. With a reasonable reduction in the Net Trade Cycle they found that it could create an increase in firm's performance.

Deelof (2003:585) affirmed that "*Most firms have a large amount of cash invested in working capital*". He studied a sample of non-financial large-sized Belgian companies, the relationship between WCM and profitability during the period 1992-1996. He found a significant negative relationship between gross operating income and the number of days' accounts receivable, inventories and accounts payables of the non-financial companies that were analyzed in the study. Reducing the number of days receivables and inventories suggest that managers could achieve higher corporate profitability and then create more value for the company. The negative relation of accounts payables for Deelof (2003), might be explained by the reason that less lucrative firms tend to delay their payments. Although for CCC he did not find any significant relation, but stated that perhaps the modeling could be affected by possible unobservable heterogeneity problems.

In the Pakistan environment, Raheman and Nasr (2007) linked the effect of working capital in liquidity and profitability. The authors used a sample of listed Pakistani firms for the period 1994-2004. In their research they analyzed the effect of the different determinants of working capital including, average collection period, inventory turnover, average payment period, Cash Conversion Cycle (CCC)[2] and current ratio for the firms in place. The findings in the study suggest that exists a strong negative relationship between the determinants and the corporate performance. The managers can create value reducing the CCC to a reasonable minimum and reducing its value by increasing CCC. Furthermore, they found also that exists a significant relationship between liquidity and profitability. They also found a positive relationship between the size of the firms (measured by the natural logarithmic of sales) and the profitability.

In Kenya, Mathuva (2010) for a sample of listed firms and during the period 1993-2008, found influence of managing working capital policies on corporates' profitability. In the study, the data was analyzed and conducted using Pearson and Spearman's correlations, the OLS model, and the fixed effects regression models. The author found that exists a significant negative relationship between the accounts collection period and profitability, significant

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[2] CCC measures the days that funds are committed to inventories and accounts receivables, subtracting the days that payments to suppliers are deferred (Gitman, 1974).

positive relationship between profitability and the determinants of inventory conversion period and average payment period. The author concluded that the firms with better corporate performance take less time to collect their bills to their clients and also, firms that maintain reasonable high levels of inventories tend to reduce the risk and costs of interruptions in the production, which may reduce the loss of business due to the scarcity of products. Reducing the supply costs and protecting them against price fluctuations they may increase firm's profitability. Finally, he concluded that firms that wait longer to pay their bill to its creditors have a better corporate performance.

Researching the relationship between WCM and firm profitability, Bagchi and Khamrui (2012), for a sample of Indian fast moving consumer goods (FMCG), researched the possible existence of the relationship between these two variables. As determinants, they used ROA as proxy of firm's profitability and as explanatory variables it was used the CCC ,interest cycle, interest coverage ratio, age of inventory, age of creditors, age of debtors and debt-equity ratio. As suggested by Raheman and Nasr (2007), there is a strong negative relationship between WCM and firm's performance. For Bagchi and Khamrui (2012) as the CCC increases the firm performance decreases, and value can be created for the firm by decreasing the CCC to a reasonable minimum level. In the research was concluded also that exists a negative relationship between debt and firm's profitability, supporting the POT theory.

2.5. Working capital and profitability in SMEs

The majority of the research based on the relationship between working capital and profitability focused essentially on large firms. This type of research for SMEs was probably started by García-Teruel and Martínez-Solano (2007). For these authors "*...the management of current assets and liabilities is particularly important in the case of small and medium-sized companies...*" (García-Teruel and Martínez-Solano, 2007:165) because the assets are essentially in the form of current assets and the current liabilities are the major part of financing of these firms. Using a sample of Spanish SMEs during 1996-2002, their approach focused on testing the effects of WCM on firm profitability, using the panel data methodology. Their research found a negative significant relation between the ROA and the number of accounts receivable, inventories, and accounts payables. For CCC and profitability, the authors also found a negative significant relationship. With these findings they affirmed that managers can create value reducing their inventories and the number which their bills are outstanding. Then, reasonable shortening of the CCC, may increase corporates' performance

for these firms. It is important to remark that their research did robustness tests for the possible endogeneity problems on their approach. These tests confirmed the previous findings of the effects of the CCC on corporate profitability and not the inverse.

Building a non-linear model, Baños-Caballero *et al.* (2012) studied the relationship between WCM and profitability for a sample of non-financial Spanish SMEs, during 2002-2007. Controlling unobservable heterogeneity and possible endogeneity they analyzed a possible quadratic relation between working capital and firms' profitability. They found a concave relationship between these variables. Against findings of previous research, they affirm that firms have a working capital optimal level that maximizes the profitability.

The profitability effect and the risk of having firms with low levels of working capital, might create this optimal level of working capital. Also, through additional tests the authors found that the firm's performance decreases when it goes above or below that level of optimal level of working capital. They suggest that their findings have important implications for managers and literature and a quadratic relation should be used in new researches.

Afeef (2011:173) affirmed that "*…management of working capital might have a more profound impact on profitability of small enterprises than on the performance of larger companies since a substantial proportion of the total assets of small and medium firms are constituted of the Current Assets and a sizeable fraction of their total liabilities is consisted of the Current Liabilities*". The author used a sample of Pakistani SMEs, for the period 2003-2008, and researched the relationship between WCM and corporate performance. Based on correlation analysis and regression analysis, Afeef (2011) found that exists a strong negative relationship between inventory conversion period and receivable collection period with the operational performance of the firms. Although for payable deferral period[3] and CCC, the author found no significant relationship between them. As their previous article for listed companies (Afeef, 2010), the author suggested that are WCM factors that might influence the profitability of SMEs (as seen above), although for the variable that measure the working capital requirements (CCC) he found no statistical significance.

Recently, for a sample of multi-sourced Pakistani SMEs during 2006-2012, Gul *et al.* (2013) found that accounts payables has as positive relation with the firm's performance and average collection period, inventory turnover and CCC have a significant negative relationship with

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[3] "*Payable Deferral Period (PDP) is the number of days (on average) it takes a firm to pay off its credit purchases. It is calculated as: Payable Deferral Period = (Payables/Cost of Sales) × 365*" (Afeef, 2011:176).

the firm's performance, which is in line with the generality of previous literature. Also, the variables size and growth influence the performance positively while the debt ratio influences negatively the firm's profitability, in accordance with POT theory.

2.6. Working capital determinants and relationships

Taking into consideration the research outlined above, this sector will focus on what causalities affect the WCM, in order to understand how literature tries to explain which factors affect working capital. The relation is important, in order to understand how previous relationship with profitability is constructed. There are a variety of researchers suggesting factors that might affect working capital measures. The factors suggested are: capacity to generate internal resources, leverage, growth opportunities, size, firm's age, tangible fixed assets, return and industry (Kieschnick *et al.*, 2006; Chiou *et al.*, 2006; Baños-Caballero *et al.*, 2010; Nazir and Afza, 2009; Taleb *et al.*, 2010; Palombini and Nakamura, 2011; Abbadi and Abbadi, 2013).

2.6.1. Capacity to generate internal resources

As mentioned, asymmetric information generates higher costs on firm's external financing because it leads to a conflict of interests between shareholders and creditors. Hence, the creditors demand a higher risk premium (Myers, 1977), resulting in a higher cost for external financing, which leads to firms giving priority to resources generated internally over debt and new equity (Myers, 1984). Fazzari and Pettersen (1993) suggested that working capital investment is related with cash flow for a sample of US manufacturing firms, during 1970-1979. The researchers found that firms with larger capacity to generate internal resources have a higher level of current assets, which are probably due to the lower cost of financing working capital for those firms.

For a sample of Taiwan firms between March 1996 and December 1998, Chiou *et al.* (2006) found that the cash flow has a significant positive relation with the net liquid balance but a negative relation with the working capital requirements. The result goes against to the results outlined above and suggests that firms with higher cash flows have better efficient WCM. More recently, various empirical researches found opposite results than Chiou *et al.* (2006). For Baños-Caballero *et al.* (2010), Taleb *et al.* (2010), and Abbadi and Abbadi (2013) the cash flow has a significant positive impact on the working capital measures, being in the direction as the ones outlined above.

2.6.2. Leverage

It is expected when managing the cost of financing working capital that companies with a higher leverage ratio have to pay a higher risk premium according to the studies mentioned above. These findings are in accordance with previous empirical evidence and capital structure POT.

These studies proved that there is a significant negative relation with working capital measures when firms increase their leverage (Chiou *et al.*, 2006; Rahman and Nasr, 2007; Baños-Caballero *et al.*, 2010; Taleb *et al.*; 2010 and Abbadi and Abbadi, 2013). This suggests that for higher leverage levels the more attention has to be made by the firms to reduce capital related to current assets. Companies with higher levels of debt tend to seek lower working capital requirements.

2.6.3. Growth opportunities

The variable that measure the growth opportunities can also affect the WCM, as it was found in various empirical studies (Kieschnick *et al.*, 2006; Baños-Caballero *et al.*, 2010; Taleb *et al.*, 2010; Palombini and Nakamura, 2011). Also, for Baños-Caballero *et al.* (2010:515): "*This variable might affect trade credit granted and received by firms, as well as their investment in inventories*".

Through research conducted in the United States Kieschnick *et al.* (2006), found empirical evidence that future sales growth has a positive relation with the companies' CCC, which probably suggests that firms tend to keep inventories higher to meet the future sales growth. Palombini and Nakamura (2011) also confirm this positive relation, but for the Brazilian market.

However, Cuñat (2007) suggests that firms with higher growth probably use more trade credit as a financing source for their growth, due to the difficulty to obtain other financial sources. This suggests that companies with higher sales growth opportunities probably have lower CCC (Baños-Caballero *et al.*, 2010). On the other hand, Emery (1987) proposes that firms increase their levels of trade credit to their customers intending to increase their sales in periods of low demand. These two theories outlined above are in line with the findings from Pettersen and Rajan (1997) and probably suggest there is a negative relation with growth opportunities and WCM as it was found in Baños-Caballero *et al.* (2010) and Palombini and Nakamura (2011).

Since it exists three points of views that led to different conclusions the effect of growth opportunities is not clear (Baños-Caballero *et al.*, 2010).

2.6.4. Size

It exists a variety of empirical studies that prove that size affects the WCM. Kieschnick *et al.* (2006) and Chiou *et al.* (2006) found a positive relation with size and the measures of WCM. This relation is explained probably because the cost of financing used to invest in current assets decreases with the size of the firm, as smaller firms have greater information asymmetries (Jordan *et al.*, 1998; Berger *et al.*, 2001) higher informational opacity (Berger and Udell, 1998) and are less followed by analysts (Baños-Caballero *et al.* , 2010).

The arguments outlined above go in the same direction as the trade-off theory goes. Having smaller companies a higher probably of bankruptcy and being larger companies more diversified, the latter have a lower chance to fail and then have a lower probability to go bankrupt. According to Petersen and Rajan (1997) firms with better access to capital markets extend more trade credit, while smaller companies probably face greater financial constraints, (Whited, 1992 and Fazzari and Petersen, 1993), causing an increase of trade credit levels because they cannot access other sources of financing (Petersen and Rajan, 1997) or had already been exhausted (Walker, 1991; Cuñat, 2007).

According to Baños-Caballero *et al.* (2010), small companies have higher costs of financing their current assets, which probably might decrease accounts receivables and inventories. According to the theories above, small companies use more trade credit from suppliers and for Baños-Caballero *et al.* (2010), size is expected to positively influence the measures of working capital (CCC).

2.6.5. Firm's age

The firm's age makes part of the relevant variables that was measured in the literature as part of the working capital determinants. Chiou *et al.* (2006) and Baños-Caballero *et al.* (2010), found a positive significant relation between firm's age and the measures of working capital (CCC). The variable measures the time the firm might be known to its customers and, firm's quality and reputation (Petersen and Rajan, 1997) or according to Cuñat (2007) the length of the relationship between suppliers and customers.

The positive significant relation between firm's age and CCC might be explained by the findings from Berger and Udell (1998) on trade credit. They found that older companies have more availability in external finance than the smaller ones and these larger companies can finance with lower financial costs. Then, according with these theories, a positive relation is expected between age and the measures of working capital.

2.6.6. Tangible fixed assets

As well as with the determinants mentioned above, previous empirical research has found a relation between tangible fixed assets and working capital measures. Fazzari and Petersen (1993), for firms facing financial constraints, found that the working capital investment as, a use or source of funds, is negative related with fixed investment. These findings are supported by the previous empirical studies from Kieschnick *et al.* (2006) and Baños-Caballero *et al.* (2010), where it was found that fixed assets are significantly negatively related with the working capital measures (CCC).

2.6.7. Return

Firm's return is the working capital determinant that measures the relation between performance of the firm and its effect on working capital. Previous empirical studies found relevant influence, but the relationship is not clear.

