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Working Capital Management and Profitability of Wine Firms in France: An Empirical Analysis

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Abstract
This study investigates the impact of working capital management (WCM) on firm profitability in the French wine industry. Based on annual data of 430 wine-producing firms from 2003 to 2014, we estimated the impact of the cash conversion cycle (CCC) and its components (days inventory, receivable and payable) on the return on assets. Other firm factors, such as size, growth, tangibility and leverage, were used for control. We took into account nonlinearity, unobservable heterogeneity, heteroscedasticity and endogeneity through the two-step GMM estimation method and showed that WCM did not have a significant impact on the profitability of French wine firms. Furthermore, we found no optimal level of CCC that would allow the firms to maximize their profitability. Only days account receivable and payable significantly and negatively impacted profitability. These results differ from those of previous studies and suggest that French wine firms should shorten the time both to collect cash from sales and pay providers. Contrarily to what we believe, the delay in converting inventories to cash does not significantly impact profitability. The managerial implications of these results were further explored by interviewing three wine firms in the south of France.

JEL classification: G32
Keywords: French vineyards, working capital management, profitability

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1. Introduction

Working capital refers to the difference between a firm's current assets, such as inventory and accounts receivable, and its current liabilities, such as accounts payable. For each, the term "current" implies a life span of less than one year. Thus, working capital reflects the notion that the cash that will become available within the next 12 months exceeds the cash that must be paid within the same period. In other words, working capital meets a firm's short-term financial requirements. Working capital management (WCM) is a day-to-day activity that ensures that a firm has sufficient resources to continue its operations and avoid costly interruptions. According to Padachi (2006), working capital is the lifeblood of any firm, and it is one of the drivers of value creation. The objective of WCM is to maintain an optimal balance between inventories, receivables and payables. This involves a trade-off between risk and profitability (Smith, 1980; Tauingana and Afrifa, 2013) and results in decisions about the amount and composition of current assets and how to finance them.

The academic literature on this topic is huge, although most of these studies are empirical with qualitative studies being quite sparse (e.g., Maxwell et al., 1998; Ooghe, 1998; Singh and Prasad, 2007). The data cover a large number of countries and industries (such as food retailing, health care, construction, services, manufacturing industries, financial services, etc.). Our study contributes to this literature with an investigation of the wine industry, as we have been unable to find previous studies on WCM in the wine sector. Yet in our opinion, WCM is crucial for this sector because of the potentially high value of inventories and receivables, as has been noted by professional services and journals like *Park Street* and *Les Echos*. This situation can be attributed to the wine production process itself (long period for vinification) and customer payment delays (according to the wine firms that we interviewed). We chose to study the case of France because it is the biggest wine producer in the world in terms of production surface and was the second overall biggest wine producer in 2015, behind Italy (see Decanter for more information). France is composed of 50 wine regions[1] and 16 vineyards.[2] Furthermore, the French wine sector is mostly made up of SMEs (family and artisanal firms). WCM is thus crucial since these small structures are often fragile and indebted (more details in Section 3). Moreover, wine firms are far more accustomed to producing wines than to managing their working capital.

[1] For further details, see Aytaç et al. (2014), p.27.
[2] By alphabetical order: Alsace, Bordeaux, Beaujolais, Burgundy, Bugey, Champagne, Corsica, Jura, Languedoc, Lorraine, Loire, Provence, Roussillon, Rhone, Savoie, South-West.

To investigate WCM in the French wine industry, we examined the annual accounting data of 430 firms from 2003 to 2014 provided by Bureau van Dijk. To assess the impact of WCM on firm profitability, we used the model proposed by Banõs-Caballero et al. (2012) because it takes nonlinearity into account. We also used the GMM estimation method to control for unobservable heterogeneity and possible endogeneity. WCM was measured by the cash conversion cycle (CCC), as has been done in numerous studies (e.g., Baňos-Caballero et al., 2012; Deloof, 2003; Tauringana and Afrifa, 2013). This measure is robust because the three elements composing working capital are clearly distinguished (more details in Section 2). Profitability was measured by the return on assets (ROA), and other firm factors were also used for control (size, growth, leverage and tangibility). Our results showed that WCM had no significant impact on the profitability for our sampled firms. Furthermore, there was no optimal value of CCC. Last, only accounts receivable and payable had significant and negative impacts on profitability. The managerial implications of these findings were further explored by interviewing three wine firms in the south of France.

The rest of the paper is organized as follows. Section 2 presents the literature review on the relationship between WCM and firm profitability. Section 3 focuses on the data sample and methodology. Section 4 discusses the empirical results while Section 5 concludes the paper.

2. Literature review

The first subsection describes the different ways to measure WCM and the second presents our review of the previous studies on WCM.

2.1. Working capital management (WCM) measures

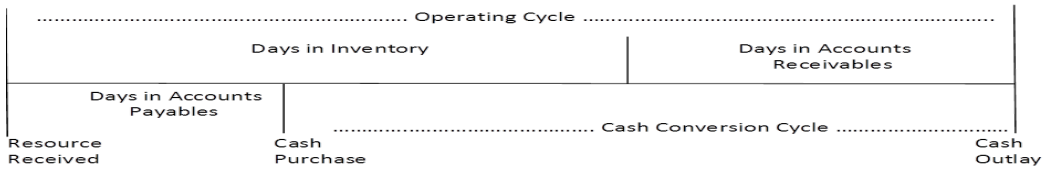
There are different ways to measure corporate liquidity, with traditional ratio analysis being the most conventional. This refers to the current ratio[3] and the quick ratio (or acid-test ratio),[4] and these measures reflect a firm's ability to pay off its short-term liabilities by its current assets. Thus, high current and quick ratios indicate good liquidity positions. However, they are not meaningful indicators from a cash-flow standpoint since both are static and their adequacy to assess the efficiency of WCM has been questioned by many authors (Aziz-Lawson, 1990; Emery, 1984; Kamath, 1989; Largay-Stickney, 1980; Richards and Laughlin,

[3] Current ratio = Total current assets / Total current liabilities.
[4] Quick ratio = (Total current assets – Inventory) / Total current liabilities.

1980). Therefore, alternative WCM concepts,[5] called dynamic measures, have been developed in an effort to improve the conventional ratios.

Introduced by Gitman (1974) as a crucial element in WCM and refined by Gitman and Sachdeva (1982), the CCC approach is the most recommended and has been widely used in empirical studies (Baños-Caballero et al., 2010, 2012; Deloof, 2003; Garcia-Teruel and Martinez-Solano, 2004; Soenen, 1993; Tauringana and Afrifa, 2013). The CCC measures the time lag between the expenditure for purchasing raw materials and the collection of sales of finished goods. Wasiuzzaman (2015) noted that, in practice, cash inflows and outflows of short-term activities are uncertain and unsynchronized, and the CCC is able to capture this non-synchronization. The CCC is a dynamic measure since it includes the time dimension by combining both balance sheet and income statement data.

