

Behavior or culture? Investigating the use of cryptocurrencies for electronic commerce across the USA and China

Electronic
commerce

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Abstract

Purpose – This paper claims to identify the behavioral and cultural features that push to use, or not, cryptocurrencies for electronic commerce. Indeed, despite the use of cryptocurrencies for electronic commerce spreading worldwide at a fast and growing pace, there are supporters and detractors among their users. The analysis of what distinguish these two groups of users is fundamental for understanding their different intention to use cryptocurrencies for electronic commerce.

Design/methodology/approach – A survey has been administered to 2,532 cryptocurrencies' users across the USA and China, collecting data on their behavioral predispositions and cultural features. Results were then analyzed through structured equation modeling.

Findings – Results showed that while attitude, subjective norms, perceived behavioral control and herding behavior have a positive impact on the intention to use cryptocurrencies for electronic commerce, financial literacy has no influence. Cultural dimensions amplified or reduced the discovered relationships and caused different effects: positive for the USA and negative for China when considering illegal attitude and perceived risk.

Originality/value – Theory of planned behavior, financial behavior and cultural factors can, all together, represent a useful framework for envisioning the behavior of users in adopting cryptocurrencies for electronic commerce purposes through a test of all its elements. To the best of the authors' knowledge, this is the first study considering behavior and cultural variables on the intention to use cryptocurrencies for electronic commerce as well as being the largest carried out, in terms of sample, on the cryptocurrency topic.

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Keywords Consumer behavior, Culture, Hofstede, Theory of planned behavior, Electronic commerce, Other management-related topics, Cryptocurrency

Paper type Research paper

1. Introduction

Cryptocurrencies are a digital representation of value based on cryptography that are exchanged; thanks to peer-to-peer technologies on networks whose nodes are made up of user computers. These new exchange means are considered as the main methods through which electronic commerce – i.e. financial transactions via electronic information exchanged over telecommunications lines – will be increasingly done in the near future (Batten and Yi, 2019). Indeed, by quoting the data of Chainalysis, Kharif (2019) unveiled that the amount of digital money sent to 16 merchant service providers such as BitPay rose 65% between January and July 2019. Moreover, this trend is being increasingly fostered by the current COVID-19 pandemic that, as demonstrated by Demir *et al.* (2020), leads people, that heavily operate electronic commerce, to increasingly use cryptocurrencies for their electronic exchanges – because of their inner capability of mitigating some of the uncertainty issues that come with the new realities that the pandemic has brought.

In this regard, there is an increasing interest of electronic commerce users of buying with cryptocurrencies (e.g. 46 million US consumers plan to use them in the next future to make payments; PYMNTS, 2021), but there is still a lot to do; indeed, only 2% (\$4bn) of whole electronic commerce transactions are paid by cryptocurrencies (Jonker, 2019; Popper, 2020). However, a forecasted exponential growth in the use of cryptocurrencies for electronic commerce all over the world is expected (Treiblmaier and Sillaber, 2021) because of cryptocurrencies' ability in allowing transactions to who: does not have the necessary requirements for opening a bank account, cannot access traditional financing in a certain place or want to capitalize upon the speed of transaction.

Because of the growing projected trend, cryptocurrencies' adoption in electronic commerce did not receive the attention of national regulators, which are suspicious about the exclusion of qualified third parties within cryptocurrency-based electronic commerce (Liu and Tsyvinski, 2018; Bovaird, 2020). As a result of the above, there are two main groups of cryptocurrencies' audience among users: supporters (Sharma, 2019) and detractors (Cao and Zhu, 2019). In sum, characteristics of cryptocurrencies can be a gift to consumers or a threat. From that, the emerged research question is:

RQ1. How behavioral and cultural features of users influence the intention to use cryptocurrencies for electronic commerce?

Results to this question have been contrasting: Arias-Oliva *et al.* (2019) derived that social influence and perceived risk do not influence the intention to use cryptocurrencies for electronic commerce, while other scholars found an opposite result (Bannier *et al.*, 2019). As to give an answer, the theory of planned behavior (TPB) (Ajzen, 1991) – that, as emerged in this journal, is one of the most adopted in the study of behavior in management research (Lebek *et al.*, 2014) – has been used and extended. According to Ajzen (2002), there are three factors that drive the intention to act:

- attitude toward the effect of the action;
- the implicit subjective rule perceived by the actor; and
- perceived behavioral control in carrying out the intended behavior.

Following [Sardanelli et al. \(2019\)](#), that investigated factors influencing customers' behavior, a series of other variables that play a pivotal role in electronic commerce have been included, namely: perceived risk, perceived benefit, financial literacy, herding behavior and illegal attitude. Yet, because of the worldwide spread of cryptocurrencies and their different adoption in distinct countries, it has been also recurred to the Hofstede's cultural model as to identify whether the use of cryptocurrencies is influenced or not by cultural features. In doing that, this work directly answers the recent call, raised by the meta-analysis of [Liu et al. \(2019\)](#) of including cultural considerations in studies investigating factors affecting consumers' behavior toward electronic means. Yet, this study completes – by looking at the consumer side – the one of [Al-Bakri and Katsioloudes \(2015\)](#) on the pages of *Management Research Review* that explored internal and external organizational factors affecting electronic commerce adoption by small- and medium-sized enterprises. This work also advances other studies that deals with the TPB – and that neither included all the tested variables nor implemented them in different cultural contexts – and with electronic commerce through TPB but that did not consider cryptocurrencies. Yet, it provides important insights in how to develop electronic commerce based on new technologies, as asked by recent reviews.

To address the proposed research gap, a survey administered to 2,532 cryptocurrencies' users across the USA and China was carried out, collecting data on their behavioral predispositions and cultural features. Results were then analyzed through partial least squares (PLS); in particular, it emerged that: attitude, subjective norms and perceived behavioral control have a positive impact on users' intentions to use cryptocurrencies for electronic commerce. Yet, about the role of culture, it has been found that attitude and subjective norms were moderated by it: their effects on the intention to use cryptocurrencies for electronic commerce are stronger for China than the USA. The herding behavior, connected with the intention to use cryptocurrencies for electronic commerce, is greater in China than in the USA. Culture also amplifies the relationship of both illegal attitude and perceived risk with the intention to use cryptocurrencies; however, there is, respectively, a positive and a negative influence when considering the USA and Chinese contexts.

This is the first study that considers the influence of behavior variables and cultural features on the intention to use cryptocurrencies for electronic commerce as well as the largest ever produced, in terms of sample, on the cryptocurrency topic. These two features lead this study to be more precise (because considering the different effects on individualistic and collectivist cultures) on the identification of the characteristics of individuals that drive to the use of cryptocurrencies for electronic commerce as well as it establishes solid and generalizable insights on consumers' behavior toward cryptocurrency adoption.

2. Theoretical background

2.1 *Cryptocurrencies: a theoretical premise and a comparison with stablecoins*

Cryptocurrencies are based on an open-source, public and decentralized network; owing to this, the entire transaction history is stored in a series of chains, which refer to the "blockchain" ([Ammous, 2018](#)) – allowing to bypass the established banking system. Cryptocurrencies first appeared publicly in January 2009 with the advent of Bitcoin, a digital representation of value ideated by a computer programmer named Satoshi Nakamoto (diffusely considered as a nickname). Yet, these new electronic commerce means are not issued or controlled by any specific institute and can be used to securely store and transfer any number of values anywhere in the world without the permission of a third party (e.g. banks and their systems). This point, however, is both an advantage and a disadvantage.

Indeed, the lack of control of a qualified third-party (i.e. bank) over cryptocurrencies' transactions, does not allow to check whether users are operating legal or illegal operations (e.g. money laundering) (Dierksmeier and Seele, 2018).

However, scholars interested in the investigation of cryptocurrencies – still not a huge number – have pointed out some beneficial trends that are favoring the adoption of this new mean for electronic commerce. DeVries (2016), for example, highlighted that “the ability for cryptocurrency to perform microtransactions may allow it to bridge an economic gap that traditional state sponsored currencies would not be able to solve” (p. 8); and the same would apply to smart contracts, thus programmed payments happen when a set condition occurs.

Nevertheless, despite having a market capitalization close to \$2.6tn (CoinMarketCap, 2021b) and exponential growth of the possibility of using cryptocurrencies in everyday life (Treiblmaier *et al.*, 2020; Bezovski *et al.*, 2021), the cryptocurrency market is characterized by extreme volatility. For instance, scholars like Corbet *et al.* (2020) have tracked the 1-h fluctuations during a year time span (2019) recording extreme values of -23.91% (Bitcoin Cash) and $+40\%$ (Stellar) of loss and gain, respectively.

