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Less cash, more splash? A meta-analysis on the cashless effect

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ABSTRACT

Over 40 years of research links cashless payment methods to increased consumer spending. Referred to as the "cashless effect," this phenomenon has recently come under scrutiny as consumers are increasingly familiar with non-cash methods which could weaken the cashless effect, while other research challenges the robustness of the effect and questions which conditions could strengthen or weaken it. The current study contributes to reaching a consensus in this ongoing debate through a large-scale meta-analysis leveraging a meta-analytical framework that synthesizes the insights from the extant literature. Across 392 effect sizes from 71 papers, we reveal a small, but significant, cashless effect. Further, we show no evidence that cashless payment method features influence the cashless effect, while various consumption situations and contextual factors do. Specifically, the cashless effect is stronger in conspicuous consumption situations, while it is weaker in pro-social consumption situations. The results also reveal that the business cycle impacts the cashless effect, with it being stronger in periods of economic growth. Finally, the cashless effect has generally weakened over time. Our findings offer novel and actionable insights for academics, consumers, and practitioners such as retailers, charities, and policymakers interested in the effects of payment methods on consumer spending behavior.

1. Introduction

Rapid technological advancements are significantly changing the retail landscape (Luceri et al., 2022; Schambach, 2023). Apart from the ever-increasing popularity of online shopping, and augmented and virtual reality disrupting traditional customer journeys, retailers are also grappling with an increase in the number of cashless payment options available to (and demanded by) consumers (PwC, 2021). Innovative digital payment methods such as Buy-Now-Pay-Later (BNPL) schemes and eWallets are quickly replacing cash, with only 13 % to 14 % of American consumers still using the latter for most of their purchases (Gallup, 2022; Pew Research Center, 2022). As experts warn that a failure to embrace the "cashless revolution" could result in revenue losses (Schmidt, 2023), industry leaders are adjusting their marketing strategies by offering embedded payment methods on their platforms such as *Apple Pay* (Arbabi, 2023) or creating entirely cashless stores such as *Amazon Go* (Sweeney, 2023). *Yet, is this transition from cash to digital payments truly beneficial for retailers and consumers?*

Despite the advantages of cashless payment methods over cash for retailers (e.g., better consumer data paired with improved operational efficiency; Harvard Business Review, 2021) as well as consumers (e.g., higher security, convenience,

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Table 1
Overview of prior research on the cashless effect.

Moderators	Tested Previously?	Expected Influence on the Pain of Paying	Prior Effect of Moderator on Spending Outcomes (Representative Examples)[1]		
			Positive	Null	Negative
Cashless Payment Method Features					
Decoupled Payments	√	Decreases	Soman (2001) Monger and Feinberg (1997)	Falk et al. (2016) Boden et al. (2020) Liu and Dewitte (2021)	Boden et al. (2020)
Transparency	√	Increases	Meyll and Walter (2019)	Liu and Dewitte (2021) Boden et al. (2020)	Runnemark et al. (2015) Boden et al. (2020)
Consumption Situations					
Hedonic	√	Increases/Decreases	Liu and Choi (2020) Thomas et al. (2010)	Liu and Dewitte (2021)	Park and Banker (2022) Liu and Dewitte (2021)
Conspicuous	✗	Decreases	N/A	N/A	N/A
Pro-Social	√	Decreases	Feinberg (1986) McCall and Belmont (1996)	Kakkar and Li (2022) Lee et al. (2018)	Dewald (2003) Soetevent (2011)
Contextual Factors					
GDP Change	✗	Decreases	N/A	N/A	N/A
Inflation Rate	✗	Increases	N/A	N/A	N/A
Time	✗	Decreases	N/A	N/A	N/A

Notes: [1]These examples are intended to be illustrative; for comprehensive data coding details, please refer to Web Appendix C. N/A (not applicable) indicates moderator has not been tested in previous work.

and ease-of-use; Kapron, 2023), there are also increasing concerns about this shift. On one hand, empirical evidence suggests that the revenue benefits for retailers of going cashless may be weak or confined to specific industries or geographical regions (Jain, 2023; Krivosheya & Korolev, 2018). On the other hand, policymakers worry that certain cashless methods can lead consumers into "debt traps" by stimulating unsustainable spending (Hardekopf, 2023; Schomburgk & Hoffmann, 2023). Against this backdrop, there is an urgent need for retailers and consumers alike to clarify how cashless payment methods exactly impact spending outcomes in an increasingly digital society. While there has been a substantial amount of effort in the extant literature to answer this question, consensus is still missing, and a number of important questions remain unanswered.

Indeed, until recently, empirical research has generally suggested that the use of cashless payments methods (vs. cash) is associated with consumers spending more money (Feinberg, 1986; Hirschman, 1979; Thomas et al., 2010), buying a greater number of shopping items (Inman et al., 2009), and having a higher willingness to pay for products (Prelec & Simester, 2001). This phenomenon has been coined the "cashless effect" (Liu & Dewitte, 2021) and is typically attributed to the so-called "pain of paying" or psychological suffering that consumers experience when parting with their cash (Prelec & Loewenstein, 1998; Zellermayer, 1996). However, scholars have recently started to question whether the cashless effect has faded, disappeared, or even reversed over time (Lie et al., 2010; Liu & Dewitte, 2021; Nakajima & Izumida, 2015), with research increasingly recognizing that there may be contingency factors at play that can shift or moderate the cashless effect (Boden et al., 2020).

In this regard, Table 1 provides an overview of potential moderators of the cashless effect as suggested by the extant literature. First, a considerable stream of literature has assessed the influence of *cashless payment method features*—in particular whether the cashless effect is stronger or weaker for payment methods that temporally separate the costs and benefits of consumption (Gourville & Soman, 1998) or that are perceptually more or less similar to cash in terms of physical transparency (Soman, 2003). Second, given the clear emotive experience associated with paying for products or services, prior literature has also explored the role of *consumption situations*—specifically whether distinct motivations are driving the consumption of a particular product or service, such as the hedonic (vs. utilitarian) benefits that they might offer to an individual. Finally, prior work acknowledges that consumer spending behavior cannot be separated from the social and economic context in which payments are made (Feinberg, 1990), suggesting the moderating role of *contextual factors*, including the economic situation, inflation, and the passing of time. As shown in Table 1, to date the effects of these moderators remain ambiguous because they have (1) either not been empirically tested yet or (2) demonstrated inconsistent or mixed results.

The aforementioned contention in the extant literature does not only prevent scholars from developing generalizable theoretical and empirical knowledge, but also deprives retailers, consumers, and policymakers of relevant insights into reliable practical measures that can either weaken or strengthen the cashless effect. To address these shortcomings and systematically unify the extant knowledge on this topic, we conduct a meta-analysis of 40 years' worth of empirical findings ($k = 392$ from 71 papers), aiming to answer two overarching questions*: Do cashless payment methods generate greater spending outcomes in comparison to cash? If so, under what circumstances is this "cashless effect" either weakened or strengthened?* In doing so, we develop a novel organizing framework of the literature (Fig. 1) that assists us in testing how the cashless effect is

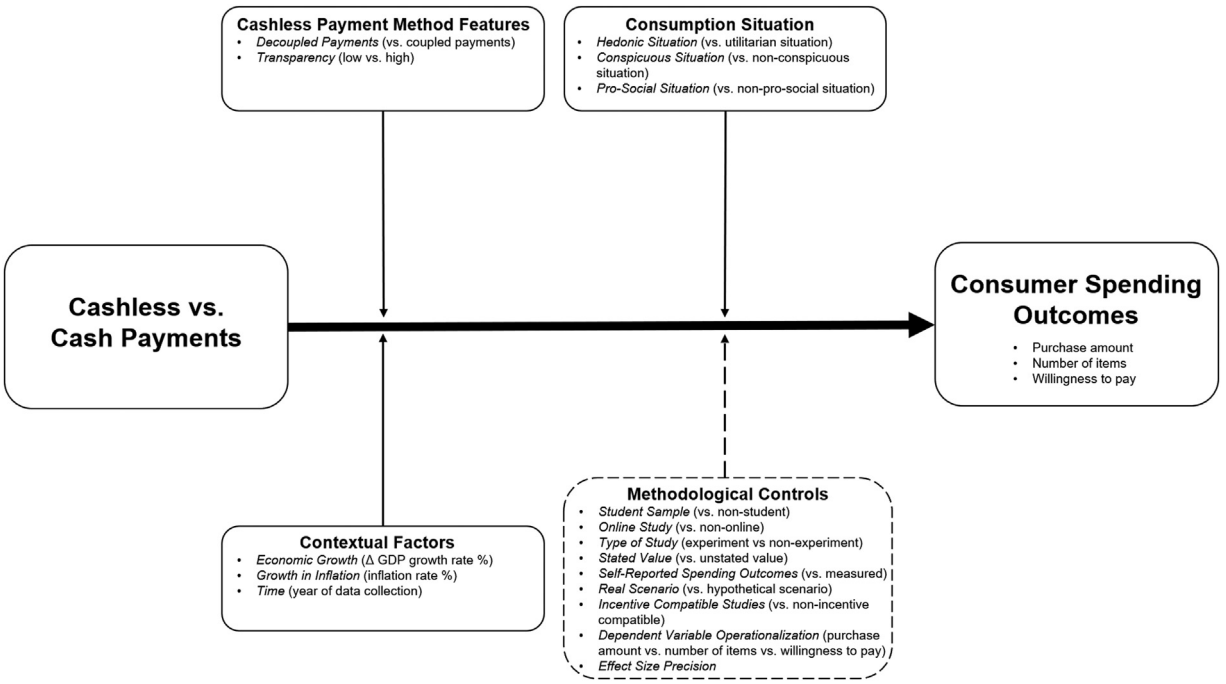

Fig. 1. Meta-analytical framework.

influenced by (1) *cashless payment method features*, (2) *consumption situations*, and (3) *contextual factors*. In contrast to previous attempts in the field to aggregate findings, which involved either qualitative approaches (Reshadi & Fitzgerald, 2023) or a narrow-scope meta-analysis (Liu & Dewitte, 2021),[1] our wide-ranging meta-regression findings provide robust evidence of the factors that influence the size and direction of the cashless effect based on the most comprehensive empirical evidence to date.

Our study offers important contributions to both marketing theory and practice. First, we develop a meta-analytical framework that synthetizes the extant research on the cashless effect through the lens of the pain of paying as the underlying explanatory mechanism. This framework helps us uncover and test the effects of various contingency factors of the cashless effect and directly responds to the call for research on generalizations of the effects of payment methods (Kamakura et al., 2014) and the moderators of the cashless effect (Boden et al., 2020; Liu & Dewitte, 2021). Thus, on one hand, we challenge previously held conceptions of relevant moderators while, on the other hand, we present novel, untested, but theoretically relevant contingency effects. For example, we are first to investigate and discover a negative effect of the passing of time and a positive effect of economic growth on the cashless effect, thereby providing much-needed initial insights into how socio-economic conditions affect people's spending behavior (Dekimpe & van Heerde, 2023; Feinberg, 1990; Gielens, 2023). Finally, based on our meta-analytical framework and findings, we present an extensive research agenda to guide future scholarly investigation in this field.

