Bachelor Thesis

How does reverse factoring affect operating performance? An event study of United States manufacturing firms

TILBURG ✦ UNIVERSITY

Understanding Society

by

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09 June 2022

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Program of Study: Liberal Arts & Sciences – Major Business & Economics

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Management summary

Reverse factoring is an innovative technique in supply chain finance, one that has been gaining attention in both theory and practice. It has been widely adopted by buyer firms, however, the extant literature on the performance effect of implementing reverse factoring using archival data remains scarce. This research wanted to narrow this gap by examining the relationship between reverse factoring implementation and operating performance, and the influence of culture on the strength of the relationship. This study considers the abnormal performance of publicly listed buying firms in the manufacturing sector in the United States of America after reverse factoring implementation announcements. The results show that reverse factoring has a positive effect on buyers' operating performance in terms of profitability (return on assets) and operating profit margin. However, no effect was found for cost efficiency. In addition, the results show that United States culture possibly weakens the relationship between reverse factoring and operating performance. Overall, this study shows that the implementation of reverse factoring within the United States is beneficial but does need careful consideration.

List of abbreviations

CEO: Chief Executive Officer

ERBV: Extended Resource-Based View

NAICS: North American Industry Classification System

RBV: Resource-Based View

RF: Reverse Factoring

SCF: Supply Chain Finance

SCV: Supply Chain Visibility

SET: Social Exchange Theory

SME: Small and Medium-Sized Enterprise

US: United States

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1 Introduction

The term 'supply chain finance' was first explicitly mentioned by Stemmler (2002). Supply chain finance (SCF) is commonly defined as "the inter-company optimization of financing as well as the integration of financing processes with customers, suppliers, and service providers in order to increase the value of all participating companies" (Pfohl & Gomm, 2009, p. 151). However, many different definitions are used. SCF is sometimes an umbrella term for a range of financial instruments, as Pfohl & Gomm (2009) describe, but it can also refer to a specific technique of the SCF portfolio. SCF is a form of collaboration between buyer and supplier, which has gained more attention in Supply Chain Management research, and helps firms improve their working capital significantly (Chan & Chan, 2009). A supply chain is considered as an inter-company combination of product, information, and financial flows (Pfohl & Gomm, 2009). In the past, research in supply chain management mainly focused on making the material and information flow more efficient, but the financial flows between companies have only gained attention in the past years (Pfohl & Gomm, 2009). SCF combines the two fields of operations and finance. Where one matches the demand of material flows with supply in operations management, the other does the same for the demand of monetary flows in finance (Zhao & Huchzermeier, 2018). Applying the perspective of the resource-based view (RBV) of the firm, combining these two practices in an integrative way effectively can create a sustainable competitive advantage. Financial institutions can offer SCF by granting both the buyer and supplier better payment terms that improves liquidity and working capital (Hofmann et al., 2017; Marchi et al., 2020). SCF is getting more attention because working capital has become an important metric for CEOs with a focus on profitable growth, since the environment is turning increasingly competitive and globalized (Hofmann et al., 2017).

The effectiveness of SCF depends on the extent of cooperation between the actors. Good cooperation between buyer and supplier can lower debt costs, make way for new opportunities to obtain loans, and improve working capital (Marchi et al., 2020). There are different forms of supply chain finance that a company can utilize. As was outlined by the Euro Banking Association (2014), a company can use supplier-centric traditional factoring, trade credit or inventory-centric finance, and buyer-centric reverse factoring. Traditional factoring is an approach initiated by the supplier, where they sell accounts receivable to a third party at a discount for immediate cash, to improve working capital (Zhao & Huckzermeier, 2018). Inventory financing means that a company uses a short-term loan or line of credit to purchase new inventory to sell at a later date. The inventory is then used as collateral for the loan (Jiang & Liu, 2018). SCF is often used interchangeably with reverse factoring (RF). Reverse factoring is one of the most popular external SCF initiatives. It is initiated by the buyer, which is the main difference with traditional factoring where the supplier approaches the financial

institution (Iacono et al., 2015). The buyer uses its credit rating to give the supplier access to cash. Instead of paying the supplier directly, the buyer allows a financing firm to interpose itself between their own company and the supplier. The invoice sent by the supplier is paid relatively quickly by the financial institution at interest rate lower than the market, allowing the buyer to pay the financing firm back at a later date, combined with the loan principle (Iacono et al., 2015; Tanrisever et al., 2015; Grüter & Wuttke, 2017). Especially with the increasingly complex and globalized environment, and challenging economic conditions, finding tools to make supply chains more efficient, increase working capital and improve buyer-supplier relationships is essential.

Considering the context, COVID-19 has caused supply chains around the world to grind to a halt, stretching working capital of many companies (Basquill, 2020). Atlanta-based PrimeRevenue, a provider of RF, reported that because of the sudden need for liquidity, "the proportion of invoices traded for early payment rose from 77% in January to 93% two months later" (Basquill, 2020). Funding from these providers appear to have remained resilient, indicating that this form of financing is stable under unstable conditions. The benefits of reverse factoring for actors are clear. Suppliers reduce their working capital costs through implementation of RF as they access more liquidity. Banks benefit from RF through the income they receive through interest or fees charged when suppliers borrow against the value of their accounts receivable (Iacono et al., 2015; Grüter & Wuttke, 2017). However, for buyers the benefits are less clear or quantifiable. Buyers can directly benefit from the payment term extensions or price discounts originating from RF, but buyers can also indirectly benefit from the suppliers' ability to avoid liquidity shortages, leading to fewer supply disruptions (Grüter & Wuttke, 2017). So, there is still a significant gap within literature on the benefits for buying firms in a reverse factoring arrangement. Moreover, Zhang et al. (2019) found that implementing reverse factoring also comes with some downsides for the buyer, like additional efforts in training and IT tools. Because of both the benefits and the drawbacks of SCF from a buyer perspective, but also the vague nature of the benefits, having a good indication whether reverse factoring is positively associated with buyer performance is necessary. Firms can use this information to gain a more complete picture of the effects of implementation of reverse factoring and to see if implementation actually leads to improved operating performance.

To date there have been case studies (van Laere, 2012; Liebl et al., 2016) and model development (Marchi et al., 2020; Iacono et al., 2015; Bi et al. ,2022) to examine the performance effect of reverse factoring, but a quantitative method using archival data has rarely been used. Using archival data helps offer a unique perspective on old research questions that were already examined in previous studies (Miller et al., 2021). Archival data are often unique items that cannot be obtained elsewhere, are more publicly available allowing for true *re*-search, and are usually more objective,

especially financial data, thus enhancing the credibility of the research (Calantone & Vickery, 2010). A recent article by Shou et al. (2021) was one of the first in which archival data was used to assess the relationship of RF and operating performance. In this research, Chinese buying firms in the manufacturing sector, who announced implementation of reverse factoring, were used to measure this relationship. One of the issues identified by this research, was that generalizability was not optimal because the research was focused only on Chinese buying firms in the manufacturing industry (Shou et al., 2021). This research will focus on listed manufacturers in the United States which have announced and implemented reverse factoring. This will fill the gap and contribute to the generalizability of the findings identified in other studies.

This research is grounded by social exchange theory (SET) and extended resource-based view (ERBV). Implementing reverse factoring can help strengthen the relationship between buyer and supplier, thus creating a partnership. Both SET and ERBV help explain how such a relationship creates additional benefits such as reciprocity, trust, and transparency, how it can help companies accumulate relational resources, that help avoid certain deviant behaviors, lower costs, and can improve performance significantly. Grounded by ERBV and SET, this research will advance the SCF literature by offering additional empirical research on the performance effect of reverse factoring. Moreover, it will contribute to a deeper understanding of reverse factoring on a buyer firm's operating performance. Many studies have used operating performance as a dependent variable in SCM research (Lee, 2021; Liu et al., 2020). Operating performance measures results relative to the assets are used to get to those results. It can be examined looking at cost efficiency and profitability of a firm (Shou et al., 2021). Financial measures, such as sales growth and profits as a percent of sales can reflect differences in life cycles of firms, product mixes, and financing choices made by the firm. They do not, however, give an indication of differences in overall operating performance, which explains what returns you get on your asset investments (Core et al., 2006). So, to provide a full account of the effect of RF on operating performance, examining operating performance through cost efficiency and profitability in combination with the financial measure 'operating profit margin' will be best suited. Providing this deeper understanding of the impact of this relationship could help companies in providing arguments to implement reverse factoring.

In addition to this, this research will contribute to current research by examining the possible differences in context between two distinct cultures. To date, not much research has been done on the possible effects of culture on the success of reverse factoring implementation. Shou et al. (2021) found that, within Chinese context, reverse factoring had a positive effect on buying firms' operating performance in terms of cost efficiency and profitability measured by ROA. However, cultural factors of the US might lead to a different result by affecting the differences in social exchanges between

buyers and suppliers, or the strength of the relationship between actors. China has a high-power distance, collectivist culture and long-term orientation, while the US has low power distance, an individualistic culture and have a more short-term orientation (Hofstede, 2011). Through a RF arrangement, the supplier has more financial security. Especially in a collectivist culture, like the one in China, the supplier might experience the buyer's RF initiative as putting more effort into the relationship, essentially developing social capital (Abreu & Camarinha-Matos, 2010). In an individualistic culture, like the US, implementing RF might not lead to the accumulation of social capital and thus could weaken the relationship between RF and operating performance. This could mean US culture negatively affects the relationship between reverse factoring and performance.

This study aims to address the following problem: *To what extent does reverse factoring affect operating performance of buying firms in the manufacturing industry in the US, and how does the relationship differ from the results in China?*

The following research questions must be answered to provide an answer to the problem statement.

