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# THE DETERMINANTS AND CONSEQUENCES OF WORKING CAPITAL MANAGEMENT

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# ABSTRACT

Well-managed working capital plays an important role in running a sound and successful business as it has a direct influence on liquidity and profitability. Working capital management (WCM) has recently received an increased focus from businesses and been regarded as a key managerial intervention to maintain solvency, especially during the global financial crisis when external financing was less available (PwC, 2012). This thesis contains a comprehensive analysis of the determinants and consequences of WCM.

For the determinants of WCM, the results suggest that the nature of a firm's WCM is determined by a combination of firm characteristics, economic condition, and country-level variables. Sources of financing, firm size, and levels of profitability and investment in long-term assets play a vital role in the management of working capital. The financial downturn has also put increased pressure on firms to operate with a lower level of working capital. In addition, country-level variables (i.e., legal environment and culture) have a significant influence on determining a firm's WCM as well as its determinants.

For the consequences of WCM, the findings highlight the importance of higher efficiency in WCM in terms of its potential contribution in enhancing profitability. In particular, firms operating with lower accounts receivable, inventory, and accounts payable periods are associated with higher profitability. Firms can also enhance their profitability further by ensuring a proper "fit" among these components of working capital. Finally, achieving higher efficiency in inventory management can be a source of profitability improvements during the financial crisis.

Overall, the thesis contributes to the accounting and finance literature in two distinct ways: research design and new findings. A more extensive data set (in terms of countries coverage and time frame), new estimation technique (i.e., dynamic panel generalised method of moments (GMM) estimation to produce more consistent and reliable results), and substantive robustness tests (conspicuous by their absence in prior studies) were applied and result in several new empirical findings. First, a firm's WCM is influenced not only by internal factors but also external factors such as country setting, legal environment and culture. Second, a comprehensive measure of WCM (i.e., cash conversion cycle (CCC)) does not represent a useful surrogate for the effects of WCM on corporate profitability. Instead, an examination of the individual components of CCC gives more pronounced and valid results. Third, by managing working capital correctly, firms can enhance their profitability even further, at different levels, and through different components of profitability (including profit margin and asset productivity).

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# DECLARATION

I declare that this thesis has been composed by myself and that all the work is my own.

This work has not been submitted for any other degree or professional qualification.

Sasithorn Supatanakornkij, December 2014

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# CHAPTER 1

# INTRODUCTION

This introduction chapter, firstly, outlines the issues which lead to initial research questions. Secondly, the prior relevant literature is briefly overviewed as a basis for shaping the framework of the research conducted. Research opportunities evident in the literature are also highlighted. Thirdly, the research objectives are set out. Fourthly, the key findings and main research contributions are summarised. Finally, the structure of this thesis is explained.

## 1.1 Background

Corporate finance can be categorised into three main areas comprising capital budgeting, capital structure and dividend policy, and working capital management (WCM) (e.g., Hillier et al., 2010; Moles et al., 2011). While the first two areas, which involve raising and using long-term capital, traditionally have a high profile in the literature, WCM, which involves investing short-term capital in day-to-day operations and represents a significant element of a company's statement of financial position, draws relatively less research attention.

However, the importance of WCM should not be underestimated because even profitable and high growth firms cannot remain solvent without good liquidity management (Jose et al., 1996). More importantly, since the recent global economic downturn, not only did consumer demand shrink, which significantly hurt corporate revenue and the bottom line, but the availability of debt finance and businesses' ability

to secure it were also affected. As a result, the need to maintain low levels of working capital has become even more crucial. The credit crunch has tested the working capital practices at firms and, in several cases, firms with unsound WCM have become insolvent and ceased to exist. This failure has not affected only small or start-up companies. Several established businesses have failed due to a lack of liquidity rather than a lack of profitability (Crump, 2012). Accordingly, it is necessary for management to direct more attention to working capital strategies and policies in order not only to ensure firms survived during the financial crisis, but also to improve their competitive position and profitability.

### 1.2 Problems and Research Questions

During the uncertain economic conditions, WCM has been rising up the corporate agenda and there has been an increased pressure for businesses to take robust actions to reduce working capital. Some examples highlighted in practitioners' reports are presented here:

- 86% of over 800 executives from large global organisations indicate that their companies have intensified attempts to improve working capital processes and have also become more focused on cash management (Ernst & Young, 2010).
- 65% - 80% of respondents of a survey of 200 financial executives of European companies state that their companies will pursue either moderate or substantial improvement in different areas of WCM, including investment return on cash and cash equivalents, days sales outstanding, days payable outstanding, and days inventory outstanding (RBS, 2011).

- Based on the largest 500 global companies (by revenue) between 1987 and 2009, working capital performance has gradually improved across the board (KPMG, 2011).

Despite the attempts being made to improve WCM efficiency, several concerns about corporate WCM are also evident in contemporary practitioners' reports. These concerns can be grouped into three different categories relating to WCM. First, there are still dramatic levels of cash tied up in working capital. "All Tied Up", a series of WCM reports by Ernst & Young (2011), reveals that the working capital cash 'opportunity' for the leading 2,000 US and European companies in 2010 and 2011 is $1.1 and $1.2 trillion of cash, respectively. This amount is equivalent to almost 7% of annual sales. Similarly, Deloitte (2012), based on UK listed companies with annual sales more than £60 million, reports an increasing level of excess working capital from £59 billion in 2009 to £60 billion in 2010, and £64 billion in 2011. These figures show that there are marked differences in companies' working capital performance, and the upper quartile performers demonstrate that there is considerable scope for others to improve. A marked gap exists (and is becoming bigger) between those companies who are efficient in WCM and those who are not. Such variations in companies' WCM performance provide an opportunity to investigate firm-specific factors that drive these differences in firms' WCM.

Second, apart from there being diverging WCM performance within countries, there is also evidence of a significant diverging trend across countries. For example, Ernst & Young (2011) indicate that US-headquartered companies have exhibited much

lower levels of working capital than those based in Europe. The reasons that may partially explain the working capital performance gap between these two regions include smaller and dispersed production, logistics and distribution facilities over several countries in Europe, and benefits from the absence of national borders in US. Deloitte (2012) shows marked differences in working capital performance between UK companies and their Western European and US peers. In particular, while there is no prevailing difference in days receivable outstanding (DSO) among UK, Western Europe and US, days payable outstanding (DPO) are much shorter in UK and US than those of Western European companies. This may be due to the cultural norm in Western Europe primarily driven by both longer payment terms and delays in payment. In addition, US companies seem to pay greater attention to inventory management as indicated by lower days inventory outstanding (DIO) and narrower quartile spread. Hence, there is also potential for research to examine the extent to which country-level factors can explain the variations in international WCM performance.

Finally, it is common in WCM benchmarking practice for companies' working capital performance to be compared against those of their industry upper quartile companies i.e., those evidencing the highest levels of efficiency in WCM (shorter DSO, shorter DIO, and longer DPO). In other words, these upper quartile companies tend to adopt more aggressive WCM policies. However, it can be argued that aggressive WCM policies do not always necessarily represent a better way of WCM. This is because they may incur costs related to a fall in customer retention, materials scarcity and price fluctuations, missed early payment discount, and late payment penalties. Therefore,

valid focus for research is the extent to which efficiency in WCM can improve corporate profitability.

As a result of these three concerns in WCM, the research questions for this doctorate are identified as shown in Table 1.1 below.

**Table 1.1: Potential Research Questions**

| Empirical Concerns | Research Questions |
|---|---|
| 1) Wider gaps in WCM performance are reported at firm level. | 1) To what extent do firm-specific factors influence the variations in corporate WCM? |
| 2) Marked differences in WCM performance are reported at country level. | 2) To what extent do country-specific factors influence the variations in corporate WCM? |
| 3) Both aggressive and conservative WCM policies have benefits and drawbacks on profitability. | 3) To what extent can higher efficiency in WCM improve corporate profitability? |

### 1.3 Summary of Current Literature and Research Opportunities

As a first step in answering these three research questions, the prior literature has been reviewed. To date, the WCM literature comprises mainly empirical studies. In particular, there are two main lines of research: 1) the determinants of WCM, and 2) the relationship between WCM and a firm's profitability.

### 1.3.1 The Determinants of WCM

The first research stream focuses on the determinants of WCM as summarised in Table 1.2. Despite the limited number of research studies within this particular stream, the prior literature has evolved in several different ways. Firstly, there has been the investigation of a range of determinants extending from fundamental firm characteristics such as firm size, age, and growth opportunities to levels of asymmetric information, and financial distress conditions. These additional variables help to achieve a better fit for empirical models as indicated by the improvement in adjusted $R^2$. To demonstrate, adjusted $R^2$ increases from 0.05 in Chiou et al. (2006) to 0.10-0.15 in Hill et al. (2010), and 0.21 in Wasiuzzaman and Arumugam (2013), in part, due to a greater number of independent variables being used.

Secondly, to alleviate potential endogeneity concerns i.e., that independent variables (e.g., sales growth and profitability) can be influenced by the dependent variable of WCM, Hill et al. (2010) use lag independent variables in their study. This approach is later followed by Wasiuzzaman and Arumugam (2013). To ensure more robust results, Baños-Caballero et al. (2013) adopt the two-step system Generalised Method of Moments (GMM) estimator in their study.

Finally, Baños-Caballero et al. (2013), for the first time, employ a target level of working capital as one of the determinants of the current level of working capital. Peles and Schneller (1989) suggest that current assets and liabilities are to a large extent easier to adjust and manipulate, even in a short term (as cited in Baños-Caballero et al., 2013, p.979).

## Table 1.2: Summary of Prior Empirical Research of the Determinants of WCM

| | Chiou et al. (2006) | Kieschnick et al. (2006) | Nazir and Afza (2009) | Hill et al. (2010) | Baños-Caballero et al. (2013) | Wasiuzzaman and Arumugam (2013) |
|---|---|---|---|---|---|---|
| Dependent Variable | Working capital requirements | Cash conversion cycle | Working capital requirements | Working capital requirements | Working capital requirements | Working capital requirements |
| Country | Taiwan | USA | Pakistan | USA | Spain | Malaysia |
| Period | 1996-2004 | 1990-2004 | 2004-2007 | 1996-2006 | 1997-2004 | 2000-2007 |
| Methodology | OLS | FE | OLS | FE | GMM | OLS |
| Determinants | | | | | | |
| **Macroeconomic:** | | | | | | |
| Economic condition | – | n/a | Not sig. | n/a | + | + |
| **Firm Characteristics:** | | | | | | |
| Leverage | – | n/a | – | n/a | – | – |
| Growth opportunities | Not sig. | + | Not sig. | – | – | + |
| Firm size | + | + | Not sig. | + | Not sig. | – |
| Firm age | + | n/a | n/a | n/a | n/a | – |
| Profitability | + | n/a | + | Not sig. | – | Not sig. |
| Operating cash flow | – | n/a | Not sig. | + | + | + |
| Market power | n/a | Not sig. | n/a | Not sig. | n/a | n/a |
| Asset tangibility | n/a | Not sig. | n/a | n/a | – | – |
| Asymmetric information | n/a | n/a | n/a | – | n/a | – |
| Sales volatility | n/a | n/a | n/a | – | n/a | – |
| Financial distress | n/a | n/a | n/a | – | – | n/a |
| Targeted level of working capital | n/a | n/a | n/a | n/a | + | n/a |
| **Board Characteristics:** | | | | | | |
| Board size | n/a | Not sig. | n/a | n/a | n/a | Not sig. |
| Board independence | n/a | – | n/a | n/a | n/a | Not sig. |
| CEO's compensation | n/a | – | n/a | n/a | n/a | n/a |
| CEO's unexercised stock options | n/a | – | n/a | n/a | n/a | n/a |
| Proportion of stocks held by CEO | n/a | + | n/a | n/a | n/a | n/a |

*Notes:* As the definition and formula of variables mentioned in this table may vary across the literature, please refer to their corresponding literature for the full definition.
+ indicates a significant and positive relationship; – indicates a significant and negative relationship;
Not sig. indicates an insignificant relationship; n/a indicates a variable not being included in the literature.

Hence, Baños-Caballero et al. (2013) expect that firms will adjust their working capital to a target level where the benefits of doing so exceed the costs of adjustment. Using a partial adjustment model, their results confirm that firms have a target level of working capital and actively pursue policies to reach their target.

Although the prior literature does address the first research question (in Table 1.1), there remains a number of research opportunities in this area:

- Little is known about the determinants of WCM in European countries. Given that there are differences in firms' fundamental characteristics, there is not sufficient evidence on how theories formulated for firms operating in US or Asia can be applied elsewhere. Research based on European firms will provide a good opportunity to compare and contrast the results with those of other regions.
- As the prior literature has been country specific in its location, the international WCM differences (directly related to the second research question) cannot be reliably explained because of this design characteristic.
- Timescales of the prior literature cover the period before the recent financial crisis. Thus, missing from the literature is research examining the extent to which the financial crisis has had an impact on how firms manage their working capital.

### 1.3.2 WCM and Corporate Profitability

The second research stream, which has received relatively more research attention, focuses on the effects of WCM on a firm's profitability. A change in working capital components can influence profitability as summarised below.

For accounts receivable, an account receivable increase may incentivise customers to more sales when the demand is low as it allows customers sufficient time to test the products and services quality before paying. However, an increase in accounts receivable may incur higher operating costs in relation to personnel in credit control, debt collection and losses from bad debts, and higher financing costs in the form of accounts receivable financing and the opportunity cost of delayed payment to suppliers.

For inventory, an inventory increase may boost sales as it allows a quicker off the shelf service to customers. On the other hand, an increase in inventory may incur higher operating costs in relation to storage, security, and insurance costs, as well as costs relating to obsolescence and pilferage. In addition, an increase in inventory may restrict funding for profitable opportunities.

For accounts payable, an accounts payable increase (i.e., stretching payment to suppliers) may result in firms forgoing an early payment discount (which will reduce gross purchases by the amount of cash discount received). Although suppliers do not charge an explicit interest rate, the most typical term of trade (i.e., 2/10 net 30) indicates the cost of not making the prompt payment within 10 days to take the advantage of the cash discount and borrowing from suppliers for 20 more days being

equal an implicit annual interest rate of 43.9%. In addition, if firms pay after the credit term provided by their suppliers, late payment penalties may be applied.

These changes in individual working capital components are likely to have various influences on levels of sales, costs of sales, and operating and financing expenses (i.e., the components of accounting profit). If such changes increase sales more than costs of sales and expenses as if they simply reduce costs and expenses, these will have a positive impact on profit and vice versa. In addition, while some of the impact can be quantified, others are very difficult to predict. On the one hand, an increase in bad debts expense in respect of accounts receivable; storage, insurance and obsolescence in respect of inventory; and late payment penalty in respect of accounts payable can be estimated (e.g., using the common-size analysis). To illustrate, based on historical data, accounts receivable aging suggests that uncollectible debt is about 3% of total accounts receivable account. Thus, if accounts receivable increases by $10,000, it is likely that bad debts expense will increase by $300. It will have a net negative impact on profit by $30 given that an increase in accounts receivable does not have a positive impact on sales. Likewise, if inventory aging schedule suggests that obsolete inventory which has to be written down is 4.5% of inventory balance, given an increase of inventory by $20,000 in following year, it can be expected that this will cause loss for a company of $900. PwC (2012) reports that a typical business with a credit purchase of €100 million per year is likely to incur a late payment penalty of at least €0.8 million. Thus, an increase in credit purchase (i.e., higher accounts payable) will result in an increase in late payment penalty which simultaneously reduces profit. On the other hand, the effect of

inventory and accounts receivable being higher on customer demand is much more intricate to quantify. Chapter 5 of the thesis may throw some light on the magnitudes.

The prior literature is summarised in Table 1.3. Empirical contributions to this line of research have been developed in the following ways. To start with, apart from using the integrated measures of WCM (e.g., net trade cycle (NTC) and cash conversion cycle (CCC)), Deloof (2003) examines the effects of individual components of working capital (i.e., accounts receivable (AR), inventory (INV) and accounts payable (AP)) and, thus, provides evidence on which components are likely to exercise a greater influence on corporate profitability. A similar specification which adopts the components of working capital as main independent variables is later applied in other research studies (e.g., Lazaridis and Tryfonidis, 2006; Garcia-Teruel and Martinez-Solano, 2007; Gill et al., 2010; Raheman et al., 2010). Among the three components (i.e., AR, INV and AP), the prior literature somewhat conclusively suggests that a reduction in AR is the most crucial component to profitability enhancement.[1]

Furthermore, since Deloof (2003, p.584) states that "it cannot be ruled out that the negative relation between WCM and profitability is to some extent a consequence of profitability affecting WCM, and not *vice versa*", potential endogeneity problems appear to be another main contribution in the literature. Garcia-Teruel and Martinez-Solano (2007) adopt instrumental variables (IV) to address this concern and find an insignificant relationship between AP and a firm's profitability. This is in contrast to the significant and negative relationship apparent when not controlling for endogeneity.

[1] As summarised in Table 1.3, there is an exception in this conclusion in Raheman et al. (2010) whose result shows that there is no significant relationship between AR and a firm's profitability based on fixed effect estimation.

**Table 1.3: Summary of Prior Empirical Research of the Relationship between WCM and a Firm's Profitability**

| Paper | Country | Sample Size | Period | Performance Measure | WCM Measure | Methodology | Findings |
|---|---|---|---|---|---|---|---|
| Soenen (1993) | USA | 5,043 | 1970-1989 | Total return on total assets (TROTA) | Net trade cycle (NTC) | Chi-square test | Negative but not very strong. |
| Jose et al. (1996) | USA | 54,360 | 1974-1993 | Return on assets (ROA), Return on equity (ROE) | Cash conversion cycle (CCC) | OLS | Negative and significant. |
| Shin and Soenen (1998) | USA | 58,985 | 1975-1994 | Operating income plus depreciation to total assets (IA) and to total sales (IS) | NTC | OLS | Negative and significant. |
| Wang (2002) | Japan, Taiwan | 21,274 | 1985-1996 | ROA, ROE | CCC | OLS | Negative and significant. |
| Deloof (2003) | Belgium | 5,045 | 1992-1996 | Gross operating profit (GOP) | CCC, AR, INV, AP | OLS, FE | Negative and significant, except for that of CCC based on FE which is negative but not significant. |
| Eljelly (2004) | Saudi Arabia | 107 | 1996-2000 | Net operating income (NOI) | Current ratio (CR), CCC | OLS | Negative and significant for CR, and negative but not significant for CCC. |
| Lazaridis and Tryfonidis (2006) | Greece | 524 | 2001-2004 | GOP | CCC, AR, INV, AP | OLS | Negative and significant, except for that of AP which is positive and significant, and that of INV which is negative but not significant. |
| Afza and Nazir (2007) | Pakistan | 1,664 | 1998-2005 | ROA, ROE, Tobin's q | Total current assets to total assets (TCA/TA), total current liabilities to total assets (TCL/TA) | OLS | Positive and significant for TCA/TA, and negative and significant for TCL/TA. |
| Garcia-Teruel and Martinez-Solano (2007) | Spain | 38,464 | 1996-2002 | ROA | CCC, AR, INV, AP | FE, IV (instrument: first lag of CCC, AR, INV, AP) | Negative and significant, except for that of AP based on IV which is negative but not significant. |
| Gill et al. (2010) | USA | 264 | 2005-2007 | GOP | CCC, AR, INV, AP | OLS | Negative and significant for AR, positive and significant for CCC, positive and not significant for INV and AP. |
| Raheman et al. (2010) | Pakistan | 2,040 | 1998-2007 | Net operating profit (NOP) | CCC, NTC, AR, INV, AP | FE | Negative and significant, except for that of AR which is negative but not significant, and that of AP which is positive but not significant. |
| Baños-caballero et al. (2014) | UK | 1,606 | 2001-2007 | Tobin's q | NTC | GMM (instrument: up to four-year lag of all independent variables) | Positive and significant below the optimal level but negative and significant above the optimum level. |

*Notes:* For the full definition of variables mentioned in this table, please refer to their corresponding literature.

These contrasting results reflect the endogenous nature of WCM variables, in particular AP, and suggest that fixed effect estimation (FE) that does not address the endogeneity issue may lead to biased results.

A final development in this line of research is in Baños-Caballero et al. (2014). They mention two competing views on WCM (i.e., aggressive and conservative approaches). As both approaches have positive and negative effects on firm performance, they expect possible non-linearities in this relationship. Their findings indicate an inverted U-shape relation between working capital and firm performance. They suggest that at working capital levels below the optimal level (i.e., net trade cycle of 66.95 days), an increase in working capital has a positive impact on firm performance primarily due to increased sales and early payments discounts. Conversely, at levels above the optimum, an increase in working capital has a negative impact on firm performance due to rising opportunity costs and financing costs.

Despite prior research providing some evidence to answer the third research question proposed in this paper (in Table 1.1), there are still gaps in the literature as outlined below:

- Although the prior literature focuses on how to manage working capital at both an overall level (as measured by CCC and NTC) and individual elements level (as measured by AR, INV, and AP), it can be argued practically that a firm should manage its working capital in concert rather than individually. Neglecting an appropriate "fit" between each element of working capital may lead to a company developing serious liquidity problems. One of the more

obvious examples is "overtrading" which occurs when a company expands its operations too quickly (aggressively) and its own sales invoices are being paid with delays.[2] As a consequence, there is not sufficient cash to pay their suppliers and employees.

- Although some of the potential endogeneity concerns have been addressed in Garcia-Teruel and Martinez-Solano (2007) and Baños-caballero et al. (2014), the prior literature still overlooks another important type of endogeneity concern called "dynamic endogeneity". A dynamic endogeneity exists when the past value of a dependent variable (a firm's profitability) affects the current value of an independent variable (WCM). Without acknowledging and, therefore, properly controlling for this particular type of endogeneity, the prior literature still has the potential to generate biased results.
- While the existing literature examines the effects of WCM on a firm's profitability as commonly measured by return on assets (ROA) and return on equity (ROE), there is an opportunity for further investigation to improve the understanding regarding the mechanism of how corporate profits are affected by WCM efficiency. To be more precise, whether efficiency in WCM takes effect through some components of ROA and ROE (i.e., profit margin, assets productivity, and equity multiplier) or all components to generate a multiplicative boost to profitability.

[2] "Overtrading, or undercapitalisation, occurs if a company is trying to support too large a volume of trade from too small a working capital base, and emphasises the need to make adequate provision for investment in working capital. It is essentially the result of the supply of funds failing to satisfy the demand for funds within a company. Even if a company is operating at a profit, overtrading can result in a liquidity crisis with the company being unable to meet its debts as they fall due, because cash has been absorbed by growth in fixed assets, stock and debtors." (Watson and Head, 1998, p.275)

- Finally, an analysis of the effects of WCM on a firm's profitability both before and during the financial crisis will shed light on the greater importance of efficiency in WCM during the economic downturn.

### 1.4 Research Objectives

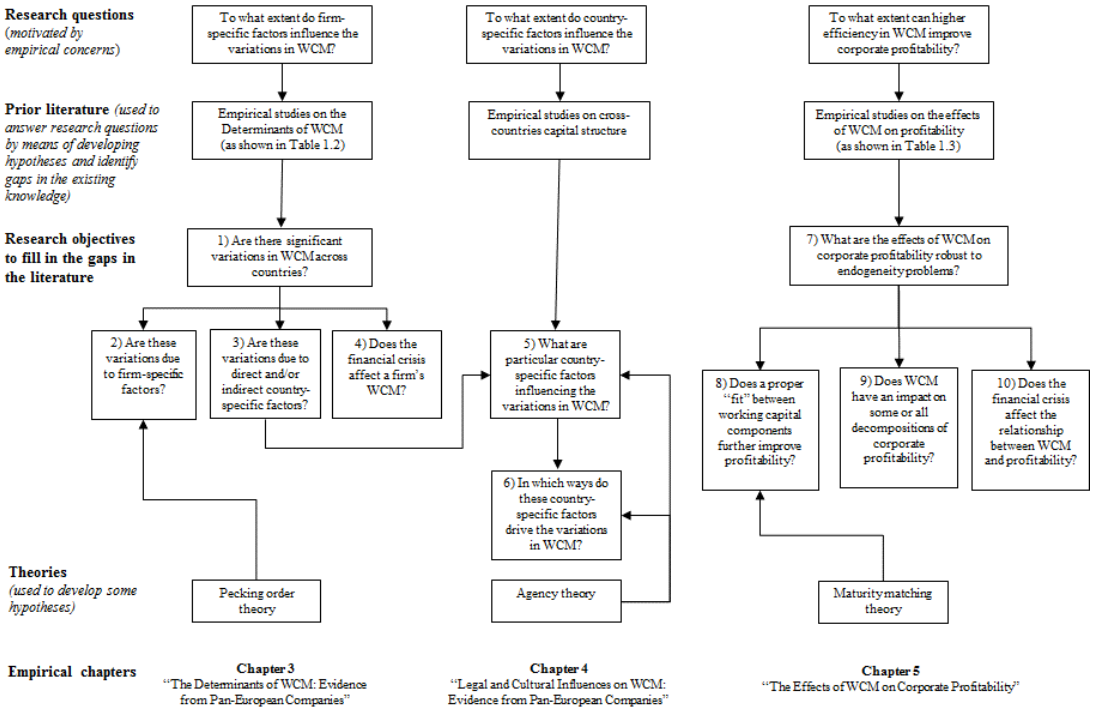
In order to answer the research questions and fill in the gaps in the literature, the research objectives are set as follows:

1) To examine whether there are (statistically) significant variations in WCM across countries.
2) To examine whether the variations in WCM are due to firm-specific factors.
3) To examine whether the variations in WCM are also due to country-specific factors (direct country effects) and/or differences in firm-specific factors across countries (indirect country effects).
4) To examine the effects of the financial crisis on a firm's WCM.
5) To identify particular country-specific factors that can influence the variations in WCM.
6) To examine in which ways and to what extent the identified country-specific factors drive the variations in WCM.
7) To examine the effects of WCM efficiency on corporate profitability, controlling for all of the potential endogeneity concerns.
8) To examine whether or not a proper "fit" between the components of working capital further enhances corporate profitability.
9) To explore a mechanism of how WCM can affect corporate profitability, in particular through profit margin, asset productivity, equity multiplier, or altogether.

10) To examine the effects of the financial crisis on the relationship between WCM and corporate profitability.

The links between the above objectives of this research and the prior literature are depicted in Figure 1.1 below. These research objectives are separately explored in three empirical chapters where a number of formal research hypotheses are tested. The objectives 1) – 4) are addressed in Chapter 3; objectives 5) and 6) in Chapter 4; and objectives 7) – 10) in Chapter 5. The methodologies employed are primarily drawn from the previous literature, after addressing related issues. Rigorous robustness tests are also conducted to ensure that the reported results are not sensitive to potential confounding factors.

**Figure 1.1: The Links of Current Research with the Empirical Literature on WCM**



## 1.5 Theory Choice and Use in the Thesis

As seen in Figure 1.1, for WCM research, hypotheses are typically underpinned by empirical studies. However, in this study, three main theories (i.e., pecking order theory, agency theory, and maturity matching theory) are also applied to derive some hypotheses.

### 1.5.1 Pecking order theory

According to pecking order of capital structure, as mentioned in Myers (1984), firms prefer internal finance. This is because there are costs of relying on external financing (e.g., administrative and underwriting costs, and in some cases underpricing of the new securities). In addition, Myers (1984, p. 584) states that "asymmetric information creates the possibility of a different sort of cost: the possibility that the firm will choose not to issue, and will therefore pass up a positive-NPV investment. This cost is avoided if the firm can retain enough internally-generated cash to cover its positive-NPV opportunities". However, if internally generated cash flow is not sufficient for investment opportunities, external finance is required and firms issue the safest security first (i.e., debt, hybrid securities, and equity, respectively). In addition, Myers (1984) also argues the practicality of the pecking order theory that:

> Of course, the pecking order hypothesis can be quickly rejected if we require it to explain everything. There are plenty of examples of firms issuing stock when they could issue investment-grade debt. But when one looks at aggregates, the heavy reliance on internal finance and debt is clear. For all non-financial corporations over the decade 1973-1982, internally generated cash

> covered, on average, 62 percent of capital expenditures, including investment in inventory and other current assets. The bulk of required external financing came from borrowing. Net new stock issues were never more than 6 percent of external financing. Anyone innocent of modern finance who looked at these statistics would find the pecking order idea entirely plausible, at least as a description of typical behavior (Myers, 1984, p. 582).

Pecking order theory is applied in Chapter 3 to help in examining the effects of firm-specific determinants on WCR. In particular, firms with higher internally generated cash flow are expected to have greater capability to invest more in working capital as the cost of using cash flow to fund working capital is cheaper than the cost of using external finance. On the other hand, firms with higher external finance reflect the circumstance of having less internally generated cash flow. These firms should exercise more restrictive working capital policies in order to squeeze cash that is unnecessarily tied up in working capital, and so eliminate triggering additional external finance.

### 1.5.2 Agency theory

According to agency theory, the board of directors (shareholders) perform two main activities i.e., monitoring top executives (managers) and giving them a reward (Jensen and Meckling, 1976; Fama and Jensen, 1983). The separation between ownership and control addresses some issues since shareholders and managers may have different sets of goals, and agents may act to pursue their own interests rather than shareholders' interests (moral hazard). In addition, because shareholders are at a greater distance from the firm as compared to managers, the former processes less information (Nowak

and McCabe, 2003). Due to this information asymmetry which gives managers an information advantage, there is a chance for managers to act opportunistically (Hölmstrom, 1979).

Capital structure theories have emphasised the role played by debt in reducing agency conflicts between shareholders and managers (e.g., Jensen, 1986; Hart and Moore, 1995). In particular, debt reduces the agency cost of free cash flow by reducing the cash flow available (i.e., the discretionary funds for spending under managerial control are less).

Agency theory is applied in Chapter 4 to examine the direct effects of culture on WCR and the indirect effects of culture on WCR through the use of debt. For the direct effects, in cultures that have a lower agency problem (i.e., cultures where group interests precede individual interests) managers are likely to act in the best interests of shareholders. Thus, higher efficiency in working capital management (i.e., lower levels of WCR) is expected as this means higher levels of cash are available to be distributed directly to shareholders in terms of dividends. For the indirect effects, it can be expected that in cultures that have a lower agency problem, the benefit and therefore the use of debt finance is decreased. As a result, firms in this culture are less likely to finance their WCR with debt.

### 1.5.3 Maturity matching theory

Maturity matching theory suggests that asset maturity may influence the choice of debt maturity of firms. Myers (1977) argues that matching the maturities between debt and

assets of a firm ensure that debt repayments are scheduled to correspond with the decrease in the asset values, thereby reducing the agency costs of debt. Therefore, firms with more long-term assets will have more long-term debt and vice versa. Stohs and Mauer (1996) also argue that when debt maturity is shorter than that of assets, firms are unlikely to have enough cash to meet their obligations when fall due. On the other hand, when debt maturity is longer than that of assets, cash flow from assets is likely to cease before fulfilling debt obligations. Likewise, this theory is applied in the studies of trade credit. Petersen and Rajan (1997) suggest that it is less likely that firms will finance long-term investments with trade credit. In particular, firms whose assets comprise mainly of short-term assets will demand more trade credit. Based on their results, demand for trade credit is positively related to short-term assets (excluding cash). At the margin, 17% of the firm's current assets are financed by trade credit.

Maturity matching theory is applied in Chapter 5. This theory provides rationales based on the empirical implication that firms do not management working capital components (e.g., accounts receivable, inventory, and accounts payable) separately. Instead, there is interdependence between the components of working capital. In particular, Chapter 5 will examine the consequence of the adoption of maturity matching in WCM whether it will provide positive or negative effects on a firm's profitability.

### 1.6 Key Findings and Research Contributions

The key findings and novel contributions of all three empirical chapters (Chapters 3-5) are summarised below:

### 1.6.1 Chapter 3 – The Determinants of WCM: Evidence from Pan-European Companies

The findings suggest that there are significant variations in WCM across pan-European companies. Firms' WCM are influenced by a combination of firm-specific characteristics (i.e., external and internal financing, firm size, and levels of profitability and investment in fixed assets) and country setting. The findings provide new insights that country setting has both direct effects and indirect effects through firm-specific determinants on corporate WCM. In addition, the finding adds to the literature that WCM is also influenced by economic condition, especially the shock of financial crisis.

### 1.6.2 Chapter 4 – Legal and Cultural Influences on WCM: Evidence from Pan-European Companies

Two country-level variables (i.e., legal environment and culture) are found to have a significant influence in determining a firm's WCM. In addition to their direct effects on WCM, legal environment and culture also have indirect effects on WCM through the use of external debt to finance working capital. The findings provide original evidence to systematically explain the reasons behind variations in WCM across countries.

### 1.6.3 Chapter 5 – The Effects of WCM on Corporate Profitability

The findings suggest that higher efficiency in WCM by means of a reduction in accounts receivable, inventory, and accounts payable periods are associated with increased operating profit. In addition, a proper "fit" among these three components of working capital that is consistent with the maturity matching hypothesis will further enhance profitability at both operating profit and net income levels. The findings raise

the understanding and importance of WCM in terms of its contributions on corporate profitability. By managing working capital effectively, firms are able to improve profitability at different levels, through different components of profit return, and even during the economic downturn.

### 1.7 Thesis Outlines

This thesis is organised in six chapters. Chapter 2 provides the definition of WCM that is used in the study, presents the broad overview of WCM concept, and describes the measures of WCM which will be later selected and applied in each empirical chapter. The next three chapters contain the three empirical research studies. Chapter 3 examines the determinants of WCM. Chapter 4 examines country-specific influences on WCM. Chapter 5 examines the effects of WCM efficiency on profitability. Within each empirical chapter, a set of relevant and important prior literature is reviewed. In addition, data sets, variables, and methodologies employed are described, empirical results are presented and discussed, robustness tests are performed, and main practical implications are summarised. Chapter 6 concludes the thesis by summarising the main findings, highlighting key contributions, discussing the limitations of this study, and considering possible extensions for future work.

# CHAPTER 2

# OVERVIEW OF WORKING CAPITAL MANAGEMENT

This chapter provides the definition and overview of WCM and its components, and presents a number of WCM variables which will be employed in Chapters 3-5.

## 2.1 Definition of WCM

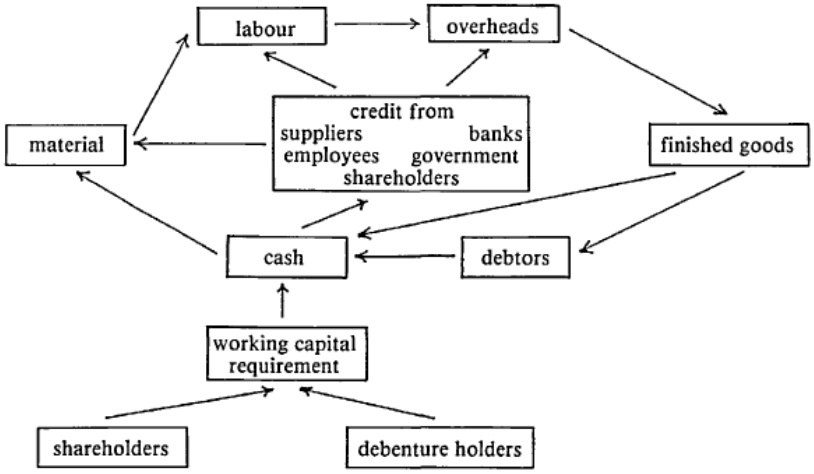
Pass and Pike (1984) summarise balance sheet accounts into five broad catergories: 1) fixed assets, 2) current assets, 3) current liabilities, 4) shareholders' equity, and 5) long-term loans. They state that "working capital may be regarded as the *balance* between current assets and current liabilities" (Pass and Pike, 1984, p.1). In addition, Berk and DeMarzo (2007) state that the level of investment in working capital varies from firm to firm, and industry to industry.[3]

Apart from being viewed as a static value as shown in a balance sheet, working capital can also be viewed as a "flow" value. As depicted in Figure 2.1, Pass and Pike (1984) connect the concept of working capital with a firm's cycle of activities to illustrate a dynamic flow of cash. The sources of funding of working capital requirements are from shareholders, debenture holders as well as operational cash inflows. These sources are used to finance materials needed for production. If purchases are made on credit, they are initially financed by the suppliers until payables are paid. Once the production is completed, finished goods are sold to customers. Subsequently, money

[3] Several studies of working capital examine if industry differences exist in working capital policies (e.g., Hawawini et al.,1986; Weinraub and Visscher, 1998; Filbeck and Krueger, 2005). Their results suggest that there is a significant industry effect on a firm's investment in working capital and firms are likely to adhere industry benchmarks when setting their working capital policies.

from sales will be used to pay off payables, finance new investments, or return to shareholders as dividends. From here, the cycle starts over again. Therefore, it is clear from this diagram that a primary task of WCM involves the management of current assets and current liabilities in terms of both timing and magnitude to ensure that a firm's day-to-day operations can run without interruption.

**Figure 2.1: The Working Capital Cycle**




Source: Pass and Pike (1984, p.2)

As working capital is the net of current assets and current liabilities, positive working capital shows that companies have current assets that exceed current liabilities. This situation indicates that companies have sufficient short-term assets to pay off their short-term obligations. Nonetheless, positive working capital is not always a good thing. This is because it can reflect a high level of capital tied up in companies' current assets. In contrast, negative working capital typically indicates that companies do not have liquid assets sufficient to pay off short-term debts. However, for some firms (e.g., cash based retail firms), negative working capital is not detrimental but beneficial. This

is because these firms tend to be better at raising cash than those with positive working capital balances. Nathan (2012) observes that negative working capital is usually found in companies with high market power. They can demand longer credit terms from 'fragmented' suppliers, while they are able to sell for cash and/or collect payments from customers relatively quickly. In addition to market power, negative working capital arises in certain types of business. For instance, negative working capital is common in telecoms, retail, and fast-moving consumer goods (FMCG) sectors which are able to collect cash upfront and pay suppliers later.

### 2.1.1 Components of Working Capital

Although the main components of working capital are typically cash, inventory, accounts receivable and accounts payable, Berk and DeMarzo (2007, p.830) point out that "working capital includes the cash that is needed to run the firm on a day-to-day basis. It does not include excess cash, which is cash that is not required to run the business and can be invested at a market rate. …, excess cash may be viewed as part of firm's capital structure, offsetting firm debt". In addition, unlike accounts receivable, inventory, and other current assets, cash holdings are invested by firms in commercial paper, treasury bills, or short term government securities which present a fair return for riskless investments. Due to its different levels of returns and risks, cash should not be included in measures of working capital, especially when a focus is placed on examining the effects of WCM on a firm's profitability (Chapter 5). Last but not least, cash holdings are usually studied in the literature that is distinct from that of working capital (e.g., Faulkender and Wang, 2006; Pinkowitz et al., 2006; Dittmar and Mahrt-Smith, 2007 on the value of cash holdings, and Kim et al., 1998; Opler et

al., 1999 on the determinants of corporate cash holdings). Consequently, the term 'working capital' in this thesis is defined as non-cash working capital.

### 2.1.2 Aggressive versus Conservative WCM Policies

For effective management of working capital, two main goals should be satisfied: profitability and liquidity (Pass and Pike, 1984). While the profitability goal can be defined as shareholder wealth maximisation or at least enhancement, the liquidity goal ensures a firm's ability to meet its financial obligations and continue as a going concern (Pass and Pike, 1984). However, these dual goals conflict i.e., low liquidity risk and low return WCM policies are regarded as conservative, whereas high liquidity risk and high return WCM policies are regarded as aggressive (Weinraub and Visscher, 1998).

Firms adopting conservative WCM policies invest more in short-term assets, most of which are financed by higher cost long-term debt or even equity in order to postpone or avoid the principal repayment of debt (Weinraub and Visscher, 1998; Van Horne and Wachowicz, 2004). These policies enhance liquidity but sacrifice some profitability. On the other hand, firms adopting aggressive WCM policies tend to minimise both short-term assets and higher cost long-term debt. As a result, these policies are inclined to utilise higher levels of lower cost short-term debt. This approach decreases capital costs but increases the risk of short-term liquidity problems. As both conservative and aggressive WCM policies have advantages and disadvantages, management should establish the optimal trade-off between

profitability and liquidity to pursue effective WCM. Some advantages and disadvantages of both WCM policies are listed below.