Second, our findings provide timely and practical insights for retailers, consumers, and policymakers. For retailers, we help answer important questions such as whether those firms that only accept cash as a method of payment (or are considering doing so) could be inadvertently diminishing their potential sales revenues in the evolving economic landscape towards a cashless world. Given the range of moderators that we examine, our findings provide valuable insights into the specific contexts in which cashless payment methods should be more actively promoted by retailers. Next, we provide specific recommendations for charities and consumers relying on pro-social spending by showing that cashless payment methods and cash are equivalent in terms of their influence on tipping and donation behaviors. Finally, for policymakers and consumer advocates, our research extends the growing discussion suggesting a potential "dark side" of a cashless society (Anaza et al., 2022). In particular, our findings highlight a possible negative impact of the use of cashless payment methods on consumer welfare in the sense of them spending more than intended, thereby impairing their (financial) well-being.

[1] Liu and Dewitte (2011) limited their scope to studies focusing solely on credit cards (k = 26 from 16 papers), whereas our investigation encompasses all forms of cashless payment methods, yielding 15 times more observations (k = 392 from 71 papers). Furthermore, Liu and Dewitte (2011) only considered the location and year of data collection as moderators of the cashless effect, whilst we consider 8 different theoretical moderators.

2. Theory and conceptual framework

Fig. 1 presents our conceptual framework. We first lay out the relationship between the usage of cashless payment methods (vs. cash) on consumer spending outcomes (i.e., purchase amount, number of items purchased, and willingness to pay), and then explain how (1) *cashless payment method features*, (2) *consumption situations*, and (3) *contextual factors* may influence this relationship in terms of moderating the cashless effect.

2.1. The cashless effect

According to the traditional economic view, which assumes that consumers behave rationally, there should be no discernible differences in spending behavior between payment methods (Soman, 2001). In essence, monetary funds should be spent equivalently, regardless of whether those funds are in a cash, card, online, or other form (Yao & Chen, 2014). However, a comprehensive body of research has held the consensus that consumers spend more when paying with cashless methods than with cash (Hirschman, 1979; Monger & Feinberg, 1997; Prelec & Simester, 2001; Raghubir & Srivastava, 2008). This observation contradicts traditional economic theory and is referred to as the "cashless effect." The main underlying theory used to explain the existence of this effect relates to the concept of the "pain of paying."

First described by Zellermayer (1996), the pain of paying refers to the negative emotions associated with the act of paying for goods and services, both after and before a payment is made (Reshadi & Fitzgerald, 2023). Given that humans are inherently loss averse (Kahneman & Tversky, 1979), individuals seek to avoid losses. As cash payments involve a physical loss of money, the pain of paying should be the greatest with cash (Chatterjee & Rose, 2011), a notion which is supported by preliminary neurological evidence (Mazar et al., 2017). Accordingly, consumers prefer payment methods which lower this pain (Zellermayer, 1996). As indicated by a recent systematic review, the most significant consequence of a lowered pain of paying is increased spending (Reshadi & Fitzgerald, 2023). Hence, the pain of paying is the predominant theory explaining why consumers spend more with cashless payment methods (Liu & Dewitte, 2021).

While alternative mechanisms have been proposed to explain the cashless effect, the underlying concepts often remain closely tied to the core idea of the pain of paying. For instance, Soman (2001) proposes a memory-based explanation, in which certain cashless payment methods have the potential to lead individuals to underestimate their prior expenditures, thereby leading to increased spending for additional products. In other words, certain cashless methods generate less memorable transactions when compared to cash payments, where money must be physically counted and handed over. This reduced memorability naturally reduces the pain of paying, making it easier for consumers to spend more with cashless methods. More recently, payment convenience has been proposed as an alternative mechanism to explain the cashless effect, based on the notion that "it is easier to swipe a credit card than search for coins" (Boden et al., 2020, p. 3). Once again, the argument relates to the pain of paying, suggesting that more convenient payment methods lower this pain.

In summary, the extant research focuses on the pain of paying as the underlying driver of the relationship between payment methods and consumer spending outcomes. As a starting point for our framework, we expect that cashless payment methods decrease the pain of paying (relative to cash), leading consumers to spend more freely. Therefore, we hypothesize that:

H1. *The use of cashless payment methods (*vs. *cash) is associated with greater consumer spending outcomes, an association which we will refer to as the "cashless effect."*

In the following sections, we discuss how certain factors can increase (decrease) the pain of paying, and thereby moderate the cashless effect. In line with our framework based on prior literature, we discuss the moderating role of (1) *cashless payment method features*, (2) *consumption situations*, and (3) *contextual factors*. We develop directional hypotheses when a clear direction of the moderating effect can be deduced based on the extant literature and rely on competing hypotheses when arguments can be proposed for either direction of the effect.

2.2. Cashless payment method features

Whilst cash serves as the baseline method of payment given that it is the legal tender of money, cashless payment methods can differ substantially from each other. Cashless payment methods often involve decoupled (or delayed) payments, and they also differ in their perceptual resemblance to cash.[2] Below, we develop hypotheses related to these factors and provide a visual representation of the differences between cashless payment methods in Fig. 2.

2.2.1. Decoupling

Prelec and Loewenstein (1998) distinguish between payment methods (or mechanisms) which decouple costs (i.e., payment) from benefits (i.e., consumption) and those that do not. This temporal separation extends to traditional (i.e., credit cards) as well as more innovative forms of BNPL schemes (e.g., Afterpay) (Schomburgk & Hoffmann, 2023). BNPL schemes

[2] Although multi-functionality has also been identified as a distinguishing factor of payment methods (Gafeeva et al., 2018), this factor did not appear in at least five observations, which is the required minimum number of observations to test for moderation in a meta-analysis based on prior literature (Palmatier et al. 2006). Consequently, we are unable to test directly for multi-functionality, but it will inform our future research agenda.

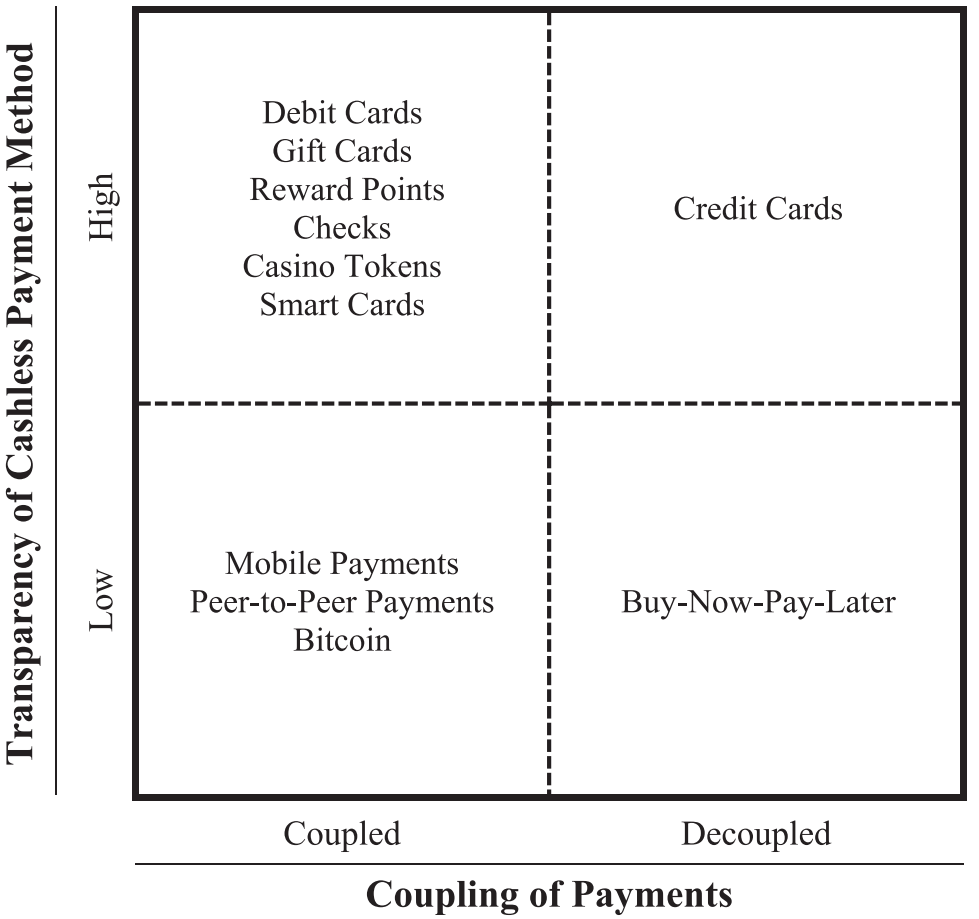

Fig. 2. Classification of cashless payment methods.
Notes: Transparency is the relative salience of a payment method, both in terms of physical form and amount, relative to cash (Soman, 2003). Coupling of payments refers to the temporal separation between the purchase and the actual payment (Prelec & Loewenstein, 1998).

temporally separate the costs and benefits of consumption (Gourville & Soman, 1998; Soman, 2001), which can make a payment less memorable as it might only be viewed as a commitment to pay instead of an actual payment. Consequently, the delay between obtaining the benefits of consumption and the costs thereof as is the case with decoupled payment methods lowers the pain of paying, which reduces barriers to spending (Prelec & Loewenstein, 1998). This can lead decoupled payment methods to be treated as "monopoly money" (Raghubir & Srivastava, 2008), enticing consumers to spend more compared to when using more immediate (i.e., coupled) payment methods. Hence, we hypothesize:

H2. *The cashless effect is stronger for decoupled (*vs. *coupled) cashless payment methods.*

2.2.2. Transparency

Soman (2003, p. 175) highlighted the transparency of different payment methods as an important distinguishing factor, which was defined as the "relative salience of the payment, both in terms of physical form and the amount, relative to paying by cash." Some cashless payment methods, such as credit cards, debit cards, and gift cards, exhibit a high level of transparency as they bear some resemblance to cash and often rely on tangible cards which require swiping or signing of a receipt. In contrast, other cashless payment methods, such as mobile payments, are considered to have low transparency as they negate the physical need for signing a receipt or using a plastic card (Falk et al., 2016; Liu et al., 2021). Payment methods with lower transparency make it harder for consumers to realize the monetary impact of a purchase, as funds are exchanged electronically, which individuals might not even be aware of (Xu et al., 2020). Hence, the depletion of money when using low-transparency payment methods is less vivid, given that there is nothing handed over physically. This, in turn, lowers the pain of paying, which can increase consumer spending outcomes. Therefore, we hypothesize:

H3. *The cashless effect is stronger for low (*vs. *high) transparency cashless payment methods.*

2.3. Consumption situations

Prior work has examined the cashless effect across a range of different consumption situations where a payment method is utilized. In this research, we define consumption situations as the distinct motives or benefits that drive the consumption of particular products and services. Specifically, in the following section, we develop hypotheses for how hedonic, conspicuous, and pro-social consumption situations influence the cashless effect.

