



**LISBOA
SCHOOL OF
ECONOMICS &
MANAGEMENT**

**MESTRADO
FINANÇAS**

**TRABALHO FINAL DE MESTRADO
DISSERTAÇÃO**

HOW DOES WORKING CAPITAL MANAGEMENT AFFECT
FIRMS' PROFITABILITY? – EVIDENCE FROM PORTUGAL

DIOGO FILIPE NASCIMENTO GOMES

SETEMBRO – 2013



**LISBOA
SCHOOL OF
ECONOMICS &
MANAGEMENT**

**MESTRADO
FINANÇAS**

**TRABALHO FINAL DE MESTRADO
DISSERTAÇÃO**

**HOW DOES WORKING CAPITAL MANAGEMENT AFFECT
FIRMS' PROFITABILITY? – EVIDENCE FROM PORTUGAL**

DIOGO FILIPE NASCIMENTO GOMES

ORIENTAÇÃO:

PROFESSORA DOUTORA ANA ISABEL ORTEGA VENÂNCIO

SETEMBRO – 2013

ABSTRACT

The purpose of this study is to analyze the relationship between working capital management (WCM) and firm's profitability for Portugal. We use a database, combining firm-level financial data with a matched employer-employee data, for the period from 2004 to 2009, obtaining a sample of 106,961 observations corresponding to 41,536 firms. Like previous studies, we examine the existence of a non-linear relationship between WCM and firm's profitability. Unlike them, we evaluate how the non-linear relationship is affected by CEO's demographic and educational characteristics and firm's characteristics such as age, size, industry sector and location.

The relationship between WCM and profitability is analyzed using panel data methodology, applying Fixed Effects model with robust standard errors.

Our results show that there is a concave relationship between WCM and profitability, indicating that firms have an optimal working capital level where firms should stand to maximize profitability. For CEO's characteristics these are positively related with profitability, showing that male, Portuguese, older and with higher educational level CEOs have more profitable firms. The age, size, industry and location of firms affect the optimal WCM level that maximizes profitability. For firms, with the WCM level below the optimal point, in order to increase profitability, should increase the investment in WCM, once there is a positive relation between the two variables for low levels of working capital.

JEL classification: G30; G31; G32; L26; M10

Keywords: Working Capital Management; Firm's Profitability; Portugal.

RESUMO

Este estudo examina a relação entre *working capital management* (*WCM*) e a rentabilidade das empresas em Portugal. Recorremos a uma base de dados, que combina informação financeira das empresas com dados do empregado-empregador, para o período de 2004 a 2009, obtendo uma amostra de 106,961 observações num total de 41,536 empresas. Tal como em outros estudos, examinamos a existência de uma relação não-linear entre *WCM* e a rentabilidade, mas também como a relação não-linear é afectada pelas características demográficas e educacionais do CEO e da empresa, de acordo com a idade, a dimensão, o sector industrial e a localização.

A relação entre o *WCM* e a rentabilidade é testada através da metodologia *panel data*, aplicando modelo Efeitos Fixos com resíduos padronizados robustos.

Os resultados demonstram a existência de uma relação côncava entre *WCM* e a rentabilidade, indicando a existência de um nível óptimo de investimento em *working capital* que permite maximizar a rentabilidade. As características demográficas e educacionais do CEO estão positivamente relacionadas com a rentabilidade das empresas, onde CEOs masculinos, Portugueses, de maior idade e com maior nível educacional apresentam empresas mais lucrativas. A idade, dimensão, indústria e localização influencia o nível óptimo de *WCM* que maximiza a rentabilidade. Assim, para empresas com um nível de *WCM* inferior ao óptimo, por forma a aumentar a rentabilidade devem aumentar o investimento em *WCM* dado a existência de uma relação positiva entre as variáveis para baixos níveis de *working capital*.

Classificação do JEL: G30; G31; G32; L26; M10

Palavras-chave: Working Capital Management; Firm's Profitability; Portugal.

ACKNOWLEDGMENTS

I am grateful to many people for help, both direct and indirect, in writing this dissertation.

First of all, I would like to thank my supervisor, Prof. Ana Venâncio, for all the support, advice and guidance. Her contributions to the development of this research, both in terms of intellectual insight and comments were essentials for the success of this paper.

Secondly, my warmest thanks to my family and closest friends for all the support, love and encouragement.

Finally, I would like to thank the Portuguese Ministry of Employment and Social Security and *Gabinete de Estratégia e Planeamento* (GEP) for giving me access to the matched employer-employee data. All errors remain my own. Views expressed are those of the author and do not necessarily reflect those of any branch or agency of the Government of Portugal.

TABLE OF CONTENTS

ABSTRACT	i
RESUMO	ii
ACKNOWLEDGMENTS	iii
TABLE OF CONTENTS	iv
LIST OF FIGURES	v
LIST OF TABLES	v
1. INTRODUCTION.....	1
2. LITERATURE REVIEW.....	4
2.1. Working Capital Management and Firm Value.....	5
2.2. Working Capital Management Policies and Firm Profitability	6
2.3. Determinants of Working Capital Management.....	9
3. THEORY AND HYPOTHESES	14
4. DATA AND DESCRIPTIVE STATISTICS	17
4.1. Sample and Data Description	17
4.2. Variables Description	18
4.3. Descriptive Statistics.....	19
5. EMPIRICAL METHODOLOGY AND RESULTS	22
5.1. Regression Analysis.....	24
6. CONCLUSION	37
7. BIBLIOGRAPHY	40
APPENDIX	46

LIST OF FIGURES

Figure 1- Short-term operating activity and cash-flow of firm	5
---	---

LIST OF TABLES

Table 1 - Linear Relationship between Working Capital Accounts and Working Capital Policies	7
Table 2 - Summary Statistics.....	20
Table 3 - CEO's Characteristics	21
Table 4 - Estimation and Identification of Panel data Model.....	26
Table 5 - Working Capital Management relationship with profitability according to firm's age.....	30
Table 6 - Working Capital Management relationship with profitability according to firm's size.....	31
Table 7 - Working Capital Management relationship with profitability according to firm's industry sector	33
Table 8 - Working Capital Management relationship with firm's profitability according to firm's location (NUTS II).....	35
Table A 1 - Working Capital Management and the Relationship with Determinants....	46
Table A 2 - Variables Description and Measurement	47
Table A 3 - Correlations Matrix	48
Table A 4 - Number of Financial Institutions Across Regions	48
Table A 5 - Distribution of Medium and Large Firms Across Regions (NUTS II)	48

1. INTRODUCTION

For long, working capital management has been considered an important component of firms' financial decision process, occupying a major portion of managers' time and resources (Richard & Laughlin, 1980; Silva, 2012).

Working capital management reflects the time interval between actual cash expenditures on a firm's purchase of productive resources and the recovery of cash receipts from sales, during firm's regular course of operations (Richards & Laughlin, 1980; Dong & Su, 2010). Therefore, working capital connects short-term financial management with firms' strategic decisions¹, affecting firm's profitability, risk, and consequently its value, even for firms with favorable long-run prospects (Smith, 1980; Richards & Laughlin, 1980).

First studies on this area suggest the existence of a linear relation between working capital management and firms' profitability². Thus, firms can maximize profitability and minimize associated risks through an efficient management of working capital accounts. In fact, manager's goal is to improve financial performance through working capital policies (Gitman, 1974; Gitman & Sachdeva, 1982).

In order to improve profitability, through linear relation, firms may adopt two types of working capital policies: the aggressive and conservative policies. The aggressive working capital policy implies that firms become more profitable and more risky by decreasing investments in working capital accounts³. In contrast, conservative working

¹ Strategic decisions that have to do with the amount invested in inventories and how much trade credit extend to customers or accept from suppliers. These are the main drivers of working capital.

² See for example: Czyzewski & Hicks, (1992); Long, Malitz, & Ravid, (1993); Jose, Lancaster, & Stevens, (1996); Deloof & Jegers, (1996); Shin & Soenen, (1998); Deloof, (2003); Valadas, (2005); García-Teruel & Martínez-Solano, (2007).

³ See for example: Jose & Lancaster (1996); Shin & Soenen (1998); Deloof (2003); Valadas (2005); Kieschnick, LaPlante, Moussawi, & Baranchuk, (2006); García-Teruel & Martínez-Solano (2007); Garcia, J.L. (2011).

capital policy implies that firms become less profitable and less risky as they increase investment in working capital accounts. However, some empirical studies⁴ support that aggressive working capital policies enhances profitability, neglecting relevant aspects, such as, the risk of losing sales or interruptions in production process if firms reduce excessively their investment in working capital (Baños-Caballero, et al., 2012). For Kamath, (1989); Long, et al., (1993) and Deloof & Jegers, (1996) adopt conservative policies might increase sales increasing profitability.

Recent studies point to the existence of an optimal level of working capital, captured through a concave relation between WCM and profitability, showing that firms pursue an optimal working capital level that maximizes profitability (Baños-Caballero, et al., 2012). The non-linear relationship is positive when firms hold low levels of investment in working capital and becomes negative for higher levels (Baños-Caballero, et al., 2010); (Baños-Caballero, et al., 2012).

In this study we provide empirical evidence about the effects of WCM on Portuguese firms' profitability and the importance of working capital policies. Moreover, we evaluate the existence of a non-linear relationship between WCM and profitability, and how this relation varies according to size, age, industry sector, location and CEO's demographic and educational characteristics. To answer our key questions, we combine firm-level financial data with a matched employer-employee data from 2004 to 2009, gathering detailed information on firms' year-end financial data, and CEO demographic and educational characteristics.

⁴ See the authors: Jose & Lancaster (1996); Shin & Soenen (1998); Deloof (2003); García-Teruel & Martínez-Solano (2007).

A more thorough understanding of the impact of working capital on firms' profitability is important to define and understand which working capital strategies fit within different frameworks. Our conclusions are likely to be extended to other European countries, based on banking oriented financial system, where firms face long-term capital markets funding constraints.

Our results suggest a concave relationship between WCM and profitability, having firms an optimal working capital level that maximizes profitability. Analyzing CEO's characteristics effects over profitability, results show that all variables are positively related, where male, Portuguese, older and with higher education CEOs have more profitable firms. For the sub-samples, results also suggest a non-linear relationship, showing that WCM for older firms is higher, that WCM practices within industries are different and that working capital level of firms across locations with more financial institutions are also different. For all sub-samples, the average working capital levels stands below the optimal, showing that firms can improve performance through longer inventory turnover periods, extension of trade credit to customers and reduction of suppliers financing, indicating that higher investment in working capital leads to higher profitability and that beyond the optimal level the relation becomes negative, due to the concave relationship between the two variables.

The remaining sections are organized as follows. Section II reviews the literature on the relationship between working capital management and profitability. Section III exhibits theories and hypotheses. Section IV, describes dataset and its construction. The empirical methodology and results are described in section V. Finally, we present our conclusions in section VI.

2. LITERATURE REVIEW

WCM is an important component of the overall financial strategy of any firm to create value, having a significant impact on profitability and risk (Richard & Laughlin, 1980; Smith, 1980; Lamberson, 1995). It involves planning and controlling current assets⁵ and current liabilities⁶, in a manner that eliminates the risk of not meeting short-term obligations and avoid the excessive investment in firm's assets and activities (Eljelly, 2004). The objective of WCM is to maintain the optimum balance of each account, namely: receivables, inventory and payables, that influence firm's performance (Filbeck & Krueger, 2005).