Figure 1: The Cash Conversion Cycle (CCC)



Source: Jose et al. (1996), p.34

As illustrated in Figure 1, the CCC is estimated as follows:

CCC = Days accounts receivable outstanding (DSO) + Days inventory outstanding (DIO) – Days accounts payable outstanding (DPO)

With:

DSO = Accounts Receivable*365/Sales

DIO = Inventory*365/Cost of goods Sold

DPO = Accounts Payable*365/Purchases

In sum, the CCC[6] indicates the number of days it takes for a company to convert inputs into cash flows. In other words, it determines the degree to which a firm must rely on external financing (Soenen, 1993). A short CCC indicates that the firm is receiving cash quickly while

[5] Apart from the three main measures that we present below, there are also two other dynamic measures: the comprehensive liquidity index and the net liquid balance. The comprehensive liquidity index (CLI) was developed by Melnyk and Birati (1974) as a liquidity-weighted version of the current ratio. It is calculated by dividing the adjusted total current assets by the adjusted current liabilities, where each current asset and liability is weighted based on its nearness to cash. For further details, see Scherr (1989). The net liquid balance (NLB), applied by Shulman and Dambolena (1986), corresponds to the sum of cash and marketable securities minus all liquid financial obligations including payables and the current portion of long-term debt. For further details, see Kamath (1989). While a negative NLB indicates dependence on short-term external funding, its positive value indicates the true liquid surplus of a firm.

[6] Cost of sales = Purchases of goods + Variations in inventories (beginning of the year – end of the year) + Consumptions of the year. In French, we have: *coût des produits vendus = Achats de marchandises + Variation de stocks de marchandises + Consommation de l'exercice*.

paying suppliers later. Thus, the shorter the CCC, the more efficient the firm's internal operations are and the closer the availability of net cash flow is. This indicates a firm with a good liquidity position.

Gentry et al. (1990), however, noted that the CCC does not take into account the amount of funds committed to a product since it focuses only on the length of time that the funds are tied up in the cycle. Thus, they developed the concept of the weighted cash conversion cycle (WCCC), a modified version of the CCC. The WCCC estimates the weighted number of days that funds are tied up in receivables and inventories less the weighted number of days cash payments to suppliers are deferred (payables). The weight is determined by dividing the amount of cash tied up in each component by the final value of the product. Thus, the WCCC combines the timing and the amount of funds used in a cycle. Although Gentry et al. (1990) concluded that the WCCC focuses on the real resources used for the total working capital process and thereby provides a deeper appreciation of the complexities of the CCC, Lyroudi and Lazaridis (2000) pointed out that the concepts of WCCC and CCC are not directly comparable. The WCCC is highly sensitive to the size of payables and thus the CCC is a more robust liquidity measure.

Another alternative WCM measure is the net trade cycle (NTC), used initially by Soenen (1993) and Shin and Soenen (1998). This measure is quite similar to the CCC and measures the liquidity on a flow basis. However, it is less precise since the three elements of working capital are compared with the same denominator, which is sales, as follows:

$$NTC = (Inventory + Accounts\ Receivable - Accounts\ Payable)*365/Sales$$

Similar to the CCC, the shorter the NTC is, the higher the present value of the net cash flow generated by the assets. Also, a shorter NTC indicates more efficient WCM and thus the firm should have a lower need for external financing. As noted above, the NTC is less robust than the CCC because only sales are used for comparison with the three components of working capital. Indeed, the CCC compares each component with its related cash cycle (accounts receivable with sales, inventory with cost of goods sold, and payables with purchases). For this reason, we chose to use this measure in our study, as have numerous other studies (mentioned above).

The next subsection will detail the literature review on WCM.

2.2. Working capital management (WCM) and firm profitability

WCM is a significant research area in financial management. While some research has focused on the factors affecting WCM, most have examined the connection between WCM

and firm performance in various markets. Our literature review is therefore organized as follows. We first summarize the factors affecting WCM and then present the two approaches to WCM: aggressive and conservative. The question of an optimal level of working capital will be addressed in the last subsection.

A. Factors affecting WCM

The factors affecting WCM can be external or internal. The external factors can be at the macro-level or the micro-level. While macro-level factors affect all firms regardless of industry, micro-level factors affect firms within a specific industry. According to previous studies, the external factors include: the availability of attractive financing, government regulations, economic conditions, competition, and environmental factors. Internal factors are firm-specific and include managerial skills, workforce, organizational behavior, investment policy, financial management practices, and so on. Table 1 summarizes the external and internal factors that have been investigated in previous studies.

Table 1: External and internal factors affecting WCM, a review

External factors	Authors (year)
External macro-factors	
Politics	Carey (1949)
Business and economic environment	Ben-Horim and Levy (1983)
Between-industry effects	Hawawini et al. (1986)
Legislation	Peel et al. (2000)
External micro-factors	
Financing methods	Cocheo (2004)
Competitor effects	Filbeck and Krueger (2005)
Collaboration in supply chains	Wadhwa et al. (2006)
Internal factors	
Management system/method/practice	Deloof (2003), Johnson and Soenen (2003), Garica-Teruel and Martinez-Solano (2007), Narender et al. (2008), Kieschnick et al. (2013)
Organizational behavior	Loeser (1988)
Credit policy	Ooghe (1998)
Investment policy	Akhtar (2014)
Management financial capability	Abdul Rahman and Mohamed Ali (2006)
Supply chain management	Rafuse (1996), Sehgal et al. (2006)
Inventory management	Yang et al. (2005)

B. WCM and firm profitability

The findings on the relationship between WCM and firm profitability[7] have been mixed and have therefore inspired debate on whether high or low levels of working capital are better for firms. The studies used various methodologies and measures and the result has been the

[7] More details on firm profitability measures are in Section 3.

emergence of two competing views of the WCM impact on firm performance[8]: aggressive and conservative.

When a firm has more current liabilities than current assets, its working capital is negative. In other words, its short-term payables are higher than its short-term receivables. The excess of current liabilities might have been used to fulfill its financial commitments and obligations to shareholders and the firm does not have enough capital to finance its short-term debts. On the other hand, the disadvantages should be considered when a high level of capital is tied up in current assets (inventories+receivables) that are not generating additional value for the firm. More precisely, if the liquidity implications of working capital are misevaluated, creditors and investors may be subject to an unanticipated default risk. When a firm adopts inadequate WCM, allocating more than enough working capital reduces the benefits of short-term investments. However, if the working capital is too low, the firm may miss profitable opportunities or may have short-term liquidity crises.

