Short-Term Credit Policies and Operating Performance

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Abstract

Using a sample of United Kingdom (UK) non-financial firms from 2009 to 2021, this paper examines the operating performance effect of aggressive and moderate use of trade payables and bank credit. The results demonstrate a hierarchical effect of the use of short-term credit on firms operating performance. In particular, the results show that aggressive use of bank credit achieves higher operating performance, followed by moderate use of trade payables and bank credit and then aggressive use of trade payables. We further document that operating performance of firms dealing in differentiated products, lower firm size, firms with higher market power and financially stable firms' increases with aggressive and moderate use of trade payables and bank credit. Overall, the results indicate that firm operating performance is an increasing function of bank credit use and demonstrate the importance of short-term credit policies on firms' operating performance. The results are robust after using a novel approach in addressing the issue of endogeneity.

Keywords: Operating performance; aggressive use of trade payables; aggressive use of bank credit; moderate use of trade payables and bank credit; nature of the product; firm size

1. Introduction

Firms of all types and sizes depend on a combination of suppliers' credit (hereafter trade payables) and short-term bank credit (hereafter bank credit) (Yang, 2011; Goto et al., 2015) to cater for their short-term financing needs (Palacín-Sánchez et al., 2019). However, due to differences in financial constraints (Cuñat 2007; Giannetti et al., 2011), some firms depend

more on trade payables (Wang et al., 2023), whereas others depend more on bank credit. Therefore, firms can be grouped into three categories of short-term credit use: (1) aggressive use of trade payables; (2) aggressive use of bank credit; and (3) moderate use of trade payables and bank credit. Firms with aggressive use of trade payables are those with difficulties in accessing institutional finance because they are financially constrained (Petersen and Rajan, 1997; Abdulla et al., 2017). Firms with aggressive use of bank credit are those that are financially less constrained and can therefore access bank credit (Burkart and Ellingsen, 2004; Engemann et al., 2014). Firms with moderate use of trade payables and bank credit are those that have moderate access to institutional credit and therefore rely on trade payables and bank credit in a complementary fashion (Cook, 1999; Deloof and La Rocca, 2015). We use this grouping strategy, for the first time, to examine the effect of aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit on firm operating performance.

Bank credit is generally considered as a cheaper short-term credit than trade payables (Hill et al., 2012; Afrifa et al., 2019; Chen et al., 2019) because the latter has an inherent cost (Ng et al., 1999) arising from the loss of cash discount (Nilsen, 2002; McGuinness and Hogan, 2016). Several studies have postulated a higher performance effect of bank credit than trade payables (Du et al., 2012; Kestens et al., 2012; Afrifa et al., 2018). However, other studies argue that depending on the credit term (Chen et al., 2024; Hill et al., 2017), trade payables could be cheaper than bank credit (Lin and Chou, 2015; Hill et al., 2017). This is because some firms can access trade payables at a low or zero cost (Giannetti et al., 2011). There are also some operational imperatives that can make trade payables more value-enhancing. First, trade payables are illiquid, which makes it difficult for managers to divert for their use (Aktas et al., 2015). Second, trade payables may encourage future sales by strengthening the supplier-customer relationship (Chen et al., 2024; Kim and Shin, 2012). Third, trade payables may help suppliers to price discriminate between customers (Brennan et al., 1988). Fourth, trade payables may be used as an implicit product warranty to guarantee product quality (Long et al., 1993). So far, the empirical evidence of the effect of trade payables and bank credit on firm operating performance in the existing literature remains mixed, which provides an opportunity for the examination of this phenomenon using a different identification strategy: aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit.

The nature of products may influence the operating performance effect from aggressive and moderating use of trade payables and bank credit (Burkart and Ellingsen, 2004; Cuñat, 2007; Fabbri and Menichini, 2010). This is because products with quality that is difficult to verify will require a longer credit period (Hill et al., 2012), and therefore more need for short-term finance (Afrifa et al., 2018). Generally, the quality of differentiated products is difficult to verify than standardised products and services (Giannetti et al., 2011; Mateut et al., 2015). As such, firms dealing in differentiated products extend a longer credit period to customers than firms dealing in other products (Cuñat, 2007; Giannetti et al., 2011). However, firms use trade payables and bank credit to finance credit to customers (Du et al., 2012; Engemann et al., 2014; Afrifa at al., 2018). This suggests that firms dealing in differentiated products may have to depend more on trade payables and/or bank credit, to finance credit to customers. Therefore, we examine how the nature of products influences the operating performance from aggressive and moderate use of trade payables and bank credit.

The aggressive and moderate use of trade payables and bank credit on operating performance may be influenced by the size of the firm. Previous studies have shown that, when it comes to access to credit, firm size matters (Petersen and Rajan, 1997; Marotta, 2005; McGuinness et al., 2018). Small firms struggle to access external finance (Petersen and Rajan, 1997; Rahaman, 2011) due to their high information asymmetry (Bhalla and Kaur, 2012) and

high likelihood of failure (Sogorb-Mira, 2005). According to Aterido et al. (2011) and Dinh et al. (2012), access to finance remains one of the key practical challenges that hinder the performance of small firms. This suggests that access to trade payables and bank credit should enhance the operating performance of small firms. However, whether the pursuit of aggressive and moderate use of trade payables and bank credit will improve the operating performance of small firms remains unexplored in the current literature. Therefore, we explore the extent to which different firm sizes affect the operating performance from aggressive and moderate use of trade payables and bank credit.

Using a sample of 34,051 UK[2] firms and 244,870 firm-year observations for the period 2009 to 2021, the results of the empirical analysis, support the view that bank credit is value-enhancing than trade payables. Specifically, we find that aggressive use of bank credit achieves the highest operating performance, followed by moderate use of trade payables and bank credit and then aggressive use of trade payables. Further analysis shows the highest operating performance from aggressive and moderate use of bank credit and bank credit for firms with differentiated products, small firms, firms with higher market power and financially stable firms. The findings are consistent after the control of endogeneity and a series of additional robustness tests.

This paper contributes to the extant literature in two main ways. First, we contribute to the growing debate in short-term financing literature on the substitutability between trade payables and bank credit (Cook, 1999; Chen et al., 2019; Palacin-Sanchez et al., 2019). According to the financing theory (Petersen and Rajan, 1997; Cosci et al., 2020), firms that are more financially constrained can rely on trade payables as a source of finance (Ouyang et al., 2023) from their less financially constrained trade suppliers (Jain, 2001; Huyghebaert, 2006; Love et al., 2007; McGuinness et al., 2018). Several studies (Nilsen, 2002; Yang, 2011; Atanasova, 2007; Garcia-Appendini and Montoriol-Garriga, 2013; Casey and O'Toole, 2014; Palacin-Sanchez et al., 2019) advocate for the substitutability between trade payables and bank credit. However, Cosci et al. (2020) examined the substitutability of trade payables and bank credit by dividing the sample into net borrowing firms and net lending firms and find that trade payables do not efficiently substitute for bank credit. Chen et al. (2019) also used natural experiments and find that firms increase their use of trade payables when bank credit is tightened and decrease their trade payables use when bank credit is relaxed. Therefore, they argue that bank credit is a more preferred short-term financing choice than trade payables, which supports the inefficient substitutability of trade payables for bank credit. Our paper extends these studies by highlighting the operating performance effect from aggressive and moderate use of trade payables and bank credit due to the inefficient substitutability between trade payables and bank credit.

Second, we contribute to the literature by showing that the operating performance from aggressive and moderate use of trade payables and bank credit is higher for firms that deal in differentiated products, small firms, firms with market power and financially stable firms. The importance of trade payables and bank credit to firms with differentiated products, small firms, firms with market power and financially stable firms has long been recognised in the short-term financing literature (Petersen and Rajan, 1997; Rahaman, 2011; Abdulla et al., 2020). However, evidence of how these factors may affect the operating performance from aggressive and moderate use of trade payables and bank credit is absent. Firms that deal in differentiated products where quality is difficult to assess (Mateut et al., 2015) will require aggressive use of trade payables and/or bank credit because of the need to extend lengthy credit to customers (Hill et al., 2012; Afrifa et al., 2018), which supports the product guarantee theory (Long et al.,

[2] The emphasis on UK is because this country has a well-developed banking sector (Schmidt and Tyrell, 1997) and extensive use of trade payables (Summers and Wilson, 2000).

1993). Also, the finding that operating performance effect from aggressive and moderate use of trade payables and bank credit is higher in small firms aligns with the financing theory argument that small firms because of their difficulties in accessing alternative sources of finance will achieve higher operating performance if they can access trade payables and bank credit.

The rest of this paper is organised as follows. Section 2 presents the literature review and hypotheses development. Section 3 contains the study data and research design. Section 4 and 5 display the main results and further analysis, respectively. The robustness tests are presented in section 6, whereas section 7 concludes the paper.

2. Literature Review and Hypotheses Development

When it comes to trade payables and bank credit effect on firm performance literature, as far as the authors are aware, only studies by Du et al. (2012) and Heo (2023) have investigated the use of trade payables and bank credit on firm profitability and sales performance, respectively. Du et al. (2012) used a sample of 1,556 Chinese firms from the 2003 World Bank data to examine how trade payables and bank credit together affect firm performance. Using the Instrumental Variable Estimation, their results show that the effect of bank credit on performance is higher than that of trade payables. Therefore, they conclude that bank credit is central to firms' performance, but trade payables are less important. However, they do not separate their sample into aggressive and moderate use of trade payables and bank credit. More recently, Heo (2023) used a sample of Korean firms to examine the influence of bank credit and trade credit on firm sales performance during the global financial crisis. Using a sample period from 2000 to 2011, the results show that firms that rely more on bank credit than trade credit recorded slower sales growth.

Some studies have also examined the effects of trade payables and bank credit on firm performance separately. Afrifa et al. (2018) used a sample of 2,559 UK firms from 2005 to 2014 to examine the association between trade payables and firm performance under different product and market dynamics. Their main results show that trade payables have a positive relationship with firm performance, especially for firms with differentiated products, sales volatility and smaller market share. Using a sample of 570 state-owned Chinese firms from 1994 to 1999, Ge and Qiu (2007) examined how financial development, bank discrimination and trade payables affect firm performance. The study concludes that state-owned Chinese firms with access to trade payables have higher financial performance than those that do not. Therefore, they maintain that firms in countries with poor financial sector development can use trade payables to boost performance. Using data from 1970 to 1998, Fisman and Love (2003) examined the relationship between trade payables and intermediary financial development on industry growth for 44 countries and 37 industries. Their findings show that, in weaker financial institutions, firms operating in industries with higher trade payables experience superior growth. Employing survey data of Chinese firms from the World Bank in 2003, Li et al. (2016) examined the association between trade payables and firm performance. The results from Instrumental Variable Estimations show no influence of trade payables on firm performance in the short-run. Kestens et al. (2012) examined the association between trade payables and firm performance in the recent financial crisis using 15,440 non-financial Belgian firms from 2006 to 2009. The findings indicate that the financial crisis reduced firms' performance; however, it was more severe for firms with higher trade payables.