First, there are the findings from Chiou *et al.* (2006) and Baños-Caballero *et al.* (2010). These researchers found that firm's return (ROA) has a negative relationship with the measures of working capital. These findings are in accordance with Petersen and Rajan (1997), since the researchers showed that firms with higher performance receive from their supplier higher credit levels and according to Shin and Soenen (1998) firms with higher returns have higher performance in WCM, because of their market dominance, due to their market bargaining power with suppliers and customers. Also, Chiou *et al.* (2006) affirms that firms with higher performance can have better access to external finance and then invest in more profitable investments.

Conversely, empirical evidence from Nazir and Afza (2009) and Abbadi and Abbadi (2013), found a positive relationship between a firm's return and measures of working capital. Nazir and Afza (2009) and Mehmet and Eda (2009) affirm that firms with better performance are less concerned with an efficient management of working capital.

2.6.8. Industry

There are several studies relating the effect between the industry in which the firm is operating and is effect on WCM. Hawawini *et al.* (1986) in their research suggest that working capital policies are sensitive to industry practices and are stable over time. Also, they found that working capital policies differ across industries, due to the inventory requirements that are different between industries.

Later studies (Weinraub and Visscher, 1998; Filbeck and Krueger, 2005; Kieschnich *et al.*, 2006; Nazir and Afza, 2009), also showed that it exists an industry effect that is probably explained by the differences on investment in inventories and in trade credit between industries. Confirming the effects on the industries and its effect on WCM, are the findings of Niskanen and Niskanen (2006). The authors suggest that accounts receivable and accounts payable between industries are sensitive across different industries.

3. EMPIRICAL RESEARCH: HYPOTHESES, DATA SAMPLE AND METHODOLOGY

In order to present a description and characterization of the empirical research proposed, the present chapter will clarify the hypotheses to be tested, characterize and define the sample and provide the variables which have been created to conduct this research. Consequently, it will be explained the research methodology and the assumptions related to the study about profitability and WCM on Portuguese SMEs.

3.1. Hypotheses

As stated in chapter 2, previous literature relates the effect of WCM upon companies' profitability (*e.g.* Jose *et al.,* 1996; Shin and Soenen, 1998; Deelof 2003; Raheman and Nasr, 2007; García-Teruel and Martínez-Solano (2007); Baños-Caballero *et al.*, 2010). Although the generality of the research points out that are a negative relation between WCM and profitability, there are some relevant empirical studies that found opposite results as Dellof (2003) and Baños-Caballero *et al.* (2012). Taking into account the previous literature findings and since one of the research objectives is to understand the relationship between WCM and operating profitability, the *Hypothesis 1* is proposed as follows:

H1: There is a negative relationship between CCC length and firm's GOP[4].

According to Baños-Caballero *et al.* (2010) and Baños-Caballero *et al.* (2012), there is an optimal level of working capital that balances the benefits and risks. Since there might exist a tradeoff between the risk of loss of business and interruptions of production process due to the lower investment in working capital, it can also exist the adverse effect in a high investment in working capital. In an empirical research, Baños-Caballero *et al.* (2012) found a concave relationship between working capital and firm profitability. With these findings they confirmed the target optimal level that maximizes the profitability and also proved that for the SME Spanish firms, firms' performance decreases when it goes above or below that level of optimal level of working capital. Based on the above discussion, *Hypotheses 2* and *3* are proposed as follows:

H2: Firms pursue a target optimal level of CCC.

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[4] GOP measures the firm's operational profitability in relation to their non-financial assets.

H3: The deviations on both sides of optimal CCC reduce firm profitability.

H3.a- Bellow-optimal deviations are negatively related with firm's profitability.

H3.b- Above-optimal deviations are negatively related with firm's profitability.

As asymmetric information generates higher costs on firm's external funding (Myers, 1977), firms tend to seek internal finance over debt and new equity (Myers, 1984). Also, firms with greater capacity to generate cash flows tend to have a higher level of current assets (Fazzari and Pettersen ,1993). Although for empirical research the direction is not clear. First, there are the researches, which state that cash flow has a significant positive impact on the working capital measures (Baños-Caballero *et al.* (2010), Taleb *et al.* (2010), Abbadi and Abbadi (2013), and conversely, the research of Chiou *et al.* (2006) suggesting a negative relation with the working capital requirements. Then, *Hypothesis* 4 is proposed as follows:

H4.a: Cash flow is negatively related to CCC.

H4.b: Cash flow is positively related to CCC.

As seen above, the pecking order theory states that a firm short of funds will tend to raise capital inside before issue debt outside (Myers, 1984). Then, more debt tends to decrease internal resources and increase its funding costs, expecting a negative relation between leverage and CCC. Also, this relation were confirmed by empirical research (*e.g.* Chiou *et al.*, 2006; Rahman and Nasr, 2007; Baños-Caballero *et al.*, 2010; Taleb *et al.*; 2010 and Abbadi and Abbadi, 2013). Based on the above deduction, *Hypothesis 5* can be stated as follows:

H5: Leverage is negatively related to CCC.

As outlined above the relationship between Growth rate and Working capital measures is not clear. Growth might affect the trade credit granted and received by the firms and for Kieschnick *et al.* (2006) and Palombini and Nakamura (2011), there is a positive relation with sales growth and working capital measures, due to the firm seeking high inventories to meet future sales growth. On the other hand, findings from Pettersen and Rajan (1997) and empirical results from Baños-Caballero *et al.* (2010), due to the firm increase their trade credit to increase their sales in period of low demand or by using more trade credit as form to finance their growth, as seen in chapter 2.2, is expected that exists a negative relation with growth opportunities. Then *Hypothesis 6* can be proposed as follows:

H6.a: Growth opportunities are negative related to CCC.

H6.b: Growth opportunities are positively related to CCC.

According to previous WCM empirical research from Kieschnick *et al.* (2006) and Chiou *et al.* (2006), it exists a positive influence of firm size on the CCC. As seen in literature review, this relation could be explained by the cost of funding current assets decreasing with the size of the firm, since smaller firms have greater information asymmetries (Jordan *et al.*, 1998; Berger *et al.*, 2001), higher informational opacity (Berger and Udell, 1998) and are less followed by analysts (Baños-Caballero *et al.* , 2010). The 7th *Hypothesis* is settled as follows:

H7: Size is positively related to CCC.

Previous research states that there is a relation between tangible fixed assets and working capital requirements. Fazzari and Petersen (1993) found that working capital, as a source of funding, is negative related with fixes investment for firms with financial constraints. These results are in line with Kieschnick *et al.* (2006) or Baños-Caballero *et al.* (2010). The *Hypothesis 8* is proposed as follows:

H8: Tangible fixed assets are negatively related to CCC.

As previously stated in chapter 2, there are several empirical studies that found a significant relation with return and the WCM, although the relation is not clear. Chiou *et al.* (2006) and Baños-Caballero *et al.* (2010) found that firm's return has a negative relation with the measures of working capital. The relation might be explained with the findings of Petersen and Rajan (1997), which found that firms with higher performance receive from their suppliers higher credit levels. Also, Shin and Soenen (1998) found that firms with higher returns have higher performance in WCM, because of their market dominance, due to their market larger bargaining power with suppliers and customers. Conversely, there are the empirical researches of Nazir and Afza (2009) and Nazir and Afza (2009), which found a positive relationship between a firm's return and measures of working capital. The relation could be explained, since firms with better performance are less concerned with an efficient management of working capital Nazir and Afza (2009). Thus, *Hypothesis 9* is proposes as follows:

H9.a: ROA is negatively related to CCC.
H9.b: ROA is positively related to CCC.

There are several studies relating the effect between the industry which the firms is operating and is effect on WCM. Hawawini *et al.* (1986) in their research suggest that working capital policies are sensitive to industry practices and are stable over time. Also, they found that working capital policies differ across industries, due to the inventory requirements being different between industries.

Later studies (Weinraub and Visscher, 1998; Filbeck and Krueger, 2005; Kieschnich *et al.*, 2006; Nazir and Afza, 2009), also showed that it exists an industry effect that is probably explained by the differences in the investment in inventories and in trade credit between industries. Confirming the effect on the industry which the firms are operating and its effect on WCM are the findings of Niskanen and Niskanen (2006). The authors suggest that probably accounts receivable and accounts payable between industries are sensitive across different industries.

Between industries, firms are sensitive to the different impacts of economic events due to the different nature of operations (Chiou *et al.*, 2006). Niskanen and Niskanen (2006) suggest findings in accordance with the effect on the industry which the firms are operating and its effect on WCM. These findings are confirmed by several empirical researches (*e.g.* Weinraub and Visscher, 1998; Filbeck and Krueger, 2005; Kieschnich *et al.*, 2006; and Nazir and Afza, 2009). The *Hypothesis 10* is stated as follows:

H10: Firms of different industries differ in their management of working capital.

There are previous empirical researches that studied GDP, as an external factor that influences the WCM. According to the findings of Zariyawati, *et al.* (2010), GDP is positively related with working capital measures. Although, for Baños-Caballero *et al.* (2010) there is no significant relation between GDP and the WCM. Since one of the objectives is to study the influence of GDP on firms WCM, and taking into account the previous literature, the *Hypothesis 11*, is proposed as follows:

H11: GDP is significant related with CCC.

3.2. Data sample and methodology

3.2.1. Sample

The research sample was based in data provided from the firm *Informa D&B Portugal*. *Informa D&B Portugal* gathers the data on SABI (Iberian Balance Sheets Analysis System) database developed by INFORMA D&B in collaboration with Bureau Van Dijk. The database has annual accounts over 1.2 million Spanish companies and more than 400 thousand Portuguese firms.

The research proposed uses a data panel of non-financial Portuguese SMEs. The selection of SMEs was defined according to the requirements of the European Commission's recommendation 2003/361/EC. In the research only firms with the following assumptions were gathered:

- less than 250 employees;
- turnover less or equal than 50 € million;
- total assets less than 43 € million.

With a total of 2000 firms respecting the criteria above for the period 2009-2011, it was needed to improve the data by applying different filters. Firstly, it was followed the filtering suggested by Deloof (2003) excluding from the sample firms from water, energy, financial and securities industries[5]. Firms that present negative illogical values in accounts receivables and account payables, firms which fixed assets higher than total assets and firms with missing values in sales, total assets, EBIT and net profit were excluded from the sample. Firms with no value of COGS but with value of inventories and account payables were also excluded from the sample, since firms with purchases and with inventories but not operating (COGS=0) are not compatible with the sample characterization.

Also, 1 % of the extreme values of all the variables were eliminated. These filters are consistent with previous studies (Shin and Soenen, 1998; Deloof, 2003; Raheman and Nasr, 2007; García-Teruel and Martínez-Solano, 2007; Baños-Caballero *et al.*, 2010).

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[5] It was used CAE rev. 3 for the filtering. CAE rev. 3 establishes the classification of the Portuguese economic activities that are harmonized with the NACE industrial classification from the Europe Union.

From the 2000 SMEs provided, it was reached a final sample set of 1192 Portuguese SMEs, resulting in a final sample of 3576 firm-year observations. Also these companies were aggregated in 8 different economic sectors.

3.2.2. Data

3.2.2.1. Data analyses

In order to characterize the determinants that might affect WCM and the relation between WCM and profitability of the Portuguese SMEs, it was used different type of analyses. Firstly, it was conducted a univariate analysis in function of WCM measured by the CCC, and operational profitability measured by the GOP ratio. Secondly, it was used correlation analysis between the research variables, in order to indicate possible relations. Thirdly, was carried a multivariate analysis based on multiple regression analysis, in order to test the relationship between the dependent variables and explanatory variables for the models in analysis. Lastly, the ANOVA (F-test) to test the equality of means, the t-test for the equality of means and descriptive statics for each industry were implemented.

The univariate analysis can be divided in 3 sections: sample characterization; dependent variable characterization and; impact of the explanatory variables. The sample characterization was made in order to better understand how the sample is composed and what cautions would be needed to take into account in the research analysis. For the dependent variable characterization, was stated the mean for the dependent variables for each year, to realize what was the average values of each year, in order observe the behavior of each measure. Also, a relation with Portuguese GDP to indicate possible relations was made. Descriptive statistics were used in order to provide a useful summary for the characterization of the dependent variables. For the explanatory variables it was also conducted descriptive statistics in order to better characterize and summarize the observations.

The correlation analyses were made to measure the linear relationships between the variables of the research, although these results were made in a simple bivariate correlation and do not take into account the others research variables. The method applied was the Pearson's correlation and its significance level across the research variables as used in previous studies (*e.g.* Deloof, 2003; García-Teruel and Martínez-Solano, 2007; Baños-Caballero et al., 2010; Gul et a.l, 2013). The intuit of the correlation analysis was to use the coefficients as only indicators for the possible level and direction of relation between the variables and also its

significance, since the Pearson coefficients represent weak instruments for the possible causal association among the variables.

