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# CASHLESS PAYMENTS AND CORRUPTION: THE ROLE OF LEGAL INSTITUTIONS – EVIDENCE FROM VIETNAM

**Le Thi Thuy Hang[1*], Nguyen Tuan Duy[1], La Quoc Trung[1],**

**Nguyen Huynh Bao Han[1], Vu Van Nhi[1], Pham Thi Xuan Trang[1], Ngo Nhut Duy[1]**

[1]University of Finance - Marketing, Vietnam

| ARTICLE INFO | ABSTRACT |
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| | This study examines the institutional drivers of corruption reduction and digital finance adoption in Vietnam from 2002 to 2022, with a particular focus on the impact of regulatory quality (RQI) and rule of law (RLI). Using wavelet analysis, the study finds that RQI plays a decisive and multi-directional role: it negatively affects corruption (CI) while positively promoting online payment adoption (OPI). These results suggest that improving regulatory quality is an effective lever to simultaneously reduce institutional inefficiencies and promote financial innovation. Furthermore, the relationship between RQI and both CI and OPI suggests a mutually reinforcing mechanism whereby improved governance strengthens the financial system and, in turn, digital adoption and anti-corruption outcomes enhance overall governance quality. In contrast, RLI did not show a consistent or significant impact on CI or OPI, suggesting that regulatory frameworks without corresponding regulatory implementation will lack the practical impact needed to address corruption or accelerate digital transformation. Overall, the findings emphasize that regulatory quality – rather than legal form – is the real driver of transparency, accountability, and digital financial growth. Policy recommendations aim to strengthen regulatory institutions, align laws with market practices, and invest in both technological infrastructure and institutional capacity to ensure sustainable and transparent development in Vietnam's financial ecosystem. |

*Corresponding author:*

Email: ltt.hang@ufm.edu.vn

## 1. Introduction

In the context of digital transformation and global economic integration, the shift from traditional cash-based transactions to modern electronic payment methods has become an inevitable trend, particularly for developing countries like Vietnam. The revolution in information and communication technology has ushered in a new era for financial transactions, driving a significant transition from conventional cash payments to advanced digital solutions. Digitizing transactions not only enhances convenience, security, and cost-efficiency but also contributes to greater transparency and oversight, thereby curbing fraudulent activities and corruption. These are persistent challenges that undermine the effectiveness of state governance and severely erode public trust. Moreover, corruption exerts a detrimental impact on individuals, businesses, and society as a whole, with far-reaching consequences across all facets of the economy (Argandoña, 2007). However, in economies where financial management systems remain underdeveloped, cash transactions are easily exploited for fraud, tax evasion, and illicit financial activities. This makes non-cash payment systems, with their ability to automatically store and retrieve transaction data, a vital tool for improving oversight processes and enhancing the transparency of financial flows. In practice, cash payments are not only insecure and difficult to monitor but also facilitate illegal activities, including tax evasion, thereby fostering and sustaining underground economies (Singh & Bhattacharya, 2017).

The study focuses on theories of macroeconomic policies and economic growth related to the Rule of Law Index, Regulatory Quality Index, electronic payments, and Corruption Index in Vietnam.With specific objectives (1) To test the impact of non-cash payments on corruption levels; (2) To evaluate the influence of the legal-institutional framework on corruption; (3) To propose policy recommendations to enhance the effectiveness of non-cash payments in reducing corruption, grounded in Vietnam's legal-institutional framework.

Vietnam has a unique institutional framework where factors like Rule of Law Index (RLI) and Regulatory Quality Index (RQI) strongly influence policy decisions and the implementation of anti-corruption measures. This study not only helps clarify the relationship between these factors and corruption and cashless payment adoption but also indicates that improving managerial quality and institutional frameworks can play a critical role in both combating corruption and promoting digital payments. Thus, this study provides valuable insights for policymakers in Vietnam. While international literature has established a connection between cashless payments and reduced corruption, there remains a significant gap in empirical studies specifically focused on the Vietnamese context. This research seeks to fill that gap by exploring the relationship between the Corruption Index (CI) and the Online Payment Index (OPI), offering new insights into the potential role of cashless payment systems in mitigating corruption. Examining this relationship within the unique political and legal framework of Vietnam is essential, as it contributes to a more nuanced understanding of the factors that shape the development and effectiveness of digital payment systems in a developing economy.

## 2. Literature review

This study is grounded in the Institutional Theory framework (Scott, 2005) and the Diffusion of Innovations Theory (Rogers, 1983). The Institutional Theory posits that the effectiveness of public policies, such as those related to financial transaction management,

largely depends on the quality of existing legal institutions and oversight mechanisms. A robust legal system creates barriers that minimize fraud and corruption, whereas a weak legal framework enables the exploitation of technological advancements for unlawful purposes. Meanwhile, the Diffusion of Innovations Theory focuses on the spread and adoption of new technologies within society, suggesting that the transition from traditional to digital transactions is not merely a technical process but also involves shifts in attitudes, behaviors, and societal structures. This diffusion depends on factors such as user acceptance, technological accessibility, and the coherence of the legal framework. Consequently, the Diffusion of Innovations Theory helps elucidate how non-cash payment solutions are adopted and implemented in Vietnam, as well as the potential barriers in the digital transformation process. While non-cash payment can reduce corruption, high levels of corruption can also hinder the effective development of these systems.

Institutional theory has a clear connection to the corruption of countries because corruption is a part of weak institutions where social norms or formal legal institutions are not strong enough to prevent illegal behavior. And in weak institutional environments, legitimizing factors such as norms or legal institutions are not only not strong enough to prevent corrupt behavior but also open up opportunities for corruption to develop when individuals feel that following the procedures is enough and do not need to be responsible for the actual results .Institutional Theory is closely linked to national corruption, as corruption often stems from weak institutions where social norms or formal legal frameworks fail to deter illegal acts. In such environments, legitimizing factors like norms or legal institutions not only lack the strength to prevent corruption but may even create opportunities for it to flourish. So

Institution quality also affects the inclusiveness of non- cash payment adoption (Jončić, 2010).