Theoretical research questions

RQ1: How can reverse factoring be defined and how do companies benefit from this service?

RQ2: How does reverse factoring affect operating performance?

RQ3: How does US culture influence the relationship between reverse factoring and operating performance?

Practical research questions

RQ4: What is the effect of reverse factoring on the operating performance of manufacturers in the United States?

RQ5: How does the relationship between reverse factoring implementation and operating performance differ between the US and China?

This paper will examine these research questions using longitudinal archival data from 36 announcements of reverse factoring implementation made by publicly listed US manufacturing firms between 2014-2018. The rest of the paper is organized as follows. In chapter 2, the relevant literature is reviewed, and hypotheses are developed. In chapter 3, the data collection process and the event study method are elaborated on. In chapter 4, the results of the analysis of data are included. In

chapter 5, the findings are discussed, theoretical contributions are summarized and limitations and implications for future research are elaborated on.

2 Literature review

2.1 Origin of literature

One main literature stream informs this research, which is literature on the intersection between supply chain management and financial management. The main research area in this literature stream is financial supply chain management (Liebl et al., 2016). SCF can be localized within this area. The exact meaning of SCF is not always clear, as definitions change with the scope of SCF an author applies. There are two common scopes one can apply when defining SCF. In this research, reverse factoring is seen as a subcategory of SCF, the categories also including inventory financing, regular factoring, trade credit and fixed asset financing as additional SCF initiatives (Gelsomino, 2016; Zhang et al., 2019). This perspective is more common in academic literature as opposed to the second scope, where SCF is considered the same as reverse factoring, assuming a buyer-driven orientation (e.g., Kouvelis & Xu, 2021). Here SCF purely takes a 'financial perspective', thus focusing on financial product for companies in supply chains (Basu & Nair, 2012). This perspective was initially taken in the 1980s automotive industry (Zhang et al., 2019). Now, it is used by commercial sources, papers, and informative websites (Accounting Tools, 2021; Fernyhough & Evans, 2020). Because seeing RF as a subcategory is more common in academic literature, it is the scope that is applied in this research.

2.2 Defining reverse factoring

Since 2005, RF has gained more attention in both literature and business practices (Klapper, 2006), but it is still young. In a reverse factoring arrangement, the buyer uses its own credit rating to give the supplier access to cash between delivery and execution of payment obligations. To do this, the buyer approaches a financial institution (or factor), such as a bank, or a factoring company, to provide these funds to the supplier (Grüter & Wuttke, 2017). The buyer can extend its own payment terms and gives the supplier more access to working capital by allowing them to receive their money early from the financial institution. Reverse factoring can be offered in two ways. Originally, reverse factoring was buyer-owned or bank-owned, but more recently it has moved towards an internet-based service model in the cloud (Serrano & Lekkakos, 2015). Reverse factoring is different from regular factoring because it is buyer-centric. Up until now, a number of studies have discussed the conditions under which RF is effective and ineffective. Tanrisever et al. (2012) found conditions under which RF is beneficial, such as when the spread in deadweight financing costs is high, or when the SME employs an aggressive working capital policy. Furthermore, the double benefit buyers and suppliers can get through reverse factoring depends heavily on market conditions, including interest rates (Iacono et

al., 2015). Moreover, RF implementation only works if buyers pay on time. If a buyer fails to meet the obligations set in the agreement, the financial institution would be forced to drop out and the often relatively weak supplier would go under (Serrano & Lekkakos, 2015). RF also encourages a level of indebtedness between buyers and suppliers, and this brings risks for individual companies and economies. So, there are also numerous challenges involved in the implementation of reverse factoring.

2.2.1 Benefits of reverse factoring

A company can benefit from implementing SCF in general through its multiple facilitating roles. First, its coordinating role, where SCF leads to improved collaboration, and integration of physical and information flows with the financial flow (Lee & Rhee, 2011; Zhang et al., 2019). Second, its stabilizing role, as SCF reduces risk in the supply chain and thus stabilizes the many processes that happen (Klapper, 2006). Third, its value-enhancing role, where the increased collaboration and reduced risk help a firm lower capital cost, and provide new opportunities for getting loans, which improves financial performance (Randall & Farris, 2009). These benefits are also embedded within and translated to reverse factoring. In general, benefits of reverse factoring include standardization of payment terms, improved supplier relations, more transparency, and fewer conflicts between actors (Seifert & Seifert, 2011). At the same time, all actors involved in reverse factoring implementation benefit from it differently.

First, the buyer extends payment terms and simultaneously improves the liquidity of suppliers by giving them the opportunity to get paid quickly by the financial institution and giving themselves a longer time to pay (Liebl et al., 2016). So, suppliers benefit by receiving money earlier and thus maintaining their level of working capital and liquidity. Klapper (2006) is among the first to provide an analysis of the benefits for suppliers of reverse factoring for financing SMEs. She explained how reverse factoring resolves some of the issues that arise from regular factoring, such as the limited profitability arising from it, a high degree of fraud, and capital shortages for suppliers (Klapper, 2006). Klapper (2006) elaborated that reverse factoring is especially beneficial for small to medium-sized suppliers, and one can develop relationships without taking on additional risk.

Financial institutions also benefit from reverse factoring. Buyers are usually investment grade companies and are highly involved, so financial institutions have better information and can release funds earlier and thus carry less risk and can charge lower interest rates (Seifert & Seifert, 2011).

Lastly, few benefits are discussed in the literature for buyers. Buyers mainly benefit from RF using it as a negotiation tool, to strengthen the relationship with their suppliers, and reduce supplier risks (Liebl, et al., 2016). Moreover, they extend their own payment terms, allowing them to pay later and thus maintain working capital. However, as Milne (2009) described, the collaborative spirit is not

always implemented, as some large corporations only introduced it as a 'sweetener' to the decision to move its payment terms to suppliers from 45 to 90 days. Companies like the one described here plan to extend their payment terms anyway, so offering reverse factoring is a 'take-it-or-leave-it' arrangement for suppliers.

Seifert & Seifert (2011) found some drawbacks of reverse factoring in their survey to both suppliers and buyers engaged in RF. Some respondents reported to having reduced credit availability, pressure to guarantee payments and some other minor drawbacks, but most executives of the sample reported no drawbacks to RF.

2.3 Prior research on reverse factoring and operating performance

This study focuses on the performance effects of reverse factoring, so here the related studies to this relationship are reviewed. There have been some studies were the effect of reverse factoring on performance was examined. Lekkakos & Serrano (2016) argued that many organizations face a shortage of funds to meet their daily operational requirements, which directly or indirectly influence performance. They found that reverse factoring does improve operating performance, but only found evidence for suppliers. Moreover, Marchi et al. (2020) found that reverse factoring can improve overall performance within the supply chain. Furthermore, SCF and especially, RF is a particular form of intra-chain collaboration (Tanrisever et al., 2012). Gronum et al. (2012) found that strong ties within supply chain networks, for example through RF, enhance organizational performance. Many of these studies, however, are not essentially focused on buyer firm operating performance or use empirical data. Therefore, the empirical evidence demonstrating the impact of reverse factoring on firm performance needs further exploration and presentation. In addition, very few studies (Shou et al., 2021) have used secondary data to examine the relationship between RF and operating performance.

Many studies focus on examining the changes in operating performance from several types of supply chain events. One study examined the effect of supply chain glitches on firm operating performance (Hendricks & Singhal, 2005). The focus was operating performance because efficiency, reliability and responsiveness, essential elements of operating performance, are key drivers of a firm's profitability. Another study looked at the difference between firm operating performance based on supply chain visibility (SCV) (Swift et al., 2019). They focused on operating performance by looking at profitability of the firm through cost efficiency and sales growth and argued this would give a better indication of the effect SCV has on operations of a firm. Lastly, a study examined the effect of supply chain finance initiatives on operating performance (Beka Be Nguema et al., 2022). They argued organizations do not want to adopt traditional financial credit rating perspectives but focus on performance characteristics such as operating performance. For the above mentioned reasons, this study will assess the effect of RF implementation on operating performance.

2.4 The relationship between reverse factoring and operating performance

Two different theories (i.e., social exchange theory and extended resource based view) are used in combination to explain the relationship between reverse factoring and operating performance. The first relevant theory is the social exchange theory (SET). Social exchange theory is perceived through many different views, but all perspectives agree that it involves a series of interactions that generate obligations between actors (Emerson, 1976). In addition, it emphasizes that these transactions are interdependent on the actions of others and could generate high-quality relationships under certain circumstances (Cropanzano & Mitchell, 2005). As such, according to SET, attitudes and behaviours are determined by the rewards of interaction minus the penalty or cost of that interaction (Griffith et al., 2006). Relationships develop over time into trusting commitments, if partners follow certain rules of exchange, such as reciprocity, but also rules negotiated within a contract (Blau, 1964). This theory is based on the assumptions that humans seek rewards, avoid punishment, and deliberate and engage in a negotiation looking and expecting to gain maximum profit. These rewards could be of economic nature, in the form of monetary benefits, or of social nature, such as satisfaction (Blau, 1964). In the context of supply chain relationships, the supplier gives something to the buyer, a token of trust. Through this offering, the supplier forms an expectation to receive something in return, while the buyer develops a sense of obligation to reciprocate (Sprecher, 1998). Within supply chain relationships trust, commitment, reciprocity, and power are important social exchange issues that determine information sharing and collaboration (Wu et al., 2014; Yang et al., 2008; Hallen et al., 1991). Establishing a relationship between supply chain members can enhance information sharing and collaboration within the supply chain through these issues and improve overall chain performance.