The multivariate analyses, based on multiple regression analyses, were made under panel data methodology. The panel data methodology used followed previous research (*e.g.* Deloof, 2003; García-Teruel and Martínez-Solano, 2007; Baños-Caballero *et al.*, 2010; Baños-Caballero *et al.*, 2012; Gul *et al.*, 2013). According to Hsiao (1985), there is a possibility to control the unobservable heterogeneity in panel data methodology and with this kind of methodology is possible to exclude biased results because of the existence of individual effects. Also, Baltagi (2005) states that panel data give more informative data, less collinearity problems between variables, more degrees of freedom and more efficiency. Raheman and Nasr (2007) on using panel data methodology on their research stated that have more utility on using the dynamics of adjustment for data panel method and have more availability to identify and measure the effects that are not detectable in cross-section or time-series models.

According to Wooldridge (2002), in order to identify the proper method for the estimation, it requires a previous test to identify the correct method. The test implies analyzing the research data, considering the Pooled Ordinary Least Squares (OLS) methodology, in order to compute the F-statistic under the null hypothesis that the constant terms are equal among the firms. On the rejection of the null hypothesis, is considered that the regression has unobservable individual affects and methodologies that care about of unobservable individual affects are preferred.

In order to treat the firm specific individual unobservable effects or by the other way, the unobservable heterogeneity, the Hausman test was conducted under the null hypothesis of that the unobservable heterogeneity term is uncorrelated with the explanatory variables. The test was constructed to determine if the unobservable heterogeneity is uncorrelated or not with the explanatory variables, while assume that the explanatory variables are uncorrelated with the disturbance term in each time period. As output, when the hypothesis is not rejected, there are random affects and the model is estimated by Generalized Least Squares (GLS) and if the null hypothesis is rejected the effects are considered to be fixed and the model considered to use is fixed effects method (Wooldridge, 2002). When modeling for fixed effects the method assumes that the unobservable heterogeneity term captures the effects of the variable for each

firm and is constant over the period (year in this research), being unique to the firm and should not be correlated with other firms characteristics.

When applying the fixed effect estimation the unobservable heterogeneity is correlated with the regressors (as seen above) and according to Cameron and Triverdi (2009) this allows a form of endogeneity between the variables. For the authors, the problem of endogeinity occurs when the factors that are supposed to explain the effect of a particular outcome, depend themselves on that outcome. To treat the problem of endogeinity, further method is needed, where particular regressors are treated as endogenous. In order to beware of the endogeinity problems, it was used panel instrumental variables (IV) methodology. Cameron and Triverdi (2009) concerning the IV methodology, indicate that the methodology provides a consistent estimation assuming the existence of valid instruments. Also and according to the authors, the instrument variables presented in the methodology in order to be valid, must be correlated with the endogenous explanatory variable and also, under the exogeneity assumption, must be uncorrelated with the disturbance term. In order to check the validity of the instruments, the Hansen test was applied in order to measure the fitness of the model. The Hansen test is the test for the absence of correlation between the instruments and the disturbance term, under the null hypothesis that the instruments are valid (Cameron and Triverdi, 2009).

It was selected two-step dynamic panel generalized method of moments (GMM) as a coefficient estimation technique for IV methodology. This technique was guided by the research of Baños-Caballero *et al.* (2012), where they assume the need of avoiding unobservable heterogeneity and possible problems with endogeneity in their WCM research. This method was proposed by Arellano and Bond (1991) and for the author this method allows to use past and present values of the exogenous variables to build instruments for lagged dependent variables and other non-exogenous variables once the "…*permanents effects have been differenced out.*" (Arellano and Bond, 1991:277). It was used this model because first, it was needed a dynamic specification for the research method due to the lagged variables derived from our annual panel data and regression, second the likelihood of an expected specific correlation between unobserved variables and research observable variables (heterogeneity) and third the existence of the endogeinity problems and need to control them, since it was tried to explain the effects are due to the explanatory variables on dependent variables as in Deloof (2003) and García-Teruel and Martínez-Solano (2007), and not vice-versa.

The multivariate analysis was decomposed in 2 main research models[6]. The first model to be tested was a linear model to test what are the firm's characteristics that might affect the firm's CCC in the Portuguese SMEs. The second model passes to evidence if WCM (CCC) has any influence in the firm operational profitability. The two models were regressed implementing the methodology suggested above.

For the model 1 the equations regressed are proposed as follows:

$$(1)\ CCC_{it}^* = \beta_0 + \beta_1 CashFlow_{it} + \beta_2 Leverage_{it} + \beta_3 ROA_{it} + \beta_4 Size_{it} + \beta_5 TFA_{it}$$
$$+\eta_i + \varepsilon_{it}$$

$$(2)\ CCC_{it}^* = \beta_0 + \beta_1 CashFlow_{it} + \beta_2 Leverage_{it} + \beta_3 ROA_{it} + \beta_4 Size_{it} + \beta_5 TFA_{it}$$
$$+\beta_6 Growth_{it} + \eta_i + \varepsilon_{it}$$

$$(3)\ CCC_{it}^* = \beta_0 + \beta_1 CashFlow_{it} + \beta_2 Leverage_{it} + \beta_3 ROA_{it} + \beta_4 Size_{it} + \beta_5 TFA_{it}$$
$$+\beta_6 Growth_{it} + \eta_i + \lambda_t + \varepsilon_{it}$$

$$(4)\ CCC_{it}^* = \beta_0 + \beta_1 CashFlow_{it} + \beta_2 Leverage_{it} + \beta_3 ROA_{it} + \beta_4 Size_{it} + \beta_5 TFA_{it}$$
$$+\beta_6 Growth_{it} + \beta_6 GDP + \eta_i + \varepsilon_{it}$$

For the equations, i represents the company and t the year, while the β_k is the unknown parameters to be estimated, which measure the effect of the explanatory variables on the dependent variable. The term ε_{it} measures the random disturbance. The variable η tries to capture the firm specific unobservable effects or by the other way, the unobservable heterogeneity. This variable takes the specific characteristics of the firms as well as the industry where the firm is placed. The variable λ is the time dummy variable that changes for times period but is equal for all the firms. This variable was designed to capture the macroeconomics effects that might affect CCC but which firms cannot control.

The equation (1) is the basis for model 1, incorporating the determinants of WCM as explanatory variables and by dependent variable the CCC. On equation (2) was inserted the Growth variable, to control its effect on WCM, since this variable has less observations than the other explanatory variables[7]. In the equation (3) was inserted period fixed variable λ in order to control the unobservable macroeconomic effects. Finally, in the equation (4) was

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[6] The analysis of the WCM's determinants will be further-mentioned as model 1 and WCM effect on profitability as model 2.
[7] The variables Growth has less observation since was not possible to obtain values of sales to 2008

inserted the variable GDP and excluded the variable λ. The objective of this equation is to relate the effect of the external factor GDP on firms WCM.

For the model 2 the equations regressed are proposed as follows:

(5) $GOP_{it} = \beta_0 + + \beta_1 CCC_{it} + \beta_2 Leverage_{it} + \beta_3 Size_{it} + \eta_i + \varepsilon_{it}$

(6) $GOP_{it} = \beta_0 + + \beta_1 CCC_{it} + \beta_2 Leverage_{it} + \beta_3 Size_{it} + \beta_4 Growth_{it} + \eta_i + \varepsilon_{it}$

(7) $GOP_{it} = \beta_0 + + \beta_1 CCC_{it} + \beta_2 Leverage_{it} + \beta_3 Size_{it} + \beta_4 Growth_{it} + \eta_i + \varepsilon_{it}$

(8) $GOP_{it} = \beta_0 + + \beta_1 CCC_{it} + \beta_2 Leverage_{it} + \beta_3 Size_{it} + \beta_4 Growth_{it} + \beta_5 GDP + \eta_i + \varepsilon_{it}$

The equation (5) is the basis for the model 2, being GOP the dependent variable, CCC the independent variables and as controls variables, Leverage and Size. On the equation (6) was inserted the control variable Growth and the equation (7) the period fixed effect λ, with the same reasoning as in the model 1. In the equation (8) was inserted the control variable GDP in order to control the model with external factors.

In order to compute the IV methodology was inserted the first lagged variables of the dependent variable, for the model 1 and 2.

As previously stated in chapter 3, Baños-Caballero *et al.* (2012) provide evidence of a non-linear relationship between WCM and profitability, indicating a tradeoff between costs and benefits of investing in working capital. In order to test the *Hypotheses 2 and 3* was implemented non-linear equations using fixed effects and IV methodology. The equations are proposed as follow:

(9) $GOP_{it} = \beta_0 + \beta_1 GOP_{i,t-1} + \beta_2 CCC_{it} + \beta_3 CCC_{it}^2 + \beta_4 Leverage_{it} + \beta_6 Size_{it_{it}}$
$\qquad + \beta_7 Growth_{it} + \eta_i + \varepsilon_{it}$

(10) $GOP_{it} = \beta_0 + \beta_1 GOP_{i,t-1} + \beta_2 CCC_{it} + \beta_3 CCC_{it}^2 + \beta_4 Leverage_{it} + \beta_6 Size_{it_{it}}$
$\qquad + \beta_7 Growth_{it} + \eta_i + \varepsilon_{it}$

Since it was tried to prove an inverted U-shaped relationship between working capital and profitability and according to Baños-Caballero *et al.* (2012), the equation (9) and (10) have a break point which can be achieved by deriving the CCC variable equaling the derivation to 0. The result of this derivation is $CCC_{it} = -\frac{\beta_2}{2\beta_3}$ as for the equation this is expected to be a maximum. This tradeoff point is where firms might maximize their profit.

To double check the results, it was implemented a two-steps robustness test according to Tong (2008) and followed by Baños-Caballero *et al.* (2012). The process passes to verify the deviation between the below and above side of the deviations, under the *Hypotheses 1, 2 and 3*. If the results show evidence similar to previous results obtained in the present research, the tests could give robustness to the research findings. It was used fixed effects methodology since by this method it can be extracted residuals for all years of observations.

The step one passes to use model 1 and the equation (2), to obtain the residuals. These residuals are proxy of the deviation of the optimal CCC. The objective is to measure the deviations of the optimal target level of CCC and then apply to profitability. These deviations were used as deviation effect on step 2.

As was outlined in the first model the CCC could not be always their optimum (target level) and deviations might occur. The variable Deviation was created to capture these effects, being the absolute value of the residuals. Also, the dummy variable RES was inserted in the model. The variable is 1 for positive residuals and 0 for negative ones. If variable RES is one the actual CCC is greater than the optimal CCC, and if 0 the actual CCC is lower than the optimal. To progress in step two, the equations above that propose to relate the effect of deviations of optimal CCC on profitability were regressed.

$$(11)\; GOP_{it} = \beta_0 + \beta_1 Deviation_{it} + \beta_2 Leverage_{it} + \beta_3 Size_{it_{it}} + \beta_4 Growth_{it} + \eta_i + \varepsilon_{it}$$

$$(12)\; GOP_{it} = \beta_0 + \beta_1 Deviation_{it} + \beta_2 (Deviation_{it} \times RES_{it}) + \beta_3 Leverage_{it}$$
$$+ \beta_4 Size_{it_{it}} + \beta_5 Growth_{it} + \eta_i + \varepsilon_{it}$$

The two equation derivate from the previous equation (6) and (9) which were substituted the "CCC effect on profitability" (CCC and CCC_{it}^2) by the deviation effect [$Deviation_{it}$ and $(Deviation_{it} \times RES_{it})$]. The equation (11) tried to relate the general deviations, expecting when it exists deviations from CCC this effect reduces the firm profitability. This effect is represented if β_1 estimator on equation (11) is negative.

The equation (12) relates the deviation below and above the optimal level with the profitability. It was expected that below and above optimal levels decrease the firms profitability that in the equation are represented by the effects on estimators, when $\beta_1 < 0$ and $\beta_1 + \beta_2 < 0$. The expectation (Baños-Caballero *et al.*, 2012) is that firms increase profitability when are near to the target level and reduce when increase the distance to the target.

Finally and to test the *Hypothesis 10*, the analysis were made by taking sub-samples for the 8 industries. It was used the average of CCC length held by the firms, for and between the research's period in order to characterize the WCM between the industries and to state differences among them. In order to give also evidence of the difference between the industries, it was used the ANOVA (F-test) to test the equality of means of the same variable, under the the null hypothesis of the equality of the means. For last, it was conducted the t test on the equality of means for independent samples, in order to identify if the mean length of CCC held by each industry in 2009 differs significantly, from the mean CCC values of 2011, under the null hypothesis of equal means.