B.1. Aggressive WCM, a review

According to the aggressive approach, a reduction in working capital will increase firm profitability by reducing investments in inventory and A/R while increasing A/P. This leads to a negative relationship between WCM and firm performance. In other words, a shorter CCC will improve profitability. According to Hager (1976), firms with shorter CCCs usually have better operating performance. Shin and Soenen (1998) found a negative relationship for listed American firms for the 1975-1994 period. Jose et al. (1996), in their study covering 2,718 firms worldwide from 1974 to 1993, also highlighted that CCC and profitability are negatively related. Deloof (2003) confirmed this negative relationship for 1,009 Belgian nonfinancial firms over the 1992-1996 period. Numerous other studies have reported similar results, as shown in Table 2.

Table 2: Aggressive working capital management, a review

Authors (year)	Sample firms, period, WCM measures
Wang (2002)	1,555 Japanese and 379 Taiwanese firms from all sectors, 1985-1996, CCC
Eljelly (2004)	929 joint stock companies in Saudi Arabia, 1996-2000, current ratio and CCC
Lazaridis and Tryfonidis (2006)	131 Greek firms listed on the Athens Stock Exchange, 2001-2004, CCC

[8] Modigliani and Miller (1958) stipulated that in perfect markets, investment decisions are independent from financing decisions. However, in practice, firms do not operate in a perfect market and thus financial decisions have impacts on profitability. In this context, low or high levels of working capital have associated costs or benefits for firms.

Garcia-Teruel and Martinez-Solano (2007)	8,872 Spanish SMEs, 1996-2002, CCC
Raheman and Nasr (2007)	94 Pakistani firms listed on the Karachi Stock Exchange from different sectors (except financial sector, banking and finance, insurance, leasing, *modarabas*,[9] business services, renting and other services), 1999-2004, CCC
Uyar (2009)	166 Turkish firms listed on the BIST (Borsa Istanbul), 2007-2009, CCC
Chatterjee (2010)	30 UK firms listed on the London Stock Exchange, 2006-2008, CCC
Zariyawati et al. (2010)	148 Malaysian firms listed on the Bursa Malaysia Stock Exchange (a panel set of 1,628 firm-year observations for 6 economic sectors: construction, consumer product, industrial product, plantation, property and trade/service), 1996-2006, CCC
Saghir et al. (2011)	60 Pakistani textile firms listed on the Karachi Stock Exchange, 2001-2006, CCC
Mansoori and Muhammad (2012)	92 Singapore firms listed on the Singapore Stock Market Exchange (a panel data set of 736 firm-year observations for 5 economic sectors: electronic, construction and material, technology hardware, industrial engineering and food producers), 2004-2011, CCC
Ogundipe at al. (2012)	54 Nigerian firms listed on the Nigerian Stock Exchange from all sectors (except the financial sector), 1995-2009
Vural et al. (2012)	75 Turkish manufacturing firms listed on the BIST, 2002-2009, CCC
Majeed et al. (2013)	32 Pakistani firms from 3 manufacturing sectors: chemical, automobiles and construction and material , 2006-2010, CCC
Shubita (2013)	39 Industrial Jordanian firms listed on the Amman Stock Exchange, 2004-2011, NTC
Tufail et al. (2013)	117 Pakistani textile firms, 2005-2010, Quick ratio
Wasiuzzaman (2015)	160 Malaysian manufacturing firms (a panel-data set of 960 firm-year observations), 2005-2010, CCC

The next part of the literature review focuses on those studies supporting conservative WCM.

B.2. Conservative WCM, a review

According to the conservative approach, investing heavily in working capital will result in higher profitability. This means increasing inventories and accounts receivable and reducing accounts payable, contrarily to the aggressive approach. The conservative view thus stipulates

[9] *Modaraba* is a form of financial contract in some Muslim countries in which the investor entrusts money to a financial manager. Any profits and losses are shared between them in an agreed upon manner (source: *Wikitionary*).

that WCM is positively related to firm performance. Lyroudi and Lazaridis (2000) supported this method with data from a sample of Greek companies in the food and beverage industry. Chiou et al. (2006) also confirmed the positive relationship between WCM, measured by the NLB,[10] and firm performance in Taiwan between 1996 and 2004. A positive relationship was also noted by Rimo and Panbunyen (2010) for a sample of 40 Swedish large-cap companies. Similar results have been found by other researchers, as shown in Table 3.

Table 3: Conservative working capital management, a review

Authors (year)	Sample firms, period, WCM measures
Gill et al. (2010)	88 American manufacturing firms listed on the New York Stock Exchange, 2005-2007, CCC
Sharma and Kumar (2011)	263 Indian firms listed on the Bombay Stock Exchange (except banking, finance and information technology sectors), 2000-2008, CCC
Ali (2011)	160 Pakistani textile firms, 2000-2005, CCC
Abuzayed (2012)	52 Jordanian nonfinancial firms listed on the Amman Stock Exchange (sectors included: pharmaceutical and medical industries, chemical industries, paper and cardboard industries, printing and packaging, food and beverages, tobacco and cigarettes, mining and extraction industries, engineering and construction, electrical industries, textiles, leather and clothing, glass and ceramic industries), 2000-2008, CCC
Tariq et al. (2013)	Pakistani cement sector firms listed on the Karachi Stock Exchange, 2007-2011, CCC, NTC

The only exception to our knowledge concerns the study of Vishnani and Shah (2007). They found no systematic significant relationship between WCM and firm profitability, but instead observed that the relationship depended on the company and industry. Their sample covered firms in the consumer electronics industry in India from 1997 to 2005. We explore the nature of this relationship in our investigation of the wine industry in France.

To sum up, all of the above-mentioned studies assumed a linear relationship between WCM and profitability, from both aggressive and conservative WCM viewpoints. However, Baños-Caballero et al. (2012) pointed out that the relationship between these variables might be nonlinear. Using panel data of Spanish SMEs from 2002 to 2007, these authors showed a concave relationship between working capital level, measured by the CCC, and firm performance. Baños-Caballero et al. (2014) reached the same conclusion in a sample of UK firms from 2001 to 2007 using the NTC measure for WCM. Afrifa and Padachi (2016) also showed a concave relationship between WCM and profitability in SMEs from the UK from

[10] For a brief explanation of this measure, see footnote 5.

2005 to 2010. We therefore followed the method proposed by Baños-Caballero et al. (2012) to take into account nonlinearity (see Section 3 for more details).