In addition, the Institutional Analysis and Development (IAD) framework pioneered by Ostrom et al. (2011) incorporates game theory to explain social behavior. This theory argues that the choice of agents is influenced by the decision-making ability of each individual and institutions. And when the IAD framework is combined with Onuf's constructivist approach, the mechanistic process of institutional structure with the decision-making process of actors becomes clearer. Because Onuf's approach assumes that social rules have become central to the modern social world and fully explain social behavior. In line with the IAD principle, a key tenet of constructivism is that people and society are constituted together as a continuous process (Onuf, 1994). This analytical framework is particularly useful in understanding corrupt behavior because internal factors (individual willingness to be corrupt) and the external world (weak institutions or opportunities for corruption in society) can create an environment where corrupt behavior becomes rational and normal for actors. This framework also shows that the IAD framework not only emphasizes decision-making ability but also but also the quality of decicions, which depends on institutional capacity, access to accurate data. In contexts with weak rules of law, decicions- making tends to be short term, politically motivated and pȯoly enforced, affecting the implementation of non-cash payment systems. This also shows that corruption not only changes the behavior of individuals but also affects the development and transformation of social institutions and rules, forming a feedback loop in the system.

In parallel, the Diffusion of Innovations Theory (DOI) explains how technological innovations, particularly non-cash payment systems, are adopted and spread within a society.

DOI identifies key factors that influence the adoption process, such as relative advantages, compatibility, and complexity, as well as the role of communication channels and the social system in facilitating or impeding diffusion. In the context of this study, DOI helps clarify how the widespread adoption of electronic payments can contribute to greater transparency and reduce opportunities for corruption by minimizing cash-based transactions, which are more susceptible to fraud and illicit activities.

The Diffusion of Innovations Theory (DOI), developed by Rogers in 1962, can explain how innovations in the field of electronic payments impact the economy and society (Tee & Ong, 2016). In his early work, Rogers analyzed in detail how innovations are transmitted and gradually adopted by individuals in a social system over time (Rogers, 1983). DOI identifies four main factors in the diffusion of innovations: innovation, communication channels, time, and social system (Rogers, 1983).

Innovation is defined as any idea or practice that is considered new to an individual or organization. The adoption of an innovation depends on attributes such as relative advantage, observability, trialability, compatibility, and complexity. Communication channels, especially mass media such as television, newspapers, and the internet, play an important role in transmitting information about an innovation to a large number of potential users. Time is an important factor in determining the speed and extent of adoption of an innovation. Finally, the social system is the environment in which individuals and organizations interact, influencing the diffusion of new ideas and practices.

This theoretical framework combines institutional theory and diffusion of innovation theory to explain how institutional factors and changes in social behavior can impact the reduction of corruption, especially through the innovation of electronic payment systems. The diffusion and adoption of electronic payment innovations are important tools in changing social behavior, improving institutions, and reducing corruption in society.

By integrating these two theories, this research examines how institutional quality, and the diffusion of non-cash payment technologies interact to influence corruption dynamics in Vietnam. The combined framework enables a comprehensive analysis of both structural and behavioral factors, providing a deeper understanding of how strengthening legal institutions and promoting technological innovation can serve as complementary strategies to combat corruption and enhance governance.

Ambiguous or inconsistently enforced regulations often provide a legitimizing context for corruption, particularly in developing countries like those in Asia – a region long grappling with corruption issues. In South Asia, excluding Bhutan, corruption remains pervasive, with Control of Corruption (CoC) scores below 50% (CoC is a World Bank indicator of corruption control) and lower than the global average of 50.03% (Han, 2023), including Vietnam. This enables individuals and organizations to exploit these gaps, justifying their actions as aligned with existing norms. The challenge lies in how the persistence of corruption enabled by weak legal systems and governance, affects to the sucessful integration of non-cash payment systems. This may face resistance from individuals and organizations that benefit from the weak system and the emergence of coruption. Therefore, this also causes disadvantages for the non-cash payment systems and any efforts to develop transparency in the financial system.

Research by everages institutional perspectives to explain corruption through three core national institutions political, legal, and media tied to Institutional Theory and

diffusion processes. These studies draw on analyses of corruption (CI), institutions (RLI), and information management systems across countries to inform policies and projects for electronic initiatives aimed at reducing corruption. In the study by (Castro et al., 2020), corporate corruption is presented as a rational action, an institutionalized practice, a cultural norm, and a moral failure. These actions, if not properly managed, will turn cashless payments becomes the other way for corruption to thrive instead of a tool to address corruption situation.

The adoption of non-cash payments not only enhances transaction efficiency but also delivers significant benefits in reducing corruption. Research by (Tee & Ong, 2016) demonstrates that electronic payment systems can increase transparency and mitigate fraudulent behaviors due to their ability to track and record transactions. Particularly in Asian countries, where institutional development and corruption levels vary widely, non-cash payments have proven to be an effective tool for promoting reform.

For example, the study by (Casu & Lazo, 2017) demonstrates that the adoption of electronic payments in public services across various countries can reduce corruption by minimizing direct interactions between public officials and citizens. In countries like India, electronic payment systems have enhanced the transparency of government subsidies, while in China, mobile payment platforms such as Alipay and WeChat Pay have transformed transaction practices, reducing reliance on cash and informal dealings. Innovations in payment systems and tools have shifted consumer preferences toward more convenient payment methods. Consumers are expected to benefit from these tools in terms of both time and cost savings.

According to (Tee & Ong, 2016), the expansion of public electronic payment systems

helps reduce cash-related corruption and enhances transparency through the storage and retrieval of transaction histories. The authors argue that dependence on cash is a core driver of corruption, including money laundering and associated illegal activities. However, these behaviors can be significantly curbed through the implementation of policies promoting non-cash payments. The adoption of electronic payment methods enables most transactions to be conducted securely and transparently, thereby reducing the need for cash in daily community activities. This also facilitates easier tracking and auditing of transactions through technological tools, fostering accountability among stakeholders.

Based on the theoretical framewworks, this study reveals a novel perspective: the impact of non- cash payment systems is not solely determined by technology but is strongly influenced by factors such as management quality, the rule of law, and the level of corruption. These institutional factors can transform non- cash payment systems from a potential anti- corruption solution into new channel that inadvertently facilitates corupt practices. Therefore, this study indicates that these factors: Rule of Law Index, Regulatory Quality and Corruption Index Play a crucial role in influencing the non-cash payment system. Effectively controlling these factors will directly enhance the positive impact of the non-cash payment system and ensure transparency in financial operations.