3.2.2.2. Dependent variables: CCC and GOP

In the empirical research it was used two dependent variables for two different models. The first model used CCC as a measure of WCM efficiency, which measures the number of days that funds are committed to inventories and accounts receivables, less the number of days that payments to suppliers are deferred (Gitman, 1974). This model has the objective to explain the firm's characteristics that might determine CCC and how they might affect its length. Previous empirical research used CCC as a measure of working capital (*e.g.* Smith, 1973; Jose *et al.*, 1996; Shin and Soenen, 1998; García-Teruel and Martínez-Solano, 2007; Baños-Caballero *et al.*, 2010; Baños-Caballero *et al.*, 2012). The longer the length of CCC, the larger the funds invested in working capital and then, higher is the firm's need for additional financing (Baños-Caballero *et al.*, 2010).

For the second model, which aims to realize a non-linear relation with WCM and firms profitability, the dependent variable used is gross operating profitability (GOP). This variable was used as a measure of company profitability and is defined as sales less the cost of goods sold, all divided by total assets less the financial assets. The objective using this measure passes to relate operating performance with the explanatory variables (to be defined below), instead of using other measure as profit before or after taxes. The objective to define this measure as dependent variable, passes to focusing in the operational activity, and for that it was excluded the financial activity that could affect firm overall profitability. Thus, as in Lazaridis and Tryfonidis (2006), financial assets were deducted from total assets.

Table 3: List of Dependent Variables

Dependent variables	
CCC	$\frac{Account\ Receivables}{Sales} * 365 + \frac{Inventories}{COGS} * 365 - \frac{Account\ Payables}{COGS} * 365$
GOP	$\frac{Sales - Cost\ of\ Goods\ Sold}{Total\ Assets - Financial\ Assets}$

3.2.2.3. Explanatory variables

According to the findings outlined in the litetarature review's chapter, to test the formulated hypotheses were used several explanatory variables[8] that might affect the dependent variables for the models proposed.

For the model of CCC determinants it was essentialy folowed the same pattern as the previous empirical working capital determinants research as, Kieschnick *et al.* (2006), Chiou *et al.* (2006) and Baños-Caballero *et al.* (2010). The variables proposed for the model are as follows:

- **Cash flow:** As previous outlined, asymmetric information generates higher costs on firm's external financing (Myers, 1977), firms tend to seek internal finance over debt and new equity (Myers, 1984) and firms with greater capacity to generate cash flows tend to have a higher level of current assets (Fazzari and Pettersen ,1993). A negative relation between cash flows was suggested by previous empirical researches (Chiou *et al.*, 2006; Rahman and Nasr, 2007; Baños-Caballero *et al.*, 2010; Taleb *et al.*; 2010; Abbadi and Abbadi, 2013). Cash flow measures the cash that firm will obtain from its

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[8] All explanatory variables are in Table 4.

performance. "Cash flow ratio" was computed through the net income more depreciations and deflated by total asset (Baños-Caballero *et al.*, 2010);

- **Leverage:** Pecking order theory states that a firm short of funds will tend to raise capital inside before issuing debt outside (Myers, 1984) and an increasing debt tends to decrease internal resources and increase its funding costs, thus it is expected a negative relation between leverage and CCC. Leverage ratio was picked in order to point the relation between external financing and firms total assets. Is calculated by dividing total debt per total assets. Leverage ratio was also used as explanatory variable in several studies (*e.g.* Chiou *et al.*, 2006; Rahman and Nasr, 2007; Baños-Caballero *et al.*, 2010; Taleb *et al.*; 2010; Abbadi and Abbadi, 2013);

- **Growth opportunities:** As seen in literature there is no clear relation between growth and measures of working capital. Growth might affect the trade granted and received, due to firms seeking high inventories to meet future demand, affecting positively the working capital (Kieschnick *et al.*, 2006). However, firms can increase their trade credit to increase their sales in periods of low demand or by using more trade credit as a way to finance their growth (Pettersen and Rajan, 1997; Baños-Caballero *et al.*, 2010) and this could affect negatively working capital. To measure growth opportunities it was calculated the firm sales annual variation, deflated by the sales of the previous year. Although this is a past measure, it was assumed, as suggested by Scherr and Hulburt (2001), that a firm with better past growth, has higher chances of continuing to grow in the future;

- **Size:** Concerning size, it was stated in the literature review that was found a relation with the cost of financing and a decreasing effect on firm size. The relation can be explained according to various researches as seen in chapter 2 (Jordan *et al.*, 1998; Berger and Udell, 1998; Berger *et al.*, 2001; Baños-Caballero *et al.*, 2010). Greater information asymmetries, higher informational opacity and firms are be less followed by analysts, are factors that explain the size affects the WCM, according to the previous research outlined. In order to measure size, the variable was defined as the natural logarithm of sales. This definition is consistent with several previous empirical studies (*e.g.* Baños-Caballero *et al.*, 2010; Taleb *et al.*; 2010; Abbadi and Abbadi, 2013);

- **Tangible fixed assets:** Investment in fixed assets is negatively related with working capital measures (Fazzari and Petersen, 1993; Kieschnick *et al.*, 2006; Baños-Caballero *et al.*, 2010). To measure the effect of the tangible fixed assets on CCC the variable was defined as the firms total fixed assets divided by total assets;

- **Return on Assets (ROA):** As outlined in the literature review, there are several studies that found evidence of the effect of ROA in the firm's working capital requirements (*e.g.* Petersen and Rajan, 1997; Shin and Soenen 1998; Chiou *et al.*, 2006; Nazir and Afza, 2009; Baños-Caballero *et al.*, 2010; Abbadi and Abbadi, 2013). This variable aims to relate the firm performance in generating profits with the firm's assets. It is calculated as earnings before interest and taxes divided by total assets;

- **Industry:** According to Chiou *et al.* (2006) firms are sensitive to the different impacts of the economy, since they are characterized by different operations. This also affects the working capital requirements according to several research studies (*e.g.* Weinraub and Visscher, 1998; Filbeck and Krueger, 2005; Kieschnich *et al.*, 2006; Nazir and Afza, 2009). To control the effect of industry on CCC determinants it was included a dummy variable. This variable tried to capture the particular characteristics of the firm and the firm industry, as proposed by Baños-Caballero *et al.* (2010) and Baños-Caballero *et al.* (2012).

- **GDP:** According to Zariyawati, *et al.* (2010) determinants of working capital are divided to internal and external factors. Previous empirical research studied the GDP as external factor of the WCM (Baños-Caballero *et al.*, 2010; Zariyawati, *et al.*, 2010). The variable GDP aims to incorporate in the model the effect of macroeconomics as external factor and is defined as the growth of the Portuguese GDP at market prices.

Table 4: List of Explanatory Variables

Explanatory variables	
Cash Flow	$\dfrac{Net\ profit + Depreciation}{Total\ Assets}$
Leverage	$\dfrac{Total\ Debt}{Total\ Assets}$
Growth	$\dfrac{Sales_1 - Sales_0}{Sales_0}$
Size	$\ln(Total\ Assets)$
Tangible Fixed Assets (TFA)	$\dfrac{Tangible\ Fixed\ Assets}{Total\ Assets}$
ROA	$\dfrac{EBIT}{Total\ Assets}$
Industry	Industry dummy variable
CCC	$\dfrac{Account\ Receivables}{Sales} * 365 + \dfrac{Inventories}{COGS} * 365 - \dfrac{Account\ Payables}{COGS} * 365$
Size	$\ln(Total\ Assets)$
Growth	$\dfrac{Sales_1 - Sales_0}{Sales_0}$
Leverage	$\dfrac{Total\ Debt}{Total\ Assets}$
Industry	Industry dummy variable
GDP	$\dfrac{GDP(market\ prices)_1 - GDP(market\ prices)_0}{GDP(market\ prices)_0}$

4. EMPIRICAL RESEARCH: RESULTS

In order to understand the relation of the CCC and the control variables on firms' profitability and which determinants impact on firms' CCC, in the present chapter is conducted an empirical research that can be summarized in 4 sections. The first section corresponds to the major descriptive statistics for all the variables used, in order to observe the major tendencies, evolutions and composition of the variables and to give an overview of the sample for the period 2009-2011. In the second section it was used the Pearson correlation and hypothesis test for each variable, in order to indicate possible relation between the variables. Thirdly, it was used pooled, fixed effect (cross sectional) and IV methodology in order to verify and understand which are the economic and statistical significant variables and their relation with GOP and CCC, leading to the support or rejection of the existent theories. Finally, it was conducted the ANOVA (F-test), the t-test and descriptive statics to verify the influence of industries in the WCM.

4.1. Sample characterization

Table 5 presents the sample of 1192 Portuguese SMEs according to its industry and by firms' EU size category for the year 2011[9]. As can be seen, the wholesale trade and retail trade (34.73%), services (22.65%) and manufacturing (13.93%), are the major represented industries in the research sample, which together account for 71.31% of the all sample. On the other hand, agriculture and mining (1.17%), education (1.43%), and health (6.88%) are the industries that are less represented in the sample of Portuguese SMEs.

Concerning the EU firms' size categories for SMEs, micro-sized companies are the most represented type of firm in the sample, corresponding to 81.88% of the total sample, with 976 companies, followed by small-sized (17.20%) with a total of 205 companies. With only 11 companies, the medium-sized companies are the least represented type of companies, accounting for 0.92 % of the total sample (please see Figure 1).

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[9] The results are similar to the previous years, as can be seen in Appendix 1 and 2.

Table 5: Overall sample according to Industry and Size[10] for 2011

Industry	Medium		Small		Micro		Total	
	Count	%	Count	%	Count	%	**Count**	**%**
Agriculture and Mining	0	0.00%	7	3.41%	7	0.72%	**14**	**1.17%**
Construction	0	0.00%	35	17.07%	96	9.84%	**131**	**10.99%**
Education	1	9.09%	3	1.46%	13	1.33%	**17**	**1.43%**
Health	0	0.00%	10	4.88%	72	7.38%	**82**	**6.88%**
Manufacturing	4	36.36%	50	24.39%	112	11.48%	**166**	**13.93%**
Services	5	45.45%	42	20.49%	223	22.85%	**270**	**22.65%**
Transport and Storage	0	0.00%	3	1.46%	95	9.73%	**98**	**8.22%**
Wholesale Trade and Retail Trade	1	9.09%	55	26.83%	358	36.68%	**414**	**34.73%**
Total	**11**	**100.00%**	**205**	**100.00%**	**976**	**100.00%**	**1192**	**100.00%**

Figure 1: Overall sample according to Size (EU Categories) in % of Total Sample
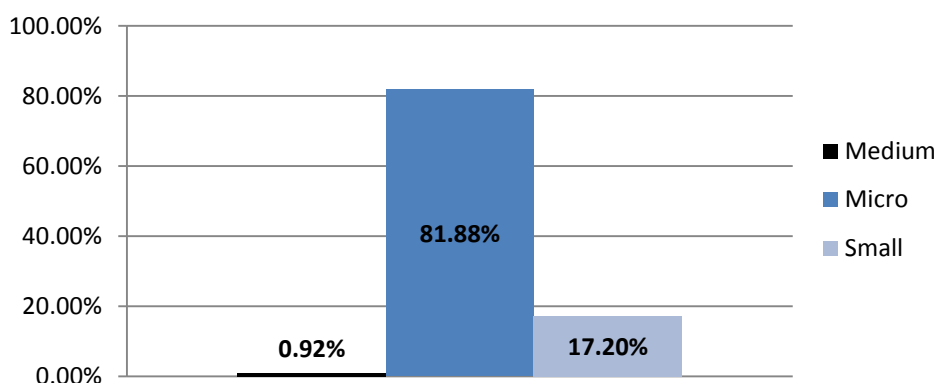
4.2. Dependent variables characterization: CCC and GOP

Table 6 provides the evolution of the average values for the variables GOP and CCC, and the growth of Portuguese GDP for the research period 2009-2011. As can be seen, there is a substantial decrease in CCC and a decrease of 1.92 percentage points (pp) in GOP during the period 2009-20011. The mean values for the observations of Portuguese SMEs for the GOP ratio increased from 74% of (total assets - financial assets) in 2009 to 75% in 2010, decreasing to 72 % in 2011. In respect to the average length of CCC held by the Portuguese SMEs, it decreased from 143.64 days in 2009 to 105.49 days in 2010, followed by an increase to 123.76 days in 2011. For the period in analysis when the economic situation deteriorates (GDP decreases), the GOP ratio decreases and the CCC number of days increases for the average observation of the Portuguese SMEs, and when the GDP increases the GOP ratio

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[10] According to size defined in the European Commission Recommendation of 2003/361/EC.

increases and the CCC increases. These might suggest that with best economic environment the SMEs in analysis are more profitable, and take less time to transform firms' inputs resources to cash flows. Also, the Table 6 might suggest a negative relation between GOP and CCC throughout the years 2009 and 2011, since when GOP increases the CCC decreases for the average of the observations.