In the extant literature, both low and high levels of WCM have costs and benefits for firms. Low investment in working capital may result in higher profitability because of the expensive nature of external finance in particular. When the requirement in working capital is reduced, the need for financing and the cost of capital decrease. This results in an increase in available cash for shareholders (Ganesan, 2007). On the other hand, a high level of working capital may improve profitability by stimulating sales, preventing production interruptions and enhancing long-term relationships with customers. In this contradictory context, Baños-Caballero et al. (2012, 2014) showed that an optimum level of working capital could be determined. According to the authors, managers prefer to increase the investment in working capital in order to improve sales, and they prefer to receive more discounts from suppliers for early payments. However, beyond a certain level, high investment in working capital could have negative effects in terms of value creation because of the additional interest expenses. An optimal level would thus balance costs and benefits and thereby maximize firm performance. In other words, firm performance will increase up to a certain working capital level. Beyond this level, however, the relationship becomes negative. In this case, the relationship between WCM and profitability is an inverted U-shape. As this can be tested by introducing the square of the WCM measure into the model, we have done so in our study.

The next section presents the data, research hypotheses and methodology.

3. Data, variables, hypotheses and methodology

3.1. Data

Although WCM is important for any firm, it is more important for small and medium-sized enterprises (SMEs) than for larger firms (Peel and Wilson, 1996). Previous studies have shown the importance of financial management to SME survival (Berryman, 1983), and according to Rafuse (1996), poor WCM is the major cause of small business failure in many developing and developed countries. These firms generally have limited access to long-term capital markets and the opportunity cost of financing is usually high (Fazzari and Petersen, 1993; Hugues, 1997; Whited, 1992). As noted by McCosker (2000), SMEs have more WCM problems although these problems can affect firms of any size. Such problems may arise through more owner financing, trade credit and short-term bank loans to finance their investments in A/R, inventory and cash, thereby threatening firm survival and growth.

According to the report from PWC (2015),[11] in 2014 large firms improved their working capital performance whereas SMEs experienced a sharp deterioration,[12] and the gap between working capital in SMEs and large firms widened between 2010 and 2014. In sum, this report pointed out that SMEs are nowadays in a situation of competitive disadvantage because of their dependence on external financing, their inability to generate cash from operations and the costly indebtedness.

In this context, we focused on small firms in the wine sector for our empirical study. To our knowledge, no study has yet investigated the wine sector, although the need for WCM is likely to be high because of the wine production process. As explained in Section 1, we chose the case of France because it is one of the biggest wine producers in the world. To obtain accounting data on wine-producing firms, we used the Bureau van Dijk database for French firms (called Diane). By selecting all firms in the vinification sector (with the French sector code NAF 1102 B), our initial sample was composed of 744 firms. We then cleaned this sample, deleting firms that were not really involved in wine production (i.e., growing and vinifying grapes). For example, we deleted firms that only provide services to wine producers. We then excluded all firms with outlying values (1% and 99% quantiles) for the WCM variables (days accounts receivable, days inventory, and days accounts payable) and the dependent variable (profitability). The objective was to obtain robust empirical results by excluding extreme values. The final data sample was composed of 430 wine firms and covered the period from 2003 to 2014 (3,038 firm-year observations).

As for the variables and methodology, we followed Banõs-Caballero et al. (2012). We first detail the variables and then the methodology in the next two subsections.

3.2. Variables

The variables used by Banõs-Caballero et al. (2012) were CCC, profitability, size, growth, leverage and tangibility. Table 4 summarizes the calculation of each variable. For the CCC measure, we followed Deloof (2003) and used the denominator related to each component of the CCC: sales for accounts receivable, cost of sales for inventory and purchases for accounts payable. We note that these denominators can be sales-only for the three components (e.g., Lind, 2012), or they can be sales, purchases and purchases, respectively (e.g., Banõs-Caballero et al., 2012). The cost of sales is calculated by the purchases plus the variation in inventories (the beginning value minus the ending value). Purchases are the sum of the three

[11] PricewaterhouseCoopers, *Bridging the Gap. 2015 Annual Global Working Capital Survey*.
[12] The ratio of Working Capital/ Net Revenues was 18.5% in 2010 against 20.8% in 2014 for SMEs and 10.6% in 2010 against 10.2% in 2014 for large firms.

elements composing the operating expenses available in the firm income statements: purchases of goods, purchases of raw materials and other goods, and other external purchases and expenses.

Table 4: Variable measures

Variables (*Abbreviation*)	Measures
Days accounts receivable outstanding (*DSO*)	(Accounts receivable * 365) / Sales
Days inventory outstanding (*DIO*)	(Inventory * 365) / Cost of sales
Days accounts payable outstanding (*DPO*)	(Accounts payable * 365) / Purchases
Cash Conversion Cycle (*CCC*)	DSO + DIO – DPO
Profitability (*Profit*)	EBIT/Total asset
Size (*Size*)	Ln(Total asset)
Growth (*Growth*)	Sales (t) / Sales (t-1)
Leverage (*Lev*)	Total debt / Total asset
Tangibility (*Tang*)	Tangible assets / Total asset

To measure the performance of firms, we calculated the ROA. This measure was chosen since it has been widely used in previous studies (e.g., Afrifa and Padachi, 2016; Ali, 2011; Banõs-Caballero et al., 2014; Garcia-Teruel and Martinez-Solano, 2007; Jose et al. 1996; Nazir and Afza, 2009; Padachi, 2006; Rimo and Panbunyen (2010); Samiloglu and Demirgünes, 2008; Shubita, 2013; Soenen, 1993; Tauringana and Afrifa, 2013; Uyar, 2009; Wang, 2002; Wasiuzzaman, 2015). Furthermore, this measure is consistent with the study of WCM because it directly concerns firm operating activities. According to Padachi (2006), ROA is a good measure because it relates firm profitability to the asset base since ROA = Earnings before Interest and Taxes (EBIT) / Total Assets.[13] For the control variables (size, growth, leverage and tangibility), we used the traditional measures, as shown in Table 3. The next subsection details the research hypotheses and the methodology used to test them.

3.3. Hypotheses and methodology

Our objective was to investigate how WCM impacts the profitability of French wine firms. To do this, we tested the impact of CCC on profitability and also the impact of each component

[13] Gross operating profit (GOP) is also used in the literature to estimate firm profitability (e.g., Abuzayed, 2012; Deloof, 2003; Gill et al., 2010; Hill et al., 2010; Lazaridis and Tryfonidis, 2006; Vural et al., 2012) where GOP = (Cost of goods sold) / (Totals assets – Financial assets). Other measures used to evaluate firm profitability in previous studies are return on equity (ROE) (Afrifa and Padachi, 2016; Ali, 2011; Jose et al., 1996; Malik and Bukhari, 2014; Wang, 2002), return on investment (ROI) (Lyroudi and Lazaridis, 2000) and return on capital employed (ROCE) (Afrifa and Padachi, 2016; Vishnani and Shah, 2007) where ROE = Net income / Shareholders equity, ROI = Net income / Total assets, ROCE = EBIT / Capital employed.

of CCC (DSO, DIO and DPO)[14] in order to better determine the WCM strategy that should be used by wine firms in France. In this context, the following hypotheses were formulated.