## 3. Methodology

The overview of theories and empirical studies in part 2 on the relationship between corruption variables, rule of law, regulatory quality and cashless payment systems shows some positive impacts on corruption. These theories clarify the challenge of institutional factors and cashless payment technologies

affecting corrupt practices, but the findings are not really consistent.

According to Uddin et al. (2017), time domain analysis can answer the incomplete and ambiguous information about the causal relationship between economic variables. And indeed, looking at the presented studies, we can clearly see that the research variables are influencing each other, but we cannot see which variable is the pioneer in each study for each region and country. Therefore, this study focuses on time domain and frequency domain analysis using the Wavelet transform method. According to Rua (2012) and Merry (2005), Wavelet analysis is a useful tool in economics to study how variables are related to each other at different frequencies and how the variables change over time. In addition, this method allows us to analyze a non-stationary time series because it decomposes the time series into different time scales and frequencies. This is because the data of developing countries like Vietnam is quite scarce compared to developed countries. Therefore, by examining the causal relationship between the variables of rule of law, decision quality, corruption, cash and non-cash payments, this study adds a new direction to the existing studies. In short, we use Wavelet research to show the antecedent relationship between the research variables over many time periods instead of just studying the relationship between these variables in the short or medium term and only.

In this study, we will use the Wavelet method in the following order:

### 3.1. Wavelet Coherence

In this study, Wavelet Coherence (WTC) was selected as the primary analytical tool to elucidate the dynamic relationships between cashless payments and corruption within Vietnam's institutional and legal context, across both time and frequency domains. WTC allows for measuring the degree of co-movement between two non-stationary or nonlinear time series, thereby uncovering hidden relationships that traditional methods, such as linear regression or Granger causality tests, may fail to fully detect. A key strength of WTC is its ability to analyze localized correlations between two series across different time scales, enabling the identification of short-term versus long-term relationships and highlighting periods when these relationships may shift due to macroeconomic or institutional factors.

The analysis begins with the application of the Cross-Wavelet Transform (XWT) to identify the common power between two observed variables: the Online Payment Index (OPI) and the Corruption Index (CI). XWT assesses the synchronization of the two data series across specific frequency bands and time intervals, thereby pinpointing periods when the variables exhibit co-movement or divergence. Subsequently, Wavelet Coherence (WTC) is employed to measure the consistency (coherence) of the relationship between the variables. The WTC coefficient ranges from 0 to 1, with higher values indicating stronger synchronized linkage at a given time scale and point in time. Furthermore, to determine the direction of causality, the study analyzes the phase difference to clarify which variable leads and which follows. Specifically, arrows on the WTC plot represent phase shifts: right-pointing arrows indicate in-phase relationships (positive co-movement), while left-pointing arrows suggest anti-phase relationships (negative co-movement). Upward or downward arrows reveal lead-lag dynamics, indicating the timing of influence between the variables.

The WTC coefficient calculation in this study is adapted from Grinsted et al. (2004), expressed as:

$$R_{xy}^2(s) = \frac{|S\left(s^{-1}W_{xy}(s)\right)|2}{S(s^{-1}|Wx(s)|^2).S(s^{-1}|Wy(s)|^2)}$$

*Where*: $W_{xy}$ (s) is the cross-wavelet transform between two times series $x_1$ and yt, S is a smoothing operator, and, s denotes the scale. This normalization eliminates short-term noise, ensuring reliability in assessing the linkage between the variables. WTC not only provides insights into the strength of the relationship but also explores different phases of interaction, while qualitatively verifying the consistency and stability of the relationship over time and scale.

Wavelets allow for handling non-stationary and time-varying relationships, which are not effectively modeled by traditional methods such as ARDL, VAR or cointegration. On the other hand, Wavelets are capable of multi-resolution analysis, which is suitable for economic data affected by short-, medium- and long-term cycles (Aguiar-Conraria & Soares, 2011; Rua, 2010).

### 3.2. Data

This study examines the relationships between Online Payments Index (OPI), Regulatory Quality Index (RQI), Rule of Law Index (RLI), and Corruption Index (CI) in Vietnam. Data were collected from 2002 to 2022 from reliable sources such as the World Bank. Further details regarding the variables are described in the following table:

**Table 1.** Data description

| Symbol | Variable | Data Source |
| --- | --- | --- |
| OPI | Online Payment Index | Worldbank |
| RQI | Regulatory Quality Index | Worldbank |
| RLI | Rule of Law Index | Worldbank |
| CI | Corruption Index | Worldbank |

Short data series are a limitation, but the study used Continuous Wavelet Transform analysis instead of Discrete Wavelet, which is less affected by series length. Academic studies also used 20–25 years of data for Wavelet to demonstrate the feasibility of using Wavelet for short time series (Tiwari et al., 2013; Aguiar-Conraria & Soares, 2011). On the other hand, in the regression process, the study used Quadratic Match - Sum method to convert annual data into quarterly frequency data.

## 4. The results

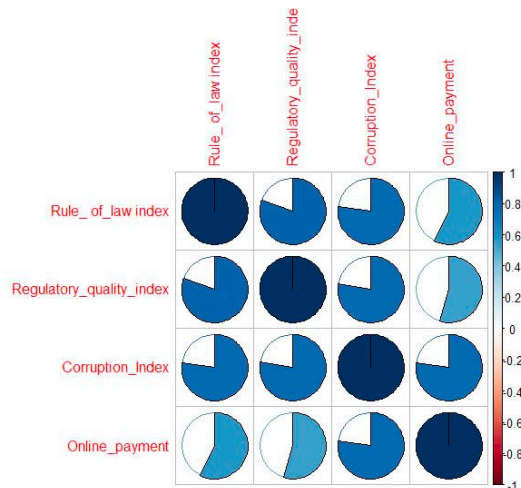### 4.1. Correlation Results

**Figure 1.** The distribution and pairwise correlation plots of the variables

Figure 1 above illustrates the correlation matrix among four quantitative variables: the Rule of Law Index, Regulatory Quality Index, Corruption Index, and Online Payment. Each circle in the matrix represents the Pearson correlation coefficient between a pair of variables, where the color intensity and size of the pie slice reflects the magnitude and direction (positive or negative) of the relationship. Dark blue tones indicate strong positive correlations, whereas lighter shades or white areas denote weak or negligible associations.