According to Deloof, (2003) efficient WCM is fundamental for maximizing profitability. Therefore, maximizing profit is the main objective for firms; however, firms need at the same time to focus on liquidity to prevent insolvency (Raheman & Nasr, 2007). This happens because working capital investments are not converted into cash at the same moment in time or with the same cash flow magnitude, thereby, firms should guarantee the necessary amounts of available funds to match firm's liquidity needs (Richard & Laughlin, 1980).

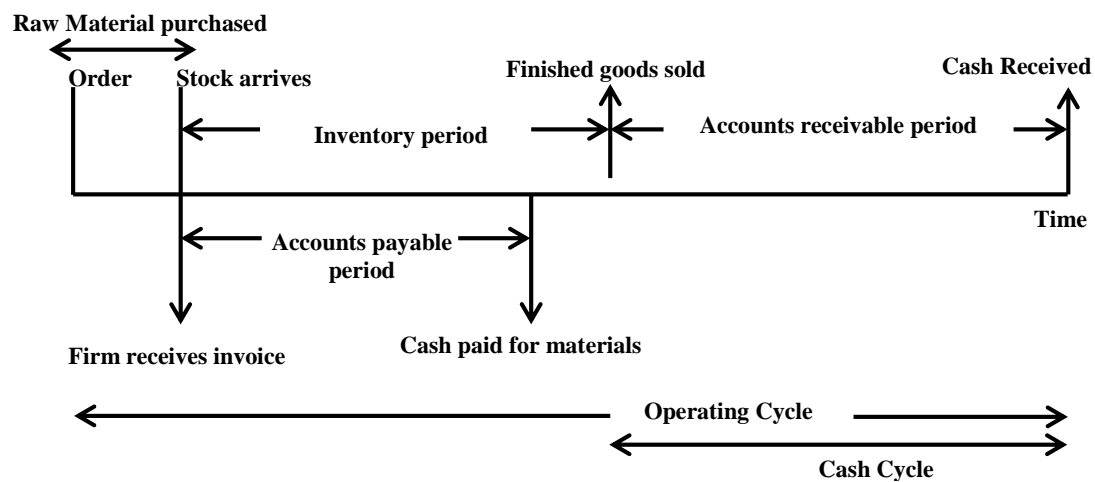
WCM is particularly important for small firms, with limited access to long-term capital markets; once these firms tend to rely heavily on financing from trade credit and short-term bank loans to finance the needed investments in cash, accounts receivables and inventory (Long, et al., 1993).

⁵ Current assets are cash and assets that can be converted into cash within one year (Hillier, et al., 2010).

⁶ Current liabilities are obligations that require cash payments within one year (Hillier, et al., 2010).

Short-term finance is concerned with short-term operating activities such as buying materials, paying cash for purchases, product manufacturing, product selling or cash collecting. These activities create patterns of cash inflows and cash outflows that are unsynchronized and uncertain. Hillier, et al., (2010), used a framework to explain the functioning of WCM (see Figure 1).

Figure 1- Short-term operating activity and cash-flow of firm



Source: Hillier et al., 2010

Operating cycle is the interval between the order of inventory and the date that cash is collected. In the meantime, cash cycle begins when firms pay suppliers for the materials purchased and ends when cash is collected from customers (Hillier, et al., 2010).

2.1. Working Capital Management and Firm Value

Previous empirical studies with respect to the impact of WCM over firm's value do not provide clear evidence on whether firms actually do maximize their value through their WCM choices (Kieschnick, et al., 2006). In fact, the study that comes nearest of addressing this issue is Shin & Soenen, (1998), where firms that manage working capital more efficiently, through shorter net trade cycles, experience higher operating cash flows

and are more valuable. Therefore, reducing the net trade cycle to a reasonable minimum is a strategy to create value (Shin & Soenen, 1998).

In order to study the effects of WCM on firm's value, it is important to understand the relevance of under-investment and over-investment in working capital on firms' valuation (Kieschnick, et al., 2006). An efficient management of working capital is crucial, once under-investment result on firm's inability to meet obligations, whereas, for situations of over-investment, the return on capital employed will not be maximized (Kieschnick, et al., 2006). Thus, firms within the optimal level experience lower risk, are more prepared for uncertainty and have a cash reserve that can be used during difficult times (Autukaite & Molay, 2011).

The over-investment situation, studied by Valadas, (2005) and Kieschnick, et al., (2006) suggests a negative relationship between value and WCM, once additional investment in working capital is associated with a reduction in firm value. When looking at the factors that influence the efficiency of working capital, Kieschnick, et al., (2006) point to size and future sales growth. Indeed, industry practices have strong influence on firm's working capital adopted policies, Hawawini, Viallet, & Vora, (1986), found evidence of substantial industry effects on working capital policies, as well as the existence of benchmarks to which firms adhere when implementing working capital policies.

2.2. Working Capital Management Policies and Firm Profitability

Studies on the relationship between WCM and firms' performance, started through the analysis of a linear relation.

Working capital investment involves a trade-off between profitability and risk, demanding the understanding that decisions which enhance profitability usually do not

boost the chances of adequate levels of liquidity and, conversely, decisions that focuses entirely on maximize liquidity decreases profitability (Smith, 1980). Thus, this trade-off depends on working capital policies adopted, distinguished as conservative or aggressive policies (see Table 1).

Table 1 - Linear Relationship between Working Capital Accounts and Working Capital Policies

	Profitability	Risk	Accounts Payable	Inventories	Accounts Receivable	WCM Investment/Length
Linear Relation						
Conservative Policy	<i>Lower</i>	<i>Lower</i>	<i>Shorten</i>	<i>Higher levels</i>	<i>Extend</i>	<i>Higher Investment /Longer</i>
Aggressive Policy	<i>Higher</i>	<i>Higher</i>	<i>Extend⁷</i>	<i>Lower levels</i>	<i>Shorten</i>	<i>Lower Investment/Shorter</i>

The conservative working capital policy implies a higher investment in working capital accounts, such as higher levels of inventories, extending more trade credit to customers and reducing supplier's financing, resulting in a lower profitability and lower risk. However, for some authors, conservative working capital policy positively affect profitability⁸, due to higher sales (Petersen & Rajan, 1997); higher levels of inventories that prevents interruptions in operating cycle process and a reduction of supply costs, reducing both the risk of price fluctuation among business cycles and the risk of losing customers due to product scarcity (Blinder & Maccini, 1991; Carpenter, et al., 1994, Fazzari, & Petersen, 1994).

In terms of trade credit to customers adopting conservative working capital policies may increase profitability because extend trade credit helps to ensure that the contracted services have been carried out, allowing customers to check if purchased products and services are as agreed in quality and quantity terms prior to payment, leading to repeated

⁷ Postpone payments to suppliers, which is considered to be a way of obtaining financing.

⁸ For example: Czyzewski & Hicks, (1992); Long, et al., (1993) and Deloof & Jegers, (1996).

sales (Long, et al., 1993; Deloof & Jegers, 1996). Extend trade credit to customers, also reduces asymmetric information between buyer and seller (Smith, 1987), strengthening long-term supplier-customer relationships, increases sales in periods of low demand and reduces transaction costs (Emery, 1987). Reduction on supplier's financing, allows customers to take advantage of prompt payment discounts due to early payments, as well as, reduction of the costs of external financing (Ng, et al., 1999; Wilner, 2000; Baños-Caballero, et al., 2010).

In contrast, aggressive working capital policy implies lower investments in working capital accounts, through lower levels of investment in inventories, shortening trade credit to customers and postponing payments to suppliers, resulting in an increase of profitability and risk for firms⁹. Authors like Hager, (1976); Jose, et al., (1996) provided evidence of an inverse relationship between working capital and profitability, where firms that keep lower investment in working capital tend to be more profitable, that is achieved by minimizing the cost of holding unproductive assets, such as cash and marketable securities, rather than by increasing payables; reducing the dependency of external financing preserves firm's debt capacity, since less short term borrowing is required to provide liquidity. Further these results fit better to large firms, being the relationship sensitive to industry factors.

Authors like Shin & Soenen, (1998) and Deloof, (2003) suggest a negative relationship between WCM and profitability, showing that a reduction in working capital accounts, namely accounts receivables and inventories, to a reasonable extend, increases profitability, arguing that less profitable firms need more time to pay their bills. In sum,

⁹ See for example: Jose, et al., (1996); Shin & Soenen, (1998); Deloof, (2003); Valadas, (2005); García-Teruel & Martínez-Solano, (2007).

this policy leads to a reduction in costs due to the low levels of inventories and account receivables. The risks taken are low, because of the low levels of accounts receivables. Therefore, small firms can create value by reducing working capital accounts to a reasonable minimum due to the observed negative relation (Dong & Su, 2010).

More recent studies on the relationship between WCM and profitability, (Baños-Caballero, et al., 2012; Silva, 2012), point to a non-linear relationship, indicating that there is an optimal working capital level that maximizes profitability, which indicates that both high and low working capital levels are associated with a lower profitability. Such relationship between WCM and profitability, behaves positively for low levels of investment in working capital and negatively for high levels of investment in working capital, showing the greater profitability effect but also the greater risk effect for firms with low levels of working capital (Baños-Caballero, et al., 2012).

2.3. Determinants of Working Capital Management

Despite the importance of WCM, few studies have looked into his determinants (Baños-Caballero, et al., 2009). When analysing the determinants of WCM, internal and external finance are not perfect substitutes¹⁰. In these circumstances firms' investments and financing decisions are interdependent and firms may have an optimal working capital level that balances costs and benefits and maximizes firm value (Baños-Caballero, et al., 2010).

Within the macroeconomic context, gross domestic product (GDP) is an important determinant for WCM. According to Lamberson, (1995), changes in economic activity

¹⁰ External finance, debt or new finance issues, may be more expensive than internal finance because of financial market imperfections (Baños-Caballero, et al., 2012).

affect WCM decisions of small firms, although these responses may be different from those taken in large firms¹¹. Further, Lamberson, (1995) finds a negative relation between inventory levels and GDP, where firms hold less inventories during economic expansion and more inventories during recessions. On the contrary, Blinder and Maccini, (1991), finds that firms reduce inventories during economic recessions, also Chiou, et al., (2006) finds a positive relation, having firms more receivables and inventories during recessive economic periods.

For age¹², this is associated with firm's source of financing and trade credit relationships. According to Chiou, et al., (2006), age is positively related with working capital requirements, this is explained by the fact that older firms can get external financing easier and under better conditions. According to Baños-Caballero, et al., (2010), there is a positive relation, once older firms, with better access to external financing, maintain higher investment in WCM. Moreover, García-Teruel & Martínez-Solano, (2010), finds that younger firms use more credit from suppliers, and old firms less, since they have other sources of finance as consequence of their credit capacity and reputation.

Size¹³ is another variable that affects working capital investment. Results found by Petersen and Rajan, (1997); García-Teruel & Martínez-Solano, (2010) suggest that large firms provide more credit to customers, whereas, small firms use more trade credit. Chiou, et al., (2006); Kieschnick, et al., (2006)¹⁴ found a positive relation for small firms because

¹¹ According to Chiou, et al., (2006), it is difficult for a firm to get external financing during economic recessions, because of limited cash supplies.

¹²This determinant has been used as a proxy for the time the firm may have known its customers and the firm's quality and reputation (Petersen & Rajan, 1997) as well as for the length of the relationship between suppliers and customers (Cuñat, 2007) and firm's creditworthiness to suppliers of debt and equity (Niskanen & Niskanen, 2006).

¹³ According to Long et al., (1993) large firms with an established reputation on product quality, have little need to extend trade credit. Small firms that have no reputation need to provide trade credit to guarantee product quality.