Hypothesis 1: The CCC will have a negative impact on wine firm profitability.
Hypothesis 1a: The DSO will have a negative impact on wine firm profitability.
Hypothesis 1b: The DIO will have a negative impact on wine firm profitability.
Hypothesis 1c: The DPO will have a positive impact on wine firm profitability.
Hypothesis 2: There will be an optimal level of CCC that maximizes wine firm profitability.

For hypothesis 1, we assumed that the fewer the number of days to get cash back, the higher firm profitability would be. This means that more efficient WCM would result in higher profitability. In posing this hypothesis, we thus took the aggressive WCM viewpoint (see Section 2) as found in Hager (1976), Shin and Soenen (1998) and Deloof (2003), among others. Indeed, we stipulated that the sooner customers paid the wine firms (or the lower the DSO), the less the firm would need to borrow money, the lower the debt cost and thus the higher the profitability would be (hypothesis 1a). Similarly, the smaller the time span to convert inventories into cash (or DIO), the higher firm profitability would be (hypothesis 1b). For the value of payables (DPO), we assumed that the longer the time to pay suppliers, the more the firm would be able to use this money for short-term investments (such as exports to a new country, buying a new machine, etc.) and the higher the firm profitability would be (hypothesis 1c). Given the different impact channels from the three components of working capital on profitability, we then stipulated that there would be an optimal combination of DSO, DIO and DPO to maximize wine firm profitability (hypothesis 2).

Following Banõs-Caballero et al. (2012), the models that we used to test the above hypotheses are as follows:

Hypotheses 1 and 2: The CCC will have a negative impact on wine firm profitability and there will be an optimal level of CCC that maximizes the profitability.

$$PROFIT_{i,t} = \beta_0 + \beta_1 PROFIT_{i,t-1} + \beta_2 CCC_{i,t} + \beta_3 CCC_{i,t}^2 + \beta_4 SIZE_{i,t} + \beta_5 GROWTH_{i,t} + \beta_6 LEV_{i,t} + \beta_7 TANG_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t} \quad [1]$$

Hypothesis 1a: The DSO will have a negative impact on wine firm profitability.

$$PROFIT_{i,t} = \beta_0 + \beta_1 DSO_{i,t} + \beta_2 PROFIT_{i,t-1} + \beta_3 SIZE_{i,t} + \beta_4 GROWTH_{i,t} + \beta_5 LEV_{i,t} + \beta_6 TANG_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t} \quad [1a]$$

Hypothesis 1b: The DIO will have a negative impact on wine firm profitability.

$$PROFIT_{i,t} = \beta_0 + \beta_1 DIO_{i,t} + \beta_2 PROFIT_{i,t-1} + \beta_3 SIZE_{i,t} + \beta_4 GROWTH_{i,t} + \beta_5 LEV_{i,t} + \beta_6 TANG_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t} \quad [1b]$$

[14] See section 2 for more information. As a reminder, CCC = DSO + DIO – DPO. With: DSO = Receivables*365/Sales; DIO = Inventory*365/Cost of goods sold; DPO = Payables*365/Purchases.

Hypothesis 1c: The DPO will have a positive impact on wine firm profitability.

$$PROFIT_{i,t} = \beta_0 + \beta_1 DPO_{i,t} + \beta_2 PROFIT_{i,t-1} + \beta_3 SIZE_{i,t} + \beta_4 GROWTH_{i,t} + \beta_5 LEV_{i,t} + \beta_6 TANG_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t}$$ [1c]

where $PROFIT_{i,t}$, $CCC_{i,t}$, $SIZE_{i,t}$, $GROWTH_{i,t}$, $LEV_{i,t}$, $TANG_{i,t}$ are variables defined in Table 3 for firm *i* at time *t*. λ_t is a time dummy variable that changes in time but is equal for all firms in each of the time periods considered. In other words, it is equal to 1 for a given year and 0 for the other years. This parameter is designed to capture the influence of the economic factors that may also affect firm profitability but which companies cannot control for. η_i is the unobservable heterogeneity or the firm's unobservable individual effects to measure its unobservable heterogeneity and thus it captures the particular characteristics of each firm. It is equal to 1 for firm *i* and 0 for all other firms. $\varepsilon_{i,t}$ is the random disturbance. Following hypotheses 1, 1a, 1b and 1c, the coefficient β_2 should be negative in equations 1, 1a, and 1b, and positive in equation 1c. Following hypothesis 2, the coefficient β_3 (related to $CCC_{i,t}^2$) should be significant and negative (Banõs-Caballero et al., 2012). This is thus equivalent to the existence of an optimal level of CCC that maximizes profitability. According to Banõs-Caballero et al. (2012), this optimal level is $CCC = -\beta_2 / 2\beta_3$, the breakpoint that makes the derivative of profitability with respect to CCC equal to 0. The relationship between CCC and profitability is an inverted U-shape if the second partial derivative ($2\beta_3$) is negative. Thus, β_3 should be significant and negative to validate hypothesis 2.

To estimate the parameters in the above equations, we used the generalized method of moments (GMM) developed by Arellano and Bond (1991). This method can control for unobservable heterogeneity and possible endogeneity, which, if not controlled for, will produce biased estimates (Banõs-Caballero et al., 2012). Indeed, firms are heterogeneous and there can be characteristics influencing profitability that are not included in the model. Thus, using panel data helps to eliminate the risk of obtaining biased results (Hsiao, 1985). Moreover, in line with Banõs-Caballero et al. (2012), we used the two-step estimation method since it is robust to heteroscedasticity as compared with the one-step method. Finally, including the variable CCC² allowed us to detect the possible nonlinearity between WCM and profitability.

The next section presents the empirical results, which were further explored by interviews that we conducted with three wine firms in southern France.

4. Results and discussion

We begin this section by presenting the principal descriptive statistics of our sample. We then follow by analyzing the results for each hypothesis formulated above.