The results reveal a strong positive correlation among the governance indicators. Specifically, the Rule of Law Index shows a very high correlation with both the Regulatory Quality Index (approximately 0.9) and the Corruption Index (around 0.85). Likewise, the Regulatory Quality Index is strongly correlated with the Corruption Index, suggesting that institutional dimensions such as administrative efficiency, transparency, and accountability tend to move together and reinforce each other in building robust governance frameworks.

Notably, the Online Payment index also exhibits a clear positive correlation with all three governance indicators, especially with the Corruption Index (around 0.7). This implies that countries or regions with higher governance quality, a transparent legal environment, and lower levels of corruption are more likely to develop a thriving digital payment system. In contexts where citizens and businesses can place trust in legal and regulatory institutions, and where corruption is effectively controlled, the adoption of financial technology, particularly digital payment methods, is more likely to be widespread and sustainable.

From a financial and macroeconomic perspective, these findings are highly significant. They indicate that to promote the development of a digital payment ecosystem an essential pillar of the digital economy policymakers must simultaneously focus on enhancing legal infrastructure, improving the efficiency of public administration, and intensifying anti-corruption efforts. Strengthening institutional capacity not only boosts economic performance but also fosters public confidence in engaging with modern financial services.

### 4.2. Descriptive Statistics

**Table 2.** Summary of Descriptive Statistics

| Variable | RLI | RQI | OPI | CI |
|---|---|---|---|---|
| Observations | 21 | 21 | 21 | 21 |
| Mean | -0.364 | -0.546 | 92.197 | 30.524 |
| Median | -0.46 | -0.6 | 120.32 | 31 |
| Maximum | 0.07 | -0.24 | 140.64 | 42 |
| Minimum | -0.68 | -0.77 | 1.9 | 24 |
| Std. Dev. | 0.236 | 0.128 | 53.557 | 5.076 |
| Skewness | 0.516 | 0.632 | -0.805 | 0.633 |
| Kurtosis | 1.912 | 2.797 | 1.922 | 2.485 |
| Jarque- Bera | 1.967 | 1.434 | 3.286 | 1.636 |
| Probability | 0.374 | 0.488 | 0.193 | 0.441 |
| Sum | -7.65 | -11.46 | 1936.14 | 641 |
| Sum Sq. Dev. | 1.112 | 0.33 | 57368.036 | 515.238 |

The descriptive statistics for the variables RLI, RQI, OPI, and CI are summarized in Table 2. It is evident that the mean values of the rule of law (RLI) and regulatory quality (RQI) variables are negative, while the other two variables exhibit positive means, suggesting that the level of rule of law across the Asian countries in the dataset is relatively weak. The standard deviation of OPI is the highest at 53.557, indicating that electronic payments exhibit the greatest variability among the variables studied. Conversely, RQI has the smallest standard deviation (0.128), implying less variability relative to its mean compared to the other variables. Regarding skewness, OPI is left-skewed with a negative coefficient of -0.805, while the remaining variables—RLI (0.516), RQI (0.632), and CI (0.633)—are right-skewed with positive coefficients. The Jarque-Bera test results indicate that all variables (RLI, RQI, OPI, CI) are statistically significant, suggesting that none of them follow a normal distribution. This once again confirms that the use of Wavelet analysis is appropriate

### 4.3. Wavelet analysis

Notes: Time and frequency are displayed on the horizontal and the vertical axis, respectively. The thick black contour presents a significant region at the 5% level, and the curved black line denotes a cone of impact, which reveals regions influenced by edge effects. Right up and down show in-phase, while left up and down indicate out of phase.
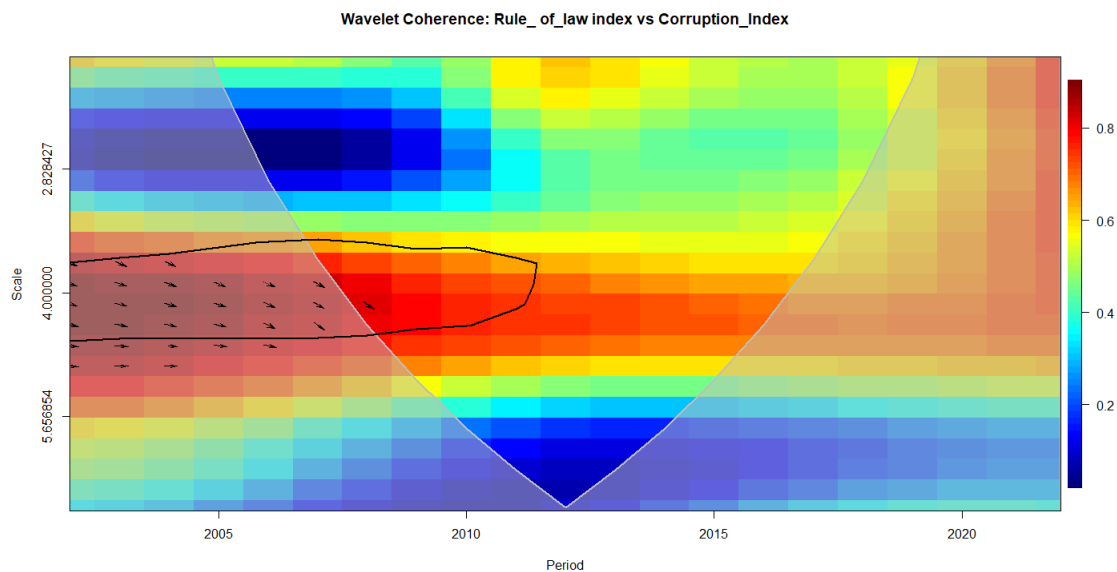
**Figure 2.** Wavelet Coherence: Rule of Law Index vs Corruption

Figure 2 illustrates the wavelet coherence between the Rule of Law Index and the Corruption Index across different time horizons—short-term, medium-term, and long-term—during three sub-periods: 2002-2006, 2007-2012, and 2013-2022. In the 2002-2006 period, the short-term relationship is weak (represented in blue), while the medium-term displays the strongest coherence (dark red areas), with downward-pointing arrows indicating a negative correlation. The long-term relationship during this period is moderate, shown by blue and yellow areas. In the 2007-2012 period, the short-term connection strengthens to a moderate level (blue and yellow), and the medium-term remains strong (red and orange). A moderate relationship is also observed in the long term. From 2013 to 2022, the short-term coherence increases further, reaching a moderately strong level (blue, yellow, and red), while the medium-term continues to reflect a strong association (red and orange). In contrast, the long-term coherence weakens, returning to a low level (blue).