Conservative WCM Policies

- Long trade credit allows customers a sufficient time to test the products and services quality before paying, thereby stimulating sales (Smith, 1987; Long et al., 1993; Deloof and Jegers, 1996).
- When demand is low, generous credit terms can also be used to incentivise customers to more sales (Emery, 1987).
- High inventory levels make prompt customer service easier.
- High inventory protects firms from business interruptions and losses from stockouts due to high demand, product scarcity, and materials price fluctuation (Blinder and Maccini, 1991).
- However, a large amount of cash is 'trapped' in working capital investments and this may restrict investment in other profitable opportunities.
- In extreme situations, a conservative WCM policy can reflect the problem of overtrading and become highly detrimental to firms.
- Firms incur higher financing costs due to higher levels of investment in short-term assets and higher costs of long-term debt relative to that of short-term debt.

Aggressive WCM Policies

- Firms incur lower operating costs as a result of lower levels of short-term assets (e.g., personnel costs in credit control and debt collection, and losses from bad

debts in respect of accounts receivable, and warehouse rental and insurance expense, and cost of obsolete inventory in respect of inventory).

- Firms incur lower financing costs primarily due to higher reliance on accounts payable, and cheaper cost of short-term debt.
- However, firms may face risks from stockouts and a fall in customer retention.
- Firms may forgo an early payment discount from stretching payment to suppliers.
- Firms may be charged a late payment penalty.
- Constant delays in payment may destroy an established relationship with suppliers and firms may be unable to negotiate better deals in the future.

## 2.2 Measurements of WCM

The prior literature provides several financial ratios which represent good summary indicators or measures of WCM.

### 2.2.1 The Current Ratio and Quick Ratio

The most conventional approaches to measuring liquidity and WCM are the current ratio and the quick ratio. The current ratio is defined as the ratio of current assets to current liabilities. The quick ratio is the ratio of current assets net of inventory to current liabilities. These ratios, however, have been criticised by many authors (e.g. Emery 1984; Kamath, 1989) owning to their static nature. In other words, the current ratio and the quick ratio measure corporate liquidity based on balance sheet data at a given point in time and assess the firm's ability to meet obligations through the liquidation of assets (Farris and Hutchison, 2002). Finnerty (1993) also indicates the

inadequacy of using the current ratio and the quick ratio as a measure of liquidity. He criticises that inclusion of operating assets which are tied up in operations or otherwise stated unproductive assets not necessary to run the business in these traditional ratios formula makes the current ratio and quick ratio inappropriate measures of future cash flows and liquidity based on an ongoing concern point of view.

### 2.2.2 The Cash Conversion Cycle

The concept of the cash conversion cycle (CCC) was first introduced by Gitman (1974) and later suggested by many authors (Hager, 1976; Richards and Laughlin, 1980; Emery, 1984; Kamath, 1989) as a more dynamic approach as compared to the current ratio and quick ratio.

> The CCC, which mirrors the operating cycle, measures the interval between the time cash expenditures are made to purchase inventory for use in the production process and the time that funds are received from sale of the finished products. This time interval is measured in days and is equal to the net of the average age of the inventory plus the average collection period minus the average age of account payable (Schilling, 1996, p.5).

The average age or number of days inventory (INV) is measured as (365×inventory)/costs of sales. The average collection period or number of days accounts receivable (AR) is measured as (365×accounts receivable)/sales. The average age or number of days accounts payable (AP) is measured as (365×accounts

payable)/costs of sales. By the definition, a shorter CCC, therefore, represents a higher efficiency in WCM.

There are several advantages of CCC as a measure of WCM. First, it can be used to depict the firm's average liquidity position and assess the current assets' ability to generate future operating cash flows. Second, by adopting the CCC, firms are able to evaluate how efficiently they allocate, monitor and control their capital among working capital components. As there are costs associated with obtaining capital, firms should circulate it among components of working capital in the way that would maximise economic benefit. Third, an analysis of the components of the CCC internally as well as against peers and industry benchmarks can direct management's attention on operational issues (e.g. cash collection management, cash disbursement management, and supply chain management). Finally, not only can CCC be used to measure efficiency in WCM, but it is also closely related to firm's valuation and profitability. That is, a shorter CCC implies fewer days' cash is tied up in working capital requirements, resulting in a higher present value of free cash flow. This free cash flow can be distributed immediately to shareholders in terms of dividends which, in turn, can increase the firm's value.

### 2.2.3 The Net Trade Cycle

The concept of the net trade cycle (NTC) is very similar to that of CCC. "The NTC actually indicates the number of "days sales" the company has to finance its working capital under ceteris paribus conditions. This instrument provides an easy estimate for additional financing needs with regard to working capital expressed as a function of

the projected sales growth" (Shin and Soenen, 1998, p.38). To illustrate, assuming that Wal-Mart's sales in 1995 were $82.5 billion and would grow at 13% in 1996 with the same 40 days NTC, the firm would, therefore, need $1.19 billion (= $82.5 billion ×13%×(40/360)) of additional financing for working capital requirements.

As the NTC is calculated using this formula: (accounts receivable + inventory – accounts payable) × (365/sales), the major difference between CCC and NTC lies in the denominators used. In particular, all of the three components of the NTC are divided by sales, whereas those of the CCC are different for each component. Both NTC and CCC are commonly applied as a measure of WCM in the literature regarding the relationship between WCM and a firm's profitability (refer to Table 1.3).

### 2.2.4 The Working Capital Requirement

Instead of assessing WCM in terms of the time interval like CCC and NTC, the working capital requirement (WCR) demonstrates the level of working capital required for a firm. The WCR is commonly used as a proxy of WCM in the literature on the determinants of WCM (refer to Table 1.2), and is expressed as (accounts receivable + inventory – accounts payable)/sales (or total assets). Chiou et al. (2006) provide a justification for the exclusion of cash holdings, short-term investment, short-term borrowing, and long-term debt due in a year from the WCR. These accounts are related to a company's financing decision and, therefore, are considered irrelevant to the operating cycle and not suitable as an indicator of liquidity.

Although it is not clearly stated in the literature on the determinants of WCM why CCC and NTC are not typically used as a proxy of WCM, a possible explanation is that WCM is treated as the dependent variable in these studies. Both CCC and NTC, which are measured in days, may not be found to be normally distributed and, therefore, do not meet the assumptions of parametric statistical tests (e.g., *T*-test, ANOVA and linear regression). Conducting parametric statistical tests on such data may yield misleading results. Hence, in some cases, transforming the data is necessary as it will make the data fit the assumptions better. Kieschnick et al. (2006) is the only study that applies CCC as a dependent variable (refer to Table 1.2). They transform CCC by using logarithmic transformation. However, as CCC is measured in days and can be negative and zero, applying logarithmic transformation straight away on such data is not considered appropriate. This is because it will result in missing data after transformation.[4] Another reason that CCC and NTC are not typically adopted as a proxy of WCM may be because applying logarithmic transformation on a dependent variable causes difficulty in interpreting coefficients in log-linear model.[5]

### 2.3 Summary of Chapter 2

This chapter has provided an overview of WCM and defined the scope of the term 'working capital' used in this thesis. Since working capital varies from firm to firm, industry to industry, and possibly country to country, Chapters 3 and 4 will further investigate the factors influencing the variations in WCM based on a panel data set. Having been widely used in the prior literature, the WCR will be adopted as the

[4] A solution is to add a constant to each number to make it positive or non-zero before using logarithmic transformation.

[5] Log linear model is expressed as: $logYi = \alpha + \beta Xi + \epsilon i$. The effect of each increase in X will result in an increase in the expected value of Y by $e^{\beta}$.

dependent variable in these two chapters. Furthermore, the overview of WCM suggests that conservative and aggressive WCM policies have both benefits and drawbacks to a firm's bottom line. Chapter 5 will test statistically the extent to which higher efficiency in WCM can improve a firm's profitability. Following the literature, the CCC will be adopted as a proxy of WCM, the dependent variable, in this chapter.

# CHAPTER 3

# THE DETERMINANTS OF WORKING CAPITAL MANAGEMENT: EVIDENCE FROM PAN-EUROPEAN COMPANIES

## 3.1 Introduction

Working capital management (WCM) is one of the most important aspects of a company's operational efficiency and financial health. By achieving higher efficiency in WCM, firms can 'squeeze' as much cash as possible from their operational activities. As a result, they may avoid having to seek costly additional external financing. Thus, sound WCM can improve cash flow from operations and reduce outlays on financing costs. Improving WCM efficiency is, therefore, important to a firm's liquidity and profitability. Given the current economic globalisation trends, where lenders and investors have greater mobility about money transfer, firms with a relatively higher efficiency in WCM are likely to be favoured by investors. Consequently, if WCM improvement is to be analysed and pursued, it is necessary to identify the key factors (firm- and country-specific factors) that influence efficiency in WCM. This evidence can also be used to explain significant WCM variations across countries.

The sparse literature on WCM does include some studies of the determinants of WCM. To date, these determinants have been based primarily on firm-specific characteristics, including operating conditions and ability to finance WCM. However, this prior research has all been country-specific (e.g., Chiou et al., 2006 in Taiwan; Hill et al.,

2010 in US; Wasiuzzaman and Arumugam, 2013 in Malaysia) and this limits the opportunity to examine whether or not the country setting has an influence on a firm's WCM. Moreover, the study of the determinants of WCM has not yet been undertaken in a European context. Thus, a pan-European study permits investigation of whether there are significant variations in WCM across countries and represents a research contribution which fills a significant gap in the existing literature.

Several practitioners have conducted series of annual WCM analysis across borders (e.g., All Tied Up by Ernst & Young, 2011, 2012, 2013; European Working Capital Annual Review by PwC, 2012, 2013; Payment Practices Barometer by Atradius, 2011). These demonstrate wide variations in the working capital performances across the countries surveyed. Despite comparing WCM between countries, it is not evident if the differences found between countries are, in fact, statistically significant. In addition, it is important to ascertain whether the differences in WCM are due to real differences between countries (direct country effects) or differences in firm-specific determinants across countries (indirect country effects).

Building on the above gaps in previous research, four main objectives are identified:

1) a first objective is to examine whether or not there are statistically significant variations in WCM across pan-European countries;
2) a second objective is to examine whether or not the variations in WCM are influenced by firm-specific factors;
3) a third objective is to empirically investigate whether or not such variations in WCM across countries represent real differences between countries

(direct country effects) or differences among countries in firm-specific factors (indirect country effects);

4) the final objective is to examine whether or not the global financial crisis has had an impact on a firm's WCM.

Consistent with the prior literature on the determinants of WCM (e.g., Chiou et al., 2006; Nazir and Afza, 2009; Hill et al., 2010; Wasiuzzaman and Arumugam, 2013) and to facilitate comparisons wherever possible, this paper uses the working capital requirement (WCR), defined as the sum of accounts receivable and inventory net of accounts payable, deflated by total assets, as an integrated measure of WCM.

Using a sample of 10,818 firm-year observations from 15 pan-European countries between 2000 and 2011, the weighted least square (WLS) results indicate that, among other factors, a firm's WCM depends primarily on availability of external and internal financing, firm size, and levels of investment in fixed assets and profitability. In addition to firm-specific characteristics, the paper demonstrates that a firm's WCM is influenced by the country where its shares are listed and by economic conditions. The results also highlight the wide variations that exist in WCM across European economies (i.e., a range of WCR from 0.20 in Portugal to 0.32 in Greece). The findings are also consistent with cross-country differences in WCM being due to both direct country effects and indirect country effects that influence the underlying firm-specific characteristics used in this study.

This research is novel in examining the determinants of WCM in an international context. It, thus, represents a contribution to the current literature by establishing links between both direct and indirect country effects and WCM. In addition, a comparison of this study's results with those of the prior literature provides an indication of whether or not European and other countries' WCM are driven by similar factors. This study, therefore, gives insight into how WCM practices are determined across countries. The study also helps to explain the prior literature's mixed findings on the determinants of WCM based on individual country research.

The reminder of this chapter is organised as follows. Section 3.2 reviews the determinants of WCM with reference to relevant literature and develops hypotheses. Section 3.3 presents the sample used. Section 3.4 describes the methodology employed. Section 3.5 presents and discusses empirical results. Robustness tests related to main findings are provided in Section 3.6. Section 3.7 concludes the main findings and contributions. Finally, Section 3.8 summarises the chapter.

## 3.2 Literature Review and Hypothesis Development

This section first reviews the literature indicating the possible determinants of WCM.[6] For each determinant identified, a testable hypothesis is developed. Subsequently, evidence of prior research on the variations in international WCM is then reviewed.

[6] The summary of prior literature provided for the interested readers can be referred to Table 1.2.

### 3.2.1 Firm-Specific Determinants of WCM

**(a) Leverage**

Myers's (1984) pecking order theory suggests that a firm should finance its investment projects firstly with internal sources of financing prior to seeking external sources of financing (i.e., debt and equity). This is because raising capital externally will incur issuing costs and increase outside monitoring and cause restrictions from lenders and shareholders. Based on the pecking order theory, Chiou et al. (2006) argue that firms with higher leverage reflect the circumstance of having less internal financing available for daily operations. Hence, it is considered likely that these firms should exercise more restrictive working capital policies (e.g., accelerating receivables collection, liquidating inventory, and stretching credit terms from suppliers). They should also use their working capital more efficiently as a rational response to avoid further aggravation in the shortage of funds and so eliminate triggering additional external financing. Prior literature uses total debts or long-term debt as proxies of leverage, and documents a negative relationship between leverage and WCM (e.g., Chiou et al., 2006; Nazir and Afza, 2009; Wasiuzzaman and Arumugam, 2013).

Nonetheless, according to the maturity matching hypothesis as mentioned in Van Horne (1998), firms strive to match their loan maturities with their asset maturities. Thus, firms appear to finance their short-term assets with short-term liabilities (i.e., accounts payable and short-term debts). In this study, leverage is, therefore, measured by both the ratio of short-term debt to total assets (STDEBT) and the ratio of long-term debt to total assets (LTDEBT). Following the matching hypothesis and pecking order theory, the following hypotheses are proposed, respectively.

*H1: There is a significant positive relationship between STDEBT and WCM.*

*H2: There is a significant negative relationship between LTDEBT and WCM.*

**(b) Operating Cash Flow**

Again, as suggested by the pecking order theory, the first source of financing for a firm's investment should come from internal cash flow. Hence, it can be implied that firms with a higher internally generated cash flow will have a greater capability to invest more in their working capital as the costs of funds invested in working capital are relatively lower than those for firms with lower cash flow. Operating cash flow (OCF) is defined as operating income before depreciation and amortisation expenses minus interest expenses and income taxes scaled by sales. The hypothesis is proposed as follows.

*H3: There is a significant positive relationship between OCF and WCM.*

**(c) Sales Growth**

The nature of the impact of sales growth on a firm's working capital is inconclusive due to the different effects found for sales growth on each component of WCM. With respect to accounts receivable, previous research has found a negative relationship. Petersen and Rajan (1997) mention that changes in a firm's sales may indicate shocks to the firm's operations. They conclude from the inverse relationship that firms in trouble (firms with declining sales growth) may attempt to maintain their sales by using the extension of credit. In addition, Molina and Preve (2009) find that when

firms encounter negative sales growth, they lose their ability to enforce payment from their customers, thereby resulting in an increase in accounts receivable.

However, an anticipation of higher sales growth could lead to firms stocking up inventory and this may outweigh the effect on trade credit (Kieschnick et al. 2006). With respect to accounts payable, Petersen and Rajan (1997) and Deloof and Jegers (1999) indicate that the higher the growth opportunities a firm has, the higher the demand for trade credit is also likely to be. As prior research suggests the relationship between WCM and sales growth can be in different directions, this study proposes an alternative hypothesis as follows. Sales growth (GROWTH) is calculated as a change in sales over the period *t*-1 to *t*.

*H4: There is a significant relationship between GROWTH and WCM.*

**(d) Firm Size**

Evidence on the relationship between WCM and firm size is also mixed. On the one hand, Hill et al. (2010) and Wasiuzzaman and Arumugam (2013) equate capital market access with firm size and expect a positive relationship between the variables. They argue that since large firms face increased monitoring by analysts, these firms tend to have lower information asymmetries and are, therefore, provided with more superior capital market access and fewer borrowing constraints, relative to smaller firms. Consequently, larger firms have a higher capability to finance increased working capital.

On the other hand, firm size is associated with bargaining power over suppliers and customers. Hence, a negative relationship between these variables can be expected. To a certain extent, large firms can use their size to forge relationship with suppliers in order to hold less inventory and stretch credit terms offered. Moreover, firms with higher bargaining power relative to their customers can require more restrictive credit terms with less likelihood of losing customers. Similarly, based on product quality theory (e.g., in Long et al., 1993), a negative relationship between accounts receivable and firm size can be expected. As smaller firms are less likely to have an established reputation, they should extend trade credit to guarantee their product quality. As the prior literature shows contrasting implications for this factor, the hypothesis is proposed as follows. Firm size (SIZE) is measured by the natural logarithm of total assets.

*H5: There is a significant relationship between SIZE and WCM.*

**(e) Firm Age**

There is also no clear consensus on the relationship between WCM and firm age. Chiou et al. (2006) find a positive relationship and conclude that as a company grows more mature, its WCM becomes less efficient as management loosens. In contrast, Wasiuzzaman and Arumugam (2013) associate firm age with growth opportunities and find that as younger firms grow at a faster pace compared to more mature firms, the younger ones need to invest more in working capital to support their sales growth. As the relationship between WCM and growth opportunities has been found to differ, the hypothesis is proposed as follows. Firm age (AGE) is measured as the number of year since the year of its incorporation.

*H6: There is a significant relationship between AGE and WCM.*

**(f) Profitability**

Some research studies on the determinants of WCM find a significant and positive relationship between profitability and WCM (e.g., Chiou et al, 2006; Nazir and Afza, 2009), while others find the relationship is positive but not significant (e.g., Hill et al., 2010; Wasiuzzaman and Arumugam, 2013). The positive relationship can be implied that firms with higher prior period profitability are likely to be less concerned with efficiency in WCM as they have achieved planned levels of profitability.

In contrast, empirical research on the effects of WCM on corporate profitability report a negative relationship (e.g., Jose et al., 1996; Shin and Soenen, 1998; Wang, 2002; Deloof, 2003; Lazaridis and Tryfonidis, 2006; Teruel and Solano, 2007). In general, these results suggest that decreasing working capital can affect profitability as a result of operating costs and borrowing costs savings. Despite examining the impact of WCM on profitability, Deloof (2003) provides alternative explanations, indicating the possible consequences of profitability on WCM. These are that less profitable firms offer longer credit terms to incentivise their customers; suffer from falling sales and, in consequence, rising stock levels; and experience delays in paying their bills. As there is no clear consensus on the relationship between WCM and profitability, the hypothesis is proposed as follows. Gross profit margin (PM) is used as a proxy of a firm's profitability and calculated as the ratio of sales minus costs of goods sold to sales.

*H7: There is a significant relationship between PM and WCM.*

**(g) Asset Tangibility**

Given constraints on funds available, if a firm invests more in fixed assets, fewer funds remain for the investment in working capital. Baños-Caballero et al. (2010) find a negative relationship between asset tangibility and working capital. This is consistent with the findings of Fazzari and Petersen (1993). In studies of the determinants of WCM, Kieschnick et al. (2006) and Wasiuzzaman and Arumugam (2013) include asset tangibility as one of the factors affecting WCM. Both report a significant and negative relationship. Following these prior findings, the hypothesis is proposed as follows. Asset tangibility (TANG) is measured by the ratio of a firm's fixed assets to total assets.

*H8: There is a significant negative relationship between TANG and WCM.*

**(h) Asymmetric Information**

Hill et al. (2010) argue that, according to Myers and Majluf (1984), for firms with greater informational asymmetries (less transparent) long-term projects and cash flows are more difficult to be valued. As a result, capital markets would extract a higher premium for these firms, resulting in higher costs of borrowing. Hence, greater informational asymmetries firms are expected to squeeze as much cash as possible from their working capital in order to rely less on external financing. Accordingly, this study proposes the following hypothesis. Following Hill et al. (2010), the market-to-book ratio is used as a proxy for the degree of asymmetric information. The market-to-book (MB) ratio is defined as the sum of the book value of liabilities plus the market value of equity, divided by the book value of total assets.

*H9: There is a significant negative relationship between MB and WCM.*

**(i) Domestic/Multinational Firms**

The research that examines the relationship between exporting and productivity (e.g., Bernard and Jensen, 2004; Girma et al., 2004) suggests that firms with significant foreign sales tend to have higher productivity than firms without foreign sales. Zhao (2011) shows that firms with higher levels of foreign sales tend to design performance drivers to optimize each sub-process and, therefore, increase productivity. In addition, exporting firms are found to implement Just-in-time (JIT) and supply chain management (SCM) more than non-exporting firms to help reduce their in-process inventory and associated carrying costs (Zhao, 2011).

Nonetheless, substantial foreign sales may indicate that a company's main operational clusters are, in fact, outside the country where it is listed. Thus, it is likely that a firm with higher foreign sales may have higher foreign exposures (e.g., due to local laws and regulations, and different customer behaviours) and a higher degree of decentralisation. These firms may find it more difficult to control and align efficiency in WCM across foreign businesses. As the relationship between type of firms (i.e., domestic or multinational) and WCM is not clear, the alternative hypothesis used is as follows. The dummy variable (EXP) is used to indicate whether a firm is domestic or multinational. If the ratio of international sales to total sales is greater than zero, a firm is trading multinationally and the dummy variable is set equal to one and zero otherwise.

*H10: There is a significant relationship between EXP and WCM.*

**(j) Economic condition**

During the period of economic recession when cash supply from external financing is tight, WCM represents a key managerial intervention to maintain solvency. Thus, more rigorous management of working capital can be expected. In contrast, during the period of economic boom and recovery, when financing is abundant, firms may lose their focus on maintaining liquidity. The pursuit of growth becomes priority for firms. Accordingly, firms may provide longer collection period and possibly keep higher levels of inventory. As a result, the relationship between economic condition and WCM can be predicted as follows. Following Baños-Caballero et al. (2013) and Wasiuzzaman and Arumugam (2013), economic condition is captured by the growth or annual change in gross domestic product (GDP). Alternatively, the dummy variable (CRISIS) is used to indicate a period during the financial crisis. If a year is between 2008 and 2011 when the financial crisis took place, the dummy variable is set equal to one and zero otherwise.

*H11: There is a significant positive relationship between GDP and WCM.*

### 3.2.2 Evidence on Variations in International WCM

Surveys of international WCM practices (e.g., Gentry et al., 1979; Belt and Smith 1991; Khoury et al., 1999) provide indications of several factors that have an association with differences in WCM practices across countries. According to the results of these surveys, such variations in WCM could be driven by country-specific factors such as the level of development of capital markets and national cultures. For instance, Belt and Smith (1991) mention that the national banking system in Australia

enhances the efficiency in firms payment practices as compared with that of American counterparts (i.e., Australian firms are more likely to take cash discounts and less likely to miss discounts and pay later).

Several practitioners have undertaken benchmarking exercises for WCM across countries. Atradius (2011) examines payment behaviour of European companies and suggests that different durations of credit and payment periods between Northern and Southern Europe are due to prevailing differences in cultural traits. The findings of this study show that payment terms in Northern Europe are the shortest, especially Denmark and Germany, whereas Spain and Italy have the longest payment period. Apart from the influence of culture, this survey also identifies other country-specific attributes such as the complexity of the payment procedure for foreign customers (that are common in one country but less familiar in others) and the inefficiency of the banking system that may be the key drivers of variations in WCM across countries. Sawers (2012) observes that different cultures affect attitudes toward WCM. Consistent with Atradius's (2011) findings, Spanish and Italian firms were found to have considerably longer accounts receivable and payable periods as compared with those of German or Scandinavian firms. Although longer accounts receivable and payable periods are considered less efficient, this system habitually works in Spain and Italy.[7]

[7] Average accounts receivable periods (AR) in Spain, Italy, Germany and Scandinavia in 2011 are 69, 76, 51, and 50 days, respectively, while average accounts payable periods (AP) are 69, 77, 36, and 30, respectively. However, after allowing for inventory period, Spain and Italy report better days working capital at 26 and 37 days, respective, as compared with that of UK 38 days, Germany 65 days and Sweden 74 days (Sawers, 2012).

In addition to a direct impact of country-specific factors on WCM, it is likely that firm-specific characteristics such as size and profitability vary across countries and so create differences in WCM. For instance, Bell and Smith (1991) indicate that WCM of Australian firms are more centralised than that of American firms, but this may be primarily a size-of-firm issue. Likewise, Khoury et al. (1999) show that only 7% of Canadian firms adopt formal WCM policies. This percentage is far smaller than that of Australian and American firms. They claim that the difference is due to firm size being generally smaller in Canada. Given that firm size is a determinant of WCM, the variations in size of firms across countries would also result in different WCM at national level. Based on this evidence, differences in WCM across countries can be attributable to both the effects of country-specific factors (e.g. culture and capital market development) and the effects of firm-specific characteristics that systematically differ across countries (e.g., firm size). As a result, the following hypotheses are proposed.

*H12: The variations in WCM are due to real differences between countries (direct country effects).*

*H13: The variations in WCM are due to differences in firm-specific characteristics across countries (indirect country effects).*

### 3.3 Data and Summary Statistics

#### 3.3.1 Data Source and Sample

The initial data set consisted of all listed firms in 16 European countries included in La Porta et al. (1997). These countries represent a broad geographical mixed and

comprise Ireland, United Kingdom, Belgium, France, Greece, Italy, Netherlands, Portugal, Spain, Austria, Germany, Switzerland, Denmark, Finland, Norway and Sweden. The firm-level financial data required to construct the variables used in this study was retrieved from Worldscope and Datastream, provided by Thomson One Banker from 1999 to 2011.[8] Three restrictions on the data were imposed. First, to mitigate the effects of different industry compositions across countries, this study focuses on manufacturing industries (using 2-digit SIC codes 20-39). Appendix A provides the list of two-digit SIC codes. Second, firm-years with missing financial data and negative values of assets were eliminated.[9] Finally, the firm-level ratios were winsorised at 1% and 99% to moderate the influence of extreme values.[10] As a result of these filters, the final unbalanced panel data set consisted of 10,818 firm-year observations from 15 countries, covering the 12-year period from 2000 to 2011. Appendix B presents the structure of the unbalanced panel data set. France has the largest firm-year observations (19.8% of total firm-year observations) whereas Portugal has the smallest firm-year observations (1.0% of total firm-year observations). Differences in the number of firm-year observations across countries will be taken into account when performing regression estimates in Section 3.4.

### 3.3.2 Descriptive Statistics

Table 3.1 presents descriptive statistics for the variables used to estimate the determinants of WCM.

[8] The 1999 data was required to construct some lagged explanatory variables.

[9] As a result of the first two filters, there is no observation from Ireland remaining in the data set.

[10] Winsorisation was applied because the distributions of lagged operating cash flow ($OCF_{t-1}$) and lagged profitability ($PM_{t-1}$) are strongly negatively skewed whereas that of lagged sales growth ($GROWTH_{t-1}$) is strongly positively skewed. To ensure the consistency, winsorisation at 1% both tails is applied to all variables used.

**Table 3.1: Summary of Statistics of Variables**

| Variable | N | Mean | Std. Dev. | Min | Median | Max |
|---|---|---|---|---|---|---|
| WCR | 10,818 | 0.281 | 0.148 | -0.025 | 0.278 | 0.639 |
| $STDEBT_{t-1}$ | 10,818 | 0.101 | 0.104 | 0.000 | 0.068 | 0.492 |
| $LTDEBT_{t-1}$ | 10,818 | 0.135 | 0.123 | 0.000 | 0.109 | 0.548 |
| $OCF_{t-1}$ | 10,818 | 0.057 | 0.200 | -1.424 | 0.078 | 0.367 |
| $GROWTH_{t-1}$ | 10,818 | 0.086 | 0.281 | -0.526 | 0.053 | 1.599 |
| $SIZE_{t-1}$ | 10,818 | 12.982 | 2.149 | 8.650 | 12.715 | 18.414 |
| AGE | 10,818 | 65.349 | 47.441 | 6.000 | 50.000 | 190.000 |
| $PM_{t-1}$ | 10,818 | 0.300 | 0.192 | -0.216 | 0.277 | 0.875 |
| $TANG_{t-1}$ | 10,818 | 0.266 | 0.171 | 0.009 | 0.242 | 0.741 |
| $MB_{t-1}$ | 10,818 | 1.508 | 1.050 | 0.548 | 1.186 | 7.249 |
| EXP | 10,818 | 0.962 | 0.191 | 0.000 | 1.000 | 1.000 |
| GDP | 10,818 | 1.402 | 2.560 | -8.539 | 1.826 | 6.557 |

*Notes:* The final data set contains an unbalanced panel data of 10,818 firm-year observations, corresponding to 15 countries over the period from 2000 to and 2011. WCR is calculated as the sum of accounts receivable and inventory net of accounts payable, deflated by total assets. STDEBT is short-term debt to total assets. LTDEBT is long-term debt to total assets. OCF is defined as operating income before depreciation and amortisation expenses minus interest expenses and income taxes scaled by sales. GROWTH is calculated as a change in sales over the period *t-1* to *t*. SIZE is measured by the natural logarithm of total assets. AGE is measured as the number of year since the year of its incorporation. PM is the ratio of sales minus costs of goods sold to sales. TANG is measured by the ratio of a firm's fixed assets to total assets. MB is defined as the sum of the book value of liabilities plus the market value of equity, divided by total assets. EXP is a dummy variable and set equal to one if a firm is trading internationally and zero otherwise. GDP is the growth or annual change in gross domestic product.

Both mean and median WCR, the dependent variable, are 0.28 suggesting that on average, for every Euro of assets held by firms, 0.28 cents is tied up in net working capital. This figure is rather similar to that of US companies in Hill et al. (2010) at 0.23, but about twice as much as that of Malaysian companies in Wasiuzzaman and Arumugam (2013) at 0.13. For independent variables, on average, listed firms in European countries rely on long-term external financing more than short-term external financing with mean lagged long-term debts and mean lagged short-term debts are 0.14 and 0.10, respectively. Mean lagged operating cash flow is 0.06. Mean lagged sales growth is 0.08. Firm age is, on average, 65 years. Mean lagged gross profit margin is almost 0.30. Lagged fixed assets to total assets is, on average, 0.27 suggesting that European companies' investments between fixed assets and working capital are about the same. Mean lagged market-to-book ratio is 1.51. A majority of

firms in this study are international firms whilst only 3.8% are domestic firms. The average GDP growth across 15 countries from 2000 to 2011 is 1.4.

Table 3.2 Panel A provides the distribution of mean values of WCR and its determinants across countries. Most firms' WCRs are typically between 0.26 and 0.31. Portugal reports the lowest mean WCR (0.20) whereas Greece reports the highest mean WCR (0.32). Panel B of Table 3.2 shows the results of the One-Way ANOVA for difference-in-means for key variables across 15 European countries. The null hypothesis assumes that the means of WCR and its 11 firm-specific determinants are the same for every country. The test rejects the null hypothesis of all variables at the 5% level. Hence, it is apparent that there are statistically significant variations in WCR and its firm-specific determinants across pan-European countries. This result suggests that country settings may have an effect on both a firm's WCR and the determinants of WCR.

Although the One-Way ANOVA indicates significant variations in WCR across 15 European countries, Dendrogram for cluster analysis in Figure 3.1 shows that these countries are not individualistic in their WCM but there is a degree of similarity in WCM among a group of countries.[11] Four main groups of countries that have similar WCR are documented and ordered in ascending order of their WCR average: Group 1) Portugal (mean WCR 0.197); Group 2) UK, Italy, Spain and Norway (mean WCR 0.211); Group 3) Belgium, Sweden, France, Finland, Netherlands and Austria (mean WCR 0.281); Group 4) Greece, Germany, Switzerland and Denmark (mean WCR 0.314).

[11] Using dissimilarity measure of 0.075 as indicated in a dotted line in Figure 3.1, four groups of countries are observed.

## Table 3.2: Summary of Variables across Countries

| Panel A: Mean values | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | N | WCR | $STDEBT_{t-1}$ | $LTDEBT_{t-1}$ | $OCF_{t-1}$ | $GROWTH_{t-1}$ | $SIZE_{t-1}$ | AGE | $PM_{t-1}$ | $TANG_{t-1}$ | $MB_{t-1}$ | EXP | GDP |
| UK | 832 | 0.209 | 0.052 | 0.162 | 0.095 | 0.120 | 13.151 | 85.109 | 0.410 | 0.261 | 1.837 | 0.928 | 1.65 |
| Belgium | 377 | 0.259 | 0.096 | 0.110 | 0.090 | 0.076 | 12.476 | 61.430 | 0.212 | 0.288 | 1.464 | 0.958 | 1.54 |
| France | 2,146 | 0.290 | 0.096 | 0.120 | 0.046 | 0.084 | 12.547 | 60.666 | 0.226 | 0.190 | 1.475 | 0.979 | 1.30 |
| Greece | 946 | 0.321 | 0.188 | 0.133 | 0.049 | 0.080 | 11.775 | 42.534 | 0.280 | 0.389 | 1.218 | 0.923 | 0.97 |
| Italy | 824 | 0.218 | 0.123 | 0.141 | 0.074 | 0.092 | 13.496 | 56.113 | 0.423 | 0.222 | 1.270 | 0.917 | 0.44 |
| Netherlands | 285 | 0.287 | 0.084 | 0.142 | 0.077 | 0.064 | 13.379 | 64.288 | 0.288 | 0.246 | 1.528 | 1.000 | 1.51 |
| Spain | 350 | 0.214 | 0.119 | 0.139 | 0.087 | 0.118 | 13.454 | 57.114 | 0.279 | 0.347 | 1.618 | 0.926 | 2.10 |
| Portugal | 108 | 0.197 | 0.128 | 0.271 | 0.126 | 0.072 | 13.858 | 32.398 | 0.220 | 0.418 | 1.192 | 0.954 | 0.69 |
| Austria | 214 | 0.285 | 0.130 | 0.118 | 0.100 | 0.087 | 12.654 | 96.836 | 0.269 | 0.367 | 1.305 | 1.000 | 1.73 |
| Germany | 2,137 | 0.318 | 0.103 | 0.125 | 0.052 | 0.077 | 12.502 | 76.518 | 0.305 | 0.263 | 1.409 | 0.962 | 1.33 |
| Switzerland | 910 | 0.304 | 0.079 | 0.127 | 0.084 | 0.045 | 13.510 | 76.459 | 0.326 | 0.277 | 1.559 | 0.990 | 1.87 |
| Denmark | 409 | 0.314 | 0.119 | 0.134 | 0.048 | 0.073 | 14.255 | 76.878 | 0.338 | 0.335 | 1.739 | 0.976 | 0.88 |
| Finland | 403 | 0.294 | 0.083 | 0.160 | 0.056 | 0.060 | 12.762 | 55.422 | 0.271 | 0.294 | 1.589 | 0.983 | 2.03 |
| Norway | 261 | 0.201 | 0.065 | 0.200 | -0.065 | 0.173 | 14.732 | 58.027 | 0.314 | 0.295 | 1.912 | 0.966 | 1.35 |
| Sweden | 616 | 0.270 | 0.054 | 0.144 | -0.007 | 0.121 | 14.688 | 51.547 | 0.301 | 0.210 | 1.918 | 1.000 | 2.36 |
| Panel B: ANOVA | | | | | | | | | | | | | |
| *F*-Statistic | | 61.83* | 91.44* | 24.62* | 19.48* | 5.81* | 112.86* | 65.25* | 86.92* | 112.22* | 29.36* | 15.36* | 26.05* |

*Notes:* Panel A provides mean values of key variables across 15 countries. All variables are defined as in Table 3.1. Panel B reports the One-Way ANOVA for the differences-in-means of which the null hypothesis is that the mean of each variable is the same across countries. * indicates the statistical significance at the 5% level.

This finding suggests that, although a firm's WCR may be determined by its country setting, some countries may share common country-level factors with others, resulting in similarity in WCR among those countries. Whether similarities and differences in WCR across countries are due to direct country effects or indirect country effects through variations in firm-specific determinants will be examined in Section 3.5.

**Figure 3.1: Dendrogram for WCR Cluster Analysis across Countries**

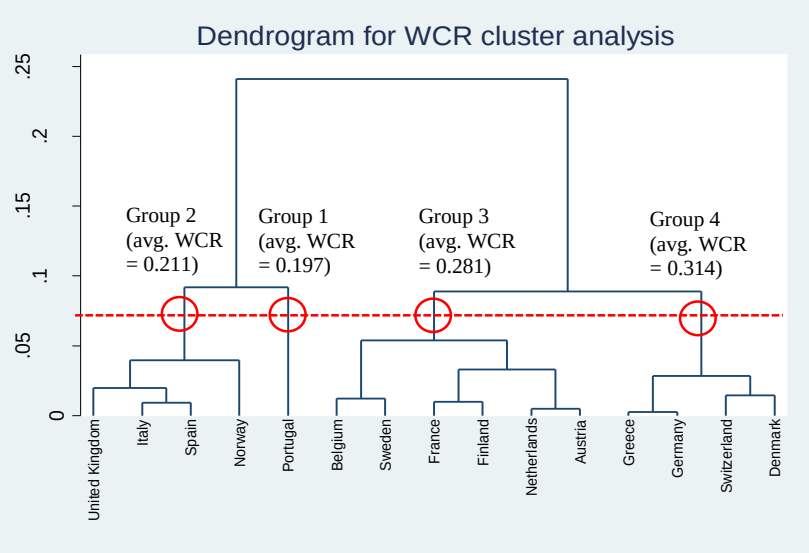
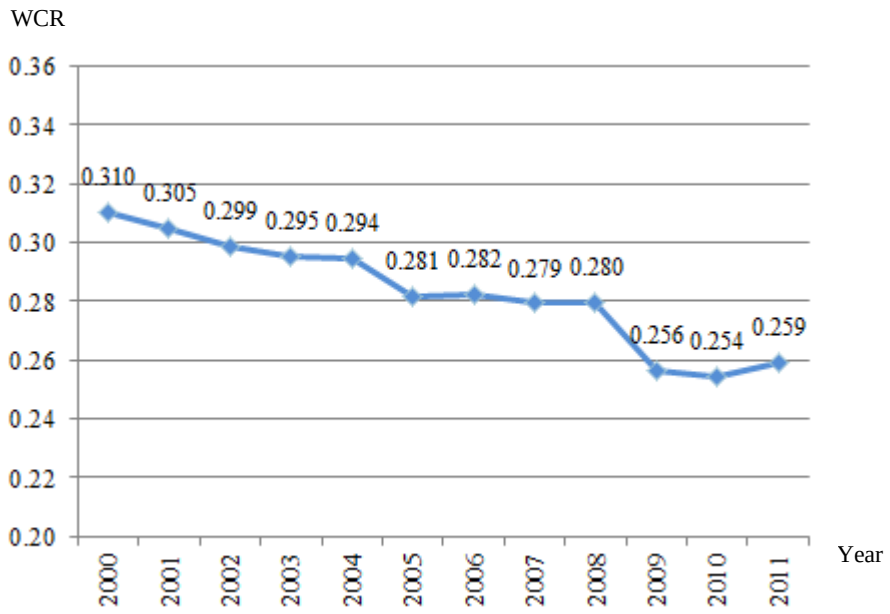



Figure 3.2 illustrates mean WCR for 15 European countries over the 12-year period from 2000 to 2011. Overall, there has been a downward trend in WCM which may be attributed to globalisation of the supply chain and adoption of best practices for working capital optimisation. Two interesting findings can be documented from this figure. First, a dramatic drop in WCR by approximately 8.6% is spotted in 2009 when the financial crisis spread widely throughout Europe. This indicates the recession triggered companies' focus on running tight WCM as external financing became more difficult to secure and more costly. Second, the improvement in WCM made during

the recession seems to be temporary as WCR reverted back towards its prior recession level in 2011 when the economy started to gradually pick up. In sum, this figure highlights that firms' WCR varies with economic condition, especially the shock of financial crisis.

**Figure 3.2: Mean WCR from Year 2000 to 2011**




### 3.3.3 Univariate Results

Table 3.3 displays the matrix of Pearson correlation coefficients. They are consistent with expectations where the direction of relationship was specified (refer to Section 3.2.1). WCR is positively related with lagged short-term external financing (*H1*), lagged operating cash flow (*H3*) and economic condition (*H11*). In addition, WCR is negatively related with lagged long-term external financing (*H2*), lagged level of investment in fixed assets (*H8*) and lagged level of informational asymmetry (*H9*).