The extended resource-based view is an extended version of the regular RBV of the firm developed by Barney (1991). Barney argued that firms can gain and hold a sustainable competitive advantage if they acquire and develop resources that are valuable, rare, inimitable, and not substitutable (VRIN criteria). The RBV holds that resources that create a competitive advantage must be confined by the firm's boundaries. Most definitions of resources, including the one by Barney, mention that resources are controlled by and tied to the firm, a single firm (Barney, 1991; Amit & Schoemaker, 1993). This proprietary assumption does not incorporate the possible benefit that could arise from the transfer of resources between alliance partners (Lavie, 2006). That is one of the reasons why the resource-based view had to be expanded. The ERBV was first explored by Lavie (2006) and is based on the notion that alliances or collaboration between partners gives the focal firm access to additional partnership resources that they can exploit (Lavie, 2006). When an alliance is formed, each firm shares resources with the other firm, expecting to generate common benefits from these shared resources (Lavie, 2006). Henderson & Cockburn (1994) found that the ability to access new knowledge

and resources outside organizational boundaries is important for enduring organizational success and competitive advantage. Strategic alliances are a way to obtain these critical external resources for many firms (Eisenhardt & Schoonhoven, 1996). The ERBV suggests that internal capabilities can help facilitate the exploitation of external resources, and thus could further enhance firm performance (Lewis et al., 2010). According to the relational view of strategic management, forming relational networks with other firms for mobilizing external resources can help in gaining a sustainable competitive advantage (Wong, 2011; Cheng, 2011).

Within supply chains, long-term relationships between actors increase efficiency and effectiveness (Choi & Hartley, 1996; Shin et al., 2000). From this relationship both buyers and suppliers receive financial benefits, but also benefits arising from social exchange. The adoption of reverse factoring creates strong partnerships that help improve commitment between supply chain members and improves collaboration which strengthens information sharing and communication. Many studies have applied SET to examine the relationships within a supply chain (Kwon & Suh, 2005; Wei et al., 2012; Wu et al., 2014). Reverse factoring in an example of the many types of relationships supply chain members can form with each other. Supply chain performance and individual firm performance are the ultimate goals for actors to engage in relationships with supply chain members (Tan et al., 2002). The profitable implementation of RF indicates the establishment of a relationship and requires transparency between supplier and buyer, effective information sharing and collaboration. According to SET, this relationship is formed and maintained because the partners offer reciprocal benefits to one another. Particularly, as an important form of SCF initiatives, RF is beneficial for enabling information exchange between buyers and their suppliers, thereby improving transparency of the financial process within the supply chain (Gelsomino et al., 2016). Through the adoption of RF, both parties benefit from the increased reciprocity and commitment, financial flows will be managed more efficiently by buying firms through increased visibility and control, and collaboration will be enhanced (Seifert & Seifert, 2011; Wuttke, et al., 2013). So, following the social exchange theory, these positive social exchanges that originate from reverse factoring adoption can help a buyer firm improve efficiency within its operations, and thus achieve superior operating performance.

Concerning eRBV, when a buyer firm initiates reverse factoring, they form a relational network with suppliers through information sharing, and thus obtain relational resources that are specific to that relationship (Klapper, 2006; Wang et al., 2020). When two actors enter an RF agreement, the relationship that is formed improve the reliability, cooperation, speed and ease of conducting operational aspects (Freiling, 2011). As such, reverse factoring can help buyers effectively collaborate with suppliers, lowering both buyer and supplier risk because of relational stability, and ensuring their suppliers gain additional working capital because of the relatively quick payment and can apply it more

effectively (Wuttke et al., 2013). This allows suppliers to make more risky investments and engage in innovation, through improving product processes for example, meaning suppliers will be able to create or develop resources that originate from the benefits of a reverse factoring partnership (van der Vliet et al., 2015; Lekkakos & Serrano, 2016). Buyers themselves also benefit from the collaboration and stability through an optimized cash flow, and, together with suppliers, from the development of relationship-specific resources (Wang et al., 2020; Wuttke et al., 2013). Relationship-specific resources are rare, hard to imitate and non-substitutable, thus help both buyer and supplier gain a competitive advantage in the industry. Lastly, the quality and delivery time will be more consistent and dependable because of the accumulation of the relational network and trust between supplier and buyer. As such, supply chain members become more connected and dysfunctional conflicts are mitigated because of the newfound stability and cooperation in the relationship and the supply chain (Seifert & Seifert, 2011). While implementing RF, both the buyer and supplier share resources to reach a common goal, optimizing financial flows. Because of the relational stability the sharing of resources creates, the buyer and supplier form favorable supply chain linkages, increasing overall chain stability and transparent information sharing, which are valuable strategic resources originating from the relationship that can help a buying firm gain a competitive advantage (Yang et al., 2019). When a firm gains a competitive advantage, it controls relationship-specific resources that are hard to substitute and imitate for competitors, helping the firm to stand out, which can significantly improve firm performance (Lavie, 2006). In short, drawing on ERBV, this research argues that reverse factoring can help buyers obtain resources that are valuable, rare, inimitable and non-substitutable, enabling buyers to achieve competitive advantage and improving operating performance.

Hence, this research proposes that RF implementation leads to improved cost efficiency for buying firms. When implementing RF, buyers usually use payment term extensions (Tanrisever et al., 2012; Iacono et al., 2015), because this optimizes their cash in- and outflows and liquidity needs. Buyers find value in extending payment terms through a reduction in financing costs and a reduction in supply chain disruptions (Grüter & Wuttke, 2017; Liebl et al., 2016). Reverse factoring can thus help buyers reduce capital costs. Second, a buyer can improve their negotiation position. As was explained previously, buyers that offer reverse factoring to their suppliers may also be in a better position to negotiate favourable commercial terms with those suppliers, like lower prices, because of the reciprocity that arises within a partnership (Liebl et al., 2016; Klapper, 2006). Third, a buyer firm can lower transaction costs. The close collaboration between buyer and supplier strengthens information sharing and communications between these two actors. Information asymmetry is reduced, and actors build trust, causing the buyer to not invest as much money in monitoring and controlling transaction, which results in lower transaction costs (Aviv, 2007; Klapper, 2006). Similarly, Corsten and

Felde (2005) found that on the demand side, collaboration with a supplier can create a sense of harmony that helps companies reduce procurement costs. This indicates that reverse factoring helps buyers reduce costs, thus contributing to their operating performance. That is why this research proposes that reverse factoring has a positive effect on cost efficiency.

H1A: Reverse factoring has a positive effect on cost efficiency

Moreover, this research proposes that reverse factoring implementation leads to improved profitability for buying firms. Profitability can be accomplished through either increasing sales or decreasing costs. First, Chuk et al. (2021) found that firms that implement RF perform better on several accounting outcomes for firms linked to operating performance, such as higher ROA, higher profit margins, lower ROA volatility, and lower return volatility than firms that did not implement RF. Second, implementing RF can lead to increased revenues. Following SET, the relational benefits that arise from information sharing between supplier and buyer reinforce the connectedness between them and mitigates the risks and conflicts that can arise within the chain (Cheng, 2011). Lower conflicts and less risks between buyer and supplier help prevent disruptions of production and therefore buyers can maintain an elevated level of efficiency and reliable customer service, thus increasing their revenues. Third, Marchi et al. (2020) found through an economic lot size model that implementing reverse factoring within the supply chain improves economic performance, thus increasing revenues of the firm. Other than increasing revenues, in the discussion before it became clear the RF helps buying firms reduce costs, thus increasing overall profitability of the buyer firm. That is why this research proposes reverse factoring has a positive effect on profitability and the operating profit margin.

H1B: Reverse factoring has a positive effect on profitability
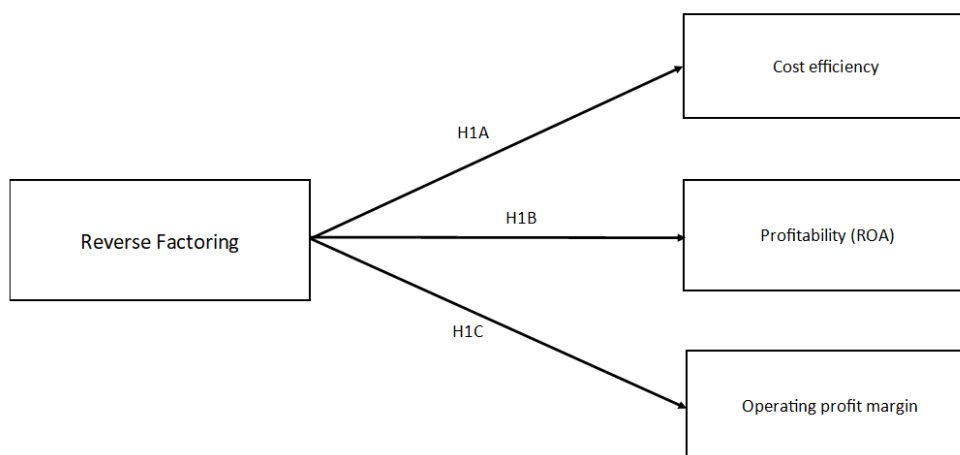*H1C: Reverse factoring has a positive effect on operating profit margin*

Figure 1: Conceptual model hypothesis 1

2.5 The influence of US culture on reverse factoring implementation
2.5.1 National culture

In addition to the relationship between reverse factoring and operating performance, this study will assess the strength of this relationship by investigating it in a different culture. Up until now, there has been a lack of attention placed on the effect of macro-environmental factors on the relationship between reverse factoring and performance. For this study, Hofstede's definition of culture has been chosen due to its specific description. He defines culture as "the collective programming of the mind that distinguishes the members of one group or category of people from another" (Hofstede, 2001, p.9). Assessing a certain phenomenon within its own context is important because national cultures differ in their set of values, beliefs, ideas, attitudes, and morals, which guide the behaviour of individuals (Vitell et al., 1993). The differences in national culture translate to organizational cultures, thus affecting the management and operations of companies in different countries. Prior studies have examined the moderating impact of national culture on the relationship between supply chain collaboration and performance (Flynn et al., 2010; Wong et al., 2017), but not the differences that are present between intra-country collaborations or how specific national cultures might affect the collaboration itself. Wong et al. (2017) found that national cultures do significantly moderate the relationship between supply chain integration and operational performance. Furthermore, Zainuddin et al. (2020) found that national culture national culture dimension "individualism" negatively moderates the relationship between microfinance institutions and financial sustainability. It is important to examine the effect of national culture on the relationship between reverse factoring and operating performance because national culture evidently moderates other relationships between supply chain events and performance, and it can help one determine whether the implementation is worthwhile in a particular culture.