¹⁴ Kieschnick, et al., (2006) finds positive but not significant relationship between size and cash conversion cycle, for small firms.

the cost of funds used to invest in current assets decreases with firm size, as smaller firms have greater information asymmetry, greater informational opacity and are less followed by analysts. Moreover, according to the trade-off theory, they have a higher likelihood of bankruptcy, as larger firms are more diversified failing less often. This might affect the trade credit granted, because, according to Petersen and Rajan, (1997) and Niskanen and Niskanen, (2006), firms with better access to capital markets extend more trade credit. Whited, (1992) and Fazzari and Petersen, (1993) showed that small firms also face greater financial constraints, which also increases trade credit received from suppliers, using this form of credit when other forms are unavailable or have been exhausted¹⁵. In addition, Nakamura & Palombini, (2009), finds a negative relation between size and accounts receivables, suggesting a greater market power from large firms or that small firms provide more trade credit to guarantee product quality.

For Chiou, et al., (2006), there is a negative relation between profitability and working capital requirements, once more profitable firms have better access to external capital, and thus can invest in more profitable investments. Also for Shin & Soenen, (1998), more profitable firms have better WCM, because of their market dominance, having larger bargaining power with suppliers and customers. For Petersen and Rajan, (1997) firms with higher profitability receive significantly more credit from suppliers.

In terms of Cash flows, these are generated internally, being expected that firms with bigger cash flows and lower leverage to grant more trade credit to customers in order to get a competitive advantage. On the contrary, these firms need less credit from suppliers (García-Teruel & Martínez-Solano, 2010). Authors Fazzari and Petersen, (1993),

¹⁵ See the authors: Walker, (1991); Petersen and Rajan, (1995); Petersen and Rajan, (1997); Cuñat, (2007).

demonstrated that investment in working capital is sensitive to cash flow, suggesting that firms with larger capacity to generate internal resources have higher current asset levels, which might be due to the lower cost of funds invested in working capital. According to Chiou, et al., (2006), there is a negative relation with working capital requirements¹⁶, suggesting that firms with greater cash flows have better WCM. Nazir & Afza, (2008) did not find any statistical significant relationship.

Sales growth affects trade credit granted and received, as well as investment in inventories (Nunn, 1981). Firms with fast growing sales pay more attention to WCM¹⁷ (Chiou, et al., 2006). According to Chiou, et al., (2006) there is a negative but not significant relationship between growth and working capital requirements. Furthermore, Nakamura and Palombini (2009), found negative relationship between growth and cash conversion cycle. For García-Teruel & Martínez-Solano, (2010) growth is negatively related to accounts receivable and positively with accounts payable for small firms. On the other hand, Kieschnick, et al., (2006) show a positive relation with firm's WCM suggesting that firms build up inventories anticipating future sales growth.

Investment in tangible fixed assets can affect WCM. Fixed assets are negatively related with working capital requirements because the proportions of accounts receivable and inventories almost fully determine the proportion of firm's fixed assets (Kieschnick, et al., 2006). On the other hand, firms with more tangible assets have lower costs when

¹⁶ According to Niskanen & Niskanen, (2006); García-Teruel & Martínez-Solano, (2010) there is a significant negative relation between cash flow and payables, whereas Niskanen & Niskanen, (2006) find an insignificant positive with receivables. Nakamura & Palombini, (2009) find significant negative relation between free cash flow and inventory.

¹⁷ An example of more attention to WCM in growing firms is that managers may decide to build up inventory levels to anticipate future sales growth (Kieschnick, et al., 2006; Nunn 1981).

raising funds to invest in current assets, which increase their working capital (Baños-Caballero, et al., 2010). Thus the relation is not clear.

Lastly, leverage, Chiou, et al., (2006) encountered a negative relationship with working capital requirements. Also Baños-Caballero, et al., (2010), found negative relation between leverage and inventories and a positive with payables, as well as, receivables, indicating that firms with better access to financial credit redistribute it, to firms with poor access to these markets, through trade credit.

These relationships between working capital management and its determinants are described on Table A 1, in Appendix.

3. THEORY AND HYPOTHESES

Previous authors point to an increase of firm's profitability through a lower investment in working capital. In fact, the relationship between working capital and firm's profitability may be concave rather than linear (Baños-Caballero, et al., 2012; Silva, 2012). This non-linear relation between the two variables indicates that both high and lower levels of working capital investment are associated with lower profitability. In order to improve financial performance, firms should balance the benefits and costs of investing in working capital. Therefore, it is expected that profitability and working capital to relate positively at low levels of working capital and negatively at higher levels of investment in working capital ¹⁸ (Baños-Caballero, et al., 2012). Managers should aim to keep as close to the optimal working capital level and avoid deviations to maximize profitability.

Hypothesis 1 - There is a non-linear (concave) relationship between working capital management and firm's profitability.

The age of firms is likely to affect the optimal level of working capital. Age is associated to firm's source of financing an trade credit, being age used as a proxy for the time firms may know its customers, firm's quality and reputation, as well as, for the length of the relationships between suppliers and customers and for firm's creditworthiness to suppliers of debt and equity. Younger firms present higher growth rates from the early years of a firm, which forces manager to efficiently control working capital that slows down in the course of time. Moreover, younger firms lack reputation and creditworthiness having higher costs for investing in WCM. On the other hand, old firms can easily access

¹⁸ It's expected that firm's profitability to rise as working capital increases, until a certain level, given that the increase of profitability will not offset the high risk borne. Beyond that level, due to low return of current assets is expected increases in working capital to be related with decreases in profitability (Baños-Caballero, et al., 2012).

external financing under better conditions than younger firms, so the cost of funds of investing in working capital are lower for these firms, therefore, WCM is expected to increase with age due to lower cost of invested funds.

Hypothesis 2 – The non-linear relationship between working capital management and firm's profitability differs according to firms' age.

The size of firms is likely to affect the level of working capital. Smaller firms need to monitor working capital due to their volatile cash flows, dependence on short-term debt and less liquidity, compared to large firms, due to greater information asymmetry. In fact, small firms should adopt WCM routines in order to reduce the likelihood of bankruptcy and failure, as well as, to enhance profitability. Small firms are expected to receive more trade credit, due to greater financial constraints, using this form of credit when other forms are not available. Small firms also have lower receivables and inventory levels once the cost of funds invested in current assets is higher for these firms, which makes these firms to have a lower optimal working capital level, compared to large firm that allocate more resources and expertise in the management of working capital profiting more from economies of scale, once the cost of funds used to invest in current assets decreases with size. In sum, as firms dimension increases, is expected the complexity of its operations to increase and more amounts of working capital will be needed.

Hypothesis 3 – The non-linear relationship between working capital management and firm's profitability differs according to firms' size.

Firms within different industry sectors are likely to present different levels of working capital following different working capital policies in order to maximize performance. Industry practices are significant determinants of firm's WCM policies, since distribution

of credit to customers, the management of inventory and firm's ability to postpone payments to suppliers depend on industry structures. Some firms can easily minimize accounts receivables and inventory levels; others are best suited to maximize accounts payables. Several studies as Hawawini, et al., (1986); Filbeck & Krueger, (2005) proved that WCM is affected by industry factors, although WCM practices within industries change significantly over time, distinctions between industries persist. Therefore, industry effects on WCM policies may be explained by differences in trade credit and investment in inventories. In order to identify industry benchmarks to which firms adhere when implementing WCM policies we use the median working capital level of firms to proxy for the typical WCM practices within such industry.

Hypothesis 4 – The non-linear relationship between working capital management and firm's profitability differs according to firms' industry sector.

Firm's geographic location (by NUTS II) and the number of financial institutions available affect the optimal working capital level, once the fact that firms located at a considered more favorable region, with more financial institutions, can have easier access to financing, making the optimal WCM level to alter when compared to regions with less external financing offer. Therefore, using NUTS we define a set of sub-regions that are used to study how WCM practices varies according to regions conditions. For regions it may be found variations in the optimal working capital levels, but also in the access external financing.

Hypothesis 5 – The non-linear relationship between working capital management and firm's profitability differs according to regional characteristics.

4. DATA AND DESCRIPTIVE STATISTICS

4.1. Sample and Data Description

Our analysis draws on a matched employer-employee database (QP - “*Quadros de Pessoal*”) combined with firms' financial database, the SCIE (Simplified Corporate Information).

The matched employer-employee database (QP) is a mandatory survey submitted annually to the Portuguese Ministry of Employment and Social Security by firms with at least one employee. It covers the entire Portuguese private sector from 1986 to 2009, gathering comprehensive information on more than 220,000 firms and 2,000,000 individuals per year. Every year, firms report: year of creation, geographic location, size, industry classification, number of establishments, initial capital and ownership structure. At the individual level, the database contains employers' information on CEOs' gender, age and education.

As QP dataset lacks economic and financial information, we use the SCIE to collect year-end information on several accounting variables for private firms and self-employed individuals in Portugal. The SCIE is a mandatory survey, that results from institutional cooperation among the Portuguese Ministry of Justice, Ministry of Finance and Public Administration, National Institute of Statistics (INE) and Portuguese Central Bank, resulting on an integrated reporting system that meets different disclosure needs, namely trade registers and provision of notarial services, accounting statements and tax returns, production of statistics and economic analysis of corporations and activity sectors. An exact match between SCIE and QP was provided by INE.

From our matched employer-employee, we select all eligible firms for which we could identify CEOs and their background history. We also restrict the sample to CEOs aged between 20 and 60, ending up with a total of 106,961 observations, corresponding to 41,536 firms.

4.2. Variables Description

For the descriptive statistics from our sample we summarize in Table A 2, in Appendix, the main variables used in this study.

The profitability (*PRO*), is the return on assets (ROA), given by operating income over total assets. Working capital management (*WCM*) is measured by the aggregate summary indicator: cash conversion cycle (CCC) (Emery, 1984). The CCC, is a performance indicator of WCM efficiency, measuring the number of days that funds are committed to inventories and accounts receivable minus the number of days that payment to suppliers is deferred (Gitman, 1974). Size (*SIZE*), is computed by the number of individuals in employee records yearly. Firm's growth (*GROWTH*), is measured as sales growth, affecting trade credit granted and received, as well as investment in inventories (Baños-Caballero, et al., 2012). Leverage (*LEV*) is measured as the ratio of debt (short and long-term loans) to total assets (Deloof, 2003; Lazaridis & Tryfonidis, 2006; Dong & Su, 2010).

As CEO's characteristics, *Gender* this is a dummy variable equaling one for men and zero for women. For age, we define four categorical variables: *Age20-29* coded one for individuals aged between 20 and 29, *Age30-39*, coded one for individuals aged between 30 and 39; *Age40-49*, coded one for individuals aged between 40 and 49 and finally *Age50-60*, coded one for individuals aged between 50 and 60. For education, we have

four categorical variables: *higheducation* that is a dummy variable, equaling one for founders with bachelors, masters or doctoral degrees; *mediumeducation*, is a dummy variable equaling one for individuals reporting a high school diploma or vocational school degree; *loweducation*, is a dummy variable equaling one for individuals that attended junior high school and *veryloweducation*, is a dummy variable equaling one for individuals who never attended or completed elementary school. Lastly, *Nationality*, which is a dummy variable equaling one for foreign managers and zero for Portuguese.