## Table 3.3: Pearson Correlation Matrix

| | WCR | $STDEBT_{t-1}$ | $LTDEBT_{t-1}$ | $OCF_{t-1}$ | $GROWTH_{t-1}$ | $SIZE_{t-1}$ | AGE | $PM_{t-1}$ | $TANG_{t-1}$ | $MB_{t-1}$ | EXP | GDP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WCR | 1.000 | | | | | | | | | | | |
| $STDEBT_{t-1}$ | 0.197*** | 1.000 | | | | | | | | | | |
| $LTDEBT_{t-1}$ | -0.176*** | 0.020* | 1.000 | | | | | | | | | |
| $OCF_{t-1}$ | 0.056*** | -0.064*** | 0.050*** | 1.000 | | | | | | | | |
| $GROWTH_{t-1}$ | -0.046*** | -0.080*** | -0.023* | 0.032** | 1.000 | | | | | | | |
| $SIZE_{t-1}$ | -0.262*** | -0.118*** | 0.251*** | 0.246*** | 0.006 | 1.000 | | | | | | |
| AGE | 0.030** | -0.038*** | 0.006 | 0.127*** | -0.105*** | 0.252*** | 1.000 | | | | | |
| $PM_{t-1}$ | -0.223*** | -0.156*** | 0.067*** | 0.263*** | 0.078*** | 0.230*** | -0.031** | 1.000 | | | | |
| $TANG_{t-1}$ | -0.207*** | 0.116*** | 0.215*** | 0.152*** | -0.069*** | 0.098*** | 0.130*** | -0.025** | 1.000 | | | |
| $MB_{t-1}$ | -0.067*** | -0.154*** | -0.118*** | -0.100*** | 0.208*** | -0.050*** | -0.135*** | 0.248*** | -0.201*** | 1.000 | | |
| EXP | 0.048*** | 0.006 | 0.058*** | 0.058*** | -0.011 | 0.137*** | 0.018 | 0.003 | -0.037*** | -0.002 | 1.000 | |
| GDP | 0.057*** | -0.074*** | -0.037*** | 0.042*** | 0.019 | 0.008 | 0.016 | -0.006 | 0.001 | 0.143*** | 0.005 | 1.000 |

*Notes:* This table provides Pearson correlation matrix of all main variables used in this Chapter 3. All variables are defined as in Table 3.1. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Where the direction of relationship is not specified, a negative association is documented between WCR and lagged sales growth, firm size and profitability. In contrast, a positive association is found between WCR and firm age and a binary variable of international firms. All correlation coefficients with WCR are very significant. None of the correlation coefficients are so high in magnitude to suggest a collinearity problem.

### 3.4 Methodology

This section contains a discussion of the methodology employed to investigate 1) what firm-specific factors underpin the WCM of European firms? and 2) whether variations in international WCM are due to real country differences or differences in firm-specific determinants across countries?

#### 3.4.1 The Determinants of WCM

To test *H1 – H11*, the following empirical model which is inspired by Hill et al. (2010) and Wasiuzzaman and Arumugam (2013) is estimated:

$$\begin{aligned} WCR_{i,t} = {} & \beta_0 + \beta_1 STDEBT_{i,t-1} + \beta_2 LTDEBT_{i,t-1} + \beta_3 OCF_{i,t-1} + \beta_4 GROWTH_{i,t-1} + \\ & \beta_5 SIZE_{i,t-1} + \beta_6 AGE_{i,t} + \beta_7 PM_{i,t-1} + \beta_8 TANG_{i,t-1} + \beta_9 MB_{i,t-1} + \\ & \beta_{10} EXP_{i,t} + \beta_{11} GDP_{i,t} + \sum_{t=2}^{12} a_j Year_t + \varepsilon_{i,t} \end{aligned} \quad (1)$$

where *WCR* is calculated as the sum of accounts receivable and inventory net of accounts payable, deflated by total assets. Following the methodology employed in Hill et al. (2010), lagged values are adopted for most of explanatory variables in order to alleviate endogeneity problems (i.e., explanatory variables may be influenced by

WCR). *STDEBT* is short-term debt to total assets. *LTDEBT* is long-term debt to total assets. *OCF* is defined as operating income before depreciation and amortisation expenses minus interest expenses and income taxes scaled by sales. *GROWTH* is calculated as a change in sales over the period *t*-1 to *t*. *SIZE* is measured by the natural logarithm of total assets. *AGE* is measured as the number of year since the year of its incorporation. *PM* is the ratio of sales minus costs of goods sold to sales. *TANG* is measured by the ratio of a firm's fixed assets to total assets. *MB* is defined as the sum of the book value of liabilities plus the market value of equity, divided by total assets. *EXP* is a dummy variable and set equal to one if a firm is trading internationally and zero otherwise. *GDP* is measured by the annual change in the real GDP. Year dummies are also included in the model. The parameter $\varepsilon_{i,t}$ is a random error term.

Since the sample of this study consists of countries with an unbalanced number of firms, equation (1) is estimated using the weighted least square (WLS) methodology, with weights equal to the inverse of the number of firm-year observations in each country (Kusnadi and Wei, 2011). As a result, the paper is able to mitigate biases in regression coefficients which could be mainly attributable to countries with the extreme number of firm-year observations.[12] In addition, to achieve more robust results, the paper estimates the standard errors of equation (1) that are adjusted for the problems of heteroskedasticity and autocorrelation using: 1) the Huber-White estimator, and 2) Roger's standard errors adjusted for clustering across firms, 3) time and 4) both dimensions.

[12] For example, France and Germany, each of which has firm-year observations accounting for approximately 20% of total final observations.

As indicated in Table 3.2 Panel B, there are significant variations in WCM across pan-European countries. One of the main focuses of this study is to examine whether or not the country setting has a direct effect on a firm's WCM (i.e. to test *H12*). Equation (1) is augmented by country dummies as shown in equation (2). Essentially, this study expects the coefficients ($b_j$) to be significant, and equation (2) yields a better fit than equation (1) (i.e., higher adjusted $R^2$).

$$\begin{aligned} WCR_{i,t} = {} & \beta_0 + \beta_1 STDEBT_{i,t-1} + \beta_2 LTDEBT_{i,t-1} + \beta_3 OCF_{i,t-1} + \beta_4 GROWTH_{i,t-1} + \\ & \beta_5 SIZE_{i,t-1} + \beta_6 AGE_{i,t} + \beta_7 PM_{i,t-1} + \beta_8 TANG_{i,t-1} + \beta_9 MB_{i,t-1} + \\ & \beta_{10} EXP_{i,t} + \beta_{11} GDP_{i,t} + \sum_{t=2}^{12} a_j Year_t + \sum_{j=2}^{15} b_j Country_i + \varepsilon_{i,t} \end{aligned} \quad (2)$$

### 3.4.2 The Variations in International WCM

In addition to the direct country effects on a firm's WCM mentioned earlier, the following methodology is designed to examine whether the variations in WCM are also due to the indirect country effects through differences in firm-specific factors across countries (i.e., to test *H13*). Inspired by the methodology used in Hall et al. (2004), the null hypothesis is that variations in firm-specific determinants across countries do not affect a firm's WCM.

To test the null hypothesis, an *F*-test is applied to the difference in the residual sum of squares (RSS) of a restricted and an unrestricted model. For the (completely) restricted model, it is as shown in equation (1) where WCR is regressed on firm-specific determinants and year dummies. For the (completely) unrestricted model, equation (1)

is augmented by country constant dummies and country slope dummies for each of the explanatory variables, an addition of 14 constant and 140 slope dummies.[13]

Following Hall et al. (2004), establishing which firm-specific variables exhibit variations that have an impact on WCM across countries was achieved by the comparison between the RSS of the (completely) unrestricted model and that of 10 (partially) restricted model in which the slope dummies of each explanatory variable are omitted, respectively. The *F*-test takes the form (Gujarati, 1995):

$$F = \frac{(RSS_R - RSS_U)/m}{(RSS_U)/(n-k)}$$

where $RSS_R$ is residual sum of squares in the restricted model. $RSS_U$ is residual sum of squares in the unrestricted model. *m* is number of linear restrictions. *n* is number of observations. *k* is number of variables in the unrestricted model.

### 3.5 Empirical Analysis

In this section, firstly the results from examining the determinants of WCM, comprising firm-specific characteristics (*H1-H11*) and country setting (*H12*), is presented and discussed. Secondly, the analysis will address the extent to which variations in WCM across European countries are not only due to direct country effects but also indirect country effects through variations in firm-specific characteristics (*H13*). Finally, the OLS regression estimation of 15 individual countries will be presented.

[13] 140 country slope dummies are derived from 14 country constant dummies × 10 independent firm-specific variables (i.e., STDEBT, LTDEBT, OCF, GROWTH, SIZE, AGE, PM, TANG, MB, and EXP).

### 3.5.1 The Determinants of WCM

**(a) Firm-Specific Factors**

Table 3.4 columns (1) – (5) presents cross-country results of equation (1) using various techniques (i.e., WLS, WLS with the Huber-White, WLS with the Roger's standard errors adjusted for clustering across firm, time and both dimensions, respectively). Given the size of the standard errors, it is apparent that column (3) based upon the Roger's standard errors adjusted for clustering across firms produces the most unbiased standard errors. Therefore, the following discussion on the determinants of WCM is based on the results in column (3). It is noted that apart from the size of the standard errors, all five techniques yield similar regression coefficients except for the coefficients of firm age and market-to-book ratio that lose significance in column (3).

The results show that firms' WCM is strongly influenced by both short-term and long-term external and internal financing resources, firm size, profitability, level of investment in fixed assets, international trading and economic condition. These relationships are highly significant at the 1% level, except for those of firm size and level of investment in fixed assets that are significant at the 5% level.

Consistent with the maturity matching hypothesis, there is a positive relationship between WCR and lagged short-term debts. European firms that have relatively higher short-term external financing invest more in working capital. This relationship reflects the finding in Deloof and Jegers (1999) that there may be substitution between a firm's short-term financing resources (i.e., accounts payable and short-term debt).

## Table 3.4: The Determinants of WCM

| Dependent Variable: WCR | Completely Restricted Models | | | | | Unrestricted Model |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $STDEBT_{t-1}$ | 0.4540*** | 0.4540*** | 0.4540*** | 0.4540*** | 0.4540*** | 0.3483*** |
| | (0.0126) | (0.0382) | (0.0853) | (0.0201) | (0.0382) | (0.0827) |
| $LTDEBT_{t-1}$ | -0.2148*** | -0.2148*** | -0.2148*** | -0.2148*** | -0.2148*** | -0.1826** |
| | (0.0104) | (0.0271) | (0.0586) | (0.0238) | (0.0271) | (0.0586) |
| $OCF_{t-1}$ | 0.0802*** | 0.0802*** | 0.0802*** | 0.0802*** | 0.0802*** | 0.1284*** |
| | (0.0065) | (0.0126) | (0.0218) | (0.0155) | (0.0126) | (0.0204) |
| $GROWTH_{t-1}$ | -0.0130** | -0.0130 | -0.0130 | -0.0130 | -0.0130 | -0.0131 |
| | (0.0045) | (0.0082) | (0.0079) | (0.0101) | (0.0082) | (0.0081) |
| $SIZE_{t-1}$ | 0.0073*** | 0.0073*** | 0.0073** | 0.0073*** | 0.0073*** | -0.0119** |
| | (0.0005) | (0.0011) | (0.0028) | (0.0008) | (0.0011) | (0.0038) |
| $AGE_t$ | 0.0001*** | 0.0001* | 0.0001 | 0.0001** | 0.0001* | -0.0001 |
| | (0.0000) | (0.0001) | (0.0002) | (0.0000) | (0.0001) | (0.0001) |
| $PM_{t-1}$ | -0.1172*** | -0.1172*** | -0.1172*** | -0.1172*** | -0.1172*** | 0.1402*** |
| | (0.0077) | (0.0169) | (0.0334) | (0.0234) | (0.0169) | (0.0297) |
| $TANG_{t-1}$ | -0.1251*** | -0.1251*** | -0.1251** | -0.1251*** | -0.1251*** | -0.1642** |
| | (0.0075) | (0.0165) | (0.0406) | (0.0185) | (0.0165) | (0.0528) |
| $MB_{t-1}$ | 0.0084*** | 0.0084*** | 0.0084 | 0.0084*** | 0.0084*** | -0.0016 |
| | (0.0013) | (0.0026) | (0.0054) | (0.0018) | (0.0026) | (0.0057) |
| $EXP_t$ | 0.1644*** | 0.1644*** | 0.1644*** | 0.1644*** | 0.1644*** | 0.0279 |
| | (0.0062) | (0.0160) | (0.0367) | (0.0105) | (0.0160) | (0.0198) |
| $GDP_t$ | 0.0062*** | 0.0062*** | 0.0062*** | 0.0062* | 0.0062*** | 0.0037** |
| | (0.0007) | (0.0016) | (0.0014) | (0.0023) | (0.0016) | (0.0011) |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Country dummies | No | No | No | No | No | Yes |
| N | 10,818 | 10,818 | 10,818 | 10,818 | 10,818 | 10,818 |
| Adjusted $R^2$ | 0.6381 | 0.6381 | 0.6381 | 0.6381 | 0.6381 | 0.6950 |

*Notes:* Columns (1) - (5) report the results of the weighted least square (WLS) estimation of regression equation (1) of which the standard errors are adjusted for the problems of heteroskedasticity and autocorrelation using the Huber-White estimator (column 2), and Roger's standard errors adjusted for clustering across firms (column 3), time (column 4) and both firms and time dimensions (column 5). Column (6) reports the results of the WLS estimation of regression equation (2), which country dummies are introduced, using Roger's standard errors adjusted for clustering across firms. Year dummies are included in all models. All variables are defined as in Table 3.1. Standard errors of coefficients are reported in parenthesis. *, ** and *** indicate the coefficient significance at the 10%, 5% and 1% levels, respectively.

The relationships between WCR and lagged long-term debts and lagged operating cash flow are also in line with the predictions. That is, firms with higher operating cash flow are able to invest more in working capital since their cost of funds is relatively lower than that of firms with lower operating cash flow (i.e., higher levered firms). In contrast, highly levered firms indicate the circumstance of having less capital available for daily operations and other profitable investment opportunities. On the one hand, these firms have lower capability to invest in working capital as their cost of funds is higher. On the other hand, they have higher pressure to manage their working capital more efficiently so as to avoid triggering additional external financing.

WCR is positively related with lagged firm size. The relationship found is consistent with Kieschnick et al. (2006) and Hill et al. (2010) and substantiates the assumption in the prior literature that size can be a proxy for capital market access. Hence, it is possible that larger firms may have better lines of credit and cheaper and more alternatives of financing instruments to finance their working capital relative to smaller firms.

Previous period profitability is negatively associated with WCR. This direct correlation supports the results of empirical research on the effects of WCM on a firm's profitability (e.g., Shin and Soenen, 1998; Deloof, 2003; Teruel and Solano, 2007). The relationship suggests that more profitable firms do not need to incentivise their customers by extending credit term and/or are able to pay their suppliers early to benefit from cash discounts offered. Essentially, the result also supports the argument

in Gardner et al. (1986) and Weinraub and Visscher (1998) that more aggressive WCM policies are associated with higher profitability.

Consistent with the expectation, a relationship between investments in working capital and fixed assets is found to be an inverse one. As documented in Baños-Caballero et al. (2010), the result confirms that investments in tangible assets and working capital need to compete with each other for the limited funds available.

There is a positive relationship between WCR and a dummy variable for the international trading firm. The coefficient can be interpreted that international firms typically have higher WCR than domestic firms by a ratio of 0.16, approximately. This contradicts the finding in Zhao (2011) who argues that exporting firms tend to design performance drives to optimise each sub-process and are likely to implement Just-in-time and supply chain management to streamline their inventory. However, it can be explained as being due to international firms typically being larger than domestic firms.[14] Thus, given a positive relationship between WCR and firm size, this may, in part, suggest that international firms have wider capital market access, resulting in greater capability to finance their working capital. In addition, an alternative explanation of a positive association is that as domestic firms are smaller in scale, it is easier for them to have a closer monitoring and tighter control of WCM efficiency.

[14] Pearson correlation matrix in Table 3.3 shows a significant and positive correlation between firm size and a dummy variable of international firm (0.137 and significant at the 1% level), suggesting that international firms tend to be larger firms.

Finally, the significant and positive relationship between WCR and GDP growth is in line with the notion that bad economic condition serves to sharpen companies' focus on running more efficient WCM to ensure sufficient liquidity. The positive relationship also indicates that countries experiencing higher GDP growth invest more in their working capital. This finding is in line with the justification provided in PwC (2013) that in a growth market, banks are more willing to finance higher levels of working capital. Therefore, firms in these countries have less pressure to maintain low levels of working capital. Subsequently, GDP growth is replaced by the dummy variable of CRISIS which equals one if the period is between 2008 and 2011 and zero otherwise. The coefficient of CRISIS (not tabulated) is (-0.0001) and significant at the 1% level. This finding confirms that the latest financial crisis triggered firms to tighten their WCM.

In sum, most of the first 11 testable hypotheses are supported by the results, except for *H4* (sales growth), *H6* (firm age), and *H9* (asymmetric information) where the coefficients are not found to be significant.

The adjusted $R^2$ shown in Table 3.4 is considerable high at 0.6381. As discussed in Section 3.4, weighted least square (WLS) estimation was applied to mitigate biases in regression coefficients which could be mainly attributable to countries with large number of firm-year observations and heteroskedasticity. The adjusted R2 in WLS regression as reported in Table 3.4 is considerably high at 0.6381 as compared to that of (unreported) corresponding OLS at 0.2818. However, Willett and Singer (1988) point out that an improvement in the coefficient of determination (R2) can be expected

when regression models are fit by WLS as compared to OLS. The interpretation of an increased R2 should be made with caution as it reflects, in part, the success of solving heteroskedasticity but not an improvement in the goodness of fit of the regression model.

> "Weighted least-squares regression analysis minimizes the sum of squared residuals (and therefore maximizes the coefficient of determination) with respect to the transformed variables, whereas OLS regression analysis minimizes the sum of squared residuals (and maximizes the coefficient of determination) with respect to the original variables. Providing that the weighting scheme has been chosen appropriately to counteract the heteroscedastic nature of the random errors, a better fit will be achieved by WLS in the transformed world. Thus the coefficient of determination obtained unthinkingly from a statistical computer package under WLS regression is frequently much larger than the value obtained under the corresponding OLS fit" (Willett and Singer, 1988, p. 236).

**(b) Country-Specific Factors**

Thus far, the regression model has not controlled for country effects. When 14 country dummies are introduced to the baseline regression model as shown in column (6), two key findings emerge. It should be noted that the results in column (6) are based on the Roger's standard errors adjusted for clustering across firms in order to be comparable to column (3). A first insight is that when country dummies are included as explanatory variables, the adjusted $R^2$ increases from 0.64 to 0.70 (an increase of approximately

8.9%). This highlights country setting as a significant explanatory variable of a firm's WCM. In other words, there is a direct country effect on a firm's WCM and *H12* is, therefore, supported.

A second insight is that the coefficients of some firm-specific determinants change in magnitude while some even change in sign and significance when moving from column (3) to column (6). For instance, the coefficient of firm size changes from positive to negative.[15] In addition, the coefficient of a dummy variable for the international firm loses significance. Thus, when taking country settings into consideration, *H10* is no longer supported. Accordingly, this insight implies a relation between country setting and firm-specific factors which, in turn, indicates that not only does country setting directly affect WCM but it also indirectly affects WCM through firm-specific determinants of WCM.

### 3.5.2 The Variations in International WCM

Table 3.4 column (6) has already shown that country has a direct effect on a firm's WCM. What is not obvious is whether the differences in WCM are also due to indirect country effects that may also impact firm-specific determinants. Table 3.5 reveals an important finding that address this question. When the RSS of 10 (partially) restricted models (from the model dropping country slope dummies of STDEBT to the model dropping country slope dummies of EXP) is compared to that of the unrestricted model, all corresponding *F*-statistics are significant at the 5% level.

[15] In Table 3.4 column (6), when taking country setting into consideration, country dummies may capture the nature of capital market access, while firm size may turn to indicate a firm's bargaining power over suppliers and customers. Accordingly, a negative relationship is, therefore, expected between WCR and firm size (refer to an argument made in Section 3.2.1 (d)).

**Table 3.5: *F*-Test Comparing Restricted and Unrestricted Models**

| | $RSS_R$ | $RSS_U$ | *F* | Critical *F* | Result |
|---|---|---|---|---|---|
| Dropping STDEBT dummies | 0.000428 | 0.000424 | 6.555* | 1.667 | Short-term debt effect varies. |
| Dropping LTDEBT dummies | 0.000430 | 0.000424 | 9.732* | 1.667 | Long-term debt effect varies. |
| Dropping OCF dummies | 0.000433 | 0.000424 | 14.866* | 1.667 | Operating cash flow effect varies. |
| Dropping GROWTH dummies | 0.000428 | 0.000424 | 5.251* | 1.667 | Sales growth effect varies. |
| Dropping SIZE dummies | 0.000431 | 0.000424 | 11.822* | 1.667 | Firm size effect varies. |
| Dropping AGE dummies | 0.000445 | 0.000424 | 34.848* | 1.667 | Firm age effect varies. |
| Dropping PM dummies | 0.000429 | 0.000424 | 8.344* | 1.667 | Profitability effect varies. |
| Dropping TANG dummies | 0.000438 | 0.000424 | 22.139* | 1.667 | Asset tangibility effect varies. |
| Dropping MB dummies | 0.000430 | 0.000424 | 9.314* | 1.667 | Asymmetric information effect varies. |
| Dropping EXP dummies | 0.000430 | 0.000424 | 9.715* | 1.667 | International trading effect varies. |
| Dropping all dummies (Completely restricted model) | 0.000658 | 0.000424 | 389.782* | 1.667 | Country effect varies. |

*Notes:* The *F*-statistics follows the *F* distribution with m, (n-k) degrees of freedom. * indicate the coefficient significant at the 5% level.

Thus, the null hypothesis that variations in firm-specific factors across countries have no effect on WCM is rejected. These results indicate that WCM varies from country to country because the effects of firm-specific determinants on WCM are different across countries. Thus, the findings confirm the indirect country effects on WCM and, therefore, support *H13*.

As country setting is captured by dummy variables in this paper, a limitation is that there is no specific identification of country-level factors (e.g., cultures, development of capital markets, investors' legal protection and relationships with banks) to which differences in WCM across countries can be attributed. Future research can further explore this issue and explain variations in WCM across countries in greater detail by introducing particular country factors that are likely to determine WCM.

### 3.5.3 Implications of the Indirect Country Effects on WCM

Having demonstrated that the variations in international WCM are due to both direct country effects and indirect country effects through differences in the firm-specific determinants of WCM, further consideration can be given to how the firm-specific determinants of WCM are influenced by country. Table 3.6 reports the OLS regression results of equation (1) for the individual 15 countries.

For short-term debt, three countries (i.e., France, Germany and Switzerland) show a very strong positive relationship with WCR. The results indicate that, the need for and importance of, short-term debt is likely to be higher for firms listed in these countries.

## Table 3.6: Determinants of WCM by Country

| Dependent Variable: WCR | UK | Belgium | France | Greece | Italy | Netherlands | Spain |
|---|---|---|---|---|---|---|---|
| $STDEBT_{t-1}$ | 0.2405* | 0.3231* | 0.3079*** | 0.1487* | 0.2667* | 0.1607 | 0.2158 |
| | (0.0981) | (0.1495) | (0.0677) | (0.0723) | (0.1210) | (0.1116) | (0.1716) |
| $LTDEBT_{t-1}$ | -0.0694 | -0.2914* | -0.0223 | 0.042 | -0.1327 | 0.0617 | -0.2813* |
| | (0.0823) | (0.1353) | (0.0703) | (0.0626) | (0.1052) | (0.0918) | (0.1206) |
| $OCF_{t-1}$ | 0.1164* | 0.1519 | 0.1166*** | 0.1955*** | 0.1300 | 0.1122 | 0.0412 |
| | (0.0517) | (0.2453) | (0.0266) | (0.0375) | (0.0661) | (0.0981) | (0.0777) |
| $GROWTH_{t-1}$ | -0.0158 | 0.0335 | -0.0306* | -0.0092 | -0.0156 | 0.0230 | 0.0072 |
| | (0.0191) | (0.0283) | (0.0148) | (0.0149) | (0.0182) | (0.0208) | (0.0192) |
| $SIZE_{t-1}$ | -0.0271*** | 0.0018 | -0.0199*** | -0.0174 | -0.0181 | -0.0240** | -0.0113 |
| | (0.0062) | (0.0134) | (0.0038) | (0.0096) | (0.0096) | (0.0069) | (0.0147) |
| $AGE_t$ | 0.0004 | -0.0003 | 0.0001 | -0.0005 | -0.0001 | -0.0001 | -0.0006 |
| | (0.0002) | (0.0005) | (0.0002) | (0.0004) | (0.0003) | (0.0003) | (0.0005) |
| $PM_{t-1}$ | -0.0358 | -0.0278 | -0.0579 | -0.2153** | -0.1945* | -0.2826*** | -0.1585 |
| | (0.0518) | (0.1227) | (0.0343) | (0.0651) | (0.0937) | (0.0710) | (0.0909) |
| $TANG_{t-1}$ | -0.2279** | -0.2822* | -0.2861*** | -0.4449*** | -0.0561 | -0.0593 | -0.1690 |
| | (0.0699) | (0.1053) | (0.0536) | (0.0577) | (0.0972) | (0.0979) | (0.1411) |
| $MB_{t-1}$ | 0.0029 | -0.027 | -0.0062 | -0.0229 | -0.0106 | 0.008 | 0.0083 |
| | (0.0093) | (0.0190) | (0.0060) | (0.0136) | (0.0154) | (0.0177) | (0.0152) |
| $EXP_t$ | -0.0225 | 0.0064 | 0.0281 | -0.0091 | 0.0107 | - | 0.0768 |
| | (0.0371) | (0.0603) | (0.0463) | (0.0215) | (0.0407) | - | (0.0473) |
| $GDP_t$ | 0.0015 | 0.0080* | 0.0031** | 0.0033* | -0.0006 | 0.0065* | 0.0167* |
| | (0.0014) | (0.0037) | (0.0010) | (0.0014) | (0.0014) | (0.0026) | (0.0063) |
| N | 832 | 377 | 2,146 | 946 | 824 | 285 | 350 |
| Adjusted $R^2$ | 0.3716 | 0.4197 | 0.3050 | 0.3775 | 0.2995 | 0.5665 | 0.3368 |

*Notes:* This table reports the results of the ordinary least square (OLS) estimation of regression equation (1) for 15 individual countries. Standard errors are robust to the problems of heteroskedasticity and autocorrelation. Year dummies are included in all models. All variables are defined as in Table 3.1. Standard errors of coefficients are reported in parenthesis.
*, ** and *** indicate the coefficient significance at the 10%, 5% and 1% levels, respectively.

## Table 3.6: Determinants of WCM by Country (Continued)

| Dependent Variable: WCR | Portugal | Austria | Germany | Switzerland | Denmark | Finland | Norway | Sweden |
|---|---|---|---|---|---|---|---|---|
| $STDEBT_{t-1}$ | 0.0091 | 0.0920 | 0.1848*** | 0.2276** | 0.1846 | 0.2851* | 0.1860 | 0.0512 |
| | (0.0952) | (0.1605) | (0.0483) | (0.0709) | (0.1044) | (0.1221) | (0.1402) | (0.1014) |
| $LTDEBT_{t-1}$ | -0.0517 | 0.0541 | -0.1333* | 0.0482 | -0.0879 | -0.1877* | -0.0676 | 0.1865* |
| | (0.0959) | (0.1399) | (0.0532) | (0.0624) | (0.0930) | (0.0905) | (0.0922) | (0.0873) |
| $OCF_{t-1}$ | 0.0157 | -0.3238 | 0.1457*** | 0.1957*** | 0.2121*** | 0.1003 | 0.1384*** | 0.2127*** |
| | (0.0629) | (0.3351) | (0.0257) | (0.0565) | (0.0419) | (0.0537) | (0.0302) | (0.0322) |
| $GROWTH_{t-1}$ | -0.0254 | -0.0490* | -0.0077 | 0.0149 | -0.0351 | 0.0269 | -0.0249 | -0.0505* |
| | (0.0144) | (0.0205) | (0.0142) | (0.0233) | (0.0192) | (0.0264) | (0.0157) | (0.0194) |
| $SIZE_{t-1}$ | 0.0509 | 0.0040 | -0.0149*** | -0.0268*** | -0.0157 | -0.0080 | -0.0065 | -0.0192* |
| | (0.0318) | (0.0114) | (0.0035) | (0.0063) | (0.0096) | (0.0078) | (0.0071) | (0.0079) |
| $AGE_t$ | -0.0054 | -0.0003 | 0.0007*** | 0.0003 | -0.0004 | -0.0009* | -0.0008* | 0.0006 |
| | (0.0033) | (0.0003) | (0.0001) | (0.0002) | (0.0003) | (0.0004) | (0.0004) | (0.0005) |
| $PM_{t-1}$ | -0.0504 | -0.1361 | -0.0735 | -0.1030 | -0.2212* | 0.1261 | -0.0547 | -0.1756*** |
| | (0.0724) | (0.2513) | (0.0445) | (0.0673) | (0.0868) | (0.1018) | (0.0518) | (0.0499) |
| $TANG_{t-1}$ | -0.1313 | 0.0090 | -0.3458*** | -0.2549*** | -0.3552*** | -0.3108*** | -0.1695 | -0.2204* |
| | (0.0972) | (0.1688) | (0.0443) | (0.0621) | (0.0937) | (0.0707) | (0.1093) | (0.0917) |
| $MB_{t-1}$ | 0.0085 | 0.0107 | -0.0195* | 0.0110 | 0.0047 | -0.0005 | -0.0161 | 0.0012 |
| | (0.0278) | (0.0106) | (0.0076) | (0.0083) | (0.0107) | (0.0135) | (0.0112) | (0.0066) |
| $EXP_t$ | 0.0120 | - | 0.0927** | 0.2389*** | -0.0013 | -0.2080*** | 0.0864 | - |
| | (0.0414) | - | (0.0315) | (0.0604) | (0.0408) | (0.0534) | (0.0825) | - |
| $GDP_t$ | 0.0085 | 0.0038 | 0.0013 | 0.0019 | 0.0000 | -0.0005 | 0.0018 | 0.0025 |
| | (0.0060) | (0.0036) | (0.0009) | (0.0027) | (0.0019) | (0.0015) | (0.0077) | (0.0019) |
| N | 108 | 214 | 2,137 | 910 | 409 | 403 | 261 | 616 |
| Adjusted $R^2$ | 0.9357 | 0.2258 | 0.3817 | 0.3645 | 0.5241 | 0.4785 | 0.4971 | 0.3875 |

*Notes:* This table reports the results of the ordinary least square (OLS) estimation of regression equation (1) for 15 individual countries. Standard errors are robust to the problems of heteroskedasticity and autocorrelation. Year dummies are included in all models. All variables are defined as in Table 3.1. Standard errors of coefficients are reported in parenthesis.
*, ** and *** indicate the coefficient significance at the 10%, 5% and 1% levels, respectively.

Coincidentally, this finding is consistent with that of Bancel and Mittoo (2004), who report that managers in French and German civil law countries value matching maturity much more highly than do their counterparts in Scandinavian civil law countries and English common law countries. Thus, it is possible that the legal system may play a major role in the relation between short-term external financing and WCM.[16]

Operating cash flow is significantly and positively related to WCR in eight countries. Comparing the coefficient of operating cash flow with those of short- and long-term debts for each individual country, the result is inclined to suggest that operating cash flow is more crucial source of funds in financing working capital for Scandinavian firms. This result is likely to suggest that the pecking order theory is applied in Scandinavian countries (i.e., firms prefer internal to external financing).

An insignificant relationship between WCR and long-term debts in most European countries reflects that European countries are inclined to adopt the maturity matching hypothesis. Interestingly, this contrasts with the negative relationship found by Chiou et al. (2006) in Taiwan and Wasiuzzaman and Arumugam (2013) in Malaysia (refer to Table 1.2). This comparison suggests that differences in breadth and development of capital markets between developed and developing countries may have an effect on a firm's choice of financing resources towards WCM.[17]

[16] Chapter 4 is undertaken to warrant this information by examining both a direct effect of a country's legal system on a firm's WCM and an indirect effect of a country's legal system on a firm's WCM through the use of financial debt.

[17] Provided that firms follow the pecking order theory and the capital markets are more superior in developed countries than in developing countries, firms in former countries are likely to enjoy more readily available short-term debts. In contrast, firms in latter countries may face insufficient short-term debts which lead them to come down the pecking order and use long-term debts to finance their investments in working capital.

In addition, for a majority of the countries, sales growth, firm size, firm age, profitability, informational asymmetry and whether or not firms trade internationally do not matter when it comes to investing in working capital. For the latter, as indicated by the coefficient of EXP being insignificant, it implies that WCM policies are dominated by the headquarters, regardless of where their operational clusters are.

### 3.6 Comparison of the Results with Previous Studies

| Previous Studies | Current Research |
|---|---|
| Prior literature suggests that firm-specific characteristics do matter in determining and affecting WCR (e.g., Chiou et al., 2006; Hill et al., 2010; Banos-Caballero et al., 2013; Wasiuzzaman and Arumugam, 2013). | Prior literature was conducted based on individual country setting and this research is the first to examine the determinants of WCR based on cross-country data.<br><br>This research highlights that apart from firm-specific characteristics, country settings also have significant influence on a firm's WCR and can explain considerable portion (almost 9%) of variations in WCR across countries. Knowing country settings is important in determining and affecting working capital management, and it is useful to take into accounting this factor in the analysis of working capital management. Thus, the research yield a new result that there is the direct impact of country settings on WCR. |
| Prior literature provides mixed results for the effects of firm-specific characteristics, particularly sales growth, firm size, firm age, profitability, and operating cash flow, on WCR. | As a result of the cross-country analysis, this research is able to explain the mixed findings in the literature. These inconclusive results are, in part, because country settings also influence the roles of firm-specific determinants of WCR. Therefore, the result also shows that there is the indirect impact of country settings on WCR. |

### 3.7 Robustness Test

In this section, the paper conducts robustness tests to validate the main results reported. Firstly, the paper reestimates the baseline model, equation (2), through partitioning of the data by year from 2000 to 2011. The cross-sectional results (not tabulated) remain essentially the same as those of the panel data presented earlier in Table 3.4 column (6).

Secondly, the baseline model is reestimated using non-winsorised data. The results (not tabulated) confirm the earlier findings in Table 3.4 column (6), except for the coefficients of $OCF_{t-1}$ and $PM_{t-1}$ that lose significance while that of $GROWTH_{t-1}$ remains negative but becomes significant at the 5% level. The changes in coefficients' significance can be explained by the fact that non-winsorised $OCF_{t-1}$ and $PM_{t-1}$ are heavily negatively skewed while non-winsorised $GROWTH_{t-1}$ is heavily positively skewed (refer to footnote 10). As a result, this robustness test justifies the appropriateness of the main results based on the winsorised data.

Finally, earlier findings at both regional and country levels suggest that European firms tend to finance their working capital using short-term financial debt rather than long-term financial debt.[18] To ensure the conclusion that pan-European firms finance their working capital in the way that is consistent with the maturity matching approach, the following robustness tests are performed. First, in Table 3.7 columns (1) and (2), where each of $STDEBT_{t-1}$ and $LTDEBT_{t-1}$ is included as the only source of external financing, a corresponding regression adjusted $R^2$ is 0.69 and 0.67, respectively.

[18] For regional level based on 15 pan-European countries, the finding in Table 3.4 column (6) shows that the coefficient of $STDEBT_{t-1}$ is more significant than that of $LTDEBT_{t-1}$. For country level, Table 3.6 shows that the coefficient of $STDEBT_{t-1}$ is significant for eight out of 15 countries whereas that of $LTDEBT_{t-1}$ is significant for five out of 15 countries and only at the 10% level.

## Table 3.7: The Relative Importance of Short-term and Long-term External Financing on WCM

| Dependent Variable: WCR | (1) | (2) | (3) |
|---|---|---|---|
| $STDEBT_{t-1}$ | 0.3708*** | - | 0.3165*** |
| | (0.0892) | - | (0.0771) |
| $LTDEBT_{t-1}$ | - | -0.2103** | -0.2078*** |
| | - | (0.0658) | (0.0613) |
| $OCF_{t-1}$ | 0.1304*** | 0.1224*** | 0.1295*** |
| | (0.0215) | (0.0210) | (0.0203) |
| $GROWTH_{t-1}$ | -0.0127 | -0.0193* | -0.0122 |
| | (0.0088) | (0.0085) | (0.0079) |
| $SIZE_{t-1}$ | -0.0151*** | -0.0146*** | -0.0121** |
| | (0.0041) | (0.0037) | (0.0039) |
| $AGE_t$ | 0.0000 | 0.0000 | -0.0001 |
| | (0.0002) | (0.0001) | (0.0001) |
| $PM_{t-1}$ | -0.1623*** | -0.1569*** | -0.1429*** |
| | (0.0284) | (0.0310) | (0.0311) |
| $TANG_{t-1}$ | -0.1889*** | -0.1566** | -0.1607** |
| | (0.0539) | (0.0566) | (0.0509) |
| $MB_{t-1}$ | 0.001 | -0.0045 | -0.0021 |
| | (0.0056) | (0.0062) | (0.0058) |
| $EXP_t$ | 0.0362 | 0.0335 | 0.0328 |
| | (0.0219) | (0.0202) | (0.0222) |
| $GDP_t$ | 0.0041*** | 0.0036** | 0.0039** |
| | (0.0011) | (0.0012) | (0.0012) |
| $STDEBT_{t-1} \times LTDEBT_{t-1}$ | - | - | 131.4735 |
| | - | - | (169.6500) |
| N | 10,818 | 10,818 | 10,818 |
| Adjusted $R^2$ | 0.6869 | 0.6743 | 0.6985 |

*Notes:* Columns (1) and (2) report the results of the weighted least square (WLS) estimation of regression equation (1) when each of $LTDEBT_{t-1}$ and $STDEBT_{t-1}$ is dropped from the equation, respectively. Column (3) reports the result of the WLS estimation of regression equation (1) when the interaction term between $STDEBT_{t-1}$ and $LTDEBT_{t-1}$ is augmented in equation (1). Year dummies are included in all models. All variables are defined as in Table 3.1. Standard errors of coefficients are errors are adjusted for the problems of heteroskedasticity and autocorrelation using Roger's standard errors adjusted for clustering across firms and reported in parenthesis. *, ** and *** indicate the coefficient significance at the 10%, 5% and 1% levels, respectively.

This indicates the use of short-term debt can explain the variations in WCM across European firms better than the use of long-term debt. In other words, short-term debt is more widely used to finance European firms' working capital than long-term debt.

Second, the interaction term between $STDEBT_{t-1}$ and $LTDEBT_{t-1}$ is also introduced in the core model. Column (3) shows that the coefficient of the interaction term is not significant. This indicates that while firms primarily use short-term debts to finance their working capital, they do not substitute short-term debts with long-term debts.

### 3.8 Conclusion

In summary, the findings, based on 15 pan-European countries, show that external and internal funding, firm size, and levels of profitability and investment in fixed assets play an important role in European firms' WCM. Bad economic conditions, especially the recent financial crisis starting in late 2008, stimulate firms to have a tight control over WCM. It is also clear that the country setting has an important impact on WCM both directly and indirectly through variations in firm-specific determinants.

The country-level analysis also implies that the national legal system is likely play a major role in the relation between WCM and sources of financing. In particular, French and German civil law countries are more inclined to use short-term external financing whereas Scandinavian civil law countries are more inclined to use internal financing from operating cash flow to finance their working capital. There is also evidence that, in most European countries, working capital is not financed with long-term debt. This

is in accordance with the maturity matching hypothesis as mentioned in Van Horne (1998).

When compared to prior literature, the insignificance of the relationship between long-term debt and WCM in the European context is in contrast with the strong and negative relationship found based on emerging markets such as Taiwan in Chiou et al. (2006), Pakistan in Nazir and Afza (2009) and Malaysia in Wasiuzzaman and Arumugam (2013). It is possible that differences between developed and developing economies could explain the relationship between WCM and long-term debts, and further research is needed on this issue. The current study, therefore, lays out an implication that there may be particular country-level factors (e.g., legal system and financial development) that influence differences in the firm-specific determinants of WCM which ultimately impact a firm's WCM. Further study on the detailed nature of country-specific factors that are associated with variations in the determinants of WCM will be examined in Chapter 4. In addition, there is an opportunity for future research to investigate the determinants of WCM on a larger scale to cover countries from developed, developing and underdeveloped economies across continents.