Stemming from the above, a new bundle of digital assets, always based on blockchain technology, have appeared in the past years: stablecoins. These are defined as a particular kind of cryptocurrencies that – by combining collaterals (such as precious metals and fiat currencies) or algorithmic mechanisms of stabilization with the management of the supply – hold a stable value against a target price, which is usually \$1 (Dell'Erba, 2019). Precisely, the first stablecoin, i.e. Tether, was created in 2014 as to offer a solid alternative to cryptocurrencies, such as Bitcoin, Ethereum and Ripple (Bullmann *et al.*, 2019; Baur and Hoang, 2021). Nowadays, according to CoinMarketCap (2021a), Tether represents more than 50% (\$73bn) of the worldwide stablecoins market capitalization (\$141bn). However, different types of stablecoins exist according to the adopted stabilization mechanisms (Berentsen and Schär, 2019):

- commodities-backed stablecoins: whose value is anchored to real estate or gold or other precious metals' value;
- fiat currencies-backed stablecoins: whose value is anchored to standard currencies such as US Dollar, Euro or Chinese Yuan;
- cryptocurrencies-backed stablecoins: whose value is anchored to cryptocurrencies, such as Bitcoin or Ethereum; or
- seigniorage-backed stablecoins: meaning that they do not rely on any kind of collateral value except on the algorithms that control the supply volume to keep constant their market value.

From the above, cryptocurrencies and stablecoins share and differ on some features, see Table 1. About the commonalities, cryptocurrencies and stablecoins are both:

- founded upon the blockchain; and
- suffering of a paucity of international, and often even national, legal regulations (Iredale, 2021; DeNicola, 2021).

Instead, for what concerns the differences, stablecoins diverge from cryptocurrencies on different aspects (Geroni, 2021; Lorentz, 2021), such as:

- Volatility for conventional cryptocurrencies is high and proved, while stablecoins have a partially confirmed stability.

	Cryptocurrencies	Stablecoins	
Definition	Peer-to-peer virtually represented cash exchanged on the basis of blockchain	Cryptocurrency with the backing of commodities, fiat currency or any other real-world assets	
Reason for the creation	To remove the third-party intermediaries that are traditionally required to conduct digital monetary transfers	To represent a less volatile alternative to conventional cryptocurrencies	
Use	Mainly used for exchanging, trading and online payments	Primarily used in real-world transactions involving cryptocurrency	
Volatility	High: proved	Medium-high: partially confirmed	
Collaterals	Absence of collaterals. The price is based only on the demand	Commodities, fiat currencies, other cryptocurrencies or seigniorage	
Financial return	Investors can leverage volatility for cashing out cryptocurrencies' value	No opportunities for achieving improved returns because stablecoins are linked to existing fiat currency or other assets' value	
Some among main authors	Bezhovski, Davcev, Leung, Lytras, Mendoza-Tello, Mitreva, Mora, Pujol-López, Sillaber, Treiblmaier	Berentsen, Bullmann, Dell'Erba, Klemm, Ma, Pinna, Schär, Wang, Wu	

Table 1.
Main differences
between
conventional
cryptocurrencies and
stablecoins

- Collaterals for conventional cryptocurrencies are featured by the absence of collaterals, while stablecoins are backed by different kinds of collaterals as aforementioned.
- Control for conventional cryptocurrencies is actively played by investors/users who can leverage volatility, while stablecoins being pegged with third assets do not allow investors/users to leverage their value (Carstens, 2019).

However, despite stablecoins' features can push toward thinking they have a greater potential than cryptocurrencies in electronic commerce, a recent study did not support their superior performance. In particular, Baumöhl and Vyrost (2020) analyzed 1-min price variations, for the entire year 2019, of the five largest cryptocurrencies (Bitcoin, Ethereum, Ripple, Bitcoin Cash and Litecoin) and the six largest stablecoins (Tether, USD Coin, True USD, Paxos Standard Token, Dai and Gemini Dollar) on 18 different exchange markets. Results shown that only three stablecoins (True USD, Paxos Standard Token and Gemini Dollar) may serve as "safe havens" – assets that are uncorrelated with other assets during times of market turmoil (Wang *et al.*, 2020; Baur and Hoang, 2021). Thus, despite stablecoins' apparently "safer" characteristics, they are not always consistently stable over time; in other words, stablecoins are not generally superior to cryptocurrencies.

2.2 Cryptocurrencies in electronic commerce

Electronic commerce became a worldwide business model (Treiblmaier and Sillaber, 2021), with retail electronic commerce sales amounting to US\$2.89tn in 2021 and an expected increase to US\$6.39tn by 2024 (Statista, 2021a). In comparison, the total market capitalization of cryptocurrencies amounted to US\$2.89bn in 2021 (Statista, 2021b), with a big jump from the US\$900mn in 2020 that surpassed any reasonable projection. Taking into account already discussed pros and cons of cryptocurrencies, such as being based on the blockchain technology, they have the potential to facilitate electronic sales that are trustless

and allow performing them without dedicated intermediaries (Treiblmaier and Sillaber, 2021). In this regard, however, only a tiny amount of platforms – around 2% according to Jonker (2019) – are accepting cryptocurrencies, but, the volume of transactions of goods and services paid by cryptocurrencies is already impressive: over \$4bn in 2019 (Popper, 2020) and a forecasted exponential growth all over the world is expected (Treiblmaier and Sillaber, 2021).

Related to the above, an increasing number of organizations – such as AXA Insurance, AT&T, Expedia, Tesla, Visa, KFC, Burger King (in Germany), Norwegian Air and AirBaltic – allow their clients to pay by using cryptocurrencies (Walsh, 2021). In this vein, some of the most famous precursors have been Virgin Galactic and Microsoft which, since 2013 and 2014, respectively, started allowing customers to book trips into space and to buy digital contents by Bitcoins (Cryptolocally, 2020). In addition, rumors claim that soon also Amazon will accept payments by the mean of cryptocurrencies (Day and Chiglinsky, 2021).

As a result of the reported cryptocurrencies' exciting dynamics, many scholars have devoted their research to highlight the main e-commerce platforms' features that might favor or, conversely, interfere with the users' willingness to adopt cryptocurrencies as a mean of payment during online transactions. In particular, according to Mendoza-Tello *et al.* (2018), the main issue that restrains consumers to fully embrace cryptocurrencies for online shopping activities lays on the reliability of transactions – delegated to a cryptographic test and not to the supervision of a control authority. To develop possible solutions to this lack of trust in the usage of cryptocurrencies on e-commerce platforms, Mendoza-Tello *et al.* (2018) have analyzed the questionnaires administered to 125 e-commerce users. Results of their research point out that “social commerce” – defined as an internet-based commercial application supporting social interaction and user-generated content, which influence decision purchases – may represent a solution to overcome such lack of trust in cryptocurrencies use. In fact, these authors claimed that the features provided by social commerce platforms, such as the users' ability to exchange advices foster the creation of relationships based on mutual trustworthiness, which – by leveraging the overall participation of users – may positively enhance the propagation of higher volumes of information concerning the feasibility of adopting cryptocurrencies as mean of payment.

In the same vein, Treiblmaier *et al.* (2020), by surveying a sample population of 161 Asian travelers, highlighted the most impacting factors that foster, or not, the buyers' willingness to pay by the mean of cryptocurrencies on electronic travel-related platforms. On one hand, they have found evidence that electronic commerce's ability to furnish – in terms of proper information on information technology standards – adequate levels of security, easiness of use and customer care foster users' enthusiasm toward payment made by the use of cryptocurrencies. On the other hand, the presence of insufficient levels of the aforementioned factors pushes shoppers to use the traditional payment methods (e.g. debit card and bank transfer). Treiblmaier and Sillaber (2021) furtherly advanced such findings by adding that electronic commerce platforms that held their transactions via blockchain can increase a greater sense of trust in buyers when the platform is committed in storing purchase-related data in an unchangeable way; this, indeed, helps improve data provenance and traceability, fostering the buyers' feeling of confidence in using cryptocurrencies – in line with Lo *et al.* (2017).

Therefore, from the aforementioned contributions, it is evident that the main concerns about using, or not, cryptocurrencies in electronic commerce lay on the perceived trust and security that the online platforms are able to communicate to their users (Jonker, 2019; Bezovski *et al.*, 2021).

3. Hypotheses development

Figure 1 presents the proposed research model in which the dependent variable is the “intention to use cryptocurrencies for electronic commerce,” while the independent variables emerge from the TPB – attitude, subjective norm and perceived behavioral control – and consumer behavioral literature – illegal attitude, herding behavior, perceived risk and financial literacy – that already investigated electronic commerce and cryptocurrencies.

Both these clusters of variables directly influence the use cryptocurrencies for electronic commerce. These relationships are also investigated according to cultural differences on the following dimensions:

- collectivism/individualism;
- high/low power distance; and
- long-/short-term orientation.

All these influences and substantiating hypotheses are detailed in the following sub-sections.