2.3.1. Hedonic (vs. utilitarian) consumption situations

The most common distinction of consumption situations is between those that are hedonic vs. utilitarian. Hedonic situations involve purchases that predominantly provide emotional and psychological value, such as perfume, while utilitarian situations are associated with purchases that are mainly useful, practical, and functional, such as a dishwasher (Dhar & Wertenbroch, 2000).

The largely held consensus within the literature is that the cashless effect is stronger for hedonic compared to utilitarian consumption situations (Inman et al., 2009; Liu & Chou, 2020; Thomas et al., 2010). Utilitarian items are often aligned with achieving a predefined goal (Scarpi, 2020), allowing consumers to rationalize their spending as a necessity. Doing so is more challenging for hedonic items, given that in this consumption situation, spending motivations are primarily emotional (Thomas et al., 2010). Consequently, consumers may perceive a lower pain of paying when purchasing utilitarian instead of hedonic items, thereby reducing their tendency to spend more when using cashless payment methods instead of cash.

However, there are some notable opposing findings in the literature, which suggest that consumers' tendency to spend more when using cashless payment methods may be reduced in hedonic instead of utilitarian consumption situations (Bagchi & Block, 2011; Park & Banker, 2022). This is because hedonic items provide consumers with additional emotional pleasure in comparison to utilitarian items, and these added benefits may offset or override the pain of paying (Bagchi & Block, 2011). Accordingly, there is also reason to expect the cashless effect to be lower for hedonic as opposed to utilitarian consumption situations. Given these contrasting predictions based on the extant literature, we present a set of competing hypotheses:

H4a. *The cashless effect is stronger for hedonic (*vs. *utilitarian) consumption situations.*

H4b. *The cashless effect is weaker for hedonic (*vs. *utilitarian) consumption situations.*

2.3.2. Conspicuous consumption situations

The term "conspicuous consumption" was first coined by Veblen (1899) to explain how people consume certain goods and services primarily for the purpose of displaying wealth or attaining social status. This type of consumption is often driven by the human inclination to make social comparisons, where consumers are engaged in publicly displaying material goods (e.g., luxury cars) or experiential services (e.g., fine-dining) to "keep up with the Joneses" (Banuri & Nguyen, 2023). In light of this basic human desire, individuals often have to live beyond their financial means in order to keep up (Christen & Morgan, 2005). We posit that the associated financial burden that is often incurred, along with the predominantly extrinsic motivations to showcase social status rather than achieve personal intrinsic gains, result in a higher overall pain of paying in conspicuous consumption situations. Consequently, we expect individuals to spend more with less painful (cashless) methods. Accordingly, we hypothesize:

H5. *The cashless effect is stronger for conspicuous (*vs. *non-conspicuous) consumption situations.*

2.3.3. Pro-social consumption situations

A large body of research has assessed the role of cashless payment methods in pro-social consumption situations, such as when giving tips or making donations (Feinberg, 1986; Lynn & Mynier, 1993; McCall & Belmont, 1996; McCall et al., 2004). While the impact of cashless payments in this context has yielded mixed results (Bluvstein Netter & Raghubir, 2020; Kakkar & Li, 2022; Lynn & McCall, 2000), it is well-established that individuals can experience a sense of "warm glow" and increase their happiness by pro-social spending (Aknin et al., 2022). The warm glow experienced through spending on others may buffer the pain of paying (Reshadi & Fitzgerald, 2023). As a result, the overall pain of paying in pro-social consumption situations may be lower, reducing the cashless effect. We therefore hypothesize:

H6. *The cashless effect is stronger for pro-social (*vs. *non-pro-social) consumption situations.*

2.4. Contextual factors

The pain of paying might also depend on situational factors (Reshadi & Fitzgerald, 2023). More specifically, prior work has hinted at the significance of the economic and historical context of a particular study in influencing the cashless effect (Feinberg, 1990; Lie et al., 2010). In the following sections, we discuss hypotheses related to such contextual factors.

2.4.1. Gross domestic product (GDP) change

As a key economic indicator, when a country's GDP increases, consumers tend to become more confident and optimistic about their financial situation and the future. As a consequence, they are likely to perceive a lower pain of paying as they are less worried about the cost implications of their purchases (Griffiths, 2000). Such an expectation is consistent with prior research finding that higher levels of optimism about the economic situation lead consumers to exhibit lower self-control and make less prudent financial decisions (Puri & Robinson, 2007). A generally lower pain of paying during periods of economic growth implies that the cashless effect will be less pronounced. We hypothesize:

H7. *The cashless effect is weaker in periods of positive (*vs. *negative) changes in GDP.*

2.4.2. Inflation rate

As another key economic indicator, consumers often adjust their spending behavior in response to inflation. When the inflation rate is high, the prices of goods and services go up relatively quickly, eroding consumers' purchasing power. As a result, periods of high inflation will make people more cautious about their spending habits. Specifically, individuals are likely to have heightened financial awareness during these times. Given that being cognizant of a financial loss is a precursor to the pain of paying (Reshadi & Fitzgerald, 2023), we expect that the overall pain of paying for goods and services will be greater amid periods of higher inflation (Gladstone & Masters-Waage, 2023), increasing the cashless effect. We thus hypothesize:

H8. *The cashless effect is stronger in periods of higher (*vs. *lower) inflation.*

2.4.3. Time

As previously mentioned, cashless payment methods have witnessed a steady increase in consumer adoption over the years. Recent survey data suggests that only 13 % to 14 % of Americans now use cash to make all of their purchases (Gallup, 2022; Pew Research Center, 2022). Given that younger generations often no longer carry any cash (Pew Research Center, 2022), individuals have become increasingly familiar with the process of paying for goods and services with cashless payment methods over time (Liu & Dewitte, 2021). The COVID-19 pandemic has further fueled this trend (The World Bank, 2022a), with hygiene concerns of handling cash further ingraining consumer usage of cashless payment methods. It is likely that the regular usage of cashless payment methods has blurred the distinction between their use and that of physical cash over time, thereby also narrowing the difference in the pain of paying associated with these payment methods (Broekhoff & van der Cruijsen, 2024). This reasoning aligns with adaptation level theory (Helson, 1948), which suggests that individuals' judgments of stimuli are shaped by their previous experience. Thus, the cashless effect is likely to have diminished over time due to the habituation resulting from increased utilization of cashless payment methods, weakening their impact on individuals' response. Therefore, we hypothesize:

H9. *The cashless effect has weakened over time.*

3. Methodology

3.1. Data collection

To identify relevant studies to include in our meta-analysis, we conducted an extensive search which considered both peer-reviewed and non-peer-reviewed studies. We searched using keywords such as "Cash", "Credit Card", "Buy-Now-Pay-Later", "Debit Card", "Cheque", "Mobile Payment", "Online Payment", "Payment Method", "Payment Scheme", "Payment Instrument", "Payment Mode", "Cashless Payment", "'Digital Currency", "Currency", "Pain of Payment", "Pain of Paying", and "Credit Card Effect" in the title, abstract, and main text of the studies. First, we manually searched through all marketing, psychology, finance, and economics journals listed in the Australian Business Deans Council (ABDC) journal quality list. Second, we manually retrieved any articles that did not appear in the initial set of papers by searching through their reference lists. Third, to attenuate potential publication bias, we broadened our search through Google Scholar, SSRN, and ResearchGate to include non-peer reviewed studies in the form of working papers, conference proceedings, books, and dissertations.

To be included, an eligible study must (1) make a direct comparison between two different payment methods; (2) be an empirical paper written in English; and (3) contain enough information to compute effect sizes. If such information was not retrievable from the papers, we requested it from the authors. With this initial search, we completed our data collection in December 2022, and captured 197 papers—which are all listed in Web Appendix A.

We then excluded various studies based on the following eligibility criteria. First, we removed duplicate papers ($n = 2$) (i.e., those which were originally conference papers but were later published within journals), as well as papers for which we were unable to source sufficient data to perform our analysis, even after contacting the authors ($n = 11$). Second, we excluded papers which manipulated payment methods but failed to make a direct comparison to cash ($n = 20$), such as studies comparing credit cards vs. mobile payments. Third, we limited our focus to the consumer level and excluded papers which assessed spending behavior at the firm level ($n = 6$). Fourth, we excluded papers which did not clearly identify the individual payment method ($n = 13$). Finally, to capture the cashless effect, our dependent variable is consumer spending outcomes (see Web Appendix B). Note that the focus of our research is on spending outcomes *conditional* on the choice

of a payment method already being made. That is, we do not aim to explain what drives consumer choice for a particular payment method in the first place. In line with prior research on the cashless effect (Feinberg, 1986; Gafeeva et al., 2018; McGrath, 2006; Park & Banker, 2022), we operationalize spending outcomes across multiple dimensions. We specifically measure spending outcomes by considering the number of items purchased, the total purchase amount, and individuals' willingness to pay for products, irrespective of whether these transactions arise from hypothetical or real purchase scenarios. Accordingly, we excluded papers which measured other constructs ($n = 73$), such as psychological commitment (Shah et al., 2015) or purchase intentions (Han, 2022).

Applying these criteria, we retrieved 72 eligible papers that were published (or made available to us) between 1978 and 2022. At this stage, the number of effect sizes was 394. Following the recommendation of Viechtbauer and Cheung (2010), we found and removed 2 cases which were both outliers and influential, as indicated by their studentized deleted residuals and Cook's distance.[3] Therefore, our final sample size consisted of 392 effect sizes extracted from 71 eligible papers (55 peer-reviewed journal articles, 10 dissertations, 4 working papers, 1 conference paper, and 1 report), involving 11,257 unique participants, spanning 338,513 transactions across 17 different countries. In support of our considerable effort to identify unpublished work, 23 % of the included papers are not published in a peer-reviewed journal, which is a substantially higher percentage than in comparable recent meta-analyses (i.e., 3 % in Roschk et al. (2017); 9 % in Belli et al. (2022b)). See Web Appendix C for the effect sizes and the coding of the moderators for the papers included in our meta-regression.

3.2. Effect size computation

We utilized Hedges' *g* as our effect size measure, which is the bias-corrected standardized difference between two means (Cohen, 2013). A positive (negative) Hedges' *g* represents a greater (lower) spending outcome for cashless payment methods compared to cash. This effect size measure is appropriate given that most studies included experimental designs which compared the spending outcomes across independent groups. In cases where means where not reported, we used other indicators (e.g., *F*-value, *t*-value, *p*-value, correlation coefficient *r*) and converted these into Hedges' *g*, using the formulas in Borenstein et al. (2009). Web Appendix D includes the formulas used to calculate the effect sizes and their variances.