2.1. Hypothesis Development

2.1.1 Trade payables and bank credit effect on operating performance

The use of trade payables and bank credit by firms has been shown to be an important determinant of their financial performance (Heo, 2024; Chen et al., 2019; Ng et al., 1999). Prior

studies have shown that trade payables are advantageous to firms, allowing them to acquire necessary inputs for production without immediate payment (Goto et al., 2015; Afrifa et al., 2018). This helps to prevent any production interruptions (Afrifa et al., 2018) and promotes continuous sales (Hill et al., 2012). Trade payables also help firms to give credit to their customers with the benefit of higher sales and an eventual higher financial performance (Ferrando and Mulier, 2013; Afrifa et al., 2018). However, despite the many benefits of trade payables, empirical evidence has demonstrated that bank credit is the preferred choice for short-term finance (Chen et al., 2019). This is because it is seen as being cheaper than trade payables due to the inherent cost of the latter (Kestens et al., 2012; Ng et al., 1999). According to Ng et al. (1999), the implicit cost of trade payables can be as high as 43.9 per cent. Furthermore, bank credit extends over a more extended period than trade payables, reducing liquidity pressure (Burkart and Ellingsen, 2004; Garcia-Appendini and Montoriol-Garriga, 2013).

The link between a firm's return on assets (ROA) and its credit type has been studied extensively in the literature. Studies have shown that firm performance is significantly influenced by the type of finance used (Chen et al., 2019; Afrifa et al., 2018). According to the pecking order theory, firms tend to prefer internal financing over external financing because it is cheaper (Myers and Majluf 1984; Smith and Watts 1992). Thus, when firms use bank credit, they reduce their dependence on trade payables and avoid the loss of cash discount associated with it. This leads to improved performance outcomes, such as increased ROA. Additionally, the agency costs theory states that when a firm's management makes decisions about financing, they may choose methods that benefit themselves rather than maximise shareholder value. Thus, when firms use bank credit as opposed to trade payables, they can avoid agency costs associated with trade payables such as higher interest rates, shorter repayment periods and lower quality of financing (Ng et al., 1999). This increases the ROA of the firm. Furthermore, the free cash flow theory states that firms can make investments that increase their ROA when they have excess cash flow. As bank credit is perceived to be cheaper than trade payables (Kestens et al., 2012; Afrifa et al., 2018)), firms that aggressively use bank credit can free up more cash flow which can then be used for investments or other purposes such as paying dividends or repurchasing shares. Consequently, this leads to lower interest rates and shorter loan repayment periods, resulting in higher ROA.

Du et al. (2012) supports this argument by suggesting that trade payables are not perfect substitutes for bank credit because it has a lower positive effect on firm performance. Therefore, we expect an aggressive use of bank credit to be associated with the highest ROA, followed by moderate use of both trade payables and bank credit and then aggressive use of trade payables due to its inherent cost associated with it. This cost includes both explicit costs such as fees charged by suppliers and implicit costs such as lost discounts from suppliers due to late payments (Ng et al., 1999). Additionally, while bank credit and trade payables offer liquidity to firms (Garcia-Appendini and Montoriol-Garriga, 2013), the cost associated with trade payables is much higher than with bank credit (Kestens et al., 2012; Afrifa et al., 2018)). As such, firms which utilise aggressive use of bank credit should be better able to sustain their operations ((Goto et al., 2015) and achieve a higher ROA than those that rely heavily on trade payables. We, therefore, hypothesize as follows:

Hypothesis 1: *The ROS is an increasing function of bank credit use: a higher ROS from aggressive use of bank credit, followed by moderate use of trade* payables *and bank credit and then aggressive use of trade* payables.

2.1.2 Nature of product, aggressive and moderate use of trade payables *and bank credit effect on operating performance*

The quality of a product is an important factor to consider when assessing its potential for operating performance (Burkart and Ellingsen, 2004; Cuñat, 2007; Fabbri and Menichini; 2010). Generally, firms' products can be categorised into three including standardised products, services and differentiated products (see, Hill et al., 2012; Mateut et al., 2015; Afrifa et al., 2018). Among these three categories of products, differentiated product quality is considered much more difficult to verify (Giannetti et al., 2011; Hill et al., 2012). As such, customers of differentiated products will therefore require a longer credit period (payables) from their suppliers to assess the quality of these products (Cuñat, 2007; Mateut et al., 2015) Thus, firms dealing in differentiated products will enjoy extended suppliers credit than those dealing in standardised products and services. However, buying firms of differentiated products are also required to offer extended credit to customers (receivables), which will need financing (Molina and Preve, 2009; Ferrando and Mulier, 2013) using either trade payables or bank credit. According to Hill et al. (2012), the financing of customers with bank credit is value enhancing than using trade receivables. This is because trade payables contain both implicit and explicit cost such as loss of cash discount and fees (McGuinness and Hogan, 2016). Therefore, aggressive and moderate use of trade payables and bank credit is expected to lead to higher ROS for firms dealing in differentiated products than for those dealing in services or standardised products.

We, therefore, hypothesize as follows:

Hypothesis 2: *The ROS from aggressive use of bank credit, moderate use of trade* payables *and bank credit and aggressive use of trade* payables *increases with the importance of assessing product quality.*

2.1.3 Firm size, aggressive and moderate use of trade payables and bank credit effect on operating performance

Generally, small firms have limited access to external sources of finance due to their high information asymmetry (Petersen and Rajan, 1997; Bhalla and Kaur, 2012) and high failure rate (Sogorb-Mira, 2005). As a result, small firms are financially constrained (Beck and Demirgüç-Kunt, 2006; McGunness et al., 2018). Therefore, trade payables and bank credit are two of the most important sources of finance for small firms (McGuinness and Hogan, 2016; Palacin-Sanchez et al., 2019). On the contrary, large firms have access to wide-ranging sources and long-term finance (Abdulla et al., 2017), which are considered cheaper than short-term finance (Brav, 2009; Farre-Mensa and Ljungqvist, 2015). Given the financial constraint of small firms and the availability of alternative financing options for large firms, aggressive and moderate use of trade payables and bank credit is expected to increase ROA in small firms. This is because such use can help procure inputs of production (Goto et al., 2015), smooth operations, and extend credit to customers to boost sales and ROA (Hill et al., 2012; Fabbri and Klapper 2016; Lin and Chou, 2015; Caglayan et al., 2012; Afrifa and Gyapong, 2017). Furthermore, small firms can combine both trade payables and bank credit to expand their business, since they have high growth opportunities (Beck and Demirgüç-Kunt, 2006; Beck et al., 2008) as compared to large firms. Access to finance has been noted as one of the main hindrances to small firms' performance and survival (Aterido et al., 2011; Carbo-Valverde et al., 2016); thus, aggressive and moderate use of trade payables and bank credit is expected to be beneficial for small firms. On the other hand, large firms' dependence on short-term finance is expected to be value decreasing because they can access cheaper alternative souces of finance. Therefore, we hypothesize that the ROA from aggressive use of bank credit, moderate use of trade payables and bank credit and aggressive use of trade payables decreases with firm size. Therefore, we hypothesize as follows:

Hypothesis 3: *The ROS from aggressive use of bank credit, moderate use of trade* payables *and bank credit and aggressive use of trade* payables *decreases with firm size.*

3. Sample data and research design

3.1. Sample data

The data for this paper is collected from the FAME database over the period 2009 to 2021. We exclude financial firms for comparison and meaningful analysis because they have different financial structures (see, Deloof, 2003). As a result, the final unbalanced sample size for this paper consists of 34,051 firms and 244,870 firm-year observations.

The core dependent variable used in this paper to represent firm operating performance is the ROS, which is typically used in the short-term credit literature (see, Scott et al., 2017; Saliba de Oliveira et al.,). We define ROS as the operating income before depreciation scaled by total sales. As a robustness test, we also employ a different operating performance measure of the dependent variable in section 6.

The two main explanatory variables employed are trade payables and bank credit. We follow Petersen and Rajan (1997), Fukuda et al. (2007), Love et al. (2007), García-Teruel and Martínez-Solano (2010) and Yang (2011) and define trade payables as trade payables scaled by total assets. Bank credit is defined as short-term bank debt scaled by total assets (Afrifa et al., 2018).

The two main moderating variables are the nature of products and firm size. We follow previous studies (Giannetti et al., 2011; Hill et al., 2012; Mateut et al., 2015; Afrifa et al., 2018) and define the nature of products in three ways: standardised products, services and differentiated products, following the UK SIC (2003). To avoid the possibility of bias in the selection process, we identify all firms without UK SIC classification code as standardised products (see, Hill et al., 2012; Afrifa et al., 2018)[3]. Appendix 1 presents the different industry types that are grouped under standardised products, services and differentiated products. **To** measure firm size (size) we use the logarithm of total sales revenue (see, Aktas et al., 2015).

[APPENDIX 1 HERE]

The next step is to classify the firms in our sample into three categories, including aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit. To do this, we first calculate the industry mean trade payables and then subtract it from each firm's yearly trade payables to get the industry adjusted trade payables (IndAdjTC) as follows:

$$\text{IndAdjTC}_{i.t} = \text{Trade payables}_{i,t} - \text{Industry mean trade payables}_{i,t} \quad (1)$$

Second, we calculate the industry mean bank credit and then subtract it from each firm's yearly bank credit to get the industry adjusted bank credit (IndAdjBC) as follows:

$$\text{IndAdjBC}_{i.t} = \text{bank credit}_{i,t} - \text{Industry mean bank credit}_{i,t} \quad (2)$$

Third, we create four different dummy variables as follows:

(1) IndAdjTC^{75} = 1 if the firm's IndAdjTC is above the 75th percentile, otherwise 0
(2) IndAdjTC^{25} = 1 if the firm's IndAdjTC is below the 25th percentile, otherwise 0
(3) IndAdjBC^{75} = 1 if the firm's IndAdjBC is above the 75th percentile, otherwise 0
(4) IndAdjBC^{25} = 1 if the firm's IndAdjBC is below the 25th percentile, otherwise 0

Fourth, we define a firm as aggressive use of trade payables if its IndAdjTC^{75} is equal to 1 and its IndAdjBC^{25} is equal to 1. These firms are considered to pursue an aggressive trade payables policy because whereas their use of trade payables is above the 75 percentile, their use of bank credit is below the 25 percentile within the respective industry. Likewise, we define a firm as aggressive use of bank credit if its IndAdjBC^{75} is equal to 1 and its IndAdjTC^{25} is equal to 1. These firms are considered to pursue an aggressive bank credit policy because whereas their use of bank credit is above the 75 percentile, their trade payables use is below the 25 percentile within the respective industry. Finally, we define a firm as moderate use of

[3] The results from excluding firms without UK SIC classification produce qualitatively similar results.

trade payables and bank credit if that firm does not belong to the aggressive use of trade payables or aggressive use of bank credit category. Thus, we have three different dummy variables: a dummy variable equal to one for the aggressive use of trade payables, otherwise zero, a dummy variable equal to one for the aggressive use of bank credit, otherwise zero and a dummy variable equal to one for moderate use of trade payables and bank credit, otherwise zero.