3.1 General factors influencing the intention to use cryptocurrencies for electronic commerce

As introduced, some scholars have already investigated the factors that influence using cryptocurrencies for electronic commerce. Among these scholars, it is noteworthy to recall

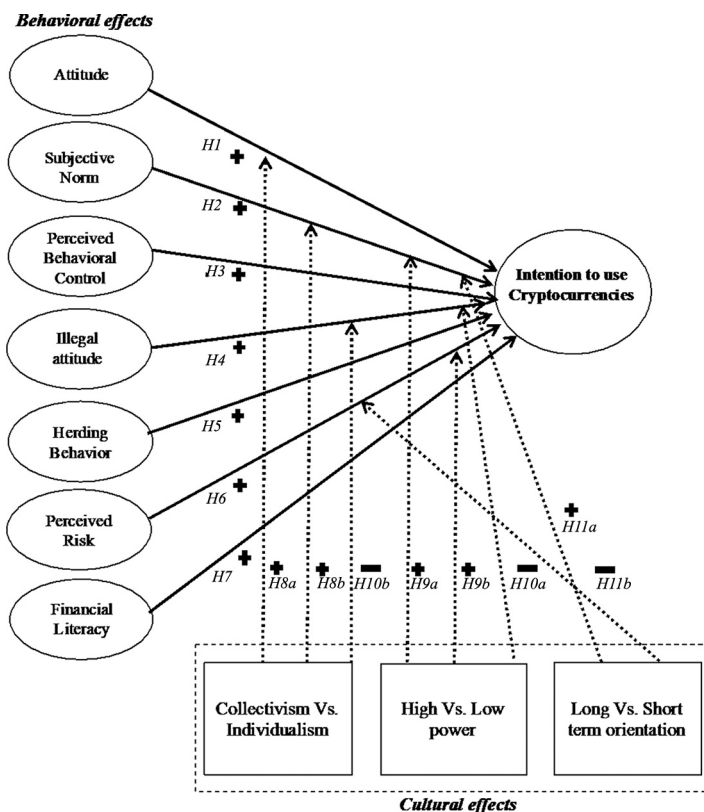


Figure 1. Proposed research model

the contribution brought by [Li and Wang \(2017\)](#) who have, through the use of a theory-driven empirical investigation concerning Bitcoin vs USD exchange rate determination, firstly indicated that the use of cryptocurrencies is going to be more affected by the economic factors (i.e. cryptocurrencies' interest rate, trade volume and price volatility) and less affected by the technological ones (e.g. troubles concerning the mining technologies and processes). Nevertheless, the investigation completed by [Li and Wang \(2017\)](#) was carried out without checking the major determinants that push respondents to use, or not, cryptocurrencies. In contrast to this latter, [Sohaib et al. \(2019\)](#), using a survey administered to over 100 students and staff from the University of Technology Sydney, have found that technology readiness (i.e. discomfort and insecurity) of cryptocurrencies has a significant relationship with technology acceptance (i.e. perceived ease of use and perceived usefulness). From that, early adopters of technology are the more willing to use cryptocurrencies and this attitude increases as the complexity in using cryptocurrencies decrease. This last result was previously intuited by [Shahzad et al. \(2018\)](#) who, moreover, found that awareness and perceived trustworthiness toward cryptocurrencies are comparatively significant factors to determine the intention to use them in electronic commerce. However, none of the reported studies adopted a clear and recognized model, such as the TPB that clearly links behavioral factors with the intention to use cryptocurrencies as well as having determined the influence of culture.

3.2 Theory of planned behavior factors influencing the intention to use cryptocurrencies for electronic commerce

The TPB was conceptualized by [Ajzen \(1991, 2002\)](#) as a direct evolution of the theory of reasoned action (TRA). According to TPB's principles, economic agents' willingness to conduct a specific action can be forecasted by paying attention to the:

- attitude toward the consequences, resulting from that specific action as well as the expectation about the effects originated from it;
- subjective norms (also known as normative belief), this bundle of rules reflects the consciousness that specific behavior is or is not envisioned by individuals significant for the investor (e.g. family); and the
- perceived behavioral control concerns how well people can handle actions needed for dealing with forthcoming situations.

Specifically, the TPB unquestionably diverges from the TRA since the involvement of the perceived behavioral control variable, which has been confirmed, guiding to make improved forecasting in terms of the tendency of translating an intention into a behavior than the former ([Madden et al., 1992](#)).

Ordinarily, TPB has been repeatedly adopted in a broad array of behavioral investigations, such as envisioning customers' intention to pick a specific product, people's willingness to start a business or even the individuals' preferences for what concerns household financing ([Ajzen, 1991](#)).

About the attitude variable, studies that implement TPB for the investigation of consumers' intention toward electronic means ([Liu et al., 2019](#); [Sardanelli et al., 2019](#)) generally found a positive influence of attitude toward their adoption. About the use of cryptocurrencies, in particular, [Gazali et al. \(2019\)](#) have studied the correlation between attitudes, subjective norms, financial risk tolerance and perceived benefits from (the last two variables have been conveniently added to the theoretical model) the intention to use cryptocurrencies – in particular, Bitcoin – highlighting the positive influence, played by

the aforementioned factors, on the willingness to use cryptocurrencies for electronic commerce. Nevertheless, as previously claimed, the findings advanced by [Gazali et al. \(2019\)](#) can be considered as not fully satisfactory because of the narrow sample size (45 respondents). Yet, in their recent contribution, [Mendoza-Tello et al. \(2018\)](#) have empirically explained, by the use of a survey administered to over 100 respondents, that users see some psychological benefits in cryptocurrencies, among the ones the most claimed was “feeling safe,” that elicit their intention to use them. From that, we hypothesize the following: ([Table 7](#))

H1. Positive attitude positively influences the intention to use cryptocurrencies for electronic commerce.

Behavioral consumers’ researchers have studied the influential role played by subjective norms, through the implementation of the TPB lens, in shaping how usage decisions are made. In this vein, scholars such as [Arias-Oliva et al. \(2019\)](#) have not found any important influence of this variable for what concerns the willingness to use cryptocurrencies for electronic commerce purposes. Other researchers, instead, have found hints suggesting that cryptocurrencies users’ choices are frequently made in correspondence to the suggestions proposed by close people such as colleagues, friends and relatives ([Liu et al., 2019](#)) – that, sometimes, are intentionally looked for ([Sondari and Sudarsono, 2015](#)). Concluding, subjective norms can progressively pressurize cryptocurrency users that have to make decisions – also in circumstances where they have not received any kind of suggestions; indeed, individuals appear to act resolutely also just observing the behaviors of others, and from them they are socially influenced. Results on the positive influence, in terms of raising the intention to use cryptocurrencies for electronic commerce, some subjective norms have been verified also by other recent studies about cryptocurrency’s consumer behavior ([Gazali et al., 2019](#)). Therefore, *H2* could be stated as follows:

H2. Subjective norm positively affects the intention to use cryptocurrencies for electronic commerce.

[Liu et al. \(2019\)](#) in their meta-analysis about the factors influencing consumers’ mobile payment behavior found that there is a significantly positive influence of the perceived ease of use on consumers’ attitude toward mobile payment. In practice, the user that does not experience troubles in the adoption of a new mean is more prone to its permanent adoption because generating a sense of control and usefulness of the new mean. This can be seen in the study proposed by [Ali \(2011\)](#), according to which perceived behavioral control represents a factor for carrying out a specific behavior. Specifically, these scholars have found a positive level of influence played by behavioral control on the willingness to use cryptocurrencies for electronic commerce. The same positive influence has been tested by [Arias-Oliva \(2019\)](#) on the intention to adopt cryptocurrencies in the Spanish market. Thus, *H3* could be advanced as follows:

H3. Perceived behavioral control positively affects the intention to use cryptocurrencies for electronic commerce

3.3 Other behavioral factors influencing the intention to use cryptocurrencies for electronic commerce

[Narayanan et al. \(2016\)](#) conceptually advanced that users of cryptocurrencies may be attracted by their ability to trade illegal products/services without being traced, because of

the anonymity provided; because of the latter, tax evasion is another emerging big concern for regulators. This has been recently advanced also by [Dyntu and Dykyi \(2018\)](#) through an analysis of historical stages of cryptocurrency creation and cases of money laundering, where criminals who used cryptocurrency have been identified and charges have been pressed; it resulted in anonymity and decentralization, i.e. the two main innovative features of cryptocurrencies, which are the characteristics that push people to use them for illegal activities. Above results are in line to what emerged in prior studies looking at deviant behavior of consumers in digital channels ([Higgins et al., 2008](#); [Williams et al., 2010](#)). From that, we hypothesize the following:

H4. Illegal attitude positively influences the intention to use cryptocurrencies for electronic commerce.