Table 6: Average GOP, CCC and GDP Growth, 2009-2011

Variable	2009	2010	2011	Average (2009-2011)
GOP	74.39%	74.77%	72.47%	**73.88%**
CCC	143.64 days	105.49 days	123.76 days	**124.29 days**
GDP Growth (market prices)	-1.85%	2.5%	-1.23%	**-0.19%**

Table 7 provides additional descriptive statistics for the dependent variables for the research period from 2009 to 2011. On average, firms have a GOP of 74% (of total assets – financial assets), while the median value indicates that 50 % of the variable's distribution is equal to 53%. Also, the GOP ratio has a minimum value of -8% and a maximum value of 548%, being this variable highly dispersed with a standard deviation of 69%. Concerning CCC, the average for the observation between the firms is 124.3 days and the median is 28.8 days, and the range between variables minimum and maximum is between -12948.2 and 19696.1 days. As expected, there exists a high value for the standard deviation (1208.92), indicative of the high dispersion of the variable previous stated.

Table 7: Descriptive statistics of dependent variables, 2009-2011

Variables	Obs.	Mean	Std. Dev.	Min.	P 05	P 25	Median	P 75	P 95	Max
CCC (days)	3576	124.3	1208.92	-12948.2	-403.8	-8.6	28.8	28.7	914.3	19696.1
GOP	3576	74%	69%	-8%	10%	30%	53%	53%	202%	548%

4.3. Impact of the explanatory variables

Table 8 presents the major descriptive statistics on the explanatory variables for the sample of Portuguese firms over the research period of 2009-2011. The total number of observation for all sample variables is 3576 except for the variable Growth that has 2384 observations. This was due to the non-availability of sales values for the year 2008, which turned impossible to compute the growth value for 2009.

As can be seen in Table 8, the mean values for growth and ROA is 0.2%. The mean cash flows are around 24% of the total assets and the total fixed assets correspond on average to 23% of total assets. The natural logarithm of the total assets (Size) has a minimum value of 8.68 and a maximum value of 16.17, with a standard deviation of 1.41 and a mean of 12.07. There are firms with no debt and no TFA for the SMEs (Min=0).

Concerning the Leverage ratio, debt represents on average 74 % of the total assets with a standard deviation of 0.62 (the higher between the ratios, excluding size). The variable during the research period showed that median is 70 % of debt in term of total assets with a maximum value of 650% debt over total assets. With a median around 70%, a 95% percentile of 170% and a maximum of 650%, it can be stated that leverage has a great number of extreme values. Also, relating these aspects with the mean and the standard deviation, the observation of variable leverage might suggest that firms might have serious problems of financial distress.

The variable Growth, Cash Flow and ROA, have negative values on their minimums, being -0.94, -1.75 and -1.95, respectively. The variable Growth presents a negative median of -0.03 and the maximum value correspond to 3.67 (367% over the last year) and a standard deviation of 0.35. The variable Cash Flow shows a median of 0.19, a maximum of 104 % of cash flows above total assets and a standard deviation of 0.31. Finally, the variable ROA shows the lowest standard deviation between the ratios (excluding Size) with a median of 0.03 and a maximum ROA observable of 0.58.

Table 8: Descriptive statistics of explanatory variables, 2009-2011

Variables	Obs	Mean	Std. Dev.	Min.	P 05	P 25	Median	P 75	P 95	Max
Size	3576	12.07	1.41	8.68	9.77	11.01	12.07	13.05	14.44	16.17
Growth	2384	0.002	0.35	-0.94	-0.44	-0.14	-0.03	0.09	0.48	3.67
Cash Flow	3576	0.24	0.31	-1.75	-0.18	0.06	0.19	0.43	0.81	1.04
Leverage	3576	0.74	0.62	0	0.05	0.39	0.70	0.89	1.70	6.50
TFA	3576	0.23	0.24	0	0	0.03	0.14	0.37	0.75	0.96
ROA	3576	0.002	0.19	-1.95	-0.32	-0.02	0.03	0.08	0.21	0.58

4.4. Correlation analysis

Table 9 shows the Pearson correlation effects of the dependent variables and explanatory variables. The purpose of the analysis, already mentioned, is to verify the relationship between the different variables of the research as was done in previous researches (*e.g.* Deloof, 2003; García-Teruel and Martínez-Solano, 2007; Baños-Caballero *et al.*, 2010; Gul *et al.*, 2013). However, the correlations coefficients are used only as indicators for the relationship between the variables, since they provide weak instruments for the possible association among the variables.

Table 9: Pearson correlation matrix
(p-values are reported in parentheses)

Correlation	GOP	CCC	Cash Flow	Growth	Leverage	ROA	Size	TFA	GDP
GOP	1								

CCC	-0.07655	1							
	(0.00020)	-----							
Cash Flow	-0.04586	-0.07196	1						
	(0.02510)	(0.00040)	-----						
Growth	0.09732	-0.03627	0.08358	1					
	(0.00000)	(0.07670)	(0.00000)	-----					
Leverage	0.10617	-0.05485	-0.27565	-0.02370	1				
	(0.00000)	(0.00740)	(0.00000)	(0.24740)	-----				
ROA	-0.03522	0.01132	0.55740	0.15934	-0.53445	1			
	(0.08550)	(0.58060)	(0.0000	(0.00000)	(0.00000)	-----			
Size	-0.44630	0.00506	0.28854	0.03444	-0.16637	0.22815	1		
	(0.00000)	(0.80500)	(0.0000	(0.09270)	(0.00000	(0.00000)	-----		
TFA	-0.02401	-0.08216	0.72238	-0.00068	0.07164	-0.05881	0.16952	1	
	(0.24130)	(0.00010)	(0.0000)	(0.97360)	(0.00050)	(0.00410)	(0.00000)	-----	
GDP	0.01624	-0.00718	0.04759	0.14292	-0.02297	0.07393	0.01029	0.00811	1
	(0.42800)	(0.72610)	(0.0201)	(0.0000)	(0.2622)	(0.0003)	(0.6157)	(0.6921)	-----

Taking in consideration the Pearson coefficients from the Table 9, it is possible to observe that there are a weak negative significant relation between GOP and the variables CCC and Cash flow. There is also, a moderate negative significant relation between Size and GOP. The variable Growth is highly significant and weak positively correlated with GOP as in Baños-Caballero *et al.* (2012), suggesting that firms with more growth opportunities have better operational performance. Concerning the relation with GOP and CCC there is a high significance of the negative relation, as in previous studies (*e.g.* Deloof, 2003; Baños-Caballero *et al.*, 2012), although this relation is weak. This relation suggests that operational profitable firms might have lower length of CCC. Size is also highly significant negatively correlated with GOP as in Baños-Caballero *et al.* (2012) but with a moderate relation between

the variables. The Leverage and GOP variables are significant, but weak positively correlated. This is against previous studies on WCM and POT as stated in the literature review and should be further investigated in the next step of the present research.

The variable CCC is highly significant and negatively weak correlated with Cash Flow, Leverage and TFA. Also the Growth variable is significantly negatively weak correlated with CCC but at a significance level below 10 %. These results suggest that firms with more debt in their financing structure might have a shorter period of CCC, which is consistent with the results of Baños-Caballero *et al.* (2012). Firms that have better growth opportunities and generate internal funds have lower periods of CCC. Also, firms that have a greater percentage of fixed assets held a lower period of CCC.

There are also interesting associations between the explanatory variables that should to take into account. Bigger companies have bigger cash flows and bigger overall profit. The relation with ROA and Leverage is highly significant and moderated negative. This result is interesting since the relation with overall profitability is negative but with the operational (GOP) is positive. Firms with more growth opportunities have lower levels of debt and bigger firms have more percentage of debt. The GDP is not significant either for CCC or GOP, suggesting that GDP does not influence the WCM or either the operational profitability. The Pearson coefficients between the variables dependent and explanatory ones, show no more than weak relationships (except Size and GOP that are moderated), which might suggest that all variables are possible to be tested in a multivariate analysis.

4.5. Empirical models

In this section multiple regression analysis is conducted in order to test the research hypotheses. This type of methodology will help to understand the effect of the explanatories variables in the WCM (CCC) and in the operational profitability (GOP). Model 1 was used in order to test *Hypotheses 4, 5, 6, 7, 8, 9* and *11* and model 2 was considered to test *Hypotheses 1, 2* and *3*. A set of different methodologies were applied in order to test the hypotheses. Also, robustness tests were applied, in order to double-check the validity of the results. Finally, *Hypothesis 10* was tested in order to evidence if the different industries differ in their WCM.

4.5.1. Model 1 – WCM's determinants

In this model, the purpose is to test empirically the *Hypotheses 4, 5, 6, 7, 8, 9* and *11*. The hypotheses testing model was used taking in consideration the methodology described in section 3.2.

4.5.1.1. Regression using Fixed Effects Methodology

Equation (2) was regressed taking in consideration the Pooled OLS method[11], in order to apply the F-test presented in Table 10. Has can be seen, the p-value for the F-test is less than 0.0001, which means that we reject the null hypothesis at a highly significance level and the unobservable individual effects are present. The estimation by the polled effect method is rejected.

Table 10: F-test and Hausman test for equation (2)

Test Summary	Chi-Sq. Statistic (d.f)	F-test statistic	p-value
F-test	---	10.49772	0.0000
Hausman test	10.3629(5)	---	0.0656

The Hausman test was conducted in order to indicate which estimation method is more suitable for the research, the fixed effects or random effect model. As can been seen above, the null hypothesis is rejected (at a 10% significance level) and the unobservable individual effects was decided to be treated as fixed effect.

For model 1, the estimation methodology using fixed effects was applied to the equation (1) (2) (3) and (4), correspondent to the *Hypotheses 4, 5, 6, 7, 8, 9* and *11*. These estimations were carried in order to analyze the determinants of CCC and its effects. The results are presented below, in Table 11.

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[11] For more detail of the Polled OLS regression please see Appendix 3.

Table 11: Results using fixed effect methodology, for equation (1), (2), (3) and (4)
(p-values are reported in parentheses)

Equations	(1)	(2)	(3)	(4)
Cash Flow	-693.229	-1129.784	-1131.430	-1131.430
	(0.036)	(0.03)	(0.0299)	(0.0299)
Leverage	-165.375	-186.825	-187.434	-187.434
	(0.0135)	(0.105)	(0.1046)	(0.1046)
ROA	718.291	1173.558	1176.523	1176.523
	(0.0347)	(0.0299)	(0.0298)	(0.0298)
Size	30.695	-184.708	-183.940	-183.940
	(0.6706)	(0.1372)	(0.1399)	(0.1399)
TFA	767.316	1483.089	1486.561	1486.561
	(0.0402)	(0.0142)	(0.0142)	(0.0142)
Growth		-213.081	-212.145	-212.145
		(0.0004)	(0.0005)	(0.0005)
GDP				-81.381
				(0.9257)
Period fixed	no	no	yes	no
F-test	5.8310	4.4107	4.4033	4.4033
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Adjusted R^2	0.6178	0.6314	0.6311	0.6311
Observations	3576	2384	2384	2384

Concerning the adjusted coefficient of determination ($\bar{R}^2$), it can be stated that the explanatory variables explain between 61.78 % (equation (1)) and 63.14 % of the CCC variance. Adding variable growth to the models increase its explanation (but exclude observations), while adding period fixed effects and GDP does not create more explanation power to the model.