3.2. Econometric Models

We employ the fixed effects (FE) panel data in all regression models and include the year and industry dummies. Also, we control for heteroscedasticity by clustering the standard errors at the firm level.

To test hypothesis 1, which compares the ROS of aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit, we run the regression model below:

$$\mathrm{ROS}_{it} = \beta_0 + \beta_1 \mathrm{ATC}_{it} + \beta_2 \mathrm{ABC}_{it} + \beta_3 \mathrm{Control}_{it} + \text{Year effects} + \text{Industry effects} + \varepsilon_{it} \quad (3)$$

In regression model 3, we set the dummy variable, which defines a moderate use of trade payables and bank credit as the base case (see, Hill et al., 2012; Afrifa et al., 2018). Therefore, the ROS of aggressive use of trade payables and aggressive use of bank credit are compared with the base case (moderate use of trade payables and bank credit).

To test hypothesis 2, which examines how the nature of the product influences the ROS differences of aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit, we run the following regression model below:

$$\mathrm{ROS}_{it} = \beta_0 + \beta_1 \mathrm{ATC}_{it} + \beta_2 \mathrm{ABC}_{it} + \beta_3 \mathrm{ATC}_{it} * \mathrm{Services}_{it} + \beta_4 \mathrm{ATC}_{it} * \mathrm{DiffProd}_{it} + \beta_5 \mathrm{ABC}_{it} * \mathrm{Services}_{it} + \beta_6 \mathrm{ABC}_{it} * \mathrm{DiffProd}_{it} + \beta_7 \mathrm{Control}_{it} + \text{Year effects} + \text{Industry effects} + \varepsilon_{it} \quad (4)$$

In regression model 4, we set the dummy variables, which define a moderate use of trade payables and bank credit (MTBC) and standardised products (stanprod) as the base cases. Therefore, the effects of the interactions of aggressive use of trade payables and aggressive use of bank credit with services and differentiated products on operating performance are compared with the interaction effect of moderate use of trade payables and bank credit and standardised products (base cases) on operating performance.

To answer hypothesis 3, which examines how firm size influences the operating performance from aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit, we run the following regression model below:

$$\mathrm{ROS}_{it} = \beta_0 + \beta_1 \mathrm{ATC}_{it} + \beta_2 \mathrm{ABC}_{it} + \beta_3 \mathrm{ATC}_{it} * \mathrm{Size}_{it} + \beta_4 \mathrm{ABC}_{it} * \mathrm{Size}_{it} + \beta_5 \mathrm{Control}_{it} + \text{Year effects} + \text{Industry effects} + \varepsilon_{it} \quad (5)$$

In regression model 5, we set the dummy variables, which define a moderate use of trade payables and bank credit (MTBC) and medium firms as the base cases. Therefore, the effects of the interactions of aggressive use of trade payables and aggressive use of bank credit with large firms and small firms on operating performance are compared with the interaction effect of moderate use of trade payables and bank credit with medium firms (base cases) on operating performance.

In regression models (3) to (5), ATC represents aggressive use of trade payables, ABC represents aggressive use of bank credit, MTBC represents moderate use of trade payables and bank credit, Diffprod represents differentiated products, services represent service firms, Size represents the logarithm of total sales revenue. Following similar previous studies (Abdulla et al., 2017; Abdulla et al., 2020; Afrifa et al., 2018; McGuinness and Hogan, 2016; McGuinness

et al., 2018) control represents the control variables including firm age, sales growth, cash holding, firm size, leverage, research and development (R&D) and trade receivables (TREC). The definitions of all the variables are presented in Table 1.

[TABLE 1 HERE]

4. Empirical Analyses

4.1. Summary statistics and univariate analysis

Table 2 presents the summary statistics results, which show that, on average, the firms in the sample are about 5.16% profitable. This is similar to the 5.01% reported by Aktas et al. (2015). The mean raw trade payables and bank credit are 15.05% and 7.49%, respectively. These values are comparable to those described by Abdulla et al. (2017). Regarding the separation of the sample into the three categories, aggressive use of trade payables represents 15.71%, aggressive use of bank credit represents 12.73%, whereas moderate use of trade payables and bank credit presents 71.56%. Thus, most firms in our sample use trade payables and bank credit as complements, consistent with previous studies (see, Demirgüç-Kunt and Maksimovic, 2001; Giannetti et al., 2011). This also supports the findings in the literature that although firms prefer bank credit, most of them rely on trade payables (Engemann et al., 2014) because they have restricted access to bank credit. In terms of the nature of products, the percentages are as follows: standardised products are 53.33%, services are 24.57% and differentiated products are 21.10%. Regarding firm size, the average logarithm of total sales revenue is 9.48. The summary statistics of the control variables are similar to past studies. The average firm is approximately 23.15 years old. Sales growth is, on average, 9.35%. The average firm's cash holding is 16.49%. The natural log of the total assets of the average firm is approximately 10.34. The R&D of the average firm is 2.75%, whereas the trade receivable of the average firm is 19.40%.

[TABLE 2 HERE]

The univariate analysis results, which show firms' characteristics separately for the three categories, are presented in Table 3. The results show that the category with the highest profitability is the aggressive use of bank credit (9.30%), followed by moderate use of trade payables and bank credit (5.14%). The aggressive use of trade payables has the least operating performance with (1.91%). These preliminary results confirm the relative higher performance effect of bank credit than trade payables (Du et al., 2012). The ANOVA test of mean difference shows significant results for all the variables except sales growth.

[TABLE 3 HERE]

4.2. Pearson correlation matrix

The Pearson correlation matrix results are displayed in Table 4. The results show a statistically significant and positive but insignificant correlation between ROS and trade payables (β= 0.0015) and a positive and significant correlation between ROS and bank credit (β= 0.1894). The rest of the correlations between variables are all below the threshold stated by Field (2005). To further check for possible multicollinearity, we also performed the Variant Inflation Factor (VIF). The results showed no sign of multicollinearity as it ranges from 1.00 to 1.06 with a mean of 1.03 (results not shown).

[TABLE 4 HERE]

4.3. Multivariate regression results and discussion

4.3.1. The aggressive and moderate use of trade payables and bank credit effect on firm operating performance

Table 5 reports the baseline results, which examine the operating performance effect from aggressive use of trade payables and aggressive use of bank credit in comparison with moderate

use of trade payables and bank credit. The results from running Equation (3), which compares the operating performance of aggressive use of trade payables and aggressive use of bank credit with the base case (moderate use of trade payables and bank credit) are displayed in column (1). The findings show a negative and statistically significant coefficient of aggressive use of trade payables (β= −0.0386) at the 1% level and a positive and statistically significant coefficient of aggressive use of bank credit (β= 0.0233) at the 1% level. The coefficients show that comparatively, aggressive use of trade payables achieves lower operating performance than moderate use of trade payables and bank credit, whereas aggressive use of bank credit achieves higher operating performance than moderate use of trade payables and bank credit. Specifically, the operating performance effect from aggressive use of trade payables is 3.86% lower than moderate use of trade payables and bank credit. In contrast, the operating performance effect from aggressive use of bank credit is 2.33% higher than moderate use of trade payables and bank credit. This is consistent with the hypothesis (1) and shows that, in comparison, aggressive use of bank credit achieves the highest operating performance, followed by moderate use of trade payables and bank credit and then aggressive use of trade payables. These results cast more light on the operating performance effect from aggressive and moderate use of trade payables and bank credit. The results document new findings, which show that firm operating performance is an increasing function of aggressive use of bank credit. Our findings support previous studies that show that bank credit is valuable than trade payables (Du et al., 2012; Hill et al., 2012; Afrifa et al., 2018).

Previous studies show that firms follow the pecking order in assessing short-term credit by first seeking the maximum bank credit available before resorting to trade payables as a supplement (Chen et al., 2019). Therefore, our finding lends support to the pecking order in assessing short-term credit and explains the economic rationale of why firms first seek the maximum available bank credit before turning to trade payables. The plausible reason for the above result may be that bank credit is on average cheaper than trade payables (Yang, 2011; Afrifa et al., 2018) which allows the pursuit of aggressive use of bank credit to have a lower cost of inputs of production and operations. Another possible reason may be that, on average, bank credit is offered for a much longer period than trade payables (Burkart and Ellingsen, 2004) and therefore improves firms' liquidity position (Garcia-Appendini and Montoriol-Garriga, 2013).

To further expatiate on the results in column 1, we now turn our attention to comparing the operating performance of each category against the other two at a time in separate regressions (columns 2 to 4). The results in column (2) display a negative and statistically significant coefficient of aggressive use of trade payables (β= −0.0449) at the 1% level. Specifically, the results show that aggressive use of trade payables has, on average, 4.49% lower operating performance compared with both the aggressive use of bank credit and moderate use of trade payables and bank credit. The results in column (3) show that the coefficient of aggressive use of bank credit is statistically significant and positive at the 1% level (β= 0.0370). Specifically, the results indicate that the operating performance of aggressive use of bank credit is, on average, 3.70% higher than both aggressive use of trade payables and moderate use of trade payables and bank credit. The results in column (4) show a statistically significant and positive coefficient of moderate use of trade payables and bank credit (β= 0.0138) at the 1% level. This indicates that the moderate use of trade payables and bank credit have, on average, 1.38% higher operating performance of both aggressive use of trade payables and aggressive use of bank credit. Overall, the results in columns (2) to (4) are consistent with the results contained in column (1) because the coefficient of aggressive use of bank credit is the highest, followed by moderate use of trade payables and bank credit and then aggressive use of trade payables.

Concerning the control variables, the results show that firm age, cash holding, R&D and trade receivables are all positive and statistically significant with firm operating performance in all columns, except that the coefficient of firm age is not statistically significant in columns (1) and (3). On the other hand, firm size is statistically significant and negatively related to operating performance at the 1% level in all columns. However, sales growth and leverage are not statistically significant in any of the columns.

[TABLE 5 HERE]

4.2 Regression results conditional on the nature of products

The results from running Equation (4), which examines the effects of aggressive and moderate use of trade payables and bank credit on firms operating performance, conditional on the nature of products classification are displayed in columns (1) to (4) of Table 6. In column (1), the MTBC and standardised products are used as the base cases. Thus, the effects of the interactions of aggressive use of trade payables and aggressive use of bank credit with services and differentiated products on operating performance are compared with the interaction effect of moderate use of trade payables and bank credit and standardised products (base cases) on operating performance.

The interaction variable of moderate use of trade payables and bank credit and standardised products is used as the base case. Therefore, we first compare the operating performance effect of moderate use of trade payables and bank credit interactions with services and differentiated products and moderate use of trade payables and bank credit interaction with standardised products. The results in column (1) show that the coefficient of services is negative and statistically significant at the 1% level (β= −0.0116). For differentiated products, the coefficient is positive and statistically significant at the 1% level (β= 0.0471). Judging from the coefficients of services and differentiated products, in comparison with standardised products (base case), the results show that moderate use of trade payables and bank credit interaction with differentiated products enjoy a higher operating performance, followed by standardised products then services.