Building on the results of [Kengatharan and Kengatharan \(2014\)](#), [da Gama Silva et al. \(2019\)](#) recently tried demonstrating the presence of herding behavior among cryptocurrency users. In particular, through an indirect analysis (based on cross-sectional absolute deviation and cross-sectional standard deviation tests) of the 50 most liquid and capitalized cryptocurrencies, they found that cryptocurrency users tend to follow and copy what other users are doing within the cryptocurrency market – leading to the excess of volatility and short-term trends that feature in this market ([Liu and Tsyvinski, 2018](#)). Results of this study have been later supported by [Gurdgiev and O'Loughlin \(2020\)](#) – despite the fact they did not directly test this behavioral variable in the same way as [da Gama Silva et al. \(2019\)](#). Therefore, we propose the following hypothesis:

H5. Herding behavior positively influences the intention to use cryptocurrencies for electronic commerce.

About the perception of risk on the intention to use cryptocurrencies for electronic commerce, [Arias-Oliva et al. \(2019\)](#) did not find any significant influence in their empirical research comparing characteristics and behavior of cryptocurrency and noncryptocurrency users (in line with [Sardanelli et al., 2019](#)). However, [Pelster et al. \(2019\)](#) found that the overall behavior of cryptocurrency users is driven by excitement-seeking; in particular, when engaging in cryptocurrency, users simultaneously increase their risk-seeking behavior in exchanging them as they increase their trading intensity. This is in contrast to the meta-analysis of [Liu et al. \(2019\)](#) on the factors influencing consumers' adoption of mobile payment (i.e. perceived risk toward a new exchange mean negatively influences the intention to use it); but, the context of adoption is substantially different from the prior reported words and the one at the center of this proposed work. Accordingly, we propose the following:

H6. Perception of risk positively influences the intention to use cryptocurrencies for electronic commerce.

To explain the gender gap in the knowledge of cryptocurrency characteristics, [Bannier et al. \(2019\)](#) found that measures for actual financial literacy accounts for approximately 40% of the gender gap in Bitcoin literacy. This proposes financial literacy as an explanatory variable of the behavior of users toward cryptocurrencies – in line with other works assigning value to the financial literacy variable to explain the willingness to use cryptocurrencies for electronic commerce ([Stolper and Walter, 2017](#)). However, the same was not found by [Arias-Oliva et al. \(2019\)](#), whose empirical analysis of behavioral variables influencing users showed that financial literacy did not have a significant influence on the

intention to use cryptocurrencies for electronic commerce. This last result is in contrast with the important discovery by [Lusardi and Mitchell \(2014\)](#), who found a positive result for this relationship through their review of empirical papers and their resultant findings on the influence of financial literacy on economic decision making. Accordingly, we propose the following:

- H7.* Financial literacy positively influences the intention to use cryptocurrencies for electronic commerce.

3.4 Hofstede's cultural dimensions and their interrelationships with theory of planned behavior and the other behavioral factors

From time to time, studies that implemented TPB also included cultural influences as to be comprehensive in the explanation of what “really” drives the intention to act, mainly using the Hofstede model of cultural dimensions ([Hassan et al., 2016](#)). [Hofstede \(2001\)](#) identifies five dimensions of national culture, namely:

- individualism, i.e. the degree to which individuals are integrated into groups, such as that individualistic societies show loose ties between individuals and seek forms of society that are more independent;
- power distance, i.e. the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally;
- uncertainty avoidance, i.e. the extent to which people feel threatened by ambiguous situations and create beliefs and institutions in an attempt to avoid them, such as that people with high uncertainty avoidance seek stability, predictability and low risk rather than change and new experiences
- masculinity, i.e. the degree to which a society is characterized by either assertiveness or nurturance, such as that more masculine countries place greater emphasis on wealth, success, ambition, whereas more feminine countries place greater value on people and helping others; and
- long-term orientation, i.e. the extent to which a society exhibits a pragmatic, future-oriented perspective rather than a conventional historic or short-term perspective.

In particular, stemming from the fact that favorable attitude is expected to ease online transactions ([Pavlou, 2002](#)) and reduce barriers to the adoption of cryptocurrencies for electronic commerce, [Pavlou and Chai \(2002\)](#) – through the adoption of TPB and Hofstede's cultural dimensions – found that attitude positively influences consumer behavioral intentions to engage in product purchases across the USA – an individualistic society – and China – a collectivist society – such that relationship between attitude and transaction intention is stronger in collectivist than in individualist societies. This happens because members of a collectivist culture would like to maintain harmonious consumer–vendor relationships. Moreover, members of individualistic societies tend to be independent, while those in collectivistic cultures endorse the interdependent natures of their societies and obligations to the group ([Pavlou and Chai, 2002](#)), accepting to be influenced by the societal norm (one operationalization of subjective norm; [Hofstede, 2001](#)) while building their intention to act. From that, we propose the following:

H8a. The relationship between attitude and the intention to adopt cryptocurrencies for electronic commerce is stronger in collectivist than in individualist societies.

H8b. The relationship between subjective norm and the intention to adopt cryptocurrencies for electronic commerce is stronger in collectivist than in individualist societies.

Collectivist societies are also featured by a high power distance: people accept a hierarchical system with an unequal power distribution (Hofstede, 2001). This leads, of course, to a greater social influence – which reflects family, friends’ and influencers’ opinions – and to a positive relationship with electronic commerce intentions (Pavlou and Chai, 2002). The same result has been recently supported by other cross-cultural studies on the intention to trade within e-commerce web-sited and social media commerce platforms (Han and Kim, 2018). From that, we propose the following:

H9a. The positive relationship between social influence and the intention to adopt cryptocurrencies for electronic commerce is stronger in societies characterized by high power distance.

H9b. The positive relationship between herding behavior and the intention to adopt cryptocurrencies for electronic commerce is stronger in societies characterized by high power distance.

Chinese culture, in particular, and collectivist cultures in general, influence the group norm leading to avoid illegal attitudes. In fact, as demonstrated by Huang and Lu (2017), consumers with a stronger collectivist orientation are more likely to regard questionable consumer activities as unethical, mainly because of the fact that they treat group norms as the standard by which to measure behavior. However, while the above stated relationship seemed to be valid in public life, the same has not been found for private businesses. Indeed, as demonstrated by the work of Chan *et al.* (1998) investigating Chinese consumer unethical practices, Chinese consumers framed buying counterfeit products as a “questionable action” but not as an unethical one. If these illegal acts are committed in private life and there is no harm for the businesses, they will tend to do illegal activities; the same has been recently found in the study of Sardanelli *et al.* (2019) that for investigating the adoption of on-line streaming services, considered an Italian sample of consumers (closer to Americans in terms of cultural dimensions; Hofstede, 2001). However, if people of collectivist cultures feel that these illegal activities will finance organized crime or they have an attitude to business, as assumed for cryptocurrencies (Foley *et al.*, 2019), they will not act illegally (Chang *et al.*, 2019). Stemming from that, and from how questions within the questionnaire have been posed, it is possible to state:

H10a. The positive relationship between illegal attitude and the intention to adopt cryptocurrencies for electronic commerce is weaker in societies characterized by high power distance.

H10b. The positive relationship between illegal attitude and the intention to adopt cryptocurrencies for electronic commerce is weaker in collectivist societies.

According to Hofstede (2001), collectivist societies, like China, are featured by a long-term orientation: people feel free to postpone decisions till they are comfortable with their expected consequences, giving such people more control over their actions. As found by Pavlou and Chai (2002), Chinese users try to be more in control of their electronic commerce

transactions than the US users and rely on this control in their online transaction behavior. This has been also confirmed by following studies (Han and Kim, 2018).

H11a. The positive relationship between perceived behavioral control and the intention to adopt cryptocurrencies for electronic commerce is stronger in societies characterized by long-term orientation.

H11b. The positive relationship between perceived risk and the intention to adopt cryptocurrencies for electronic commerce is weaker in societies characterized by long-term orientation.