4.1. Descriptive statistics

We first present the descriptive statistics of the CCC variables (Table 5) and then those of the other firm factors (Table 6). In Table 5, we also highlight the values of sales and exports in order. Linear correlations between variables are presented in Table 7. From Table 5, we can draw some indication of WCM in our sample firms. First, the days inventory (DIO) is very high, about 200 days of the cost of sales per year. This thus confirms our intuition that wine firms have a high amount of capital tied up in inventory, probably because the wine production process is long, especially for red wines, which may require several years. During this time, wine is stored in bulk, which increases the investment in working capital. In addition to the production inventory, there are inventories of final products before being sold, which also increase the value of firm working capital. We noted an increase in the value of DIO from 2008. Could this be due to the impact of the 2007 financial crisis, which decreased the sales of wine (see report of Agreste) and thus increased the inventory? As for DSO (days accounts receivable), the values are lower than that of DIO, at about 100 days of the sales per year, almost half that of DIO. This means that, for the wine-producing firms in our sample, the value of receivables from the customers was much lower than the value of inventory. Once again, we noted the impact of the financial crisis on accounts receivable, which increased in 2008 compared with 2007. This suggests that the financial crisis lengthened the delay in customer payment.

Table 5: CCC descriptive statistics

Year	N	DIO	DSO	DPO	CCC	Sales (in ,000 euros)	Exports (in ,000 euros)
2014	344	191.60	91.46	98.02	148.49	6172.83	567.22
2013	363	211.62	88.67	101.76	168.07	5813.23	758.41
2012	369	224.57	92.66	105.06	183.05	5510.71	542.83
2011	360	220.51	95.90	92.05	188.05	5125.45	500.64
2010	362	228.25	98.57	93.32	196.79	4566.04	521.43
2009	357	228.46	93.74	85.45	196.75	4642.92	563.62
2008	333	222.27	102.99	93.09	179.56	4816.67	570.45
2007	337	206.15	98.57	109.71	152.60	4607.45	645.27
2006	315	216.38	97.47	106.28	152.05	4180.45	549.88
2005	311	215.87	95.22	102.33	151.23	4441.30	705.71
2004	309	186.32	101.33	121.08	119.70	4578.15	618.13
2003	297	183.39	106.19	125.79	113.42	4664.47	569.17

Note: N denotes the number of firms that have available data for each year. DIO = days inventory outstanding (Inventory*365/Cost of sales); DSO = days accounts receivable outstanding (Receivables*365/ Sales); DPO = days accounts payable outstanding (Payables*365/Purchases); CCC = cash conversion cycle (DIO+DSO-DPO).

Sales and Exports are presented in thousands of euros. The values presented in this table are average values for all firms in the sample for each year.

For DPO, days accounts payable outstanding, the value is about 100 days over the purchases per year, which is close to the value of DSO. This confirms Lind's (2012) finding that firms with a high value of receivables also have a high value of payables. In this case, the investment in wine firm working capital is constituted essentially of inventory since receivables are mostly compensated by payables. Furthermore, we also remarked that the DPO value decreased in 2008 compared with that in 2007. This may suggest that the financial crisis made it more difficult for suppliers to accept a payment delay from wine firms. The CCC confirmed our previous analysis since its value was close to that of DIO (days inventory), because DSO (receivables) and DPO (payables) were almost equivalent. Last, the CCC represents nearly 150 days per year and is higher during than before the financial crisis. On the other hand, the value of sales increased in 2008 but decreased in 2009 and 2010 before rising between 2011 and 2014. This suggests that the impact of the financial crisis on the wine-producing firms was not immediately felt in 2008 but only one to two years later (in 2009 and 2010). The recovery began in 2011 when sales started rising. As for the value of exports, the financial crisis had a negative impact since the export decrease in 2008 continued in 2009, 2010, 2011 and 2012, with a recovery starting only in 2013. This indicates that the increase in sales came essentially from sales in France and not from exports in 2011, 2012 and 2014. The value of exports in 2013 is very high compared to the other years (see report of FranceAgriMer for 2013).

Table 6 presents some descriptive statistics of other firm variables used for control.

Table 6: Descriptive statistics of control variables

Variables	Mean	SD	Median	Min	Max
Profitability	0.01	0.07	0.00	-0.43	2.67
Size	8.15	1.17	8.15	3.31	11.67
Growth	0.28	3.88	0.03	-0.99	2.61
Leverage	0.67	0.56	0.58	0.11	17.17
Tangibility	0.29	0.15	0.27	0.00	0.96

Note: These are average values for all firms over all the years under study. Profitability = EBIT/Total Asset; Size = Log(Total Asset); Growth = [Sales(t)-Sales(t-1)]/Sales(t-1)]; Leverage = Total Debt/Total Asset; Tangibility = Tangible assets/Total Asset. SD denotes standard deviation.

Table 6 shows that the average profitability of the firms in our sample over the study period is 1% of the total assets. However, heterogeneity in the sample is high, given the large gap between the minimal and maximal values (-0.43% and 2.67%, respectively) and the standard deviation (0.07%). The sales growth (growth variable) in our sample firms is 28%

over the study period. This value is very high and suggests that overall sales in the wine firms of France tended to an increase from 2003 to 2014. We also noted that leverage is very high for the wine firms (67% of the total assets on average), suggesting that French wine firms are financed essentially by debt. Last, tangible assets represent nearly 30% of the total assets on average. This high value is explained by the process of producing wine, which needs high tangible assets such as land and production tools.

Table 7 presents the linear correlations between the above-mentioned variables over the study period. The correlation between CCC and profitability is negative, as expected. However, the coefficient is very small (-0.01), possibly indicating no significant relationship between wine firm CCC and profitability. The CCC is positively correlated with firm size and the correlation coefficient is quite high (0.17). This suggests that the bigger the firm is, the longer the CCC and the lower the efficiency of WCM. This in turn indicates that bigger firms invest more in working capital possibly because of bigger wine inventories. The same negative correlation with CCC is found for leverage and tangibility. However, the coefficient with debt is very low (-0.06), suggesting no significant correlation between debt and CCC. As with tangible assets (coefficient: -0.17), this negative correlation can be explained by the observation that the higher the value of tangible assets is, the higher the purchase of fixed assets, and thus, the higher the value of payables and the lower the value of CCC.

Table 7: Linear correlation matrix

	CCC	Profitability	Size	Growth	Leverage	Tangibility
CCC	**1**	-0.01	0.12	-0.06	-0.06	-0.17
Profitability		**1**	-0.07	0.05	0.06	-0.02
Size			**1**	-0.07	-0.21	0.17
Growth				**1**	0.18	-0.04
Leverage					**1**	-0.09
Tangibility						**1**

Note: These are average correlation coefficients between variables for the whole sample over the whole period. CCC = cash conversion cycle (DIO+DSO-DPO); Profitability = EBIT/Total Asset; Size = Ln(Total Asset); Growth = [Sales(t)-Sales(t-1)]/Sales(t-1)]; Leverage = Total Debt/Total Asset; Tangibility = Tangible assets/Total Asset. SD denotes standard deviation.