2.5.2 Prior research

Many recent studies focus on the relationship between RF and performance, of which some look at moderators concerning internal factors, such as innovation capability, environmental dynamism, and supply chain visibility (Shou et al., 2021; Nguema et al, 2021; Ali et al., 2020), but this study focuses on external factors, namely national culture. There are conflicting findings within the literature on this particular relationship, because those studies use different countries and different samples. So, this study will examine how the difference between macro environments might affect this relationship. Shou et al. (2021) examined changes in operating performance resulting from reverse factoring implementation in Chinese context using an event study method[1]. They found that within Chinese

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[1] See appendix 2 for an overview of the results by Shou et al. (2021).

context, reverse factoring positively influenced operating performance. More specifically, they found that for the operating performance indicator "cost efficiency", the median abnormal cost efficiency performance is 0.019 and statistically significant ($p < 0.1$) from year $t - 1$ to $t + 1$. the sign test showed that 59.9% of the sample firms achieve positive abnormal change in cost efficiency ($p < 0.05$). In addition, for the operating performance indicator "profitability", the median abnormal profitability is 0.009 ($p < 0.05$) for the same year. In this year, 58.7% of the sample firms achieve positive abnormal performance in profitability ($p < 0.05$). Considering the increasing importance of finding financial solutions and improving supply chain processes, it is necessary to conduct a systematic performance evaluation of implementation of a company's RF within a different context, because it is myopic to assume another culture will yield the same result.

2.5.3 Individualism vs collectivism

This study applies replication through empirical generalization, replications that use data from a different population, but use the same research design as a previous study (Dau et al., 2022). Here this study evaluates the generalizability of the original study to a distinct cultural context. National cultures have many distinct characteristics. Many researchers have identified different constructs to measure national culture by. The best know are Hofstede's with up to six cultural dimensions, or the GLOBE survey with nine dimensions (Hofstede, 2011; House et al., 2004). Another often cited work is the theory of cultural value orientations created by Schwartz (1994). Hofstede's cultural dimensions are used most often to measure culture. Wang & Esqueda (2014) use Hofstede's dimensions to look at ADRs from emerging countries, to determine how culture affects capital structure decisions. In addition, Gleason et al. (2000) divided European countries into four clusters based on Hofstede's cultural characteristics, to look at how being part of a cluster affects the capital structure of retailers within those countries. Even though Hofstede's dimensions have been criticized (Wang & Esqueda, 2014), they are still very applicable to the study at hand to differ between Chinese and US culture.

Especially relevant and impactful in the field of operations management (OM) is the cultural trait individualism/collectivism (Hofstede, 2001). According to the Hofstede dimensions, the US is a country that scores low on power distance, high on individualism and is short-term oriented among other dimensions (Smith, 2021). On the other hand, China scores high on power distance, and long-term orientation, and low on individualism (Hofstede, 2011; Smith, 2021). In the study at hand, the individualism and collectivism difference will take precedence, because they are the most prevalent distinguishing factor between the US and China. This study proposes that in countries with an individualistic culture, such as the US, the individualism of a country weakens the relationship between reverse factoring and operating performance. In its most extreme form, individualistic people consider dependency upon others as shameful. Independence is particularly important.

Movement in groups is a function of self-interest, and individual rights take precedence (Cohen & Avrahami, 2007). In individualistic cultures, companies view their collaborations and relationships from a calculative perspective. Collectivism within a culture, which is present in China, sees individuals as embedded within the group, while individualistic cultures are geared towards an individual's autonomy and independence (Power et al., 2010). There is quite some evidence that partnerships and trust are more prevalent and valuable in collectivist cultures.

2.5.4 The negative influence of individualism

According to SET, if a buyer is devoted to building a relationship of reciprocity with suppliers and the other way around, by fulfilling each other's interests, both actors will be willing to make extra efforts to serve with transparency and collaborative behaviour as a means of reciprocity to their partner. First, Zhao et al. (2006) compiled a number of studies that explain how collectivism leads to an increased level of trust and shared vision in trading partner relationships in China (Armstrong & Yee, 2001; Wong et al., 2005). Second, Abe & Fitzgerald (1995) found through a historical analysis of growth in Japanese manufacturing capability (a collectivist culture), that the growth could be attributed to specific cultural characteristics, including collectivism. Third, Zhao et al. (2008) found that in the field of OM, collectivism is associated with a higher inclination for relationship commitment. All these studies have in common that within collectivist cultures, firms are more inclined to have close and effective collaboration and strong partnerships.

On the other hand, buying firms characterized by individualism are less likely to value high quality social exchanges or to involve suppliers the same way as firms in collectivist cultures do within a buyer-supplier relationship (Ketkar et al., 2012). Within individualistic cultures, buyers are less dependent on suppliers. This allows buyers to keep control, because suppliers have less control over buyer decisions (Provan & Skinner, 1989). In addition, trust is an important concept within the relationship a buyer establishes with its suppliers within reverse factoring implementation, as was elaborated on using SET. Individualist buyers are less likely to develop the same level of trust with suppliers as collectivist buyers do (Ketkar et al., 2012). Multiple studies have found that trust brings greater transparency in the buyer-supplier relationship, and important aspect of SCF practices (Dyer & Cho, 1998; Noorderhaven & Harzing, 2009), so within individualistic cultures the same result may not be achieved. Lastly, a supplier within an individualistic country may be reluctant to make investments specific to the relationship if they suspect that the commitment of the buyer is no sufficient (Sako et al., 1995).

The adoption of RF set within a country with a collectivist culture, as opposed to an individualistic culture, could be advantageous for the relationship between reverse factoring and operating performance, because it facilitates the accumulation of trust, relationships, and strong

partnerships more, and thus increases visibility and control, lowering transaction costs, and improving efficiency within their operations. Within individualistic cultures this effect may not be as strong, because partnerships are established less quickly, and transparency and trust are less likely to be developed fully, so buyers and suppliers cannot reap the same benefits from the relationship as they would within a collectivist culture. Moreover, following the eRBV, even if suppliers gain higher levels of working capital, the supplier might not reciprocate, but could tap into their individualistic nature and approach other buyers to receive more benefits, thus nullifying the resources that can be gained through an effective relationship. So, looking at these main identifying characteristics of both China and the US, this research proposes that the US culture negatively influences, or weakens the relationship between reverse factoring and operating performance based on its individualistic trait.

H2: US culture weakens the relationship between reverse factoring and operating performance.

3 Methodology

3.1 The nature of the research

This research is explanatory by nature, as its main purpose is to explore why something occurs, and how it occurs. It includes research hypotheses that specify the nature and direction of the relationships between variables being studied (DeCarlo, 2018). The research makes use of deductive reasoning, as it tests both social exchange theory and transaction cost economic theory in a particular context and moves from broad generalizations of theoretical frameworks to the applicability of these frameworks to the relationship between reverse factoring and performance, a more specific observation (Johnson-Laird, 1999).

3.2 Research strategy

To answer the practical research questions, this research is making use of archival data. Archival data, although it is not an immensely popular data source in SCM and there are many considerations to make during research, allows researchers to push the boundaries of existing knowledge. It could provide the ability to examine phenomena through panel and time series studies, on a much larger scale than primary data could provide (Miller et al., 2021). Archival data has been used often to examine financial changes that occur due to a specific phenomenon within a supply chain (Modi & Mabert, 2010; Liu et al., 2020). For this research, archival data is most appropriate, because the research question requires historical data by nature. In addition, archival data is easily accessible and more affordable compared to primary data (Vogt et al., 2012). Using primary data, for example through interviews or survey research, would be very time consuming and be less appropriate for the large population this research examines.

Two different elements are examined. One the one hand, as Shou et al. (2021) demonstrated, announcements of reverse factoring implementation are useful in assessing which companies between 2014-2018 engaged in reverse factoring. Where Shou et al. (2021) used Chinese databases, which were better suited to their research context, this research used American databases. This research examines announcements of reverse factoring implementation made by publicly listed US manufacturing firms (NAICS codes 31-33).