4. Methodology

To answer the research question on the basis of this work, i.e. how the inner features of users – i.e. behavioral and cultural – affect the intention to use cryptocurrencies for electronic commerce?, a structured and self-administered online survey (in line with similar studies; Arias-Oliva *et al.*, 2019; Shahzad *et al.*, 2018) was given to a cross-cultural sample of cryptocurrencies' users. Cultural differences have been investigated as suggested and implemented by Pavlou and Chai (2002) – later better explained. Initially, 16 cryptocurrency experts [1] were invited to a semi-structured in-depth interview to identify other behavioral factors, apart from the variables outlined in the TPB, that could influence the use of cryptocurrencies in electronic commerce [2]. Among these 16, eight comes from the USA and eight from China; these have been chosen through convenience sampling and contacted through LinkedIn. It emerged that herding behavior, perceived risk, perceived benefits and financial literacy were other important variables to consider when assessing the intention to use cryptocurrencies for electronic commerce. Then, to establish reliability and validity of the questionnaire, the latter was administered to sample of 50 people – already using cryptocurrencies for electronic commerce for six years at least twice a week – as to verify it before being implemented for the survey. Also in this case, among the 50 people, 25 comes from the USA and 25 from China; these have been chosen through convenience sampling and contacted through LinkedIn. Cronbach's alpha was used to measure reliability of random errors resulting in 0.822, which indicated high reliability. The questionnaire, incorporating the suggested variables, was administered physically or on-line to the participants of some of the biggest event dedicated to blockchain and cryptocurrency in the USA and China [3]. Recruiting participants from specialized conferences/workshops/events is a data collection method that has already been proved to be solid for finding informed respondents (Bouter *et al.*, 2016). In total, 2912 responses have been collected and 2,532 (the USA = 1,317, 52%; Chinese = 1,215, 48%) qualified for the analysis. Those eliminated were because of incomplete answers to any of the questions or because the nationality of the respondent was not Chinese or American. The nationality variable was posed as a first question within the tool as to clearly identify the culture of the user. In particular, apart from asking the nationality, it has been also asked whether that person has been living in the USA or China for at least past five years, as to guarantee even more the presence of the cultural effect; all those who did not tick this box were excluded from the sample.

Table 1 shows the breakdown of demographics in total and by country. In particular, there were 59% ($n = 1483$) men and 41% ($n = 1049$) women who participated in the study; regarding the age, the majority (46%) was 28–38 years old, followed by 18–28 (32%) years old, 38–48 (15%) years old and more than 48 (6%) years old. The majority of respondents (66%) have a bachelor's degree, while in regard to income the majority (51%) declared to earn between \$10,000 and \$30,000 per year. Finally, about the frequency of

cryptocurrencies' use, the majority (51%) declared to use them between six and ten times in a month.

As reported, the questionnaire was designed based on the main factors mentioned in the TPB. Yet, in line with similar and recent studies investigating factors influencing customers' behavior (Sardanelli *et al.*, 2019), the initial TPB model was extended by incorporating factors that are specific to consumer behavior in this particular field. Most items were taken from published similar works, specifically: attitude (Ganzach *et al.*, 2008; five items, Cronbach's alpha = 0.75), subjective norms (Gazali *et al.*, 2019; five items, Cronbach's alpha = 0.86), perceived behavioral control (Shahzad *et al.*, 2018; Arias-Oliva *et al.*, 2019; four items, Cronbach's alpha = 0.94), herding behavior (Kengatharan and Kengatharan, 2014; three items, Cronbach's alpha = 0.85), perceived risk (Faqih, 2016; three items, Cronbach's alpha = 0.84), perceived benefits (Venkatesh *et al.*, 2012; three items, Cronbach's alpha = 0.88), financial literacy (Hastings *et al.*, 2013; Skagerlund *et al.*, 2018; four items, Cronbach's alpha = 0.56), illegal attitude (Wang and McClung, 2011; three items, Cronbach's alpha = 0.83) and intention to use (Chen *et al.*, 2016; five items, Cronbach's alpha = 0.88). About illegal attitude, because this is a first contribution directly investigating it in cryptocurrencies' intention to use with a sample of respondents, the adoption of a three-item scale (Wang and McClung, 2011) followed established methodology for detecting the illegal behavior of consumers in digital channels (e.g. digital piracy). In particular, as reported by the review by Williams *et al.* (2010) on this last topic, a frequent approach for this kind of variable detection is to ask about the likelihood to commit an illegal act attached to a hypothetical scenario (Higgins *et al.*, 2008), as done in this proposed study.

The final questionnaire held 17 questions – all based on a seven-point Likert scale. Following Shahzad *et al.* (2018), Yeong *et al.* (2019); and Ter Ji-Xi *et al.* (2021), the last section of the questionnaire included the following control variables: gender, age, education level, income level and frequency of use of cryptocurrencies. In line with these cited studies, it has not been found any meaningful relationship with the intention to use cryptocurrencies for electronic commerce.

As done in similar contributions (Pavlou and Chai, 2002), after the development of scales, a first version of the tool was created and revised by two expert scholars in psychological research for clearness. The questionnaire was translated from English to Chinese by one external consultant and back-translated for improving accuracy. To verify the appropriateness of the questionnaire, it was pre-tested with 25 Chinese and 25 US consumers, who varied in age and gender; none of the reported phases revealed significant problems; however, the questionnaire was progressively refined and simplified.

The collected data were cleaned and entered into SPSS IBM version 20 for data analysis, which consisted of factor analysis and multiple linear regression analysis.

5. Results

5.1 Measure validation

About the discriminant and convergent validity of the scales, they were initially investigated through an exploratory principal component factor analysis – with a Varimax rotation (Table 2). Component factor analysis is a statistical approach usually implemented for data reduction by creating one or more index variables (often referred to as factors, components and dimensions) from a larger set of measured variables (Field, 2013).

All the items of the questionnaire significantly loaded on the constructs; using the 0.40 rule-of-thumb, all cross-loadings are low, while the resulting solution explained 78% of the total variability. Then, through the implementation of the PLS, a confirmatory factor

Characteristics	Total	Average in total	the USA	(%)	China	(%)
<i>Gender</i>						
Men	1,483	59	737	56	746	61
Women	1,049	41	580	44	469	39
<i>Age</i>						
18–28	810	32	397	30	413	34
28–38	1,170	46	593	45	577	47
38–48	389	15	246	19	143	12
Above 48	163	6	81	6	82	7
<i>Education</i>						
High school	173	7	63	5	110	9
College	416	16	195	15	221	18
Bachelor's degree	1,666	66	926	70	740	61
Master's degree	277	11	133	10	144	12
PhD	0	0	0	0	0	0
<i>Income</i>						
Less \$10,000	279	11	120	9	159	13
From \$10,000 to \$30,000	1,277	51	632	48	645	53
From \$30,000 to \$50,000	557	22	336	26	221	18
From \$50,000 to \$70,000	228	9	119	9	109	9
Above \$70,000	191	8	110	8	81	7
<i>Frequency of cryptocurrencies' use in e-commerce (times in a month)</i>						
0	0	0	0	0	0	0
1–5	349	14	185	14	164	13
6–10	1305	51	696	53	609	50
11–2,015	358	14	175	13	183	15
16–20	267	11	152	12	115	9
>20	253	10	109	8	144	12

Table 2.
Description of
sample data

analysis was implemented to determinate discriminant validity of the principal constructs; thus, to test whether the data fit the hypothesized measurement model (Field, 2013). As usually done, discriminant validity is shown when the square root of each construct's average variance extracted (AVE) is larger than its correlations with other constructs.

Tables 3 and 4 report that the square root of the AVE is much larger than all other cross-correlations for both the USA and China samples. Tables 3 and 4 report the:

- reliability coefficients and AVE values;
- correlation matrix and descriptive statistics of the study's principal factors for the USA and China; and
- Cronbach's alpha coefficient for each construct as to measure reliability (for both countries they are above 0.70).

5.2 Hypotheses testing

The hypotheses developed in the prior sections have been tested by recurring to a PLS. PLS is able to specify the relationships among the principal construct, as well as with their

Table 3.
Exploratory
principal component
factor analysis result

		Rotated component matrix ^a								
Questions substantiating variables		Items	1	2	3	4	5	6	7	8
Attitude	Using cryptocurrencies will increase my opportunities to achieve important goals for me	AT1	0.677							
	Using cryptocurrencies will help me achieve my goals more quickly	AT3	0.623							
	Using cryptocurrencies will increase my standard of living	AT5	0.607							
	The people who are important to me will think that I should use cryptocurrencies	SN2		0.709						
Social norm	The people who influence me will think that I should use cryptocurrencies	SN1		0.702						
	People whose opinions I value would like me to use cryptocurrencies	SN3		0.692						
	I have the necessary resources to use cryptocurrencies	PBC5			0.801					
Perceived behavioral control	I have the necessary knowledge to use cryptocurrencies	PBC3			0.755					
	Cryptocurrencies are compatible with other technologies that I use	PBC1			0.705					
	I can get help if I have difficulty using cryptocurrencies	PBC4			0.679					
	I can use cryptocurrencies for not legal activities	IA1				0.653				
Illegal attitude	Using cryptocurrencies will help me in masking my identity in transactions	IA2				0.621				
	Using cryptocurrencies will help me in hiding money	IA3				0.595				
	Other users' decisions of using cryptocurrencies have impact on my using decisions	HB1					0.722			
	Other users' decisions of the cryptocurrency volume have impact on my intention to use	HB3					0.685			
Herding behavior	Other users' decisions of using cryptocurrencies have impact on my intention to use decisions	HB2					0.654			

(continued)

Rotated component matrix ^a		Component								
	Questions substantiating variables	Items	1	2	3	4	5	6	7	8
Perceived risk	Using cryptocurrencies is risky	PR3						0.910		
	There is too much uncertainty associated with the use of cryptocurrencies	PR1						0.900		
Financial literacy	Compared with other currencies, cryptocurrencies are riskier due to their high volatility	PR2						0.855		
	I have a good level of financial knowledge	FL1							0.754	
	I have a high capacity to deal with financial matters	FL2							0.654	
Intention to use cryptocurrencies for electronic commerce	I intend to use cryptocurrencies for electronic commerce	INT1								0.901
	I predict that I will use cryptocurrencies for electronic commerce	INT2								0.923
	I will use cryptocurrencies for electronic commerce on a regular basis	INT3								0.892
	I believe using cryptocurrencies to timely fulfill my obligations	INT4								0.845
	I intend to use cryptocurrencies as an alternative mean of doing electronic commerce	INT5								0.822

Notes: Extraction method = principal component analysis; rotation method = Varimax with Kaiser normalization. Explained variation % = 70.9%; a = rotation converged in six iterations.