The correlations between profitability and the other variables are positive for almost all the firm factors under study, except for size, which shows a negative coefficient. This thus suggests that the bigger the wine firm, the lower its profitability will be. In our sample, bigger firms were usually cooperatives with the objective of paying each member, not profitability (see for example Valette et al., 2016). This may explain the negative correlation between wine firm size and profitability. Otherwise, higher growth, leverage and tangibility are associated with higher profitability. This result seems to be logical for growth, since an increase in sales

leads to an increase in profitability. For leverage, the positive correlation seems to suggest that high debt indicates high investment and thus high profitability. A higher value for tangibility may lead to better production efficiency and thus greater profitability. However, the coefficients were quite small (between 0.02 and 0.07, in absolute values) and the analyses thus were checked by our regressions results in the next subsection.

Firm size is negatively correlated with growth and leverage but positively correlated with tangibility. The coefficients for leverage and tangibility are much higher (-0.21 and 0.17, respectively). The negative correlation between size and growth indicates that bigger firms show lower growth, and vice versa. This suggests that bigger firms have less expansion in the value of sales. However, the positive correlation between size and leverage suggests that bigger firms have more debt to finance their activities. This may also be explained by the observation that bigger firms can obtain loans from banks more easily than small firms (see for example Huyghebaert and Van de Gucht, 2007). Last, the negative correlation between size and tangibility suggests that bigger firms in the wine sector (such as cooperatives) have fewer tangible assets because the grapes are grown by the members and not by the cooperative itself.

Sales growth (variable growth) is positively correlated with leverage and negatively correlated with tangibility (0.18 and -0.04, respectively). Profit from greater sales may therefore motivate firms to take on more debt to expand their activities, thereby further increasing debt. The negative correlation with tangible assets suggests that the profit from higher sales is not used to acquire more tangible assets but to finance other assets. Last, the small and negative correlation between leverage and tangibility (-0.09) indicates that for wine firms in France, the increase in the value of debt is used to finance not firm tangibility but operating activities.

The next subsection analyzes the results obtained from the GMM regressions.

4.2. GMM regressions results

In this section, we present our results. Table 7 covers hypotheses 1 and 2 while Tables 7a, 7b and 7c cover hypotheses 1a, 1b and 1c.

From Table 7, we note that hypothesis 1 is not validated since the coefficient $\beta_2(CCC_{i,t})$ is not significant. The same result is found for hypothesis 2 since the coefficient $\beta_3(CCC_{i,t}^2)$ is positive and very small (1.75E-8) and significant only at 10%. We therefore conclude that there is no optimal level of CCC that maximizes the profitability of wine firms in France. This result is quite similar to that obtained by Banõs-Caballero et al. (2012) for the agricultural

sector. However, unlike our results, Banõs-Caballero et al. (2014) and Afrifa and Padachi (2016) showed a concave relationship between working capital level and profitability. There is thus an optimal working capital level that maximizes the profitability of firms in these studies. Their samples included 1,008 nonfinancial Spanish SMEs and 258 nonfinancial listed firms and 160 Alternative Investment Market-listed SMEs in the UK, respectively. For our study, these findings suggest that WCM does not have a significant impact on wine firm profitability and that no optimal level of WCM can maximize profitability. Is this specific to the wine sector? Most of the previous studies (more details in Section 2) have found that WCM has a significant impact on profitability, either positive (conservative WCM) or negative (aggressive WCM). To our knowledge, only one study found a neutral effect of WCM on profitability in the consumer electronics industry in India from 1997 to 2005 (Vishnani and Shah, 2007).

Table 7: Hypotheses 1 and 2

The CCC will have a negative impact on wine firm profitability and there will be an optimal level of CCC that maximizes the profitability.

$$PROFIT_{i,t} = \beta_0 + \beta_1 PROFIT_{i,t-1} + \beta_2 CCC_{i,t} + \beta_3 CCC_{i,t}^2 + \beta_4 SIZE_{i,t} + \beta_5 GROWTH_{i,t} + \beta_6 LEV_{i,t} + \beta_7 TANG_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t}$$

Variables	Coefficients	Variables	Coefficients
$\beta_1(PROFIT_{i,t-1})$	0.418*** (0.104)	$\beta_6(LEV_{i,t})$	0.011* (0.006)
$\beta_2(CCC_{i,t})$	-0.00002 (0.00002)	$\beta_7(TANG_{i,t})$	0.057* (0.030)
$\beta_3(CCC_{i,t}^2)$	1.75E-8* (1.05E-8)	D_{2010}	-0.007* (0.004)
$\beta_4(SIZE_{i,t})$	-0.004 (0.014)	m_2	0.710
$\beta_5(GROWTH_{i,t})$	0.009* (0.005)	Hansen test	325.83

Note: m_2 is a second-order serial correlation test using residuals of first differences, asymptotically distributed as N(0,1) under the null hypothesis of no serial correlation. Hansen's test is a test of over-identifying restrictions distributed asymptotically under the null hypothesis of the validity of instruments as chi-squared. The degrees of freedom are given in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

The control variables of growth, leverage and tangibility affect French wine firm profitability significantly and positively. However, the coefficients are small and the significance level is only 10% (0.009, 0.011 and 0.057, respectively). This finding indicates that higher growth, leverage and tangibility mean higher profitability in wine firms.[15] This in turn implies that increases in sales, debt and tangible assets help the firms to improve their financial performance. It also suggests that debt helps them to invest more in tangible assets

[15] While Deloof (2003), Garcia-Teruel and Martinez-Solano (2007), Samiloglu and Demirgünes (2008) and Wasiuzzman (2015) found a positive relationship between growth and profitability, they showed that, contrary to our results, a higher level of leverage leads to lower profitability. However, our result is consistent with Manzoor (2013), who also found a positive relationship between debt and profitability.

in order to enhance efficiency in the production cycle and sales. On the other hand, firm size has no significant impact on profitability, meaning that the value of their total assets does not affect the ability of wine firms to make a profit. As expected, past values of profit (lag 1) have significant and positive impacts on current profits. This implies that good profitability in the past can help wine firms to make a good profits in the present. Last, the time dummy variable is significant and negative for 2010, indicating that this was a difficult year for wine firms in France. One explanation is the decrease in wine French exports in 2010 (see report of FranceAgriMer for 2010).

The results of hypotheses 1a, 1b and 1c regarding the impact of each WCM component on wine firm profitability are shown in Tables 8a, 8b and 8c.