We next examine how the different product types affect the operating performance of aggressive use of trade payables. The results in column (1) show that the coefficient of aggressive use of trade payables (β= −0.0305), which represents the base case (standardised products) is statistically significant and negative at the 1% level. The results also show that the operating performance effect of aggressive use of trade payables interaction with services, captured by the coefficient of the interaction term ATC * Services (β= −0.0182), plus the coefficient of the stand-alone ATC (β= −0.0305) and the coefficient of stand-alone Services (β= −0.0116) = −0.0603, is statistically significant and negative. Furthermore, the results of the operating performance effect of aggressive trade payables interaction with differentiated products, captured by the sum of the coefficient of the interaction term ATC * Differentiated (β= −0.0156), the coefficient of the stand-alone ATC (β= −0.0305) and the coefficient of the stand-alone Differentiated (β= 0.0471) = 0.0010, is statistically significant and positive. Therefore, the results show that aggressive use of trade payables interaction with differentiated products achieves the highest operating performance, followed by the aggressive use of trade payables interaction with standardised products and then aggressive use of trade payables interaction with services.

Third, we examine how the different product types affect the operating performance of aggressive use of bank credit. The results in column (1) show that the coefficient of ABC (β= 0.0058), which represents the base case (standardised products) is statistically significant and positive at the 5% level. The results in column (1) show that the operating performance effect of aggressive use of bank credit interaction with services, obtained from the sum of the coefficients of the interaction term ABC * Services (β= 0.0077), plus the stand-alone ABC (β=

0.0058) and the stand-alone services (β= −0.0116) = 0.0019, is statistically significant and positive. Alternatively, the results of the operating performance effect of aggressive use of bank credit interaction with differentiated products, taken from adding up the coefficients of the interaction term ABC * Differentiated (β= 0.0189), the coefficient of the stand-alone ABC (β= 0.0058) and the coefficient of the stand-alone Differentiated (β= 0.0471) = 0.0718, is statistically significant and positive. Therefore, the results show that aggressive use of bank credit interaction with differentiated products achieves the highest operating performance, followed by the aggressive use of bank credit interaction with services and then aggressive use of bank credit interaction with standardised products.

In columns (2) to (4), we evaluate separately the operating performance effects of aggressive use of trade payables, aggressive use of bank credit and moderation use of trade payables and bank credit interactions with services and differentiated products, respectively (using standardised products as the base case). The results in column (2) show that the operating performance of aggressive use of trade payables interaction with services, captured by the sum of the coefficients of the interaction term ATC * Services (β= −0.0224), stand-alone ATC (β= −0.0346) and stand-alone Services (β= −0.0092) = −0.0662, is negative and statistically significant. For aggressive use of trade payables interaction with differentiated products, the effect on operating performance, captured by the sum of the coefficients of the interaction term ATC * Differentiated (β= −0.0196), stand-alone ATC (β= −0.0346) and stand-alone Differentiated (β= 0.0496) = 0.0046, is positive and statistically significant. This is consistent with the results in column (1) which show that firms dealing in differentiated products have a higher operating performance from aggressive use of trade payables than firms dealing in services and standardised products.

The results in column (3) show that the operating performance of aggressive use of bank credit interaction with services, captured by the sum of the coefficients of the interaction term ABC * Services (β= 0.0137), stand-alone ABC (β= 0.0134) and stand-alone Services (β= −0.0174) = 0.0097, is positive and statistically significant. For aggressive use of bank credit interaction with differentiated products, the effect on operating performance, captured by the sum of the coefficients of the interaction term ABC*Differentiated (β= 0.0295), stand-alone ABC (β= 0.0134) and stand-alone Differentiated (β= 0.0414) = 0.0843, is positive and statistically significant. This is consistent with the results in column (1) which show that firms dealing in differentiated products have a higher operating performance from aggressive use of bank credit than firms dealing in services and standardised products.

The results in column (4) show that the operating performance of moderate use of trade payables and bank credit interaction with services, captured by the sum of the coefficients of the interaction term MTBC*Services (β= 0.0030), stand-alone MTBC (β= 0.0043) and stand-alone Services (β= −0.0163) = −0009, is negative and statistically significant. For moderate use of trade payables and bank credit interaction with differentiated products, the effect on operating performance, captured by the sum of the coefficients of the interaction term MTBC* Differentiated (β= 0.0121), stand-alone MTBC (β= 0.0043) and stand-alone Differentiated (β= 0.0431) = 0.0595, is positive and statistically significant. This is consistent with the results in column (1) which show that firms dealing in differentiated products have a higher operating performance from moderate use of trade payables and bank credit than firms dealing in services and standardised products. The coefficients of the control variables in all columns are broadly similar to the results presented in Table 5.

[TABLE 6 HERE]

4.3 Regression results conditional on firm size classification

The results from running Equation (5), which examines the effects of aggressive and moderate use of trade payables and bank credit on firms operating performance, conditional on size are

displayed in columns (1) to (4) of Table 7. In column (1), moderate use of trade payables and bank credit interaction with size is used as the base case. Thus, the effects of the aggressive use of trade payables and aggressive use of bank credit interactions with size on operating performance are compared with the operating performance effect of moderate use of trade payables and bank credit interaction with size (base case).

The interaction of moderate use of trade payables and bank credit with size is used as the base case. The results also show that the operating performance effect of aggressive use of trade payables interaction with large firms, captured by the coefficient of the interaction term ATC *size (β= −0.0070), plus the coefficient of the stand-alone ATC (β= −0.0300) and the coefficient of stand-alone size (β= −0.0217) = −0.0587, is statistically significant and negative. Therefore, the results show that aggressive use of trade payables effect on operating performance is negatively related with size.

Next, we examine how size affect the operating performance of aggressive use of bank credit. The results also show that the operating performance effect of aggressive use of bank credit interaction with size, obtained from the sum of the coefficients of the interaction term ABC*size (β= −0.0221), plus the stand-alone ABC (β= 0.0284) and the stand-alone size (β= −0.0217) = −0.0154, is statistically significant and negative. Therefore, these show that aggressive use of bank credit effect on operating performance on operating performance is negatively related with size.

In columns (2) to (4), we evaluate the operating performance effect of the interactions of aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit with size, separately. In column (2), the operating performance of aggressive use of trade payables interaction with size, captured by the sum of the coefficients of the interaction term ATC *size (β= −0.0014), stand-alone ATC (β= −0.0313) and stand-alone size (β= −0.0267) = −0.0594, is negative and statistically significant. The results in column (3) show that the operating performance of aggressive use of bank credit interaction with size, captured by the sum of the coefficients of the interaction term ABC*size (β= −0.0214), stand-alone ABC (β= 0.0343) and stand-alone size (β= −0.0204) = −0.0075, is negative and statistically significant. The results in column (4) show that the operating performance of moderate use of trade payables and bank credit interaction with size, captured by the sum of the coefficients of the interaction term MTBC*size (β= −0.0239), stand-alone MTBC (β= 0.0081) and stand-alone size (β= −0.0078) = −0.0236, is negative and statistically significant. The results in columns (2) to (4) are consistent with the results in column (1) which show that the aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit effect on operating performance is negatively related with size. The control variables in all columns are broadly similar to those presented in Table 5.

[TABLE 7 HERE]

5 Further analysis

5.1 Regression results conditional on market power

Previous studies have shown that firms with strong bargaining power are able to access finance easily and cheaply (Campello et al., 2011; Saunders and Steffen et al., 2011; Abdulla et al., 2017). This is because such firms have higher sales volumes (Abdulla et al., 2017) and therefore greater market share (Hill et al., 2012). Consistent with the market power explanation, Klapper et al. (2012) postulate that larger firms are offered generous trade payables terms by their smaller suppliers. Thus, our results reported so far may be affected by the bargaining power of the firms. Therefore, this section examines whether firms' market power influences how trade payables and bank credit use affect firm performance.

Following Hill et al. (2012), we use the firm's sales revenue relative to the industry sales revenue as a proxy for market power. We then develop dummy variables and categorise

the firms into high market power (Hmktpower) and low market power (Lmktpower) by using the 75th quartile as the cut-off point. More specifically, the dummy variable – Hmktpower is equal to one for firms with sales revenue to industry sales revenue above the 75th quartile and zero otherwise. On the other hand, the dummy variable – Lmktpower is equal to one for firms with sales revenue to industry sales revenue below the 75th quartile and zero otherwise. The results are contained in Table 8 and show that firms with higher market power can enjoy the higher performance from aggressive and moderate use of trade payables and bank credit. These findings are consistent with previous studies and demonstrate the market power influence of trade payables and bank credit use on performance.

[TABLE 8 HERE]

*5.2 Regression results conditional on **cash holding***

Firms that are more financially stable are seen by banks and trade suppliers as creditworthy (Fidrmuc and Hainz, 2013) because they are less likely to default payment (Degryse et al., 2018). As such financially stable firms may be able to access short-term credit at an affordable cost. This is expected to allow financially stable firms to enjoy a higher performance from bank credit and trade payables use. For example, Yang (2011) suggests that financially weak firms pay costly external finance premiums on bank loans. Thus, our results reported so far may be affected by the differences in the cash holding of the firms in our sample. Therefore, this section examines whether firms' level of cash holding influences how trade payables and bank credit use affect firm performance.

We follow Baños-Caballero et al., (2014) and use the level of cash holdings a proxy for financial stability. Cash holding is defined as cash and cash equivalent, scaled by total assets. Table 9 presents the results which show that firms with higher operating cash flows are able to enjoy a higher performance from aggressive and moderate use of trade payables and bank credit. These findings support previous studies and indicate that financially stable firms are able to access short-term finance cheaper.

[TABLE 9 HERE]

6 Robustness Test

6.1 Results based on the propensity score matching technique

So far, the results in Table 5 show that aggressive use of bank credit achieves higher operating performance followed by moderate use of trade payables and bank credit and then aggressive use of trade payables. However, the results could be influenced by differences in the individual firm characteristics of these three categories. This is true for the univariate analysis in Table 3, which displays statistically significant variations in firm characteristics between the three categories (based on the ANOVA test). Therefore, we test the robustness of our main results reported in Table 5 to differences in firms' individual characteristics by use of a propensity score matching technique. This technique matches firms known, observed characteristics based on all the control variables used in this paper.