According to the results generated from model 1 (Table 11), each CCC's determinant might have different relation and significance with the explanatory variable (CCC). The impacts throughout the variables and relation with the explanatory variable are discussed and pointed below:

- **Cash Flow:** The results for the variable Cash flow show a significant negative relation at 5% level of significance in the four equations. The first equation has a β=-693.229 for Cash Flow, meaning that an increase, in average, of one pp in Cash Flow will lead to a decrease of 6.93229 days of CCC held by the firms. Although adding the Growth variable, the association negatively increases to a $\beta \approx$ -1130 around the 3 equations. This negative relation between the variables is against the findings of Baños-Caballero

et al. (2010)[12], and Abbadi and Abbadi (2013). Suggested from the results of Abbadi and Abbadi (2013), this relation could be explained since the Portuguese SMEs in this period did not have enough internal generated funds to finance their working capital needs;

- **Leverage:** The estimated coefficient obtained for the Leverage ratio in equation (1) is significantly negatively correlated with the variable CCC, presenting a β=-165.375 and significant at a 5% level of significance. Although when the Growth variable is included to the model the relation is almost significant at 10% level of significance (p-value $\approx$ 0.105). This non-significance might be due to the decreasing of observations generated by the inclusion of the Growth variable. For the research purposes it was stated that in general and by the indications of the results that Leverage is negatively related with CCC, taking in consideration the method employed. This relation is in accordance with previous empirical studies (Chiou *et al.*, 2006; Rahman and Nasr, 2007; Baños-Caballero *et al.*, 2010; Taleb *et al.*; 2010 and Abbadi and Abbadi, 2013). The relation as reviewed in section 2.4, confirms that firms with more levels of debt tend to seek lower working capital requirements;

- **ROA:** The overall profitability ratio ROA, has a significant positive relation with the CCC held by the firms throughout the 4 models at a 5 % level of significance. The coefficient β increases when is added the Growth variable (less observations) and has values of 718.29, 1173.558, 1176.523 and 1176.523 for the equations (1), (2), (3) and (4) respectively. The results go against the findings of Chiou *et al.* (2006) and Baños-Caballero *et al.* (2010). Conversely, the results go in the same direction of Nazir and Afza (2009), Mehmet and Eda (2009) and Abbadi and Abbadi (2013). Concerning the findings of Nazir and Afza (2009) and Mehmet and Eda (2009) the relation may be explained since firms with better performance are less concerned with an efficient management of working capital;

- **Size:** It was not found any significant relation between the variable Size and the dependent variable CCC. All the p-values are higher than the maximum significance level of the study (10%). Also, with the inclusion of the variable Growth the

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[12] For the model with IV/GMM estimation method. Baños-Caballero *et al.* (2010)'s fixed effects methodology presents similar results as this study.

coefficient changed sign of the possible relation with the variables. In the equation (1) there is a positive β of 30.695 while in equations (2), (3) and (4) represent -184.708, -183.940, and -183.940 respectively;

- **TFA:** The variable that measures the effect of firms holding fixed tangible assets is statically significant to the CCC held by the firms (at a 5% significance level). The relation between the variables is positive and TFA is the variable where an increase, in average, of 1 pp on the TFA ratio will increase more the value of CCC among the explanatory variables. The increase of number of days of CCC with an increase of 1 pp in TFA corresponds to a 7.67316 days in equation (1), 14.83089 days in (2) and around 14,86561 days in (3) and (4);

- **Growth:** The variable growth was not inserted in equation 1 (as previous stated in the methodology) and is highly significant for the equation (2), (3) and (4). The coefficient β for equation (1) suggests a decrease of 2.13081 days of CCC due to increase 1 pp of sales growth. For equations (3) and (4) the effect of increase 1 pp on Growth is around a decrease of 2.12145 days in CCC. This reveals a negative significant relation between the variables;

- **GDP:** There is no significance in the GDP's coefficient as stated by the equation (4) (p-value=0.9257). The β coefficient is negative with CCC but not significant at a 10% level of significance.

4.5.1.2. Testing endogeneity problems using IV Methodology

The previous research about WCM theme, revealed concern about the causalities between the dependent and explanatory variables that could lead to endogeneity issues in their researches (Deloof, 2003; García-Teruel and Martínez-Solano, 2007; Baños-Caballero *et al.*, 2010; Baños-Caballero *et al.*, 2012). In the current research it was decided to control for problem of endogeneity to give strength to the results. As mentioned above in the methodology chapter, the method to treat the endegeneity issues was the IV methodology and GMM coefficient estimation as used in Baños-Caballero *et al.* (2010) and Baños-Caballero *et al.* (2012).

Equations (1) (2) (3) and (4) were re-estimated using the IV methodology. For each equation it was set a panel of instrument variables. The panel of instrument variables was made by the first lagged of the variable CCC and the year value of the explanatory variables inserted in the models.

As can be seen in Table 12, according to the Hansen test, the null hypothesis of the validity of instruments is not rejected for the four equations. Also, the results change significantly and this could be due to possible problems endogeneity of the variables. The equations (3) and (4) show identical values when fixed period effects and GDP variables are included, which are variables that are not statistically significant.

Table 12: Results using fixed effect methodology, for equation (1), (2), (3) and (4)
(p-values are reported in parentheses)

Equations	(1)	(2)	(3)	(4)
CCC(-1)	-0.539566	-0.5341	-0.534025	-0.534025
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Cash Flow	-758.8273	-777.206	-778.747	-778.747
	(0.090)	(0.0827)	(0.0823)	(0.0823)
Leverage	-238.3521	-234.088	-235.106	-235.106
	(0.0162)	(0.0183)	(0.0180)	(0.0180)
ROA	498.4657	557.111	553.707	553.707
	(0.2813)	(0.2310)	(0.2347)	(0.2347)
Size	-38.43054	-41.350	-43.458	-43.458
	(0.7194)	(0.6991)	(0.6851)	(0.6851)
TFA	673.9241	710.344	709.331	709.331
	(0.1952)	(0.1728)	(0.1743)	(0.1743)
Growth		-65.104	-66.173	-66.173
		(0.2273)	(0.2251)	(0.2251)
GDP				146.734
				(0.8449)
Period fixed	no	no	yes	no
Hansen's J-statistic	0.7944	0.8457	0.8328	0.8328
(d.f.)	1	1	1	1
Prob (J-statistic)	(0.3728)	(0.3578)	0.361456	0.361456
Observations	1192	1192	1192	1192

From the Table above, it can been seen that by applying the GMM coefficient estimation were excluded two years of observations in all the equations and might be an issue for the research. The reducing of years of observation is linked to the lagged variable and to the instruments applied in the IV methodology. During the model regression, all explanatory were considered endogenous and were used (more the constant) as instruments in the computation of the IV methodology.

The regressions show a highly significant coefficient lagged CCC variable. As suggested by Baños-Caballero *et al.* (2010) this result suggests that firm pursue a target CCC that balance the costs and the benefits. The coefficient is negative and this suggests that when firms want to adjust their target, in average, an increase of one day of the CCC from the previous year decreases around 0.54 days of the firms current CCC.

When controlling for possible endogeneity problems the number of explanatory variables that are significant decrease in relation to the previous fixed effects model. The variable Cash flow shows significance at a 10 % significance level for the equations regressed and maintains its negative relation with the dependent variable. The variable Leverage is now significant in all equations at a 5 % significance level, maintaining its negative relation with the variable CCC, suggesting that in average, an increase of the debt levels decrease the CCC held by firms.

By contrast the variables ROA, TFA and Growth are no longer significant. This might indicate that the coefficients for these variables in the fixed effect methodology are weak estimators since there is a suggestion that there are exogenous factors to the model that might affect their relationship. Also, IV methodology found similar results for the variables Size and GDP. Their coefficients revealed no statistical significance when used as determinants of the CCC held by the Portuguese SMES, as in the previous methodology applied.

4.5.2. Model 2 – WCM and profitability

For model 2, the empirical research is concerned in testing the *Hypotheses 1, 2 and 3*. The methodology employed is detailed on the section 3.2 of this research.

4.5.2.1. Testing Using Fixed Effects Methodology

As done for model 1, equation (5) was regressed taking in consideration the Pooled OLS method and its F-test is presented in the table below[13]. Table 13 provides evidence of the high rejection of the null hypothesis, since the p-value is less than 0.0001. There are unobservable individual effects and estimation by the pooled effect method is rejected.

Table 13: F-test and Hausman test for equation (5)

Test Summary	Chi-Sq. Statistic (d.f)	F-test statistic	p-value
F-test	---	308.6942	0.0000
Hausman test	343.756(3)	---	0.0000

From Table 14 it can be seen that the null hypothesis of the Hausman test is rejected and the method more suitable for the estimation of model 2 is the fixed effects.

In order to test the *Hypotheses 1, 2 and 3*, fixed effects regressions were applied to equations (5), (6), (7) and (8). The regressions were carried in order to test if there are causal effects

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[13] For more detail of the Polled OLS regression please see Appendix 3.

between the WCM and the profitability of the Portuguese SMEs. Table 14 provides the results.

Table 14: Results using fixed effect methodology, for equations (5), (6), (7) and (8)
(p-values are reported in parentheses).

Equations	(5)	(6)	(7)	(8)
CCC	-0.0000011	0.0000064	0.0000064	0.0000064
	(0.8728)	(0.4389)	(0.4407)	(0.4407)
Leverage	0.0454	0.0682820	0.0736960	0.0736960
	(0.0275)	(0.0281)	(0.018)	(0.018)
Size	-0.6718510	-0.5977970	-0.6041910	-0.6041910
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Growth		0.2313020	0.2243420	0.2243420
		(0.0000)	(0.0000)	(0.0000)
GDP				0.5464180
				(0.027)
Period fixed	no	no	yes	no
F-test	21.93543	19.6311	19.68323	19.68323
(p-value)	0	0	0	0
Adjusted R^2	0.8749	0.9033	0.9036	0.9036
Observations	3576	2384	2384	2384

As can be seen by the results on Table 14, there is a high level of fitness of the model. The adjusted coefficient of determination ($\bar{R}^2$) varies between 0.8749 and 0.9036 in the four equations, being the equations (3) and (4) the ones who explain more the variance of GOP. Explanatory variables explain between about 87.49 % and 90.36% of the variance of the dependent variable.

The results obtained by the model applying fixed effects methodology are examined below in order to determine if there is significant relation between the explanatories variables and the dependent variables. The results suggest:

- **CCC:** The results show that the variable CCC is not significant for the four equations regressed. In the equation (5) the β is equal to -0.0000011 but the p-value for the associated t-test turns out to be extremely high, resulting in a not statistically significant coefficient. The variables are also not significant for the equations (6), (7) and (8), but the coefficient of the variable CCC change for a positive sign. Comparing to the pooled OLS model previous elaborated the results change and the variable is now not significant, suggesting that may exist unobservable heterogeneity affecting the variable. The results outlined suggest that CCC does not affect operational profitability of the Portuguese SMEs, which is in line with the research of Deloof (2003);

- **Leverage:** The variable that measures the firms' levels of debt and its relation on profitability is significant and positively related with the dependent variable. The coefficient for the equation (4) is significant at 5 % significance level, with β equal to 0.0454, meaning that in average, an increase of 1 pp on the leverage ratio will lead to an increase of 0.0454 pp of the GOP ratio. For equation (5), (6) and (7) the increase on GOP ratio, by the influence of increasing 1 pp on Leverage, is respectively 0.06833 pp, 0.0737 pp and 0.737 pp. The relation suggests when firms increase their debt levels, the operational profitability based on is assets tend to increase. The result is according to agency costs and POT theories, suggesting that the benefits of tax shield are higher than the cost of bankruptcies, creating value when increase their debt, or otherwise, since the problem of the divergences between shareholders and managers is low or insignificant, the increasing of debt creates the benefit of debt financing as suggested by Jensen and Meckling (1976).

- **Size:** Size is the only variable for the model 2 that presents a negative coefficient, corresponding to a negative relation between the size of the companies and the GOP ratio. The variable's coefficient is statically significant at 1% significance level for the four equations. Since the size is the natural logarithm of assets, when the assets increase 1 %, the GOP ratio decreases 0.6719 pp in equation (5), 0.5978 pp in equation (6) and 0.6042 pp in (7) and (8). The results might suggest that the bigger the companies, the less efficient are, and non-financial assets generates less operational profitability;

- **Growth:** As in the previous model the variable Growth when inserted in the regression decreases the model observations to 2384. The variable Growth is highly significant (at 1% level of significance) and is positively correlated with GOP for the three equations regressed. The coefficient β for equation (2) means that an increase of 1 pp in the variable Growth leads on average to an increase of 0.2313 pp in GOP, and for the equations (3) and (4) explains an increase of 0.2243 pp of the dependent variable;

- **GDP:** The variable GDP has a positive relation with GOP, and it is significant at a 5% level of significance. When the variable increases 1 pp, the GOP ratio increases on average 0.5464 pp. The result suggests that Portuguese GDP influenced the

operational profitability of Portuguese SMEs. Also, the results are statistical equal to the variable for the fixed period, as the whole effect in equation (7) is equal to the (8).

4.5.2.2. Testing model 2 using IV methodology

As previous stated, there are several empirical studies that revealed concern about endogeneity issues. The methodology applied was the same as the one in section 4.5.1, for the CCC determinants model. Equation (5), (6), (7) and (8) were re-estimated using the GMM coefficient estimation, as used in the WCM researches of Baños-Caballero *et al.* (2010) and Baños-Caballero *et al.* (2012). It was set a panel of instrument variables to regress the model, made by the first lagged variable of GOP and the year values for each explanatory variable in the model.

Concerning the Hansen test, the null hypothesis of the validity of the instruments was rejected in equation (6), as can be seen in Table 15. The instruments for the equation (6) are statically weak. Although for the remaining 3 equations the results can be considered valid and an analysis can be performed. As in the IV model of the section 4.5.1 the equations (7) and (8) (with period effect and with GDP) present similar results.

Table 15: Results using IV methodology, for equations (5), (6), (7) and (8)
(p-values are reported in parentheses).