The black arrows in the coherence diagram indicate the phase difference between the two variables. Most arrows point rightward, suggesting that the Rule of Law Index and Corruption Index move in phase—when the Rule of Law improves, corruption tends to decrease, and vice versa. Moreover, the leading relationship of the Rule of Law Index over the Corruption Index is evident across all periods, implying that changes in the legal and institutional environment may precede and potentially drive subsequent changes in corruption levels. This temporal precedence supports the view that improvements in the rule of law can serve as a proactive mechanism in anti-corruption strategies.

The WTC and phase differences for four sets of indicator pairs RLI and CI (Figure 2), RLI and OPI are shown in Figure 3, RQI and CI (Figure 4), and RQI and OPI are shown in Figure 5. Relative phase relationships are shown by the arrow. The right (left) arrow indicates that the series is in (out of) phase, while the up (down) arrow indicates that the first (second) series lead to another series. The color represents the degree of co-movement between two indicators, with the horizontal line denoting the time component and the

vertical line denoting the frequency component (quarters). The interdependence of economic series with dense red regions is strong, compared to those with light blue islands. The regions that are statistically significant at the 5% level are shown by the thick, black outline, which was computed using a Monte Carlo simulation. Data on wavelet coherence and phase differences corroborate our predictions.

According to Wavelet analysis in the period from 2005-2010, Corruption will be the variable leading to the Rule of Law variable. In the period from 2010-2020, the correlation between these two variables is still quite strong but there is no significant change over time or no clear change (no arrow appears). Compared with the current situation of corruption in Vietnam, this result is quite suitable. Because the corruption situation in Asia is considered quite serious because most of the countries in the region are developing countries, including Vietnam. And because the strong outbreak of this problem

has created the need for reforming the rule of law institution, consistent with the results of the Wavelet test. Therefore, corruption is the factor leading Asian countries including Vietnam to improve the rule of law institution to manage and control corruption. From there, we can see more clearly why there is a tendency for corruption to be a variable leading to legal institutions and not the other way around, from the high level of corruption over the years thus promoting the rule of law institutions in these countries to develop more strongly. It can be seen that in the long term, the corruption variable can be seen to be well overcome because the rule of law variable represented by the CPI index of the Asian region has increased quite steadily in recent years according to VNTOWORD. Therefore, the rule of law needs to be strengthened in developing countries to address the complex developments of the problem of corruption, which is also consistent with the research results of the Journal of Business ethics by Nawabuzor-2005.
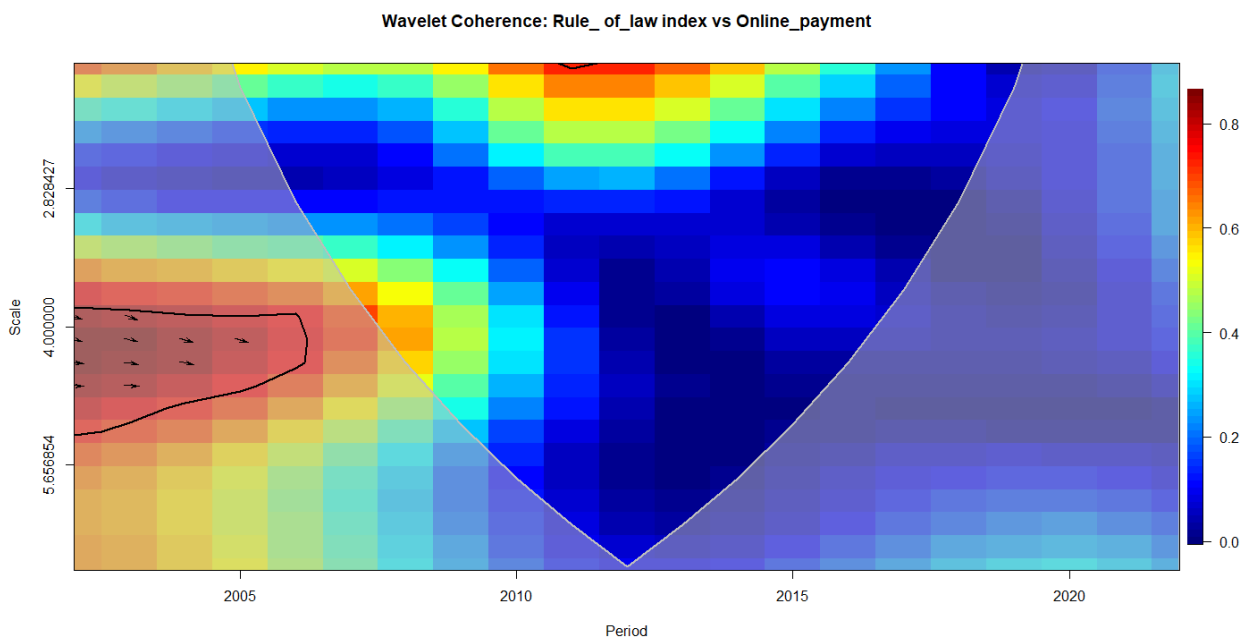


**Figure 3.** Wavelet Coherence: Rule of Law Index vs Online Payment

Figure 3 illustrates the wavelet coherence between the Rule of Law Index and Online Payment across three periods: 2002-2006, 2007-2011, and 2011-2022, analyzed over short-term, medium-term, and long-term time horizons. In the 2002-2006 period, the relationship between the two variables is weak in the short term (blue areas) but becomes stronger in the medium term (blue and yellow areas). Notably, the downward-pointing arrows in this region indicate that the two series move in phase and that the Rule of Law Index leads to the changes in Online Payment. In the long term, the relationship remains at a moderate level (blue and yellow), suggesting a more stable and persistent influence.

During the 2007-2011 period, the short-term relationship is moderate (blue and yellow), but there is no significant coherence observed in the medium and long term. Similarly, in the 2011-2022 period, the relationship between the Rule of Law Index and Online Payment remains weak across all time horizons, with no clear directional or phase connection detected.