Table 3.

	Intention to use	Attitude	Subjective norm	Perceived behavioral control	Illegal attitude	Herding behavior	Perceived risk	Financial literacy
Intention to use	0.81	0.36	<i>0.43</i>	0.23	0.45	0.28	0.34	0.30
Attitude		0.87	<i>0.58</i>	0.34	0.82	<i>0.54</i>	0.32	0.21
Subjective norm			0.92	0.28	0.59	0.19	0.44	0.52
Perceived behavioral control				0.92	0.23	0.22	0.53	<i>0.42</i>
Illegal attitude					0.94	0.38	0.66	0.74
Herding behavior						0.87	0.42	0.50
Perceived risk							0.78	0.44
Financial literacy								0.80
Cronbach's alpha	0.78	0.82	0.85	0.76	0.71	0.74	0.88	0.90
Mean value	6.6	5.6	4.5	4.2	4.9	3.0	3.2	4.0
SD	1.2	1.3	1.5	1.6	1.4	1.1	1.6	1.4

Table 4. Descriptive statistics, correlation matrix and AVEs of principal constructs for the USA

Notes: The main diagonal shows the square root of the AVE. Significant at $p < 0.01$ level ($r > 0.35$ or $r < -0.35$) are shown in bold; significant at $p < 0.05$ level ($r > 0.30$ or $r < -0.30$) in italics

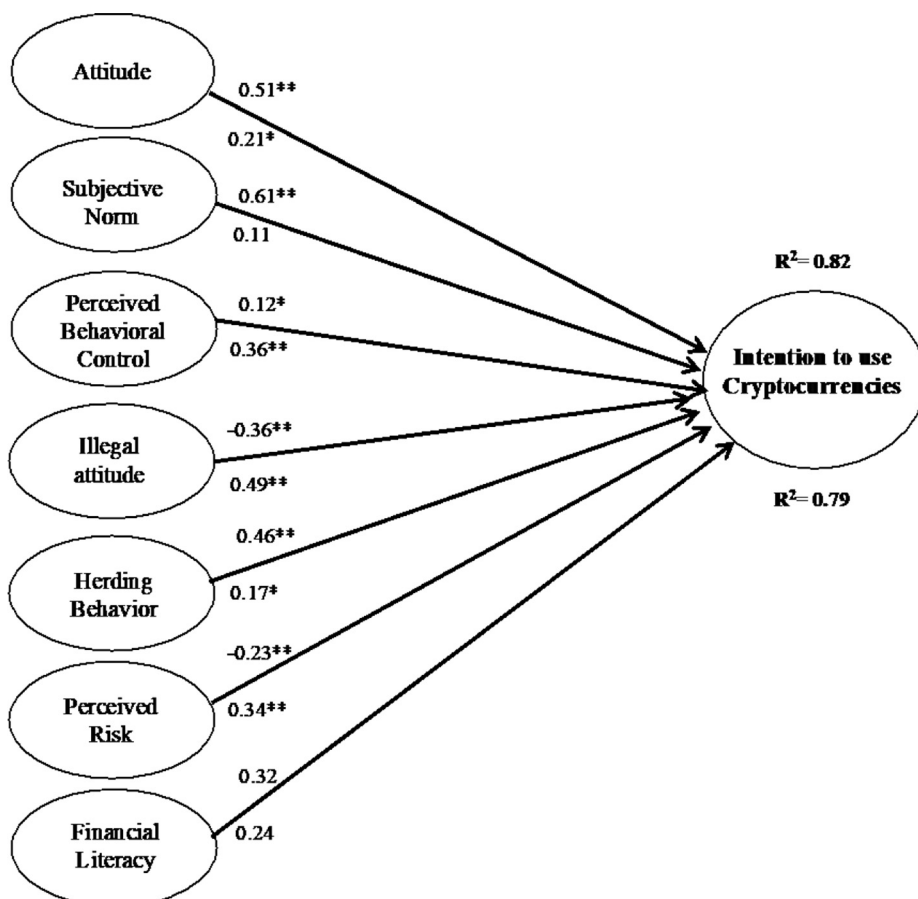
underlying items. The possibility to insert several measurements for each construct allows accurate estimates of the paths among constructs. Figure 2 depicts the results for the USA and China, widely supporting the role of the TPB and other behavioral variables for the intention to use cryptocurrencies in electronic commerce. The model is valid in both the countries presenting the following R^2 values: 0.82 for U.S. and 0.75 for China.

To test the moderating effect of cultural differences on TPB and other related behavioral variables, the test for moderators was implemented (Baron and Kenny, 1986). As reported in Table 5, and similarly to Pavlou and Chai (2002), two regression models have been compared:

- the simple regression model with seven independent variables; and
- the moderated regression model that is additionally comprehensive of the interaction of the seven behavioral variables with culture.

In particular, simple regression predicts a linear relationship, $Y = \alpha + \beta X + \varepsilon$, between a dependent variable Y and an explanatory variable X, with the error term ε encompassing omitted factors. The moderated regression model, instead, is usually adopted to identify factors that change the relationship between independent and dependent variables (i.e. moderators) (Field, 2013).

Culture moderates the relationship, as emerging from the significant interaction effect. Indeed, as stated in *H1* and *H8a*, attitude positively influences the adoption of cryptocurrencies and, related to that, collectivist rather than in individualist cultures lead to have a stronger attitude toward the adoption of cryptocurrencies in electronic commerce. These hypotheses are both verified, as it can be seen in Figure 2 (China, $b = 0.51$, $p < 0.01$; the USA, $b = 0.21$, $p < 0.05$), also because the moderated regression model, depicted in Table 5, shows that the interaction of culture with attitude is significant ($b = 0.43$, $t = 5.12$, $p < 0.001$). Similarly, *H2*, *H8b* and *H9a*, which states that subjective and societal norms positively influence the intention to use cryptocurrencies for electronic commerce, and this relationship is stronger in collectivist/high power distance cultures rather than individualist/low power distance ones, received support. Indeed, it resulted that Chinese



Notes: Top Coefficient: China; Bottom Coefficient: United States; **Indicates p -value < 0.01; *Indicates p -value < 0.05

Figure 2.
Results of partial
least squares analysis
of the research model

users of cryptocurrencies ($b = 0.61, p < 0.01$) are influenced by their society and social norms, while their counterparts in the USA are not affected at all by them ($b = 0.11, p > 0.05$); the moderated regression model also shows that the interaction of norm with culture is significant ($b = 0.59, t = 2.12, p < 0.01$), providing additional support for *H8b* and *H9a*. *H3* argues that perceived behavioral control positively influences the intention to use cryptocurrencies for electronic commerce, and this hypothesis has been verified as well (China, $b = 0.12, p < 0.05$; the USA, $b = 0.36, p < 0.01$); however, culture does not seem to moderate this relationship ($b = 0.20, t = 1.43, p > 0.05$); thus, *H11a* is rejected. About the hypothesized positive influence of illegal attitude toward the intention to use cryptocurrencies for electronic commerce, i.e. *H4*, results shown in [Figure 2](#) depict that this relationship is positive for the USA ($b = 0.49, p < 0.01$), but negative for China ($b = -0.36, p < 0.01$). This relationship seems to be strongly moderated by culture, as advanced by *H10a* and *H10b* and shown in [Table 5](#) ($b = -0.19, t = -1.54, p < 0.01$). *H5* advanced that herding