3.2.1 Research design

To quantify the performance effect of reverse factoring, this study adopts a long-term event study method, outlined by Barber and Lyon (1996) to examine abnormal operating performance. The long-term event study method has been used often to examine the effect of supply chain events on stock returns (Lam et al., 2019), or on accounting measures such as sales growth and cost reduction (de Jong et al., 2014; Corbett et al., 2005). Short-term event studies are often applied when researchers assume the response to public information about a strategic event is quick and complete, based on the efficient market hypothesis (McWilliams & Siegel, 1997). Moreover, short-term event studies are usually seen as tests of market efficiency (Bremer et al., 2010). However, as Hendricks & Singhal (2001) demonstrated, short-term event study results can lead to erroneous conclusions. They found that, compared to a short-term event study method, their study did find significant results of abnormal performance while following a long-term event study method. In addition, a long-term event study is more appropriate because it attempts to assess the impact of events as changes in the financial figures of the firm, instead of focusing on the impact of latest information on the expectation of future returns (Bremer, et al., 2010). In addition, this study will examine the financial effect of a certain event. The event year is defined as the year when the sample firms implemented reverse factoring (year t). Year t − 1 is defined as the base year, or pre-implementation year, the year in which the financial information is free from reverse factoring impact. The abnormal performance changes are examined over the three years following the base year, so year t, t + 1 and t + 2. More specifically, this research examines the change in abnormal performance in multiple periods after implementation, for instance t to t+1 and t+1 to t+2, to assess if there is a long-term effect with any significant changes in years where RF was already introduced and could have had an effect on the performance of the companies. Barber & Lyon (1996) did a review of a number of studies that researched the impact of different corporate events on operating performance and suggest that there is no theoretical or empirical guidance on what the period should be for examining performance. This timeframe was chosen because academics in the past have used data of similar age (Shou et al., 2021; Barber & Lyon, 1996). This research examines periods starting from t-1, t and t+1, looking at the change in abnormal performance between a specific year and the year of comparison.

3.3 Data collection

3.3.1 Sampling method

The population includes all firms in the United States that operate within the manufacturing sector. The manufacturing sector was selected because financial performance here is predicted largely by the strength of long-term relationships and attention to the supply chain network, and operational performance by a company's strategy for hedging risk, two essential elements RF, making it easier to identify the financial and operational impact of RF implementation (Sengupta et al., 2006). To determine the sample of the research, a non-probability sampling method is used, or more specifically, purposive sampling. Purposive sampling is a method where the researcher seeks a sample for the study that produces the best cases to address the purpose and research questions (Kelly, 2010). This is the most appropriate form of sampling, because only specific firms that are part of the US manufacturing sector have implemented reverse factoring and are relevant and useful for this research. In addition, it is most common to use purposive sampling for research in this nature, because the research requires the sample to coincide with predetermined criteria of the research (Mason, 2002; Robinson, 2014).

3.3.2 Data collection method

Reverse factoring implementation

Two methods are used in combination to find announcements of reverse factoring implementation. First, the Factiva database of Dow Jones is used to find the reverse factoring announcements made by publicly listed US firms. This database is a current international news databases produced by Dow Jones and provides access to over 32,000 major global newspapers, newswires, industry publications, and other sources with a focus on business news. It has been used in several studies for company announcements (e.g., Baghersad & Zobel, 2021; Lam et al., 2019). The search terms are "reverse factoring" (83 results), "supply chain financ*" (2109 results), "factoring", "trade financ*" (1872 results), "working capital financ*" (972 results) and "accounts receivable financ*" (1458 results). In addition, filters such as the date range 2014-2018, location (United States) and language (English and Dutch) are applied to filter out irrelevant or incomprehensible results. All results have been screened on repetition, relatedness to reverse factoring, manufacturing or non-manufacturing, and the clearness of the type of financing mentioned in the source. This resulted in 15 relevant announcements of reverse factoring, as most hits were company descriptions included in the articles.

The second method this research used is a search of Fortune 500 manufacturing firms together with the aforementioned terms on the website of the Wall Street Journal. The Wall Street Journal provides users with online coverage of breaking news and current headlines from the US and around the world. This method has been used by other studies (Hendricks & Singhal, 2005) and was

utilized because reverse factoring is not often announced with academic terms but mentioned using descriptive terms, so searching for terms in combination with company names should elevate this research. In addition, companies generally do not need to disclose supply-chain financing arrangements, and only 5% of non-financial companies disclose it on their financial statements (Maurer & Steinberg, 2021). So, using a search that utilizes more descriptive terms and a mainstream media source is a good approach. This method resulted in 21 announcements. So, in total, this research uses 36 announcements of or referrals to reverse factoring implementation. Some examples of the announcements and referrals are as follows:

(1) *In 2016, Intel set up a program within the online platform of supply-chain finance vendor C2FO, then invited suppliers around the world to sign up. (Source: Treasury & Risk)*

(2) *Coca-Cola Co. has been working to better manage its payables through supply-chain financing. The company launched its program in 2014. (Source: WSJ)*

Measuring operating performance

The WRDS COMPUSTAT database was used to gather the financial data necessary to assess whether a performance effect was present. This database is a leading provider of financial and industry data, research, news, and analytics to all kinds of users. Compustat specifically provides standardized North American and global financial statement and market data of many publicly traded companies. This database has been widely used in earlier research (Baghersad & Zobel, 2021; Ali et al., 2009). Sample firms have been classified in different industries using the Orbis database and financial data is gathered from the pre-implementation year, or the base year, and three years after the base year. An

Performance indicator	Measurement	Reference
Cost efficiency ratio	Operating expenses as a percentage of total sales	Kotabe et al. (2002)
Return on assets (ROA)	Operating income / total assets	Orzes et al. (2017) Swift et al. (2019)
Operating profit margin	Operating income / total sales	Eilon (1992)

Table 1: Measurement of performance

overview of how sample firms are distributed throughout different sectors and how announcements are divided over the years can be found in *appendix 1*. In table 1 three performance indicators are included, and the measurements of the indicators, as it is common in SCM literature to examine the performance effect through these indicators.

3.4 Data analysis

As required by the event study method, to control for industry or macroeconomic factors that influence outcomes, 36 control firms have been selected that are matched to sample firms. A similar method to Shou et al (2021), Hendricks & Singhal (2005), and Lam et al. (2019) was used to determine the control firms. The control firms are from the same industry as the sample companies, similar in size and performance (cost efficiency) (Lam et al., 2019; Shou et al., 2021). As Banz (1981) reported, small firms have higher risk adjusted returns, while this is not the case for medium to large firms, indicating size does affect performance. This study controls for size because it wants to minimize the influence size has on the performance of sample firms. First, the COMPUSTAT database was used to gather financial information of firms with the same 4-digit NAICS codes. From this set of identified firms, the size (measured as the natural logarithm of total assets) and cost efficiency (see table 1) of each firm were calculated. After this, to calculate the size and performance difference, for every possible control firm the sample value (f.e. size) was subtracted from the control value and divided by the sample value. The same was done for cost efficiency (performance). The distance was calculated as follows:

$$Distance = \sqrt{SiD^2 + PD^2}$$

Here, SiD is the size difference for that particular option for a control firm, and PD is the performance difference. Lastly, the minimum value out of all distance values from the identified control possibilities was selected as the control firm. Moreover, as another requirement, the sales and total assets of the control forms had to be within a factor of three of the sales of the sample firms[2]. If no acceptable control firm could be selected, the first criteria was relaxed to the same 3-digit NAICS code. The distance between firm size and cost efficiency ranges from 0.017 to 0.200 with only two values outside this range (0.304 and 0.363), which is acceptable.

The abnormal change is performance of the sample firms is estimated in comparison with the control firms similarly to Orzes et al. (2017), namely as follows:

$$AP_{(t+j)} = PS_{(t+j)} - EP_{(t+j)}$$
$$EP_{(t+j)} = PS_{(t+i)} + (PC_{(t+j)} - PC_{(t+i)})$$

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[2] If the sample firm has sales of $10 million, the control firms must have sales between $3.33 million and $30 million Hendricks & Singhal, 2005).

AP is the abnormal performance of the sample firms, PS is the actual performance of the sample firms, EP is the expected performance of the sample firms, PC is the actual performance of the control firms, t is the year of reverse factoring implementation, i is the starting year of comparison (i = -1, 0, 1) and j is the ending year of comparison (j = 0, 1, 2) (Shou et al. 2021).

Multiple statistical tests were considered to analyze the data. First, the one-sample t-test. The sample in this research is quite small, so the condition of normality, that the sample arises from a normally distributed sample, cannot be satisfied (Rochon et al., 2012). The condition of normality is one of the assumptions the parametric t-test relies on, so using the t-test would not be appropriate as the main test for this research. However, t-test results will be included to portray the mean of the samples across the years, because even if one cannot assume the data is sampled from a normal distribution, the t-test does provide a robust account of the population mean (Elsner & Jagger, 2013).

Second, the Wilcoxon-Signed Rank (WSR) test. Compared to a t-test, the WSR test is nonparametric, and compares the median of a sample to a hypothetical median (f.e. 0) (Rey & Neuhäuser, 2011). This test does not require one to make the normality assumption, and in the presence of outliers, the WSR test will less likely indicate spurious significance compared with the t-test (Elsner & Jagger, 2013). Other assumptions include that the sample needs to include dependent observations of the cases, the observations are independently drawn, measurements are continuous in theoretical nature, and the values should be of ordinal scale, which are all met by the current sample (King & Eckersley, 2019). That is why the WSR is one of the main statistical tests used in this research to analyze whether median abnormal operating performance is significantly different from zero.

Lastly, the sign test. The sign test is another nonparametric test that is quite simple and contains the least assumptions about the distribution (Sprent, 2011). Sample items should be independent, items are dichotomous, and the sample size is significantly less that the population size (Whitley & Ball, 2002). Even though the test contains a small number of assumptions, and it has very general applicability, the sign test is not used to assess if the percentage of positive abnormal operating performance is significantly different from 50%, because it lacks the statistical power of the WSR test (Whitley & Ball, 2002). So, the t-test and WSR test were used together, as is common in event study methods (Orzes et al., 2017; Shou et al., 2021). This study measures the significance of results conservatively by reporting two-tailed tests of significance. The results are reported in section 4.2. In addition, this study applies a post-hoc analysis, where the influence of reverse factoring on performance is further assessed by examining other performance indicators, sales growth and net operating working capital (section 4.4).