The propensity scores come from running an ordinal logistic regression with the dummy variable equal to zero for moderate use of trade payables and bank credit, one for aggressive use of bank credit and two for aggressive use of trade payables as the dependent variable. Ordinal logistic regression is the appropriate model for the propensity score matching because we have three categories (see, Wood, 2006). We have fewer observations for aggressive bank credit use than moderate use of trade payables and bank credit and aggressive trade payables. Therefore, the aggressive bank credit use observations are considered as the treated group, which are matched with observations of moderate use of trade payables and bank credit and aggressive trade payables. The propensity score matching method we choose is the one-to-one pairing to the nearest neighbourhood with no replacement. The pairing is based on

all the control variables used in the equations. The post-match diagnostic regression, matching process and estimation and the test of difference between the case and control groups results are presented in Table 10. The results based on the propensity score-matched sample which are presented in panel A are qualitatively comparable to the ones reported in Table 5. The results in columns (1) show that aggressive use of trade payables (β= −0.0366) achieves lower operating performance than moderate use of trade payables and bank credit. In contrast, aggressive use of bank credit (β= 0.0255) achieves higher operating performance than moderate use of trade payables and bank credit. The results presented in column (2) for aggressive use of trade payables (β= −0.0506), column (3) for aggressive use of bank credit (β= 0.0494) and column (4) for moderate use of trade and bank credit (β= 0.0118) also confirm the results in column (1). These findings, therefore, support the previous findings and show that aggressive use of bank credit achieves higher operating performance than moderate use of trade and bank credit and aggressive use of trade payables, even for firms with similar individual characteristics.

Panel B of Table 10 reports the difference for each variable between the treated sample (ABC) and the matched control sample (ATC & MTBC). As indicated by the t-stat values, non of the differences in the variables are statistically significant. Overall, the results show that the diagnostic test from the propensity score matching has successfully removed all observarable differences between the characteristics of the treated and matched control samples other than the outcome variable - ROS. Thus, the results increases the likelihood that any difference in ROS is due to the differences in ATC and ABC and MTBC.

Finally, Panel C of Table 10 reports the propensity score matching estimate. The results indicate that there is a significant differences at the 1% level in ROS between ABC on one hand and ATC and MTBC on the other hand.

[TABLE 10 HERE]

6.2 Alternative measures of trade payables and short-term bank credit

Some past studies have used the cost of sales (Wu et al., 2012; Afrifa et al., 2018) and current liabilities (McGuinness and Hogan, 2016) to deflate trade payables and bank credit, respectively. Therefore, we examine the sensitivity of our main results in Table 5 to alternative measures of trade payables and bank credit. We employ the same methodology as before by calculating the industry adjusted trade payables and industry adjusted bank credit and following the steps detailed in sections 3.2 and 3.3 above. The results of using the cost of sales and current liabilities as trade payables and bank credit deflators are presented in Table 11. Overall, the results are qualitatively the same as the main findings in Table 5. Thus, our main findings are not sensitive to trade payables and bank credit alternative measurements.

[TABLE 11 HERE]

6.3 Return on assets as the dependent variable

Some papers have also used the return on assets (ROA) instead of ROS as the dependent variable (Aktas et al., 2015; Goto et al., 2015; Li et al., 2016; Afrifa et al., 2018). Therefore, we re-run Equation (3) to examine the robustness of the baseline results in Table 5 to a variation in the definition of the key dependent variable. The results presented in Table 12 are qualitative the same as the main results in Table 5. The results confirm the lower operating performance of aggressive use of trade payables (β= −0.0336) than moderate use of trade payables and bank credit, and higher operating performance of aggressive use of bank credit (β= 0.0264) than moderate use of trade payables and bank credit. The results presented in column (2) for aggressive use of trade payables (β= −0.0423), column (3) for aggressive use of bank credit (β= 0.0419) and column (4) for moderate use of trade payables and bank credit (β= 0.0118)

also confirm the results in column (1). These indicate that our results are robust to a different definition of firm operating performance.

[TABLE 12 HERE]

6.4 Return on equity as the dependent variable (ROE)

In this section, we use the return on equity (ROE) as an alternative measure of firm operating performance. This is important because the use of bank credit is expected to boost ROE, as ROE can be defined as ROA multiplied by financial leverage. Therefore, we re-run Equation (3) to and report the results in Table 13. The results contained in column (1) of Table 13 are similar to the main results in Table 5. According to the results, aggressive use of bank credit (β= 0.0296) achieves higher ROE than moderate use of trade payables and bank credit; whereas aggressive use of trade payables (β= −0.0387) achieves lower ROE than moderate use of trade payables and bank credit. Similarly, the results in columns (2)-(4) show that aggressive bank credit (β= 0.0455) achieves the highest ROE, followed by moderate trade payables and bank credit (β= 0.0126) and then aggressive use of trade payables (β= −0.0476). These results indicate that our results are robust to a different definition of firm operating performance.

[TABLE 13 HERE]

6.5 Survivorship bias regression

There is a concern that firms unable to obtain short-term finance (either trade payables or bank credit) drop out and therefore lack complete data (Afrifa et al., 2019). This is important in our case because access to finance has been noted as crucial to firm survival and performance (Carvalhal and Nobili, 2011; Carbo-Valverde et al., 2016). Studies have tried to reduce the influence of survivorship bias by including all firms within the sample period (Goto et al., 2015; Afrifa et al., 2018). As a result, we have included all firms within our sample period (and hence unbalanced panel); however, including all firms within the sample period may cause the outcome to be influenced by firms with complete data (those that have survived). Therefore, we follow the procedure by Schaeck and Cihák (2012) and test the effect of survivorship bias by limiting the sample to firms without full data over the sample period. The results, which are presented in Table 14, confirm the lower operating performance of aggressive use of trade payables (β= −0.0385) than moderate use of trade payables and bank credit, and higher operating performance of aggressive use of bank credit (β= 0.0230) than moderate use of trade payables and bank credit. The results displayed in column (2) for aggressive use of trade payables (β= −0.0437), column (3) for aggressive use of bank credit (β= 0.0340) and column (4) for moderate use of trade payables and bank credit (β= 0.0124) also confirm the results in column (1). Thus, the results indicate that survivorship bias does not influence our main results reported in Table 5.

[TABLE 14 HERE]

6.6 Endogeneity

In this section, we try to account for the three main endogeneity concerns. First, the issue of omitted variable bias may prevail if some important control variables are not included in our Equations (3) to (5) due to data unavailability (Wooldridge, 2002). Second, there could also be the issue of a correlation between the error term and a regressor. This could be the case if trade payables and bank credit are endogenous instead of exogenous. Third, the endogeneity issue of simultaneity may exist. This is where trade payables and bank credit are concurrently determined by operating performance. This is because more profitable firms are considered by banks as worthwhile (Baños-Caballero et al., 2010), which will allow them to increase their access to bank credit and therefore reduce their dependence on trade payables. Therefore, we tackle endogeneity in two ways: First, we conduct the two-stage least squares (2SLS) technique. Second, we implement the Oster test of endogeneity, which is new and more novel.

5.6.1 Two-Stage Least Squares (2SLS) Estimation

We first identify an appropriate instrument for the 2SLS regression. An appropriate instrument is highly correlated with the independent variables (Afrifa et al., 2019). Raw material inventory holding is anticipated to be highly associated with both trade payables and bank credit (Petersen and Rajan, 1994; Abdulla et al., 2017). This is because firms use trade payables and bank credit to finance raw material inventory (Yang, 2011; Goto et al., 2015). When it comes to raw material inventory financing, firms have the option of either buying on credit or making an immediate payment (Goto et al., 2015). Whereas the buying on credit will increase trade payables (Hill et al., 2010), paying for raw material inventory may require bank credit (Petersen and Rajan, 1997). Several studies have shown that firms switch between trade payables and bank credit for inventory financing (Yang, 2011; Atanasova, 2012). According to Caglayan et al. (2012), firms increase their inventory when they buy from suppliers on credit. In fact, over 80% of the merchandise in the UK is financed by suppliers' credit (Peel et al. 2000). Moreover, Mateut et al. (2015) found that non-quoted stock exchange firms depend on bank credit as an avenue of inventory financing. Accordingly, Carpenter et al. (1994) argue that inventory holding is more sensitive to trade payables and bank credit. Therefore, we employ raw material inventory as an instrument for trade payables and bank credit.

To start with, we perform the Durbin-Wu-Hausman (DHW) test to determine whether the use of raw material inventory as an instrument in the 2SLS is appropriate. The DHW results reported in all the columns of Table 15 indicate the presence of endogeneity and therefore justify the use of 2SLS and the validity of the use of raw material inventory as the instrumental variable.

We observe that raw material inventory has a statistically significant and highly positive correlation with trade payables and bank credit (not reported). Therefore, we run the 2SLS using raw material inventory as an instrument for trade payables and bank credit. We present the second stage regressions only for brevity purposes. In the first stage, we replace aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit with raw material inventory and make aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit the dependent variables in Equation (3), separately. We then predict the values for aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit and use them as the key independent variables in Equation (3). The second stage results of the 2SLS are displayed in Table 15. The results in column (1) show a statistically significant and negative coefficient of aggressive use of trade payables (β= –0.0343) and a statistically significant and positive coefficient of aggressive use of bank credit (β= 0.0475). The coefficients show that aggressive use of trade payables achieves lower operating performance than moderate use of trade payables and bank credit. In contrast, aggressive use of bank credit achieves higher operating performance than moderate use of trade payables and bank credit. Similarly, the results in columns (2) to (4) confirm the higher operating performance effects of aggressive use of bank credit than moderate use of trade payables and bank and aggressive use of trade payables reported in column (1). The results imply that firm operating performance is still an increasing function of access to bank credit even after controlling for endogeneity, using 2SLS.

[TABLE 15 HERE]

5.6.2 Oster test of endogeneity

This section addresses the endogeneity concern of omitted variable bias using a more novel and important technique developed by Oster (2019). This test is a sensitive-type technique that determines how the coefficients of the key variables are affected by the omission of both time-variant and time-invariant unobserved variables (Afrifa et al., 2019; Oster, 2019). The test is

necessary since the exclusion of important control variables may weaken the coefficients of the main results reported in Table 5 (Wang and Yin, 2018). Therefore, we examine the possible consequence of the presence of omitted control variables by testing the stability of the coefficients of the key variables of interest centred on the two core assumptions of the Oster test. The first assumption is that both the omitted and observed control variables have the same equal importance. The second assumption is that the R-squared of the key regressions can be increased by 1.3 times by including the omitted control variables. Thus, the Oster (2019) test enables the determination of the extent to which unobserved control variables make the coefficients reported in Table 5 superfluous.

Following Oster (2019) and Afrifa et al. (2019), we investigate if the results displayed in Table 5 are affected by the possible omission of key control variables. The results are displayed in Table 16. The coefficients of the key variables in Table 5 are displayed in column (1). The 95% confidence intervals of the coefficients of key variables are displayed in column (2). Column (3) presents the R-squared of variables of interest in Table 5. Column (4) contains the recognised set of bounds of the coefficients for the monitored set (reported in Table 5) and the full set (together with the omitted variables). The tests of movement in the coefficients of the key variables are displayed in column (5). Column (6) estimates if the coefficients of the key variables are inside the 95% confidence intervals. Specifically, the results in column (5) show that the coefficients of the independent variables all shift away from zero. Also, the results presented in column (6) indicate that the coefficients of the key variables are all inside the 95% intervals. Overall, the results contained in Table 16 suggest that the main results displayed in Table 5 are unaffected by omitted variables bias.