4.3. Descriptive Statistics

For the descriptive statistics, we begin with the correlations matrix, Table A 3, in Appendix, although describing the relationship between variables it does not identify the causes. Therefore, the estimated correlations between explanatory variables and profitability show a higher correlation between profitability, given by ROA, and profitability in previous period, about 67.2%. Leverage is also highly correlated with profitability, about 74.3%. Finally, it is also observable that WCM is highly correlated, 84.7%, with its square.

Table 2 and Table 3 provide descriptive statistics of our sample. On average the profitability shows how profitable a firm is compared to its total assets, ROA gives an idea of how efficient management is, using its assets to generate earnings; therefore, on average, the profitability of our sample is negative (-59%). The average numbers of days, since the purchase of raw materials until firms collect receivables, is on average 34 days. Firms in our sample almost do not grow, when compared to the homologous period, and have on average 6 employees. In terms of leverage, short and long-term loans represent an average of 79% of firms' total assets.

Table 2 - Summary Statistics

Variables	Observations	Mean	Std. Dev.	Min.	Median	Max.
PRO_t	106,961	-0.59	119.61	-29000	0.04	140.02
PRO_{t-1}	106,961	-0.36	81.13	-26000	0.04	8.04
WCM	106,961	34.23	57.98	-70.98	19.98	194.98
WCM²	106,961	4532.95	7497.67	0.00	1178.93	38018.91
SIZE	106,961	5.70	11.35	1.00	3.00	1062
GROWTH	106,961	-0.02	0.48	-9.46	0.00	7.99
LEVERAGE	106,961	0.79	101.96	0.00	0.32	33341.00

This table reports summary statistics during the period 2004-2009. Descriptive statistics are the following: Number of Observations, Mean, Standard Deviation, Minimum, Median and Maximum. Variables are as follows PRO = Firm Profitability; PRO_{t-1}= Firm Profitability in previous period; WCM= Number of days of Working Capital Management; WCM²= Squared Number of days of Working Capital Management; SIZE= Reported Number of Employees within Firms; GROWTH= Natural Logarithm of Sales; LEVERAGE= Firm Financial Debt Ratio to Total Assets.

For CEO's characteristics, presented in Table 3, firms in our sample are managed mainly by men (68.8%); within respect to CEO's age, 11.52% are aged between 20 and 29; 39% are aged between 30 and 39; 31.88% are between 40 and 49 and the remaining 17.58% are aged between 50 and 60. Therefore, is possible to conclude that firms in our sample are managed by middle aged men. Also majority of CEOs are Portuguese (96.76%). Regarding CEO's educational level, 42.08% they present a low educational level; 24.88% has a medium educational level; 17.49% present high educational level and 15.55% present a very low educational level, showing that the majority of CEOs in our sample never attended or completed elementary school, followed by CEOs with high school diploma or vocational school degree Lastly, is possible to see that the majority of firms were established between 2001 and 2006, 81.69%, being observable a decline justified by the recessive macroeconomic cycle in Portugal from 2007/2008.

Table 3 - CEO's Characteristics

<i>GENDER</i>	Frequency		Percent
Male	73,596		68.81%
Female	33,365		31.19%
<i>AGE</i>			
	Mean	Frequency	Percent
20 to 29	26.60	12,327	11.52%
30 to 39	34.56	41,732	39.02%
40 to 49	44.13	34,099	31.88%
50 to 60	54.09	18,803	17.58%
<i>EDUCATION</i>			
	Frequency		Percent
Very Low	16,630		15.55%
Low	45,010		42.08%
Medium	26,614		24.88%
High	18,707		17.49%
<i>NATIONALITY</i>			
	Frequency		Percent
Portuguese	103,491		96.76%
Europe	1,758		1.64%
Africa	443		0.41%
Asia	437		0.41%
South American	779		0.73%
Central and North American	49		0.05%
Other	4		0.00%
<i>ENTRY YEAR</i>			
	Frequency		Percent
2000	9,872		9.23%
2001	20,978		19.61%
2002	16,432		15.36%
2003	12,041		11.26%
2004	12,089		11.30%
2005	13,900		13.00%
2006	11,933		11.16%
2007	7,447		6.96%
2008	1,967		1.84%
2009	302		0.28%

This table reports CEO's Characteristics statistics during the period 2004-2009. Descriptive statistics are the following: GENDER= CEO's gender; AGE= CEO's comprehended interval of years; EDUCATION= CEO's educational level; NATIONALITY= CEO's Nationality. ENTRY YEAR= Firm's year of establishment.

5. EMPIRICAL METHODOLOGY AND RESULTS

In order to test the effects of WCM on profitability we conduct a multivariate analysis based on multiple regression analysis in order to test the relationship between dependent and explanatory variables.

Being this an empirical longitudinal study, data is analyzed under panel data methodology. According to Brooks, (2008) this methodology presents benefits: (i) gives access to more information by combining time-series and cross-sectional, allowing to address more complex issues that would not be possible with time-series or cross-sectional data; (ii) allows the use of a large number of observations, ensuring the asymptotic properties of estimators and increases the degrees of freedom, meaning more robust and meaningful *t* and *F* *Statistic tests*; (iii) reduces risk of Multicollinearity, since the data between entities have different structures; (iv) increases efficiency and stability of estimators by conducting adequate regression methods allowing a safer choice between different methods. Panel data also allows controlling for unobserved cross-section heterogeneity, making possible to exclude bias derived from the existence of individual effects. That is possible because it confines the heterogeneity to the intercept term of the relationship (Baum & F., 2006).

The equation to determine the relationship between WCM and profitability is:

$$\text{Equation (1): } PRO_{fitc} = \alpha_f + \lambda_t + \beta_j + \theta_c + \delta_i + X_1 PRO_{ft-1} + X_2 WCM_{ft} + X_3 WCM_{ft}^2 + X_4 GROWTH_{ft} + X_5 LEV_{ft} + \omega_{ft} + \eta_f + \varepsilon_{fitc}$$

Where, *f* indicates firm, *i* refers to the CEO, *j* indicates the industry, *t* the time period and *c* the region.

The dependent variable profitability (PRO_{fitc}), is defined as the return on assets (ROA), being given by operating income over total assets. Independent variables include (PRO_{ft-1}) which is given by firm's return on assets in the previous period; Working Capital Management (WCM_{ft}) and its square, (WCM_{ft}^2), which are measured by the CCC; Firm growth ($GROWTH_{ft}$) is the logarithm of sales growth; Firm leverage (LEV_{ft}) is measured as the ratio of debt to total assets; Our model includes the vector ω_{ft} , which is a vector for CEO's characteristics, which includes CEO's gender (equaling one for men and zero for women); four categorical variables for age (*Age 20-29* coded one for individuals aged between 20 and 29; *Age 30-39* coded one for individuals aged between 30 and 39; *Age 40-49* coded one for individuals aged between 40 and 49 and; *Age 50-60* coded one for individuals aged between 50 and 60); four categorical variables for educational level (*veryloweducation*, is a dummy variable equaling one for individuals who never attended or completed elementary school; *loweducation*, is a dummy variable equaling one for individuals that attended junior high school; *mediumeducation*, is a dummy variable equaling one for individuals reporting a high school diploma or vocational school degree and *higheducation*, is a dummy variable equaling one for founders with bachelors, masters or doctoral degrees); finally, CEO's nationality (equals one for foreign CEO's and zero for Portuguese). In reporting the estimated coefficients our omitted category is CEO's aged 20-29 and with very low educational level.

For firms, *age dummy variable* (γ_i) defined with five categorical variables, equaling one for the reference year; *size dummy variable* (δ_i), that equals one according to the number of employees; *Industry dummy variable* (β_j), defined with seventy eight categorical variables, according to industry classification, CAE review 2.1, equaling one for the

respective industry code; *Regional dummy variable* (θ_c), defined with seven categorical variables, following NUTS II, equaling one for the respective territorial unit; and, *year dummy variable* (λ_t), defined with four categorical variables, from 2006 to 2009, equaling one for the respective reference year; α measures the constant term; the η_f is the unobservable heterogeneity or firm's unobservable individual effects and ε_{fitc} the random disturbance.

5.1. Regression Analysis

The estimation and identification of panel data models requires previous tests to identify the correct method. Such method implies firstly to analyze data considering Pooled Ordinary Least Squares (OLS) estimation, in order to test for unobserved heterogeneity effects across firms.

Pooled OLS estimation provides an *F Statistic test* under a null hypothesis that the constant terms are equal across entities. If the null hypothesis is rejected there are unobservable individual effects that have to be properly treated.

There are several techniques to analyze panel data, in which Fixed Effects (FE) or Random Effects (RE) are usually chosen. We choose which methodology is used through the *Hausman test* that examines whether the unobservable heterogeneity term (η_i) is correlated with explanatory variables, while continuing to assume that regressors are uncorrelated with the disturbance term in each period. The null hypothesis for this test is that unobservable heterogeneity term is not correlated with the independent variables $E\left(\frac{\eta_i}{x_{it}}\right) = 0$. If the null hypothesis is rejected then we employ Fixed Effects (FE) methodology.

Fixed effects are used whenever we are interested in analyzing the impact of variables that vary over time, exploring the relationship between the explanatory variables and the dependent variable within an entity. When using FE, we assume that something with time-invariant characteristics, within the entity, may impact or bias the explanatory variables, needing to be controlled. FE removes the effects of those time-invariant characteristics so that we can assess the effect of explanatory variables over the dependent variable. Another important assumption is that those characteristics are unique to the entity and should not be correlated with other individual characteristics, if that does happen then FE is suitable.

Table 4 - Estimation and Identification of Panel data Model

Variables	Pooled OLS (1)	Fixed Effects (2)	Random Effects (3)
<i>PRO</i> _{<i>t</i>-1}	0.982*** (0.000289)	0.448*** (0.00227)	0.954*** (0.000593)
<i>WCM</i>	-0.000214 (0.000772)	0.000563*** (0.000189)	0.000128 (0.000250)
<i>WCM</i> ²	-6.81e-07 (5.89e-06)	-2.78e-06** (1.34e-06)	-1.78e-06 (1.78e-06)
<i>GROWTH</i>	-0.0866* (0.0498)	-0.0735*** (0.00988)	-0.0364*** (0.0131)
<i>LEV</i>	-0.865*** (0.000230)	-0.718*** (0.00315)	-0.857*** (0.000480)
<i>Gender</i>	0.0143 (0.0531)	0.00349 (0.0117)	0.0104 (0.0156)
<i>Age 30 – 39</i>	0.0707 (0.0798)	0.0194 (0.0195)	0.0163 (0.0259)
<i>Age 40 – 49</i>	-0.0519 (0.0838)	0.0120 (0.0227)	0.0121 (0.0301)
<i>Age 50 – 60</i>	-0.0632 (0.0958)	0.0113 (0.0264)	0.0372 (0.0350)
<i>Low Educ</i>	-0.193*** (0.0736)	0.0264 (0.0237)	-0.0262 (0.0314)
<i>Medium Educ</i>	-0.201** (0.0852)	0.0561* (0.0289)	-0.0329 (0.0383)
<i>High Educ</i>	-0.235** (0.0999)	0.0247 (0.0353)	-0.0402 (0.0464)
<i>Foreign</i>	0.00338 (0.135)	-0.0411 (0.0510)	-0.0619 (0.0671)
<i>c</i>	0.702 (3.443)	0.836 (0.817)	0.860 (0.964)
F Statistic test	-	157.21	5.91e+06
(P-value)	(0.0000)	(0.0000)	(0.0000)
Hausman test	-	913,51	913,51
(P-value)	-	(0.0000)	(0.0000)
Observations	106,961	106,961	106,961
Number of firms	-	41,536	41,536
R- Squared	99.6	72.6	70.5

This table reports the regression estimates, during the period 2004-2009. The variables used in this analysis are as follows. Variables are as follows *PRO* = Firm Profitability; *PRO*_{*t*-1}= Firm Profitability in previous period; *WCM*= Number of days of Working Capital Management; *WCM*²= Squared Number of days of Working Capital Management; *GROWTH*= Natural Logarithm of Sales Growth; *LEV*= Firm Financial Leverage. The dummy variables are: “Gender”, “Age20-29”, “Age30-39”, “Age40-49”, “Age50-60” “Very Low Education”, “Low Education”, “Medium Education”, “High Education”, “Foreign”, “Year”, “NUTS”, “Industry”, “Size” and “Age” are control variables for CEO and firm characteristics. Some dummy variables are omitted in order to avoid collinearity problems. Robust *t Statistic* in parentheses. *Hausman test* provides a statistical test that evaluates the significance of an estimator (RE) versus an alternative estimator (FE). P-value of *Hausman test* in parentheses. *F test* is carried on under the null hypothesis that the constant terms are equal across entities (firms). The null hypothesis, of both tests, must be rejected at the 5 percent significance level. P-value of *F test* in parentheses. *R-squared* expressed in percentage. ***, ** and * mean statistical significance at the 1% level, 5% level and 10% level, respectively.