3.5 Influence of US culture on the relationship

The difference in performance due to cultural differences was examined by comparing the results of Shou et al. (2021) to the results of this study. A similar method, and the same statistical tests were used to increase the comparability between the two studies and increase the validity of the study. A comprehensive overview of the results of the study by Shou et al (2021) can be found in appendix 2. This overview is used to assess the possibility of a moderating effect of culture on the relationship between reverse factoring and operating performance. The focus of the comparison is on the mean from the t-test and the median from the WSR test, but also the p-value to assess the strength of the pattern that is observed. The results of this comparative study can be found in section 4.3.

3.6 Validity and reliability

As a robustness check, to ensure reliability of the results, this research investigates multiple performance indicators for its main hypothesis, to see if results are consistent across similar indicators. Furthermore, this study uses reliable objective financial data, collected by WRDS directly from balance sheets. Especially after IFRS implementation, financial data collected from balance sheets increased significantly in reliability (Jianu & Jianu, 2021), making this a reliable source of data, and ensuring the reliability of this study. Moreover, WRDS Compustat has been used frequently in similar studies, as is mentioned above, ensuring its reliability. The factiva database is a complete database including many qualities news sources, such as the Wall Street Journal, containing direct accounts of business events all in one place. It has been used often to find company announcements and is considered a reliable source. As this study does not make use of survey research, or a case study method with interviews, response bias is not relevant, reducing the threat of reliability issues.

To ensure both internal and external validity, this study makes use of control groups matched based on size and performance as explained above. By making use of matched control pairs, the results will correspond more accurately to real properties and variations in the physical world, and all industry-wide events will be controlled for. This study further examines the external validity by comparing its results to a similar study executed in a different context, to make the findings more generalizable. It increases its internal validity by only examining manufacturing firms in a specific context, not including other industries.

4 Results

4.1 Descriptive statistics

An overview of the characteristics of sample and control firms can be found in *table 2.* Panel A presents the characteristics of the sample firms in the base year t - 1, including total assets, sales, operating

costs, operating income and the number of employees, and panel B presents the same characteristics of the control firms in the base year.

	Mean	SD	Min	Max
Panel A: The characteristics of sample firms				
Total assets ($ Million)	69425.64	85948.72	45.98	376841.00
Sales ($ Million)	63473.19	89336.69	14.04	482154.00
Operating costs ($ Million)	53557.88	81400.57	35.47	452560.00
Operating income ($ Million)	7154.35	10184.58	-110.71	48999.00
Number of employees (Thousands)	176.84	382.79	0.10	2300.00
Panel B: The characteristic of control firms				
Total assets ($ Million)	43943.16	81834.28	119.33	446898.44
Sales ($ Million)	37857.32	56719.75	96.78	274101.51
Operating costs ($ Million)	33250,67	51991.03	92.59	24860.85
Operating income ($ Million)	2936.80	3260.84	0.71	11553.00
Number of employees (Thousands)	91.38	134.88	0.40	572.80

Table 2: *Characteristics of sample and control firms*

4.2 The effect of reverse factoring on performance

The event study results of the statistical tests performed on three operating performance indicators are shown in table 3. This study focuses on the periods where both the t-test and the nonparametric WSR test provide significant results, because the population sample size is small. The median is less susceptible than the average alone when analyzing small samples, and because this test makes fewer assumptions about the sample data (Barber & Lyon, 1996; De Jong et al., 2014; Hendricks & Singhal, 2005).

Hypothesis 1A stated that reverse factoring has a positive effect on cost efficiency. The results indicate that the abnormal changes in performance for the performance indicator "cost efficiency" are not statistically significant ($p > 0.1$) for both the pre- and post-implementation periods (year t-1 to t, t-1 to t+1, t-1 to t+2, t to t+1, t to t+2, and t+1 to t+2). This implies that reverse factoring does not significantly affect buyers' cost efficiency and shows that H1A is not supported.

Hypothesis 1B stated that reverse factoring has a positive effect on profitability. A similar result to cost efficiency was found for the pre-implementation period (year t-1 to t) and post-implementation periods (year t-1 to t+2, t to t+1, t to t+2 and t+1 to t+2) of the performance indicator "profitability" assessed through ROA. However, for the time period t-1 to t+1, the t-test shows that the mean abnormal performance is -0.0255 and statistically significant ($p = 0.045$), and the WSR test

shows that the median abnormal profitability performance is 0.0031 and statistically significant (p = 0.090). Since both the mean and median of abnormal performance in ROA are significantly different from zero, results are not due to chance. There is sufficient evidence to support the claim that the mean and median score in both tests were different from zero, so H1b is supported.

Period	N	AP mean	p-value (t-test)	AP median	p-value (WSR)
Cost efficiency					
t-1 to t	36	-0.0166	0.137	-0.0028	0.354
t-1 to t+1	36	0.0280	0.122	0.0031	0.765
t-1 to t+2	36	-0.0072	0.353	0.0010	0.730
t to t+1	36	-0.0096	0.185	0.0005	0.982
t to t+2	36	0.0043	0.310	-0.0024	0.700
t+1 to t+2	36	0.0029	0.352	-0.0020	0.492
Profitability (ROA)					
t-1 to t	36	-0.0069	0.215	-0.0004	0.694
t-1 to t+1	36	-0.0255	0.045**	0.0031	0.090*
t-1 to t+2	36	0.0112	0.168	-0.0045	0.637
t to t+1	36	0.0034	0.323	0.0027	0.734
t to t+2	36	0.0155	0.079*	0.0053	0.124
t+1 to t+2	36	0.0094	0.108	0.0024	0.274
Operating profit margin					
t-1 to t	36	0.0212	0.092*	0.0027	0.120
t-1 to t+1	36	0.0484	0.063*	0.0282	0.043**
t-1 to t+2	35	0.0412	0.117	0.0084	0.334
t to t+1	36	0.0124	0.140	0.0006	0.637
t to t+2	35	0.0192	0.177	0.0077	0.190
t+1 to t+2	35	0.0067	0.286	0.0036	0.159

*Note(s): *p<0.1, **p<0.05 All p-values are two-tailed. In some of the periods, the sample size is reduced because of missing values.*

Table 3: *Abnormal operating performance of sample firms.*

Lastly, Hypothesis 1C stated that reverse factoring has a positive effect on the operating profit margin. The final performance indicator "operating profit margin" did not provide significant results in most periods (p > 0.1), except for year t-1 to t+1. As is visible in table 3, the abnormal performance mean for operating profit margin is 0.0484, and statistically significant (p = 0.063), and the AP median is 0.0282, and statistically significant (p = 0.043). Since both the mean and the median of the abnormal performance of the operating profit margin is significantly different from zero, the results are not due to chance. There is sufficient evidence to support the claim that the mean and median score in both tests were different from zero, so, H1c is supported.

4.3 The influence of US culture on the relationship

Compared to the study of Shou et al (2021), of which an overview can be found in appendix 2, this study found comparable results. The comparison only considers the performance indicators cost efficiency and ROA as profitability as these are the same performance indicators Shou et al. (2021) examined.

First, one main similarity between the two studies are the non-significant ($p > 0.1$) results for most periods (t-1 to t, t-1 to t+2, t to t+1, t to t+2, t+1 to t+2). This means that this study found no other effects in the long-term considering these performance indicators and only the period t-1 to t+1 has significant abnormal performance (see table 4). This similarity proves consistency across the two studies in the short-term effect of RF on performance.

	Current study		Shou et al. (2021)	
Period	AP median	p-value (WSR)	AP median	p-value (WSR)
Cost efficiency				
t-1 to t	-0.0028	0.354	0.005	0.250
t-1 to t+1	0.0031	0.765	0.019	0.075*
t-1 to t+2	0.0010	0.730	0.022	0.375
t to t+1	0.0005	0.982	0.000	0.418
t to t+2	-0.0024	0.700	0.016	0.186
t+1 to t+2	-0.0020	0.492	0.004	0.696
Profitability (ROA)				
t-1 to t	-0.0004	0.694	0.006	0.225
t-1 to t+1	0.0031	0.090*	0.009	0.039**
t-1 to t+2	-0.0045	0.637	0.002	0.917
t to t+1	0.0027	0.734	0.001	0.316
t to t+2	0.0053	0.124	-0.000	0.769
t+1 to t+2	0.0024	0.274	0.005	0.420

Note(s): *p<0.1, **p<0.05. all p-values are two-tailed.

Table 4: *WSR test results of the compared studies*

A main point of comparison is the WSR test result in period t-1 to t+1, of which an overview can be found in table 5. Shou et al. (2021) found, similar to this study, a statistically significant result through the WSR test for this period (AP median profitability = 0.009, p = 0.039). The current study found a statistically significant AP median of 0.0031 (p = 0.090). This means that in both contexts, the median is significantly different from zero and results are not due to chance. In addition, concerning this period, the AP mean for profitability was significantly different from 0 in the current study, namely -0.0255 (p = 0.045), lower than the AP mean of Shou et al. (2021), which is 0.013 (p = 0.085).