[TABLE 16 HERE]

6 Conclusion

We examine the operating performance effect from aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit. Specifically, the first question we address is whether the operating performance is higher for aggressive use of trade payables, aggressive use of bank credit, or moderate use of trade payables. To this end, we concentrate on a sample of UK non-financial firms from 2009 and 2021. Precisely, we discover that aggressive use of bank credit achieves the highest operating performance, followed by moderate use of trade payables and bank credit and then aggressive use of trade payables and bank credit. Gauging the operating performance differences of aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit differentiates this paper from previous studies. The findings also add to the literature on working capital management as firms finance their inventory and credit to customers with trade payables and bank credit. The significant result of this paper is that bank credit is value-enhancing than trade payables, which indicates that firms should first seek bank credit before turning to trade payables.

The second question we address is how the nature of products and firm size influence the effects of aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit on operating performance. Further results indicate that the operating performance from aggressive use of trade payables, aggressive use of bank credit and moderate use of trade payables and bank credit is higher for differentiated products and firm size. These results suggest that the nature of products and firm size affect trade payables and bank credit operating performance. The outcomes have important suggestions for corporate strategy.

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Appendix 1. Nature of products classification using the UK SIC 2003 codes

Nature of product	Standardised products	Services	Differentiated products
Industry classification according to UK SIC 2003 code	1, 2, 7, 8-10, 12-17, 20-24, 26, 28, 29, 31, 33, 40, 43, 46, 58, 60, 62, 63,	41, 42, 44, 45, 47-57, 59, 61, 65, 73, 75, 78 and 79	25, 27, 30, 32 and 34-39

64, 67, 70, 72, 76, 80, 81-84, 86-89,
91-97 and 99

Table 1. Variable definitions

Variable	Definition
Return on assets (ROS)	Operating income before depreciation divided by total sales revenue
Trade payables	Trade payables scaled by total assets
Short term bank credit	Short term debt scaled by total assets
Industry adjusted trade payables (IndAdjTC)	Trade payables minus industry average trade payables
Industry adjusted short-term bank credit (IndAdjBC)	Short-term bank credit minus industry average short-term bank credit
Aggressive use of trade payables (ATC)	A dummy variable equal to one for firms with trade payables use above the 75 percentile and bank credit use below the 25 percentile within the industry and zero otherwise
Aggressive use of bank credit (ABC)	A dummy variable equal to one for firms with bank credit use above the 75 percentile and trade payables use below the 25 percentile within the industry and zero otherwise
Moderate use of trade payables and bank bank credit (MTBC)	A dummy variable equal to one if the firm is neither an aggressive use of trade payables nor aggressive use of bank credit and zero otherwise.
Standardised products	An indicator variable equal to one if the firm produces standard products, and zero otherwise.
Services	An indicator variable equal to one if the firm is a service provider, and zero otherwise.
Differentiated products	An indicator variable equal to one if the firm produces differentiated products, and zero otherwise.
Market power (mktpower)	Calculated as annual firm sales divided by annual industry sales.
High market power (Hmktpower)	An indicator variable equal to one if the firm's sales market share is above the 75^{th} quartile and zero otherwise.
Low market power (Lmktpower)	An indicator variable equal to one if the firm's sales market share is in below the 75^{th} quartil and zero otherwise.
Firm age	Number of years between incorporation and the calendar year end of each firm
Annual sales growth	One-year growth rate of sales at time t-1: (SALEt-SALEt-1)/SALEt-1
Cash holding	Cash and cash equivalent, scaled by total assets.
Firm size	Total assets of firms
Financial leverage	Total long-term debt, scaled by total assets
Research and Development (R&D)	Research and development expenditure to total assets
Trade receivables	Trade receivables scaled by total assets

Table 2. Descriptive statistics

This table provides summary statistics on our sample firms. Variable definitions are provided in Table 1. N denotes the sample size.

Variable	N	Mean	S.D	p50	p10	p75	p95
ROA	244,870	0.0516	0.0953	0.0432	-0.0130	0.0060	0.0927
Trade payables	244,870	0.1505	0.0834	0.1365	0.0562	0.0882	0.1918
ST Bank credit	244,870	0.0749	0.0559	0.0539	0.0142	0.0300	0.1043
Trade payables$^{ind\ adj}$	244,870	0.0000	0.0420	-0.0063	-0.0429	-0.0219	0.0083
ST Bank credit$^{ind\ adj}$	244,870	0.0009	0.0386	0.0003	-0.0498	-0.0190	0.0213
ATC	244,870	0.1571	0.3639	0.0000	0.0000	0.0000	0.0000
ABC	244,870	0.1273	0.3333	0.0000	0.0000	0.0000	0.0000
MTBC	244,870	0.7156	0.4511	1.0000	0.0000	0.0000	1.0000
Stanprod	244,870	0.5333	0.4989	1.0000	0.0000	0.0000	1.0000
Services	244,870	0.2457	0.4305	0.0000	0.0000	0.0000	0.0000
Diffprod	244,870	0.2210	0.4149	0.0000	0.0000	0.0000	0.0000
Sales (log)	244,870	9.4836	0.8691	9.6502	8.3182	9.0096	10.0418
Hmktpower	244,870	0.2554	0.4361	0.0000	0.0000	0.0000	1.0000
Lmktpower	244,870	0.7446	0.4361	1.0000	0.0000	0.0000	1.0000
Age	244,870	23.1483	20.9248	16.4164	5.7014	9.4274	29.1370
Sale growth	165,180	0.0935	0.3457	0.0290	-0.0714	-0.0301	0.1952
Cash holding	244,870	0.1649	0.2217	0.0510	0.0000	0.0212	0.2549
Size (log)	244,870	10.3395	0.7620	10.5237	9.2990	9.9673	10.8936
Leverage	244,870	0.1639	0.1548	0.1195	0.0616	0.0872	0.1931
R&D	244,870	0.0275	0.0247	0.0268	0.0041	0.0160	0.0268
Trade receivables	244,870	0.1940	0.0843	0.1364	0.1080	0.1315	0.3003

Table 3. Sample characteristics based on trade payables and bank credit dependency.

This table compares the sample characteristics of ATC firms, ABC firms and MTBC firms. Variable definitions are provided in Table 1. N denotes the sample size.

	ATC firms		ABC firms		MTBC firms		ANOVA test of mean	
Variable	**mean**	**p50**	**Mean**	**p50**	**mean**	**p50**	**F–stat**	**P–value**
ROS	0.0191	0.0195	0.0930	0.0940	0.0514	0.0417	5404.52	0.0000
Firm age	23.9842	17.2521	23.8780	17.2274	22.8350	16.1069	69.33	0.0000
Sales growth	0.0917	0.0291	0.0903	0.0288	0.0945	0.0290	1.75	0.1733
Cash holding	0.1724	0.0649	0.1588	0.1014	0.1643	0.0496	34.58	0.0000
Firm size (log)	10.2064	10.3670	10.1600	10.3344	10.4006	10.6037	2047.85	0.0000
Leverage	0.1540	0.1164	0.1408	0.1162	0.1701	0.1213	572.30	0.0000
R&D	0.0256	0.0161	0.0268	0.0268	0.0281	0.0268	182.25	0.0000
Trade receivables	0.1855	0.1365	0.2159	0.1929	0.1920	0.1361	1311.63	0.0000

Table 4. Pearson correlation matrix

This Table presents the Pearson's correlation coefficients for the dependent and independent variables. Variable definitions are provided in Table 1. * indicates statistical significance at the 5%.

Variable	1	2	3	4	5	6	7	8	9
ROA	1								
Trade payables	0.0015	1							
Bank credit	0.1894*	0.3731*	1						
Firm age	0.0081*	0.0274*	0.0189*	1					
Sales growth	–0.0046	–0.0033	–0.0092*	0.0032	1				
Cash holding	–0.1200*	0.0497*	–0.0164*	–0.0082*	0.0134*	1			
Firm size (log)	–0.2201*	–0.0825*	0.0202*	–0.0334*	0.0090*	0.1306*	1		
Leverage	–0.0821*	–0.1249*	–0.1956*	–0.0590*	0.0142*	0.0779*	–0.0866*	1	
R&D	0.0587*	–0.0073*	–0.0523*	–0.0067*	0.0095*	0.0491*	–0.0885*	0.0685*	1
Trade receivable	0.2010*	0.1412*	0.1895*	–0.0336*	0.0021	0.1423*	0.0698*	–0.0747*	0.0129*

Table 5. Baseline regression

Trade payables and bank credit use effect on operating performance. The dependent variable in each specification is a measure of firm i's operating performance (ROA). Coefficients marked ∗, ∗∗ and ∗∗∗ are significant at the 10%, 5% and 1% level, respectively, and t-statistics are reported in parenthesis. Variable definitions are provided in Table 1. N denotes the sample size.

Variable	**1**	**2**	**3**	**4**
ATC	–0.0386***	–0.0449***		
	(–64.13)	(–81.74)		
ABC	0.0233***		0.0370***	
	(24.78)		(41.78)	
MTBC				0.0138***
				(21.35)
Firm age (log)	0.0005	0.0008**	0.0001	0.0006*
	(1.53)	(2.21)	(0.28)	(1.78)
Sales growth	0.0006	0.0006	0.0006	0.0007
	(0.91)	(0.92)	(0.93)	(0.95)
Cash holding	0.0042***	0.0041***	0.0048***	0.0046***
	(5.05)	(4.91)	(5.65)	(5.50)
Firm size (log)	–0.0258***	–0.0269***	–0.0230***	–0.0256***
	(–31.30)	(–32.72)	(–28.57)	(–31.23)
Leverage	–0.0128	–0.0138	–0.0086	–0.0110
	(–1.26)	(–1.35)	(–0.89)	(–1.10)
R&D	0.3742***	0.3719***	0.4084***	0.4033***
	(22.33)	(22.29)	(23.62)	(23.81)
Trade receivables	0.2033***	0.2099***	0.2155***	0.2299***
	(50.35)	(52.59)	(54.49)	(59.59)
Constant	0.2067***	0.2192***	0.1646***	0.1791***
	(18.05)	(19.08)	(14.91)	(16.05)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
R-squared	0.2080	0.2027	0.1883	0.1820
N	165180	165180	165180	165180

Table 6. Regression results conditional on nature of products classification

Trade payables and bank credit use effect on operating performance. The dependent variable in each specification is a measure of firm i's operating performance (ROA). Coefficients marked ∗, ∗∗ and ∗∗∗ are significant at the 10%, 5% and 1% level, respectively, and t-statistics are reported in parenthesis. Variable definitions are provided in Table 1. N denotes the sample size.