3.3. Coding of the moderators

Next, we coded for the moderators within our meta-analytical framework (Fig. 1). Table 2 provides a full list of the moderators as well as their definition and operationalization. Before including them in the model, we mean-centered continuous moderators while we dummy-coded categorical moderators. In the first phase of data coding, the first author coded for all studies such that there was no missing data. The second phase involved a trained research assistant who also coded for the categorical moderators independently and was blind to the hypotheses and goals of the research. The inter-coder agreement rate was 93.62 % and any disagreements were resolved through discussion. Table 2 summarizes our coding scheme for the moderators.

We first coded for whether the cashless payment method decouples (vs. couples) the benefit (i.e., consumption) from the cost (i.e., payment), such as with a credit card (debit card) (1 = decoupled payments; 0 = coupled payments). Second, given that our meta-analysis is a comparison against cash, we assessed whether there is a difference between cashless payment methods with high transparency against those with low transparency (1 = high; 0 = low).

For consumption situations, we first coded for whether it can be predominantly classified as hedonic. Given the blurred line for some products in terms of whether they provide predominantly hedonic or utilitarian benefits, such as food, we also code for a mixed situation (1 = hedonic, or else 0; 1 = mixed, or else 0, ref. = utilitarian). We also assess whether the consumption situation associated with the effect size can be labeled as conspicuous (1 = yes; 0 = no), that is, whether a product or service is used to publicly display wealth and gain social status (Belli et al., 2022a; Veblen, 1899). Finally, we coded for whether the payment action involved a pro-social consumption situation, such as tips and donations (1 = pro-social situation; 0 = no pro-social situation).

In terms of contextual factors, we obtained the annual change in the GDP growth rate as well as the inflation rate within the country under examination from The World Bank (2022a, 2022b) for the year in which the data collection took place. Additionally, we incorporated the year of data collection to capture the temporal dimension. If the data were collected over a multi-year window, we used the median year. If the year of data collection was not reported, we applied the t – 2 rule which is commonly utilized in the meta-analytical literature (Melnyk et al., 2022). This rule involves subtracting 2 years from the year of publication to account for the time it takes to write and complete a study and move through the peer-review process.

For the methodological controls, we coded for whether the effect size came from a study utilizing a student (1 = yes; 0 = no) or an online sample (1= yes; 0 = no). Further, we coded for the type of study design (1 = experimental design; 0 = non-experimental design). We also accounted for whether the value of the products under study was presented to participants or not (1 = stated value; 0 = unstated value). For example, some study designs asked for a reservation price for a

[3] We report the model with the two cases removed in our robustness checks (Web Appendix H.1 – Model 1). Our conclusions remain qualitatively the same.

Table 2
Definitions and operationalizations of moderators.

Moderators	Definition	Operationalization	Variable Name
Cashless Payment Method Features			
Decoupling	Categorical variable indicating whether the cashless payment method decouples the benefit (i.e., consumption) from the cost (i.e., payment), such as credit cards and buy-now-pay-later schemes. Dummy-coded.	0 = Coupled payments 1 = Decoupled payments	DECOUPLED
Transparency	Categorical variable indicating whether the cashless payment method can be classified as having low transparency (e.g., mobile payment), or high transparency (e.g., card payment) (Falk et al., 2016). Dummy-coded.	0 = Low transparency 1 = High transparency	TRANSPARENCY
Consumption Situations			
Hedonic Situation	Categorical variable indicating whether product is primarily consumed for hedonic, utilitarian, or mixed benefits. *Hedonic* products are typically associated with pleasure and excitement, such as ice cream (Boden et al., 2020), *utilitarian* products are predominantly used for functional and practical reasons, such as a smartphone charger (Boden et al., 2020), *mixed* products are a combination of both. Dummy-coded.	1 = Hedonic situation, or else 0 1 = Mixed situation (hedonic and utilitarian), or else 0 Ref Cat. = Utilitarian situation	HEDONIC MIXED
Conspicuous Situation	Categorical variable indicating whether the product is predominantly utilized to display wealth or status. Dummy-coded.	0 = Non-conspicuous situation 1 = Conspicuous situation	CONSPICUOUS
Pro-Social Situation	Categorical variable indicating whether the payment action involves a pro-social situation, such as tips and donations, or no pro-social situation, such as consumption for oneself. Dummy-coded.	0 = Non-pro-social situation 1 = Pro-social situation	PRO_SOCIAL
Contextual Factors			
GDP Change	Continuous variable based on the annual change in the GDP growth rate (World Bank, 2022a) in the year of data collection and the country of the sample (in comparison to the year prior to data collection).	Mean-centered annual GDP growth rate.	GDP_CHANGE
Inflation Rate	Continuous variable based on the annual inflation rate (World Bank, 2022b) in the year of data collection and the country of the sample.	Mean-centered annual inflation rate.	INFLATION_RATE
Time	Continuous variable indicating the year of data collection. If the year of was not reported, we subtracted 2 years from the year of publication. If the data collection period lasted multiple years, we utilised the median year of data collection (Belli et al., 2022b).	Mean-centered year of data collection of study.	TIME
Methodological Controls			
Student Sample	Categorical variable indicating whether the effect size was extracted from a student sample study. Dummy-coded.	0 = Non-student sample 1 = Student sample	STUDENT_SAMPLE
Online Sample	Categorical variable indicating whether the effect size was extracted from an online sample study. Dummy-coded.	0 = Non-online sample 1 = Online sample	ONLINE_SAMPLE
Type of Study	Categorical variable indicating whether the effect size was extracted from a study with an experimental design (majority of studies), or a non-experimental design (survey or panel data). Dummy-coded.	0 = Non-experimental design 1 = Experimental design	EXPERIMENT
Stated Value	Categorical variable indicating whether the price of the good/service is stated to participants or not. Dummy-coded.	0 = Value not stated 1 = Stated value	STATED_VALUE
Self-Reported	Categorical variable indicating whether the spending outcome was measured or self-reported.	0 = Measured 1 = Self-reported	SELF_REPORT
Real Scenario	Categorical variable indicating whether the study involved a hypothetical or real scenario. Dummy-coded.	0 = Hypothetical scenario 1 = Real scenario	REAL_SCENARIO
Incentive Compatibility	Categorical variable indicating whether the offered incentive is consistent with participants acting in accordance with their true preferences. Dummy-coded.	0 = Not incentive compatible 1 = Incentive compatible	INCENTIVE_COMP
Dependent Variable Operationalization	Categorical variable indicating whether the dependent variable was number of items, purchase amount, or willingness to pay (see Appendix B). Dummy-coded.	1 = Number of items, or else 0 1= Purchase amount, or else 0 Ref Cat. = Willingness to pay	ITEMS PURCHASE_AMOUNT
Precision	Continuous variable, calculated as the inverse of the pooled variance of the effect size (Stanley & Doucouliagos, 2012).	Mean-centered precision of an effect size.	PRECISION

Notes: In separate robustness checks (Web Appendix H), we also control for the average age of the sample, the proportion of females within the sample, whether the effect size came from a peer-reviewed journal, an FT50 journal, a marketing journal, or a longitudinal study.

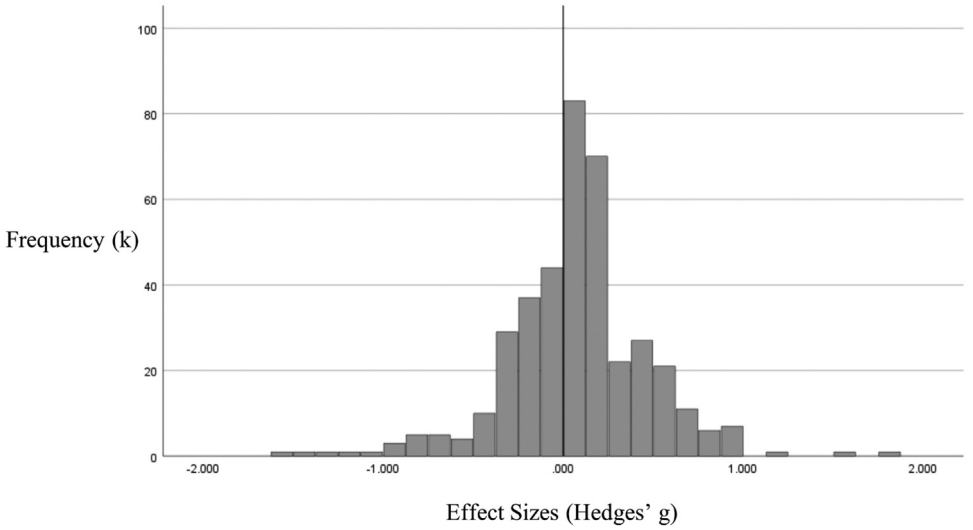

Fig. 3. Distribution of the effect sizes included in the meta-analysis.

product without presenting its price (Liu & Dewitte, 2021), while other designs presented the price (Liu & Chou, 2020), although they both intended to measure a willingness to pay. We also accounted for whether the study utilized self-reported spending outcomes (1 = self-reported; 0 = measured), involved a real scenario (1 = real scenario; 0 = hypothetical scenario), and was incentive compatible (1 = yes; 0 = no). Further, we controlled for the operationalization of spending outcomes (purchase amount vs. number of items vs. willingness to pay—see Web Appendix B). Finally, to account for potential publication bias, we included effect size precision, which represents the inverse of the pooled variance of the effect size (Stanley & Doucouliagos, 2012) and controls for whether effect sizes with less precision (i.e., those having a greater standard error) have a greater bearing on the results. We also run a series of diagnostic tests to assess potential publication bias in Web Appendix E.

3.4. Model specification

To address the nested data structure's potential for correlated errors and bias, we estimated a multilevel mixed effect meta-regression model (Van den Noortgate et al., 2015). This model assumes that observed effects sizes are randomly drawn from the population of true effect sizes, while their variation can be explained by moderators which act as fixed effects, and by random effects at the sample, study, and paper level to account for the nested structure of the data (Cheung, 2019). Thus, we modeled the effect sizes (ES) which are extracted in sample *i*, nested within study *j*, and further situated within paper *z* as:

$$\begin{aligned} ES_{ijz} = {} & \beta_0 + \beta_1 DECOUPLED_{ijz} + \beta_2 TRANSPARENCY_{ijz} + \beta_3 HEDONIC_{ijz} + \beta_4 MIXED_{ijz} + \beta_5 CONSPICUOUS_{ijz} \\ & + \beta_6 PRO\_SOCIAL_{ijz} + \beta_7 GDP\_CHANGE_{jz} + \beta_8 INFLATION\_RATE_{jz} + \beta_9 YEAR_{jz} + \beta_{10} STUDENT\_SAMPLE_{jz} \\ & + \beta_{11} ONLINE\_SAMPLE_{jz} + \beta_{12} EXPERIMENT_{jz} + +\beta_{13} STATED\_VALUE_{ijz} + \beta_{14} SELF\_REPORT_{jz} \\ & + \beta_{15} REAL\_SCENARIO_{jz} + \beta_{16} INCENTIVE\_COMP_{jz} + \beta_{17} ITEMS_{ijz} + \beta_{18} PURCHASE\_AMOUNT_{ijz} \\ & + \beta_{19} PRECISION_{ijz} + y_z + e_i + w_{jz} + u_{ijz} \end{aligned}$$

where $y_z \sim N(0, \sigma_y^2)$ is a random effect to estimate variance between papers, e_i is the sampling variance of the observed effect sizes, $w_{jz} \sim N(0, \sigma_w^2)$ is a random effect to estimate the variance between the studies nested within papers, $u_{ijz} \sim N(0, \sigma_u^2)$ is a random effect to estimate the variance between samples nested within studies and within papers, β_0 is the intercept, and β_{1-19} are the parameter estimates for all moderator variables detailed in Table 2. We analyzed the data using the Metafor package within R (Viechtbauer, 2010), utilizing a full maximum likelihood estimation method.