Period t-1 to t+1 (ROA)	AP mean	p-value (t-test)	AP median	p-value (WSR)
Current study	-0.0255	0.045**	0.0031	0.090*
Shou et al. (2021)	0.013	0.085*	0.009	0.039**

Table 5: comparison of period t-1 to t+1 for performance indicator "profitability" (ROA)

Both the mean and median of this performance indicator are lower than the findings from Shou et al (2021), meaning that on average, the AP of sample firms' ROA lies lower, and, considering the median this means that in the current study, half the sample has values that are relatively lower than the sample of Shou et al. (2021). In addition, the p-value of the WSR test for ROA in this period is lower in Shou et al.'s (2021) sample, compared to the current study, meaning that the statistical significance of the observed abnormal performance in China is is stronger, and the observed pattern is stronger and clearer in Shou et al.'s context. Considering other time periods with non-significant results, the AP medians for profitability were lower in most periods (year t-1 to t, t-1 to t+2, and t+1 to t+2).

Period t-1 to t+1 (cost efficiency)	AP mean	p-value (t-test)	AP median	p-value (WSR)
Current study	0.0280	0.122	0.0031	0.765
Shou et al. (2021)	-0.001	0.963	0.019	0.075*

Table 6: comparison of period t-1 to t+1 for performance indicator "cost efficiency"

Moreover, as can be seen in table 6, there is a stark difference in results for the performance indicator cost efficiency. While Shou et al. (2021) found statistically significant results for period t-1 to t+1 (AP median: 0.019, p = 0.075), this study found no significant results for this performance indicator, indicating reverse factoring does not significantly affect cost efficiency in this context (see table 6).

The results imply that the strength of the relationship between reverse factoring and performance is weaker for this study's sample in this particular context compared to Shou et al.'s result. This means that there is a negative effect of US culture on the relationship between reverse factoring and operating performance, so hypothesis 2 is supported.

4.4 Post-hoc tests

This study performed a set of post-hoc tests to examine the performance effect of reverse factoring concerning other performance indicators, more distantly related to operating performance, but intricately linked to reverse factoring. One of the two performance indicators is net operating working

capital. This performance indicator is relevant because it directly measures a company's liquidity and operational efficiency within its supply chain (Caniato et al., 2016). This study measures net operating working capital, similar to other studies (Ross et al., 2005), as follows:

$$net\ operating\ working\ capital = \frac{current\ assets - current\ liabilities}{total\ assets}$$

As can be seen in table 7, for year t+1 to t+2, the AP median is 0.0167 and statistically significant ($p = 0.095$). This means that, in this period the median of abnormal performance for net operating working capital is significantly different from zero and not due to chance. Moreover, compared to other performance indicators examined before, reverse factoring has a significant effect on abnormal

Period	N	AP mean	p-value (t-test)	AP median	p-value (WSR)
Operating working capital					
t-1 to t	34	-0.0166	0.191	-0.0047	0.590
t-1 to t+1	34	-0.0107	0.280	0.0129	0.912
t-1 to t+2	32	0.0191	0.241	0.0158	0.614
t to t+1	35	0.0047	0.404	-0.0014	0.600
t to t+2	33	0.0221	0.232	0.0115	0.386
t+1 to t+2	33	0.0270	0.175	0.0167	0.095*
Sales growth					
t-1 to t	34	0.0989	0.205	0.0127	0.713
t-1 to t+1	34	-0.0084	0.434	-0.0122	0.626
t-1 to t+2	33	0.0085	0.458	0.0490	0.339
t to t+1	36	-0.1017	0.120	-0.0385	0.267
t to t+2	36	-0.0940	0.141	0.0038	0.814
t+1 to t+2	36	-0.0116	0.413	0.0245	0.551

Note(s): *p<0.1, **p<0.05 All p-values are two-tailed. In some of the periods, the sample size is reduced because of missing values.

Table 7: *Post-hoc analysis results of abnormal performance of sample firms*

performance of net operating working capital of buyers in the long-term (t+1 to t+2) instead of the relatively short-term (t-1 to t+1), only measuring an effect two years after implementation.

In addition, sales growth is also an important performance indicator, especially concerning performance within the market. Sales growth is measured through the sales growth ratio, the annual rate of change in sales (Swift et al., 2019). As is shown in table 7, the abnormal performance in sales growth is not statistically significant for any of the periods ($p > 0.1$), implying that reverse factoring does not significantly affect buyers' sales growth.

5 Discussion

5.1 Theoretical contributions

This study analyzes the impact of reverse factoring implementation on buyers' operating performance and examines the possibility of a moderating effect of US culture, with a focus on individualism, on this relationship. From the results reported in the previous section, several main conclusions can be derived. First, the results of this study indicate that reverse factoring has a positive effect in buyers' operating performance in terms of profitability and operating profit margin. This provides empirical support for the extant literature which postulated that reverse factoring implementation leads to improved performance for buying firms (Shou et al., 2021; Marchi et al., 2020). More specifically, it shows that buying firms can improve their profitability and operating profit margin by implementing reverse factoring. This study thus offers additional insights on the impact of reverse factoring on buyer firm performance. It also sustains the hypothesis, grounded in social exchange theory and the extended resource-based view, that the transparency, effective information sharing and collaboration with suppliers and financial institutions acquired through reverse factoring and the competitive advantage that originates from relational resources formed in the partnership do improve performance of buying firms. There is still a limited number of empirical studies that have examined the association between reverse factoring and operating performance, and this study contributes to the arguments of several previous studies on the positive performance effect of RF (van der Vliet et al., 2015; Beka Be Nguema, 2022; Bi et al., 2022; Liebl et al., 2016). So, this study greatly advances the knowledge about RF.

Interestingly, no effect was found for cost efficiency. the cause of this interesting finding could lie in operating costs. Throughout an SCF program, companies may face different costs in the different implementation stages because it has to invest many resources. On the one hand, costs could go up through inefficient use and unsuccessful application, as was speculated by Bozani et al. (2018). In addition, implementing RF consists of planning costs and implementation costs. As Seifert & Seifert (2011) highlighted in their research, the selection process of the provider, the financial institution, takes some time. Especially in choosing the platform, for example a cloud solution provided by a SCF provider, or a platform owned by the bank, takes time and builds up significant scouting costs. Moreover, there are significant implementation costs. De Boer et al. (2015) found that one of the main drawbacks of RF is the on-boarding process of suppliers, as it takes time and resources to educate and convince suppliers of the solution. Additional operating costs that are acquired in the process include training costs of staff, as employees have to be aware of RF and its workings (Zhang et al., 2019). All these additional costs could have significantly increased operating costs that, combined with total sales, determine cost efficiency (Kotabe et al., 2002). The increase in operating costs could explain

that reverse factoring is not positively related to cost efficiency. That RF does have a positive effect on profitability, and total sales as well, could be explained by the fact that profitability is not only determined by the operating costs of a company, but also through the general economic performance that is improved through reverse factoring implementation (Marchi et al., 2020; Chuk et al., 2021).

An additional explanation could be found in the methodology. While a similar methodology was used compared to similar studies (Shou et al., 2021), the sample size was significantly lower. This was mostly caused by specific characteristics of the population, namely that firms within the US are currently not required to disclose supply-chain financing arrangements in their financial filings (Maurer & Steinberg, 2021). This presented this study with a challenge in finding RF implementation announcements and caused the lower sample size, increasing the margin of error and reducing the chance of detecting a true effect (Button et al., 2013).

Second, the cultural comparison between China, a collectivist culture, and the United States, an individualistic culture, shows that the relationship between RF and operating performance within in US context is still positive, but it is weaker than in China. This provides some tentative evidence that US culture, characterized by individualism and other cultural traits, is less accommodating towards reverse factoring implementation, while a collectivist culture like China facilitates a stronger effect. The comparison revealed that the results of the tests are consistently non-significant in most periods, and the effect of RF on performance has a short-term positive effect in both contexts, proving that the RF effect is fixed across the different contexts. However, the effect was weaker in the US. This provides this research with enough evidence to suggest moderation of US culture, however, future research would be necessary to examine this concretely and statistically. The comparison also satisfies the need to assess the effect of reverse factoring in different contexts, to see if the hypotheses proposed by Shou et al. (2021) hold. These findings are particularly relevant since, to the best of this study's knowledge, the possibility of a moderating effect of national culture on the relationship between RF and firm performance has not been studied previously. A main difference that was identified was the presence of an effect of reverse factoring on cost efficiency in the study by Shou et al. (2021), but no effect in the current study. It is interesting that an effect was found in China as compared to the US. An explanation could be found in the individualism and its relation to the increased operating costs. As was explained before, increased operating costs can arise because of planning and implementation costs associated with RF. Earlier it was discussed that US culture, especially individualism within this culture, the benefits that arise through social relationships and partnerships with other actors can have been less prevalent because of the specific context, in this case individualism (Ketkar et al., 2012; Sako et al., 1995). Possibly, opposing Aviv's (2007) argument,

because buyers and suppliers are not fully transparent and trustful, information asymmetry will not be reduced and the buyer will still invest money in monitoring and controlling the transaction, thus not lowering transaction costs significantly (Dyer & Chu, 2003). Not fully trusting your partner could lead to higher transaction costs of picking and monitoring that strategic partner, resulting in higher operating costs. This could explain why reverse factoring does not positively affect cost efficiency in US context, but it does in Chinese context. Other performance indicators could remain unaffected, because operating costs could remain high even when the buyer starts receiving and noticing benefits from the arrangement in profits (for example through an increase in sales).