Variables	**1**	**2**	**3**	**4**
ATC	–0.0305***	–0.0346***		
	(–32.35)	(–40.87)		
ATC × Services	–0.0182***	–0.0224***		
	(–14.63)	(–21.12)		
ATC × Differentiated	–0.0156***	–0.0196***		
	(–14.24)	(–19.45)		
ABC	0.0058**		0.0134***	
	(2.23)		(5.63)	
ABC × Services	0.0077***		0.0137***	
	(4.93)		(9.24)	
ABC × Differentiated	0.0189***		0.0295***	
	(15.69)		(26.84)	
MTBC				0.0043**
				(2.57)
MTBC × Services				0.0030**
				(2.53)
MTBC × Differentiated				0.0121***
				(13.12)
Services	–0.0116***	–0.0092***	–0.0174***	–0.0163***
	(–8.37)	(–6.75)	(–13.15)	(–9.61)
Differentiated	0.0471***	0.0496***	0.0414***	0.0431***
	(29.86)	(32.14)	(26.81)	(27.20)
Firm age (log)	0.0005	0.0007**	0.0000	0.0006
	(1.35)	(1.99)	(0.12)	(1.59)
Sales growth	0.0007	0.0007	0.0007	0.0007
	(1.01)	(1.02)	(0.98)	(0.98)
Cash holding	0.0087***	0.0086***	0.0092***	0.0090***
	(11.00)	(10.83)	(11.27)	(11.13)
Firm size (log)	–0.0260***	–0.0271***	–0.0232***	–0.0258***
	(–31.63)	(–33.05)	(–28.80)	(–31.58)
Leverage	–0.0124	–0.0133	–0.0082	–0.0104
	(–1.22)	(–1.30)	(–0.84)	(–1.04)
R&D	0.3473***	0.3439***	0.3831***	0.3749***
	(20.85)	(20.74)	(22.24)	(22.20)
Trade receivables	0.1991***	0.2053***	0.2123***	0.2271***
	(49.26)	(51.53)	(53.47)	(58.78)
Constant	0.2133***	0.2257***	0.1707***	0.1879***
	(18.86)	(19.89)	(15.65)	(17.05)
Year FE	Yes	Yes	Yes	Yes
Industry FE	**Yes**	**Yes**	**Yes**	**Yes**
R-squared	0.2130	0.2078	0.1923	0.1857
N	165180	165180	165180	165180

Table 7. Regression results conditional on firm size classification

Trade payables and bank credit use effect on operating performance. The dependent variable in each specification is a measure of firm i's operating performance (ROA). Coefficients marked ∗, ∗∗ and ∗∗∗ are significant at the 10%, 5% and 1% level, respectively, and t-statistics are reported in parenthesis. Variable definitions are provided in Table 1. N denotes the sample size.

Variables	1	2	3	4
ATC	0.0300***	–0.0313***		
	(4.41)	(–5.84)		
ATC × Size (log)	–0.0070***	–0.0014***		
	(–10.33)	(–2.60)		
ABC	0.0284***		0.0343***	
	(11.22)		(12.37)	
ABC × Size (log)	–0.0221***		–0.0214***	
	(–9.77)		(–10.09)	
MTBC				0.0081***
				(25.57)
MTBC × Size (log)				–0.0239***
				(–23.93)
Firm age (log)	0.0005	0.0008**	0.0001	0.0007*
	(1.51)	(2.22)	(0.29)	(1.91)
Sales growth	0.0007	0.0006	0.0007	0.0007
	(0.97)	(0.91)	(1.04)	(0.99)
Cash holding	0.0040***	0.0041***	0.0046***	0.0047***
	(4.84)	(4.90)	(5.48)	(5.63)
Size (log)	–0.0217***	–0.0267***	–0.0204***	–0.0078***
	(–22.27)	(–30.88)	(–23.47)	(–7.44)
Leverage	–0.0118	–0.0138	–0.0081	–0.0108
	(–1.18)	(–1.35)	(–0.84)	(–1.08)
R&D	0.3749***	0.3712***	0.4122***	0.3579***
	(22.23)	(22.24)	(23.59)	(23.18)
Trade receivables	0.1999***	0.2096***	0.2143***	0.2194***
	(51.55)	(52.85)	(55.24)	(56.67)
Constant	0.1643***	0.2170***	0.1358***	–0.0006
	(12.83)	(18.45)	(11.59)	(–0.05)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
R-squared	0.2116	0.2029	0.1915	0.1893
N	165180	165180	165180	165180

Table 8. Results based on market power

Trade payables and bank credit use effect on operating performance. The dependent variable in each specification is a measure of firm i's operating performance (ROA). Coefficients marked ∗, ∗∗ and ∗∗∗ are significant at the 10%, 5% and 1% level, respectively, and t-statistics are reported in parenthesis. Variable definitions are provided in Table 1. N denotes the sample size.

Variables	1	2	3	4
ATC × Hmktpower	0.0138***	–0.0043*		
	(5.66)	(–1.80)		
ATC × Lmktpower	–0.0410***	–0.0473***		
	(–71.17)	(–90.96)		
ABC × Hmktpower	0.0599***		0.0711***	
	(69.48)		(95.43)	
ABC × Lmktpower	–0.0079***		0.0055***	
	(–5.11)		(3.67)	
MTBC × Hmktpower				0.0653***
				(50.03)
MTBC × Lmktpower				–0.0088***
				(–11.85)
Firm age (log)	0.0009**	0.0012***	0.0004	0.0008**
	(2.27)	(2.97)	(1.11)	(2.25)
Sales growth	0.0007	0.0007	0.0007	0.0007
	(0.99)	(0.97)	(1.06)	(0.99)
Cash holding	–0.0085***	–0.0095***	–0.0094***	–0.0067***
	(–10.64)	(–11.24)	(–11.42)	(–8.46)
Firm size (log)	–0.0189***	–0.0223***	–0.0174***	–0.0137***
	(–24.78)	(–29.22)	(–23.41)	(–17.97)
Leverage	–0.0147	–0.0164	–0.0106	–0.0107
	(–1.47)	(–1.61)	(–1.10)	(–1.17)
R&D	0.3353***	0.3336***	0.3740***	0.3007***
	(21.35)	(20.69)	(22.79)	(21.90)
Trade receivables	0.2149***	0.2345***	0.2306***	0.2044***
	(54.75)	(57.80)	(58.84)	(49.88)
Constant	0.1462***	0.1793***	0.1185***	0.0924***
	(13.60)	(16.58)	(11.42)	(9.28)
Year FE	Yes	Yes	Yes	Yes
Industry FE	**Yes**	**Yes**	**Yes**	**Yes**
R-squared	0.1807	0.1539	0.1569	0.2046
N	165180	165180	165180	165180

Table 9. Results based on cash holding

Trade payables and bank credit use effect on operating performance. The dependent variable in each specification is a measure of firm i's operating performance (ROA). Coefficients marked *, ** and *** are significant at the 10%, 5% and 1% level, respectively, and t-statistics are reported in parenthesis. Variable definitions are provided in Table 1. N denotes the sample size.

Variables	1	2	3	4
ATC	0.0271***	–0.0276***		
	(4.18)	(–5.10)		
ATC × Cash holding	0.0066***	0.0018***		
	(10.39)	(3.28)		
ABC	0.1949***		0.2080***	
	(10.65)		(11.96)	
ABC × Cash holding	0.0174***		0.0175***	
	(9.04)		(9.49)	
MTBC				0.1940***
				(25.62)
MTBC × Cash holding				0.0184***
				(23.14)
Firm age (log)	0.0006	0.0008**	0.0001	0.0007*
	(1.55)	(2.22)	(0.33)	(1.86)
Sales growth	0.0006	0.0006	0.0007	0.0007
	(0.94)	(0.91)	(1.01)	(1.01)
Cash holding	0.0041***	0.0041***	0.0047***	0.0046***
	(4.94)	(4.90)	(5.56)	(5.58)
Firm size (log)	–0.0224***	–0.0266***	–0.0209***	–0.0118***
	(–23.57)	(–30.80)	(–24.41)	(–11.71)
Leverage	–0.0118	–0.0137	–0.0080	–0.0112
	(–1.18)	(–1.35)	(–0.83)	(–1.12)
R&D	0.3743***	0.3709***	0.4116***	0.3719***
	(22.25)	(22.23)	(23.62)	(23.14)
Trade receivables	0.1998***	0.2095***	0.2141***	0.2235***
	(51.62)	(52.83)	(55.39)	(58.82)
Constant	0.1712***	0.2164***	0.1411***	0.0361***
	(13.60)	(18.40)	(12.16)	(2.83)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
R–squared	0.2113	0.2029	0.1912	0.1873
N	165180	165180	165180	165180

Table 10. Propensity score matching estimator

Propensity score–matched results of trade payables and bank credit use effect on operating performance. The dependent variable in each specification is a measure of firm i's operating performance (ROA). Coefficients marked ∗, ∗∗ and ∗∗∗ are significant at the 10%, 5% and 1% level, respectively, and t-statistics are reported in parenthesis. Variable definitions are provided in Table 1. N denotes the sample size.

Panel A: Aggressive and moderate use of trade payables and bank credit - post-match diagnostic regression

Variables	1	2	3	4
ATC	–0.0366***	–0.0506***		
	(–37.03)	(–69.00)		
ABC	0.0255***		0.0494***	
	(19.47)		(49.23)	
MTBC				0.0118***
				(11.63)
Firm age (log)	0.0008*	0.0010**	0.0006	0.0009*
	(1.83)	(2.13)	(1.25)	(1.85)
Sales growth	0.0015	0.0016	0.0013	0.0014
	(1.45)	(1.55)	(1.22)	(1.31)
Cash holding	0.0047***	0.0050***	0.0044**	0.0051***
	(2.76)	(2.87)	(2.55)	(2.99)
Firm size (log)	–0.0312***	–0.0323***	–0.0286***	–0.0304***
	(–31.97)	(–33.29)	(–29.90)	(–31.11)
Leverage	–0.0369**	–0.0366**	–0.0340**	–0.0319**
	(–2.54)	(–2.52)	(–2.33)	(–2.17)
R&D	0.3487***	0.3480***	0.3794***	0.4059***
	(11.93)	(11.95)	(12.64)	(13.89)
Trade receivables	0.1941***	0.2042***	0.2074***	0.2536***
	(28.92)	(31.18)	(30.81)	(42.45)
Constant	0.2755***	0.2953***	0.2212***	0.2284***
	(17.72)	(19.02)	(14.66)	(15.07)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
R-squared	0.3183	0.3069	0.2916	0.2444
N	68306	68306	68306	68306

Panel B: Differences in firm characteristics

	ABC	ATC & MTBC		
	N = 34,153	N = 34,153	Difference	t-stat
Firm age (log)	2.9271	2.9660	-0.0389	-0.87
Sales growth	0.0903	0.0909	-0.0006	0.41
Cash holding	0.1588	0.1771	-0.0184	-0.89
Firm size (log)	10.1600	10.1640	-0.0040	0.03
Leverage	0.1408	0.1409	-0.0001	0.40
R&D	0.0268	0.0261	0.0007	-0.01
Trade receivables	0.2159	0.2068	0.0091	-0.27

Panel C: Propensity score matching estimator

	ABC	ATC & MTBC

	N = 34,153	N = 34,153	Difference	t-stat
ROS	0.0930	0.0619	0.0311***	-12.17

Table 11. Alternative measures of trade payables and bank credit

Trade payables and bank credit use effect on operating performance augmented with a different measure of trade payables and bank credit. The dependent variable in each specification is a measure of firm i's operating performance (ROA). Coefficients marked ∗, ∗∗ and ∗∗∗ are significant at the 10%, 5% and 1% level, respectively, and t-statistics are reported in parenthesis. Variable definitions are provided in Table 1. N denotes the sample size.