Table 8a: Hypothesis 1a

Hypothesis 1a: The DSO will have a negative impact on wine firm profitability.

$$PROFIT_{i,t} = \beta_0 + \beta_1 DSO_{i,t} + \beta_2 PROFIT_{i,t-1} + \beta_3 SIZE_{i,t} + \beta_4 GROWTH_{i,t} + \beta_5 LEV_{i,t} + \beta_6 TANG_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t}$$

Variables	Coefficients	Variables	Coefficients
$\beta_1(DSO_{i,t})$	-0.0020** (0.0009)	$\beta_5(LEV_{i,t})$	0.011 (0.007)
$\beta_2(PROFIT_{i,t-1})$	0.421*** (0.104)	$\beta_6(TANG_{i,t})$	0.062** (0.030)
$\beta_3(SIZE_{i,t})$	-0.007 (0.016)	m_2	0.670
$\beta_4(GROWTH_{i,t})$	0.011* (0.006)	Hansen test	303.48

Table 8b: Hypothesis 1b

Hypothesis 1b: The DIO will have a negative impact on wine firm profitability.

$$PROFIT_{i,t} = \beta_0 + \beta_1 DIO_{i,t} + \beta_2 PROFIT_{i,t-1} + \beta_3 SIZE_{i,t} + \beta_4 GROWTH_{i,t} + \beta_5 LEV_{i,t} + \beta_6 TANG_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t}$$

Variables	Coefficients	Variables	Coefficients
$\beta_1(DIO_{i,t})$	-2.74E-6 (0.00002)	$\beta_5(LEV_{i,t})$	0.010* (0.006)
$\beta_2(PROFIT_{i,t-1})$	0.421*** (0.106)	$\beta_6(TANG_{i,t})$	0.063** (0.032)
$\beta_3(SIZE_{i,t})$	-0.009 (0.014)	m_2	0.720
$\beta_4(GROWTH_{i,t})$	0.009* (0.005)	Hansen test	304.01

Table 8c: Hypothesis 1c

Hypothesis 1c: The DPO will have a positive impact on wine firm profitability.

$$PROFIT_{i,t} = \beta_0 + \beta_1 DPO_{i,t} + \beta_2 PROFIT_{i,t-1} + \beta_3 SIZE_{i,t} + \beta_4 GROWTH_{i,t} + \beta_5 LEV_{i,t} + \beta_6 TANG_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t}$$

Variables	Coefficients	Variables	Coefficients
$DPO_{i,t}$	-0.00006*** (0.00002)	$LEV_{i,t}$	0.012** (0.007)
$PROFIT_{i,t-1}$	0.422*** (0.103)	$TANG_{i,t}$	0.052** (0.030)
$SIZE_{i,t}$	-0.007 (0.013)	m_2	0.680
$GROWTH_{i,t}$	0.008** (0.004)	Hansen test	305.59

Note: m_2 is a second-order serial correlation test o using residuals of first differences, asymptotically distributed as N(0,1) under the null hypothesis of no serial correlation. Hansen's test is a test of overidentifying restrictions distributed asymptotically under the null hypothesis of the validity of instruments as chi-squared. The degrees of freedom are given in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Tables 8a, 8b and 8c show that only days accounts receivable and payable have significant and negative impacts on profitability. This result is consistent with the findings of Deloof (2003), Garcia-Teruel and Martinez-Solano (2007), Mohamad and Saad (2010), Shubita (2013) and Takon (2013), among others. However, conversely to our hypothesis, days accounts payable did not have a positive impact but a negative one (Table 8c). This finding supports previous studies such as those from Garcia-Teruel and Martinez-Solano (2007), Lazaridis and Tryfondis (2006) and Raheman and Nasr (2007). According to Deloof (2003), the explanation for this negative relationship is that less profitable firms settle their payment commitments more tardily. This negativity also suggests that the wine firms in our sample should not extend the payment delay to providers but they should instead shorten it. As noted by Raheman and Nasr (2007), thanks to late payments to suppliers, firms can assess the quality of purchased products and access an inexpensive and flexible source of financing. However, delaying payables can be costly if the firm is offered a discount for early payment. Thus, the shorter this delay, the lower the borrowing costs and the higher the profitability are. Our hypothesis for days accounts receivable is validated since the coefficient is negative (Table 8a). This suggests that when the number of days before sales are converted into cash (days receivable) is low, profitability is higher. Our finding aligns with previous studies (e.g., Deloof, 2003; Garcia-Teruel and Martinez-Solano, 2007; Lazaridis and Tryfonidis, 2006; Mathuva, 2009; Raheman and Nasr, 2007 or Samiloglu and Demirgünes, 2008) and suggests that wine firms should manage this issue carefully in order to collect the payment of wine sales as quickly as possible. In France, customers have one month to pay. However, this is rarely respected in practice, according to the firms that we interviewed. French customers (such as restaurants, hotels and wineries) usually pay in two months, the maximal delay

authorized by law. As for exports, sales are collected more quickly and even before delivery (according to our interviews). This difference makes the management of cash flows in wine firms very difficult.

Last, the number of days for inventories to be converted into cash has no significant impact on profitability (Table 8b). This finding therefore does not support hypothesis 1b, which stated that this relationship would be negative. This neutral effect of inventory to cash conversion suggests that the choice of wines produced (red, white or rosé) does not have a significant impact on profitability, even though the production procedures differ. For example, the vinification of red wines is very long, about two years, while that of white wines and rosé is shorter, about one year. Furthermore, the wines produced by a shorter vinification process are soft and can be consumed quickly. Wines that require longer vinification are more structured and need to be stored longer. For instance, some dry white wines (such as Muscadet or Sancerre, etc.), rosés or light red wines, in particular "*primeur*" wines, should be drunk young. Also, while vintages with a poor reputation should be consumed quickly, wines of great vintages generally have good aging potential.

6. Conclusions

We investigated the impact of working capital management on the profitability of wine firms in France. We therefore contribute to the existent literature as this topic has never to our knowledge been studied in the wine industry. Our sample was composed of 430 firms with annual data from 2003 to 2014. Our estimation method (GMM) and models followed those of Banõs-Caballero et al. (2012) because they take into account nonlinearity, unobservable heterogeneity, heteroscedasticity and endogeneity. The results show that WCM (measured by the cash conversion cycle, CCC) did not significantly impact French wine firm profitability over the study period. Furthermore, an optimal level of CCC did not emerge as a way to maximize the profitability of these firms. Only the CCC of accounts receivable and accounts payable had significant and negative impacts on profitability. This suggests that wine-producing firms in France should shorten the time to collect sales as well as the time to pay suppliers. Indeed, the fewer the number of days accounts receivable and accounts payable, the higher the profitability of these firms will be. Furthermore, contrarily to what one may believe, the cash conversion cycle of wine inventories does not have a significant impact on profitability. The characteristics of wine production and the inventory procedure (for red or white wines, for example) apparently do not lead to significant impacts on profitability. Therefore, wine firms should pay more attention to managing receivables and payables. To do

so, these firms, which are more specialized in wine production than in financial management, would be better off hiring professional financial managers like *Park Street*, a company specialized in the working capital management of wine firms in the USA.

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