The medium-term downward arrows during the 2002-2006 period highlight an important implication: improvements in the rule of law may precede and contribute to the development of online payment systems. This suggests that a strong legal environment can build trust and foster the expansion of digital financial services. On the other hand, a lack of legal integrity may limit the growth of such systems. Therefore, enhancing the rule of law plays a crucial role in promoting the long-term sustainability of online payment development.

Analyzing the pair of variables RLI – OP, we can clearly see that in the period from 2005 to 2015, there is a strong correlation and fluctuation between the rule of law index – electronic payment in this domain. In the period from 2010 to 2020, it seems that these two variables are not correlated at this frequency level. This is completely consistent with the reality in Vietnam, before 2010, non-cash payment methods had just appeared as a new payment method and led to legal institutions being able to control quite well. But after 2010, the relationship between these two variables was no longer correlated due to the development of Fintech technology and the proliferation of online payment transactions regardless of legal regulations, making it impossible for legal institutions to correlate with this electronic payment variable. And this also matches the research of Uña et al. (2023).

Analyzing the pair of variables RQI - CI, it can be seen that in the period from 2003 to 2020, the relationship between management quality and corruption in the Asian region in general and Vietnam in particular has changed significantly over time and economic cycles. The results show that in these periods, improvements in management quality lead to a decline in corruption after a certain period of time. In the period 2010-2015, the analysis results show an inverse relationship between corruption control and state management quality. Specifically, the increase in corrupt practices in the public sector may have negatively impacted governance efficiency, undermining the trust of people and the business community in the management system. However, since 2016, the relationship between corruption control and state management quality has tended to shift to a positive correlation, with a shorter lag. This shows that efforts to reform governance and increase transparency have initially shown positive results.
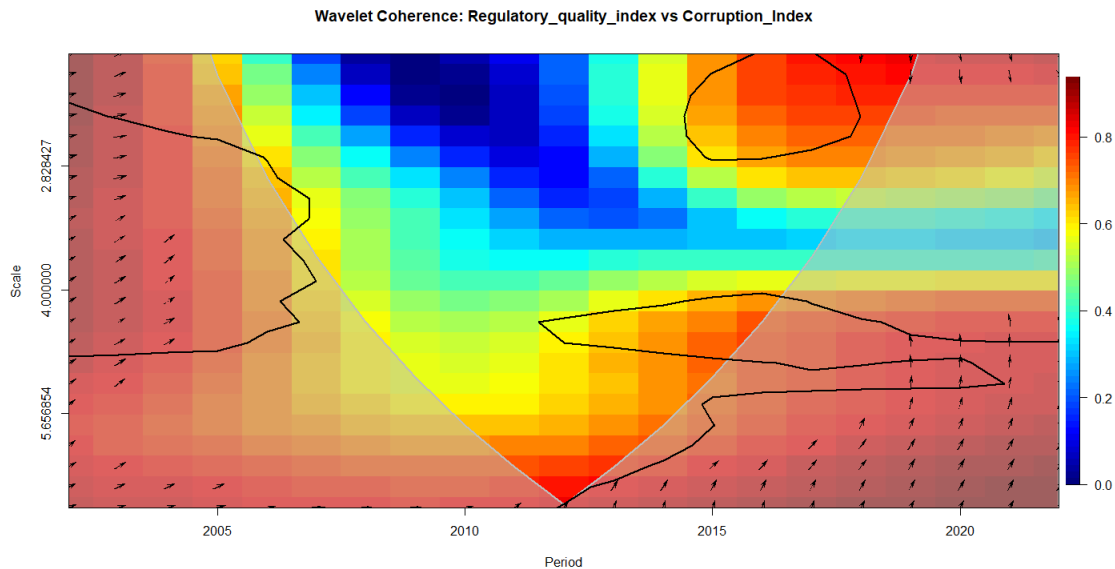
**Figure 4.** Wavelet Coherence: Regulatory Quality Index vs. Corruption Index

Figure 4 presents the wavelet coherence between the Regulatory Quality Index and the Corruption Index over the period 2002–2022, divided into short-term, medium-term, and long-term phases. During 2002–2006, a strong short-term relationship (orange-red) is observed, with the arrows indicating that the Corruption Index leads changes in the Regulatory Quality Index. In the medium term, the relationship is also strong (orange-yellow), with both series moving in phase and the Corruption Index continuing to lead. This suggests that increases or decreases in corruption levels may precede changes in regulatory quality. A similar strong and directional relationship is maintained in the long term.

Between 2007-2012, the coherence is weak and not statistically significant in the short term, while only weak to moderate interactions are observed in the medium and long term (mostly blue and orange areas), indicating limited linkage during this period. From 2013-2018, the short-term relationship is strong again (orange-red), while the medium-term relationship becomes moderate and more scattered. However, the long-term coherence remains strong, with the Corruption Index continuing to lead the Regulatory Quality Index.

In the most recent period (2018-2022), the short-term relationship remains strong, while coherence in the medium term is relatively weak and lacks statistical significance. However, the long-term relationship is strong (orange-yellow), and again, the Corruption Index precedes the Regulatory Quality Index.

The consistent lead of the Corruption Index over the Regulatory Quality Index, especially in the long term, implies that shifts in corruption levels may drive subsequent changes in regulatory quality. This highlights the economic implication that improving the quality of governance is a consequence rather than a cause of lower corruption in many cases. Hence, efforts to reduce corruption can pave the way for enhanced governance, improved investor and business confidence, and a more stable regulatory environment conducive to long-term economic growth.