Variables	**1**	**2**	**3**	**4**
ATC	–0.0077***	–0.0083***		
	(–11.74)	(–12.86)		
ABC	0.0039***		0.0050***	
	(3.02)		(3.94)	
MTBC				0.0018**
				(2.21)
Firm age (log)	0.0004	0.0004	0.0004	0.0004
	(1.19)	(1.20)	(1.14)	(1.16)
Sales growth	0.0007	0.0007	0.0007	0.0007
	(0.97)	(0.97)	(0.96)	(0.95)
Cash holding	0.0046***	0.0047***	0.0048***	0.0048***
	(5.48)	(5.52)	(5.64)	(5.69)
Firm size (log)	–0.0247***	–0.0247***	–0.0243***	–0.0244***
	(–30.61)	(–30.69)	(–30.39)	(–30.06)
Leverage	–0.0094	–0.0095	–0.0092	–0.0094
	(–0.95)	(–0.97)	(–0.94)	(–0.96)
R&D	0.4098***	0.4104***	0.4131***	0.4137***
	(23.91)	(23.94)	(24.05)	(24.10)
Trade receivables	0.2293***	0.2297***	0.2301***	0.2306***
	(59.37)	(59.51)	(59.82)	(60.02)
Constant	0.1813***	0.1816***	0.1758***	0.1750***
	(16.31)	(16.36)	(15.96)	(15.94)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
R-squared	0.1800	0.1799	0.1795	0.1795
N	165180	165180	165180	165180

Table 12. Alternative measure of dependent variable – return on assets (ROA)

Trade payables and bank credit use effect on operating performance. The dependent variable in each specification is a measure of firm i's return on sales (ROS). Coefficients marked ∗, ∗∗ and ∗∗∗ are significant at the 10%, 5% and 1% level, respectively, and t-statistics are reported in parenthesis. Variable definitions are provided in Table 1. N denotes the sample size.

Variables	**1**	**2**	**3**	**4**
ATC	–0.0336***	–0.0423***		
	(–6.54)	(–8.93)		
ABC	0.0264***		0.0419***	
	(5.40)		(9.29)	
MTBC				0.0118***
				(2.74)
Firm age (log)	–0.0015	–0.0012	–0.0019	–0.0014
	(–0.52)	(–0.42)	(–0.66)	(–0.48)
Sales growth	0.0055	0.0055	0.0055	0.0055
	(1.10)	(1.10)	(1.10)	(1.11)
Cash holding	0.0150**	0.0148**	0.0156**	0.0154**
	(2.07)	(2.05)	(2.15)	(2.13)
Firm size (log)	0.0299***	0.0288***	0.0326***	0.0308***
	(5.58)	(5.42)	(6.25)	(5.78)
Leverage	–0.0122	–0.0126	–0.0092	–0.0095
	(–0.22)	(–0.23)	(–0.17)	(–0.17)
R&D	1.3938***	1.3884***	1.4283***	1.4239***
	(14.94)	(14.90)	(15.32)	(15.27)
Trade receivables	0.4580***	0.4632***	0.4718***	0.4859***
	(17.77)	(18.00)	(18.35)	(18.98)
Constant	–0.4227***	–0.4100***	–0.4636***	–0.4563***
	(–5.77)	(–5.62)	(–6.48)	(–6.36)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
R-squared	0.0183	0.0186	0.0173	0.0181
N	165180	165180	165180	165180

Table 13. Alternative measure of dependent variable – return on assets (ROE)

Trade payables and bank credit use effect on operating performance. The dependent variable in each specification is a measure of firm i's operating performance (ROE). Coefficients marked ∗, ∗∗ and ∗∗∗ are significant at the 10%, 5% and 1% level, respectively, and t-statistics are reported in parenthesis. Variable definitions are provided in Table 1. N denotes the sample size.

Variable	1	2	3	4
ATC	-0.0387***	-0.0476***		
	(-64.96)	(-81.77)		
ABC	0.0296***		0.0455***	
	(53.57)		(82.41)	
MTBC				0.0126***
				(25.38)
Firm age (log)	-0.0007**	-0.0004	-0.0012***	-0.0006**
	(-2.52)	(-1.44)	(-3.92)	(-2.10)
Sales growth	0.0003	0.0003	0.0003	0.0003
	(0.63)	(0.65)	(0.65)	(0.67)
Cash holding	-0.0120***	-0.0121***	-0.0113***	-0.0113***
	(-12.49)	(-12.58)	(-11.11)	(-11.40)
Firm size (log)	0.0029***	0.0015***	0.0059***	0.0033***
	(7.19)	(3.73)	(14.53)	(8.13)
Leverage	-0.0161***	-0.0170***	-0.0122***	-0.0140***
	(-3.91)	(-4.02)	(-3.40)	(-3.64)
R&D	0.3936***	0.3896***	0.4310***	0.4291***
	(29.40)	(29.57)	(30.15)	(30.84)
Trade receivables	0.1249***	0.1322***	0.1392***	0.1566***
	(48.85)	(51.62)	(53.79)	(60.74)
Constant	-0.0093	0.0064	-0.0538***	-0.0390***
	(-1.56)	(1.06)	(-9.19)	(-6.71)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
R-squared	0.1897	0.1698	0.1337	0.1094
N	165180	165180	165180	165180

Table 14. Survivorship bias regression

Trade payables and bank credit use effect on operating performance. The dependent variable in each specification is a measure of firm i's operating performance (ROA). Coefficients marked ∗, ∗∗ and ∗∗∗ are significant at the 10%, 5% and 1% level, respectively, and t-statistics are reported in parenthesis. Variable definitions are provided in Table 1. N denotes the sample size.

Variables	**1**	**2**	**3**	**4**
ATC	–0.0385***	–0.0437***		
	(–64.74)	(–79.65)		
ABC	0.0230***		0.0340***	
	(24.30)		(37.74)	
MTBC				0.0124***
				(19.20)
Firm age (log)	0.0008**	0.0010***	0.0005	0.0009**
	(2.50)	(3.05)	(1.35)	(2.53)
Sales growth	0.0003	0.0004	0.0004	0.0004
	(0.53)	(0.55)	(0.53)	(0.57)
Cash holding	0.0044***	0.0043***	0.0049***	0.0047***
	(5.01)	(4.86)	(5.56)	(5.34)
Firm size (log)	–0.0275***	–0.0286***	–0.0250***	–0.0274***
	(–41.70)	(–43.51)	(–39.67)	(–41.57)
Leverage	–0.0141	–0.0153	–0.0097	–0.0125
	(–1.22)	(–1.31)	(–0.89)	(–1.10)
R&D	0.4231***	0.4223***	0.4582***	0.4547***
	(29.88)	(29.75)	(32.34)	(32.45)
Trade receivables	0.2075***	0.2155***	0.2175***	0.2331***
	(50.69)	(52.88)	(54.64)	(59.34)
Constant	0.2223***	0.2344***	0.1825***	0.1974***
	(20.29)	(21.28)	(17.69)	(18.59)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
R-squared	0.2247	0.2189	0.2042	0.1964
N	159949	159949	159949	159949

Table 15. Results based on 2SLS

Trade payables and bank credit use effect on operating performance. The dependent variable in each specification is a measure of firm i's operating performance (ROA). Coefficients marked ∗, ∗∗ and ∗∗∗ are significant at the 10%, 5% and 1% level, respectively, and t-statistics are reported in parenthesis. Variable definitions are provided in Table 1. N denotes the sample size.

Variable	**1**	**2**	**3**	**4**
ATC	–0.0343***	–0.0465***		
	(–26.99)	(–54.33)		
ABC	0.0475***		0.1482***	
	(18.57)		(48.98)	
MTBC				0.0678***
				(50.97)
Firm age (log)	0.0006*	0.0011***	–0.0005	0.0018***
	(1.71)	(3.09)	(–1.25)	(4.59)
Sales growth	0.0005	0.0006	0.0005	0.0006
	(0.66)	(0.67)	(0.61)	(0.64)
Cash holding	0.0058***	0.0056***	0.0063***	0.0052***
	(5.44)	(5.22)	(5.22)	(4.51)
Firm size (log)	–0.0268***	–0.0294***	–0.0210***	–0.0332***
	(–35.02)	(–38.19)	(–29.78)	(–38.45)
Leverage	–0.0151	–0.0185	–0.0070	–0.0238
	(–1.15)	(–1.36)	(–0.59)	(–1.63)
R&D	0.3854***	0.3851***	0.3924***	0.3817***
	(24.10)	(24.11)	(22.95)	(23.36)
Trade receivables	0.2049***	0.2220***	0.1711***	0.2453***
	(45.56)	(51.17)	(34.02)	(54.59)
Constant	0.2153***	0.2434***	0.1485***	0.2190***
	(17.16)	(19.25)	(13.05)	(16.37)
DHW test of endogeneity	52.0662***	61.8060 ***	1554.5605 ***	3523.7306 ***
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
R-squared	0.2016	0.2030	0.0373	0.1206
N	165180	165180	165180	165180

Table 16. Coefficient Stability Method - Omitted Variable Bias Test

			Controlled regression				Uncontrolled regression		Interpretation	
			1	2		3	4		5	6
Table	Regression	Variables	Coefficient from the regression	95% confidence intervals of the estimated coefficient		R-squared of the regression	Identified set of bounds (controlled - Full set)		Coefficient moves away from zero	Coefficient falls within the 95% confidence intervals
5	Column 1	ATC	–0.0386	–0.0393	–0.0372	0.2080	–0.0386	–0.0528	Yes	Yes
	Column 1	ABC	0.0233	0.0210	0.0243	0.2080	0.0233	0.0558	Yes	Yes
	Column 2	ATC	–0.0449	–0.0434	–0.0414	0.2027	–0.0449	–0.0528	Yes	Yes
	Column 3	ABC	0.0370	0.0298	0.0330	0.1883	0.0370	0.0558	Yes	Yes
	Column 4	MTBC	0.0138	0.0109	0.0132	0.1820	0.0138	0.0155	Yes	Yes

This Table presents the results of the test for potential omitted variables following the approach of Oster (2019). As recommended by Oster (2019). We run the methods of coefficient stability for our main regressions in Table 5. Columns (1), (2) and (3) show the coefficients, confidence intervals and the R-squared from the main regressions. Columns (5) and (6) report whether the bias-coefficient β^* in the identified set bounds meets the two robustness criteria in Oster (2019), specifically column (5) reports if the bias coefficient moves further away from zero and column (6) reports whether the changes in the coefficient fall within the 95% confidence intervals of the estimated coefficient β in the main regression. All variables are as defined in Table 1.