	Intention to use	Attitude	Subjective norm	Perceived behavioral control	Illegal attitude	Herding behavior	Perceived risk	Financial literacy
Intention to use	0.75	0.52	0.47	0.45	0.41	0.23	0.31	0.35
Attitude		0.84	0.51	0.44	0.65	0.51	0.37	0.28
Subjective norm			0.80	0.67	0.33	0.14	0.40	0.14
Perceived behavioral control				0.92	0.21	0.54	0.42	0.22
Illegal attitude					0.84	0.30	0.22	0.54
Herding behavior						0.83	0.33	0.40
Perceived risk							0.73	0.27
Financial literacy								0.74
Cronbach's alpha	0.71	0.77	0.80	0.76	0.74	0.73	0.83	0.78
Mean value	6.4	5.8	5.8	5.9	2.3	5.0	4.1	3.0
SD	1.1	1.2	1.0	1.5	1.6	1.1	1.0	1.5

Notes: The main diagonal shows the square root of the AVE. Significant at $p < 0.01$ level ($r > 0.35$ or $r < -0.35$) are shown in bold; significant at $p < 0.05$ level ($r > 0.30$ or $r < -0.30$) in italics

Table 5. Descriptive statistics, correlation matrix and AVEs of principal constructs for China

behavior positively influences the intention to use cryptocurrencies for electronic commerce; this has been found as verified for China ($b = 0.46, p < 0.01$) and the USA ($b = 0.17, p < 0.05$) users. Moreover, this result seems to advance that culture plays a role within this relationship, indeed the moderated regression model also shows that the interaction of herding behavior with culture is significant ($b = 0.21, t = 2.11, p < 0.05$), providing additional support for *H9b*. *H6* advanced that perception of risk positively influences the intention to use cryptocurrencies for electronic commerce, this relationship is verified and is stronger for the USA ($b = 0.34, p < 0.01$) than China ($b = -0.23, p < 0.01$), where this relationship is negative; this is also supported by the moderated regression model ($b = -0.36, t = 1.98, p < 0.01$), verifying *H11b*. Finally, *H7*, which states that financial literacy positively influences the intention to use cryptocurrencies for electronic commerce, did not find support (China, $b = 0.32, p > 0.01$; the USA, $b = 0.24, p > 0.05$).

As reported in [Table 6](#), most of the research hypotheses at the basis of this study are supported. Culture has been found to moderate the relationships between attitude, subjective and social norm, illegal attitude, herding behavior, perceived risk and the intention to use cryptocurrencies for electronic commerce; in other words, the role of cultural differences was found to be a noteworthy moderator in the proposed cryptocurrencies adoption model. However, within this model, financial literacy seems not to be a driver of the intention to use cryptocurrencies for electronic commerce; this outstanding result, together with the others, will be discussed in the following section.

6. Discussion

Findings are in line with other works substantiating a positive influence of attitude, subjective norms, perceived behavioral control and herding behavior on the intention variable ([Pavlou and Chai, 2002](#); [Sondari and Sudarsono, 2015](#); [Liu et al., 2019](#)), despite not specifically considering the case of cryptocurrencies, which for inner technological features and the huge uncertainty in its future development for the global economics, requires a specific investigation. However, while perceived behavioral control seems not be influenced by culture – in contrast to what assumed to prior studies ([Pavlou and Chai, 2002](#); [Han and Kim, 2018](#)) – attitude and subjective norms were moderated by it: their effects on the

Independent variables	R- squared adjusted	Regression coefficient	t-value
Simple regression model	0.62		
Attitude		0.10	4.12***
Subjective norm		0.10	1.56***
Perceived behavioral control		0.10	1.12**
Illegal attitude		0.15	3.21***
Herding behavior		0.18	2.45**
Perceived risk		0.18	1.96***
Financial literacy		0.04	2.24
Moderated regression model	0.83		
Attitude × Culture		0.43	5.12***
Subjective norm × Culture		0.59	2.12***
Perceived behavioral control × Culture		0.20	1.43
Illegal attitude × Culture		-0.19	-1.54***
Herding behavior × Culture		0.21	2.11**
Perceived risk × Culture		-0.36	-1.98***
Financial literacy × Culture		0.24	3.24
Culture		0.26	1.96

Table 6.
Moderated
regression analysis
on intention to use
cryptocurrencies for
electronic commerce

Notes: *** $p < 0.01$; ** $p < 0.05$

intention to use cryptocurrencies for electronic commerce are stronger for China than the USA (in line with Pavlou and Chai, 2002 and Hofstede, 2001). On the contrary, despite always positively amplified by culture, the herding behavior for China is greater than the one for the USA, mainly because of the present high power distance and subjection to societal norms. Culture also amplifies the relationship of both illegal attitude and perceived risk with the intention to use cryptocurrencies. For these two antecedents, while there is a positive influence to the intention to use cryptocurrencies when considering the US context, it has been found there is a negative effect for China: Americans do not disapprove the illegal use of cryptocurrencies, and to a high perception of risk for their use, they answer with an increased interest in them. The latter insight is in contrast to prior literature, suggesting the negative influence of perceived risk on the use of exchange means (Liu *et al.*, 2019), which, however, has been verified as still valid when referring to the Chinese context (Huang and Lu, 2017; Chang *et al.*, 2019). This difference can maybe be accounted to the financial speculative aim that is around the use of cryptocurrencies by some consumers.

Specifically, the positive consequences linked with the attitude factor demonstrates that users are inclined to adopt cryptocurrencies for electronic commerce because they glimpse future benefits such as improving the chances to achieve, in a short period, better standards of living (Mendoza-Tello *et al.*, 2018). However, users who have an egocentric approach toward the use of cryptocurrencies for electronic commerce sometimes act at the margin of illegality; indeed, often these users put in place actions aimed to mask their real identity in the transaction processes as well as for avoiding checks while they are involved in activities aimed to store money outside legal boundaries (Narayanan *et al.*, 2016; Dyntu and Dykyi, 2018). Commonly, the handling of cryptocurrencies for electronic commerce is being facilitated by the impression of having the control of essential resources, education and technology to use cryptocurrencies for electronic commerce (Shahzad *et al.*, 2018; Arias-Oliva *et al.*, 2019). The willingness to use cryptocurrencies is also encouraged by the social circle surrounding users; according to Ali (2011) and Gazali *et al.* (2019), it has appeared that the individuals who are eminent for the users or that have an influence on them toward the

MRR	H	Hypothesis statement	Result
	<i>H1</i>	Attitude positively influences the intention to use cryptocurrencies for electronic commerce	Supported
	<i>H2</i>	Subjective norm positively influences the intention to use cryptocurrencies for electronic commerce	Supported
	<i>H3</i>	Perceived control behavior positively influences the intention to use cryptocurrencies for electronic commerce	Supported
	<i>H4</i>	Illegal attitude positively influences the intention to use cryptocurrencies for electronic commerce	Supported
	<i>H5</i>	Herding behavior positively influences the intention to use cryptocurrencies for electronic commerce	Supported
	<i>H6</i>	Perception of risk positively influences the intention to use cryptocurrencies for electronic commerce	Supported
	<i>H7</i>	Financial literacy positively influences the intention to use cryptocurrencies for electronic commerce	Not supported
	<i>H8a</i>	The relationship between attitude and the intention to adopt cryptocurrencies for electronic commerce is stronger in collectivist than in individualist societies	Supported
	<i>H8b</i>	The relationship between subjective norm and the intention to adopt cryptocurrencies for electronic commerce is stronger in collectivist than in individualist societies	Supported
	<i>H9a</i>	The positive relationship between social influence and the intention to adopt cryptocurrencies for electronic commerce is stronger in societies characterized by high power distance	Supported
	<i>H9b</i>	The positive relationship between herding behavior and the intention to adopt cryptocurrencies for electronic commerce is stronger in societies characterized by high power distance	Supported
	<i>H10a</i>	The positive relationship between illegal attitude and the intention to adopt cryptocurrencies for electronic commerce is weaker in societies characterized by high power distance	Supported
	<i>H10b</i>	The positive relationship between illegal attitude and the intention to adopt cryptocurrencies for electronic commerce is weaker in collectivist societies	Supported
	<i>H11a</i>	The positive relationship between perceived control behavior and the intention to adopt cryptocurrencies for electronic commerce is stronger in societies characterized by long term orientation	Not supported
	<i>H11b</i>	The positive relationship between perceived risk and the intention to adopt cryptocurrencies for electronic commerce is weaker in societies characterized by long term orientation	Supported

Table 7.
Summary of the hypothesis test

use, or not, of cryptocurrencies for electronic commerce. This is even more true for users influenced by collectivist cultures featured by high power distance as it is for China. Within them, the respect of the subjective and societal norms is not put into discussion and they drive the behavior in public, private and business life (Hofstede, 2001).