Estimations are carried out to provide evidence for the usage of Fixed Effects model.

Table 4, starts with the Pooled OLS estimation, which provides an *F Statistic*, presenting

a *p-value* of zero, making us reject the null hypothesis, for unobservable heterogeneity effects across entities. The *Hausman Test*, is then used to determine if those unobservable effects are considered random or alternatively fixed; we have a *p-value* of zero for both fixed and random effects, making us to reject the null hypothesis, indicating a significant correlation between unobservable heterogeneity (η_i) and explanatory variables, being employed FE estimation, considered as the best methodology.

The results, for Pooled OLS, presented in column (1) indicate that, firm's profitability is positively related with ROA in the previous period, a 1% increase of ROA in previous year is associated with an increase of 98.2% on current profitability. For WCM, there is a negative relation with profitability, indicating that if working capital length increases in one day, the ROA decreases 0.0214%. Firm's growth is also negatively related with profitability, a 1% increase in sales growth decreases profit in 0.866%. Firm's leverage is negatively related with profitability, a 1% increase in leverage decreases profitability in 86.5%. For CEO's characteristics, gender is positively related with profitability, showing that male CEOs have more profitable firms, also CEOs until 39 years old have more profitable firms than CEOs aged between 20 and 29, for the others, age is negatively related with profitability, thus, older CEOs have less profitable firms compared to younger ones. In terms of education, all levels are negatively related with profitability, showing that the higher the educational level the less profitable the firm is. Finally, foreign CEOs present a negative relation with firm's profitability, showing that Portuguese ones present more profitable firms.

For the Fixed Effects, presented in column (2), firm's profitability is positively related with the ROA in the previous period, a 1% increase in ROA in the previous year is associated with an increase of 44.8% on current profitability. For WCM, there is a positive

relation with profitability, indicating that if working capital length increases in one day, the ROA increase 0.0566%. For firm's growth, there is a negative relation with firm's profitability, a 1% increase in sales growth, decreases profitability in 7.35%. Leverage is also negatively related with profitability, a 1% increase in debt ratio leads to a decrease in profitability of 71.8%. For CEO's characteristics, the majority of coefficient's estimates are not statistically significant, showing that gender is positively related with firm's profitability, thus, male CEO's have more profitable firms. For age, this is positively related with firm's profitability, showing that the older the CEO the higher the profitability of firm. For education, only medium educational level is statistically significant at 10% level, but is possible to conclude that the higher the educational level the higher the profitability is. Finally, for nationality, this is negatively related with profitability; therefore, Portuguese CEO's have more profitable firms. In sum, CEO's demographic and educational characteristics are seen as extremely relevant for the increase of firm's profitability, once they present higher experience as well as a higher educational level that enhances CEO's capacity to handle difficult situations and maximize firm's performance.

For the Random Effects, in column (3), the relationship between explanatory variables and profitability are equal to the FE estimation, except for the WCM and its square. In terms of CEO's characteristics, the relationship is also similar to FE estimation except for educational level, where the relation with profitability is negative, showing that as CEO's education improves, firm's profitability decreases.

When analyzing our data, through FE estimation methodology, our findings confirm the existence of an optimal WCM level that balances costs and benefits and maximizes firm's profitability, showing that profitability of firms increase with the investment in working

capital at low levels and decreases at higher levels. Therefore, it is possible to conclude that the quadratic function presents a maximum point, since the second partial derivative of profitability with respect to WCM is negative. The maximum point of the quadratic equation can be derived by differentiating *PRO* variable with respect to *WCM*, and making this derivative equal to zero. On solving for *WCM*, the maximum point is $WCM = \left(\frac{-X_2}{2 \times X_3}\right)$. Replacing by coefficients' estimates, presented in Table 4, column (2), $WCM = \left(\frac{-0.000563}{2 \times (-0.0000278)}\right) = 101.26$ days-sales. The results show that the optimum WCM level is around 101 days-sales. According to our findings, we expect that benefits of investing in working capital to increase until the maximum point is reached, meaning that profitability rise until the breakpoint is achieved. After reach that breakpoint, an increase in working capital level leads to a decrease of profitability. Hence we do not reject our first hypothesis.

Next, we evaluate the non-linear relationship between WCM and profitability according to firm age, size, industry sectors and geographic location, in order to determine firm's optimal WCM level that maximizes profitability. In all regressions is used robust standard errors; this option relaxes the assumption that errors are identically distributed, not changing coefficient estimates but the test statistics present more accurate p-values, correcting the presence of heteroskedasticity¹⁹.

Using equation (1), we evaluate the effects of a non-linear relationship for firms aged between one and nine years. Table 5, presents the optimal WCM level that maximizes

¹⁹ Heteroskedasticity occurs when the variance of error term differ across observations. The standard errors of the estimates become biased leading to bias in test statistics and confidence intervals.

profitability according to age, besides not being present; we estimated coefficients for all the variables as described previously in the FE estimation.

Table 5 - Working Capital Management relationship with profitability according to firm's age

Variables	1 Year (1)	2 Years (2)	3 Years (3)	4 Years (4)	5 Years (5)	6 Years (6)	7 Years (7)	8 Years (8)	9 Years (9)
<i>WCM</i>	0.00264** (0.00130)	0.00114** (0.000497)	0.00162*** (0.000468)	0.00117* (0.000663)	-0.000642 (0.00123)	0.000714** (0.000283)	5.63e-05 (0.000167)	0.000171* (9.97e-05)	0.000258 (0.000174)
<i>WCM</i> ²	-9.66e-06 (7.13e-06)	-6.88e-06** (3.26e-06)	-7.28e-06** (2.84e-06)	-2.81e-06 (3.57e-06)	-4.96e-06 (5.99e-06)	-1.67e-06 (1.39e-06)	1.07e-06 (1.04e-06)	-8.82e-07 (6.10e-07)	-9.15e-07 (9.13e-07)
<i>c</i>	1.742 (2.132)	0.603* (0.350)	-1.102** (0.549)	-3.156*** (0.206)	3.364*** (0.666)	0.220* (0.113)	-0.271 (0.189)	0.0447 (0.0972)	0.100 (0.232)
WCM Mean	23,51	24,42	26,69	29,6	32,91	36,52	40,01	41,04	39,23
Optimal WCM	-	82.84	111.26	-	-	-	-	-	-
Observations	3,343	8,712	12,206	13,668	11,836	12,019	16,179	19,536	8,944
Number of firms	2,445	5,415	5,512	5,090	4,264	4,141	5,383	6,068	2,702
R-squared	36.6	36.8	78.9	34.3	90.4	10.0	71.4	28.4	12.0

This table reports the regression estimates for our equation, using FE robust standard errors methodology, during the period 2004-2009. The variables used in this analysis are as follows. Variables are as follows PRO_{t-1}= Firm Profitability in previous period; WCM= Number of days of Working Capital Management; WCM²= Squared Number of days of Working Capital Management; GROWTH= Logarithm of Sales; LEV= Firm Financial Debt Ratio; Gender= CEO's gender; Age= CEO's comprehended interval of years; Education Level= CEO's educational experience; Foreign= CEO's Nationality; C is the intercept term. The dummy variables: "Gender", "Age 20-29", "Age 30-39", "Age 40-49", "Age 50-60" "Very Low Education", "Low Education", "Medium Education", "High Education", "Foreign", "Year of reference", "NUTS", "Industry Sector" and "Size" are control variables for CEO and firm characteristics. Some dummy variables are omitted in order to avoid collinearity problems. *R-squared* expressed in percentage. ***, ** and * mean statistical significance at the 1% level, 5% level and 10% level, respectively.

When testing for the non-linear relationship between WCM and profitability, we divided our sample according to age, where firms with two and three years present statistically significant estimated coefficients for WCM and its square, indicating the existence of an optimal WCM level that maximizes profitability.

The optimal working capital level for younger firms, in column (2), is 82.84 days and in column (3), is 111.26 days, showing that the older the firm the higher the optimal working capital level that maximizes profitability, due to lower costs of investing in working capital (Baños-Caballero, et al., 2010). The average length of working capital is used as the actual level of investment in working capital, having 24.42 days for column (2) and

26.69 days for column (3), showing that firms stand below the optimal level and that performance is not maximized. Therefore, once we have a concave relation, profitability can be improved by increasing the invested amount on working capital until the optimal level is reached.

Next, we evaluate the non-linear relationship between WCM and profitability according to firm's dimension. Table 6 presents results using equation (1). According to OECD, (2005) definition, firms are classified according to the number of employees, where micro firms have at most 10 employees, small have fewer than 50 employees, medium few than 250 employees and large more than 250 employees.

Table 6 - Working Capital Management relationship with profitability according to firm's size

Variables	Micro and Small Sized Firms (1)	Medium and Large Sized Firms (2)
<i>WCM</i>	0.000565*** (0.000202)	0.000387 (0.000409)
<i>WCM</i> ²	-2.79e-06*** (9.88e-07)	-7.81e-06*** (2.73e-06)
<i>c</i>	0.845* (0.500)	0.115** (0.0492)
WCM Mean	34.23	33.66
Optimal WCM	101.25	-
Observations	106,335	626
Number of firms	41,363	281
R-squared	72.6	27.4

This table reports the regression estimates for our equation, using FE robust standard errors methodology, during the period 2004-2009. The variables used in this analysis are as follows. Variables are as follows PRO = Firm Profitability; PRO_{t-1}= Firm Profitability in previous period; WCM= Number of days of Working Capital Management; WCM²= Squared Number of days of Working Capital Management; GROWTH= Logarithm of Sales; LEV= Firm Financial Debt Ratio; Gender= CEO's gender; Age= CEO's comprehended interval of years; Education Level= CEO's educational experience; Foreign= CEO's Nationality; C is the intercept term. The dummy variables: "Gender", "Age 20-29", "Age 30-39", "Age 40-49", "Age 50-60" "Very Low Education", "Low Education", "Medium Education", "High Education", "Foreign", "Year of reference", "NUTS", "Industry Sector" and "Age" are control variables for CEO and firm characteristics. Some dummy variables are omitted in order to avoid collinearity problems. *R-squared* expressed in percentage. ***, ** and * mean statistical significance at the 1% level, 5% level and 10% level, respectively.