This research adds to the literature on the determinants of WCM that already suggests different firm characteristics make it necessary for firms to have different working capital policies. It provides new insights into direct and indirect country effects on a firm's WCM. Two practical implications of this research are apparent. First, apart from different firm characteristics, country-level factors should be acknowledged when conducting and using international benchmarking exercises in evaluating a firm's

financial wellbeing. Thus, where a firm has a relatively higher WCR than that of its peer countries, it does not necessarily indicate poorer WCM efficiency but, simply, that it operates in a different national context. Second, with an accurate understanding of the fundamentals of WCM, international firms may learn from and exploit other markets to improve their WCM efficiency. For example, they may shorten payment terms offered to firms in countries where superior financial support exists. They may also implement early payment discounts to firms in countries, with lower availability of funds that tend to delay their payments.

### 3.9 Summary of Chapter 3

To fulfil the four research objectives identified at the start of this chapter (refer to Section 3.1), empirical findings show that there are statistically significant variations in WCM across a selection of pan-European countries. These variations in WCM are due to both country effects and differences in firm-specific effects across countries. The financial crisis has an impact on firms' WCM in the way that firms tried to intensify their WCM during an economic recession and relax their WCM during an economic recovery. As the results in this chapter suggest that the country setting has effects on both WCM and its determinants, this provides implications for Chapter 4 to examine what particular country-level factors influence WCM and its determinants, and to what extent.

# CHAPTER 4

# LEGAL AND CULTURAL INFLUENCES ON WORKING CAPITAL MANAGEMENT: EVIDENCE FROM PAN-EUROPEAN COMPANIES

## 4.1 Introduction

As indicated in Chapter 3, country settings have both significant direct and indirect effects on a firm's WCM. However, the analysis in the previous chapter has not specified what aspects of country-level factors can be attributed to the differences in WCM across countries.

Practitioners' reports have touched on cultural differences that may have an influence on attitudes towards WCM. For instance, Atradius (2011) focuses on trade credit management and payment behaviour of European Union (EU) economies, and highlights the prevailing difference between the business cultures of Northern and Southern Europe, in terms of the duration of credit and payment periods.[19] Apart from acknowledging cultural difference, he also reports that one of the reasons for the payment delays from domestic customers is predominantly due to the insufficient availability of funds (over 40% of respondents overall and as high as 59% in Italy and 71% in Spain). These findings provide an initial indication that a firm's WCM may be directly influenced by two particular country-level variables (i.e., culture and capital market access).

[19] According to Atradius's (2011) Payment Practices Barometer, at the shortest end of the scale, average payment term for domestic customers are 21 days in Denmark, followed by 24 days in Germany whereas at the longest end of the scale, that of domestic customers are 49 days in Italy and as long as 72 days in Spain.

In addition, a country-by-country analysis in Chapter 3 (Table 3.6) reveals that while the effects of some firm-level determinants are either significant (e.g., investment in fixed assets) or insignificant (e.g., sales growth, firm size, firm age, level of informational asymmetry and international trading) across almost every country in the study, the effects of short-term debt and operating cash flow vary greatly from one country to another. In particular, Belgium, France, Italy, Germany, and Switzerland are more likely to use short-term debt to finance their working capital requirements, whereas Scandinavian countries are more likely to use operating cash flow to finance their working capital requirements. Thus, based on this finding, it is possible that country-level variables may have indirect effects on a firm's WCM through differences in 'the use of financial debt'.

Incorporated the evidence from the previous two paragraphs, four main objectives of this chapter are identified as follows:

1) a first objective is to examine whether or not national "capital market access" has a *direct* influence on the variations in WCM across pan-European countries;
2) a second objective is to examine whether or not national "capital market access" also has an *indirect* influence on the variations in WCM across pan-European countries through the use of financial debt;
3) a third objective is to examine whether or not national "culture" has a *direct* influence on the variations in WCM across pan-European countries;

4) a fourth objective is to examine whether or not national "culture" also has an *indirect* influence on the variations in WCM across pan-European countries through the use of financial debt.

Using a sample of 10,818 firm-year observations from 15 European countries between 2000 and 2011, the paper finds that "capital market access" as measured by legal environment has a significant direct impact on a firm's WCM. Specifically, firms in countries with smaller capital market access or poorer legal environment (i.e., civil law relative to common law tradition) report higher working capital requirements (WCR).[20] However, "culture" as measured by Schwartz's (1994) cultural dimensions does not have a significant direct impact on a firm's WCM.

Next, this chapter explores whether "capital market access" and "culture" also have an indirect impact on a firm's WCM through differences in the use of financial debt, including short-term and long-term debts. Building on the prior literature that poor legal environment is related to narrower and less developed capital markets (e.g., La Porta et al., 1997; 1998), the paper finds that countries with poorer legal environment have a higher marginal propensity to invest in working capital from an increase in short-term financial debt more than countries with better legal environment.[21] Finally, extending from the study of Chui et al. (2002) that countries with high "conservatism" and "mastery" cultural values are more likely to decrease the use of debt finance, the

[20] Similar to that of Chapter 3, the dependent variable in Chapter 4 is working capital requirements (WCR). WCR is defined as the sum of accounts receivable and inventory net of accounts payable, deflated by total assets.

[21] In other words, as external financing is scarcer in countries with poorer legal environment, an increase in the availability of financial debt is supposed to be more highly utilised in these countries to meet the demand for working capital investments, as compared with countries with better legal environment.

paper documents that these countries are less likely to opt for both short-term and long-term debts to finance their working capital. In other words, firms in these countries rely more on operating cash flow in financing their working capital.

This research provides a contribution to the current literature by reinforcing the important role of external factors or country-level factors, particularly "capital market access" and "culture", that play in corporate WCM policies. Furthermore, managers should recognise how these country-level variables influence the use of external and internal financing in attaining optimal WCM policies for their firms. In this respect, this chapter provides a clearer insight on why variations in WCM across countries exist.

The reminder of this chapter is organised as follows. Section 4.2 develops hypotheses regarding the direct and indirect effects of legal environment and culture on a firm's WCM. Section 4.3 presents the sample and the variables used. Section 4.4 describes the methodology employed. Section 4.5 discusses empirical results. Section 4.6 conducts robustness tests. Section 4.7 concludes the main findings and practical implications. Finally, Section 4.8 summarises the chapter.

## 4.2 Literature Review and Hypothesis Development

To examine how capital market access as reflected by legal environment and culture influence a firm's WCM, this section reviews prior literature and develops hypotheses to test both the direct and indirect effects of these two country-level variables on a firm's WCM.

### 4.2.1 Legal Environment and the Availability of External Finance

La Porta et al. (1997) assess the ability of firms in different legal environments to raise external finance through debt and equity. They conjecture that better legal protection should enable investors to offer firms financing at better terms (i.e., for equity, a higher valuation relative to the underlying cash flows, and for debt a cheaper cost of funds). This is argued because better legal protection enhances investors' willingness to surrender funds in exchange for securities. Consequently, firms in countries with better legal protection would have broader and more developed debt and equity capital markets. Their results also show that countries with poorer investor protection (i.e., French civil law countries, in particular), measured by both the character of legal rules and the quality of law enforcement, have narrower and less developed capital markets, in comparison with countries that have better investor protection (i.e., common law countries). These findings are confirmed by more recent studies (e.g., Beck and Levine, 2005; Hail and Leuz, 2006; Chen et al., 2009).[22] Focusing on European countries, Bancel and Mittoo (2004)'s study on the determinants of capital structure indicates that the factors underlying debt policies vary systematically with the quality of a country's legal system. This, in turn, substantiates the arguments of La Porta et al. (1997, 1998) that a country's legal environment primarily influences the availability of external financing.

The prior literature indicates that strong legal protection eases the restrictions firms may face in raising external finance, hence resulting in relatively better terms and

[22] Beck and Levine (2005) report that firms in French civil law countries find it more difficult to obtain external financing than firms in the other countries. Hail and Leuz (2006) find that firms from countries with stricter law enforcement tend to have a significantly lower cost of capital. In addition, Chen et al. (2009) find that firm-level corporate governance has a strong negative effect on a firm's cost of equity and the result is more pronounced in countries with poor legal protections.

lower costs for external financing. If the same argument is applied for accounts payable, which is one channel of external financing, it can be expected that firms in countries with strong legal protection are likely to receive better payment terms from their suppliers (e.g., a relatively longer credit term and lower penalty charge for late payment). Considering that accounts payable is a main negative component of working capital, a direct relationship between legal environment and a firm's WCM is hypothesised as follows:

*H1: Firms in countries with weak legal environment (civil law countries) have relatively higher working capital than firms in countries with strong legal environment (common law countries).*

Other sources of funds available for the investment in working capital are debt and equity. The indirect impact of legal environment on a firm's WCM can be explained through the use of external financing to invest in working capital. As framed by Myers (1984) and Myers and Majluf (1984), the pecking order theory of finance predicts that firms favour internal funds to external funds, debt over equity, and short-term over long-term debt. This is because of asymmetric information problems and issue costs that are less severe and cheaper for retained earnings, trade payables, short-term, and long-term financial debt, respectively. To avoid potential dilution of ownership, equity should be raised as a last resort. Consequently, to finance working capital, first, managers should utilise the credit term offered by suppliers as this period is regarded as a cheaper source of funds relative to financial debt. Subsequently, short-term and long-term financial debts will be applied to finance net working capital in a respective order.

As suggested in La Porta et al. (1997; 1998), a country's legal protection of investors has a significant positive impact on the availability of external financing. In particular, common law countries have larger aggregate liabilities than France and the Scandinavian countries where civil law dominates. However, this is not the case in Germany.[23] As financial debt is more limited in countries with weak legal protections, it can be expected that a marginal propensity to invest in working capital that results from an increase in financial debt would be higher in these countries.[24] Accordingly, the paper hypothesises that legal environment would mediate the relationship between a firm's WCM and short-term and long-term financial debt as follows:

*H2A: Firms in countries with weak legal environment (civil law countries) have a relatively higher marginal propensity to invest in working capital from an increase in short-term financial debt than firms in countries with strong legal environment (common law countries).*

*H2B: Firms in countries with weak legal environment (civil law countries) have a relatively higher marginal propensity to invest in working capital from an increase in long-term financial debt than firms in countries with strong legal environment (common law countries).*

[23] La Porta et al. (1997) report the average ratio of the sum of bank debt of the private sector and outstanding non-financial bonds to GNP in 1994 for English law origin countries at 0.68, French origin countries at 0.45, German origin countries at 0.97, and Scandinavian origin countries at 0.57.

[24] The marginal propensity to invest in working capital from an increase in financial debt can be also defined as the proportion of each additional Euro of financial debt that is used to invest in working capital.

### 4.2.2 Schwartz's Cultural Dimensions

Practitioners' reports regarding international working capital mention that variations in WCM across countries and regions may be the result of culture differences (Atradius, 2011; Sawers, 2012). For instance, Atradius (2011) highlights the prevailing difference in business cultures in terms of the duration of credit and payment periods between Northern and Southern Europe. Sawers (2012) indicates that it is culture that determines how a business community operates. For example, in Spain and Italy, where business relationships are crucial, firms are unlikely to rigorously chase on receivables collections and tend to pay their suppliers later as well. Although there are some indications that culture influences a firm's WCM, no prior study on WCM has attempted to employ specific cultural factors (variables) to investigate WCM differences and explain the reasons behind the effects of culture.

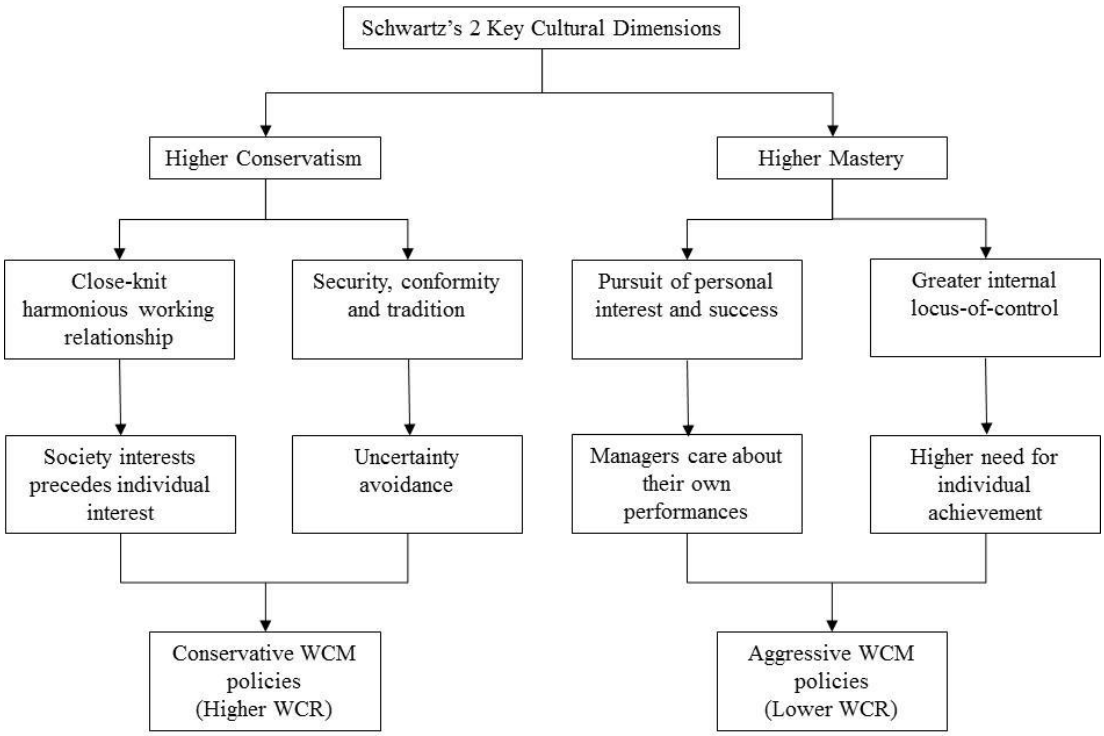
Drawing on similar research on the relationship between capital structure and culture (Chui et al., 2002), Schwartz's (1994) culture-level value types are employed in this study. [25,26] According to Schwartz (1994), culture-level dimensions can be condensed into two dimensions: a dimension of opposing conceptions of the person as autonomous *versus* embedded or related (i.e., autonomy *versus* conservatism), and a dimension opposing pursuit of collective goals *versus* personal goals (i.e., egalitarian commitment and harmony *versus* mastery and hierarchy). Using these two condensed

[25] Schwartz's (1994) cultural dimensions are based on data from 38 nations during the 1988-1992 period. His seven distinct cultural values comprise conservatism, intellectual autonomy, affective autonomy, hierarchy, mastery, egalitarian commitment, and harmony. He also mentions that although his set of dimensions is related to that of Hofstede (1980) in some respects, the two sets are quite different. This is because they are based on different theoretical reasoning, methods, set of nations, types of respondents and study period.

[26] As mentioned in Chui et al. (2002), the sample used for Schwartz's (1994) study is more contemporary than that of Hofstede (1980). In addition, Goldstein (1981) argues about cultural bond, and Triandis (1986) argues about the exclusion of some other important value dimension as other shortcomings of Hofstede's (1980) cultural dimensions (as cited in Chui et al., 2002, p.122).

cultural dimensions, this study hypothesises how culture can directly influence a firm's WCM in the manner depicted in Figure 4.1. Following the diagram, the research theorises the direct effects of culture on a firm's WCM based on these two different cultural dimensions.

**Figure 4.1: Linkages between Cultural Dimensions and WCM**




**(a) Conservatism**

Conservative societies tend to emphasise close-knit harmonious working relationship and act according to the interests of the group even when there is a conflict with one's own individual interests (Schwartz, 1994). It can be expected that relationships with customers and suppliers are very important in this society. Consequently, managers are likely to provide generous credit terms to give customers sufficient time to assess

their products and services quality and hesitate to push on collections. Simultaneously, managers need to make sure they pay their bills to suppliers in a timely manner in order to maintain good business relationship and preserve their credibility.

In addition, conservative societies value security, conformity and tradition. Offermann and Hellmann (1997) suggest that uncertainty avoidance is the extent to which members of a culture prefer certainty and predictability and find ambiguity stressful. Further, Riddle (1992) mentions that countries with high uncertainty avoidance tend to be more risk-averse. As a result, it can be expected that conservative firms will not focus on shortening the credit terms offered to customers as it might lead to a fall in customer retention. These firms will also be inclined to have high investment in inventory. This is because inventory build-up can protect firms from business interruptions due to high demand, products scarcity, and materials price fluctuation (Blinder and Maccini, 1991). Moreover, a payment should be made to suppliers promptly to ensure a late payment penalty is not applied. As firms in countries with high conservatism tend to adopt conservative WCM policies, the relationship between conservatism value and a firm's WCM is predicted as follows:

*H3: Firms in countries with high "conservatism" value have relatively higher working capital than firms in countries with low "conservatism" value.*

**(b) Mastery**

Mastery emphasises the individual's pursuit of personal interest and promotes active efforts to modify one's surroundings and get ahead of others (Schwartz, 1994). Thus,

managers tend to care about their own performance. As managers' performance is likely to be tied to a firm's performances, they need to demonstrate their ability to ensure key performance indicators (KPIs) are achieved. For instance, there might be a need to streamline the firm's debt collection and production processes, while negotiating for better payment terms and conditions with suppliers in order to expedite cash flow.

The theory of locus of control constitutes an approach that can be used to understand human motivation and behaviour. Managers are believed to have a locus of control when they believe that any consequences are internally controlled through their own actions and decisions. Chui et al. (2002) suggest that since mastery bears the value that promotes active efforts to change surroundings through self-assertion, it is, therefore, closely linked to the internal locus of control. Consequently, they hypothesise that firms in countries with high mastery value are more likely to use aggressive policies as managers want to exert their ability.[27] Thus, the relationship between mastery value and a firm's WCM is predicted as follows:

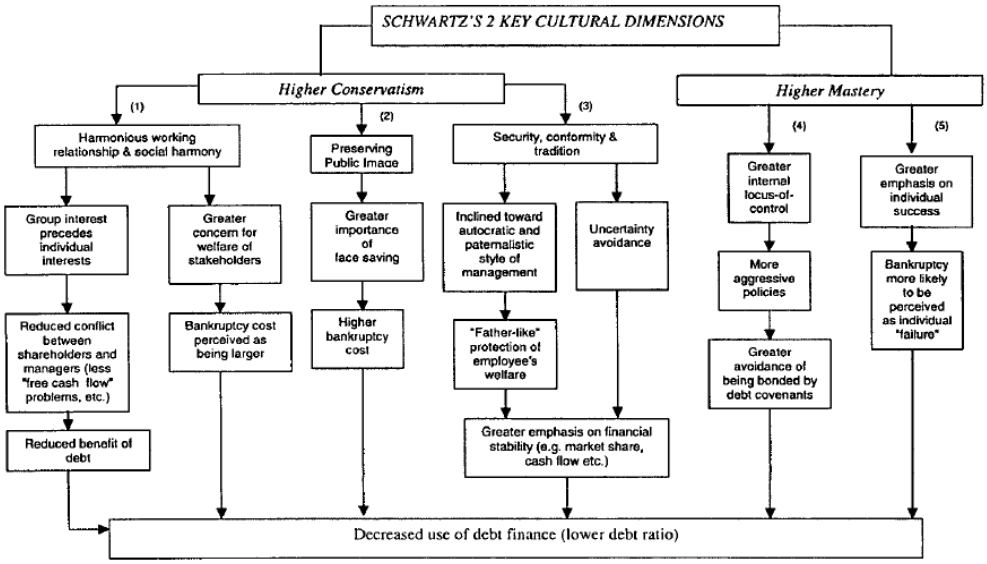
*H4: Firms in countries with high "mastery" value have a relatively lower working capital than firms in countries with low "mastery" value.*

The indirect effects of culture on a firm's WCM can be, in part, explained by the influence of culture on the use of debt. A number of prior research studies have examined the determinants of international capital structure, addressing various factors, including industry and country factors. However, as mentioned in Chui et al.

[27] For aggressive *versus* conservative WCM policies, refer to Section 2.1.2.

(2002), no specific cultural frameworks are employed to comprehensively explain the differences in cross-national capital structure. They argue that culture affects management's perception of cost and risk related to debt finance and agency problems in each country and, therefore, investigate whether or not the national culture affects corporate capital structure. Using Schwartz's (1994) two condensed cultural dimensions, they propose two hypotheses that leverage ratio is negatively related to: 1) the level of "conservatism", and 2) the level of "mastery" as shown in Figure 4.2.

**Figure 4.2: Linkages between Cultural Dimensions and Capital Structure Decisions**




Source: Chui et al. (2002, p.131)

### (a) Conservatism

Chui et al. (2002) indicate three explanations of why high conservatism is related to lower debt ratio. First, conflicts between shareholders and managers that may arise due to agency problems can be mitigated through debt financing (Jensen and Meckling,

1976). Since countries with high conservatism tend to value group interests higher than personal interests, agency problems are likely to be less severe in these countries, thereby resulting in lower benefits of debt financing and lower leverage. Second, in a conservatism culture, preserving public image is crucial. Higher use of debt finance may indicate a higher chance of bankruptcy which is regarded as a sign of public image loss. Third, conservative firms are more risk-averse while management style is likely to be autocratic and paternalistic. Since a high conservatism value is related to the decreased use of debt finance, it can be expected that firms in countries with high conservatism value will use less debt financing, in other words more internal financing, to support working capital investments. As a result, the indirect effects of conservatism value on the relationship between a firm's WCM and the use of financial debts are hypothesised as follows:

*H5A: Firms in countries with high "conservatism" value rely on short-term financial debt to finance their working capital relatively less than firms in countries with low "conservatism" value do.*

*H5B: Firms in countries with high "conservatism" value rely on long-term financial debt to finance their working capital relatively less than firms in countries with low "conservatism" value do.*

**(b) Mastery**

As suggested by Chui et al. (2002), managers in culture with a high mastery value will want to demonstrate their ability and, therefore, prefer aggressive corporate policies

and investment strategies and not to be restricted by debt covenants. Also, they prefer not to fail the debt payments schedule. This is because it could eventually lead to corporate bankruptcy which may be perceived as management failure. Consequently, countries with high mastery value tend to use sources of financing other than debts. As with a high conservatism culture, it can be speculated that the indirect effects of mastery value on the relationship between a firm's WCM and the use of financial debt are hypothesised as follows:

*H6A: Firms in countries with high "mastery" value rely on short-term financial debt to finance their working capital relatively less than firms in countries with low "mastery" value do.*

*H6B: Firms in countries with high "mastery" value rely on long-term financial debt to finance their working capital relatively less than firms in countries with low "mastery" value do.*

### 4.3 Data and Summary Statistics

#### 4.3.1 Data Source and Variables

Similar to that of Chapter 3, the initial data set consisted of all listed firms in manufacturing industries (using 2-digit SIC 20-39) in 16 European countries included in La Porta et al. (1997). These countries represented a broad geographical mixed and comprised Ireland, United Kingdom, Belgium, France, Greece, Italy, Netherlands, Portugal, Spain, Austria, Germany, Switzerland, Denmark, Finland, Norway and Sweden.

The country-level variables were focused on two categories (i.e., legal environment and culture). To assess the strength of a country's legal environment, the character of legal rules was employed. As identified in La Porta et al. (1997), legal rules (LAW) can be categorised into English common law, French, German, or Scandinavian civil laws. In addition, common law countries are regarded as better legal environment, measured by both the character of legal rules and the quality of law enforcement, as compared to civil law countries, especially French civil law countries (La Porta et al., 1997). To measure cultural values, Schwartz's (1994) two condensed cultural dimensions, comprising "conservatism" value (CON) and "mastery" value (MAS), were employed.[28]

The firm-level financial data required to construct the variables used in this study was retrieved from Worldscope and Datastream, provided by Thomson One Banker from 1999 to 2011.[29] The working capital requirement (WCR) ratio, which is defined as the sum of accounts receivable and inventory net of accounts payable, deflated by total assets, was used as an integrated measure of WCM in this study. Other firm-level variables included leverage, operating cash flow, sales growth, firm size, firm age, profitability, asset tangibility, asymmetric information, and international firm. Leverage is measured by both the ratio of short-term debt to total assets (STDEBT) and the ratio of long-term debt to total assets (LTDEBT). Operating cash flow (OCF) is defined as operating income before depreciation and amortisation expenses minus interest expenses and income taxes scaled by sales. Sales growth (GROWTH) is

[28] Schwartz's (1994) study does not cover five countries included in the current study (i.e., UK, Belgium, Austria, Norway and Sweden).
[29] The 1999 data was required to construct some lagged explanatory variables.

calculated as a change in sales over the period *t*-1 to *t*. Firm size (SIZE) is measured by the natural logarithm of total assets. Firm age (AGE) is measured as the number of year since the year of its incorporation. Gross profit margin (PM) is used as a proxy of a firm's profitability and calculated as the ratio of sales minus costs of goods sold to sales. Asset tangibility (TANG) is measured by the ratio of a firm's fixed assets to total assets. The market-to-book (MB) ratio is defined as the sum of the book value of liabilities plus the market value of equity, divided by the book value of total assets. The dummy variable (EXP) is used to indicate whether a firm is domestic or international. If the ratio of international sales to total sales is greater than zero, a firm is trading internationally and the dummy variable is set equal to one and zero otherwise.

Three restrictions applied on the data are the same as those used in Chapter 3. First, to mitigate the effects of different industry compositions across countries, this study focuses on manufacturing industries (using 2-digit SIC codes 20-39). Second, firm-years with missing financial data and negative values of assets were eliminated.[30] Finally, the firm-level ratios were winsorised at 1% and 99% to moderate the influence of extreme values.[31] As a result of these filters, the final unbalanced panel data set consisted of 10,818 firm-year observations from 15 countries, covering the period from 2000 to 2011.

[30] As a result of the first two filters, there is no observation from Ireland remaining in the data set.

[31] Winsorisation was applied because the distributions of lagged operating cash flow ($OCF_{t-1}$) and lagged profitability ($PM_{t-1}$) are strongly negatively skewed whereas that of lagged sales growth ($GROWTH_{t-1}$) is strongly positively skewed. To ensure the consistency, winsorisation at 1% both tails is applied to all variables used.

### 4.3.2 Descriptive Statistics

**(a) Country-level variables**

Last three columns in Table 4.1 present the distribution of mean values of country-level variables across 15 countries in this study. Regarding legal environment, seven countries follow French civil law system, four countries follow Scandinavian civil law system, three countries follow German civil law system, and only one country follows English common law system. Regarding culture, mean and median CON are 3.59 and 3.66, respectively, lowest in Switzerland and highest in Finland. Mean and median MAS are very similar at 4.07 and 4.08, respectively, lowest in Finland and highest in Greece.

**(b) Firm-level variables**

Table 4.1 also presents the distribution of mean values of firm-level variables across countries. Mean and median WCR, the dependent variable, are 0.28. The lowest average WCR is found in Portugal (0.20) whereas the highest is found in Greece (0.32). For firm-level control variables, listed firms in European countries tend to rely on long-term debt more than short-term debt with mean $LTDEBT_{t-1}$ and $STDEBT_{t-1}$ are 0.14 and 0.10, respectively. Mean $OCF_{t-1}$ is 0.06. Comparing mean $TANG_{t-1}$ with mean WCR, it can be suggested that, on average, European firms' capital investments between fixed assets and working capital are about the same. Finally, a majority of firms in this study are international firms whilst only 3.8% of the sample is domestic firms.

## Table 4.1: Summary of Means Variables across Countries

| Country | N | WCR | $STDEBT_{t-1}$ | $LTDEBT_{t-1}$ | $OCF_{t-1}$ | $GROWTH_{t-1}$ | $SIZE_{t-1}$ | AGE | $PM_{t-1}$ | $TANG_{t-1}$ | $MB_{t-1}$ | EXP | GDP | LAW | CON | MAS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UK | 832 | 0.209 | 0.052 | 0.162 | 0.095 | 0.120 | 13.151 | 85.109 | 0.410 | 0.261 | 1.837 | 0.928 | 1.65 | English | - [a] | - [a] |
| Belgium | 377 | 0.259 | 0.096 | 0.110 | 0.090 | 0.076 | 12.476 | 61.430 | 0.212 | 0.288 | 1.464 | 0.958 | 1.54 | French | - [a] | - [a] |
| France | 2,146 | 0.290 | 0.096 | 0.120 | 0.046 | 0.084 | 12.547 | 60.666 | 0.226 | 0.190 | 1.475 | 0.979 | 1.30 | French | 3.35 | 3.89 |
| Greece | 946 | 0.321 | 0.188 | 0.133 | 0.049 | 0.080 | 11.775 | 42.534 | 0.280 | 0.389 | 1.218 | 0.923 | 0.97 | French | 3.68 | 4.53 |
| Italy | 824 | 0.218 | 0.123 | 0.141 | 0.074 | 0.092 | 13.496 | 56.113 | 0.423 | 0.222 | 1.270 | 0.917 | 0.44 | French | 3.82 | 4.08 |
| Netherlands | 285 | 0.287 | 0.084 | 0.142 | 0.077 | 0.064 | 13.379 | 64.288 | 0.288 | 0.246 | 1.528 | 1.000 | 1.51 | French | 3.68 | 3.98 |
| Spain | 350 | 0.214 | 0.119 | 0.139 | 0.087 | 0.118 | 13.454 | 57.114 | 0.279 | 0.347 | 1.618 | 0.926 | 2.10 | French | 3.42 | 4.11 |
| Portugal | 108 | 0.197 | 0.128 | 0.271 | 0.126 | 0.072 | 13.858 | 32.398 | 0.220 | 0.418 | 1.192 | 0.954 | 0.69 | French | 3.76 | 4.25 |
| Austria | 214 | 0.285 | 0.130 | 0.118 | 0.100 | 0.087 | 12.654 | 96.836 | 0.269 | 0.367 | 1.305 | 1.000 | 1.73 | German | - [a] | - [a] |
| Germany | 2,137 | 0.318 | 0.103 | 0.125 | 0.052 | 0.077 | 12.502 | 76.518 | 0.305 | 0.263 | 1.409 | 0.962 | 1.33 | German | 3.42 | 4.07 |
| Switzerland | 910 | 0.304 | 0.079 | 0.127 | 0.084 | 0.045 | 13.510 | 76.459 | 0.326 | 0.277 | 1.559 | 0.990 | 1.87 | German | 3.25 | 4.18 |
| Denmark | 409 | 0.314 | 0.119 | 0.134 | 0.048 | 0.073 | 14.255 | 76.878 | 0.338 | 0.335 | 1.739 | 0.976 | 0.88 | Scandinavia | 3.64 | 3.97 |
| Finland | 403 | 0.294 | 0.083 | 0.160 | 0.056 | 0.060 | 12.762 | 55.422 | 0.271 | 0.294 | 1.589 | 0.983 | 2.03 | Scandinavia | 3.84 | 3.63 |
| Norway | 261 | 0.201 | 0.065 | 0.200 | -0.065 | 0.173 | 14.732 | 58.027 | 0.314 | 0.295 | 1.912 | 0.966 | 1.35 | Scandinavia | - [a] | - [a] |
| Sweden | 616 | 0.270 | 0.054 | 0.144 | -0.007 | 0.121 | 14.688 | 51.547 | 0.301 | 0.210 | 1.918 | 1.000 | 2.36 | Scandinavia | - [a] | - [a] |
| Mean | | 0.281 | 0.101 | 0.135 | 0.057 | 0.086 | 12.982 | 65.349 | 0.300 | 0.266 | 1.508 | 0.962 | 1.402 | | 3.59 | 4.07 |
| Median | | 0.278 | 0.068 | 0.109 | 0.078 | 0.053 | 12.715 | 50.000 | 0.277 | 0.242 | 1.186 | 1.000 | 1.826 | | 3.66 | 4.08 |

*Notes:* The final data set contains an unbalanced panel data of 10,818 firm-year observations, corresponding to 15 countries over the period from 2000 to and 2011. WCR is calculated as the sum of accounts receivable and inventory net of accounts payable, deflated by total assets. STDEBT is short-term debt to total assets. LTDEBT is long-term debt to total assets. OCF is defined as operating income before depreciation and amortisation expenses minus interest expenses and income taxes scaled by sales. GROWTH is calculated as a change in sales over the period *t-1* to *t*. SIZE is measured by the natural logarithm of total assets. AGE is measured as the number of year since the year of its incorporation. PM is the ratio of sales minus costs of goods sold to sales. TANG is measured by the ratio of a firm's fixed assets to total assets. MB is defined as the sum of the book value of liabilities plus the market value of equity, divided by total assets. EXP is a dummy variable and set equal to one if a firm is trading internationally and zero otherwise. GDP is the growth or annual change in gross domestic product. LAW indicates a country's legal system which can be categorised into English common law, French, German or Scandinavian civil laws. CON and MAS are conservatism and mastery cultural values according to Schwartz's (1994) cultural dimensions. (a) indicates missing data due to such countries not being covered by Schwartz's (1994) study.

### 4.3.3 Univariate Results

To examine whether or not legal environment and culture have an influence on a firm's WCM, Table 4.2 presents univariate test results, in particular the difference-in-means test.[32] This test compares means of WCR across different sub-samples, categorised by country-level variables (i.e., countries with common *versus* civil law system; countries with high *versus* low "conservatism" value; and countries with high *versus* low "mastery" value).[33]

**Table 4.2: Difference-of-Means Test**

| Variable: WCR | LAW | | CON | | MAS | |
|---|---|---|---|---|---|---|
| | Common | Civil | High | Low | High | Low |
| N | 832 | 9,986 | 2,566 | 5,952 | 2,314 | 6,204 |
| Mean | 0.000251 | 0.000378 | 0.000513 | 0.000242 | 0.000447 | 0.000278 |
| Difference | -0.000127* | | 0.000271* | | 0.000170* | |
| *T*-Statistic | -17.918 | | 23.741 | | 14.808 | |

*Notes*: This table reports *T*-test for the differences-of-means of which the null hypothesis is that mean WCR is the same across sub-samples. * indicates the statistical significance at the 1% level. All variables are defined as in Table 4.1.

The null hypothesis assumes that mean WCR is the same across sub-samples. However, the difference-in-means of WCR is significant, and the test, therefore, rejects the null hypothesis at the 1% level for every country-level variable used. In particular, when legal environment (LAW) is used to separate the sample, firms in common law countries have, on average, significantly lower WCR than those in civil law countries. When cultural values are used, firms in countries with higher CON and

[32] As the sample of this study consists of 15 countries with an unbalanced number of firms across countries, mean WCR in Table 4.2 is calculated based on weighted average WCR with weights equal to the inverse of the number of firm-year observations in each country so that mean WCR is not dominated by WCR of countries that have large number of observations.

[33] Countries with high *versus* low "conservatism" value and "mastery" value are separated by their respective median values as shown in Table 4.1 (i.e., 3.66 for "conservatism" value and 4.08 for "mastery" value).

higher MAS have, on average, significantly higher WCR than those in countries with lower CON and lower MAS.

In sum, this univariate test initially indicates that both legal environment and culture have significant effects on a firm's WCM. However, the direction and the extent to which country-level legal environment and culture directly and indirectly affect WCM, controlling for firm-level variables, will be examined in Section 4.5.

### 4.4. Methodology

In this section, a discussion is conducted on the methodology employed to investigate the direct and indirect effects of legal environment and culture on a firm's WCM.

#### 4.4.1 The Direct Effects of Legal Environment on a Firm's WCM

The following baseline model is inspired by Hill et al. (2010) and Wasiuzzaman and Arumugam (2013), and adapted for pan-European firms in this study:

$$\begin{aligned} WCR_{i,t} = {} & \beta_0 + \beta_1 STDEBT_{i,t-1} + \beta_2 LTDEBT_{i,t-1} + \beta_3 OCF_{i,t-1} + \beta_4 GROWTH_{i,t-1} + \\ & \beta_5 SIZE_{i,t-1} + \beta_6 AGE_{i,t} + \beta_7 PM_{i,t-1} + \beta_8 TANG_{i,t-1} + \beta_9 MB_{i,t-1} + \\ & \beta_{10} EXP_{i,t} + \beta_{11} GDP_{i,t} + \sum_{t=2}^{12} a_j Year_t + \varepsilon_{i,t} \end{aligned} \quad (1)$$

Firm-level variables were defined in Secion 4.3. Following the methodology employed in the prior literature mentioned above, lagged values were adopted for most of the explanatory variables in order to alleviate endogeneity problems (i.e., explanatory

variables may be influenced by WCR). Year dummies were also included in the model. The parameter $\varepsilon_{i,t}$ is a random error term.

However, the main interest in this study lies in the legal and cultural influences on a firm's WCR. Hence, to test *H1*, the baseline model (1) that includes only firm-level variables is expanded by including legal environment variables as shown in equation (2):

$$\begin{aligned} WCR_{i,t} = {} & \beta_0 + \beta_1 STDEBT_{i,t-1} + \beta_2 LTDEBT_{i,t-1} + \beta_3 OCF_{i,t-1} + \beta_4 GROWTH_{i,t-1} + \\ & \beta_5 SIZE_{i,t-1} + \beta_6 AGE_{i,t} + \beta_7 PM_{i,t-1} + \beta_8 TANG_{i,t-1} + \beta_9 MB_{i,t-1} + \\ & \beta_{10} EXP_{i,t} + \beta_{11} GDP_{i,t} + \beta_{12} CIVIL_{i,t} + \sum_{t=2}^{12} a_j Year_t + \varepsilon_{i,t} \end{aligned} \quad (2)$$

where *CIVIL* is dummy variable and equals one for firms in countries with civil law origin and zero otherwise. All other variables are defined earlier. The direct effects of legal environment on WCR are captured by the regression coefficient ($\beta_{12}$). According to *H1*, $\beta_{12}$ is expected to significant and positive.

### 4.4.2 The Indirect Effects of Legal Environment on a Firm's WCM

In examining whether or not legal environment has an indirect impact on a firm's WCM through 'the use of financial debt' (i.e., to test *H2A* and *H2B*), two approaches are employed. For the first approach, the sample is partitioned into two groups (i.e., common and civil law countries). Subsequently, equation (1) is estimated for each sub-sample separately. *H2A* and *H2B* predict that a marginal propensity to invest in working capital from an increase in short-term and long-term debt is higher for firms in civil law countries, relative to those in common law countries. Hence, the main

focus lies in a comparison of the regression coefficients of short-term and long-term debt ($\beta_1$ and $\beta_2$) in equation (1) between these two sub-samples. Essentially, the (absolute) values of $\beta_1$ and $\beta_2$ of civil law countries are predicted to be higher than those of common law countries.

For the second approach, the baseline specification (1) is augmented by interaction terms between the use of short-term and long-term debts and legal environment as shown in equation (3):

$$\begin{aligned} WCR_{i,t} = {} & \beta_0 + \beta_1 OCF_{i,t-1} + \beta_2 GROWTH_{i,t-1} + \beta_3 SIZE_{i,t-1} + \beta_4 AGE_{i,t} + \\ & \beta_5 PM_{i,t-1} + \beta_6 TANG_{i,t-1} + \beta_7 MB_{i,t-1} + \beta_8 EXP_{i,t} + \beta_9 GDP_{i,t} + \\ & \beta_{10} CIVIL_{i,t} + \beta_{11}(STDEBT_{i,t-1} \times COMMON_{i,t}) + \\ & \beta_{12}(STDEBT_{i,t-1} \times CIVIL_{i,t}) + \beta_{13}(LTDEBT_{i,t-1} \times COMMON_{i,t}) + \\ & \beta_{14}(LTDEBT_{i,t-1} \times CIVIL_{i,t}) + \sum_{t=2}^{12} a_j Year_t + \varepsilon_{i,t} \end{aligned} \quad (3)$$

where *CIVIL* is a dummy variable and equals one for firms in countries with common civil origin and zero otherwise. *COMMON* is a dummy variable and equals one for firms in countries with common law origin and zero otherwise. All other variables are defined earlier.

A particular interest of this specification is the coefficients of interaction terms. *H2A* and *H2B* conjecture that a marginal propensity to invest in working capital from an increase in short-term and long-term debt is higher for firms in civil law countries, relative to those in common law countries. Thus, the (absolute) values of the

coefficients of interaction terms that include *CIVIL* are predicted to be relatively higher than those of *COMMON* (i.e., for short-term debt, $\beta_{12}$ higher than $\beta_{11}$; and for long-term debt, $\beta_{14}$ higher than $\beta_{13}$).