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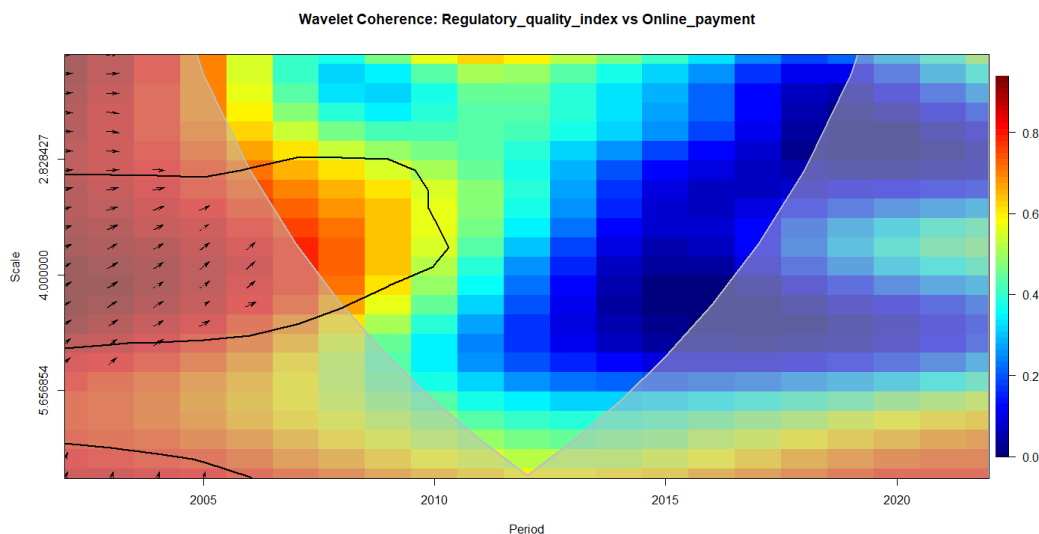


**Figure 5.** Wavelet Coherence: Regulatory Quality Index vs Online Payment

Figure 5 presents the wavelet coherence analysis between the Regulatory Quality Index and Online Payment, illustrating the dynamic relationship between these two variables across different time frequencies and over the period from 2002 to 2022. The coherence spectrum captures both the strength and directionality of co-movement, where warmer colors (red, orange, yellow) indicate higher coherence, and arrows denote the phase relationship (i.e., lead-lag structure).

In the short-term (high-frequency bands on the y-axis), the results show several periods of high coherence with arrows pointing to the right and slightly downward, particularly

during 2002-2006 and 2017-2022. This suggests a strong and positive contemporaneous relationship, where Online Payment and Regulatory Quality tend to move in phase. These periods likely reflect immediate institutional responses or regulatory adjustments following increased digital transaction volumes.

In the medium-term, the relationship appears more fragmented and unstable. While there are pockets of moderate coherence, especially around 2005 and 2015, the coherence is generally lower and more sporadic. This indicates that in the medium run, the interaction between digital payment systems and regulatory quality may be affected by other intervening

factors such as policy lags, economic shocks, or institutional inertia, weakening the direct observable link.

In the long-term (low-frequency bands), a significant area of coherence emerges during 2002-2006, characterized by arrows pointing downward and to the right. This directional pattern implies that Online Payment tends to lead changes in Regulatory Quality, suggesting that the expansion of digital financial infrastructure may exert a long-term influence on improving institutional effectiveness and governance frameworks. However, such coherence is less evident in later years, implying the diminishing long-term influence or the need for complementary policy reforms to sustain the impact.

Overall, the results imply that the growth of online payments can serve as a catalyst for regulatory development, particularly in the short and long term, but this relationship is neither uniform nor automatic. The time-varying nature of coherence underscores the importance of aligning institutional reforms with technological advancement to maximize governance outcomes.

Analysis of the RQI – OP variable pair in the period from 2003 to 2020 shows a dynamic relationship over time between the quality of state management and online payment in the Asian region, including Vietnam. In the period from 2003 to 2010, reflecting a strong positive correlation between these two variables, shows that the improvement in the quality of state management has had a positive impact on the development of online payment. In Vietnam, this is the initial stage for the modernization of the payment system. The State Bank of Vietnam (SBV) has issued important legal documents such as Decision No. 44/2002/QD-NHNN on the management and operation of the interbank electronic payment system, and at the same time deployed the electronic clearing

system and the bank card payment system, creating a foundation for the development of online payment services later. However, in the period 2010 to 2015, this was the boom period of online payment platforms and e-wallets in Vietnam, with the emergence and rapid development of Fintech enterprises. Typically, Momo (2014), and ZaloPay (2016) contributed to expanding people's access to financial services. From 2015 onwards, the positive correlation between the quality of state management and online payments returned. This was the period when Vietnam promoted legal reform and strengthened management of non-cash payment activities. By 2020, Vietnam recorded a significant increase in the number of online payment transactions, with more than 700 million transactions via Internet Banking and Mobile Banking, reaching a total value of over VND 4,900 trillion (SBV, 2021). This development is also associated with the improvement of management policies, strengthening inspection, supervision and application of technology in state administration, helping to effectively control risks and promote people's trust in the online payment system.

### 4.3. Discussion of Results

In the context of globalization and digital transformation, non-cash payments are becoming an important tool in the fight against corruption, especially in developing countries like Vietnam. Reducing cash transactions helps reduce opportunities for corruption, increase transparency, and facilitate monitoring and auditing. Successful digitalization programs such as Digital India (India), WeChat Pay and AliPay (China), or the cashless payment system (Singapore) have shown clear effectiveness. However, according to Transparency International (TI, 2020), corruption remains a major challenge in many developing countries, requiring not only technology but also strong legal reforms. Without strict supervision,

digitalization can lead to risks such as financial fraud and data misuse. Although this strongly promotes digital payments (Agarwal et al., 2018; Joshi & Desai, 2017), it is still unclear how much impact it has on corruption. The correlation between weak rule of law and high levels of corruption has been confirmed by the classic studies of Huntington (1968). This view is further reinforced by Gikay (2018), who points out that a strong legal system is the foundation for promoting safe and efficient electronic payments, through user protection and risk control. An extended study by Zhang and Adom (2018) clarifies the link between corruption control, regulatory quality and efficient energy transition. Thus, the rule of law not only plays a key role in curbing corruption but is also a prerequisite for promoting financial innovation.

*First*, the relationship between the financial index (Rule of Law (ROL) and the level of corruption (C) is a widely studied topic in the fields of economics and public administration. The ROL index reflects the level of law enforcement, transparency and effectiveness of the legal system in a country. According to Huntington (1968), when ROL is high, the law is strictly enforced, helping to reduce corrupt practices. On the contrary, when ROL is low, it creates conditions for officials and businesses to abuse their power for personal gain. In Vietnam, efforts in administrative reform and public finance transparency have made certain progress, but there are still many challenges related to the effectiveness of law enforcement. At the same time, Hall et al. (2020) emphasized that per capita income can affect corruption, as higher income helps reduce the incentive for corruption. However, research by showed that this relationship is not simply one-way, but low corruption can also lead to increased income. Salihu (2022) also stated that inflation can impact corruption, especially in developed economies. Therefore, to effectively control

corruption, Vietnam needs to not only improve the quality of the rule of law but also manage macroeconomic factors well and improve transparency in the financial system.