When testing for the non-linear relationship between the two variables, we separated our sample into two groups, where micro and small firms present statistical significant coefficients for WCM and its square, indicating the existence of an optimal working capital level that maximizes profitability. The optimal level for micro and small firms is

101.25 days, but the average working capital length for these firms stands at 34.23 days, indicating that firms are not maximizing profitability, by standing below the optimal level.

These micro and small-sized firms need to monitor working capital due to volatile cash flows, dependence on short-term debt and less liquidity due to greater information asymmetry, in order to reduce risks and maximize profitability. For medium and large firms is not possible to conclude the existence of a non-linear relation once coefficients are not statistically significant.

Therefore, for both younger and smaller firms these stand below the optimal working capital level, that maximizes firm's profitability, showing that due to the existence of a concave relationship between WCM and profitability, firms below the optimal level can increase profitability by investing in working capital, through higher investment in inventory, preventing interruptions in the production process and loss of business due to product scarcity and also reduces supply costs and price fluctuations. In addition it provides customers with better service and avoids high production costs arising from large fluctuations in production. Furthermore, firms should also increase trade credit granted which stimulates sales, allowing customers to verify product quality prior to payment reducing asymmetric information between customer and supplier. Finally, decreasing suppliers financing which means taking advantage of prompt payment discounts, due to early payments at the same time, reduces the cost of external financing. In sum, these firms should follow conservative working capital policies that according to the authors: Czyzewski & Hicks, (1992); Long, et al., (1993) and Deloof & Jegers, (1996), that point to an increase of firm's profitability by increasing the investment levels in working capital.

In Table 7, we analyze for existence of a non-linear relationship between WCM and profitability for the following industry sectors: Agriculture and Mining, Manufacturing, Construction, Wholesale and Retail Trade, Transportation and Real State. The results are obtained using equation (1), and according to the industry classification of CAE review 2.1 at two digits.

Table 7 - Working Capital Management relationship with profitability according to firm's industry sector

Variables	Agriculture and Mining (1)	Manufacturing (2)	Construction (3)	Wholesale and Retail Trade (4)	Transport (5)	Real State (6)
<i>WCM</i>	0.000200 (0.000361)	0.000393 (0.000245)	0.000997*** (0.000300)	0.000589*** (0.000183)	0.000607*** (0.000174)	-2.13e-05 (0.000856)
<i>WCM</i> ²	-1.24e-06 (2.64e-06)	-8.01e-07 (9.27e-07)	-2.47e-06* (1.31e-06)	-1.35e-06* (9.47e-07)	-4.76e-06*** (1.17e-06)	-3.54e-06 (3.82e-06)
<i>c</i>	0.251*** (0.0722)	0.0522 (0.0642)	0.441*** (0.139)	-0.327** (0.164)	0.248*** (0.0517)	0.191 (0.199)
WCM Median	34.92	28.75	34.11	18.38	9.49	26.80
Optimal WCM	-	-	201.82	218.15	63.76	-
Observations	253	12,986	19,715	40,515	7,781	16,536
Number of firms	140	4,798	7,934	15,761	3,603	7,074
R-Squared	45.9	47.7	47.5	96.2	8.1	24.9

This table reports the regression estimates for our equation, using FE robust standard errors methodology, during the period 2004-2009. The variables used in this analysis are as follows. Variables are as follows PRO = Firm Profitability; PRO_{t-1} = Firm Profitability in previous period; WCM= Number of days of Working Capital Management; WCM²= Squared Number of days of Working Capital Management; GROWTH= Logarithm of Sales; LEV= Firm Financial Debt Ratio; Gender= CEO's gender; Age= CEO's comprehended interval of years; Education Level= CEO's educational experience; Foreign= CEO's Nationality; C is the intercept term. The dummy variables: "Gender", "Age 20-29", "Age 30-39", "Age 40-49", "Age 50-60" "Very Low Education", "Low Education", "Medium Education", "High Education", "Foreign", "Year of reference", "NUTS", "Size" and "Age" are control variables for CEO and firm characteristics. Some dummy variables are omitted in order to avoid collinearity problems. *R-squared* is expressed in percentage. ***, ** and * mean statistical significance at the 1% level, 5% level and 10% level, respectively.

When testing for a concave relationship between the two variables, we divided our sample into groups, according to firm's industry sectors, where sectors of Construction, Wholesale and Retail Trade and Transportation present statistical significant coefficients for WCM and its square indicating the existence of an optimal working capital level that maximizes profitability. The optimal WCM level for the Construction sector, in column (3), is 201.82 days, but according to our sample, for this industry, the actual working capital investment level, which is given by the median WCM value of firms in our sample

for this industry sector, is 34.11 days, indicating that firms are not at the optimal working capital level. For Wholesale and Retail Trade sector, in column (4), the optimal working capital level is 218.15 days, the median working capital level for this sector is 18.38 days, showing that firms are not at the optimal working capital level. Finally the Transportation sector, in column (5), the optimal working capital level is 63.76 days which is the lowest optimal level compared to the other two sectors. Transportation sector presents also the lowest median working capital length, 9.49 days, indicating, that this sector is below the optimal level.

Therefore, firms within different industry sectors are likely to present different levels of working capital. Industry practices are significant determinants of firms' WCM policies, because distribution of trade credit, management of inventories and the ability to postpone payments depends on industry structure. Therefore, each sector should increase investment in WCM, in order to increase profitability. When looking deeply to compare these sectors, Construction is expect to present high levels of accounts receivables and payables, while for the Wholesale and Retail Trade levels of accounts receivables are very low, having more impact the management of inventories and payables. Finally, for Transportation this present almost no inventory levels but a relevant weight for accounts receivables and payables.

In sum, industry effects on firm's WCM policies may be explained by differences in the distribution of investment through working capital accounts (Filbeck & Krueger, 2005). Although, WCM practices within industries change over the time, distinctions between industries continue to persist (Hawawini, et al., 1986).

Table 8, analyses the existence of a non-linear relationship between WCM and profitability, according to firm's geographic location, using the second level of Statistic Territorial Units (NUTS II), we have the following regions: North Region, Center Region, Lisbon, Alentejo, Algarve, Autonomous Region of Madeira and Azores.

Table 8 - Working Capital Management relationship with firm's profitability according to firm's location (NUTS II)

NUTS II (code)	North (11)	Algarve (15)	Center (16)	Lisbon (17)	Alentejo (18)	A.R. Madeira (20)	A.R. Azores (30)
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
WCM	0.000716*** (0.000266)	0.000346 (0.000499)	0.000848*** (0.000160)	0.000767*** (0.000251)	0.000265 (0.000273)	-0.0122 (0.0135)	0.00158 (0.00123)
WCM²	-1.53e-07 (1.52e-06)	-6.48e-07 (3.36e-06)	-3.20e-06*** (7.58e-07)	-2.62e-06** (1.31e-06)	-2.08e-06 (1.64e-06)	-0.000137 (0.000126)	-5.79e-06 (4.65e-06)
c	-0.126 (0.158)	-0.229 (0.330)	-0.651* (0.369)	0.615* (0.364)	-0.376 (0.324)	6.620 (7.009)	-0.329 (0.365)
Mean WCM	36.25	25.77	37.88	29.84	31.02	34.97	30.41
Optimal WCM	-	-	132.5	146.37	-	-	-
Observations	40,405	5,983	24,764	26,250	5,871	821	2,867
Number of firms	15,510	2,337	9,236	10,734	2,261	397	1,121
R- Squared	38.2	42.1	24.2	76.4	99.7	7.7	14.0

This table reports the regression estimates for our equation, using FE robust standard errors methodology, during the period 2004-2009. The variables used in this analysis are as follows. Variables are as follows PRO = Firm Profitability; PRO_{t-1} = Firm Profitability in previous period; WCM= Number of days of Working Capital Management; WCM^2 = Squared Number of days of Working Capital Management; GROWTH= Logarithm of Sales; LEV= Firm Financial Debt Ratio; Gender= CEO's gender; Age= CEO's comprehended interval of years; Education Level= CEO's educational experience; Foreign= CEO's Nationality; C is the intercept term. The dummy variables: "Gender", "Age 20-29", "Age 30-39", "Age 40-49", "Age 50-60" "Very Low Education", "Low Education", "Medium Education", "High Education", "Foreign", "Year of reference", "Industry Sector", "Size" and "Age" are control variables for CEO and firm characteristics. Some dummy variables are omitted in order to avoid collinearity problems. *R-squared* expressed in percentage. ***, ** and * mean statistical significance at the 1% level, 5% level and 10% level, respectively.

When testing for a concave relationship between WCM and profitability, we found that Center Region and Lisbon, present statistical significant coefficients for WCM and its square, indicating the existence of an optimal WCM level that maximizes profitability of firms in these regions. The optimal level for Center, in column (3), is 132.50 days, being the average WCM length for firms in this region around 37.88 days, indicating that firms do not maximize profitability, once they are not standing at the optimal WCM level. For Lisbon, column (4), the optimal WCM level is 146.37 days, which is above the average

WCM length of this region, 29.84 days, showing that these firms are not at the optimal level.

Therefore, the optimal WCM level in certain regions depend on size as well as on the access to financing, conceded from institutions, being expected that firms in regions with more financial institutions to easily access financing. Table A 4, in Appendix, presents the number of institutions for each region, from 2004 to 2009, showing that in Lisbon, exists more institutions, being expected that medium and large firms to access easily to financing using less trade credit from suppliers, leading to higher levels of WCM, due to lower costs of investing in current assets, making the optimal WCM level that maximizes profitability to increase. According to our sample, Table A 5 in Appendix, the Center region has 99 medium and large firms compared to the 176 in Lisbon, justifying the difference in the optimal WCM level, from 132.50 to 146.37 days.

6. CONCLUSION

Previous studies suggest that WCM has a significant impact on firm's profitability. Our study searched for the existence of a non-linear relationship between WCM and profitability, showing that firm's working capital levels is sensitive to industry factors, geographic location, size and age, once the main objective of firms is to achieve the optimal working capital level that maximizes performance by managing the trade-off between benefits and costs of investing in working capital, especially for small firms that operate under certain constraints.

The goal of our study is to provide evidence of a non-linear relationship between WCM and profitability. Our results are in line with previous studies (Baños-Caballero, et al., 2012; Silva, 2012). Nevertheless, our study is the first to provide evidence of the effects of WCM on profitability, using data from QP combined the SCIE, from 2004 to 2009.

Our findings provide evidence of a non-linear relationship between WCM and firm's profitability, showing that firms have an optimal working capital level that maximizes profitability, suggesting that firms should stand at the optimal level avoiding deviations (positive or negative) from the optimal level that leads to a decrease in profitability, as proofed by (Baños-Caballero, et al., 2012).

In terms of firm's characteristics, we found through the Fixed Effects methodology, that profitability is positively related with the ROA from the previous period; for firm's growth, given by sales growth, there is a negative relation with profitability, showing that an increase in sales leads to a decrease of profitability once firms invest more in inventories in order to anticipate future sales; leverage is also negatively related with profitability, showing that firms with an higher debt ratio are less profitable. According

to these conclusions, it is important for CEOs to practice a good management of firm's working capital due to costs associated with the under-investment and the over-investment. Therefore, when looking at the importance of CEO's demographic and educational characteristics on firm's profitability, our analysis, show that gender, age and educational level positively affects profitability as the variable nationality is negatively related with profit. In sum, male, Portuguese, older and with higher educational level CEOs have more profitable firms.