4. Results

We first present the grand mean effect size, which represents the outcome of estimating a meta-regression without any moderators, and the distribution of individual effect sizes (Fig. 3). Next, we check for multicollinearity (Table 3) and present the results of the meta-regression testing for the moderators in Model 1 (Table 4). To aid in the interpretation of the results, we additionally compute the predicted values ($\bar{g}$) of the moderators. To estimate the predicted value of a focal moderator category in a meta-analysis, it is common practice to set the values of the other moderators to their sample

Table 3
Descriptive statistics and correlation matrix.

		M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Decoupled	0.546	0.499	1																		
2	Transparency	0.755	0.431	**0.565**	1																	
3	Hedonic	0.209	0.209	**−0.148**	−0.028	1																
4	Mixed	0.423	0.495	**0.180**	**0.116**	**−0.441**	1															
5	Conspicuous	0.033	0.179	−0.089	0.072	**0.220**	−0.043	1														
6	Pro-Social	0.105	0.306	**0.178**	0.078	**−0.114**	0.095	−0.063	1													
7	GDP Change	−0.556	1.876	−0.082	−0.042	−0.076	**−0.106**	−0.032	**0.151**	1												
8	Inflation Rate	2.256	1.215	**0.110**	**0.225**	0.006	0.027	**−0.142**	−0.058	**−0.176**	1											
9	Time	2010	10.19	**−0.272**	**−0.432**	0.079	−0.071	−0.017	**−0.100**	**−0.163**	**−0.359**	1										
10	Student	0.582	0.000	**0.109**	**0.178**	0.080	−0.079	−0.016	**−0.251**	−0.026	**0.137**	**−0.213**	1									
11	Online	0.372	0.484	0.046	**−0.273**	0.071	−0.084	−0.054	**−0.160**	**−0.109**	**−0.126**	**0.511**	**−0.299**	1								
12	Experiment	0.883	0.322	**0.145**	**−0.115**	**0.168**	**−0.201**	−0.021	**−0.186**	−0.038	−0.010	**0.158**	**0.269**	**0.248**	1							
13	Stated-Value	0.329	0.470	**−0.266**	**0.134**	0.080	0.081	−0.039	**0.204**	−0.009	**0.157**	**−0.126**	**−0.198**	**−0.236**	**−0.487**	1						
14	Self-Report	0.020	0.142	−0.050	0.040	−0.030	**0.132**	**0.175**	**0.245**	−0.023	−0.091	0.006	**−0.170**	−0.037	**−0.396**	**0.168**	1					
15	Real-Scenario	0.339	0.474	**−0.299**	**0.120**	0.055	0.073	0.018	**0.301**	**0.111**	**0.105**	**−0.214**	**−0.201**	**−0.485**	**−0.509**	**0.679**	**0.201**	1				
16	Incentive-Comp	0.148	0.356	**−0.298**	0.087	**0.263**	−0.052	0.043	**−0.142**	0.008	0.078	−0.077	**0.150**	**−0.291**	0.063	**0.396**	−0.060	**0.582**	1			
17	Number of Items	0.133	0.340	**−0.414**	0.083	**0.132**	**−0.198**	−0.072	**−0.134**	0.020	**0.113**	−0.096	0.027	**−0.192**	**−0.208**	**0.558**	−0.003	**0.466**	**0.557**	1		
18	Purchase Amount	0.278	0.449	0.074	**0.115**	−0.067	**0.229**	−0.020	**0.551**	0.041	−0.071	−0.065	**−0.259**	**−0.195**	**−0.322**	**0.365**	**0.192**	**0.397**	−0.050	**−0.243**	1	
19	Precision	8.329	14.14	**−0.241**	0.081	−0.091	**−0.101**	−0.040	0.022	**0.137**	0.015	−0.075	**−0.314**	−0.098	**−0.616**	**0.363**	**0.103**	**0.332**	−0.092	**0.414**	0.025	1

Notes: M = Mean. SD = Standard deviation. Bold numbers denote correlations that are statistically significant at the 5 % level. For the categorical moderators, the reference categories are the following: Decoupled payments = coupled payments, transparency = low transparency, hedonic situation = mixed or utilitarian situation, mixed situation = hedonic or utilitarian situation, conspicuous situation = non-conspicuous situation, pro-social situation = non-pro-social situation, student sample = non-student sample, online sample = non-online sample, experiment = non-experiment, stated value = unstated value, self-reported = measured, real scenario = hypothetical scenario, incentive compatible = non-incentive compatible, number of items = purchase amount or willingness to pay, purchase amount = number of items or willingness to pay.

Table 4
Results for the meta-regression of the cashless effect ($k = 392$), Model 1.

	k	n	b	SE	[$CI_{95\ \%}$]	Predicted Value $\bar{g}$ [$CI_{95\ \%}$]	VIF
Intercept			−0.040	0.111	[−0.257, 0.178]		
Cashless Payment Method Features							
Coupled Payments	178	33				0.243 [0.137, 0.348]	
Decoupled Payments	214	50	−0.024	0.043	[−0.108, 0.059]	0.218 [0.117, 0.319]	2.413
Transparency: Low	96	14				0.174 [0.058, 0.291]	
Transparency: High	296	63	0.073	0.047	[−0.020, 0.165]	0.247 [0.150, 0.345]	2.268
Consumption Situation							
Utilitarian Situation	144	26				0.242 [0.139, 0.345]	
Hedonic Situation	82	22	−0.033	0.034	[−0.099, 0.033]	0.203 [0.098, 0.308]	1.330
Mixed Situation	166	49	−0.014	0.032	[−0.077, 0.050]	0.221 [0.122, 0.320]	1.361
Non-Conspicuous Situation	379	70				0.218 [0.123, 0.313]	
Conspicuous Situation	13	7	0.332***	0.093	[0.151, 0.514]	0.551 [0.356, 0.745]	1.137
Non-Pro-Social Situation	351	48				0.253 [0.158, 0.349]	
Pro-Social Situation	41	25	−0.230***	0.070	[−0.367, −0.094]	0.023 [−0.130, 0.176]	1.559
Contextual Factors							
GDP Change	392	71	0.033***	0.013	[0.008, 0.057]	−1 SD 0.197 [0.098, 0.295] +1 SD 0.262 [0.166, 0.358]	1.127
Inflation Rate	392	71	−0.000	0.019	[−0.036, 0.036]	−1 SD 0.229 [0.125, 0.333] +1 SD 0.229 [0.131, 0.328]	1.406
Time	392	71	−0.006**	0.003	[−0.012, −0.001]	−1 SD 0.236 [0.141, 0.330] +1 SD 0.223 [0.128, 0.317]	1.490
Methodological Controls							
Non-Student Sample	164	52				0.202 [0.097, 0.307]	
Student Sample	228	26	0.047	0.049	[−0.049, 0.142]	0.249 [0.143, 0.354]	1.430
Non-Online Sample	246	55				0.236 [0.129, 0.342]	
Online Sample	146	21	−0.017	0.055	[−0.125, 0.091]	0.219 [0.108, 0.329]	1.595
Type of Study: No-Experiment	46	19				0.152 [−0.001, 0.304]	
Type of Study: Experiment	346	54	0.088	0.079	[−0.068, 0.244]	0.240 [0.140, 0.339]	2.211
Unstated Value	263	29				0.071 [−0.010, 0.153]	
Stated Value	129	45	0.158***	0.063	[0.035, 0.281]	0.229 [0.135, 0.324]	1.604
Measured Outcome	384	67				0.230 [0.136, 0.334]	
Self-Reported Outcome	8	4	−0.035	0.120	[−0.270, 0.200]	0.195 [−0.058, 0.448]	1.395
Hypothetical Scenario	259	29				0.236 [0.118, 0.355]	
Real Scenario	133	45	−0.021	0.084	[−0.185, 0.143]	0.215 [0.087, 0.344]	2.849
Non-Incentive Compatible	334	60				0.240 [0.142, 0.337]	
Incentive Compatible	58	12	−0.070	0.097	[−0.260, 0.120]	0.170 [−0.020, 0.359]	1.892
DV: Willingness to Pay	231	18				0.214 [0.088, 0.340]	
DV: Number of Items	52	9	−0.014	0.090	[−0.190, 0.163]	0.217 [0.063, 0.372]	2.178
DV: Purchase Amount	109	51	0.060	0.069	[−0.074, 0.195]	0.273 [0.165, 0.381]	2.411
Effect Size Precision	392	71	−0.003*	0.002	[−0.007, 0.000]	Linear (a)	1.454
Pseudo-R^2	46.13 %						

Notes: k = number of effect sizes; n = number of papers the effect sizes have been extracted from; b = unstandardized regression coefficient estimate (to aid interpretation, we offer three decimal places); SE = standard error of the regression coefficient; CI95 % = 95 % confidence interval of the regression coefficient; VIF = variance inflation factor. For the categorical moderators, the reference categories are the following: Decoupled payments = coupled payments, transparency = low transparency, hedonic situation = mixed or utilitarian situation, mixed situation = hedonic or utilitarian situation, conspicuous situation = non-conspicuous situation, pro-social situation = non-pro-social situation, student sample = non-student sample, online sample = non-online sample, experiment = non-experiment, stated value = unstated value, self-reported = measured, real scenario = hypothetical scenario, incentive compatible = non-incentive compatible, number of items = purchase amount or willingness to pay, purchase amount = number of items or willingness to pay. Predicted values are obtained while the other moderators are at their average sample value, apart from the significant categorical methodological controls which are set at 1. (a) The predicted values for the linear relationships (excluding effect size precision) are provided at +/- 1 standard deviation (SD). $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.
Notes: k = number of effect sizes; n = number of papers the effect sizes have been extracted from; b = unstandardized regression coefficient estimate (to aid interpretation, we offer three decimal places); SE = standard error of the regression coefficient; CI95 % = 95 % confidence interval of the regression coefficient; For each categorical variable, the top level represents the reference category. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

average (Belli et al., 2024; Melnyk et al., 2022). This can help establish an estimate of the mean effect size of the focal moderator category across all studies included in the meta-analysis, in average conditions. To account for method influences, we also set the significant categorical control variables at 1 (or most favorable condition) instead of their sample average (Roschk & Hosseinpour, 2020). Finally, we test for a series of two-way interactions in order to explore some interesting patterns in the data, such as the evolution of the theoretical moderators over time in Model 2 (Table 5).