Equations	(5)	(6)	(7)	(8)
GOP(-1)	-0.1433	-0.09277	-0.10485	-0.10485
	(0.0000)	(0.0002)	(0.0000)	(0.0000)
CCC	-0.00001	0.000	0.00001	0.00001
	(0.5473)	(0.5387)	(0.5301)	(0.5301)
Leverage	0.11008	0.102583	0.09785	0.09785
	(0.0011)	(0.0013)	(0.0019)	(0.0019)
Size	-0.57602	-0.591	-0.60574	-0.60574
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Growth		0.209	0.20258	0.20258
		(0.0000)	(0.0000)	(0.0000)
GDP				0.39692
				(0.1148)
Period Fixed	no	no	yes	no
Hansen's J-statistic	1.928215	4.1394	2.121311	2.121311
(d.f.)	1	1	1	1
Prob (J-statistic)	0.164954	0.041897	0.145262	0.145262
Observations	1192	1192	1192	1192

Guided by the finding of García-Teruel and Martínez-Solano (2007) and Baños-Caballero *et al.* (2012) IV methodology was applied. The GMM coefficient estimation exclude 2 years of observations in all equations regressed (as in the model 1). As in model 1, all explanatory were considered endogenous and were used as instruments in the computation of the IV methodology.

As can be seen in the table above, the results are very similar to the model with fixed effect methodology. The only variable that changes its significance is the variable GDP, which by GMM estimation is not significant at a 10 % significance level. The other variables maintain their significance and their relation with the dependent variable (GOP).

The variable CCC is not significant for the four equations regressed by IV methodology. Protecting against endogeneity problems the result is similar to those obtained using fixed effect methodology and no significant relation was found between WCM and the firm operational profitability. The result is in line with Deloof (2003), but goes against the findings of García-Teruel and Martínez-Solano (2007) and Baños-Caballero *et al.* (2012) IV methodology researches.

4.5.2.2. *Testing a non-linear relation*

Some linear models about WCM suggest that aggressive working capital strategies increase the profitability as stated in chapter 2. Following the research of Baños-Caballero *et al.* (2012) that provided evidence of a non-linear relation between CCC and operational profitability, it was regressed a non-linear system in order to determine if there is an inverted U shaped relation between CCC and the dependent variable. The relation evidences an optimum target level of CCC which balances the benefits and costs of investing in working capital.

The equations will be regressed using fixed effect methodology and IV methodology (GMM coefficient estimator). The last methodology was pointed by Baños-Caballero *et al.* (2012) by being the most common technique and was used in their research. The model applied will have in consideration the *Hypotheses 2 and 3* and equations (9) and (10) will be regressed, as predefined in the methodology chapter.

Table 16: Results for the non-linear equations (9) and (10)
(p-values are reported in parentheses).

Equations	(9) Fixed effects	(10) IV(GMM)
GOP(-1)		-0.104799
		(0.0000)
CCC	5.73E-06	4.82E-06
	(0.5196)	(0.5827)
CCC^2	1.15E-10	5.83E-11
	(0.843)	(0.9191)
Leverage	0.067933	0.097794
	(0.0292)	(0.0019)
Size	-0.598147	-0.605885
	(0.0000)	(0.0000)
Growth	0.231304	0.202599
	(0.0000)	(0.0000)
Period fixed	no	no
Hansen's J-statistic		2.12429
(d.f.)		1
Prob(J-statistic)		0.14498
F-test	19.59885	
(p-value)	(0.0000)	
Adjusted R^2	0.903237	
Observations	2384	1192

As can be seen in Table 16, the results for the two types of estimation methods applied, are similar and the relations for the variables are similar to the previous findings.

The CCC square is highly non-significant in the two models. This goes against the findings of Baños-Caballero *et al.* (2012) and no relation with CCC was also found. When controlling for heterogeneity or endogeneity the relation is not seen in the models regressed. The result suggests that firms do not pursue an optimal target of CCC and deviation to the optimal target (above or below) does not affect the profitability of the Portuguese SMEs and there are not suggestion of a tradeoff between the benefits and costs of investing in working capital.

4.5.3.3. Robustness Tests

In order to test the validity of the results it was conducted robustness tests as specified in chapter 3. Following Tong (2008) and Baños-Caballero *et al.* (2012) it was implemented the 2-step robustness test by first incorporating in the regression the absolute value of the residuals of the model 1, designated by the variable Deviation. The variable Deviation aims to be a proxy of the deviation of the optimal value targeted by the firms.

The step two runs the regression for equations (11) and (12). Equation (11) tries to relate the overall deviations from the optimal target level with the effect on firms' operational profitability. Equation (12) decomposes the effect on above and below deviation as its effect on the profitability, as previously specified.

To run this model it was used fixed effect model, since it was the only model in the research (except OLS) that could extract the residuals for all years of observations. Equations (11) and (12) were regressed in order to give robustness to the previous results derived by the *Hypotheses 1, 2 and 3.*

Table 17: Results for robustness tests using fixed effect methodology
(p-values are reported in parentheses)

Equations	(11)	(12)
Deviation	1.53E-05	4.55E-06
	(0.4464)	(0.8446)
Deviation*RES		1.55E-05
		(0.353)
Leverage	0.070524	0.071039
	(0.0239)	(0.0229)
Size	-0.606495	-0.604618
	(0.0000)	(0.0000)
Growth	0.223348	0.22491
	(0.0000)	(0.0000)
F-test	19.68297	19.66499
(p-value)	0	0
R^2	0.903631	0.90362
Observations	2384	2384

The result above from the Table 17 goes in the same direction as the previous methodology implied in the present research. As can be seen, the variable that measures the deviation for the optimal target level of CCC is not significant for the two equations, meaning that the deviation does not affect the firm operational profitability. Also, the results suggest that the above deviations from the target CCC or below deviations do not affect the firm profitability, since the variable Deviation coefficient is not significant and neither is Deviation*RES.

The results outlined above give strength to the previous methodology applied. The firms does not balance the cost and benefits of holding the CCC and this measure does not have any significant effect for the Portuguese SMEs operational profitability studied in the present research.

4.5.3. WCM between different industries

In order to study the management of working capital in different industries, it was developed an analysis of the CCC by taking sub-samples, for the 8 industries present in the research. Also, it was applied the ANOVA (F-test) and the t-test for the equality of means for independent samples.

Table 18 represents the mean value of CCC held by firms by year and industry. As can be seen the CCC held by the firms differs between them. There are industries that have positive CCC and others negative CCC. According to (Kieschnick *et al.*, 2006), a positive CCC indicates that working capital is a use of funds and there is a need of financing, and also according to Fazzari and Pettersen (1993) when exists negative values of CCC, it indicates that working capital is used as a source of fund in these industries.

From Table 18, it can be observed that, during the period of 2009-2011, there are companies that use working capital as a source of funds (ccc<0) (agriculture and mining, education, health, services, and transport and storage). The result obtained for the agriculture and mining industry is against of the findings of Baños-Caballero *et al.* (2010) and Baños-Caballero *et al.* (2012), but might be explained by the outlier value of 2010 and the small number of companies in this sample for this sector. Also, it can be stated that the construction sector has, on average, the higher period of CCC held by the firms. Conversely, education has the lower mean value of all the industries analyzed in the sample. By the simple observation of the CCC length held by the firms among different industries, there is a suggestion that the industries differ in their management of working capital.

Looking at Table 19 it can be observed the result of the ANOVA (F-test) for the sample. As the probability associate with ANOVA is highly significant (0.0000), the null hypothesis is rejected and there are at least two industries in which the average CCC held by the firms are different. The result goes in the same direction as the ones outlined above and there is evidence that the industries differ in their management of working capital.

Concerning the t test, the null is not rejected at in all industries and in the total of the sample. Based on this test it can be suggested that between the periods 2009-2011 the average CCC held by the firms in all different industries and in the total sample of Portuguese SMEs does not differ significantly.

Table 18: The average of CCC by year and industry for 2009-2011

Industry	2009	2010	2011	2009-2011	t-test[14]
Agriculture and Mining	569.40	-992.09	38.07	-128.20	0.571
Construction	684.06	519.74	759.25	654.35	-0.272
Education	-413.99	-552.38	-191.48	-385.95	-0.477
Health	-145.70	-69.39	-140.50	-118.53	-0.064
Manufacturing	80.91	94.29	79.33	84.84	0.023
Services	0.14	10.39	-34.10	-7.85	0.434
Transport and Storage	7.53	-11.11	-101.85	-35.15	0.974
Wholesale Trade and Retail Trade	189.40	167.29	165.03	173.91	0.306
Total	**143.64**	**105.49**	**123.76**	**124.30**	**0.401**

Table 19: Summary of the ANOVA test

Test Summary	(d.f)	F-test statistic	p-value
ANOVA[15]	7	16.760	0.0000

4.6. Discussion and hypotheses verification

From the estimated coefficients obtained by regressing the model 1 using fixed effect and IV methodology (Model 1 – Tables 11 and 12), is possible to observe the relationships between of the relationship with the CCC held by the Portuguese SMEs and each explanatory variable. The estimated coefficients sign establishes the impact of each explanatory variable on CCC, which can be positive, negative or not significant. The objective of the obtained results is to allow accepting or rejecting the research hypothesis previous proposed in chapter 3.

Table 20 relates the expected impact of the determinants of WCM on CCC according to the guidance of literature review, and the obtained sign by using the research model 1 regressed by the fixed effect and IV methodologies.

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[14] t is the statistic to test the equality of means for independent samples, in order to measure if the mean length of CCC held by the companies in 2009 differs significantly, from them mean CCC values of 2011, under the null hypothesis of equal means.
[15] ANOVA (F-test) is the statistic to test the equality of means of the same variable, in two or more populations, under the null hypothesis of the equality of the means.

Table 20: Expected and observed impacts on CCC

Explanatory variables	Expected sign	Fixed effects		IV (GMM)	
		Observed Sign	Significant?	Observed Sign	Significant?
Cash Flow	?	-	yes	-	yes
Leverage	-	-	yes[16]	-	yes
ROA	?	+	yes	+	no
Size	+	-	no	-	no
TFA	-	+	yes	+	no
Growth	?	-	yes	-	no
GDP	?	-	no	+	no

The results obtained for the model 1 reveal a negative and significant relationship between Cash Flow and CCC, which implies the non-rejection of the null of *Hypothesis 4*. As previous stated in chapter 3, the direction was not clear, since the empirical research diverge on the conclusions obtained. The results go in the same direction as Chiou *et al.* (2006) and are against the previous researches that found a significant positive relation (Baños-Caballero *et al.* (2010), Taleb *et al.* (2010), Abbadi and Abbadi (2013). The results suggest that the Portuguese SMEs have a more efficient WCM when their cash flows increases. This can be explained since with a more efficient WCM, the operational account payables are lengthened and operation related receivables can be accelerated into collection, causing a lower demand in working capital (Chiou *et al.*, 2006). Assuming that SMEs do not have or have few agency problems, since the ownership is more concentrate and owners usually manage the firms (Mwarari, 2013), there are less tendency to waste cash flows and these can be used on profitable projects, when at the same time firms obtain more trade credit, in order to finance the firm's working capital. Also, it can be inferred that firms with higher liquidity have manage their use of working capital better.

Concerning the Leverage and its influence on CCC, the results found are in accordance with the expectations taken from the literature. It was found a significant negative relation between the Leverage and the CCC length held by the firms. Thus, *Hypothesis 5* is not rejected. The relation suggests that firms with higher levels of debt tend to seek lower working capital requirements. This is in order with POT theory and the previous empirical research (*e.g.* Chiou *et al.*, 2006; Rahman and Nasr, 2007; Baños-Caballero *et al.*; 2010; Taleb *et al.*; 2010; Abbadi and Abbadi, 2013). When firms are short of funds and according to POT theory reviewed before, the firms tend to raise capital inside before getting external funding. Since

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[16] Just for equation (1) is significant at 5% confidence level, although for the equations (2), (3) and (4) the coefficients are almost significant at a 10% confidence level, but they are not significant.

the external funding is more expensive, firms give priority to internal generated funds and more debt means that the firms have less internal capital available. When the firms raise capital from outside in response of the need of funds, the firms need to take in attention the WCM in order to not aggravate the situation. Then working capital tends to use more efficiently at this time and efficient WCM will avoid increasing capital requirements, which increases the external borrowing. Thus, when firms need to increase their debt levels, the need of an efficient WCM requires that firms lower their working capital requirements.

In the research, the variable ROA has a positive sign in its relation with CCC, for the two methodology applied. However, for the IV methodology the result appear as not statistically significant for the ROA variable. From the literature reviewed, there is no consensus about the relationship, and according to the fixed effect methodology the ROA is positive significant with the CCC length held by the firms, supporting the researches of Nazir and Afza (2009) and Abbadi and Abbadi (2013). The relation suggests that firms with better performance are less concerned with an efficient management of working capital. Although, when controlling for the problem of endogeneity, the result is no longer significant. This could be explained since the variable ROA in the fixed effect methodology is relating its impact in the WCM, and also the inverse, the impact of WCM in the ROA, being in IV methodology not significant, due to the control of the endogeneity problem. Thus, *Hypothesis 9* is rejected.