### 4.4.3 The Direct Effects of Culture on a Firm's WCM

To test *H3* and *H4*, the baseline model (1) is expanded by including cultures variables CON_H as shown in equation (4.1) and MAS_H in equation (4.2).

$$WCR_{i,t} = \beta_0 + \beta_1 STDEBT_{i,t-1} + \beta_2 LTDEBT_{i,t-1} + \beta_3 OCF_{i,t-1} + \beta_4 GROWTH_{i,t-1} + \beta_5 SIZE_{i,t-1} + \beta_6 AGE_{i,t} + \beta_7 PM_{i,t-1} + \beta_8 TANG_{i,t-1} + \beta_9 MB_{i,t-1} + \beta_{10} EXP_{i,t} + \beta_{11} GDP_{i,t} + \beta_{12} CON\_H_{i,t} + \sum_{t=2}^{12} a_j Year_t + \varepsilon_{i,t} \quad (4.1)$$

$$WCR_{i,t} = \beta_0 + \beta_1 STDEBT_{i,t-1} + \beta_2 LTDEBT_{i,t-1} + \beta_3 OCF_{i,t-1} + \beta_4 GROWTH_{i,t-1} + \beta_5 SIZE_{i,t-1} + \beta_6 AGE_{i,t} + \beta_7 PM_{i,t-1} + \beta_8 TANG_{i,t-1} + \beta_9 MB_{i,t-1} + \beta_{10} EXP_{i,t} + \beta_{11} GDP_{i,t} + \beta_{12} MAS\_H_{i,t} + \sum_{t=2}^{12} a_j Year_t + \varepsilon_{i,t} \quad (4.2)$$

where *CON_H* is a dummy variable and equal to one for firms in countries with a "conservatism" value (*CON*) equal or higher than its respective median (3.66) and zero otherwise. *MAS_H* is a dummy variable and equal to one for firms in countries with a "mastery" value (*MAS*) equal or higher than its respective median (4.08) and zero otherwise. All other variables are defined earlier. The direct effects of culture on WCR is captured by the regression coefficient ($\beta_{12}$). According to *H3*, $\beta_{12}$ in equation (4.1) is expected to be significant and positive. On the other hand, according to *H4*, $\beta_{12}$ in equation (4.2) is expected to be significant and negative.

### 4.4.4 The Indirect Effects of Culture on a Firm's WCM

Similar to Section 4.4.2 for legal environment, two approached are employed. For the first approach, the sample is partitioned according to median CON (MAS) in order to separate the sample into low and high CON (MAS) countries. Subsequently, equation (1) is estimated for each sub-sample separately. As *H5A* and *H5B* for "conservatism" value (*H6A* and *H6B* for "mastery" value) predict that firms in countries with high CON (MAS) use less financial debt to support working capital investments than those in countries with low CON (MAS), the main focus lies in a comparison of the regression coefficients of short-term and long-term debt ($\beta_1$ and $\beta_2$) in equation (1) between these two sub-samples. Essentially, the (absolute) values of $\beta_1$ and $\beta_2$ are predicted to be lower for firms in countries with high CON (MAS) than those in countries with low CON (MAS).

For the second approach, the baseline specification (1) is augmented by interaction terms between the use of short-term and long-term debts and the "conservatism" value in equation (5.1) and between the use of short-term and long-term debts and the "mastery" value in equation (5.2):

$$\begin{aligned} WCR_{i,t} = {} & \beta_0 + \beta_1 OCF_{i,t-1} + \beta_2 GROWTH_{i,t-1} + \beta_3 SIZE_{i,t-1} + \beta_4 AGE_{i,t} + \\ & \beta_5 PM_{i,t-1} + \beta_6 TANG_{i,t-1} + \beta_7 MB_{i,t-1} + \beta_8 EXP_{i,t} + \beta_9 GDP_{i,t} + \\ & \beta_{10} CON\_H_{i,t} + \beta_{11}(STDEBT_{i,t-1} \times CON\_H_{i,t}) + \\ & \beta_{12}(STDEBT_{i,t-1} \times CON\_L_{i,t}) + \beta_{13}(LTDEBT_{i,t-1} \times CON\_H_{i,t}) + \\ & \beta_{14}(LTDEBT_{i,t-1} \times CON\_L_{i,t}) + \sum_{t=2}^{12} a_j Year_t + \varepsilon_{i,t} \end{aligned} \quad (5.1)$$

$$WCR_{i,t} = \beta_0 + \beta_1 OCF_{i,t-1} + \beta_2 GROWTH_{i,t-1} + \beta_3 SIZE_{i,t-1} + \beta_4 AGE_{i,t} + \beta_5 PM_{i,t-1} + \beta_6 TANG_{i,t-1} + \beta_7 MB_{i,t-1} + \beta_8 EXP_{i,t} + \beta_9 GDP_{i,t} + \beta_{10} MAS\_H_{i,t} + \beta_{11}(STDEBT_{i,t-1} \times MAS\_H_{i,t}) + \beta_{12}(STDEBT_{i,t-1} \times MAS\_L_{i,t}) + \beta_{13}(LTDEBT_{i,t-1} \times MAS\_H_{i,t}) + \beta_{14}(LTDEBT_{i,t-1} \times MAS\_L_{i,t}) + \sum_{t=2}^{12} a_j Year_t + \varepsilon_{i,t} \quad (5.2)$$

where *CON_H* (*CON_L*) is a dummy variable and equal to one for firms in countries with a "conservative" value higher (lower) than their respective median (3.66) and zero otherwise. *MAS_H* (*MAS_L*) is a dummy variable and equal to one for firms in countries with a "mastery" value higher (lower) than their respective median (4.08) and zero otherwise. All other variables are defined earlier.

As *H5A* and *H5B* for "conservatism" value and *H6A* and *H6B* for "mastery" value predict that firms in countries with high CON and MAS use less financial debt to invest in working capital requirements than those in countries with low CON and MAS, a particular interest of these specifications lies in the regression coefficients of interaction terms. In particular, for short-term debt, the absolute value of $\beta_{11}$ is expected to be lower than that of $\beta_{12}$; and for long-term debt, the absolute value of $\beta_{13}$ is expected to be lower than $\beta_{14}$.

**4.5 Empirical Analysis**

In this section, the results from the regression specifications constructed in Sections 4.4.1 – 4.4.4 will be presented and discussed in a respective order. This analysis will address the extent to which a firm's WCM is directly and indirectly affected by

national legal environment (*H1*, *H2A* and *H2B*) and by national culture (*H3*, *H4*, *H5A*, *H5B*, *H6A* and *H6B*).

### 4.5.1 The Direct Effects of Legal Environment on a Firm's WCM

In examining the direct effects of legal environment on a firm's WCM (*H1*), a legal origin dummy (i.e., CIVIL) was included in equation (2) of which the regression estimates are shown in Table 4.3 column (1). The regression coefficient of CIVIL (0.054) is significant at the 1% level, indicating that legal environment has a significant impact on a firm's WCM. In particular, holding other variables constant, WCR of firms in civil law countries is about 5% higher than those of firms in common law countries. In an alternative specification reported in column (2), CIVIL was replaced by three dummy variables (i.e., FR, GER and SCAN). The result shows that the regression coefficients of FR (0.029), GER (0.069) and SCAN (0.081) are all significant. These three dummy coefficients indicate that among four legal systems, firms in common law countries have the lowest WCR, followed by French, German, and Scandinavian civil law countries, respectively.

In sum, these results support *H1* that firms in countries with weak legal environment (i.e., civil law) have relatively higher working capital investments than those in countries with strong legal environment (i.e., common law).

## Table 4.3: The Direct Effects of Legal Environment and Cultures on WCM

| Dependent Variable: WCR | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $STDEBT_{t-1}$ | 0.2411*** | 0.2613*** | 0.2644*** | 0.2537*** |
| | (0.0304) | (0.0298) | (0.0325) | (0.0328) |
| $LTDEBT_{t-1}$ | -0.0612* | -0.0619* | -0.0667* | -0.0658* |
| | (0.0259) | (0.0256) | (0.0295) | (0.0294) |
| $OCF_{t-1}$ | 0.1353*** | 0.1480*** | 0.1353*** | 0.1350*** |
| | (0.0118) | (0.0123) | (0.0156) | (0.0157) |
| $GROWTH_{t-1}$ | -0.0188** | -0.0179** | -0.0138* | -0.0138* |
| | (0.0059) | (0.0059) | (0.0070) | (0.0070) |
| $SIZE_{t-1}$ | -0.0161*** | -0.0176*** | -0.0178*** | -0.0179*** |
| | (0.0018) | (0.0018) | (0.0020) | (0.0020) |
| $AGE_t$ | 0.0003*** | 0.0002** | 0.0003*** | 0.0004*** |
| | (0.0001) | (0.0001) | (0.0001) | (0.0001) |
| $PM_{t-1}$ | -0.1066*** | -0.1124*** | -0.1122*** | -0.1154*** |
| | (0.0184) | (0.0178) | (0.0215) | (0.0215) |
| $TANG_{t-1}$ | -0.2313*** | -0.2430*** | -0.2319*** | -0.2449*** |
| | (0.0202) | (0.0201) | (0.0231) | (0.0235) |
| $MB_{t-1}$ | -0.0031 | -0.0048 | -0.0036 | -0.0035 |
| | (0.0032) | (0.0032) | (0.0041) | (0.0042) |
| $EXP_t$ | 0.0328* | 0.0286 | 0.0458* | 0.0476** |
| | (0.0157) | (0.0160) | (0.0182) | (0.0181) |
| $GDP_t$ | 0.0022* | 0.0007 | 0.0017 | 0.0014 |
| | (0.0009) | (0.0009) | (0.0010) | (0.0009) |
| CIVIL | 0.0536*** | | | |
| | (0.0119) | | | |
| FR | | 0.0290* | | |
| | | (0.0124) | | |
| GER | | 0.0689*** | | |
| | | (0.0125) | | |
| SCAN | | 0.0805*** | | |
| | | (0.0142) | | |
| CON_H | | | 0.0065 | |
| | | | (0.0088) | |
| MAS_H | | | | -0.0146 |
| | | | | (0.0087) |
| N | 10,818 | 10,818 | 8,518 | 8,518 |
| Adjusted $R^2$ | 0.2903 | 0.3088 | 0.2882 | 0.2895 |

*Notes:* Columns (1), (3) and (4) report the results of the ordinary least square (OLS) estimation of regression equations (2), (4.1) and (4.2), respectively. Year dummies are included in all models. CIVIL is dummy variable and equals one for firms in countries with civil law background and zero otherwise. CIVIL is replaced by FR, GER and SCAN in column (2). FR is dummy variable and equals one for firms in countries with French civil law background and zero otherwise. GER is dummy variable and equals one for firms in countries with German civil law background and zero otherwise. SCAN is dummy variable and equals one for firms in countries with Scandinavian background and zero otherwise. CON_H is a dummy variable and equal to one for firms in countries with a "conservatism" value (CON) equal or higher than its respective median (3.66) and zero otherwise. MAS_H is a dummy variable and equal to one for firms in countries with a "mastery" value (MAS) equal or higher than its respective median (4.08) and zero otherwise. All other variables are defined as in Table 4.1. Standard errors of coefficients are reported in parenthesis. *, ** and *** indicate the coefficient significance at the 10%, 5% and 1% levels, respectively.

### 4.5.2 The Indirect Effects of Legal Environments on a Firm's WCM

**(a) The Indirect Effects through the Use of Short-Term Debt**

In examining the indirect effects of legal environment on a firm's WCM through the use of short-term debt (*H2A*), the first technique splits the sample into two groups: common and civil law countries. The baseline specification (1) for the two sub-samples is estimated separately and reported in Table 4.4. As shown in columns (1) and (2), the regression coefficient of STDEBT ($\beta_1$) is higher in both magnitude and significance for firms with a civil law tradition (0.244 and significant at the 1% level) than those with a common law tradition (0.241 and significant at the 10% level).

In an alternative specification, the sample is split into four groups as shown in columns (3) – (6). The coefficient ($\beta_1$) is highest in a magnitude for French civil law countries and significant at the 1% level for all three civil law systems whereas the coefficient ($\beta_1$) is significant at only the 10% level for English common law countries. The findings obtained support *H2A*.

The second technique employed is the inclusion of interaction terms. As reported in Table 4.5 column (1), the regression coefficient of the interaction term $STDEBT_{t-1}$×CIVIL (0.255) is significant at the 1% level and higher than that of $STDEBT_{t-1}$×COMMON (0.181) which is not significant. These coefficients indicate that an increase in short-term debt by 1% will result in an increase in working capital investment by 0.25% in civil law countries and by 0.18% in common law countries.

## Table 4.4: The Indirect Effects of Legal Environment and Culture on WCM (Partitioning Approach)

| Dependent Variable: WCR | LAW | | | | | | CON | | MAS | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) COMMON | (2) CIVIL | (3) ENG | (4) FR | (5) GER | (6) SCAN | (7) HIGH | (8) LOW | (9) HIGH | (10) LOW |
| $STDEBT_{t-1}$ ($\beta_1$) | 0.2405* | 0.2443*** | 0.2405* | 0.3005*** | 0.1607*** | 0.2630*** | 0.2494*** | 0.2576*** | 0.2114*** | 0.2583*** |
| | (0.0981) | (0.0313) | (0.0981) | (0.0421) | (0.0482) | (0.0703) | (0.0224) | (0.0163) | (0.0229) | (0.0163) |
| $LTDEBT_{t-1}$ ($\beta_2$) | -0.0694 | -0.0565* | -0.0694 | -0.0546 | -0.0402 | -0.0407 | -0.0334 | -0.0750*** | -0.0252 | -0.0881*** |
| | (0.0823) | (0.0276) | (0.0823) | (0.0402) | (0.0445) | (0.0628) | (0.0215) | (0.0147) | (0.0204) | (0.0151) |
| $OCF_{t-1}$ | 0.1164* | 0.1382*** | 0.1164* | 0.1239*** | 0.1396*** | 0.1999*** | 0.1786*** | 0.1251*** | 0.1729*** | 0.1284*** |
| | (0.0517) | (0.0122) | (0.0517) | (0.0203) | (0.0260) | (0.0200) | (0.0171) | (0.0097) | (0.0195) | (0.0096) |
| $GROWTH_{t-1}$ | -0.0158 | -0.0201** | -0.0158 | -0.0154 | -0.0087 | -0.0408*** | -0.0021 | -0.0177** | 0.0002 | -0.0194** |
| | (0.0191) | (0.0061) | (0.0191) | (0.0087) | (0.0123) | (0.0109) | (0.0091) | (0.0065) | (0.0100) | (0.0063) |
| $SIZE_{t-1}$ | -0.0271*** | -0.0150*** | -0.0271*** | -0.0199*** | -0.0135*** | -0.0101* | -0.0207*** | -0.0171*** | -0.0246*** | -0.0167*** |
| | (0.0062) | (0.0018) | (0.0062) | (0.0028) | (0.0032) | (0.0042) | (0.0016) | (0.0009) | (0.0017) | (0.0009) |
| $AGE_t$ | 0.0004 | 0.0003*** | 0.0004 | 0.0000 | 0.0004*** | 0.0000 | -0.0001 | 0.0005*** | 0.0001* | 0.0004*** |
| | (0.0002) | (0.0001) | (0.0002) | (0.0001) | (0.0001) | (0.0002) | (0.0001) | (0.0000) | (0.0001) | (0.0000) |
| $PM_{t-1}$ | -0.0358 | -0.1166*** | -0.0358 | -0.1194*** | -0.1020** | -0.1068** | -0.2438*** | -0.0563*** | -0.1547*** | -0.1108*** |
| | (0.0518) | (0.0193) | (0.0518) | (0.0254) | (0.0371) | (0.0387) | (0.0151) | (0.0103) | (0.0175) | (0.0098) |
| $TANG_{t-1}$ | -0.2279** | -0.2351*** | -0.2279** | -0.2264*** | -0.3051*** | -0.2519*** | -0.2280*** | -0.2584*** | -0.3252*** | -0.2227*** |
| | (0.0699) | (0.0214) | (0.0699) | (0.0297) | (0.0363) | (0.0534) | (0.0154) | (0.0112) | (0.0155) | (0.0116) |
| $MB_{t-1}$ | 0.0029 | -0.0027 | 0.0029 | -0.0066 | -0.0072 | 0.002 | -0.0058 | -0.0041* | -0.004 | -0.0033 |
| | (0.0093) | (0.0034) | (0.0093) | (0.0048) | (0.0058) | (0.0059) | (0.0032) | (0.0018) | (0.0028) | (0.0019) |
| $EXP_t$ | -0.0225 | 0.0441** | -0.0225 | 0.0193 | 0.1159*** | -0.0141 | 0.0068 | 0.0779*** | 0.0425*** | 0.0475*** |
| | (0.0371) | (0.0169) | (0.0371) | (0.0180) | (0.0348) | (0.0685) | (0.0104) | (0.0100) | (0.0119) | (0.0092) |
| $GDP_t$ | 0.0015 | 0.0022* | 0.0015 | 0.0027* | -0.0022 | -0.003 | 0.0024* | -0.0040* | -0.0004 | 0.0034 |
| | (0.0014) | (0.0009) | (0.0014) | (0.0012) | (0.0039) | (0.0030) | (0.0011) | (0.0019) | (0.0012) | (0.0019) |
| N | 832 | 9,986 | 832 | 5,036 | 3,261 | 1,689 | 2,566 | 5,952 | 2,314 | 6,204 |
| Adjusted $R^2$ | 0.3716 | 0.2753 | 0.3716 | 0.3118 | 0.3117 | 0.3454 | 0.3535 | 0.2879 | 0.3411 | 0.2831 |

*Notes:* This table reports the results of the ordinary least square (OLS) estimation of regression equation (1) for each particular sub-sample. All variables are defined as in Table 4.1. Standard errors of coefficients are reported in parenthesis. *, ** and *** indicate the coefficient significance at the 10%, 5% and 1% levels, respectively.

## Table 4.5: The Indirect Effects of Legal Environment and Culture on WCM (Interactions Approach)

| Dependent Variable: WCR | (1)<br>LAW | (2)<br>CON | (3)<br>MAS |
|---|---|---|---|
| $OCF_{t-1}$ | 0.1070*** | 0.1053*** | 0.1035*** |
| | (0.0122) | (0.0161) | (0.0163) |
| $GROWTH_{t-1}$ | -0.0193*** | -0.0132 | -0.0134 |
| | (0.0058) | (0.0069) | (0.0069) |
| $SIZE_{t-1}$ | -0.0179*** | -0.0199*** | -0.0201*** |
| | (0.0017) | (0.0020) | (0.0020) |
| $AGE_t$ | 0.0003*** | 0.0004*** | 0.0004*** |
| | (0.0001) | (0.0001) | (0.0001) |
| $PM_{t-1}$ | 0.0008* | -0.001 | -0.0012 |
| | (0.0004) | (0.0025) | (0.0026) |
| $TANG_{t-1}$ | -0.2324*** | -0.2324*** | -0.2460*** |
| | (0.0206) | (0.0234) | (0.0238) |
| $MB_{t-1}$ | -0.0074* | -0.0090* | -0.0090* |
| | (0.0032) | (0.0041) | (0.0042) |
| $EXP_t$ | 0.0368* | 0.0482* | 0.0508** |
| | (0.0168) | (0.0196) | (0.0196) |
| $GDP_t$ | 0.0028** | 0.0021* | 0.0020* |
| | (0.0010) | (0.0010) | (0.0010) |
| CIVIL | 0.0659*** | | |
| | (0.0125) | | |
| $STDEBT_{t-1} \times$ CIVIL | 0.2552*** | | |
| | (0.0316) | | |
| $STDEBT_{t-1} \times$ COMMON | 0.1814 | | |
| | (0.1024) | | |
| $LTDEBT_{t-1} \times$ CIVIL | -0.0594* | | |
| | (0.0284) | | |
| $LTDEBT_{t-1} \times$ COMMON | -0.1147 | | |
| | (0.0684) | | |
| CON_H | | -0.0137 | |
| | | (0.0092) | |
| $STDEBT_{t-1} \times$ CON_H | | 0.2691*** | |
| | | (0.0579) | |
| $STDEBT_{t-1} \times$ CON_L | | 0.3050*** | |
| | | (0.0391) | |
| $LTDEBT_{t-1} \times$ CON_H | | -0.0483 | |
| | | (0.0510) | |
| $LTDEBT_{t-1} \times$ CON_L | | -0.0777* | |
| | | (0.0364) | |
| MAS_H | | | 0.0142 |
| | | | (0.0089) |
| $STDEBT_{t-1} \times$ MAS_H | | | 0.2583*** |
| | | | (0.0556) |
| $STDEBT_{t-1} \times$ MAS_L | | | 0.2720*** |
| | | | (0.0401) |
| $LTDEBT_{t-1} \times$ MAS_H | | | -0.0543 |
| | | | (0.0485) |
| $LTDEBT_{t-1} \times$ MAS_L | | | -0.0779* |
| | | | (0.0366) |
| N | 10,818 | 8,518 | 8,518 |
| Adjusted $R^2$ | 0.2765 | 0.2738 | 0.2738 |

*Notes*: Columns (1) – (3) report the results of the ordinary least square (OLS) estimation of regression equations (3), (5.1) and (5.2), respectively. All variables are defined as in Table 4.1. Standard errors of coefficients are reported in parenthesis. *, ** and *** indicate the coefficient significance at the 10%, 5% and 1% levels, respectively.

In sum, the findings of the two techniques are very consistent and support *H2A*. These results suggest that legal environment has a significant impact on how firms use short-term debt to finance their working capital. They also substantiate the argument made in La Porta et al. (1997) and Beck and Levine (2005) that civil law countries, especially French civil law countries, have both weaker investor protections and less developed capital markets, as compared with common law countries. Because firms in French civil law countries find it more difficult to obtain debt financing than firms in other countries, this could explain the reason why each additional Euro of short-term financial debt obtained is more intensively used to meet working capital requirements.

**(b) The Indirect Effects through the Use of Long-Term Debt**

Similar to short-term debt, in examining the indirect effects of legal environment on a firm's WCM through the use of long-term debt (*H2B*), the regression coefficient of LTDEBT ($\beta_2$) is compared between columns (1) and (2) in Table 4.4. In contrast to the prior expectation, the absolute value of the coefficient ($\beta_2$) is higher for firms in common law countries; however, it is not statistically significant. In an alternative specification shown in columns (3) – (6), the absolute value of the coefficient ($\beta_2$) is also higher for firms in English common law countries, which again deviates from the prior expectation. However, the coefficient ($\beta_2$) is not significant for all four groups. Accordingly, *H2B* is rejected.

To validate the above finding, a second technique using interaction terms is employed as show in Table 4.5. The results are consistent with those of the first technique. In particular, the absolute value of the regression coefficient of the interaction term

$LTDEBT_{t-1}$×COMMON (-0.115) which is not significant is higher than that of $LTDEBT_{t-1}$ ×CIVIL (-0.059) which is significant at the 10% level.

In sum, based on the results of both techniques, *H2B* is, therefore, rejected. On the one hand, the findings suggest that legal environment does not differentiate how firms use long-term debt to finance their working capital. On the other hand, the results may reflect that, in the first place, pan-European firms are likely to follow the maturity matching approach, and not use long-term debt to finance their short-term assets at all.

### 4.5.3 The Direct Effects of Culture on a Firm's WCM

In examining the direct effects of culture on a firm's WCM, two variables (i.e., CON_H and MAS_H) were included in equations (4.1) and (4.2), respectively. Table 4.3 column (3) reports the regression coefficient of CON_H (0.007) is not significant. Likewise, column (4) shows that the regression coefficient of MAS_H (-0.015) is also not significant. Hence, both *H3* and *H4* are rejected. In sum, culture is not found to have the significant direct effects on a firm's WCM.

### 4.5.4 The Indirect Effects of Culture on a Firm's WCM

#### (a) The Indirect Effects through the Use of Short-Term Debt

In examining the indirect effects of cultural values (i.e., conservatism and mastery) on a firm's WCM through the use of short-term debt (i.e., to test *H5A* and *H6A*, respectively), the first technique splits the sample according to cultural values into two groups (i.e., high and low). The baseline specification (1) for each sub-sample is estimated separately and reported in Table 4.4. When measuring culture by conservatism

value as shown in columns (7) and (8), the regression coefficient of STDEBT ($\beta_1$) for firms in countries with high conservatism value (0.249) is lower than that of firms in countries with low conservatism value (0.258), while both coefficients are significant at the 1% level. Similarly, when measuring cultures by mastery value as shown in columns (9) and (10), the regression coefficient of STDEBT ($\beta_1$) for firms in countries with high mastery value (0.211) is lower than that of firms in countries with low conservatism value (0.258), while both coefficients are significant at the 1% level. These findings obtained support *H5A* and *H6A*.

The second technique employed to ensure the indirect effects of culture on the relationship between a firm's WCM and the use of short-term debt is the inclusion of interaction terms. As reported in Table 4.5 column (2), the regression coefficient of the interaction term $STDEBT_{t-1}$×CON_H (0.269) is lower than that of $STDEBT_{t-1}$×CON_L (0.305). In addition, in column (3), the regression coefficient of the interaction term $STDEBT_{t-1}$×MAS_H (0.258) is also lower than that of $STDEBT_{t-1}$×MAS_L (0.272).

In sum, the findings of the two techniques are very consistent and support *H5A* and *H6A*. These results highlight that culture has a significant impact on how firms use short-term debt to finance their working capital. In particular, firms in countries with high conservatism and mastery values are less likely to finance their working capital with short-term debt.

**(b) The Indirect Effects through the Use of Long-Term Debt**

Similar to Section 4.5.4 (a), two approaches (i.e., sample partitioning in Table 4.4 and interactions in Table 4.5) are employed. The results of the indirect effects of cultures on a firm's WCM through the use of long-term debt are similar to those of short-term debt and support *H5B* and *H6B*. The results suggest that firms in countries with high conservatism and mastery values are less likely to finance their working capital with long-term debt.

While the findings in Sections 4.5.4 (a) and (b) substantiate the argument made in Chui et al. (2002) that culture has an impact on a firm's leverage with countries with high conservatism and mastery values having lower use of debt finance, these findings also suggest that firms in countries with high conservatism and mastery values are less likely to finance their working capital with both short-term and long-term debt. Interestingly, the regression coefficient of OCF in Table 4.4 reveals that firms in countries with high conservatism and mastery values, instead, prefer using internal fund or operating cash flow to finance their working capital requirements.[34]

[34] Comparing columns (7) and (8), the coefficient of OCF for firms in countries with high conservatism is (0.179), as compared with (0.125) for firms in countries with low conservatism. Similarly, comparing columns (9) and (10), the coefficient of OCF for firms in countries with high mastery is (0.173), as compared with (0.128) for firms in countries with low mastery value.

### 4.6 Comparison of the Results with Previous Studies

| Previous Studies | Current Research |
|---|---|
| Practitioners' reports on working capital management point out a wide variation in working capital across countries (e.g., Atradius, 2011; Sawers, 2012; Ernst & Young, 2013; PwC, 2013); however, there has been no prior literature that employs specific framework to explain the differences in cross-national WCR. | Built on the literature on cross-countries capital structure, particularly Chui et al. (2002), which suggests cultures have an impact on a firm's capital structure, the research highlights that differences in cultures can explain variations in WCR. In particular, cultures influence a firm's choice of finance of WCR.<br><br>First, in countries where Conservatism cultural value is high, group interest precedes individual interests, resulting in lower agency problem. Thus, the benefits of debt to mitigate the agency problem by means of reducing discretionary funds under managerial control are lower. As a result, firms in such countries use less debt and more internally generating cash flow to finance WCR. Given the positive relationship between operating cash flow and WCR (as documented in Chapter 3), firms in countries with high Conservatism value can finance higher WCR than firms in countries with low Conservatism value.<br><br>Second, in countries where Mastery cultural value is high, managers are more likely to perceive a company's failure as individual failure and have greater emphasis on individual success. A higher use of debt which can lead to firms having more restrictions of debt covenants, higher chance of falling debt repayment schedule and corporate bankruptcy is, therefore, avoided by managers. As a result, firms in countries with high Mastery value use less debt and more internal cash flow to finance WCR, thereby having higher ability to finance increased WCR. |

### 4.7 Robustness Test

In this section, robustness tests of the main empirical findings are conducted by using alternative measures of legal environment and culture. In the empirical analysis above, the paper captures legal environment by using only legal origin, and culture by using "conservatism" and "mastery" values.

The (unreported) tests apply creditor rights (CR) and anti-director rights (SR), according to La Porta et al. (1997), as alternative measures of legal environment. CR is an index aggregating creditor rights, ranging from weakest creditor right at zero to strongest at four. Similarly, SR is an index aggregating shareholder rights, ranging from weakest shareholder rights at zero to strongest at five.[35] The robustness tests using these two alternative measures of legal environments indicate similar results to the main analysis. Firms in countries with lower creditor right and with lower anti-director right are more likely to have higher working capital. In addition, these firms have a higher marginal propensity to invest in working capital when external financial debt increases.

In addition, although Schwartz's (1994) cultural dimensions have less limitations, as compared to those of Hofstede (1980) (refer to footnote 26), the former indices are not available for five out of 15 final countries in this study. Hofstede's (1980) indices are employed in the robustness check as they are available for all 15 countries in this study, and are highly correlated with Schwartz's (1994) indices. In particular, correlations

[35] For detailed description of creditor rights and anti-director rights variables, please refer to La Porta et al. (1997, p.1134-1135).

between Hofstede value dimensions and Schwartz cultural-level value types in Schwartz (1994, p.109) show that the two relevant Schwartz's indices (i.e., conservatism (CON) and mastery (MAS)) exhibit strong and consistent pairwise correlation with at least two Hofstede's indices (i.e., individualism (IDV) and power distance (PDI)). In particular, CON and MAS exhibit a pairwise correlation with IDV at -56% and -24%, respectively, and a pairwise correlation with PDI at 45% and 26%, respectively. As PDI is positively correlated with CON and MAS, the paper adopts PDI as an alternative measure of culture in order to investigate its impact on a firm's WCM. The robustness check indicates similar results as the main empirical findings.

### 4.8 Conclusion

WCM has been widely studied in the single-country context. Prior literature has identified several firm-level determinants, including financial fundamentals, corporate governance, and behavioural aspects of a firm's WCM and investigated to what extent firm-level factors influence WCM of firms operating within a specific country. However, many recent practitioners' reports emphasise wide variations in WCM across countries and continents. In this paper, a large sample of 15 pan-European countries is employed. The main objective is to analyse the role of country-level variables, particularly legal environment and culture, in determining corporate WCM. The effects of these country-level variables are distinguished into two types: the *direct* effects of country-level factors on a firm's WCM and the *indirect* effects through the use of external debt to finance working capital.

Analysing the direct impact of country-level factors on WCM, the empirical evidence suggests that legal environment has a significant influence on corporate WCM. The findings imply that firms in countries with poorer legal environment (i.e., civil law background) are likely to have higher working capital than those in countries with better legal environment (i.e., common law background). Culture, as measured by Schwartz's cultural dimension, however, does not have a significant direct impact on a firm's WCM.

Analysing the indirect impact, civil law system enhances the need of short-term debt to support working capital investments. In addition, firms from countries with high "conservatism" value (more risk-averse) and high "mastery" value (more self-assertive) are less likely to use both short-term and long-term debt to finance their working capital. On the other hand, firms in these countries prefer using internal fund from operating cash flow to finance their working capital instead. Overall, the evidence highlights the importance of country-level factors in understanding, analysis, and determining WCM mechanisms and policies across countries.

In sum, this paper has generated novel findings on international WCM in the following ways. First, the paper highlights the relevance and important role of country-level factors in explaining the variations in WCM across countries. Second, while the findings in this paper echo much of the prior literature on international capital structure (e.g., Chui et al., 2002; Bancel and Mittoo, 2004; De Jong et al., 2008) and on the relationship between investor protection and capital markets development (e.g., La

Porta et al., 1997), they underline how country legal environment and culture can influence a firm's need and choice of finance of its working capital.

With regard to limitations and future research potential, the variables, including both country- and firm-specific factors focused on in this study account for under 30% of the differences in WCM. Accordingly, there are other factors to be determined in order to improve the empirical model of determinants of WCM across countries. Such country-level variables which can be further researched may include a country's financial system, financial development, and corporate governance mechanisms.

### 4.9 Summary of Chapter 4

To fulfil the four research objectives identified at the start of this chapter (refer to Section 4.1), empirical findings show that capital market access as measured by the legal environment has both direct and indirect effects (through the use of short-term financial debt) on a firm's WCM while culture has only the indirect effects (through the use of both short-term and long-term financial debt) on a firm's WCM. So far, Chapters 3 and 4 have identified 'the causes or the determinants of WCM'. The next chapter will complete the whole picture of WCM by focusing on 'the consequences of WCM'. In particular, it will examine how the management of working capital has an impact on a firm's profitability.

# CHAPTER 5

# THE EFFECTS OF WORKING CAPITAL MANAGEMENT ON CORPORATE PROFITABILITY

## 5.1 Introduction

Due to the recent economic challenges, with external financing less accessible and more expensive, the significance of WCM has received greater attention from management (PwC, 2012). WCM is critical to a company's survival in conditions of financial crisis as it represents a key managerial intervention to maintain solvency and improve profitability. WCM can also be an important component of competitive advantage since operating with less working capital means that funds are made available for other profitable investment opportunities. As WCM affects profits, risk and thus value (Smith, 1980), efficiency in WCM merits being a prominent managerial concern.

A large body of empirical research on the effects of WCM on a firm's profitability suggests that shortening cash conversion cycle (CCC) can improve corporate profitability. However, this research has been compromised by endogeneity issues. Firstly, it is possible that the causation is actually reversed, a firm's profitability drives efficiency in WCM (i.e., simultaneity). Secondly, there may be factors unobservable to researchers that affect both WCM and profitability (i.e., unobserved heterogeneity). Finally, current levels (values) of WCM may be influenced by past levels (values) of corporate profitability (i.e. dynamic endogeneity). In the presence of these endogeneity

concerns, traditional ordinary least square (OLS) and fixed-effects (FE) estimators commonly used in prior empirical work may be biased. Although FE accounts for time-invariant unobserved heterogeneity, it is still unable to address the simultaneity issue. In addition, FE has a strong exogeneity assumption that current levels (values) of explanatory variables (i.e., WCM) are completely independent from past levels (values) of the outcome variables (i.e.., profitability). It has been argued that this assumption is impractical (Wintoki et al., 2012).

Apart from endogeneity problem, the prior literature focuses on how to manage working capital at both an overall level (as measured by cash conversion cycle and net trade cycle) and individual elements level (as measured by accounts receivable, inventory, and accounts payable periods). However, it can be argued practically that a firm should manage its working capital in concert rather than individually. In addition, the prior literature examines the effects of WCM on a firm's profitability as commonly measured by return on assets (ROA) and return on equity (ROE). Thus, missing in the prior literature is a research study to improve the understanding regarding the mechanism of how corporate profits are affected by WCM efficiency. To be more precise, whether efficiency in WCM takes effect through some components of ROA and ROE or all components (i.e., profit margin, assets productivity, and equity multiplier) to generate a multiplicative boost to profitability. Finally, given evidence of the higher importance of WCM during the financial downturn, it is important to understand how economic condition plays a role in the relationship between WCM and a firm's profitability.

Building on the above gaps in previous research, four main objectives are identified in this chapter:

1) a first objective is to examine the effects of WCM on corporate profitability, controlling for all of the potential endogeneity concerns;
2) a second objective is to examine whether or not a proper "fit" between the components of working capital further enhances corporate profitability;
3) a third objective is to explore the mechanisms relating to how WCM affects corporate profitability, in particular through profit margin, asset productivity, equity multiplier, or through all of these aspects;
4) the final objective is to examine the effects of economic condition on the relationship between WCM and corporate profitability.

The dynamic panel generalised method of moments (GMM) results obtained show that there is no statistical association between CCC and a firm's profitability (as measured by both ROA and ROE). However, accounts receivable, inventory and accounts payable periods show a strong and negative association with corporate profitability at an operating profit level (as measured by ROA), but not at a net income level (as measured by ROE). These findings are inconsistent with much previous work that finds a very strong and negative relationship between WCM variables and corporate profitability at both ROA and ROE levels. The discussion of the empirical results reveals why traditional OLS and FE estimators that ignore one or more aspects of endogeneity (and are the biases of prior research) may be biased. Further testing shows

that a proper "fit" between the components of working capital, consistent with the maturity matching approach, can further enhance profitability.[36]

This paper, therefore, makes novel contributions to the existing literature in the following ways. First, to our knowledge this is the first study to investigate the relationship between WCM and corporate profitability in a manner that comprehensively addresses endogeneity concerns, namely simultaneity, unobserved heterogeneity, and dynamic endogeneity. Building on Deloof's (2003) argument that the negative relationship between WCM and profitability may be a consequence of profitability affecting WCM, and not *vice versa*, and the conflicting results in the prior literature, this paper recognises that any empirical estimation of the effects of WCM on a firm's profitability that neglects one or more aspects of endogeneity may yield inconsistent estimates. Second, the paper contributes to an emerging stream of empirical corporate finance research that attempts to address endogeneity issues, in particular dynamic endogeneity (e.g., Teruel and Solano, 2008; Dang, 2011; Wintoki et al., 2012). By doing so, this paper adds to the hitherto empirical literature which develops the dynamic panel GMM estimator to control for possible endogeneity concerns that may arise in corporate finance research. The results show that, as compared with traditional OLS and FE estimators, the dynamic panel GMM estimator provides a more conservative, powerful, and reliable methodology. Third, prior studies that employ extensive data sets, especially those based on US companies, cover the period from the mid-1970s to the early-1990s.[37] Since then, there has been no other

[36] The maturity matching approach as mentioned in Van Horne (1998) has an underlying assumption that firms with more short-term investments (e.g., accounts receivable and inventory) will have higher demand for short-term credit in general, and trade credit in particular.

[37] See the details regarding prior empirical research in Table 1.3.

research that applies a large-scale data set to reflect the emergence of new technologies and accounting practices (e.g., enterprise resource planning (ERP), which experienced rapid growth since the mid-1990s), and the recent global financial crisis that may have an influence on the effects of WCM on profitability.

Finally, the paper documents several new findings. On the one hand, a comprehensive measure of WCM (i.e., CCC) does not represent a useful surrogate (inference) for the effects of WCM on a firm's profitability. Instead, an examination of the individual components level of CCC (i.e., accounts receivable, inventory and accounts payable periods) gives more pronounced and valid results.[38] On the other hand, WCM can be used as a key means to improve corporate profitability at various stages. While an attempt to improve individual components of WCM efficiency enhances ROA through operating cost reduction, a focus on a proper "fit" among the three components of working capital can improve both ROA and ROE through less reliance on external finance. In addition, the findings show that WCM efficiency affects both profit margin and asset productivity to generate a multiplicative boost to ROA.

The remainder of the paper is organised as follows. Section 5.2 reviews the related empirical evidence and proposes testable hypotheses. Section 5.3 describes the sample and the variables used. Section 5.4 outlines the methodology employed. The main findings from the empirical analysis are discussed in Section 5.5. Section 5.6 provides

[38] Under the ceteris paribus condition, the dynamic panel GMM estimator reports that a reduction in accounts receivable, inventory, and accounts payable periods by 1 day leads to an increase in returns on assets (ROA) by 0.06%, 0.02%, and 0.01%, respectively, whereas a reduction in CCC by 1 day does not have a significant impact on ROA. Another comprehensive measure of WCM, namely net trade cycle (NTC) used in Shin and Soenen (1998), is applied. Similarly, there is no causal relation between NTC and a firm's profitability.

the main practical implications. Section 5.7 presents the conclusions. Finally, Section 5.8 summarises the chapter.

## 5.2 Literature Review and Hypothesis Development

This section discusses the theories and empirical studies that are central to the study: 1) the relationship between WCM and a firm's profitability, and 2) the interaction between working capital components.

### 5.2.1 The Relationship between WCM and a Firm's Profitability

WCM can be an important part of a company's overall strategy to enhance shareholder value. This is because the way firms manage their working capital greatly affects profitability as well as liquidity (Shin and Soenen, 1998). WCM involves trade-offs between investing and restricting levels of working capital investment to ensure efficiency in its use. To a certain extent, a more conservative (aggressive) approach to WCM is associated with lower (higher) risk and return (Gardner et al., 1986; Weinraub and Visscher, 1998).