For our sub-samples built from the main sample, in order to understand the existence of a non-linear relationship, as well as, impact of firm's age, dimension, industry and location over firm's optimal working capital levels we found for all tested sub-samples a concave relationship, indicating the existence of an optimal working capital level that maximizes profitability, besides firms average level of working capital stand below the optimal firms should increase investment in working capital in order to increase profitability, through conservative working capital policies. This explains that with a concave relation, an increase of firm's profitability is reached through an increase of working capital investment, for level below the optimal working capital level and the contrary for levels above the optimal.

For size, besides the existence of a concave relationship it is not possible to conclude about the impact of WCM on profitability for medium large firms once we cannot get a concave relationship in order to see the optimal working capital level, being difficult to compare with micro and small firms.

For industry sectors, our results show that firm's within different sectors present different levels of working capital. Industry practices are a significant determinant of firms' WCM

policies, which is explained by differences in the distribution of investment through working capital accounts, according to industry structures (Hawawini, et al., 1986; Filbeck & Krueger, 2005).

For firm's geographic location, the optimal working capital level of firms in certain regions depend on their size as well as on the availability of financing from financial institutions, therefore, in regions with easier access to financing, medium and large firms have use less trade credit from suppliers, leading to higher investments in working capital, increasing the optimal level compared to firms from less favorable regions.

As a limitation of our study, it should be noted that for our sub-samples is not possible to test for the existence of non-linear relationship between WCM and profitability for all firms, which may be explained due to limited number of observations or the type of sample where we have mainly young micro and small-sized firms. Further research should focus on how the non-linear relationship behaves for other CEO and firm characteristics not included in our research, as well as for regions with determined characteristics that affect the optimal working capital level of firms. Additionally, it would be useful to compare how the non-linear relation behaves among different European countries.

7. BIBLIOGRAPHY

Autukaite, R. & Molay, E., 2011. Cash Holdings, Working Capital and Firm Value: Evidence From France. *International Conference of the French Finance Association (AFFI)*, pp. 1-34.

Baños-Caballero, S., García-Teruel, P. J. & Martínez-Solano, P., 2009. *How do Market Imperfections Affect Working Capital Management - Working Paper*, Spain: Instituto Valenciano de Investigaciones Económicas, S.A..

Baños-Caballero, S., García-Teruel, P. J. & Martínez-Solano, P., 2010. Working capital management in SMEs. *Accounting and Finance*, Volume 50, pp. 511-527.

Baños-Caballero, S., García-Teruel, P. & Martínez-Solano, P., 2012. How does working capital management affect the profitability of Spanish SME's?. *Small Business Economics*, Volume 39, pp. 517-529.

Baum, C. & F., 2006. *An Introduction to Modern Econometrics using Stata*. Texas: Stata Press.

Becker, S. G., 1994. Chapter III. Investment in Human Capital: Effects on Earnings. In: *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education*. Chicago: The University of Chicago Press, pp. 29-58.

Benito, A. & Vlieghe, G., 2000. Stylised facts on UK corporate financial health, evidence from micro data. *Bank of England Financial Stability Review*, Volume 1, pp. 83-93.

Berger, A. N. & Udell, G. F., 1998. The economics of small business: The roles of private equity and debt markets in the financial growth cycle. *Journal of Banking & Finance*, Volume 22, pp. 613-673.

Blinder, A. S. & Maccini, L. J., 1991. The Resurgence of Inventory Research: What Have We Learned?. *Journal of Economic Survey*, Volume 5, pp. 291-328.

Boschker, B., 2011. *Determinants of Working Capital Management in SMEs National Culture, a Missing Piece*, s.l.: Unpublished Thesis (Masters) - Tilburg University.

Brooks, C., 2008. *Econometrics for Finance*. 2nd edition ed. New York: Cambridge University Press.

Carpenter, R. E., Fazzari, S. M. & Petersen, B. C., 1994. Inventory Investment, Internal Finance Fluctuations and Business Cycle. *Brooking Papers on Economic Activity*, Volume 25, pp. 75-135.

Chiou, J. R., Cheng, L. & Wu, H. W., 2006. The determinants of working capital management. *Journal of American Academy of Business*, Volume 10, pp. 149-155.

Cressy, R., 1996. Are business start-ups debt-rationed?. *Economic Journal*, Volume 160, pp. 1253-1270.

Cuñat, V., 2007. Trade Credit: Suppliers as Debt Collectors and Insurance Providers. *Review of Financial Studies*, Volume 20, pp. 491-527.

Czyzewski, A. B. & Hicks, D. W., 1992. Hold Onto Your Cash. *Management Accounting*, 73, pp. 27-30.

Danielson, M. & Scott, J., 2000. *Additional evidence on the use of trade credit by small firms: the role of trade credit discounts. Working Paper.* [Online] Available at: [SSRN Electronic Library.](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=236260) http://papers.ssrn.com/sol3/papers.cfm?abstract_id=236260 [Accessed 18 April 2013].

Deloof, M., 2003. Does Working Capital Management Affect Profitability of Belgian Firms?. *Journal of Business, Finance and Accounting*, Volume 30; No.3, pp. 573-587.

Deloof, M. & Jegers, M., 1996. Trade Credit, Product Quality, and Intragroup Trade: Some European Evidence. *Financial Management*, Volume 25, pp. 33-43.

Dong, H. P. & Su, J., 2010. The Relationship between Working Capital Management and Profitability: A Vietnam Case. *International Research Journal of Finance and Economics*, Volume 49, pp. 59-67.

Dougherty, C., 2006. *Introduction to Econometrics*. 3rd edition ed. New York: Oxford University Press.

Ebben, J. J. & Johnson, A. C., 2011. Cash Conversion Cycle Management in Small Firms: Relationships with Liquidity, Invested Capital, and Firm Performance. *Journal of Small Business and Entrepreneurship*, Volume 24; No.3, pp. 381-396.

Eljelly, A., 2004. Liquidity-Profitability Tradeoff an Empirical Investigation in an Emerging Market. *International Journal of Commerce & Management*, Volume 14; No.2, pp. 48-62.

Emery, G. W., 1984. Measuring Short-Term Liquidity. *Journal of Cash Management*, Volume 4, pp. 25-32.

Emery, G. W., 1987. An Optimal Financial Response to Variable Demand. *Journal of Financial and Quantitative Analysis*, Volume 22, pp. 209-225.

Enqvist, J., Graham, M. & Nikkinen, J., 2011. The Impact Of Working Capital Management On Firm Profitability In Different Business Cycles: Evidence From Finland. *European Finance eJournal*, Volume 3, pp. 1-30.

Farrar, D. E. & Glauber, R. R., 1967. Multicollinearity in Regression Analysis: The Problem Revisited. *The Review of Economics and Statistics*, Volume 49; No.1, p. 92:107.

Fazzari, S. M. & Petersen, B., 1993. Working Capital and Fixed Investment: New Evidence on Financing Constraints.. *Rand Journal of Economics*, Volume 24; No.3, pp. 328-342.

- Filbeck, G. & Krueger, T. M., 2005. An Analysis of Working Capital Management Results across Industries. *Mid-American Journal of Business*, Volume 20, pp. 11-18.
- Garcia, J. F. L., 2011. *The Impact of Working Capital Management upon Companies' Profitability: Evidence from European Companies*, Porto: Universidade do Porto.
- García-Teruel, P. & Martínez-Solano, P., 2007. Effects of Working Capital Management on SME Profitability. *International Journal of Managerial Finance*, Volume 3; No.2, pp. 164-177.
- García-Teruel, P. & Martínez-Solano, P., 2010. Determinants of Trade Credit: A Comparative Study of European SMEs. *International Small Business Journal*, Volume 28, No.3, pp. 215-233.
- Gentry, A. J., Vaidyanathan, R. & Lee, H. W., 1990. A Weighted Cash Conversion Cycle. *Financial Management*, Volume 19; No.1, pp. 90-99.
- Gill, A., Biger, N. & Mathur, N., 2010. The Relationship Between Working Capital Management and Profitability: Evidence From the United States. *Business and Economics Journal*, Volume 2010, pp. 1-9.
- Gitman, L., 1974. Corporate Liquidity Requirements: A Simplified Approach. *The Financial Review*, Volume 9, pp. 79-88.
- Gitman, L. & Sachdeva, K., 1982. A Framework for Estimating and Analyzing the Required Working Capital Investment. *Review of Business and Economic Research*, Volume 17, No.3, pp. 36-44.
- Grablowsky, B. J., 1984. Financial Management of Inventory. *Journal of Small Business Management* 22, pp. 59-65.
- Hager, H. C., 1976. Cash Management and the Cash Conversion Cycle. *Management Accounting*, Volume 57(9), pp. 19-21.
- Hawawini, G., Viallet, C. & Vora, A., 1986. Industry Influence on Corporate Working Capital Decisions. *Sloan Management Review*, Volume 24, No.4, pp. 15-24.
- Hillier, D. et al., 2010. *Corporate Finance*. 1st European Edition ed. s.l.:McGraw-Hill.
- Howorth, C. & Westhead, P., 2003. The Focus of Working Capital Management in UK Small firms. *Management Accounting Research*, Volume 14, pp. 94-111.
- Jose, M. L., Lancaster, C. & Stevens, J. L., 1996. Corporate Return and Cash Conversion Cycle. *Journal of Economics and Finance*, Volume 20, pp. 33-46.
- Kamath, R., 1989. how Usefull are Common Liquidity Measures?. *Jornal of Cash Management*, Volume 9; No.1, pp. 24-28.

- Kargar, J. & Blumental, R. A., 1994. Leverage Impact on Working Capital in Small Business. *TMA Journal* 14, pp. 46-53.
- Kieschnick, R., LaPlante, M., Moussawi, R. & Baranchuk, N., 2006. Corporate Working Capital Management: Determinants and Consequences. Working Paper. *University of Texas: Dallas*, pp. 1-33.
- Kim, Y. H. & Chung, K. H., 1990. An Integrated Evaluation of Investment in Inventories and Credit: A Cash Flow Approach. *Business Finance & Accounting*, Volume 17; No.3, pp. 381-390.
- Knauer, T. & Wöhrmann, A., 2013. Working Capital Management and Firm Profitability. *Journal of Management Control*, Volume 24, pp. 77-87.
- Korajczyk, R. & Levy, A., 2003. Capital Structure Choice: Macroeconomic Conditions and Financial Constraints. *Journal of Financial Economics*, Volume 68(1), pp. 75-109.
- Lamberson, M., 1995. Changes in Working Capital of Small Firms in Relation to Changes in Economic Activity. *Mid-American Journal of Business*, Volume 10; No.2, pp. 45-50.
- Lazaridis, I. & Tryfonidis, D., 2006. Relationship Between Working Capital Management And Profitability Of Listed Companies In The Athens. *Journal of Financial Management & Analysis*, Volume 19; No.1, pp. 26-36.
- Lee, Y. W. & Stowe, J. D., 1993. Product Risk, Asymmetric Information and Trade Credit. *The Journal of Financial and Quantitative Analysis*, Volume 28; No.2, pp. 285-300.
- Long, M. S., Malitz, I. B. & Ravid, S. A., 1993. Trade Credit, Quality Guarantees and Product Marketability. *Financial Management*, Volume 22; No.4, pp. 117-127.
- Manoori, E. & Muhammad, J., 2012. Determinants of Working Capital Management: Case of Singapore Firms. *Research Journal of Finance and Accounting*, Volume 3; No.11, pp. 15-24.
- Marriott, N. & Marriott, P., 2000. Professional Accountants and the Development of a Management Accounting Service for the Small Firms: Barriers and Possibilities. *Management Accounting Research*, Volume 11, pp. 475-495.
- Nakamura, W. & Palombini, N., 2009. *The Determinant Factors of Working Capital Management in the Brazilian Market*, São Paulo, Brazil: Universidade Presbiteriana Mackenzie.
- Nazir, M. & Afza, T., 2008. On the Factor Determining Working Capital Requirements. *Proceedings of ASBBS*, Volume 15, No.1, pp. 293-301.
- Ng, C. K., Smith, J. K. & Smith, R. L., 1999. Evidence on the Determinants of Credit Terms Used in Interfirm Trade. *Journal of Finance*, Volume 54, pp. 1109-1129.