As for ROA, the problem of endogeneity looks to be present for the variables Growth and TFA. The variable Growth shows a highly significant negative relation to CCC on the fixed effects model. Being the expected relation unknown, the result is in accordance with the findings of Baños-Caballero *et al.* (2010), suggesting that firms with higher growth probably use more trade credit as a financing source to their growth, due to the difficulty to obtain it from other financial sources. For TFA, the expected sign was negative, but conversely, the observed sign was positive, suggesting that firms when increase their investment in fixed assets, tend to increase their efficiency on WCM due to the need of funds for financing the investment in fixed assets. However, there is evidence of endogeneity problems, since when applying IV methodology the coefficients for the variables are no longer significant. The problem arises since the variables that are supposed to affect the CCC, depend themselves on the CCC. Then, *Hypotheses 6 and 8* are rejected.

Respecting the variable Size it was not found any significant coefficient proposed by the 2 models, suggesting that size does not affect CCC and is in accordance with the findings of

Baños-Caballero *et al.* (2010). Consequently, the *Hypothesis 7* is rejected. Also, for the variable GDP the variable is not significant for the coefficients regressed by the two methodologies. This goes in the same direction as the findings of Baños-Caballero *et al.* (2010) and is against of the findings of Zariyawati, *et al.* (2010). These suggest that GDP as external factor measure for macroeconomics, it does not have a significant relation with WCM. Then, one of the objectives of the research is acknowledged and the *Hypothesis 11* is rejected.

Regarding the model 2 which measures the effect of WCM on the firms' operational profitability, it was found that CCC as measure for WCM is not statically significant for the 2 methodologies applied. Controlling for the unobservable heterogeneity or for the endogeinity problems, the coefficient is not significant and is almost zero suggesting that WCM does not affect the operational profitability for the Portuguese SMEs. Thus, the *Hypothesis 1* is rejected. Although the generality of the literature found a negative relation between WCM and profitability, the research findings is in accordance with Deloof (2003) for large firms and with Afeef (2011) for SMEs.

Guided by the research of Baños-Caballero *et al.* (2012), it was implemented a non-linear model in order to test the *Hypotheses 2* and *3*. The results found, show that the variable CCC and its square are not significant, suggesting there are no evidence of an optimal level of working capital that balances benefits and risks. The result is against the findings of Baños-Caballero *et al.* (2012), and the *Hypotheses 2* and *3* are rejected. The result suggests that are no relation of WCM and operational profitability for the Portuguese SMEs, and a concave relationship between working capital and firms profitability was not found. Thus, there is no evidence of an optimal level that maximizes profitability, that obligate to this study to refute the possibility of the SMEs' performance decrease when it goes above or below that optimal level (Baños-Caballero *et al.*, 2012), since there is no evidence of this optimal level of working capital.

In order to give robustness to the tests of research model 2, it was followed Tong (2008) and Baños-Caballero *et al.* (2012) methodologies. The tests show that *Hypotheses 1, 2* and *3* are still rejected. The coefficients for Deviation and Deviation*RES are not significant, giving robustness to the previous methodologies applied. Thus, Portuguese SMEs do not balance the cost and benefits of holding the CCC and WCM does not have any significant relation with the firms' operational profitability, during the research period.

The results show evidence that if not controlled the unobservable heterogeneity and the problems of endogeneity, these issues could seriously affect the results of the study. Comparing the pooled OLS regression with the fixed effect methodology, it was suggested that unobservable heterogeneity is present. Also, when comparing the fixed effect methodology that does not control for the problem of endogeneity to IV methodology, it suggests that the problem is existent since it affects significantly the coefficients of the variables ROA, Growth and TFA, as preview evidenced.

Finally, the results obtained to test if different industries differ in their management of working capital, proposed by *Hypothesis 10*, suggest that the CCC held by the Portuguese SMEs, on average, varies across the industries. These results are in accordance with the previous literature (*e.g.* Hawawini *et al.*, 1986; Weinraub and Visscher, 1998; Filbeck and Krueger, 2005; Kieschnich *et al.*, 2006; Nazir and Afza, 2009). The results point out that in different industries (agriculture and mining, education, health, services, and transport and storage), SMEs are using working capital as a source of funds (CCC < 0) and then firms can apply the excess of funds in other areas. Also, there are industries (construction, manufacturing, wholesale trade and retail trade) where the working capital is a use of funds and there is a need of financing. The ANOVA (F-test) also suggests that exists a highly significant difference between the mean of CCC held in at least two industries, as was suggested by the average of CCC held among the industries. Therefore, the results outlined suggest to not reject *Hypothesis 10* and industries play a significant role on companies' WCM. The relation might be explained by the differences on investment in inventories and in trade credit between industries, as previous stated in chapter 2.

5. CONCLUSION

The present chapter presents the mains conclusions derived from the research and the relevance of the study for the Portuguese SMEs, for the general public and to the scientific community. Also, in the current chapter it will be presented the limitations of this study, as well as suggestions for future research.

5.1. General conclusions

The present empirical research proposes to investigate the determinants of the WCM for the Portuguese SMEs, as also the relation between the WCM and its impact on SMEs' profitability. The study offers evidence of the unobservable heterogeneity and the problem of endogeneity among the relations and controls for the possibility of these issues.

It was found that the capacity to generate internal funds and leverage are determinants of WCM and their relationship with WCM was tested in order to determine the impact of such determinants on WCM. Also, was found that WCM does not influence the firm operational profitability of the Portuguese SMEs. Concerning the two other research objectives, it was found that industries play a significant role on companies' WCM and there is not a significant relation with Portuguese GDP and WCM.

Based on a sample of 1192 Portuguese SMEs for 2009-2011, the results suggest that exists a negative relationship between the capacity to generate internal funds and WCM. The relation can be explained since with a more efficient WCM, the accounts payable are lengthened and conversely, account receivables and inventories are accelerated into collection, creating a lower demand to the working capital needs. With fewer agency problems acknowledged, SMEs tend to do not waste cash flows and they are used to profitable projects, at the same time firms obtain more trade credit from its suppliers, in order to finance their working capital needs.

The WCM's determinant leverage has a negative relation with WCM. The results suggest that the Portuguese SMEs with higher levels of debt tend to have lower needs of working capital. The relation appears to indicate that external finance is more expensive and firms tend to increase internal capital, before debt, as suggest by the POT. When debt is raised in response of need of funds, the SMEs manage their working capital more efficient, in order to avoid the increasing of capital requirements. Thus, working capital needs tend to decrease by a need of efficient WCM, in order to not aggravate the situation when firms are short on funds.

With WCM, there is a positive significant relation with the profitability of the assets and the investment in fixed assets and a negative significant relation with growth opportunities. However, the research cannot confirm that the profitability of the assets, investment in fixed assets or growth opportunities affect WCM, since the relations loose significance when the research control for possible endogeneity problems.

In contrast with the majority of the previous findings that indicate that the lower the investment in working capital the more the profitability the firms have, or with the ones that found that WCM have a non-linear relation with profitability, the present study did not found any significant relation with WCM and operational profitability, controlling for possible unobservable heterogeneity or for endogeneity problems and by applying linear-models or non-lineal models as suggested by the previous researches. Also, the results were confirmed with the robustness tests in order to strength the results. The non-significance of the WCM in the research suggests for the Portuguese SMEs, WCM does not play any significant role on firms' operational profitability and there is not an evidence of an optimal level. Thus, there are no suggestions of linear or concave relationship between working capital and firms' profitability.

In respect of the second objective, it was not found any significant relation with Portuguese GDP and the CCC length held the Portuguese SMEs. Thus, the research cannot confirm the relation between the GDP as external macroeconomic factor and the firms' WCM.

Finally, the results confirmed the previous literature evidencing that industries have an important role in Portugues SMEs' WCM. The relation suggests that on average, the WCM varies between industries. Additionally, SMEs are using working capital as a source of funds in the industries of agriculture and mining, education, health, services, and transport and storage, and conversely, as a source of funds in construction, manufacturing, wholesale trade and retail trade.

5.2. Importance of the study

The working capital literature is extensive and fragmented. This empirical research tries to fulfill the gaps, by following the recent methodologies and previous future research notes, linking the previous major findings in the WCM theme. For that it was integrated in the same study, the WCM determinants and WCM relation with profitability, in order to give a global understanding of the WCM for Portuguese SMEs.

Directly related to the size and characteristics of the sample and access to a vast conjunct of financial statements, this study gives an important contribute to the Portuguese SMEs, scientific knowledge and general public, by doing a deeper approach focused on Portuguese SMEs, relating the day-to-day WCM's determinants and profitability relation on Portuguese SMEs' WCM, giving evidence for industry and GDP, by using several techniques, and proper methodologies, derived the previous literature.

Unlike the majority of the previous studies, this research controls for unobservable heterogeinity and possible endogeneity problems in order to not generate biased and weak estimators when modeling. Also, robustness test were developed.

5.3. Limitations and future research

As evidenced in the previous research, this empirical research also has its limitations, which might be considered suggestions for future researches. First, the present study explored variables that were defined by the previous research and were available in the sample given. However, it does not mean that there are no other variables (determinants) that may play a significant role (as the case of firm's age that was not available in the sample). Variables that seem to be relevant (as firm's age) should be used in future research.

The sample period could be also increased, in order to more accurately observe the trends and relations that were tried to achieve throughout the approaches that were developed. The sample for 3 years of observations, sometimes seems to be too small, and variables that depend in past values were also influenced by the limitation of 3 years of research. For future research, a larger sample period is recommended.

Another recommendation for future research is to examine the WCM determinants and WCM effect on profitability for SMEs to a regional reality, and compare the results between the regions. As suggestion, the impact of WCM on SMEs between the European countries could be a relevant aspect in order to characterize the possible differences between the practices for the reality of Europe and to explain divergences between previous researches.

Finally, and taking into account the type of companies used in the research, it is also interesting to measure if the conclusions of this study holds for the large Portuguese firms. Then, a future research relating the dynamics of WCM on it determinants and its effect on profitability, could be also taken for the bigger firms.

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APPENDIX

List of appendixes

Appendix 1: Overall sample according to Industry and Size for 2010

Industry	Medium		Small		Micro		Total	
	Count	%	Count	%	Count	%	Count	%
Agriculture and Mining		0.00%	7	3.47%	7	0.72%	14	**1.17%**
Construction		0.00%	38	18.81%	93	9.50%	131	**10.99%**
Education	1	9.09%	3	1.49%	13	1.33%	17	**1.43%**
Health		0.00%	10	4.95%	72	7.35%	82	**6.88%**
Manufacturing	2	18.18%	49	24.26%	115	11.75%	166	**13.93%**
Services	5	45.45%	41	20.30%	224	22.88%	270	**22.65%**
Transport and Storage		0.00%	3	1.49%	95	9.70%	98	**8.22%**
Wholesale Trade and Retail Trade	3	27.27%	51	25.25%	360	36.77%	414	**34.73%**
Total	11	100.00%	202	100.00%	979	100.00%	1192	100.00%

Appendix 2: Overall sample according to Industry and Size for 2009

Industry	Medium		Small		Micro		Total	
	Count	%	Count	%	Count	%	Count	%
Agriculture and Mining		0.00%	8	3.88%	6	0.62%	14	1.17%
Construction		0.00%	41	19.90%	90	9.25%	131	10.99%
Education	1	7.69%	3	1.46%	13	1.34%	17	1.43%
Health		0.00%	10	4.85%	72	7.40%	82	6.88%
Manufacturing	2	15.38%	50	24.27%	114	11.72%	166	13.93%
Services	5	38.46%	42	20.39%	223	22.92%	270	22.65%
Transport and Storage		0.00%	3	1.46%	95	9.76%	98	8.22%
Wholesale Trade and Retail Trade	5	38.46%	49	23.79%	360	37.00%	414	34.73%
Total	13	100.00%	206	100.00%	973	100.00%	1192	100.00%

Appendix 3: Results using Pooled OLS for equations (1) and (4) (p-values are reported in parentheses).

Equations	(1)		(4)
Dependent Variable	CCC	Dependent Variable	GOP
		CCC	-0.00004
Cash Flow	-613.961		(0.0000)
	(0.0015)	Leverage	0.57080
Leverage	-100.685		(0.0011)
	(0.0073)	Size	-0.21811
ROA	384.5017		(0.0000)
	(0.085)		
Size	29.44245		
	(0.0477)		
TFA	(0.5848)		
	(0.5027)		
F-test	10.49772	F-test	308.6942
(p-value)	(0.0000)	(p-value)	(0.0000)
Adjusted R^2	0.0131	**Adjusted R^2**	0.2052
Observations	3576	**Observations**	3576