4.1. Grand mean effect size and heterogeneity

Overall, the grand mean effect size is small, positive, and significant with $g = 0.135$, $CI_{95\ \%}$ [0.068; 0.203], $k = 392$. This result indicates that using cashless payment methods (relative to cash), has a small positive effect on consumer spending

Table 5
Alternative model including exploratory interactions ($k = 392$), Model 2.

	k	n	b	SE	[$CI_{95\ \%}$]
Intercept			−0.140	0.151	[−0.437, 0.156]
Cashless Payment Method Features					
Coupled Payments	178	33			
Decoupled Payments	214	50	−0.421***	0.114	[−0.096, 0.350]
Transparency: Low	96	14			
Transparency: High	296	63	0.127	0.114	[−0.096, 0.350]
Consumption Situation					
Utilitarian Situation	144	26			
Hedonic Situation	82	22	−0.009	0.039	[−0.086, 0.068]
Mixed Situation	166	49	−0.027	0.035	[−0.096, 0.042]
Non-Conspicuous Situation	379	70			
Conspicuous Situation	13	7	0.323***	0.090	[0.146, 0.500]
Non-Pro-Social Situation	351	48			
Pro-Social Situation	41	25	−0.262***	0.067	[−0.394, −0.130]
Contextual Factors					
GDP Change	392	71	0.036***	0.012	[0.012, 0.060]
Inflation Rate	392	71	−0.011	0.019	[−0.048, 0.026]
Time	392	71	0.016	0.014	[−0.012, 0.060]
Methodological Controls					
Non-Student Sample	164	52			
Student Sample	228	26	0.042	0.047	[−0.051, 0.134]
Non-Online Sample	246	55			
Online Sample	146	21	−0.048	0.055	[−0.156, 0.061]
Type of Study: Non-Experiment	46	19			
Type of Study: Experiment	346	54	0.072	0.075	[−0.075, 0.219]
Unstated Value	263	29			
Stated Value	129	45	0.170***	0.060	[0.053, 0.288]
Measured Outcome	384	67			
Self-Reported Outcome	8	4	0.028	0.113	[−0.192, 0.249]
Hypothetical Scenario	259	29			
Real Scenario	133	45	−0.023	0.080	[−0.181, 0.134]
Non-Incentive Compatible	334	60			
Incentive Compatible	58	12	−0.033	0.094	[−0.217, 0.151]
DV: Willingness to Pay	231	18			
DV: Number of Items	52	9	−0.034	0.086	[−0.203, 0.134]
DV: Purchase Amount	109	51	0.064	0.065	[−0.063, 0.190]
Effect Size Precision	392	71	−0.003	0.002	[−0.006, 0.001]
Exploratory Interactions					
Decoupled Payments x Time	214	50	0.003	0.005	[−0.007, 0.013]
Transparency: High x Time	296	63	−0.020	0.015	[−0.050, 0.010]
Hedonic Situation x Time	82	22	−0.008	0.005	[−0.018, 0.002]
Mixed Situation x Time	166	49	0.001	0.004	[−0.007, 0.008]
Conspicuous Situation x Time	13	7	0.020	0.013	[−0.005, 0.044]
Pro-Social Situation x Time	41	25	−0.009*	0.005	[−0.018, 0.001]
GDP Change x Time	392	71	−0.002*	0.001	[−0.004, 0.000]
Inflation Rate x Time	392	71	−0.001	0.001	[−0.003, 0.001]
Decoupled Payments x Transparency: High	209	48	0.482***	0.141	[0.205, 0.759]
Pseudo-R^2	55.70 %				

outcomes, which supports H_1. The distribution of effect sizes of the influence of the usage of cashless payment methods on spending outcomes is highly heterogeneous, as shown by Fig. 3, which depicts a range of effect sizes from $g = -1.508$ to $g = 1.852$ (mean = 0.078; median = 0.077; SD = 0.397). Further, the I^2 value of 86.20 % indicates that there is a high proportion of "total variation across studies that is due to heterogeneity rather than chance" (Higgins et al., 2003, p. 558). Hence, most of the observed variability in effect sizes is attributed to systematic factors rather than arising from the sampling error, suggesting that the investigation of moderators is warranted.

In Table 3, we present the descriptive statistics and bivariate correlations between the moderators, which range from $r = -0.616$ (between precision and experimental designs) to $r = 0.679$ (between real scenario and stated value). We present the variance inflation factors (VIFs) for all moderators in Table 4, with the highest being 2.849, suggesting that multicollinearity is not a concern (Melnyk et al., 2022). In Web Appendix F, we also present a caterpillar plot for the grand mean effect size, as well as the moderating effects, which are discussed next.

4.2. Cashless payment method features

We find no support for H_2 or H_3, which suggests that the cashless effect does not differ based on the decoupled vs. coupled nature of payment methods ($b_{DECOUPLED} = -0.024$, $p = 0.568$; $\bar{g}_{DECOUPLED} = 0.218$; $\bar{g}_{COUPLED} = 0.243$), or for pay-

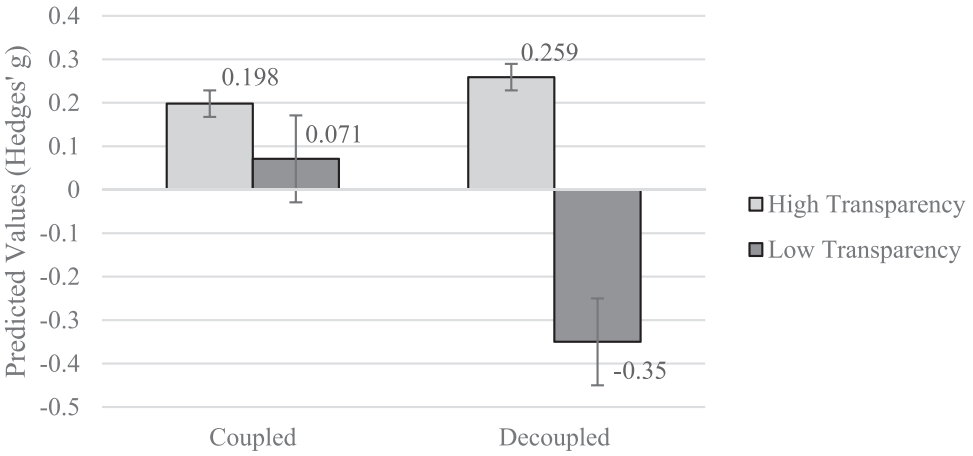

Fig. 4. Interaction between cashless payment method features on the cashless effect.

ment methods which have high transparency, in comparison to those which have low transparency ($b_{TRANSPARENCY} = 0.073$, $p = 0.122$; $\bar{g}_{HIGH\text{-}TRANSPARENCY} = 0.247$; $\bar{g}_{LOW\text{-}TRANSPARENCY} = 0.174$). However, these results do not offer a full representation of the effects. In line with previous meta-analyses in the field (Belli et al., 2024; Melnyk et al., 2022), we also ran a series of exploratory interaction analyses which revealed a significant two-way interaction between decoupled payment methods and high transparency ($b_{DECOUPLED*TRANSPARENCY} = 0.482$, $p < 0.001$; Table 5). As shown in Fig. 4, within decoupled methods, those with higher transparency have a higher cashless effect than those with lower transparency ($\bar{g}_{HIGH\text{-}TRANSPARENCY} = 0.259$, $\bar{g}_{LOW\text{-}TRANSPARENCY} = -0.350$, Wald-type test = 3.442, $p < 0.001$), but this difference is insignificant within coupled methods ($\bar{g}_{HIGH\text{-}TRANSPARENCY} = 0.198$, $\bar{g}_{LOW\text{-}TRANSPARENCY} = 0.071$, Wald-type test = 0.966, $p = 0.334$).

4.3. Consumption situations

We find that the cashless effect is not influenced by whether a consumption situation is hedonic ($b_{HEDONIC} = -0.033$, $p = 0.322$; $\bar{g}_{HEDONIC} = 0.203$) or mixed ($b_{MIXED} = -0.014$, $p = 0.668$; $\bar{g}_{MIXED} = 0.221$) as opposed to utilitarian ($\bar{g}_{UTILITARIAN} = 0.242$), which does not support H_4. Nevertheless, the cashless effect is stronger for a conspicuous vs. non-conspicuous consumption situation ($b_{CONSPICUOUS} = 0.332$, $p < 0.001$; $\bar{g}_{CONSPICUOUS} = 0.551$; $\bar{g}_{NON\text{-}CONSPICUOUS} = 0.218$), in line with H_5. Finally, in support of H_6, the cashless effect is weaker in a pro-social compared to a non-pro-social consumption situation ($b_{PRO\_SOCIAL} = -0.230$, $p < 0.001$; $\bar{g}_{PRO\_SOCIAL} = 0.023$; $\bar{g}_{NON\text{-}PRO\_SOCIAL} = 0.253$).

4.4. Contextual factors

Contrary to H_7, we find that the cashless effect is stronger when the GDP growth rate is increasing ($b_{GDP\_CHANGE} = 0.033$, $p = 0.009$; $\bar{g}_{GDP\_CHANGE+1SD} = 0.262$; $\bar{g}_{GDP\_CHANGE\text{-}1SD} = 0.197$). We find that the cashless effect is not moderated by the inflation rate ($b_{INFLATION\_RATE} = -0.000$, $p = 0.997$; $\bar{g}_{INFLATION\_RATE+1SD} = 0.229$; $\bar{g}_{INFLATION\_RATE\text{-}1SD} = 0.229$), which does not support H_8.

Furthermore, we find that the cashless effect has gotten weaker over time ($b_{TIME} = -0.006$, $p = 0.025$; $\bar{g}_{TIME+1SD} = 0.223$; $\bar{g}_{TIME\text{-}1SD} = 0.236$), in support of H_9. To explore this finding more deeply, we follow the approach of Eisend (2015) and plot the effect of time on the cashless effect in Fig. 5, whilst also testing for a quadratic term in Web Appendix G. We find a null effect for the quadratic term of time, indicating a gradual linear decline in the cashless effect over time, which is consistent with the visualization in Fig. 5. Finally, we also explore two-way interactions between time and the other moderators to further investigate this finding (Table 5). We find that the impact of pro-social consumption situations and GDP change on the cashless effect gets marginally weaker over time ($b_{PRO\_SOCIAL*TIME} = -0.009$, $p = 0.066$; $b_{GDP\_CHANGE*TIME} = -0.002$, $p = 0.059$).