*Second*, e-payments are booming, especially in developing economies, reflecting the important role of the rule of law. According to Gikay (2018), a solid legal framework builds trust among users and businesses, thereby promoting the spread of digital payment methods. This is realized through strict regulations on personal information protection, financial security and fraud prevention. When risks are controlled, people will be more confident in using e-wallets or online banking. However, in countries with limited rule of law, e-payments can easily become an opportunity for illegal activities such as money laundering and tax evasion (Weingast, 1997). The absence of mechanisms to protect property rights and enforce contracts in these contexts will undermine confidence in the financial system. The close relationship between the rule of law and e-payments is also demonstrated through the impact of regulatory policies on the development of financial technology (FinTech). Khanna and Palepu (2010) argue that in emerging economies, inconsistencies in regulations will hinder the development of digital payment platforms, as businesses face an uncertain legal environment. During the period 2010-2020, the explosion of online payments in Vietnam has demonstrated the potential of financial technology, but at the same time increased security and fraud risks. This highlights the need for policy adjustments to ensure the sustainable development of the cashless payment system.

Third, the analysis of the relationship between regulatory quality (RQI) and corruption (CI) in Vietnam from 2003 to 2020 shows significant changes over time and economic cycles. During periods of crisis or instability, corruption tends to increase first and weaken regulatory quality. Porter (1996) argues that improved

regulatory quality can promote investment in technology and optimize resource utilization, while Fredriksson et al. (2004) argue that high corruption can undermine energy regulations and policies. This requires Vietnam to improve regulatory quality, strengthen supervision, and enforce stricter anti-corruption policies. Countries with transparent regulatory systems and effective law enforcement such as Singapore or South Korea often achieve stability and attract strong investment. Meanwhile, China and Vietnam are still in the process of reform to improve institutional efficiency. Strengthening the rule of law through improving the quality of regulations will continue to be a driving force for sustainable growth.

Fourth, the relationship between Regulatory Quality (RQI) and Online Payment (OP) has been mentioned by many studies, emphasizing the role of institutions in promoting financial innovation. Acemoglu and Johnson (2005) pointed out that indicators of regulatory quality, including transparency and policy implementation efficiency, have a significant impact on the development of digital financial platforms. In Vietnam, the policy of promoting non-cash payments has achieved many positive results, with the rate of people using e-wallets and digital banks increasing. However, controlling financial fraud, ensuring consumer rights and maintaining the stability of the payment system remain major challenges. In general, the quality of state management not only determines the development of electronic payments but also affects the ability to maintain financial transparency, minimize risks and expand access to banking services for all people.

## 5. Conclusion and recommendation

From the above research results, it is evident that in Vietnam, corruption negatively impacts regulatory quality, while improving regulation does not necessarily reduce corruption immediately. Additionally, legal reform in Vietnam is primarily reactive to corruption rather than proactive in controlling it, meaning policies are often proposed only after corruption increases but do not ensure long-term effectiveness. On the other hand, rule of law influences electronic payment, but this trend weakens as financial technology develops, reflecting a divergence between legal policy and market realities. If appropriate adjustments are not made, rule of law may gradually lose its role in guiding the development of cashless payments. Meanwhile, regulatory quality promotes electronic payment, but this effect is not stable without synchronized investment in technological infrastructure.

Therefore, to ensure the sustainable development of electronic payments, Vietnam needs to synchronize legal reforms with enhancing law enforcement, making public administration transparent, strengthening independent oversight mechanisms, and investing in digital infrastructure rather than relying solely on short-term policies.

The findings from this study provide several important policy implications for the Vietnamese Government in promoting cashless payments as a tool to reduce corruption. The results indicate that cashless payments have the potential to enhance transparency and limit illegal activities, but its effectiveness depends on the legal framework, technological infrastructure, and public acceptance. Based on these analyses, the following policies should be implemented to improve the effectiveness of cashless payments in controlling corruption as follows:

*(i) Regarding the legal framework:* The Government needs to strengthen the development and refinement of legal regulations related to cashless payments to ensure transaction transparency and security.

Specifically, it is necessary to update documents such as Decree 101/2012/ND-CP to include provisions on data security and impose strict penalties for abuses of the digital payment system. Additionally, consideration should be given to the enforcement capacity of regulatory agencies and compatibility with Fintech companies, avoiding negative impacts on the development of the electronic payment market.

*(ii) Regarding technological infrastructure:* To meet the growing demand for cashless payments, it is necessary to expand technological infrastructure, particularly in rural areas, to ensure that all citizens can access digital payment services. This includes enhancing high-speed internet networks and providing transaction-supporting devices at reasonable costs. At the same time, factors such as public investment levels, people's affordability, and impacts on local economic development need to be considered.

*(iii) Regarding community awareness:* Raising awareness and skills in using cashless payments among the public is essential to increase acceptance and reduce reliance on cash. The Government should implement digital skills training programs, improve public understanding of the benefits of cashless payments in reducing corruption, and encourage changes in payment habits through incentives such as reduced transaction fees. Additionally, transparency in communication must be ensured to build trust among users.

*(iv) Regarding transaction oversight:* State agencies need to enhance oversight of cashless payment transactions, particularly in the public sector, to minimize the risk of corruption. Specifically, it is necessary to introduce automated monitoring services, such as blockchain technology applications, to record and trace transaction information, ensuring high monitoring quality at reasonable costs. At the same time, a mechanism for public disclosure of transaction data should be established to enhance accountability of relevant agencies.

*(v) Regarding financial support policies:* The Government can apply financial incentive policies, such as tax reductions for Fintech companies participating in cashless payment development or transaction fee subsidies for users in remote areas, to encourage the growth of the digital payment system. Additionally, transparency in service fee collection must be ensured to avoid affecting the demand for cashless payments among citizens and businesses.

*(vi) Regarding future trends:* The demand for cashless payments is expected to surge in the future due to digital transformation and the increasing population participating in the digital economy. Therefore, it is necessary to develop a long-term strategy for cashless payment growth, ensuring it meets market demands, maintains service quality, and ensures equitable access. At the same time, factors such as the development of new technologies and integration with international standards should be considered to enhance Vietnam's position in the region.

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