A conservative WCM policy involves heavy investment in short-term assets, most of which are financed by long-term sources (Van Horne and Wachowicz, 2004). In particular, high trade credit allows customers a sufficient time to test the products and services quality before paying, thereby stimulating sales (Smith, 1987; Long et al., 1993; Deloof and Jegers, 1996). High investment in inventory can protect firms from business interruptions due to high demand, products scarcity, and materials price fluctuation (Blinder and Maccini, 1991). Nonetheless, a large amount of cash is

trapped in working capital investment, and this may restrict investment in other profitable opportunities. In extreme situations a conservative WCM policy can reflect the problem of overtrading and become highly detrimental to the firm.

In contrast, an aggressive WCM policy relates to a firm's strategy of having lower short-term assets and higher short-term liabilities. This approach to WCM can save many of the costs that stem from conservative policies, including operating costs (e.g., personnel costs in credit control and debt collection, and losses from bad debts in respect of accounts receivable, and warehouse rental and insurance expense, and cost of obsolete inventory in respect of inventory) and external borrowings. However, by reducing working capital in too extreme manner, the firm may face risks from stockouts and a fall in customer retention. Furthermore, as shown in Ng et al. (1999) and Wilner (2000), the most common trade credit discount form of "2/10 net 30" indicates an implicit annual interest rate of 43.9%[39]. This rate reflects the opportunity cost that buyers forgo when pursuing aggressive financing policy, and not making prompt payments to suppliers in exchange for 20 more days of financing. PwC (2012) also reports that a typical business with a purchasing volume of €100 million per annum is likely to incur a late payment penalty of more than €0.8 million.

Empirical evidence on the relationship between WCM and a firm's profitability is inconclusive although the majority of it reports a negative relationship between WCM and profitability (refer to Table 1.3). The mixed results necessitate the re-examination

[39] The implicit interest rate is computed as: implicit interest rate = (100/ 100 – discount %) $^{360/(\text{no. of days net} - \text{no. of days discount})}$ - 1.

of the relationship between WCM and corporate profitability to consider whether such inconsistencies are, in part, due to the fact that endogeneity issues have been neglected and not appropriately addressed in prior studies.

For the first time, endogeneity concerns, simultaneity bias in particular, were highlighted by Deloof (2003). He suggests that "it cannot be ruled out that the negative relation between WCM and profitability is to some extent a consequence of profitability affecting WCM, and not *vice versa*" (Deloof, 2003, p.584). Given a simultaneity concern with prior empirical work, the most plausible explanations for the negative relation found between profitability and accounts receivable, inventory, and accounts payable, respectively, can be that less profitable firms offer longer credit terms to incentivise their customers, suffer from falling sales and, in consequence, rising stock levels, and experience delays in paying their bills. In this respect, WCM and a firm's profitability are simultaneously determined, and OLS and FE estimators will be biased.[40]

Another endogeneity concern this paper addresses is that of the dynamic relation between a current value of WCM and a past value of a firm's profitability. There are at least two channels by which past profitability can affect current WCM. On the one hand, building on Deloof's (2003) argument, there may be a time lag for the firm's profitability to take effect on WCM. For instance, firms with higher prior period

[40] Building on Deloof's (2003) argument, Teruel and Solano (2007) try to control endogeneity by applying instrumental variables in their regression equations. However, their research does not explicitly describe the type of application employed (e.g., simultaneous equations, 2SLS, or GMM). Neither the choices of instrumental variables are justified nor the specification tests for weak instruments, and over-identifying restrictions are reported. Lack of this information makes the reader unable to evaluate the quality and reliability of the estimators used in the research (Larcker and Rusticus, 2010).

profitability may be able to pay their bills quicker in a following year. On the other hand, based on insights from empirical work of the determinants of WCM (e.g., Chiou et al., 2006; Nazir and Afza, 2009), it is possible that firms with higher prior period profitability are likely to be less concerned with efficiency in WCM as they achieve planned levels of profitability.

A review of prior literature does suggest that there may be a negative relation between a firm's WCM profile and profitability. This is because decreasing working capital can affect profitability in a direct way, as a result of operating costs and borrowing costs savings. Accordingly, the paper hypothesises the relationship between WCM and a firm's profitability as follows. Unlike previous research, this study controls, in a comprehensive way, for the possible presence of endogeneity. Prior reliance on OLS and FE estimators has the potential to generate biased results. The findings of this study using the dynamic panel GMM estimator may, therefore, differ from prior research (e.g., in terms of magnitude and significance of the estimated coefficients of WCM variables).

*H1: There is a negative association between the accounts receivable period (AR) and corporate profitability.*

*H2: There is a negative association between the inventory period (INV) and corporate profitability.*

*H3: There is a negative association between the accounts payable period (AP) and corporate profitability.*

*H4: There is a negative association between the cash conversion cycle (CCC) and corporate profitability.*

### 5.2.2 The Interaction between Working Capital Components

The interaction between the components of working capital is implied by maturity matching theory as mentioned in Van Horne (1998). A maturity matching hypothesis has been applied in various studies that examine the use of trade credit or demand for funding (e.g., Petersen and Rajan, 1997; Deloof and Jegers, 1999; Atanasova, 2007). In particular, an underlying assumption is that firms with more short-term investments will have higher demand for short-term credit in general, and accounts payable in particular. Prior studies provide conclusive results that there is a positive relationship between trade credit demand (accounts payable to total assets as a proxy variable) and short-term assets. Petersen and Rajan (1997) conclude that firms whose assets consist mainly of short-term assets demand significantly more trade credit. Deloof and Jegers (1999) decompose the elements of short-term assets into different categories and find that an increase in accounts receivable and cash holdings are associated with an increase in trade credit.[41] However, in Atanasova (2007), the level of investment in inventory is also found to be associated with greater demand for trade credit.

Although prior research has, therefore, provided some evidence of an interaction between the components of working capital, an examination of the effects of an appropriate "fit" between WCM components on a firm's profitability remains absent

[41] Deloof and Jegers (1999) consider five different categories of short-term assets, consisting of accounts receivable, inventories, cash holdings, short-term cash investments, and other current assets.

from the literature. It may be expected that an appropriate "fit" between working capital components that is consistent with the maturity matching hypothesis entails an increasing profitability. This expectation is investigated in this study. In particular, a higher accounts receivable period and a higher inventory period should be accompanied by a higher accounts payable period to drive higher profitability. This is because more funds from accounts payable, a relatively cheap source of finance, allow firms to be able to continue carrying and investing in their short-term assets such as customer credit and inventory to stimulate further sales. Concurrently, this matching allows for less reliance on external finance, thereby improving profitability. As a result of this, two hypotheses are proposed as follows:

*H5 (Two-way interaction between AR and AP): The higher AR, the greater is the positive impact of the higher AP on corporate profitability.*

*H6 (Two-way interaction between INV and AP): The higher INV, the greater is the positive impact of the higher AP on corporate profitability.*

Despite not having been established theoretically, it can be argued that a higher inventory period should be matched with a higher accounts receivable period to increase profitability. As high inventory levels can be an indication of low demand, firms may incentivise customers by granting longer payment deadlines in order to boost sales levels while also reducing the costs associated with slow-moving inventory. As a result of this, the following hypothesis is identified for testing:

*H7 (Two-way interaction between INV and AR): The higher INV, the greater is the positive impact of the higher AR on corporate profitability.*

In addition, an analysis of three-way interaction implies that the effects of one working capital component on corporate profitability can be influenced by the level of the other two components. Thus, it is possible to develop a more comprehensive model specifying, for instance, under which level of AR (i.e., high or low) would a combination of high or low INV and AP produce more favourable financial results.[42] Since none of the existing studies has implied a three-way interdependence, nor explicitly investigated to what extent a proper "fit" among these three components has an impact on a level of profitability, a prediction of the direction of three-way interaction effect on profitability is not made. Instead, the following hypothesis is proposed:

*H8 (Three-way interaction among AR, INV and AP): There is a three-way interaction effect among AR, INV and AP on corporate profitability.*

## 5.3 Data and Summary Statistics

### 5.3.1 Data Source and Sample

The initial data set used consists of all US SIC-classifiable public firms covered by Compustat Fundamentals Annual from 1992 to 2011.[43] Three restrictions on the data

[42] A two-way interaction analysis has some drawbacks. In fact, "although bivariate analysis is an essential starting point, there is definite conceptual and practical merit in moving towards complex theories. Several variables might show significant effects in bivariate analysis, but if all these variables are simultaneously entered in a regression equation one or more may be salient as to dominate the others. Also, because "equifinality" can arise, the effects of some variables that are significant in bivariate analysis might fail to show significance in a multivariate test" (Govindarajan and Fisher, 1990, p.281).

[43] The 1992 data was required to construct some lagged explanatory variables.

were imposed. First, firms operating in utility sectors (SIC code 4900-4999) and financial sectors (SIC code 6000-6999) were excluded because they differ from other firms in their working capital structure. Second, firms with anomalies in their accounts such as negative values in their assets, sales and costs of sales were excluded from the sample. Finally, the firm-level ratios were winsorised at 1% both tails to moderate the influence of extreme values. As a result of these filters, the final unbalanced panel data set consisted of 104,469 firm-year observations covering the period from 1993 to 2011. Appendix C summarises the structure of the unbalanced panel data.

### 5.3.2 Variables

**(a) Profitability**

The dependent variable was measured in two ways. Following Jose et al. (1996), both returns on assets (ROA) defined as income before interest and taxes (EBIT) divided by total assets (TA), and pre-tax returns on equity (ROE) defined as income before taxes (EBT) divided by stockholders' equity were used to separate asset management and financing influences on profitability.

$$ROA = EBIT/TA;$$

$$ROE = EBT/Equity \text{ or } (EBIT/TA) \times (EBT/EBIT) \times (TA/Equity)$$

Therefore, the difference between ROA and pre-tax ROE is everything on the right of (EBIT/TA) which is influenced by the firm's financing decisions.

**(b) Working Capital Management (WCM)**

In line with prior research, the cash conversion cycle (CCC) was applied as a comprehensive measure of WCM. The CCC is defined as accounts receivable period (AR) plus inventory period (INV) net of accounts payable period (AP). Three individual components of CCC were also used as an explanatory variable in this research. AR was calculated as (accounts receivable×365)/sales. INV was calculated as (inventory×365)/costs of goods sold. AP was calculated as (accounts payable×365)/costs of goods sold.

**(c) Control Variables**

Several control variables such as firm size, sales growth, leverage, level of cash holdings, level of fixed assets, current ratio, and gross domestic product (GDP) growth were included. Firm size (SIZE) is the natural logarithm of total assets. Sales growth (SGROW) is the percentage change in sales of the current year from the previous year. Leverage (DEBT) is the percentage of financial debts divided by total assets. Levels of cash holdings (CASH) and fixed assets (PPE) are the percentage of cash holdings, and property, plant and equipment (net of accumulated depreciation expenses) to total assets, respectively. Current ratio (CR) is the ratio of total current assets divided by total current liabilities. GDP growth (GDPGR) is the change in GDP of the current year over the previous year.

### 5.3.3 Descriptive Statistics and Univariate Results

Table 5.1 presents the descriptive statistics. The mean ROA is -8.65% (median 5.32%), whereas the mean ROE is 3.30% (median 12.52%). As for the components level of

WCM: firms receive cash payment on sales after an average of 58.20 days (median 52.82 days); inventories are stored on average 72.91 days until they are sold (median 48.15 days); and firms take on average 87.18 days to pay their suppliers (median 43.56 days). Considering these three periods jointly, the average CCC is 48.75 days (median 56.93 days), implying that the interval between cash disbursement and cash recovery is approximately one and a half months. During this period, firms, therefore, need to seek other sources of funding to finance their working capital. In addition, the sample firms have annual sales growth of 33.44% on average. About 18.71% of their total assets are financed by debt. The average cash holdings is 13.95% of total assets. Property, plant and equipment makes up 26.59% of total assets. The mean current ratio is 2.68 times. In the 19-year period of study, the GDP in the US has grown at an average rate of 2.75% annually.

**Table 5.1: Summary of Statistics of Variables**

| Variable | N | Mean | Std. Dev. | Min | Median | Max |
|---|---|---|---|---|---|---|
| ROA (%) | 104,469 | -8.649 | 51.297 | -352.721 | 5.316 | 36.009 |
| ROE (%) | 104,460 | 3.302 | 107.242 | -574.638 | 12.520 | 504.546 |
| $AR_{t-1}$(days) | 104,469 | 58.200 | 43.811 | 0.000 | 52.820 | 268.947 |
| $INV_{t-1}$ (days) | 104,469 | 72.913 | 92.344 | 0.000 | 48.152 | 560.224 |
| $AP_{t-1}$ (days) | 104,469 | 87.180 | 176.985 | 2.964 | 43.556 | 1,405.776 |
| $CCC_{t-1}$ (days) | 104,469 | 48.749 | 167.169 | -1,006.578 | 56.934 | 476.681 |
| SIZE | 104,469 | 4.953 | 2.437 | -1.013 | 4.917 | 10.687 |
| SGROW (%) | 104,469 | 33.436 | 115.548 | -79.318 | 9.628 | 884.239 |
| DEBT (%) | 104,469 | 18.710 | 24.612 | 0.000 | 9.794 | 132.578 |
| CASH (%) | 104,469 | 13.947 | 16.871 | 0.000 | 7.377 | 79.309 |
| PPE (%) | 104,469 | 26.589 | 23.099 | 0.344 | 19.219 | 90.005 |
| CR | 104,469 | 2.683 | 2.765 | 0.064 | 1.863 | 17.729 |
| GDPGR (%) | 104,469 | 2.752 | 1.832 | -3.500 | 3.000 | 4.900 |

*Notes:* The final data set contains an unbalanced panel data of 104,469 firm-year observations over the period from 1993 to and 2011. ROA is the percentage of earnings before interest and taxes (EBIT) divided by total assets. ROE is the percentage of income before taxes (EBT) divided by stockholders' equity. AR is calculated by (accounts receivable x 365)/sales. INV is calculated by (inventory x 365)/costs of goods sold. AP) is calculated by (accounts payable x 365)/costs of goods sold. CCC equals to AR plus INV net of AP. Firm size (SIZE) is the natural logarithm of total assets. SGROW is the percentage change in sales of the current year from the previous year. DEBT is the percentage of financial debts divided by total assets. CASH and PPE are the percentage of cash holdings, and property, plant and equipment (net) to total assets, respectively. CR is the ratio of total current assets divided by total current liabilities. GDPGR is the change in gross domestic product (GDP) of the current year over the previous year, collected from the World Bank database.

Table 5.2 reports the correlation coefficients of the variables. In general, the correlations between the firm's profitability and WCM variables have the expected negative sign, except for the CCC. This positive correlation between ROA (ROE) and CCC could be explained by the magnitude of a negative correlation between ROA (ROE) and the negative component of CCC (i.e., AP) that outweighs the negative correlation between ROA (ROE) and the positive components of CCC (i.e., AR and INV). The correlations between explanatory variables are not high, except for the case of CASH and CR, with a correlation coefficient of 0.42. This was taken into account in subsequent analyses in order to avoid potential multicolinearity problem.

## 5.4 Methodology

This section contains the discussion of the theoretical basis regarding why biases arise when using static OLS and FE models to estimate the relationship between WCM and a firm's profitability. To alleviate these biases, the paper then applies the dynamic panel GMM estimator to the empirical models. Finally, specification tests to determine the validity and the strength of the instruments used in the dynamic panel GMM estimator will be described.

### 5.4.1 Sources of Endogeneity and Biases in Static OLS and FE Estimators

The empirical model in prior literature that examines the effects of WCM on a firm's profitability is typically as follows:

## Table 5.2: Pearson Correlation Matrix

| | ROA | ROE | $AR_{t-1}$ | $INV_{t-1}$ | $AP_{t-1}$ | $CCC_{t-1}$ | SIZE | SGROW | DEBT | CASH | PPE | CR | GDPGR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ROA | 1.000 | | | | | | | | | | | | |
| ROE | 0.093*** | 1.000 | | | | | | | | | | | |
| $AR_{t-1}$ | -0.044*** | -0.055*** | 1.000 | | | | | | | | | | |
| $INV_{t-1}$ | -0.026*** | -0.018*** | 0.101*** | 1.000 | | | | | | | | | |
| $AP_{t-1}$ | -0.331*** | -0.041*** | 0.201*** | 0.202*** | 1.000 | | | | | | | | |
| $CCC_{t-1}$ | 0.275*** | 0.011** | 0.151*** | 0.399*** | -0.730*** | 1.000 | | | | | | | |
| SIZE | 0.475*** | 0.118*** | -0.060*** | -0.083*** | -0.205*** | 0.123*** | 1.000 | | | | | | |
| SGROW | -0.097*** | -0.046*** | 0.217*** | 0.029*** | 0.237*** | -0.122*** | -0.097*** | 1.000 | | | | | |
| DEBT | -0.026*** | 0.080*** | -0.096*** | -0.070*** | 0.005*** | -0.072*** | 0.156*** | -0.039*** | 1.000 | | | | |
| CASH | -0.187*** | -0.121*** | 0.066*** | -0.035*** | 0.096*** | -0.089*** | -0.248*** | 0.118*** | -0.254*** | 1.000 | | | |
| PPE | 0.089*** | 0.051*** | -0.213*** | -0.164*** | 0.001 | -0.152*** | 0.221*** | -0.046** | 0.261*** | -0.347*** | 1.000 | | |
| CR | 0.080*** | -0.053*** | 0.072*** | 0.146*** | -0.043*** | 0.145*** | -0.106*** | 0.069*** | -0.228*** | 0.422*** | -0.282*** | 1.000 | |
| GDPGR | 0.026*** | -0.011*** | 0.057*** | 0.018*** | -0.005 | 0.029*** | -0.106*** | 0.077*** | -0.004 | -0.057*** | 0.027*** | 0.012*** | 1.000 |

*Notes:* This table provides Pearson correlation matrix of all main variables used in this paper. All variables are defined as in Table 5.1. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

$$Y_{i,t} = \alpha + \beta X_{i,t} + \gamma Z_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

where X, Y, and Z represent a firm's WCM, profitability and control variables, respectively. As suggested by prior research, control variables include firm size, sales growth, leverage ratio, and economic condition captured by GDP growth. In this paper, levels of cash holdings and fixed assets, and current ratio are also included for a better fit of the model. The variable $\eta_i$ represents an unobserved firm- and industry-specific effect. The parameters $\lambda_t$ is time-dummy variables and the parameter $\varepsilon_{i,t}$ is a random error term.

A first potential source of endogeneity is due to simultaneity. As discussed in Section 5.2.1, simultaneity can arise in equation (1) if X (WCM) is also affected by Y (a firm's profitability). In this case, WCM and a firm's profitability are simultaneously determined, and econometrically, $E(\varepsilon_{i,t}|X_{i,t}, Z_{i,t}) \neq 0$. As a result, both OLS and FE estimators of equation (1) will be biased.

A second potential source of endogeneity is due to unobserved heterogeneity. If there are unobservable factors specific to firms and industries that affect both WCM and a firm's profitability, in equation (1) $E(\eta_i|X_{i,t}, Z_{i,t}) \neq 0$. Therefore, an OLS estimator that ignores this unobserved heterogeneity will be biased. A panel data estimator (e.g., FE) is a potential solution to control time-invariant unobserved heterogeneity as this methodology eliminates biases derived from the existence of individual effects (Hsiao, 1985).

However, as argued in Wintoki et al. (2012), an FE estimator would be consistent only if current values of the explanatory variable (i.e., WCM) were completely independent from past values of the dependent variable (i.e., profitability). If not, this would indicate a third potential source of endogeneity (i.e., dynamic endogeneity). The discussion in Section 5.2 suggests that WCM can be influenced by past profitability (e.g., more profitable firms are able to pay their bills faster in the following year or are less concerned with WCM efficiency as they achieve their planned levels of profitability). To examine this assertion, current value of WCM variables (i.e., $AR_{i,t}$, $INV_{i,t}$, $AP_{i,t}$, and $CCC_{i,t}$) is regressed on past values of profitability (i.e., $ROA_{i,t-s}$) together with other control variables as follows:

$$AR_{i,t} = \alpha + \sum_{s=1}^{p} \kappa_s ROA_{i,t-s} + \beta_1 SIZE_{i,t} + \beta_2 SGROW_{i,t} + \beta_3 DEBT_{i,t} + \beta_4 CASH_{i,t} + \beta_5 PPE_{i,t} + \beta_6 CR_{i,t} + \beta_7 GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (s = 1,2, \ldots, p) \quad (2.1)$$

$$INV_{i,t} = \alpha + \sum_{s=1}^{p} \kappa_s ROA_{i,t-s} + \beta_1 SIZE_{i,t} + \beta_2 SGROW_{i,t} + \beta_3 DEBT_{i,t} + \beta_4 CASH_{i,t} + \beta_5 PPE_{i,t} + \beta_6 CR_{i,t} + \beta_7 GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (s = 1,2, \ldots, p) \quad (2.2)$$

$$AP_{i,t} = \alpha + \sum_{s=1}^{p} \kappa_s ROA_{i,t-s} + \beta_1 SIZE_{i,t} + \beta_2 SGROW_{i,t} + \beta_3 DEBT_{i,t} + \beta_4 CASH_{i,t} + \beta_5 PPE_{i,t} + \beta_6 CR_{i,t} + \beta_7 GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (s = 1,2, \ldots, p) \quad (2.3)$$

$$CCC_{i,t} = \alpha + \sum_{s=1}^{p} \kappa_s ROA_{i,t-s} + \beta_1 SIZE_{i,t} + \beta_2 SGROW_{i,t} + \beta_3 DEBT_{i,t} + \beta_4 CASH_{i,t} + \beta_5 PPE_{i,t} + \beta_6 CR_{i,t} + \beta_7 GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (s = 1,2, ..., p) \quad (2.4)$$

The results in Table 5.3 column (1) show that the current value of AR is significantly related to the first lag of ROA, and columns (3) and (4) show that the current values of AP and CCC are significantly related to both first and second lags of ROA.[44] Both theoretical justifications laid out in Section 5.2 and the results from the above regressions support dynamic endogeneity arising with specific reference to equation (1), especially when AP and CCC are used as a measure of WCM. Thus, if WCM is dynamic, a FE estimator would have bias. In addition, based on Wooldridge (2002), the paper predicts that if current values of WCM are negatively related to past firm profitability, then an FE estimator of current values of firm profitability on current values of WCM will be positively biased and *vice versa*.[45]

### 5.4.2 Dynamic Panel GMM Estimation

#### (a) The Effects of WCM Efficiency on a Firm's Profitability

In this analysis, to obtain consistent and unbiased estimates of the relationship between WCM and a firm's profitability, equations (3.1) – (3.4) were estimated using the two-step dynamic panel GMM estimator developed by (Arellano and Bond, 1991).[46]

[44] When regressing current values of AR, INV, AP, and CCC on past values of ROE (instead of ROA), the results (untabulated) show that AP and CCC are significantly and positively associated with the first lag of ROE, whereas AR and INV are not significantly associated with any lags of ROE.

[45] Positive (negative) bias means the estimator is too large (small) on average, compared to the true value.

[46] The two-step dynamic panel GMM estimator is well-established in econometrics literature as being more efficient than the one-step approach because it is robust to any form of heteroscedasticity.

## Table 5.3: The Relationship between WCM Efficiency and Past Profitability

| Dependent Variable | (1)<br>AR | (2)<br>INV | (3)<br>AP | (4)<br>CCC |
|---|---|---|---|---|
| $ROA_{t-1}$ (%) | -0.031** | -0.023 | -0.531*** | 0.392*** |
| | (0.010) | (0.021) | (0.071) | (0.059) |
| $ROA_{t-2}$ (%) | -0.015 | 0.021 | -0.189** | 0.175*** |
| | (0.010) | (0.019) | (0.059) | (0.048) |
| $ROA_{t-3}$ (%) | -0.005 | -0.003 | -0.08 | 0.022 |
| | (0.009) | (0.018) | (0.063) | (0.052) |
| $ROA_{t-4}$ (%) | -0.017 | -0.016 | -0.103 | 0.073 |
| | (0.009) | (0.019) | (0.056) | (0.046) |
| $ROA_{t-5}$ (%) | -0.008 | -0.005 | -0.064 | 0.03 |
| | (0.009) | (0.018) | (0.064) | (0.051) |
| SIZE | 4.516*** | 6.755*** | -1.147 | 11.647*** |
| | (0.456) | (1.038) | (2.641) | (2.307) |
| SGROW (%) | -0.005 | -0.012 | -0.086*** | 0.052** |
| | (0.004) | (0.008) | (0.022) | (0.019) |
| DEBT (%) | 0.017 | -0.015 | 0.01 | -0.021 |
| | (0.013) | (0.029) | (0.086) | (0.072) |
| CASH (%) | -0.244*** | -0.394*** | 0.074 | -0.679*** |
| | (0.023) | (0.042) | (0.117) | (0.098) |
| PPE (%) | -0.277*** | -0.142* | -0.064 | -0.347* |
| | (0.032) | (0.056) | (0.158) | (0.136) |
| CR | -0.048 | 1.140* | -2.897*** | 3.771*** |
| | (0.159) | (0.452) | (0.573) | (0.599) |
| GDPGR (%) | 1.415*** | 1.139*** | 0.455 | 1.979*** |
| | (0.087) | (0.171) | (0.377) | (0.345) |
| No. of observations | 48,893 | 48,893 | 48,893 | 48,893 |
| Adjusted $R^2$ | 0.048 | 0.022 | 0.033 | 0.048 |

*Notes:* This table reports the regression results of FE estimation of current values of WCM variables on historical values of corporate profitability measured by ROA, and the control variables based on equation (2.1) – (2.4). Year dummies are included in all equations. All variables are defined as in Table 5.1. Standard errors of coefficients are reported in parenthesis. *, ** and *** indicate the coefficient significance at the 10%, 5% and 1% level, respectively.

As shown in Table 5.3, WCM variables were significantly correlated with the first two lags of past performance. Therefore, $ROA_{t-1}$, $ROA_{t-2}$ are proposed in equations (3.1) – (3.4) to ensure dynamic completeness.[47]

$$ROA_{i,t} = \alpha + \sum_{s=1}^{2} \kappa_s ROA_{i,t-s} + \beta_1 AR_{i,t-1} + \beta_2 SIZE_{i,t} + \beta_3 SGROW_{i,t} + \beta_4 DEBT_{i,t} + \beta_5 CASH_{i,t} + \beta_6 PPE_{i,t} + \beta_7 CR_{i,t} + \beta_8 GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (3.1)$$

$$ROA_{i,t} = \alpha + \sum_{s=1}^{2} \kappa_s ROA_{i,t-s} + \beta_1 INV_{i,t-1} + \beta_2 SIZE_{i,t} + \beta_3 SGROW_{i,t} + \beta_4 DEBT_{i,t} + \beta_5 CASH_{i,t} + \beta_6 PPE_{i,t} + \beta_7 CR_{i,t} + \beta_8 GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (3.2)$$

$$ROA_{i,t} = \alpha + \sum_{s=1}^{2} \kappa_s ROA_{i,t-s} + \beta_1 AP_{i,t-1} + \beta_2 SIZE_{i,t} + \beta_3 SGROW_{i,t} + \beta_4 DEBT_{i,t} + \beta_5 CASH_{i,t} + \beta_6 PPE_{i,t} + \beta_7 CR_{i,t} + \beta_8 GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (3.3)$$

$$ROA_{i,t} = \alpha + \sum_{s=1}^{2} \kappa_s ROA_{i,t-s} + \beta_1 CCC_{i,t-1} + \beta_2 SIZE_{i,t} + \beta_3 SGROW_{i,t} + \beta_4 DEBT_{i,t} + \beta_5 CASH_{i,t} + \beta_6 PPE_{i,t} + \beta_7 CR_{i,t} + \beta_8 GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (3.4)$$

where a firm's profitability at period *t* is regressed on profitability *t-1* and *t-2*, WCM variables at period *t-1* and a set of control variables (i.e., firm size, sales growth, leverage, level of cash holdings, level of fixed assets, current ratio, and GDP growth).[48] The variable $\eta_i$ represents an unobserved firm- and industry-specific effect. The parameters $\lambda_t$ is time-dummy variables and the parameter $\varepsilon_{i,t}$ is a random error term.

[47] In addition, Glen et al. (2001) and Gschwandtner (2005) suggest that two lags are adequate to capture the persistence of profitability (as cited in Wintoki et al., 2012, p.593).

[48] The first lag of WCM variables was used as a main explanatory variable, as opposed to current WCM variables, to reduce the impact of simultaneity because past WCM and present firm performance were not determined in the same period.

The basic estimation procedure consists of two essential steps. First, equations (3.1) – (3.4) are written in first-differencing forms. This first-differencing eliminates any potential biases that may arise from time-invariant unobserved heterogeneity. To illustrate, the first-differencing form of equation (3.1) can be written as follows:

$$\Delta ROA_{i,t} = \alpha + \kappa_s \sum_{s=1}^{2} \Delta ROA_{i,t-s} + \beta_1 \Delta AR_{i,t-1} + \beta_2 \Delta SIZE_{i,t} + \beta_3 \Delta SGROW_{i,t} + \beta_4 \Delta DEBT_{i,t} + \beta_5 \Delta CASH_{i,t} + \beta_6 \Delta PPE_{i,t} + \beta_7 \Delta CR_{i,t} + \beta_8 \Delta GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (3.1.1)$$

Second, the equations in first-differencing are estimated via GMM using the lagged values of the explanatory variables in levels as instruments. In particular, the instruments of the endogenous variables (i.e., $\Delta AR_{i,t-1}$, $\Delta INV_{i,t-1}$, $\Delta AP_{i,t-1}$, $\Delta CCC_{i,t-1}$) can be drawn from the set of lagged explanatory variables (e.g.., $ROA_{i,t-k}$, $AR_{i,t-k}$, $INV_{i,t-k}$, $AP_{i,t-k}$, $CCC_{i,t-k}$, $SIZE_{i,t-k}$, $SGROW_{i,t-k}$, $DEBT_{i,t-k}$, $CASH_{i,t-k}$, $PPE_{i,t-k}$, $CR_{i,t-k}$, $GDPGR_{i,t-k}$ where $k > s$ or in this case $k > 2$).

As the dynamic panel GMM assumes that there is no second-order serial correlation in the errors in the first differences, the paper verified this assumption using the test of second-order serial correlation *AR*(2) proposed by Arellano and Bond (1991) under the null hypothesis of no second-order serial correlation. Likewise, the Hansen test under the null hypothesis of the validity of the instruments was carried out (i.e., no correlation between the instruments and the error terms). As pointed out by Bound et al. (1995), Staiger and Stock (1997), and Stock and Yogo (2005), if the endogenous variables are only weakly correlated with the instruments, the instrumental variables

(IV) estimator could also be biased. Hence, the analysis has adopted from Wintoki et al. (2012) the *F*-statistics to assess the strength of the instruments.

Finally, it should be noted that although the use of dynamic panel GMM estimator in this context improves inference beyond OLS and FE estimators, the dynamic panel GMM methodology has its limitations.

> It relies on using the firm's history (lags of dependent and independent variables) for identification. Thus, there is a potential problem with weak instruments, which becomes greater as the number of lags of the instrumental variables increases. This represents an empirical trade-off. Increasing the instruments' lag length makes them more exogenous, but may also make them weaker (Wintoki et al., 2012, p.583).

In addition, as the dynamic panel GMM estimate can control only 'time-invariant' unobserved heterogeneity (i.e., provides consistent and unbiased estimates under the assumption that unobserved heterogeneity exists but is fixed or time-invariant), the model specifications (3.1) – (3.4) in this paper include as many as possible control variables that determine WCM and eventually affect a firm's profitability. However, it cannot completely rule out that there may be omitted 'time-varying' variables that have an economically significant effect on both corporate WCM and profitability.

**(b) The Interaction Effects of WCM Components on a Firm's Profitability**

In addition, to examine the interaction effects between WCM components on a firm's profitability, multiplicative models were applied. The inclusion of a product term in a regression is a legitimate way to test for interactions (Allison, 1977). Hence, the product term of two components of WCM was introduced in equations (4) – (6), and that of three components of WCM was augmented in equation (7) as follows. Similarly, the two-step dynamic panel GMM estimator was applied in equations (4) – (7):

Two-way interaction model for AR and AP:

$$ROA_{i,t} = \alpha + \sum_{s=1}^{2} \kappa_s ROA_{i,t-s} + \beta_1 AR_{i,t-1} + \beta_2 AP_{i,t-1} + \beta_3 AR \times AP_{i,t-1} + \beta_4 SIZE_{i,t} + \beta_5 SGROW_{i,t} + \beta_6 DEBT_{i,t} + \beta_7 CASH_{i,t} + \beta_8 PPE_{i,t} + \beta_9 CR_{i,t} + \beta_{10} GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (4)$$

Two-way interaction model for INV and AP:

$$ROA_{i,t} = \alpha + \sum_{s=1}^{2} \kappa_s ROA_{i,t-s} + \beta_1 INV_{i,t-1} + \beta_2 AP_{i,t-1} + \beta_3 INV \times AP_{i,t-1} + \beta_4 SIZE_{i,t} + \beta_5 SGROW_{i,t} + \beta_6 DEBT_{i,t} + \beta_7 CASH_{i,t} + \beta_8 PPE_{i,t} + \beta_9 CR_{i,t} + \beta_{10} GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (5)$$

Two-way interaction model for AR and INV:

$$ROA_{i,t} = \alpha + \sum_{s=1}^{2} \kappa_s ROA_{i,t-s} + \beta_1 AR_{i,t-1} + \beta_2 INV_{i,t-1} + \beta_3 AR \times INV_{i,t-1} + \beta_4 SIZE_{i,t} + \beta_5 SGROW_{i,t} + \beta_6 DEBT_{i,t} + \beta_7 CASH_{i,t} + \beta_8 PPE_{i,t} + \beta_9 CR_{i,t} + \beta_{10} GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \quad (6)$$

Three-way interaction model for AR, INV, and AP:

$$ROA_{i,t} = \alpha + \sum_{s=1}^{2} \kappa_s ROA_{i,t-s} + \beta_1 AR_{i,t-1} + \beta_2 INV_{i,t-1} + \beta_3 AP_{i,t-1} + \beta_4 AR \times INV_{i,t-1} + \beta_5 AR \times AP_{i,t-1} + \beta_6 INV \times AP_{i,t-1} + \beta_7 AR \times INV \times AP_{i,t-1} + \beta_8 SIZE_{i,t} + \beta_9 SGROW_{i,t} + \beta_{10} DEBT_{i,t} + \beta_{11} CASH_{i,t} + \beta_{12} PPE_{i,t} + \beta_{13} CR_{i,t} + \beta_{14} GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,} \quad (7)$$

### 5.5 Empirical Analysis

In this section, the results from estimating the relationship between WCM and a firm's profitability are presented and discussed. In order to compare results with previous research and highlight the potential problems from neglecting endogeneity in the effects of WCM on a firm's profitability, equations described in Section 5.4 are estimated using the following models: 1) an OLS model, 2) a FE model, 3) a dynamic OLS model, and 4) a dynamic GMM model. In addition, two additional analyses are conducted to examine: 1) the mechanism of how corporate profits are affected by WCM efficiency (i.e., through profit margin, asset productivity, equity multiplier, or altogether); and 2) whether economic condition has an impact on the relationship between WCM and corporate profitability.

#### 5.5.1 The Effects of WCM on a Firm's Profitability

Tables 5.4 and 5.5 report the results obtained from equations (3.1) – (3.4) described in Section 5.4 when ROA and ROE were used as profitability measures, respectively. WCM variables (i.e., $AR_{i,t-1}$, $INV_{i,t-1}$, $AP_{i,t-1}$, and $CCC_{i,t-1}$) were assumed to be endogenous.

## Table 5.4: The Effects of WCM Efficiency on ROA

| Dependent Variable: ROA (%) | Static model | | Dynamic model | | Static model | | Dynamic model | | Static model | | Dynamic model | | Static model | | Dynamic model | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pooled OLS (1) | Fixed effects (2) | Pooled OLS (3) | System GMM (4) | Pooled OLS (5) | Fixed effects (6) | Pooled OLS (7) | System GMM (8) | Pooled OLS (9) | Fixed effects (10) | Pooled OLS (11) | System GMM (12) | Pooled OLS (13) | Fixed effects (14) | Pooled OLS (15) | System GMM (16) |
| $AR_{t-1}$ (days) | -0.010** | -0.049*** | -0.032*** | -0.055* | | | | | | | | | | | | |
| | (0.003) | (0.007) | (0.003) | (0.023) | | | | | | | | | | | | |
| $INV_{t-1}$ (days) | | | | | -0.015*** | -0.021*** | -0.013*** | -0.020* | | | | | | | | |
| | | | | | (0.002) | (0.005) | (0.001) | (0.008) | | | | | | | | |
| $AP_{t-1}$ (days) | | | | | | | | | -0.061*** | -0.023*** | -0.019*** | -0.013*** | | | | |
| | | | | | | | | | (0.001) | (0.003) | (0.001) | (0.003) | | | | |
| $CCC_{t-1}$ (days) | | | | | | | | | | | | | 0.054*** | 0.015*** | 0.009*** | -0.001 |
| | | | | | | | | | | | | | (0.001) | (0.003) | (0.001) | (0.004) |
| $ROA_{t-1}$ (%) | | | 0.604*** | 0.055 | | | 0.602*** | -0.110* | | | 0.593*** | -0.075* | | | 0.598*** | -0.153*** |
| | | | (0.004) | (0.059) | | | (0.004) | (0.049) | | | (0.004) | (0.038) | | | (0.004) | (0.046) |
| $ROA_{t-2}$ (%) | | | 0.181*** | -0.060 | | | 0.182*** | -0.114** | | | 0.168*** | -0.130*** | | | 0.176*** | -0.059 |
| | | | (0.004) | (0.053) | | | (0.004) | (0.044) | | | (0.004) | (0.038) | | | (0.004) | (0.045) |
| SIZE | 10.320*** | 17.424*** | 2.850*** | 32.302*** | 10.285*** | 17.355*** | 2.815*** | 32.275*** | 9.401*** | 16.958*** | 2.775*** | 17.752*** | 9.689*** | 16.997*** | 2.827*** | 24.927*** |
| | (0.060) | (0.554) | (0.052) | (4.852) | (0.060) | (0.554) | (0.052) | (5.118) | (0.059) | (0.536) | (0.052) | (4.520) | (0.059) | (0.537) | (0.052) | (4.941) |
| SGROW (%) | -0.021*** | 0.020*** | 0.063*** | 0.046* | -0.021*** | 0.018*** | 0.061*** | 0.017 | -0.001 | 0.022*** | 0.064*** | 0.032* | -0.013*** | 0.018*** | 0.061*** | 0.028* |
| | (0.001) | (0.002) | (0.001) | (0.019) | (0.001) | (0.002) | (0.001) | (0.020) | (0.001) | (0.002) | (0.001) | (0.014) | (0.001) | (0.002) | (0.001) | (0.013) |
| DEBT (%) | -0.193*** | -0.153*** | -0.050*** | -0.443** | -0.194*** | -0.153*** | -0.050*** | 0.040 | -0.179*** | -0.148*** | -0.048*** | -0.260** | -0.173*** | -0.150*** | -0.047*** | -0.384*** |
| | (0.006) | (0.017) | (0.005) | (0.136) | (0.006) | (0.017) | (0.005) | (0.104) | (0.006) | (0.016) | (0.005) | (0.096) | (0.006) | (0.017) | (0.005) | (0.102) |
| CASH (%) | -0.398*** | 0.000 | -0.056*** | 0.118 | -0.410*** | -0.001 | -0.063*** | 0.190 | -0.358*** | 0.007 | -0.048*** | 0.372* | -0.301*** | 0.010 | -0.038*** | 0.175 |
| | (0.010) | (0.019) | (0.008) | (0.185) | (0.010) | (0.019) | (0.008) | (0.175) | (0.009) | (0.019) | (0.008) | (0.182) | (0.009) | (0.019) | (0.008) | (0.145) |
| PPE (%) | -0.047*** | -0.292*** | -0.046*** | -0.342 | -0.049*** | -0.290*** | -0.036*** | -1.156*** | -0.040*** | -0.289*** | -0.030*** | -0.018 | 0.01 | -0.286*** | -0.022*** | -0.223 |
| | (0.007) | (0.030) | (0.006) | (0.335) | (0.007) | (0.030) | (0.006) | (0.312) | (0.007) | (0.030) | (0.006) | (0.255) | (0.007) | (0.030) | (0.006) | (0.260) |
| CR | 3.327*** | 1.568*** | 1.060*** | -0.749 | 3.398*** | 1.583*** | 1.141*** | 0.383 | 2.960*** | 1.544*** | 1.000*** | 0.803 | 2.774*** | 1.556*** | 0.982*** | 2.441 |
| | (0.055) | (0.113) | (0.045) | (1.230) | (0.055) | (0.113) | (0.046) | (1.066) | (0.053) | (0.111) | (0.045) | (1.251) | (0.054) | (0.112) | (0.046) | (1.351) |
| GDPGR (%) | 2.406*** | 1.631*** | 0.325*** | 1.817*** | 2.403*** | 1.585*** | 0.286*** | 1.777*** | 2.128*** | 1.528*** | 0.266*** | 1.120* | 2.111*** | 1.516*** | 0.262*** | 0.489 |
| | (0.115) | (0.105) | (0.073) | (0.395) | (0.115) | (0.104) | (0.073) | (0.418) | (0.112) | (0.101) | (0.072) | (0.522) | (0.113) | (0.101) | (0.073) | (0.489) |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No |
| No. of observations | 104,469 | 104,469 | 77,618 | 57,209 | 104,469 | 104,469 | 77,618 | 57,209 | 104,469 | 104,469 | 77,618 | 57,209 | 104,469 | 104,469 | 77,618 | 57,209 |
| Adjusted $R^2$ | 0.303 | 0.180 | 0.627 | | 0.303 | 0.179 | 0.627 | | 0.341 | 0.186 | 0.629 | | 0.330 | 0.181 | 0.627 | |
| *AR*(1) test | | | | -5.23 | | | | -4.18 | | | | -5.93 | | | | -3.27 |
| | | | | (0.000) | | | | (0.000) | | | | (0.000) | | | | (0.001) |
| *AR*(2) test | | | | 0.11 | | | | 0.20 | | | | 0.80 | | | | -1.41 |
| | | | | (0.914) | | | | (0.845) | | | | (0.425) | | | | (0.159) |
| Hansen test of over-identification | | | | 146.20 | | | | 164.88 | | | | 154.44 | | | | 124018 |
| | | | | (0.410) | | | | (0.102) | | | | (0.242) | | | | (0.870) |

*Notes:* This table reports the estimation results from the regression equations (3.1) – (3.4). For each equation, four estimation techniques were applied (i.e., static OLS, static FE, dynamic OLS, and dynamic GMM). For the static models, past values of profitability were not included as explanatory variables (i.e., in equations (3.1) – (3.4) $\kappa_s = 0$). The instruments used in GMM estimate are third and fourth lags of corresponding WCM variables. *AR(1)* and *AR(2)* are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test of over-identification is under the null that all instruments are valid. Year dummies are included in all equations. All variables are defined as in Table 5.1. Standard errors of coefficients are reported in parenthesis. *, ** and *** indicate the coefficient significance at the 10%, 5% and 1% levels, respectively.