4.5. Methodological controls

None of the sample characteristics are significant, indicating that the studies included in the meta-analysis yield the same results, regardless of whether they involved a student (vs. non-student) or an online (vs. offline) sample ($b_{STUDENT\_SAMPLE} = 0.047$, $p = 0.338$; $b_{ONLINE\_SAMPLE} = -0.017$, $p = 0.760$). The cashless effect is also not influenced by whether the study involves an experimental (vs. non-experimental) design ($b_{EXPERIMENT} = 0.088$, $p = 0.269$). However, we find that the cashless effect is stronger in studies that disclosed to participants the cost of a product to elicit a reservation price in comparison to those which did not do so ($b_{STATED\_VALUE} = 0.158$, $p = 0.012$). We find no significant moderation effects for self-reported (vs. measured) ($b_{SELF\_REPORT} = -0.035$, $p = 0.770$), real scenario (vs. hypothetical) ($b_{REAL\_SCENARIO} = -0.021$,

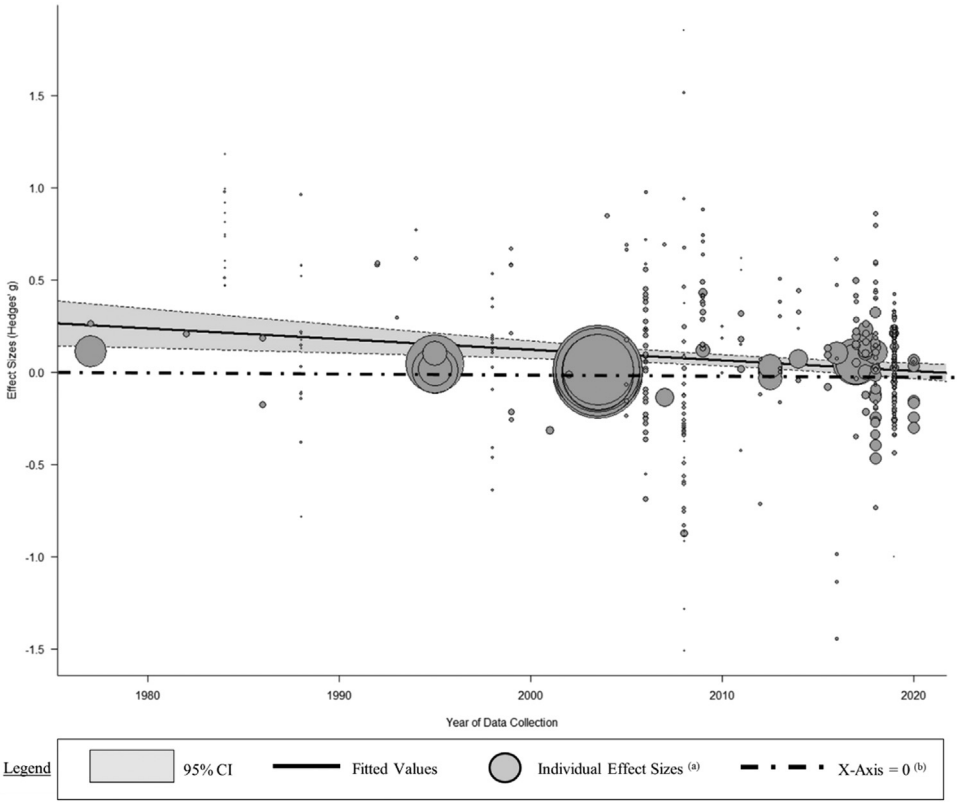

Fig. 5. : The evolution of the cashless effect over time.
Notes: (a) = size of circles are proportional to the inverse of the standard errors for individual effect sizes, (b) = line added to aid interpretation, indicates that the cashless effect has remained positive over time.

$p = 0.803$), or incentive compatible (vs. non-incentive compatible) ($b_{INCENTIVE\_COMP} = -0.070$, $p = 0.472$) studies. We also find no differences in the cashless effect for whether the dependent variable is operationalized in terms of number of items ($b_{ITEMS} = -0.014$, $p = 0.880$), or purchase amount ($b_{PURCHASE\_AMOUNT} = 0.060$, $p = 0.379$), as opposed to when it is operationalized as willingness to pay. Finally, in terms of our control for publication bias, effect size precision has a significant moderating effect ($b_{PRECISION} = -0.003$, $p = 0.054$).

4.6. Robustness checks and additional analyses

We perform multiple analyses to verify the robustness of our findings. First, we perform a series of tests to diagnose for publication bias, including the contour-enhanced funnel plot, Egger's regression test, and the trim-and-fill method (Web Appendix E). The findings suggest that publication bias within the dataset is unlikely, and that the asymmetry of the funnel plot may be due to effect size heterogeneity instead. Nevertheless, as mentioned, we relied on effect size precision to control for publication bias in our model and showed that our findings are robust.

Second, we perform analyses based on 7 alternative model specifications (Web Appendix H) that (1) include outliers, or adopt alternative methodological choices where we control for (2) the average age of the sample; (3) the proportion of female participants in the sample; (4) publication in marketing journals; (5) publication in a peer-reviewed journal; (6) publication quality in terms of the study being published in a Financial Times 50 (FT50) journal, and (7) longitudinal studies. Across all alternative models, the magnitudes, signs, and significance of the moderators are consistent, indicating that our previously reported findings are robust.

Finally, we conduct separate univariate meta-analyses for each distinct category and type of dependent variable (Web Appendix I). The results of all these analyses further confirm the robustness of our previously reported findings.

5. General discussion

Through a meta-analysis of empirical evidence from over 40 years of payment methods research, we provide robust evidence of the effect of cashless payment method usage (vs. cash) on consumer spending outcomes. In doing so, we answer calls for research in retailing to address empirical generalizations of the effects of payment methods (Kamakura et al., 2014), as well as calls for research investigating potential moderators of the cashless effect (Boden et al., 2020; Liu & Dewitte, 2021).

As outlined below, besides theoretical implications for the academic literature on payment methods, our work has practical contributions for managers and public policymakers.

5.1. Theoretical implications

Based on the most comprehensive evidence assembled to date ($k = 392$ from 71 papers), we find support for the existence of a positive, yet small, cashless effect, indicating that consumers spend more when using cashless payment methods (vs. cash). While multiple moderators explain substantial variation within the cashless effect, not all of them do, as summarized in Table 6.

First, although we find no evidence that the cashless effect is influenced by specific payment method features such as decoupling and transparency on their own, we do find a significant positive interaction effect when these two features are combined, in that payment methods that are both decoupled and have high transparency (e.g., credit cards) increase the cashless effect in comparison to those that do not have this particular combination of characteristics. Potentially, this effect can be attributed to consumers' higher familiarity with and perceived convenience of credit cards in comparison to alternative (less transparent) digital methods (Boden et al., 2020). As such, our findings address recent calls in the literature for research into the implications of non-transparent payment methods (Seldal & Nyhus, 2022).

Second, we find that the cashless effect is influenced by various consumption situations. In particular, we provide a novel contribution to the literature by examining a previously unexplored consumption situation, namely conspicuous consumption, and reveal that consumers spend significantly more with cashless methods in such situations. We propose that this finding is a result of consumers attempting to offset the pain of paying for these consumption situations. Given that conspicuous consumption is inherently extrinsically motived to show status (Veblen, 1899), cashless—and thus less painful—payment methods can help ease the cost of consumption. As a distinct consumption situation, we also contribute to the literature examining factors that promote pro-social behavior. While new research has emerged (Kakkar & Li, 2022), it has largely been accepted that cashless payment methods (particularly credit cards) can increase spending outcomes if the payment has a pro-social goal (McCall & Belmont, 1996; McCall et al., 2004). Our meta-analysis highlights the need for a more nuanced examination of this topic. Despite the results revealing that the cashless effect is weaker in pro-social (vs. non-pro-social) consumption situations, the statistically insignificant predicted value suggests that, ultimately, there is no discernable difference in pro-social spending between cashless payment methods and cash in this specific consumption situation. That is, the positive main effect of using cashless payment methods is effectively "switched off" by the negative interaction effect of being in a pro-social consumption situation. Future research should therefore further delve into this finding and investigate the psychological mechanisms underlying the cashless effect (or lack thereof) in pro-social consumption situations.

Third, we also shed new light on how macroeconomic factors may influence retailer and consumer practices alike (Dekimpe & van Heerde, 2023; Gielens, 2023). Although Feinberg (1990) and Bagchi and Block (2011) theoretically expected macroeconomic factors to play a role in the cashless effect, our study is the first to empirically test and assess their predictions. We demonstrate that the cashless effect is more pronounced during positive periods of the business cycle (i.e., an increasing GDP growth rate), but it marginally decreases over time. This observation aligns with previous empirical evidence that in periods of economic expansion, consumers feel a lower pain of paying as they are less worried about the cost implications of purchases (Griffiths, 2000). Moreover, our findings indicate that the cashless effect is unaffected by inflation, consistent with Kanz et al. (2021), who found that consumers may not necessarily be sophisticated enough to factor inflation into their spending behavior.

Finally, our findings reveal a diminishing cashless effect over time. This result suggests that the differences in the pain of paying with cash and cashless methods has decreased over time, likely due to the increased familiarity of consumers with cashless transactions (Broekhoff & van der Cruijsen, 2024). This reasoning aligns with adaptation level theory (Helson, 1948), which describes how an individual's judgment about a stimulus is heavily influenced by their prior experience. In other words, with greater usage of cashless payment methods, individuals have become accustomed to them, such that they no longer elicit a strong consumer response. Notably, we expect this habituation effect to amplify in the future as the transition to a cashless society continues globally (Marria, 2018; Wewege, 2021). Furthermore, as the proliferation and penetration of cashless methods often goes hand in hand with economic growth (Wong et al., 2020; Zandi et al., 2013), we may witness a further reduction in the cashless effect since we also document a marginally significant negative interaction between time and GDP growth. In sum, while the cashless effect is generally anticipated to fade away over time, it may linger in countries that still heavily rely on cash transactions or those that face economic downturns.

5.2. Managerial and public policy implications

Our work offers relevant and timely insights for practitioners as society embraces the "cashless revolution." In general, our meta-analysis indicates that providing consumers with the options to use cashless payment methods instead of cash increases their spending behavior, offering opportunities and challenges for both retailers and public policy makers (see Table 6).

On one hand, our results provide support for the claim from industry experts in the popular press that retailers that do not embrace the cashless transition are jeopardizing their revenue potential (Schmidt, 2023). Consequently, retailers should not only equip themselves to accept cashless payments but also actively promote this (e.g., through signs stating that they

Table 6
Summary of results and implications.