This high consideration toward subjective and societal norms forces the users to entrust their actions on the hints furnished – therefore, leading to a herding behavior that has an effective authority on the use of cryptocurrencies for electronic commerce (da Gama Silva *et al.*, 2019; Gurdgiev and O’Loughlin, 2020). Specifically, the herding behavior is a popular circumstance in financial markets, and the users’ financial education does not have an impact toward its reduction or toward guiding the users to avoid to use cryptocurrencies for electronic commerce purposes – in line with Arias-Oliva *et al.* (2019) and in contrast to Lusardi and Mitchell (2014), Stolper and Walter (2017); and Bannier *et al.* (2019). The

aftermath of this unrestrained herding behavior can be seen in the high volatility and short trends that characterize in the electronic market of cryptocurrencies – as indicated by [Liu and Tsyvinski \(2018\)](#). However, this high degree of dynamicity about cryptocurrencies' electronic market does not demoralize users characterized by an individualistic behavior; vice versa, these users are affected by enthusiasm, while they are involved in cryptocurrency trading, leading to the enhancement of their risk-seeking behavior ([Aloosh and Ouzan, 2020](#)) – which has the only effect of soaring the willingness to use cryptocurrencies for electronic commerce purposes.

Under a theoretical point of view, alternatively, how the current work has been handled overcomes the limitations affection past contributions in terms of:

- theoretical framework adopted and variables proved; and
- sample population and relevance of the collected sample.

Concerning these latter, TPB has been enforced instead of the TRA – surpassing the limits present in the contribution proposed by [Gazali et al. \(2019\)](#) – leading to the inclusion of the observed behavioral control variables, which has been extensively treated as the major descriptive factor for envisioning intentions ([Ajzen, 1991, 2002](#); [Madden et al., 1992](#)).

7. Conclusions and implications

Findings of this contribution have proved that the attitude to adopt cryptocurrencies for electronic commerce – hence, the ambition to reach outstanding goals and enhance the standard of living – and perceived behavioral control – hence, thinking of having have the necessary essential resources, education and assistance to use cryptocurrencies – unquestionably force the willingness to adopt cryptocurrencies for electronic commerce purposes ([Sondari and Sudarsono, 2015](#); [Shahzad et al., 2018](#); [Arias-Oliva et al., 2019](#); [Gazali et al., 2019](#)). Furthermore, one of the major additional values deriving from this contribution concerns the disclosure that cryptocurrencies users of individualistic culture, against those shaped by collectivist culture, do not constantly have a legal scope when using cryptocurrencies for electronic commerce reasons; in fact, often, these users adopt cryptocurrencies to deliberately conceal they identity for illegal purposes such as, for instance, the storage of money outside common legal channels. Symmetrically, the willingness to adopt cryptocurrencies for electronic commerce is certainly affected by the so-called subjective norms – therefore, the power of close individuals such as family members and friends as well as trusted people and media – which leads to herding behavior of users ([da Gama Silva et al., 2019](#); [Gurdgiev and O'Loughlin, 2020](#)) and, correspondingly, to an high degree of volatility for what concerns the cryptocurrency market ([Liu and Tsyvinski, 2018](#)). Nevertheless, users of cryptocurrencies are not crestfallen by this high volatility because they are often shaped by a risk-seeking behavior ([Pelster et al., 2019](#); [Aloosh and Ouzan, 2020](#)). What has not been found as meaningful toward the willingness to adopt cryptocurrencies for electronic commerce is financial education; hence, there is no discrepancy, also considering the cultural factor, in the aim to use or not cryptocurrencies among people with disparate levels of financial proficiency. This latter is totally in line with what was advanced by prior researchers, such as [Arias-Oliva et al. \(2019\)](#), which shed light on an often-tragic conclusion about the fact that some consumer behavior phenomena, such as herding behavior, is quite difficult to be lowered – with reference to the cryptocurrency market – leveraging on a greater education in financial topics.

The current findings provide a solid empirical proof that, finally, TPB, financial behavior and cultural factors can, all together, represent a useful framework for envisioning the behavior of users in adopting cryptocurrencies for electronic commerce purposes through a

test of all its elements. Furthermore, in terms of geographical scope. Without the inclusion of the cultural variable, it would have been not possible to identify and explain why, in contrast to prior literature, some consumers (Americans) are more prone to the use of cryptocurrencies when perceived a high risk while others (Chinese) do not.

Future research should take into consideration the findings that emerged from the present contribution, including those covered by subjective norms. Undeniably, other scholars can reinforce this study by investigating how family, friends and the media represent the preeminent influence that affects investors' willingness to use cryptocurrencies for electronic commerce scopes. Additionally, future streams of research may concern the identification of whether perceived behavioral control is shaped by alternative contextual variables that have not been tested in the current contribution – i.e. the scarcity of policies and regulations about the use of cryptocurrencies. Last but not the least, despite following an established methodology (Higgins *et al.*, 2008; Wang and McClung, 2011; Williams *et al.*, 2010) future research should overcome one of the main limits of this work: having detected illegal behavior in a direct way by asking it to respondents, therefore being subject of a not honest answer in some cases. In this regard, by following the investigation of illegal behaviors in management research, a greater approach to analyze illegal attitude in the intention to use cryptocurrencies can be by multi-method approaches that integrate both inside (e.g. questionnaires) and outside perspectives (e.g. observational methods) (Cowie *et al.*, 2002). About the inside perspective on detecting illegal attitude in the intention to use cryptocurrencies, it may be beneficial:

- designing items measuring individual acceptance of rule violation (the so-called measure of “ethical idealism”), where agreement with a number of statements is measured on seven-point Likert scales (Lysonski and Durvasula, 2008); or
- delineating open-ended questions whose contents is then thematically analyzed – these have been indeed found to elicit higher levels of reporting for threatening behavioral items than closed-ended questions (Bernard, 2017; Blair *et al.*, 1977).

Upon the findings resulting from this study, it is also possible to advance some practical suggestion. First, because of the positive authority that subjective and societal norms play on the intention to adopt cryptocurrencies for electronic commerce purposes, responsible and reliable information should be produced both by media and academic to increment the consciousness of the perils and benefits of using cryptocurrencies for electronic commerce. This phenomenon is even more valid for collectivist culture and can lead to avoid an illegal herding behavior.

Second, and connected to the first, electronic commerce platforms should eliminate (or at least trying to reduce) the lack of trust in the usage of cryptocurrencies for payment. This idea is reinforced by the results of this work. Indeed, it has been shown that people who perceive behavioral control and low risk (this latter only with regard of members of collectivistic cultures) in the usage of cryptocurrencies for electronic commerce, are more willing to that adoption. Increasing trust of users can be reached by allowing them sharing suggestions within the electronic commerce platform (Mendoza-Tello *et al.*, 2018) as well as by providing information on adopted technology protocols and standards of security (Bezovski *et al.*, 2021; Jonker, 2019; Treiblmaier *et al.*, 2020; Treiblmaier and Sillaber, 2021).

Third, administrators of cryptocurrencies and marketing officers, owing to the provided results, can design more fine-grained marketing campaigns targeting to those interested in using cryptocurrencies for electronic commerce; in this vein, they should be vigilant in subdividing them following socio-demographic characteristics and be more attentive

toward both behavioral and cultural elements that can help to discern among active users and those who will not.

However, what the governments should deal with in the imminent future concerns the use of cryptocurrencies for electronic commerce by those individuals that are pursuing criminal goals, mainly looking at individualistic societies. Indeed, the illegal attitude that has been found for the Americans' sub-sample pushes regulators to quickly find solutions to govern the cryptocurrency market and avoid the entrance, in the value chain, of private noninstitutional players. Central authorities can settle an e-cash system based on a platform capable to straightforwardly trade cryptocurrencies with traditional currencies, and all bodies running the value chain – including control authorities – as it regularly happens between financial institutions.

Notes

1. 5 trading platform owners, 3 blockchain engineers, 3 cryptocurrency media reporters, and 2 cryptocurrency philosophers; all of them having more than 5 years' experience in using cryptocurrencies on both local and international platforms.
2. Questions and answers of all interviewed experts involved in this study are available upon requests.
3. North American Bitcoin Conference (January 16th–18th, 2019), Token 2049 (March 13th–14th, 2019), Bitcoin 2019 Conference (June 25th–26th, 2019), Crypto Fest 2019 (September 6th, 2019), Cryptolina Conference for Blockchain Adoption (September 10th, 2019), CoinAlts Fund Symposium 2019 (September 26th, 2019), World Crypto Con (October 29th–31st, 2019), Blockshow Asia 2019 (November 14th–15th, 2019), Blockchain Expo North America (November 27th, 2019), CryptoBlockcon (December 10th–11th, 2019), Crypto Asia Summit (March 18th, 2020), Asia Crypto Week 2020 (March 16th–22th, 2020 and October 5th–11th, 2020), Crypto Valley Conference 2020 (June 15th, 2020), 2020 Blockchain for Business Conference (October 1st–2nd, 2020), Voice of Blockchain 2020 (October 5th–6th, 2020).

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