Niskanen, J. & Niskanen, M., 2006. The Determinants of Corporate Trade Credit Policies in a Bank-Dominated Financial Environment: The Case of Finnish Small Firms. *European Financial Management*, Volume 12; No.1, pp. 81-102.

Nunn, K., 1981. The Strategic Determinants of Working Capital: A Product-Line Perspective. *Journal of Financial Research*, Volume 4, pp. 207-219.

OECD, 2005. *SME and Entrepreneurship Outlook*, Paris, France: OECD Publishing.

Padachi, K., 2006. Trends in Working Capital Management and its Impact on Firm's Performance: An Analysis of Mauritian Small Manufacturing Firms. *International Review of Business Research*, Volume 2; No.2, pp. 45-58.

Petersen, M. A. & Rajan, R. G., 1997. Trade Credit: Theories and Evidence. *Review of Financial Studies*, Volume 10; No.3, pp. 661-691.

Preve, L. & Sarria-Allende, V., 2010. *Working Capital Management*. Oxford University Press ed. New York: Financial Management Association Survey and Synthesis Series.

Raheman, A. & Nasr, M., 2007. Working Capital Management And Profitability - Case Of Pakistani Firms. *International Review of Business Research Papers*, Volume 3; No.1, pp. 279-300.

Reid, G. & Jacobsen, L. 1., 1988. In: *The Small Entrepreneurial Firm*. Aberdeen: Aberdeen University Press.

Richard, V. & Laughlin, E., 1980. A Cash Conversion Cycle Approach to Liquidity Analysis. *Financial Management*, pp. 32-38.

Schmidt, R. & Tyrell, M., 1997. Financial Systems, Corporate Finance and Corporate Governance. *European Financial Management*, Volume 3, pp. 333-361.

Schwartz, R. A., 1974. An Economic Model of Trade Credit. *Journal of Financial and Quantitative Analysis*, Volume 9; No.4, pp. 643-657.

Shin, H. & Soenen, L., 1998. Efficiency of Working Capital and Corporate Profitability. *Financial Practice and Education*, Volume 8, pp. 37-45.

Silva, S., 2012. *Effects of Working Capital Management on the Profitability of Portuguese Manufacturing Firms*, Minho: Unpublished Thesis (Masters) - Universidade do Minho.

Smith, J. K., 1987. Trade Credit and Informational Asymmetry. *Journal of Finance*, Volume 42, pp. 863-872.

Smith, K., 1980. Profitability versus Liquidity Tradeoffs in Working Capital Management. In: K. Smith, ed. Smith, K.V. ed. St Paul, MN: West Publishing Company: Readings on the Management of Working Capital, pp. 549-562.

Smith, K. V., 1986. State of Art of Working Capital Management. *Financial Management*, Volume 2; No.3, pp. 50-56.

Valadas, J., 2005. *O Impacto do Ciclo de Exploração na Rentabilidade das Empresas Portuguesas - Um Estudo Empírico*, Lisboa: Unpublished Thesis (Masters) - Instituto Superior de Economia e Gestão.

Walker, D., 1991. An Empirical Analysis on Financing the Small Firm. In: *Advances in Small Business Finance*. s.l.:R. Yazdipour, pp. 47-61.

Weinraub, H. J. & Visscher, S., 1998. Industry Practice Relating to Aggressive Conservative Working Capital Policies. *Journal of Financial and Strategic Decision*, Volume 11, pp. 11-18.

Wilner, B. S., 2000. The Exploitation of Relationships in Financial Distress: The Case of Trade Credit. *Journal of Finance*, Volume 55, pp. 153-178.

Wu, Q. S., 2001. The determinant of working capital management policy and its impact on performance. *National Science Council Project*, pp. Project No. NSC 89-2416-H-224-028.

APPENDIX

Table A 1 - Working Capital Management and the Relationship with Determinants

Author	Data	Sample	Type of firm (Size/Age)	Dependent Variable	Independent Variable
Lamberson (1995)	1980 – 1991 Moody's Industrial Manuals	50 firms	Small/New	Changes in economic activity (GDP)	Liquidity: <ul style="list-style-type: none"> • Current Ratio (+) • Quick Ratio (+) Working Capital: <ul style="list-style-type: none"> • Investment (-) • Current Assets (-)
Chiou et al. (2006)	1996 – 2004 Listed companies in Taiwan TEJ database	19.180 firms	Mixed/Mixed	Working capital Requirements (WCR)	<ul style="list-style-type: none"> • Recession (+) • Leverage (-) • Cash Flow (-) • Growth (-) • Age (+) • ROA (-) • Size (+)
Baños et al. (2010)	2001 – 2005 Iberian Balance Sheet Analysis System (SABI)	4.076 firms	Small/Mixed	Cash Conversion Cycle (CCC)	<ul style="list-style-type: none"> • Leverage (-) • Cash Flow (+) • Growth (-) • Size (n.s.) • Age (+) • Fixed Assets (-) • Profit (-) • GDP (n.s.)
Kieschnick et al. (2006)	1990 – 2004 Compustat and CRSP data	3.155 firms	High/Old	Cash Conversion Cycle (CCC)	<ul style="list-style-type: none"> • Size (+) • Fixed Assets (-) • Growth (+)
García-Teruel et al. (2010)	1996 – 2001 AMADEUS	3.589 firms	Small/Mixed	Accounts Payable	<ul style="list-style-type: none"> • Age (-) • Size (+) • Cash Flow (-) • FCost²⁰ (+) • FDebt²¹ (+) • Growth (+) • ICA²² (+) • Accounts Receivable (+) • Inventories (+)
				Accounts Receivable	<ul style="list-style-type: none"> • Age (-) • Size (+) • Cash Flow (m. f.) • FCost (-) • FDebt (-) • CASH (-)
Niskanen & Niskanen (2006)	1994 – 1996 Private Survey	840 firms	Mixed/Mixed	Accounts Payable	<ul style="list-style-type: none"> • Total Assets (+) • Age (+) • Cash Flow (+) (n.s.) • Growth (+) • Operating Margin (+) (n.s.) • GDP (-) (n.s.)
				Accounts Receivable	<ul style="list-style-type: none"> • Size (-) (n.s.) • Age (-) • Cash Flow (-) • GDP (+)

²⁰ Cost of External Financing

²¹ Short-term Financial Debt

²² Investment in Current Assets

Legend: (+) Positive Relationship; (-) Negative Relationship; (n.s.) No Statistical Significant Relationship; (m.f) Mixed Findings.

Table A 2 - Variables Description and Measurement

Variable Description	Variable Measurement
Profitability (PRO)	$Profitability = \left(\frac{Operating\ Results}{Total\ Assets} \right)$
Profitability Previous Period (PRO_{t-1})	<i>Firm profitability in the previous period</i>
Working Capital Management (WCM)	$CCC = \left(\frac{Accounts\ Receivable}{Sales} \right) \times 365 + \left(\frac{Inventories}{Purchases} \right) \times 365 - \left(\frac{Accounts\ Payable}{Purchases} \right) \times 365$
Working Capital Management Squared (WCM²)	$CCC = \left[\left(\frac{Accounts\ Receivable}{Sales} \right) \times 365 + \left(\frac{Inventories}{Purchases} \right) \times 365 - \left(\frac{Accounts\ Payable}{Purchases} \right) \times 365 \right]^2$
Firm Size (SIZE)	$Size = \log(\text{Number of Employees})$
Firm Growth (GROWTH)	$Sales\ Growth = \log(Sales_1) - \log(Sales_0)$
Leverage (LEV)	$Debt\ Ratio = \left(\frac{Short\ term\ loans + Long\ term\ loans}{Total\ Assets} \right)$
CEO's Gender	<i>Dummy variable, equaling one for men and zero for women</i>
CEO's Age	<p>Age20 – 29 is coded one for individuals with age between 20 and 29;</p> <p>Age30 – 39 is coded one for individuals with age between 30 and 39;</p> <p>Age40 – 49 is coded one for individuals with age between 40 and 49;</p> <p>Age50 – 60 is coded one for individuals with age between 50 and 60.</p>
CEO's Educational Level	<p>higheducation is a dummy variable equaling one for founders with bachelors, masters or doctoral degrees;</p> <p>mediumeducation is a dummy variable equaling one for individuals reporting a high school diploma or vocational school degree;</p> <p>loweducation is a dummy variable equaling one for individuals that attended junior high school;</p> <p>veryloweducation is a dummy variable equaling one for individuals who never attended or completed the elementary school.</p>

Table A 3 - Correlations Matrix

	<i>PRO</i>	<i>PRO</i> _{<i>t-1</i>}	<i>WCM</i>	<i>WCM</i> ²	<i>SIZE</i>	<i>GROWTH</i>	<i>LEVERAGE</i>
<i>PRO</i>	1						
<i>PRO</i> _{<i>t-1</i>}	0.6723	1					
<i>WCM</i>	0.0030	0.0026	1				
<i>WCM</i> ²	0.0029	0.0025	0.8469	1			
<i>SIZE</i>	0.0003	0.0015	-0.0282	-0.0178	1		
<i>GROWTH</i>	-0.0004	0.0001	0.0144	0.0116	0.0153	1	
<i>LEVERAGE</i>	-0.7431	-0.0082	-0.0022	-0.0021	0.0004	0.0002	1

This table reports the correlations matrix. Variables are as follows *PRO*= Firm Profitability; *PRO*_{*t-1*}= Firm Profitability in previous period; *WCM*= Number of days of Working Capital Management; *WCM*² = The Squared Number of days of Working Capital Management; *SIZE*= Natural Logarithm of Initial Number of Employees; *GROWTH*= Natural Logarithm of Sales; *LEVERAGE*= Firm Financial Debt Ratio.

Table A 4 - Number of Financial Institutions Across Regions

Geographic Location	NUTS (code)	2009	2008	2007	2006	2005	2004	Average
North	11	1865	1816	1743	1611	1571	1557	1693.83
Center	16	1215	1189	1119	1034	990	969	1086
Lisbon	17	1792	1767	1640	1542	1502	1510	1625.5
Alentejo	18	364	352	329	309	295	297	324.333
Algarve	15	297	289	262	237	235	222	257
A.R. Azores	20	162	159	158	148	151	150	154.667
A.R. Madeira	30	182	179	171	158	154	153	166.167

This table reports the number and distribution of financial institutions across geographic locations, defined by the second level of NUTS, during the period of 2004 to 2009. Source from INE.

Table A 5 - Distribution of Medium and Large Firms Across Regions (NUTS II)

Geographic Location	NUTS (code)	Frequency	Percentage
Norte	11	281	44.89
Centro	16	99	15.81
Lisboa	17	176	28.12
Alentejo	18	32	5.11
Algarve	15	21	3.35
Região Autónoma dos Açores	20	4	0.64
Região Autónoma da Madeira	30	13	2.08
Total		626	100.00

This table reports the number of medium and large sized firms across geographic locations, defined by the second level of NUTS.