	Hypothesis	Effect	Interpretation	Practical Implications
Main Effect	*H1: The use of cashless payment methods (vs. cash) is associated with greater consumer spending outcomes, an association which we will refer to as the "cashless effect."*	√	Consumers tend to spend more when using cashless payment methods (vs. cash) – i.e., the "cashless effect".	
Moderators	***Cashless Payment Method Features***			
Decoupled Payments	*H2: The cashless effect is stronger for decoupled (vs. coupled) cashless payment methods.*	ns	The cashless effect is not influenced by payment methods that separate the benefit (i.e., consumption) from the cost (i.e., payment) [(a)]	
Transparency	*H3: The cashless effect is stronger for lower (vs. higher) transparency cashless payment methods.*	ns	The cashless effect is not influenced by cashless payment methods that have higher (vs. lower) transparency [(a)]	
	Consumption Situations			
Hedonic	*H4a(b): The cashless effect is stronger (weaker) for hedonic (vs. utilitarian) consumption situations.*	ns	The cashless effect is not influenced by a hedonic consumption situation.	
Conspicuous	*H5: The cashless effect is stronger for conspicuous (vs. non-conspicuous) consumption situations.*	+	The cashless effect is stronger for conspicuous consumption situations	Retailers dealing with products that are regularly used to signal social status (i.e., sports car brands and luxury-brand clothing) must ensure that they accept cashless methods and promote this to consumers. Moreover, for retailers in general, emphasizing that purchasing their products can contribute to an elevated social status may lead to increased spending through cashless methods.
Pro-Social	*H6: The cashless effect is stronger for pro-social (vs. non-pro-social) consumption situations.*	–	The cashless effect is weaker for consumption situations involving a pro-social goal.	Charities and employees reliant on pro-social spending should maintain traditional ways of collecting money (e.g., tipping or donation jars, spiral wishing wells), alongside more innovative methods.
	Contextual Factors			
GDP Change	*H7: The cashless effect is weaker in periods of positive (vs. negative) changes in GDP.*	+	The cashless effect is stronger when the GDP growth rate increases.	Retailers should take into consideration the economic conditions prevailing in a country, as we find that consumers adjust spending habits with payment methods in response to changes in the GDP growth rate. During periods of economic expansion (i.e., increasing GDP growth), retailers should intensify promotion of cashless methods.
Inflation Rate	*H8: The cashless effect is stronger during periods of higher (vs. lower) inflation.*	ns	The cashless effect is not moderated by the inflation rate.	
Time	*H9: The cashless effect has weakened over time.*	–	The cashless effect has gotten weaker over time.	Retailers should capitalize on the revenue potential of the cashless effect before it diminishes over time.

Notes: √ = main effect is supported, evidence for a cashless effect, ns = no significant moderating effect found, - = cashless effect is weaker, + = cashless effect is stronger, (a) see Fig. 2 for examples.

accept such payment methods).[4] While it is important to note that we find that the cashless effect has generally weakened over time, for the time being, in regions that have not yet embraced cashless payments, there remains a high likelihood that consumers will continue to be influenced by the lower pain of paying of using such payment methods. Thus, even as the cashless effect may be diminishing over time, considering that most of the world starts from a relatively low base of cashless payment methods usage, there remains revenue potential in capitalizing on the cashless effect for the foreseeable future. Furthermore, given the moderators that we examined, there are also important situations which can shift the cashless effect. For instance, our findings reveal that the negative and significant interaction effect of pro-social consumption situations effectively "switches off" the baseline cashless effect, resulting in an overall non-significant cashless effect in pro-social consumption situations. For charities and hospitality workers, it is thus important to realize that traditional cash-based ways of collecting money, such as tipping jars and spiral wishing wells, are just as effective as cashless point-of-sale terminals to collect tips or donations. Clearly, there are benefits to having alternative payment methods available, as consumers may not always carry cash. Thus, going forward, we recommend charities as well as employees reliant on tips to avoid going completely cashless.

On the other hand, our findings also indicate that the transition towards a cashless society might have unintended (negative) consequences for consumers. Importantly, a substantial proportion of the population still relies exclusively on cash, with official statistics showing that 24 % of adults globally are unbanked (approximately 1.4 billion; The World Bank (2022b) and that more than 6 % of the U.S. population still has no bank account (Federal Reserve Board, 2022). Given their unfamiliarity with cashless payment methods, these consumers need targeted support from public policy makers in the eventual transition away from cash. It is important to communicate to them that cashless payment methods can detract from rational purchasing decisions, potentially leading them to spend more than they intend or can afford, which could harm their (financial) well-being (Brüggen et al., 2017; Netemeyer et al., 2018).

For consumers, simply being aware or "mindful" (Schomburgk & Hoffmann, 2023) of the payment method used to pay for goods or services can help them spend less. In this regard, paying by cash can provide a potential self-control strategy. This is particularly important as there is growing recognition for the self-responsibility of individuals to prepare for a financially secure future (Hoffmann & Plotkina, 2020). To avoid overspending, previous studies have recommended individuals to leave their cards at home (Prelec & Simester, 2001; Wilcox et al., 2011), cut them up (Moore & Taylor, 2011), or even physically freeze them as a "circuit-breaker" of overspending (Ausubel, 1991). However, these strategies do not inherently alter consumer spending habits, and given that cards are now frequently linked to one's mobile device, the prior recommendations seem outdated. Instead, we recommend consumers to use cash for their purchases whenever possible if they suffer from self-control challenges. This approach aligns with the recent TikTok trend of "cashstuffing," which encourages consumers to return to the traditional method of managing their money through envelopes earmarked for various expense categories (DelBasso, 2022; Wu, 2023).[5]

So, how can we reconcile these seemingly contradicting recommendations? Although the benefit for retailers encouraging the use of cashless payment methods is clear in that consumers spend more (relative to cash), we urge retailers to take care with this approach and keep consumers' financial well-being in mind. In particular, given the current climate of diminished trust in retailers, they must strike a balance between profit margins and consumer trust (Gielens, 2023). Recent work has recommended retailers to aim to prevent risky indebtedness behavior within their customers as this could damage their brand image (Abrantes-Braga & Veludo-de-Oliveira, 2020). Hence, based on our findings, and in order to not jeopardize their reputation, we encourage retailers to refrain from exploiting the cashless effect through encouraging the use of transparent cashless methods that rely on funds that consumers may not have available, such as credit cards or physical BNPL cards (Klarna, 2024). Instead, retailers could try to benefit from the cashless effect by encouraging the use of cashless methods such as debit cards, through which consumers can only spend what they can immediately afford.

5.3. Limitations and future research agenda

Despite its contributions, our study has some limitations, which can guide future research. First, our meta-analysis only included effect sizes representing a comparison between cashless payment methods and cash in terms of spending outcomes, while other relevant comparisons, such as digital methods vs. credit cards, were beyond the focus of our research. In addition, our meta-analysis did not focus on the antecedents of consumer choice in terms of adopting cashless payment methods vs. cash. While we believe these are important issues for both marketing theory and practice, we purposefully decided to only conduct an investigation into the effects on consumer spending outcomes of the transition from cash to cashless payment methods, consistent with recent calls for research (Kamakura et al., 2014). Yet, we encourage future research to carry out meta-analyses on the aforementioned topics once enough effect sizes are available to provide a more nuanced interpretation of the cashless effect phenomenon.

Second, our study did not account for several moderators due to data availability issues or limited prior research studying certain variables. Below, we present a comprehensive research agenda, organized by the different types of moderators as per our conceptual framework of Fig. 1 (i.e., *cashless payment method features*, *consumption situations*, and *contextual factors*).

[4] Although cashless payment methods involve merchant service fees, one should note that cash transactions are also not without costs for retailers, as it must still be managed, guarded, and accounted for (Chakravorti, 2014).

[5] It is important to note that cash can also be stolen or lost, which can make it less safe for consumers to carry.

Given the abundance and variety of payment methods, recent research has considered multiple other *cashless payment method features*, such as their multifunctionality (i.e., their ability to be used beyond just the payment function; (Gafeeva et al., 2018) and their co-branded nature (Ferguson, 2006). On one hand, multifunctional payment methods provide additional non-payment features, such as a student ID, which has been shown to lead to a lower recollection of past spending (Gafeeva et al., 2018). On the other hand, payment methods co-branded between credit issuers and another company (e.g., the PlayStation Visa card (Myers, 2022)) often provide rewards to consumers for spending (Ferguson, 2006). Future research could thus investigate how these two features of payment methods impact the cashless effect.

Furthermore, other *consumption situations* beyond those we examined may dictate consumer spending behavior with cashless payment methods (vs. cash). First, as gift giving is a form of social exchange whereby people transfer resources to confirm social relationships (Belk, 1976; Sherry, 1983), it is more likely to occur when the social distance between giver and recipient is reduced in comparison to charitable giving (Wang et al., 2022) and tipping (Lynn et al., 1993). Since consumers tend to budget and spend more money on strong (vs. weak) social ties (Caplow, 1984; Joy, 2001), we expect that a lower social distance may lower the pain of paying and decrease, or even reverse, the cashless effect in gift-giving situations.

As for the *contextual factors*, we were unable to account for the penetration of cashless (vs. cash) payments within a country at a particular time. This is because our sample of effect sizes went all the way back to the 1970s, and data on the payment methods used by consumers is scarcely available for that period. Although the number of automated teller machines (ATMs) within a country (The World Bank, 2023) could serve as a proxy, this data is also incomplete as it only dates back to 2004, and ATMs were a technological innovation in the past rather than a reflection of a society's current reliance on cash. Similarly, our sample encompassed only a very limited number of effect sizes from studies conducted in developing countries ($k = 5$ in China; $k = 13$ in India; $k = 1$ in Poland; $k = 1$ Turkey). Accordingly, future research could explore whether the cashless effect is more or less pronounced in low-income countries, where cash remains a dominant payment method as of now (Kapron, 2023).

Finally, our meta-analytical framework did not consider personality and individual differences as a potential category of moderators due to data unavailability, but we believe this could represent a fruitful avenue for consumer research. For instance, our sub-group robustness check accounting for gender (Web Appendix H – Model 3) shows that the cashless effect decreases as the proportion of female participants in a study sample increases ($\beta_{\text{GENDER}} = -0.382$, $p = 0.022$). We contend that this effect may be ascribed to the fact that women are typically more likely to implement financial self-control practices than men (Hayhoe et al., 2000). Furthermore, prior empirical work has established individual variation in the pain of paying, where "tightwads" feel the pain of paying more severely while "spendthrifts" associate less pain with paying for their purchases (Rick et al., 2008), leading the former to display a greater cashless effect compared to the latter. This is another avenue for future work to explore.

Despite these limitations, our study breaks new ground and helps establish consensus about the cashless effect by providing the most robust meta-analytic evidence about this effect in the literature to date, and by offering insights regarding a comprehensive set of moderators.

Declaration of competing interest

None.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jretai.2024.05.003.

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