An additional explanation for these findings can be found in the type of economy both countries have. Considering the specificity of the US context in this study, the potential impact of the US context is discussed further. As was identified in the findings, the results of the sample within US culture are not as strong as Shou et al. 's (2021) results in Chinese culture. As Shou et al. (2021) identified in their research, China is an emerging economy, where SMEs often suffer from "financial issues such as the limited capacity of credit rating and the under-developed credit guarantee system, which results in financing difficulty" (Shou et al., 2021, p. 307). They argue that a financial solution such as SCF and RF could be important for firms in these economies because it can help mitigate these problems. This research found tentative evidence the effect is weaker in US culture; thus, it adds additional evidence to the argument that the effect of RF is more salient in emerging economies like China compared to developed economies like the US.

Third, the results from the post-hoc analysis reveal that RF improves buying firms' net operating working capital, a cash-based performance indicator, on a longer term (t+1 to t+2, two years after implementation). This finding implies that reverse factoring plays a significant role in helping buying firms secure financial resources in the long run. This is in line with the arguments presented by Liebl et al. (2016) and Grüter and Wuttke (2017), that buyers extend their own payment terms, allowing them to pay later, benefit from reduced costs of capital, reduced net liquidity needs and maintain and increase their net operating working capital. That the effect is only present after 2 years in interesting. Dello Iacono et al. (2015) argued that for a buyer, the benefit of a reverse factoring arrangement is the gradual reduction of working capital costs. Considering the current market conditions, the technological base of an RF arrangement and the required investments in the complete adoption process place a significant burden on the arrangement, because market conditions can change (Dello Iacono, 2015). Benefits inherent to RF can occur at any point in the process, so this could potentially explain the long-term effect observed in net operating working capital for the buyer firm.

Interestingly, the results of the post-hoc analysis suggest that reverse factoring does not affect buyers' sales growth. This supports the previous argument that relationships formed through reverse factoring implementation may not be as strong and open within the context of this study, an individualistic culture. Following ERBV, because those relationships are not fulfilled, it may not enable buying firms to utilize the relational resources that originate from the hypothesized high-quality relationships to the fullest, concluding that it mitigates the effect of buying firms' development of high-quality products for customers, not fully enhancing customer satisfaction and revenues, and causing sales growth to stall (Cheng, 2011).

This study contributes to RF and SCF literature by incorporating SET and ERBV theoretical perspectives to explain the relationship between RF and operating performance. The application of SET and ERBV in combination in this field is very scarce. On the one HANDSET suggests that the benefits that arise from collaboration, reciprocity and transparency between the buyer and suppliers in a reverse factoring arrangement help a buyer firm improve their performance, by lowering costs (e.g., transaction costs) and increasing efficiency within operations (Kwon & Suh, 2005; Gelsomino et al., 2016; Wuttke et al., 2013; Wu et al., 2014). Hence, SET provides a useful theoretical lens through which the effect of RF on operating performance can be understood. On the other hand, ERBV suggests that firms can gain a competitive advantage and achieve superior performance through the exchange and receival of external resources within a relational network, and the favorable supply chain linkages and increased stability that follow, which arise when reverse factoring in implemented (Lavie, 2006; Henderson & Cockburn, 1994). Hence, ERBV provides an additional theoretical lens to further understand the relationship.

5.2 Managerial implications

This research was aimed to provide deeper understanding of the impact of the relationship between reverse factoring and performance. It provides some new important implications for operations and supply chain managers. The results provide evidence that there is a positive effect of RF on operating performance, especially profitability and the operating profit margin. Firms can use these findings as an additional argument to implement reverse factoring in their business, and helps managers decide whether to invest resources in the development of a reverse factoring program by removing some lingering doubt about this practice. Moreover, it provides evidence that firms can gain a competitive advantage and significant social relationship benefits through implementation of RF. As Dello Iacono et al. (2015) already introduced, it also highlights the importance of transparency and trust in a RF relationship, as one can best introduce a reverse factoring arrangement when the benefits can be sustained as far as possible, not only when all participants can benefit.

Furthermore, the results of this research contribute to the generalizability of the effect to the population, because in this research a positive effect was found between RF and performance in US context, which adds to the equivalent results found in other research (Shou et al., 2021). Managers can use this information to be more confident in choosing to implement RF in multiple different contexts. This research provides tentative evidence that collectivist cultures are more suitable for RF implementation, in terms of profitability and cost efficiency. However, companies within individualistic cultures also benefit from RF because there is still a positive relationship between RF and profitability, as this research explained. If companies within individualistic cultures wish to implement RF, they have to consider that, at least in the first years, operating costs will be higher because they have to put considerable time and resources in the selection of the partner firm(s), and implementation and overseeing of RF, as trust and reciprocity are harder to come by. However, managers should not forgo RF just for this, as there are still significant benefits in terms of increased ROA and an improved operating profit margin. To successfully deal with this, managers should try to maintain a strong relationship with their suppliers and keep investing resources in and sharing them with suppliers, to make sure RF remains a beneficial arrangement for all parties involved.

5.3 Limitations and future research directions

This study does contain several limitations. First, this study is based on data gathered from publicly traded manufacturing firms in the United States. While the generalizability of the findings across countries has been improved by replicating Shou et al.'s (2021) research design in another context, this still limits the generalizability of the results to other sectors, such as the service sector, and private firms. Future research could examine the effect of reverse factoring on performance in service firms, or a case study approach could be applied to examine the effect within private firms. Second, this study provides a comparative account of two distinct cultures focusing on only one opposing cultural aspect of both China and the US. While this study found some evidence that US culture potentially negatively moderates the relationship between RF and operating performance, it has not been examined using statistical tests, using control variables. Future research could examine this more rigorously using statistical tests and controlling for additional factors, to see if individualism actually affects the relationship as was argued in the current study, or if there is no negative moderation or an influence from another cultural characteristic of the US. Third, one unique control firm was selected per sample firm based on size and performance (cost efficiency). A limitation that arises from this is that the distance between matched pairs could be different for each sample firm. To better control for possible industry-wide events that could influence the results, a minimum of three control firms per sample firm could be applied, as is common in other research (Orzes et al., 2017). Fourth, because of the study's limited sample size, it undertakes several sets of tests suitable for small samples, which

could affect the robustness of the results. If more samples can be obtained, some issues in this study still deserve further analysis. Fifth, the event study period ranged from t-1 to t+2. This did not allow this study to assess whether reverse factoring implementation has positive effects in the longer run (e.g., t+3, t+4, t+5).

Future research is needed to overcome these limitations and more generally shed further light on the effect RF on operating performance, as this is one of the very few studies that examines this phenomenon using archival data. Another future research opportunity lies in considering moderators (e.g., production and innovation capabilities, as were examined by Shou et al. (2021)) and further control variables (e.g., firm age, financial leverage, industry size) that were not considered in this study. Future research could also consider the use of alternative methods to compare different findings. Lastly, future research could examine this phenomenon in other contexts, like Europe, to further increase generalizability of the results.

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Appendices

Appendix 1: overview of sample firm distribution across industries and years

Panel A: distribution of sample firms by industry

4-digit NAICS code	Industry	Frequency	Percentage (%)
3112	Grain and Oilseed Milling	1	2.78
3121	Beverage Manufacturing	2	5.56
3152	Cut and Sew Apparel Manufacturing	1	2.78
3222	Converted Paper Product Manufacturing	1	2.78
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	1	2.78
3254	Pharmaceutical and Medicine Manufacturing	1	2.78
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	2	5.56
3261	Plastics Product Manufacturing	1	2.78
3322	Cutlery and Handtool Manufacturing	1	2.78
3331	Agriculture, Construction, and Mining Machinery Manufacturing	3	8.33
3341	Computer and Peripheral Equipment Manufacturing	4	11.11
3342	Communications Equipment Manufacturing	3	8.33
3344	Semiconductor and Other Electric Component Manufacturing	2	5.56
3352	Household Appliance Manufacturing	2	5.56
3361	Motor Vehicle Manufacturing	5	13.89
3364	Aerospace Product and Parts Manufacturing	2	5.56
3371	Household and Institutional Furniture and Kitchen Cabinet Manufacturing	1	2.78
3391	Medical Equipment and Supplies Manufacturing	3	8.33
TOTAL		**36**	**100**

Panel B: distribution of sample firms by year

Year	Frequency	Percentage (%)
2014	23	63.89
2015	4	11.11

2016	3	8.33
2017	2	5.56
2018	4	11.11
Total	**36**	**100**

Table: *Descriptive statistics of sample firms*

Appendix 2: Study results Shou et al. (2021)

Shou et al. (2021) – How does reverse factoring affect operating performance?		
Hypothesis	**Supported?**	**Explanation**
H1a: Reverse factoring has a positive effect on cost efficiency	Yes	t-test: no statistically significant results WSR: Time period year t-1 to year t+1 – the median abnormal cost efficiency performance is 0.019 and statistically significant (p < 0.1). Sign test: • year t-1 to year t+1: 59.9% of sample firms have positive abnormal cost efficiency performance (p < 0.05) • year t-1 to year t+2: 58.4% of sample firms have positive abnormal change in cost efficiency (p < 0.1) Results of all tests in other periods did not provide statistically significant results.
H1b: Reverse factoring has a positive effect on profitability	Yes	t-test: year t-1 to year t+1 – the mean abnormal performance of profitability is 0.013 and statistically significant (p < 0.1). WSR: Time period year t-1 to year t+1 – the median abnormal performance of profitability is 0.009 and statistically significant (p < 0.05). Sign test: • year t-1 to year t+1: 58.7% of the sample firms achieve positive abnormal performance in profitability (p < 0.05)

		Results of all tests in other periods did not provide statistically significant results.
Conclusion: the findings indicate that reverse factoring has a positive effect on buying firms' operating performance in terms of cost efficiency and profitability.		

Table 3: Overview of results (Shou et al., 2021)