## Table 5.5: The Effects of WCM Efficiency on ROE

| Dependent Variable: ROE (%) | Static model | | Dynamic model | | Static model | | Dynamic model | | Static model | | Dynamic model | | Static model | | Dynamic model | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pooled OLS (1) | Fixed effects (2) | Pooled OLS (3) | System GMM (4) | Pooled OLS (5) | Fixed effects (6) | Pooled OLS (7) | System GMM (8) | Pooled OLS (9) | Fixed effects (10) | Pooled OLS (11) | System GMM (12) | Pooled OLS (13) | Fixed effects (14) | Pooled OLS (15) | System GMM (16) |
| $AR_{t-1}$ (days) | -0.082*** | -0.071*** | -0.054*** | 0.082 | | | | | | | | | | | | |
| | (0.008) | (0.019) | (0.010) | (0.080) | | | | | | | | | | | | |
| $INV_{t-1}$ (days) | | | | | -0.014*** | -0.030** | -0.007 | 0.021 | | | | | | | | |
| | | | | | (0.004) | (0.010) | (0.004) | (0.030) | | | | | | | | |
| $AP_{t-1}$ (days) | | | | | | | | | -0.004 | -0.001 | 0.001 | 0.018 | | | | |
| | | | | | | | | | (0.002) | (0.005) | (0.002) | (0.012) | | | | |
| $CCC_{t-1}$ (days) | | | | | | | | | | | | | -0.008*** | -0.013* | -0.009*** | -0.026 |
| | | | | | | | | | | | | | (0.002) | (0.005) | (0.003) | (0.014) |
| $ROE_{t-1}$ (%) | | | 0.134*** | -0.318*** | | | 0.134*** | -0.304*** | | | 0.134*** | -0.280*** | | | 0.134*** | -0.252*** |
| | | | (0.004) | (0.065) | | | (0.004) | (0.057) | | | (0.004) | (0.048) | | | (0.004) | (0.052) |
| $ROE_{t-2}$ (%) | | | 0.065*** | -0.141* | | | 0.066*** | -0.209*** | | | 0.066*** | -0.210*** | | | 0.066*** | -0.376*** |
| | | | (0.004) | (0.062) | | | (0.004) | (0.056) | | | (0.004) | (0.050) | | | (0.004) | (0.062) |
| SIZE | 3.723*** | -2.798*** | 3.293*** | -6.445 | 3.646*** | -2.895*** | 3.242*** | 1.680 | 3.621*** | -3.026*** | 3.272*** | -19.143 | 3.766*** | -2.765** | 3.353*** | -1.726 |
| | (0.147) | (0.843) | (0.160) | (17.740) | (0.147) | (0.845) | (0.160) | (18.029) | (0.150) | (0.845) | (0.163) | (16.171) | (0.149) | (0.844) | (0.162) | (15.809) |
| SGROW (%) | -0.014*** | 0.015* | 0.011* | -0.084 | -0.020*** | 0.011* | 0.007 | -0.183* | -0.019*** | 0.010 | 0.007 | 0.066 | -0.022*** | 0.009 | 0.006 | -0.104 |
| | (0.003) | (0.006) | (0.004) | (0.065) | (0.003) | (0.006) | (0.004) | (0.074) | (0.003) | (0.006) | (0.004) | (0.051) | (0.003) | (0.006) | (0.004) | (0.055) |
| DEBT (%) | 0.206*** | 0.315*** | 0.182*** | 0.900 | 0.209*** | 0.315*** | 0.184*** | 0.809* | 0.211*** | 0.315*** | 0.184*** | 0.326 | 0.207*** | 0.312*** | 0.181*** | -0.013 |
| | (0.014) | (0.037) | (0.016) | (0.524) | (0.014) | (0.037) | (0.016) | (0.371) | (0.014) | (0.037) | (0.016) | (0.343) | (0.014) | (0.037) | (0.016) | (0.375) |
| CASH (%) | -0.531*** | -0.257*** | -0.410*** | -1.683* | -0.528*** | -0.257*** | -0.405*** | -0.754 | -0.512*** | -0.251*** | -0.398*** | -1.647** | -0.528*** | -0.257*** | -0.415*** | -0.315 |
| | (0.024) | (0.046) | (0.027) | (0.703) | (0.024) | (0.046) | (0.027) | (0.684) | (0.024) | (0.046) | (0.027) | (0.556) | (0.024) | (0.046) | (0.027) | (0.541) |
| PPE (%) | -0.113*** | -0.178** | -0.081*** | -3.419** | -0.081*** | -0.176** | -0.059** | -0.658 | -0.075*** | -0.173** | -0.055** | 0.392 | -0.082*** | -0.175** | -0.064*** | 0.999 |
| | (0.018) | (0.059) | (0.020) | (1.242) | (0.018) | (0.059) | (0.019) | (1.041) | (0.018) | (0.059) | (0.019) | (0.955) | (0.018) | (0.059) | (0.019) | (1.018) |
| CR | 0.330* | 1.413*** | 0.419** | -3.907 | 0.407** | 1.434*** | 0.461** | 2.358 | 0.319* | 1.423*** | 0.426** | -0.940 | 0.423** | 1.444*** | 0.533*** | -3.267 |
| | (0.135) | (0.203) | (0.152) | (4.712) | (0.136) | (0.203) | (0.154) | (3.529) | (0.136) | (0.203) | (0.153) | (4.673) | (0.137) | (0.204) | (0.156) | (5.187) |
| GDPGR (%) | -0.076 | -0.503 | -0.413 | 0.275 | -0.164 | -0.570* | -0.485 | -0.924 | -0.187 | -0.600* | -0.486 | -1.720 | -0.13 | -0.555* | -0.458 | 0.561 |
| | (0.283) | (0.266) | (0.250) | (1.600) | (0.283) | (0.265) | (0.250) | (1.915) | (0.283) | (0.265) | (0.250) | (1.891) | (0.283) | (0.265) | (0.250) | (2.423) |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No |
| No. of observations | 104,460 | 104,460 | 77,605 | 57,196 | 104,460 | 104,460 | 77,605 | 57,196 | 104,460 | 104,460 | 77,605 | 57,196 | 104,460 | 104,460 | 77,605 | 57,196 |
| Adjusted $R^2$ | 0.031 | 0.006 | 0.055 | | 0.030 | 0.005 | 0.054 | | 0.030 | 0.005 | 0.054 | | 0.030 | 0.005 | 0.055 | |
| *AR*(1) test | | | | -4.90 | | | | -5.88 | | | | -7.54 | | | | -8.43 |
| | | | | (0.000) | | | | (0.000) | | | | (0.000) | | | | (0.000) |
| *AR*(2) test | | | | -1.11 | | | | 0.29 | | | | 0.58 | | | | 3.46 |
| | | | | (0.268) | | | | (0.775) | | | | (0.563) | | | | (0.001) |
| Hansen test of over-identification | | | | 127.27 | | | | 120.84 | | | | 133.35 | | | | 145.74 |
| | | | | (0.823) | | | | (0.911) | | | | (0.707) | | | | (0.421) |

*Notes:* This table reports the estimation results from the regression equations (3.1) – (3.4) where ROE is used as the dependent variable. For each equation, four estimation techniques were applied (i.e., static OLS, static FE, dynamic OLS, and dynamic GMM). For the static models, past values of profitability were not included as explanatory variables (i.e., in equations (3.1) – (3.4) $\kappa_s = 0$). The instruments used in GMM estimate are third and fourth lags of corresponding WCM variables. *AR(1)* and *AR(2)* are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test of over-identification is under the null that all instruments are valid. Year dummies are included in all equations. All variables are defined as in Table 5.1. Standard errors of coefficients are reported in parenthesis. *, ** and *** indicate the coefficient significance at the 10%, 5% and 1% levels, respectively.

First of all, static OLS and FE estimators reported a negative relation between WCM variables and a firm's profitability (as measured by both ROA and ROE) which is consistent with a number of prior studies (e.g., Jose et al., 1996; Wang, 2002; Deloof, 2003; Teruel and Solano, 2007). One exception in the findings is that when WCM is measured by CCC, there is a positive relationship with ROA as shown in Table 5.4 columns (13) and (14). This result is, however, in line with another study using US companies by Gill et al. (2010). Overall, OLS and FE estimators yielded similar results.

To examine whether static OLS and FE estimators are biased, the paper first compares the static OLS model to the dynamic OLS model. Two key insights emerge, suggesting that the dynamic model is an improvement over the static model. The first insight is that when lagged profitability is included as explanatory variables in the dynamic OLS model, the adjusted $R^2$ increases by about two times as compared to the corresponding static OLS model. For instance, in Table 5.4 column (1) based on static OLS model, the adjusted $R^2$ is 0.303 whereas that of column (3) based on dynamic OLS model is 0.627. This highlights a firm's past profitability as a significant explanatory variable of the variation in current profitability.

More importantly, the second insight is that the coefficients on the WCM variables drop in magnitude when moving from the static OLS model to the dynamic OLS, especially the coefficients of $AP_{t-1}$ (compared those of columns (9) and (11) in Table 5.4) and $CCC_{t-1}$ (compared those of columns (13) and (15) in Table 5.4). This suggests a relationship between current values of WCM and past values of profitability which, in turn, indicates the potential dynamic endogeneity between them. This

problem is likely to be of higher concern when $AP_{t-1}$ and $CCC_{t-1}$ are used as a proxy of WCM.[49]

Second, the paper compares the traditional FE model to the dynamic GMM model. While the former accounts for unobserved heterogeneity, the latter fully accounts for unobserved heterogeneity, simultaneity, and dynamic endogeneity. In the dynamic GMM model, the estimated coefficients on the WCM variables, especially that of the CCC, drop dramatically in significance. For instance, in Table 5.4, the coefficient of $AR_{t-1}$ declines from being significant at the 1% level in column (2) to the 10% level in column (4). More obviously, the coefficient of $CCC_{t-1}$ declines from being significant at the 1% level in column (14) to being insignificant in column (16). In addition, in Table 5.5 columns (4), (8), (12) and (16) the dynamic GMM estimate shows that the relationship between all four variables of WCM and ROE becomes insignificant. In sum, the dynamic GMM results indicate that WCM variables (as measured by AR, INV and AP) are a significant factor in explaining the variation in ROA (Table 5.4), whereas they are not for ROE (Table 5.5). Several factors relating to the firm's financing decisions that are not included in the model of this study may be more superior to WCM in explaining the variations in ROE. This is one of the key results of this paper and is in sharp contrast with the findings reported in prior studies which mostly suggest a strong and negative relationship.

Finally, the specification tests (i.e., the *AR*(2) test of second-order serial correlation, and the Hansen test of over-identification) are reported in both Table 5.4 and Table 5.5.

[49] This finding substantiates the argument made based on the results in Table 5.3 and footnote 44 that dynamic endogeneity is of higher concern when AP and CCC are used as an explanatory variable.

The *AR*(2) test reveals a *p*-value of more than 0.05 in all cases, indicating that the null hypothesis of no second-order serial correlation cannot be rejected. Likewise, the Hansen *J* test with the null hypothesis that the instruments are valid cannot be rejected. The paper also tests the strength of the instruments (third and fourth lags of WCM variables).[50] As discussed in Section 5.4, this involves the *F*-statistics. The *F*-statistics for all the first-stage regressions are significant, and greater than 10.0, which is the rule of thumb critical value suggested by Staiger and Stock (1997). Overall, the *F*-statistics suggests that the instruments are strongly correlated with the endogenous variables, and therefore the dynamic GMM estimators are not driven by weak instruments.

In sum, the findings support *H1* - *H3* that there is a negative relationship between AR, INV, and AP and a firm's profitability as measured by ROA. Robust to the endogeneity issue, a decrease in previous period AR, INV, and AP of one day would result in an improvement in the following period ROA by 0.06%, 0.02%, and 0.01%, respectively. However, *H4* is rejected. There is no causal relation between CCC and a firm's profitability as measured by both ROA and ROE. This finding is likely to suggest that the examination of the impact of WCM on a firm's profitability should be conducted at the working capital components level rather than the integrated level. As a negative relationship is found for both positive components of CCC (i.e., AR and INV) and negative component of CCC (i.e., AP), these negative relationships might be offset when CCC is adopted as a measure of WCM. Furthermore, there is no causal relation

[50] As indicated in Wintoki et al. (2012), there is a trade-off in the choice of lag-length from of instruments to ensure that lag-length is long enough for instruments to be exogenous, while not so long to drive weak instruments.

between all four measures of WCM and ROE. This may be because ROE is more extensively influenced by financing related factors rather than WCM. Finally, as speculated, static OLS and FE estimators are positively biased, especially when WCM efficiency is captured by AP and CCC. This is because the dynamic endogeneity becomes more serious when AP and CCC are adopted as a measure of WCM. The biases are in terms of both magnitude and significance of the coefficients. A dynamic panel GMM estimator provides a more conservative and reliable approach toward the effects of WCM on a firm's profitability.

For the economic meaning of the results, the significant and negative coefficient of AR (-0.055) indicates that a firm that experiences an increase in the credit term given to customers will have a drop in profitability as measured by ROA. On the one hand, this result is likely to suggest that a benefit of extending trade credit in terms of increased sales is more than offset by increased operating and financing costs such as monitoring and collecting debts, losses from bad debts, and the opportunity cost of delayed payments. An increase in AR by 1 day is likely to increase costs more than sales at the margin of $1,331 which is equivalent to a 0.055% decrease in ROA for firms with the average total assets of $2.42 million, approximately.

On the other hand, the result may suggest that firms do not incentivise customers to more sales by adjusting the trade credit term (instead of changing product prices) in the first place. This implication is consistent with the findings in Ng et al. (1999) that suggest that firms rarely vary trade credit terms in response to fluctuations in market demand.

Similarly, the significant and negative coefficient of INV (-0.020) suggests that a carefully developed sales forecast is essential as overstocks can lead to a drop in profitability as measured by ROA. This is because a longer inventory turnover period incurs higher warehouse, security, insurance and obsolescence costs. The result implies that an increase in INV by 1 day is likely to increase operating expenses up to $484 which is equivalent to a 0.02% decrease in ROA for firms with the average total assets of $2.42 million, approximately.

In addition, the significant and negative coefficient of AP (-0.013) indicates that the longer the firms delay their payments to suppliers, the lower ROA they report. The negative coefficient is consistent with the evidence that trade credit is an expensive financing. "From the customer's standpoint, taking the cash discount results in zero cost borrowing for a period of time and reduces the cost of goods or services purchased. The cost of trade credit becomes high only when the firm forgoes the cash discount" (Atanasova, 2012, p. 207). In addition, trade credit is considered more expensive relative to conventional loans because suppliers have a higher direct cost of funds (e.g., due to inefficiencies or non-specialisation in the collection of payments as compared with financial intermediaries) (Atanasova, 2007). The result suggests that if firms extend their payments by 1 day, this may reduce their profits by $315 which is equivalent to a 0.013% decrease in ROA for firms with the average total assets of $2.42 million, approximately, simply due to an increase in financing cost.

### 5.5.2 The Interaction Effects between working capital components on a Firm's Profitability

Table 5.6 reports the results obtained from equations (4) – (7). These equations aim to explain the effects of interaction between working capital components on a firm's profitability. In other words, to identify the proper "fit" between working capital components that will enhance corporate profitability. Again, ROA and ROE are used as a dependent variable in order to examine the interaction effects on both operating profit and net income. To illustrate the results robust to the endogeneity, a two-step dynamic panel GMM estimator is applied for equations (4) – (7).

Based on the results, only the coefficient of 'three-way' interaction is significant at as shown in columns (4) and (8). A statistical significance of the coefficient of three-way interaction term suggests the existence of the proper fit among accounts receivable, inventory, and accounts payable periods that can improve a firm's profitability.

However, this coefficient, itself, is not sufficient to identify a particular combination of the fit among these three components that will enhance profitability. Therefore, as suggested in Southwood (1978) and Schoonhoven (1981) and applied in Gul and Chia (1994), and Chia (1995), the partial derivatives were adopted for the three-way interaction in equation (7).

## Table 5.6: The Interaction Effects of the Components of Working Capital on a Firm's Profitability

| Dependent Variable | ROA | | | | ROE | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| $AR_{t-1}$ (days) | -0.022* | | -0.028** | -0.022*** | 0.067 | | -0.032 | -0.027** |
| | (0.009) | | (0.010) | (0.003) | (0.035) | | (0.039) | (0.010) |
| $INV_{t-1}$ (days) | | -0.015*** | -0.021*** | -0.004** | | -0.034* | 0.005 | -0.024*** |
| | | (0.004) | (0.004) | (0.001) | | (0.017) | (0.015) | (0.004) |
| $AP_{t-1}$ (days) | -0.007*** | -0.012*** | | -0.003*** | 0.005 | 0.029*** | | 0.028*** |
| | (0.002) | (0.002) | | (0.001) | (0.007) | (0.006) | | (0.002) |
| $AR \times AP_{t-1}$ | $-0.006\times10^{-3}$ | | | $0.005\times10^{-3}$ | $0.028\times10^{-3}$ | | | $0.054\times10^{-3}$*** |
| | (0.000) | | | (0.000) | (0.000) | | | (0.000) |
| $INV \times AP_{t-1}$ | | $0.006\times10^{-3}$ | | $-0.008\times10^{-3}$*** | | $-0.016\times10^{-3}$ | | $-0.041\times10^{-3}$*** |
| | | (0.000) | | (0.000) | | (0.000) | | (0.000) |
| $AR \times INV_{t-1}$ | | | $0.042\times10^{-3}$ | $0.014\times10^{-3}$ | | | $-0.161\times10^{-3}$ | $-0.073\times10^{-3}$ |
| | | | (0.000) | (0.000) | | | (0.000) | (0.000) |
| $AR \times INV \times AP_{t-1}$ | | | | $-0.007\times10^{-5}$*** | | | | $0.016\times10^{-5}$* |
| | | | | (0.000) | | | | (0.000) |
| SIZE | 35.201*** | 33.023*** | 28.340*** | 35.085*** | -6.294 | -10.088** | -15.259* | -6.992*** |
| | (1.591) | (1.314) | (1.783) | (0.317) | (4.486) | (3.571) | (6.319) | (0.817) |
| SGROW (%) | 0.040*** | 0.030270*** | 0.038*** | 0.038*** | -0.008 | 0.003 | 0.032 | 0.028*** |
| | (0.005) | (0.004) | (0.006) | (0.001) | (0.015) | (0.014) | (0.022) | (0.003) |
| DEBT (%) | -0.222*** | -0.218*** | -0.171*** | -0.166*** | -0.052 | 0.319*** | 0.483** | 0.300*** |
| | (0.035) | (0.023) | (0.043) | (0.005) | (0.105) | (0.083) | (0.153) | (0.017) |
| CASH (%) | 0.284*** | 0.386*** | 0.251*** | 0.264*** | -0.999*** | -1.230*** | -0.829*** | -0.717*** |
| | (0.048) | (0.039) | (0.055) | (0.007) | (0.166) | (0.127) | (0.205) | (0.029) |
| PPE (%) | -0.104 | -0.420*** | -0.421*** | -0.285*** | -0.462 | -0.313 | -1.506*** | -0.673*** |
| | (0.076) | (0.069) | (0.100) | (0.017) | (0.249) | (0.230) | (0.407) | (0.054) |
| CR | 0.669 | -0.102 | 1.212*** | 1.310*** | -0.189 | -0.307 | 0.130 | -1.686*** |
| | (0.389) | (0.277) | (0.357) | (0.048) | (1.246) | (0.842) | (1.458) | (0.178) |
| GDPGR (%) | 1.524*** | 1.421*** | 1.359*** | 2.009*** | -0.441 | 0.406 | -0.874 | -1.782*** |
| | (0.199) | (0.201) | (0.206) | (0.101) | (0.954) | (0.919) | (0.958) | (0.376) |
| $ROA_{t-1}$ (%) | -0.018 | -0.051*** | -0.019 | -0.013*** | -0.189*** | -0.144*** | -0.218*** | -0.153*** |
| | (0.012) | (0.010) | (0.018) | (0.002) | (0.017) | (0.011) | (0.019) | (0.002) |
| $ROA_{t-2}$ (%) | -0.088*** | -0.073*** | -0.023 | -0.058*** | -0.202*** | -0.099*** | -0.198*** | -0.149*** |
| | (0.011) | (0.009) | (0.015) | (0.002) | (0.017) | (0.011) | (0.019) | (0.002) |
| No. of observations | 57,209 | 57,209 | 57,209 | 57,209 | 57,196 | 57,196 | 57,196 | 57,196 |
| *AR*(1) test | -8.76 | -9.56 | -8.12 | -9.79 | -16.13 | -18.37 | -14.81 | -20.50 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *AR*(2) test | 0.70 | -0.49 | -2.15 | -0.61 | 3.94 | 0.20 | 2.72 | 3.66 |
| | (0.485) | (0.624) | (0.031) | (0.542) | (0.000) | (0.841) | (0.006) | (0.000) |
| Hansen test of over-identification | 571.45 | 545.56 | 572.83 | 1,493.78 | 482.50 | 496.02 | 490.16 | 1,212.13 |
| | (0.080) | (0.697) | (0.353) | (1.000) | (0.371) | (0.224) | (0.283) | (0.999) |

*Notes:* This table reports the dynamic panel GMM estimation from the regression equations (4) – (7). The instruments used in GMM estimate are third and fourth lags of WCM variables. *AR(1)* and *AR(2)* are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test of over-identification is under the null that all instruments are valid. Year dummies are included in all equations. Standard errors of coefficients are reported in parenthesis. *, ** and *** indicate the coefficient significant at the 10%, 5% and 1% levels, respectively.

The partial derivative of equation (7) over AP, using ROA and ROE as a dependent variable, is presented as equations (7.1) and (7.2), respectively. These equations suggest that the effect of changing the degree of AP on the firm's profitability ($\delta ROA_{i,t} / \delta AP_{i,t-1}$) is a function of both AR and INV.

$$\delta ROA_{i,t}/\delta AP_{i,t-1} = \beta_3 + \beta_5 AR_{i,t-1} + \beta_6 INV_{i,t-1} + \beta_7 AR \times INV_{i,t-1} \quad (7.1)$$

$$\delta ROE_{i,t}/\delta AP_{i,t-1} = \beta_3 + \beta_5 AR_{i,t-1} + \beta_6 INV_{i,t-1} + \beta_7 AR \times INV_{i,t-1} \quad (7.2)$$

To examine the three-way interaction effects on ROA, the minimum value and the maximum value of INV (i.e., the minimum of 0.00 days and the maximum of 560.22 days) were applied in equation (7.1).[51] This results in equations (7.1a) and (7.1b).

$$\delta ROA_{i,t}/\delta AP_{i,t-1} = -0.003321 + 0.000005 \times AR_{i,t-1} \quad (7.1a)$$

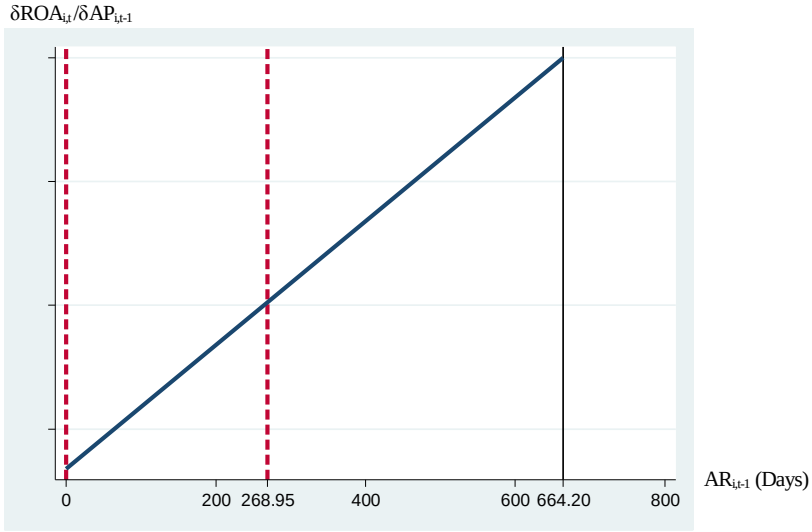
$$\delta ROA_{i,t}/\delta AP_{i,t-1} = -0.007803 - 0.000034 \times AR_{i,t-1} \quad (7.1b)$$

When equation (7.1a) equals zero, AR equals 664.20 days, which is beyond the observed range of AR (the maximum value being 268.95 days). This indicates a monotonic relationship in partial derivative equation (7.1a). As a result of a monotonic relationship as illustrated in Figure 5.1, for all values of AR, each increase in AP has a negative impact on ROA (i.e., for all values of observed $AR_{i,t-1}$, $\delta ROA_{i,t}/\delta AP_{i,t-1}$ is under

[51] As suggested in Gul and Chia (1994), the extreme values providing the observable range for a given variable are selected to ensure the presence of non-monotonic relationships in the results.

zero), and this negative effect becomes greater when AR is smaller. The result suggests that, on the one hand, firms should always ensure that AP is optimised in order to improve ROA. On the other hand, when AR becomes shorter, there must be an effort to optimise AP even further which, in turn, indicates that the maturity matching approach should be applied.

**Figure 5.1: The Effects of AR on the Relationship between AP and ROA Given INV being Low (INV = 0.00 day)**

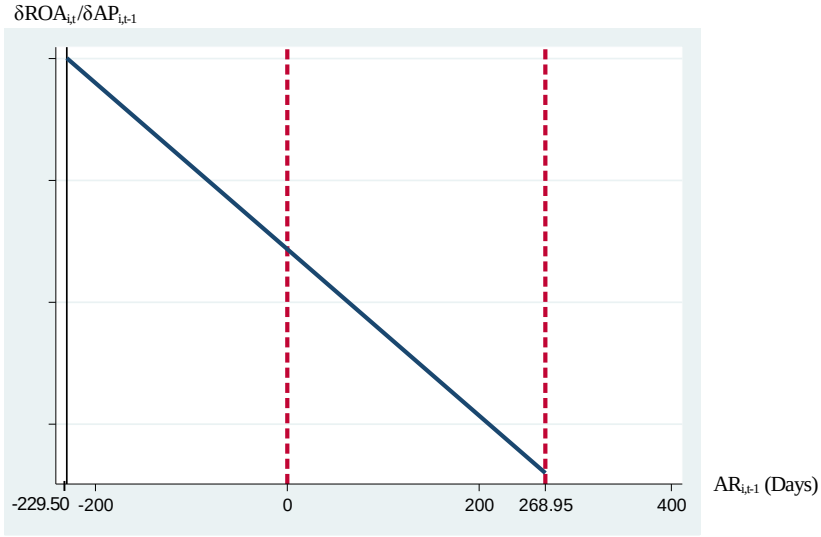



*Notes:* The figure reports the partial derivative of equation (7.1a). The Y axis represents a change in ROA, given a change in AP. The X axis represents AR in days. The range of observed AR is between two dashed lines from 0 to 268.95 days.

When equation (7.1b) equals zero, AR equals -229.50 days, which is below the observed range of AR (the minimum value being 0.00 days). This indicates a monotonic relationship in partial derivative equation (7.1b). The result illustrated in Figure 5.2 shows that for all values of observed $AR_{i,t-1}$, $\delta ROA_{i,t}/\delta AP_{i,t-1}$ is under zero. The result, once again, suggests that regardless of AR, firms should minimise their AP to improve ROA. Moreover, the negative slope indicates that when there are intensive investments in both inventory (provided that the maximum value of INV is applied in equation (7.1b)) and accounts receivable (as moving AR along the right-handed side

of the X axis), an increase in AP will reduce a firm's ROA. This situation suggests that firms signalling an overtrading problem report lower profitability.[52] This may be due to additional finance being required and an overrun on operating costs. This problem may subsequently lead to insolvency and corporate bankruptcy (Chakraborty, 2003; Watson and Head, 2009).

**Figure 5.2: The Effects of AR on the Relationship between AP and ROA Given INV being High (INV = 560.22 days)**




*Notes:* The figure reports the partial derivative of equation (7.1b). The Y axis represents a change in ROA, given a change in AP. The X axis represents AR in days. The range of observed AR is between two dashed lines from 0 to 268.95 days.

To examine the three-way interaction effects on ROE, first the minimum value and the maximum value of INV was applied in equation (7.2), resulting in equation (7.2a) and (7.2b), respectively.

[52] Among several reasons, the major cause of overtrading is over-expansion that requires a great amount of inventory and receivables to support rapid growth. If cash is not sufficiently fed back into the business through profits from operations while long-term finance cannot be raised and secured, overtrading companies have to rely more on short-term finance such as accounts payable (Ogilvie, 2009).

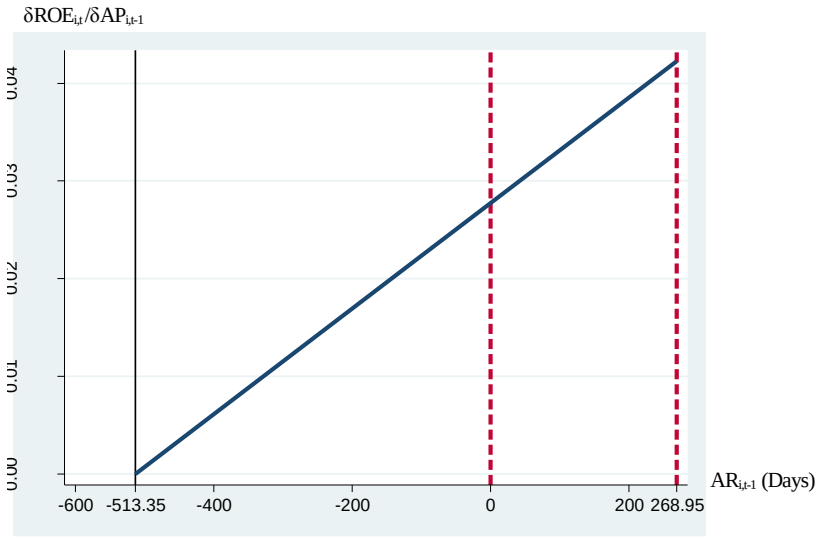
$$\delta ROE_{i,t}/\delta AP_{i,t-1} = 0.027721 + 0.000054 \times AR_{i,t-1} \quad (7.2a)$$

$$\delta ROE_{i,t}/\delta AP_{i,t-1} = 0.004752 + 0.000144 \times AR_{i,t-1} \quad (7.2b)$$

When equations (7.2a) and (7.2b) equal zero, AR equals -513.35 days and -33.08 days, respectively, which are below the observed range of AR (the minimum value being 0.00 days). Figures 5.3 and 5.4 indicate a monotonic relationship in partial derivative equations (7.2a) and (7.2b). As both figures show a positive slope, it indicates that, regardless of both INV and AR a firm operates, an increase in AP will enhance ROE. This is likely because ROE is affected by external financing cost. Higher reliance on accounts payable means that more costly external financing is less required, thereby increasing ROE. In addition, when AR increases (as moving AR along the right-handed side of the X axis), an increase in AP will enhance ROE even further ($\delta ROA_{i,t}/\delta AP_{i,t-1}$ is higher). This, again, reflects the benefit of when maturity matching hypothesis is applied.

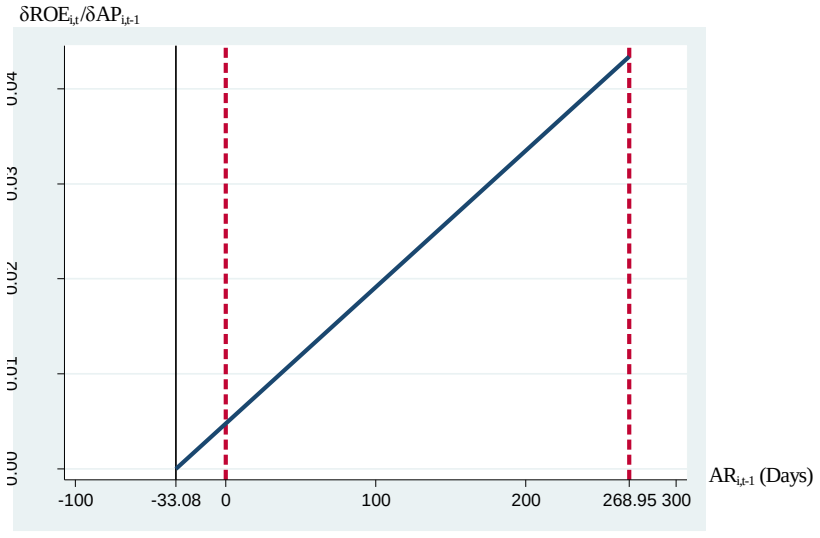
In sum, *H5 – H7* are rejected as two-way interaction terms are not found to be significant. In contrast, the findings support *H8* and suggest that firms should ensure a proper fit among three components of working capital (i.e., accounts receivable, inventory, and accounts payable) in order to improve both operating profit and net income.

## Figure 5.3: The Effects of AR on the Relationship between AP and ROE Given INV being LOW (INV = 0.00 day)




*Notes:* The figure reports the partial derivative of equation (7.2a). The Y axis represents a change in ROE, given a change in AP. The X axis represents AR in days. The range of observed AR is between two dashed lines from 0 to 268.95 days.

## Figure 5.4: The Effects of AR on the Relationship between AP and ROE Given INV being High (INV = 560.22 days)




*Notes:* The figure reports the partial derivative of equation (7.2b). The Y axis represents a change in ROE, given a change in AP. The X axis represents AR in days. The range of observed AR is between two dashed lines from 0 to 268.95 days.

To improve operating profit (as measured by ROA), firms should ensure that accounts payable period is always optimised while applying maturity matching approach (i.e., a shorter AR should be matched with a shorter AP). In contrast, to improve net income (as measured by ROE), firms should make the most of their credit term received, or renegotiate a longer credit term from suppliers in order to rely less on more expensive sources of finance such as bank borrowings.

With regards to the economic meaning of the interaction coefficient, the partial derivative of three-way interaction suggests that when firms have increasing short-term investments, the action to match higher short-term investments with higher finance by means of extending or delaying payments to suppliers is likely to result in declining profits. Alternatively, firms should consider using other sources of finance e.g., utilising lines of credit or borrowing from banks. Again, this evidence reflects that trade credit is an expensive source of finance. This is why high reliance on trade credit provides a negative impact on corporate profitability. This result also substantiates the findings in Petersen and Rajan (1994) that if a firm can secure enough credit from its financial institution, it can avoid stretching out its accounts payable as long, suggesting that borrowing from suppliers, at least for longer periods of time, is a more expensive form of credit.

### 5.5.3 The Effects of WCM on Profitability Decomposition

Additional analysis of the results is obtained by using profitability decomposition. The DuPont analysis breaks down ROE into three distinct elements, and ROA into two distinct elements as follows:

$$\text{EBIT/Assets} = \underbrace{\underbrace{(\text{EBIT/Sales}) \times (\text{Sales/Assets})}_{\textit{ROA Decomposition}} \times (\text{Assets/Equity})}_{\textit{ROE Decomposition}}.$$

The first element is profit margin (PM), which measures profit as a percentage of sales. The second element is asset productivity or asset turnover (AT), which measures the level of sales that a firm can achieve in relation to its total assets. The third element is equity multiplier (EM), which indicates the firm's use of external finance.

Since an increase (a decrease) in accounts receivable and inventory result in lower (higher) AT, this can influence the negative relationship between WCM efficiency variables and profitability. As a result, in the baseline models (3.1) – (3.4), ROA is replaced by PM, AT, and EM, respectively.

As shown in Table 5.7, the findings are robust in that AR, INV, and AP are significant and negatively associated with both PM and AT at the 1% level, except for the relationship between AR and AT in column (5) that is not significant. However, none of these WCM variables is associated with EM. The results indicate that WCM efficiency takes effect through both PM and AT, providing a multiplicative boost to ROA.

## Table 5.7: The Effects of WCM Efficiency on Profitability Decomposition

| Dependent Variable | PM | | | | AT | | | | EM | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| $AR_{t-1}$ (days) | -1.291*** | | | | $-0.252\times10^{-3}$ | | | | $-0.265\times10^{-2}$ | | | |
| | (0.236) | | | | (0.000) | | | | (0.003) | | | |
| $INV_{t-1}$ (days) | | -0.369*** | | | | $-0.419\times10^{-3}$** | | | | $-0.164\times10^{-2}$ | | |
| | | (0.068) | | | | (0.000) | | | | (0.001) | | |
| $AP_{t-1}$ (days) | | | -0.216*** | | | | $-0.188\times10^{-3}$*** | | | | $-0.295\times10^{-2}$ | |
| | | | (0.036) | | | | (0.000) | | | | (0.000) | |
| $CCC_{t-1}$ (days) | | | | 0.038 | | | | $-0.070\times10^{-3}$ | | | | $-0.067\times10^{-3}$ |
| | | | | (0.041) | | | | (0.000) | | | | (0.000) |
| SIZE | 107.742* | -33.244 | -16.491 | 45.396 | -0.382*** | -0.355*** | -0.411*** | -0.328*** | -0.361 | 0.310 | 0.929* | -0.285 |
| | (48.266) | (38.389) | (29.453) | (37.990) | (0.058) | (0.062) | (0.053) | (0.060) | (0.557) | (0.554) | (0.463) | (0.446) |
| SGROW (%) | 1.407*** | 1.316*** | 1.451*** | 1.086*** | 0.000 | 0.001** | 0.000* | 0.000 | 0.003 | 0.004* | -0.003 | 0.003 |
| | (0.200) | (0.168) | (0.151) | (0.176) | (0.000) | (0.000) | (0.000) | (0.000) | (0.002) | (0.002) | (0.002) | (0.001) |
| DEBT (%) | 0.779 | -1.657** | -1.218 | -2.516** | 0.002 | 0.002 | -0.003* | 0.001 | 0.012 | -0.017 | 0.007 | -0.006 |
| | (1.163) | (0.617) | (0.735) | (0.942) | (0.002) | (0.001) | (0.001) | (0.001) | (0.017) | (0.011) | (0.010) | (0.011) |
| CASH (%) | -1.021 | -0.553 | 0.295 | -2.782* | -0.003 | 0.002 | -0.006** | -0.005** | -0.033 | -0.017 | 0.018 | 0.037* |
| | (1.743) | (1.245) | (1.186) | (1.214) | (0.002) | (0.002) | (0.002) | (0.002) | (0.023) | (0.023) | (0.017) | (0.016) |
| PPE (%) | 0.364 | -2.845 | 2.184 | -0.467 | 0.002 | 0.002 | 0.003 | 0.001 | 0.069 | 0.005 | 0.032 | -0.016 |
| | (3.168) | (2.089) | (1.979) | (2.169) | (0.004) | (0.004) | (0.003) | (0.003) | (0.042) | (0.033) | (0.027) | (0.029) |
| CR | -8.184 | 14.299 | -9.667 | 4.395 | -0.042* | -0.036** | 0.017 | 0.027 | -0.062 | -0.246* | -0.17 | -0.125 |
| | (11.888) | (8.439) | (8.236) | (11.079) | (0.016) | (0.013) | (0.014) | (0.015) | (0.152) | (0.123) | (0.147) | (0.141) |
| GDPGR (%) | 6.672* | -1.965 | -2.294 | -3.374 | -0.039*** | -0.037*** | -0.040*** | -0.030*** | 0.009 | 0.024 | 0.113 | -0.100 |
| | (3.285) | (2.748) | (3.526) | (3.729) | (0.005) | (0.006) | (0.006) | (0.008) | (0.059) | (0.061) | (0.070) | (0.074) |
| No. of observations | 57,209 | 57,209 | 57,209 | 57,209 | 57,209 | 57,209 | 57,209 | 57,209 | 57,199 | 57,199 | 57,199 | 57,199 |
| *AR*(1) test | -7.40 | -7.13 | -8.69 | -6.93 | -5.93 | -4.65 | -3.84 | -2.74 | -3.41 | -7.12 | -6.07 | -5.95 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.006) | (0.001) | (0.000) | (0.000) | (0.000) |
| *AR*(2) test | -0.00 | -0.07 | 1.42 | 2.20 | -3.55 | -2.96 | -4.75 | -0.36 | -0.71 | -0.73 | -1.02 | 1.03 |
| | (0.996) | (0.948) | (0.157) | (0.028) | (0.000) | (0.003) | (0.000) | (0.718) | (0.480) | (0.468) | (0.309) | (0.303) |
| Hansen test of over-identification | 108.29 | 116.63 | 120.51 | 125.20 | 162.68 | 149.78 | 154.03 | 158.62 | 127.76 | 123.07 | 132.01 | 162.37 |
| | (0.986) | (0.948) | (0.914) | (0.855) | (0.124) | (0.332) | (0.250) | (0.176) | (0.815) | (0.885) | (0.735) | (0.128) |

*Notes:* This table reports the dynamic panel GMM estimation results from the regression equations (3.1) – (3.4) where PM, AT, and EM are adopted as the dependent variable, respectively. The instruments used in GMM estimate are third and fourth lags of corresponding WCM variables. *AR(1)* and *AR(2)* are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test of over-identification is under the null that all instruments are valid. Year dummies are included in all equations. All variables are defined as in Table 5.1. Standard errors of coefficients are reported in parenthesis. *, ** and *** indicate the coefficient significance at the 10%, 5% and 1% levels, respectively.

### 5.5.4 The Impact of Economic Condition on the Relationship between WCM and a Firm's Profitability

To examine whether or not economic condition meditates the effects of WCM efficiency on corporate profitability, an interaction term between WCM variables (i.e., AR, INV, AP and CCC) and economic condition as measured by GDP growth (i.e., GDPGR) is included in the baseline models (3.1) – (3.4).

Table 5.8 shows that while the regression coefficients of AR, INV and AP are negative, consistent with those of the main results in Table 5.4, the interaction terms with GDPGR are positive but only significant for INV×GDPGR at the 5% level. Given a negative regression coefficient of INV, a positive and significant interaction term of INV×GDPGR implies that the total effects of INV decrease across levels of GDPGR. In other words, a reduction in INV is more crucial to operating profits enhancement during bad economic condition than good economic condition. The result highlights that during economic downturn, an increasing efficiency in WCM, especially inventory management, is of higher importance.

## Table 5.8: The Effects of Economic Condition on the Relationship between WCM Efficiency and ROA

| Dependent Variable: ROA | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| $AR_{t-1}$ (days) | -0.062** | | | |
| | (0.020) | | | |
| $AR_{t-1}$×GDPGR | 0.003 | | | |
| | (0.002) | | | |
| $INV_{t-1}$ (days) | | -0.016 | | |
| | | (0.009) | | |
| $INV_{t-1}$×GDPGR | | 0.001* | | |
| | | (0.001) | | |
| $AP_{t-1}$ (days) | | | -0.014*** | |
| | | | (0.004) | |
| $AP_{t-1}$×GDPGR | | | 0.001 | |
| | | | (0.001) | |
| $CCC_{t-1}$ (days) | | | | 0.004 |
| | | | | (0.004) |
| $CCC_{t-1}$×GDPGR | | | | -0.001 |
| | | | | (0.001) |
| SIZE | 24.218*** | 42.343*** | 22.786*** | 25.105*** |
| | (4.950) | (5.463) | (4.837) | (4.836) |
| SGROW (%) | 0.048** | 0.019 | 0.031* | 0.013 |
| | (0.017) | (0.020) | (0.015) | (0.013) |
| DEBT (%) | -0.342* | 0.308** | -0.330*** | -0.331** |
| | (0.140) | (0.117) | (0.100) | (0.102) |
| CASH (%) | 0.287 | 0.329 | 0.796*** | 0.228 |
| | (0.202) | (0.183) | (0.184) | (0.149) |
| PPE (%) | -0.007 | -1.549*** | 0.166 | -0.173 |
| | (0.317) | (0.345) | (0.282) | (0.261) |
| CR | 0.251 | -0.023 | 2.265 | 2.347 |
| | (1.283) | (1.252) | (1.376) | (1.409) |
| GDPGR (%) | 0.763 | -0.738 | 0.980 | 0.567 |
| | (0.864) | (1.731) | (1.203) | (1.018) |
| $ROA_{t-1}$ (%) | 0.072 | -0.191*** | -0.132*** | -0.179*** |
| | (0.058) | (0.054) | (0.037) | (0.045) |
| $ROA_{t-2}$ (%) | 0.006 | -0.074 | -0.097* | -0.109* |
| | (0.056) | (0.047) | (0.038) | (0.044) |
| No. of observations | 57,209 | 57,209 | 57,209 | 57,209 |
| *AR*(1) test | -4.99 | -2.09 | -5.14 | -3.12 |
| | (0.000) | (0.037) | (0.000) | (0.002) |
| *AR*(2) test | --1.04 | -1.10 | -0.46 | -0.53 |
| | (0.298) | (0.270) | (0.644) | (0.593) |
| Hansen test of over-identification | 169.83 | 132.17 | 146.61 | 130.20 |
| | (0.056) | (0.711) | (0.378) | (0.752) |

*Notes:* This table reports the dynamic panel GMM estimation results from the regression equations (3.1) – (3.4) where PM, AT, and EM are adopted as the dependent variable, respectively. The instruments used in GMM estimate are third and fourth lags of corresponding WCM variables. *AR(1)* and *AR(2)* are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test of over-identification is under the null that all instruments are valid. Year dummies are included in all equations. All variables are defined as in Table 5.1. Standard errors of coefficients are reported in parenthesis. *, ** and *** indicate the coefficient significance at the 10%, 5% and 1% levels, respectively.

## 5.6 Comparison of the Results with Previous Studies

<table>
<tr><th>Previous Studies</th><th>Current Research</th></tr>
<tr><td>Prior literature suggests a significant negative relationship between WCM (as measured by CCC) and profitability (as measured by both ROA and ROE) (e.g., Jose et al., 1996; Wang, 2002).<br><br>For the literature that also measure WCM at individual components level (i.e., comprising AR, INV and AP), they tend to report a negative impact of AR and INV on profitability and a positive impact of AP on profitability (e.g., Lazaridis and Tryfonidis, 2006; Garcia-Teruel and Martinez-Solano, 2007; Gill et al., 2010; Raheman et al., 2010).</td><td>Three types of endogeneity concerns (i.e., simultaneity, unobserved heterogeneity, and dynamic endogeneity) that have been neglected in the literature have been mitigated in the current research using the dynamic panel GMM model. This model provides more reliable and conservative approach for the effects of WCM on profitability.<br><br>Robust to the endogeneity problems, the research provides the contrasting results with those of the literature. First, there is a significant and negative relationship between AP and ROA. This finding is consistent with the notion that trade credit is an expensive form of financing.<br><br>Second, the relationship between CCC and ROA is found to be insignificant. As the current research finds the negative relationships of all three components of CCC (i.e., AR, INV and AP) with ROA, a company that reports lower AR, INV and AP such as Company A illustrated below is more likely to have higher ROA than Company B whose AR, INV and AP are higher. However, companies with high AR, INV and AP and companies with low AR, INV and AP may report similar CCC, thereby resulting in the unclear relationship between CCC and ROA.<br><br>
<table>
<tr><th>Company</th><th>AR (days)</th><th>INV (days)</th><th>AP (days)</th><th>CCC = AR+INV-AP (days)</th></tr>
<tr><td>A</td><td>45</td><td>90</td><td>60</td><td>75</td></tr>
<tr><td>B</td><td>90</td><td>100</td><td>115</td><td>75</td></tr>
</table>
</td></tr>
</table>

| Previous Studies | Current Research |
|---|---|
| Prior literature focuses on how to manage working capital at both overall and individual elements levels. | Maturity matching theory suggests that interdependence between the components of working capital exists. This research is the first to examine the extent to which the interaction between the components of working capital affects profitability. The results highlight that when there is an increase in short-term investments, a matching with higher reliance on trade credit to finance these investments would result in decreasing ROA. The result, again, emphasises that accounts payable is an expensive form of credit. Mismatching between the components of working capital can result in declining profitability. |

### 5.7 Main Practical Implications

The main practical implication that can be inferred from the results of the study is that they are consistent with firms being able to generate important profitability benefits from pursuing relatively aggressive current asset policies simultaneously with conservative trade financing policies. Thus, for firms seeking profit growth (in addition to focusing directly on revenue and cost concerns in relation to bottom line improvements) achieving increased efficiency in WCM should receive attention. Perhaps, this can be done through benchmarking internally and with industry peers to identify best practices as well as utilising technology in credit and collection, procurement, and inventory management. In contrast to the traditional practice of extending payment terms as much as possible, more conservative financing policies are suggested. Firms are likely to benefit more from paying their suppliers within a short timeframe to take advantage of the trade discount. The implementation of accounts payable processing technology is likely to facilitate the achievement of the right balance between managing liquidity and profitability.

In addition to effectively managing individual components of working capital, firms should ensure a proper matching between accounts receivable, inventory, and accounts payable in order to improve both operating profit and net income. Hence, from a monitoring perspective, management should ensure synchronisation between procurement, warehouse, and credit and collection departments. Effective integrated collaboration is important in helping firms enhance their profitability.

### 5.8 Conclusion

The results of this study contribute to the existing weight of evidence that points to improvements in WCM efficiency being associated with enhanced corporate profitability. Although a comprehensive measure of WCM (i.e., CCC) is not found to be a useful indicator (inference) for the effects of WCM on corporate profitability, a higher efficiency in the management of individual components of CCC (i.e., accounts receivable, inventory and accounts payable periods), and a proper "fit" between these three components are associated with profitability enhancements which have been significant in scale.

Two aspects of the research design are novel and substantially augment the results obtained. First and foremost, two endogeneity concerns (i.e., simultaneity and unobserved heterogeneity) that have bedeviled prior research, and another endogeneity concern (i.e., dynamic endogeneity) that has been highlighted in this paper have been directly addressed using the dynamic panel GMM estimator. Second, a more extensive and contemporary panel data set than those employed in previous research has been used. In addition, the study contributes new findings on the research topic. While the

individual components of WCM are conjoined as having an association with operating profit, the interactions between these components are also associated with both operating profit and net income. There has also been an identification of how corporate profit returns are affected by WCM efficiency. Both profit margin and asset productivity improve to generate a multiplicative boost to ROA.

If the arguments for causality contained in this analysis can be imputed to the associations found in the data, then the main conclusion to be drawn is that it was financially beneficial for firms to actively manage working capital efficiency during the period of the study. Achieving greater "leanness" through credit and inventory control management has positively impacted on the operating profit achieved. Moreover, the findings on the interaction effects of WCM efficiency components further suggest that firms managing their working capital components following the maturity matching concept are able to generate higher operating profit. On the other hand, firms investing in large volumes of trade credit and inventory and simultaneously relying heavily on short-term finance, a sign of overtrading, face diminishing operating profit. This problem can ultimately lead to the serious problems of corporate insolvency and bankruptcy.

### 5.9 Summary of Chapter 5

Overall, this chapter highlights the importance of WCM in terms of its contribution on profitability. To fulfill the four objectives identified at the start of this chapter, empirical findings suggest that higher efficiency in the management of individual components of working capital, comprising accounts receivable, inventory, and

accounts payable, should be achieved as it has a significant impact on a firm's operating profit. In addition, a focus should also be made on a proper "fit" among these three components to further enhance profitability at both operating profit and net income levels. Additional analysis obtained by using profitability decomposition emphasises the importance of higher efficiency in WCM as it takes effect through both profit margin and asset productivity. Finally, higher efficiency in WCM, especially inventory management, is of greater significance during the economic downturn.

# CHAPTER 6

# CONCLUSIONS, LIMITATIONS AND FURTHER WORK

## 6.1 Introduction

This thesis provides the first study based on a comprehensive analysis of the determinants and consequences of WCM. In particular, the findings in this doctorate enhance knowledge regarding how a firm's WCM is determined and the extent to which the efficiency in WCM and the interaction between working capital components can help to improve corporate profitability. In addition, the research design in this doctorate was carefully developed to fulfill conspicuous gaps in the prior research literature. The analyses conducted contribute several new and substantive findings on the research topic.

Chapter 1 - *Introduction* outlines the motivations for the study, highlights the research questions, and conducts a brief review of the key literature that contextualises the research and helps to shape the research framework and objectives. Chapter 2 – *Overview of Working Capital Management* lays out the basic understanding and definition of WCM that is used in the subsequent analyses. The benefits and drawbacks of different WCM policies, and measurements of WCM are also reviewed. Chapters 3, 4 and 5 are the empirical chapters in which several hypotheses were developed. In particular, Chapters 3 and 4 focus on the determinants of WCM. Chapter 3 – *The Determinants of Working Capital Management* examines whether a firm's WCM is determined by firm characteristics and country setting. Chapter 4 – *Legal and Cultural*

*Influences on Working Capital Management* further investigates how particular country-level variables (i.e., legal environment and culture) can influence variations in WCM across countries. Finally, Chapter 5 – *The Effects of Working Capital Management on Corporate Profitability* focuses on the consequences of WCM by examining the effects of WCM on a firm's profitability.

In this concluding chapter, the main empirical findings are summarised. Key contributions to the accounting and finance literature, particularly the WCM literature, are highlighted. The limitations are also discussed. Finally, possible further developments are outlined.

## 6.2 Summary of Main Findings

The main empirical findings of this research concern the determinants and the consequences of WCM. In short, the results suggest that a firm's WCM is determined by a combination of firm-specific characteristics, country-level variables, and economic condition. The variations in WCM across countries are due to both real differences in WCM (direct country effects) and differences in the effects of firm-specific determinants across countries (indirect country effects). Two particular country-level variables (i.e., legal environment and culture) are found to have direct effects and indirect effects through the use of financial debts on a firm's WCM. The findings provide evidence to explain the reasons behind variations in WCM across countries. Regarding the consequences of WCM, the results are consistent with the notion that higher efficiency in WCM, achieved by means of a reduction in the number of days accounts receivable, inventory and accounts payable, is likely to improve a firm's

operating profit. In addition, a proper "fit" among these three components of working capital will further enhance profitability at both operating profit and net income levels.

To ensure that the research objectives set out at the beginning of this thesis in Chapter 1 Section 1.4 were accomplished, the main findings are summarised in relation to each objective identified as shown in Table 6.1.

## 6.3 Summary of Key Contributions

The research contributes directly to the accounting and finance literature in two important ways: 1) research design; and 2) new empirical findings.

### 6.3.1 Contributions on Research Design

Several aspects of research design in the current study contribute to the prior literature. First and foremost, it is found that biases arise when using traditional OLS and FE models to estimate the effects of WCM on corporate profitability. This is due to endogeneity problems. Therefore, two endogeneity concerns (i.e., simultaneity and unobserved heterogeneity) that have bedeviled prior research and another endogeneity concern (i.e., dynamic endogeneity) that has been highlighted in this paper have been directly addressed using the dynamic panel GMM estimator. The dynamic panel GMM estimate provides more conservative, reliable, and consistent results on the effects of WCM on a firm's profitability.

## Table 6.1: Main Empirical Findings

| Research Objectives | Empirical Chapter | Main Findings |
|---|---|---|
| 1) To examine whether there are (statistically) significant variations in WCM across countries. | Chapter 3 | The variations in WCM exist across European economies with a range of WCR from 0.20 in Portugal to 0.32 in Greece. These variations in WCM are statistically significant at the 5% level. |
| 2) To examine whether the variations in WCM are due to differences in firm characteristics. | Chapter 3 | The variations in WCM documented above are due to differences in firms' external and internal financing, firm size, and levels of investment in fixed assets and profitability. |
| 3) To examine whether the variations in WCM are due to direct country effects and/or indirect country effects (differences in the effects of firm-specific factors across countries). | Chapter 3 | Country setting has significant direct effects on a firm's WCM. There are also indirect country effects that influence the underlying firm-specific characteristics used in this study. This finding helps to explain the prior literature's mixed results on the firm-specific determinants of WCM based on individual country research. |
| 4) To examine the effects of the financial crisis on a firm's WCM | Chapter 3 | The latest global financial crisis starting in 2008 triggered European firms to tighten their WCM. |
| 5) To identify particular country-specific factors that can influence the variations in WCM. | Chapter 4 | There are reasons to believe that a firm's WCM is likely to be influenced by, at least, two particular country-level variables: 1) capital market access as measured by legal environment (built on e.g., La Porta et al. (1997; 1998)) and 2) culture (built on e.g., Schwartz (1994); Chui et al. (2002)). |
| 6) To examine in which ways and to what extent the identified country-specific factors drive the variations in WCM. | Chapter 4 | For a direct effect on a firm's WCM, capital market access as measured by legal environment has a significant impact on a firm's WCM. In particular, firms in countries with smaller capital market access or poorer legal environment report higher working capital requirements. However, culture does not have a significant impact on a firm's WCM.<br><br>For an indirect effect on a firm's WCM, both legal environment and culture have a significant impact on a firm's WCM. In particular, countries with poorer legal environments have a higher marginal propensity to invest in working capital from an increase in short-term financial debt more than countries with better legal environment. Countries with high conservatism and mastery cultural values are less likely to opt for both short-term and long-term debt to finance their working capital. |

## Table 6.1: Main Empirical Findings (Continued)

| Research Objectives | Empirical Chapter | Main Findings |
|---|---|---|
| 7) To examine the effects of WCM on corporate profitability, controlling for all of the potential endogeneity concerns. | Chapter 5 | Accounts receivable (AR), inventory (INV), and accounts payable (AP) periods show a significant and negative relationship with a firm's profitability at operating profit level (as measured by ROA), but not at net income level (as measured by ROE). |
| 8) To examine whether or not a proper "fit" between the components of working capital further enhances corporate profitability. | Chapter 5 | Three-way interaction between AR, INV and AP shows a significant impact on a firm's profitability. To improve operating profit, firms should ensure that AP is optimised while applying maturity matching approach (i.e., shorter AR and INV should be matched with a shorter AP). In contrast, to improve net income, firms should make the most of their credit term received, or renegotiate a longer credit term from suppliers in order to rely less on more expensive sources of finance such as bank borrowings. |
| 9) To explore a mechanism of how WCM can affect corporate profitability, in particular through profit margin, asset productivity or equity multiplier, or altogether. | Chapter 5 | Higher efficiency in AR, INV and AP takes effect through profit margin and asset productivity giving a multiplicative boost to ROA. |
| 10) To examine the effects of the financial crisis on the relationship between WCM and corporate profitability. | Chapter 5 | Higher efficiency in WCM, especially inventory management, is of greater significance during the economic downturn. |

Second, a more extensive and contemporary data set than those employed in previous research has been used. This allows several analyses to be conducted. As a result, a number of new empirical findings are documented. For instance, the timeframe of Chapters 3 and 4 covers 2000 – 2011 and that of Chapter 5 covers 1993 – 2011. This includes the period of the recent global financial crisis (2008-2011) and provides the paper the opportunity to investigate the effects of economic condition (financial crisis) on firms' WCM and on the relationship between WCM on corporate profitability. In addition, by employing cross-country data set, this provides the opportunity to examine whether or not the country setting and other country-level variables play a role in determining corporate WCM.

### 6.3.2 Contributions on Empirical Findings

The new empirical findings documented in the current study supplement existing knowledge at different levels: 1) the determinants of WCM; 2) the legal and culture influences on capital structure; 3) the effects of WCM on corporate profitability; and 4) the maturity matching theory.

#### (a) The Determinants of WCM

The results contribute to the literature on the determinants of WCM in several ways. First, it is found that a firm's WCM is influenced not only by internal factors as captured by a number of firm characteristics used in the prior literature (e.g., Chiou et al., 2006; Nazir and Afza, 2009; Hill et al., 2010; Wasiuzzaman and Arumugam, 2013), but also by external factors such as country setting, legal environment and culture. These results also provide a practical contribution (i.e., when conducting and

using international benchmarking exercises in evaluating a firm's financial wellbeing, differences in country-specific factors should be acknowledged).

Second, the results provide original evidence that country setting has both a direct effect on a firm's WCM and an indirect effect through firm-specific determinants of WCM. As a consequence, the current study also helps to explain the prior literature's mixed findings on the determinants of WCM based on individual country research. For example, a strong and negative relationship is found between long-term debt and WCM in Taiwan (Chiou et al., 2006) and Malaysia (Wasiuzzaman and Arumugam, 2013), but not in USA (Hill et al., 2010). These mixed findings might be simply due to the effects of country-level variables on the relationship between long-term debt and WCM.

Finally, apart from firm characteristics and country setting, the result suggests that economic condition also plays an important role in shaping a firm's WCM performance. It was likely that the recent financial crisis put pressure on firms to operate with lower levels of working capital as compared with the period prior to the financial crisis. Hence, a comparison of WCM performance over an extending timeframe should take into account how economic condition has evolved. Moreover, as the financial crisis may have affected different countries at different degrees, it is necessary for international benchmarking exercises to take this factor into account, especially when they are conducted across different continents and during an economic transition period.

**(b) The Legal and Culture Influences on Capital Structure**

Since no study to date has addressed what particular factors can explain the variations

in WCM across countries, the current study is built upon the prior literature that focuses on international capital structure (e.g., Chui et al., 2002; Bancel and Mittoo, 2004; De Jong et al, 2008) and ability of firms across countries to raise external finance through debt and equity (e.g., La Porta et al., 1997, 1998). Thus, the research contributes to this particular stream of the literature in two important ways. First, added to the findings in prior literature, the paper highlights the relevant and important role of legal environment and culture on a firm's financial management. Second, while the previous studies examine the influences of legal environment and culture on the use of external finance, the current research pursues the consequences of this relationship at a greater length. In particular, this research investigates how country legal system and culture can influence a firm's need and choice of finance of WCM. Consistent with La Porta et al. (1997), civil law countries, especially French civil law countries, are likely to have narrower and less developed capital markets, as compared with common law countries. As a consequence of limited capital market access, each additional Euro of short-term debt obtained is more intensively used by firms in civil law countries to meet working capital requirements. In addition, consistent with Chui et al. (2002), countries with high conservatism and mastery cultural values are likely to have lower debt ratio. As a result, firms in these countries are less likely to finance their working capital with debt but more likely to use operating cash flow.

**(c) The Effects of WCM on Corporate Profitability**

The research also makes novel contributions to the existing literature on the effects of WCM on corporate profitability in several ways.

First of all, in contrast with the findings in many previous studies (e.g., Jose et al., 1996; Shin and Soenen, 1998; Wang, 2002; Garcia-Teruel and Martinez-Solano, 2007) that may have biases due to potential endogeneity problems, the research shows that a comprehensive measure of WCM (i.e., CCC) does not represent a useful surrogate for the effects of WCM on corporate profitability. Instead, an examination of the individual components of CCC (i.e., AR, INV, and AP) gives more pronounced and valid results. The main practical implication that can be inferred from this result is that pursuing relatively aggressive current assets policies simultaneously with conservative trade financing policies, firms will generate an increase in operating profit.

Second, it adds to the extant literature that WCM can affect corporate profitability in two distinct ways: effectively managing individual components of working capital; and ensuring an appropriate "fit" between the components of working capital. As documented earlier, a reduction in accounts receivable, inventory and accounts payable periods is associated with an increase in operating profit. A proper matching among these components is identified as having an association with both operating profit (through operating cost reduction) and net income (through less reliance on external finance). Therefore, from a practical perspective, firms should ensure synchronisation and integrated collaboration among different departments (e.g., credit control and cash collection, procurement and warehousing) in order to enhance profitability even further and at different levels.

Finally, as little is known about the mechanisms relating to how WCM affects corporate profitability, the analysis provides the original evidence that a higher

efficiency in WCM take effects through both profit margin and asset productivity enhancements. The result emphasises even greater importance of WCM that not only does WCM affect different levels of profitability but it also affects different components of profit return.

**(d) Maturity Matching Theory**

This research also contributes to the maturity matching theory as mentioned in (e.g., Van Horne, 1998) and applied in (e.g., Petersen and Rajan, 1997; Deloof and Jegers, 1999; Atanasova, 2007). Although the prior literature has provided evidence of the use of trade credit and demand for funding that are consistent with the maturity matching theory, no research to date has investigated, in depth, the consequence of the adoption of maturity matching theory. The results contribute to the extant literature that the management of the working capital components consistent with the maturity matching approach will improve profitability at both operating profit and net income levels. On the one hand, a matching of shorter accounts receivable and inventory periods with a shorter accounts payable period will reduce operating costs and, therefore, improve operating profit. On the other hand, a matching between longer accounts receivable and inventory periods with a longer accounts payable period will reduce external borrowing costs and, therefore, improve net income.

## 6.4 Limitations

This thesis is subject to some limitations that need to be acknowledged to avoid biased interpretations of the results. The most important aspects that readers should take into consideration are highlighted as follows:

In Chapters 3 and 4, the data set consisted of listed firms in manufacturing industries (2-digit SIC codes 20-39) in 15 pan-European countries, provided by Thomson One Banker from 2000 to 2011. In Chapter 5, the data set consisted of US listed firms, except for firms operating utility sectors (SIC code 4900-4999) and financial sectors (SIC code 6000-6999), provided by Compustat Fundamentals Annual from 1993 to 2011. As such, all analyses and conclusions should be confined to this specific data set for the time window addressed.

Another limitation of the research is that when examining which country-level variables have an influence on a firm's WCM in Chapter 4, only two country-level variables (i.e., legal environment and culture) are identified based on the related literature. However, the inclusion of these two country-level variables together with firm-specific determinants can explain only approximately 30% of variations in WCM across pan-European countries. Consequently, it is possible that there are other country-level factors to be determined. The conclusion of the analyses undertaken does not provide all of the country-level variables that can influence the variations in WCM across countries.

In addition, legal environment and culture of firms are determined by a country where their shares are listed not a country where their main operations are located. It is possible that main operation clusters of firms are outside a country where their shares are listed. Thus, it can be argued that it is more appropriate to determine legal environment and culture using a country of main operation. However, since the data relating to a company's main operation is difficult to identify, especially for

multinational companies, and also not made available on the databases used, the results were not tested using legal environment and culture identified by a country of main operation to ensure the consistency and robustness of main results.

A final limitation should be noted in respect of the methodology used in Chapter 5. Although the current research contributes to the literature by providing economic justification for the use of dynamic panel GMM estimation and discussing the conditions under which it improves inference beyond OLS and traditional FE estimation, it should be noted that the dynamic panel GMM estimator does not solve all endogeneity problems and has its limitations as pointed out in Chapter 5.

### 6.5 Further Work

There are a number of research opportunities that can be explored further to enhance the overall understanding of the determinants and effects of WCM.

First, the research on the determinants of WCM was conducted based on 15 pan-European countries. Comparing the findings with those of the prior literature, it is found that, for instance, the insignificance of the relationship between long-term debt and WCM in the European context is in contrast with a strong and negative relationship found based on emerging markets such as Taiwan in Chiou et al. (2006), Pakistan in Nazir and Afza (2009) and Malaysia in Wasiuzzaman and Arumugam (2013). In addition, based on pan-European countries, the result indicates that the latest financial crisis has played an important role in shaping companies' WCM performance. However, KPMG (2010, p.6) reports that "companies around the world are placing

more emphasis on cash and working capital as they tackle the ongoing credit crunch while positioning themselves for an expected upturn in the global economy. The situation in China, however, has been somewhat different, where an abundance of liquidity would seem to have caused working capital levels to rise substantially over the last 12 months". Accordingly, it is possible that the determinants of WCM are likely to vary between developed and developing economies. As a result, there is an opportunity for future research to investigate the determinants of WCM on a larger scale to cover countries from developed, developing and underdeveloped economies across continents.

Second, the determinants of WCM, including both firm- and country-specific factors focused on in this study account for under 30% of the differences in WCM. There are other factors to be determined in order to improve the empirical model of determinants of WCM across countries. In particular, firm-specific factors used in the current research (e.g., firm size, growth opportunities, leverage, operating cash flow, and profitability) focus on quantitative factors and are derived from a company's financial statements. Qualitative firm-specific factors (e.g., WCM best practices, management styles and perceptions, and board characteristics) which can be collected through questionnaires and interviews should also be taken into consideration. In addition, other country-specific variables which can be further researched may include a country's financial system, financial development, and corporate governance mechanisms.

Finally, further work could be performed within a timeframe reflecting the period of the economic recovery (from 2010 onwards). Since the economic recovery has arrived, many practitioners' reports indicate that a number of companies are unable to sustain the improvements in WCM during the upturn (e.g., KPMG, 2011; Crump, 2012; Banham, 2013). Also, a degree of WCM deterioration varies as African and European companies are likely to sustain their working capital relatively better than American and Asian companies. Extending the time window from that of the current research will provide an opportunity to investigate the determinants that drive deterioration in WCM performance, especially during the period after the Great Recession, and the speed of adjustment of this deterioration. Baños-Caballero et al. (2014) indicate that as a greater working capital needs to be financed whereas a lower working capital could be detrimental to sales, the speed of working capital adjustment may be related to a firm's access to external finance and its market (bargaining) power. In addition, Banham (2013) reports that WCM deterioration seems to be more apparent in cyclical industries as their stocks are highly correlated to the economy. Apart from firm-specific determinants that may explain the degree in which WCM is deteriorated, the future research could also focus on country-level determinants such as institutional and financial environments and GDP growth as they have an impact on the access and costs of external finance as well. This potential research opportunity will help to enhance the understanding in relation to the factors that trigger a deterioration of WCM upon the economic upturn.

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# APPENDICES

## APPENDIX A: 2-digit SIC (Standard Industry Classification) Codes

| Code | Industry | Code | Industry |
|---|---|---|---|
| | **A. Agriculture, Forestry, & Fishing** | | **F. Wholesale Trade** |
| 1 | Agricultural Production - Crops | 50 | Wholesale Trade - Durable Goods |
| 2 | Agricultural Production - Livestock | 51 | Wholesale Trade - Nondurable Goods |
| 7 | Agricultural Services | | **G. Retail Trade** |
| 8 | Forestry | 52 | Building Materials & Gardening Supplies |
| 9 | Fishing, Hunting, & Trapping | 53 | General Merchandise Stores |
| | **B. Mining** | 54 | Food Stores |
| 10 | Metal, Mining | 55 | Automotive Dealers & Service Stations |
| 12 | Coal Mining | 56 | Apparel & Accessory Stores |
| 13 | Oil & Gas Extraction | 57 | Furniture & Home furnishings Stores |
| 14 | Non-metallic Minerals, Except Fuels | 58 | Eating & Drinking Places |
| | **C. Construction** | 59 | Miscellaneous Retail |
| 15 | General Building Contractors | | **H. Finance, Insurance, & Real Estate** |
| 16 | Heavy Construction, Except Building | 60 | Depository Institutions |
| 17 | Special Trade Contractors | 61 | Non-depository Institutions |
| | **D. Manufacturing** | 62 | Security & Commodity Brokers |
| 20 | Food & Kindred Products | 63 | Insurance Carriers |
| 21 | Tobacco Products | 64 | Insurance Agents, Brokers, & Service |
| 22 | Textile Mill Products | 65 | Real Estate |
| 23 | Apparel & Other Textile Products | 67 | Holding & Other Investment Offices |
| 24 | Lumber & Wood Products | | **I. Services** |
| 25 | Furniture & Fixtures | 70 | Hotels & Other Lodging Places |
| 26 | Paper & Allied Products | 72 | Personal Services |
| 27 | Printing & Publishing | 73 | Business Services |
| 28 | Chemical & Allied Products | 75 | Auto Repair, Services, & Parking |
| 29 | Petroleum & Coal Products | 76 | Miscellaneous Repair Services |
| 30 | Rubber & Miscellaneous Plastics Products | 78 | Motion Pictures |
| 31 | Leather & Leather Products | 79 | Amusement & Recreation Services |
| 32 | Stone, Clay, & Glass Products | 80 | Health Services |
| 33 | Primary Metal Industries | 81 | Legal Services |
| 34 | Fabricated Metal Products | 82 | Educational Services |
| 35 | Industrial Machinery & Equipment | 83 | Social Services |
| 36 | Electronic & Other Electric Equipment | 84 | Museums, Botanical, Zoological Gardens |
| 37 | Transportation Equipment | 86 | Membership Organizations |
| 38 | Instruments & Related Products | 87 | Engineering & Management Services |
| 39 | Miscellaneous Manufacturing Industries | 88 | Private Households |
| | **E. Transportation & Public Utilities** | 89 | Services, Not Elsewhere Classified |
| 40 | Railroad Transportation | | **J. Public Administration** |
| 41 | Local & Interurban Passenger Transit | 91 | Executive, Legislative, & General |
| 42 | Trucking & Warehousing | 92 | Justice, Public Order, & Safety |
| 43 | U.S. Postal Service | 93 | Finance, Taxation, & Monetary Policy |
| 44 | Water Transportation | 94 | Administration of Human Resources |
| 45 | Transportation by Air | 95 | Environmental Quality & Housing |
| 46 | Pipelines, Except Natural Gas | 96 | Administration of Economic Programs |
| 47 | Transportation Services | 97 | National Security & International Affairs |
| 48 | Communications | 98 | Zoological Gardens |
| 49 | Electric, Gas, & Sanitary Services | | **K. Non-classifiable Establishments** |
| | | 99 | Non-Classifiable Establishments |

Source: https://onece.ncsu.edu/mckimmon/divisionUnits/ceus/sicCodePickList.jsp

## APPENDIX B: Structure of the Unbalanced Panel Data Set in Chapters 3 and 4

| | No. of Observations | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | Total | % of Sample |
| UK | 56 | 57 | 59 | 62 | 63 | 67 | 74 | 76 | 80 | 80 | 80 | 78 | 832 | 7.69% |
| Belgium | 21 | 27 | 26 | 30 | 31 | 32 | 33 | 33 | 37 | 36 | 36 | 35 | 377 | 3.48% |
| France | 111 | 160 | 162 | 178 | 176 | 179 | 185 | 197 | 200 | 201 | 200 | 197 | 2,146 | 19.84% |
| Greece | 34 | 46 | 53 | 78 | 77 | 83 | 94 | 97 | 98 | 98 | 95 | 93 | 946 | 8.74% |
| Italy | 40 | 53 | 60 | 65 | 65 | 65 | 72 | 78 | 82 | 82 | 82 | 80 | 824 | 7.62% |
| Netherlands | 20 | 22 | 23 | 23 | 23 | 26 | 25 | 25 | 25 | 25 | 24 | 24 | 285 | 2.63% |
| Spain | 26 | 27 | 29 | 29 | 29 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 350 | 3.24% |
| Portugal | 6 | 8 | 9 | 9 | 9 | 9 | 9 | 10 | 10 | 10 | 10 | 9 | 108 | 1.00% |
| Austria | 14 | 15 | 18 | 18 | 18 | 19 | 19 | 17 | 19 | 20 | 19 | 18 | 214 | 1.98% |
| Germany | 119 | 145 | 153 | 191 | 199 | 198 | 199 | 192 | 191 | 185 | 184 | 181 | 2,137 | 19.75% |
| Switzerland | 58 | 71 | 76 | 77 | 77 | 77 | 78 | 80 | 80 | 80 | 79 | 77 | 910 | 8.41% |
| Denmark | 30 | 31 | 32 | 32 | 34 | 34 | 35 | 35 | 35 | 36 | 37 | 38 | 409 | 3.78% |
| Finland | 24 | 29 | 30 | 33 | 34 | 33 | 35 | 35 | 37 | 37 | 38 | 38 | 403 | 3.73% |
| Norway | 9 | 11 | 15 | 16 | 18 | 22 | 26 | 27 | 27 | 30 | 29 | 31 | 261 | 2.41% |
| Sweden | 23 | 30 | 33 | 48 | 57 | 59 | 60 | 60 | 60 | 62 | 61 | 63 | 616 | 5.69% |
| Total | 591 | 732 | 778 | 889 | 910 | 933 | 974 | 992 | 1,011 | 1,012 | 1,004 | 992 | 10,818 | 100.00% |
| % of Sample | 5.46% | 6.77% | 7.19% | 8.22% | 8.41% | 8.62% | 9.00% | 9.17% | 9.35% | 9.35% | 9.28% | 9.17% | 100.00% | |

*Notes:* An initial data set consists of listed firms in 16 pan-European countries collected from Thomson One Banker database. Three restrictions were imposed. First, to mitigate the effects of different industry compositions across countries, this study focuses on manufacturing industries (2-digit SIC code 20-39). Second, firms with missing data and negative values in their assets were excluded from the sample. Finally, the firm-level ratios were winsorised at 1% and 99% to moderate the influence of extreme values. As a result of these filters, the final unbalanced panel data set consisted of 10,818 firm-year observations from 15 countries over the 12-year period from 2000 to 2011.

## APPENDIX C: Structure of the Unbalanced Panel Data Set in Chapter 5

| Year | No. of Observations | % of the Sample |
|---|---|---|
| 1993 | 5381 | 5.15% |
| 1994 | 5576 | 5.34% |
| 1995 | 5832 | 5.58% |
| 1996 | 6599 | 6.32% |
| 1997 | 6,704 | 6.42% |
| 1998 | 6,432 | 6.16% |
| 1999 | 6,654 | 6.37% |
| 2000 | 6,493 | 6.22% |
| 2001 | 6,156 | 5.89% |
| 2002 | 5,745 | 5.50% |
| 2003 | 5,481 | 5.25% |
| 2004 | 5,353 | 5.12% |
| 2005 | 5,154 | 4.93% |
| 2006 | 4,961 | 4.75% |
| 2007 | 4,701 | 4.50% |
| 2008 | 4,456 | 4.27% |
| 2009 | 4,402 | 4.21% |
| 2010 | 4,278 | 4.09% |
| 2011 | 4,111 | 3.94% |
| Total | 104,469 | 100.00% |

*Notes:* An unbalanced panel data set of US SIC-classifiable listed companies was collected from Compustat Fundamental Annual database. Three restrictions were imposed. First, firms operating in utility sectors (SIC code 4900-4999) and financial sectors (SIC code 6000-6999) were excluded. Second, firms with anomalies in their accounts such as negative values in their assets, sales and costs of sales were excluded from the sample. Finally, the firm-level ratios were winsorised at 1% to moderate the influence of extreme values. As a result of these filters, the final unbalanced panel data set consisted of 104,469 firm-year observations over the 19-year period from 1993 to 2011.