

Cryptocurrency Regulation and Monetary Policy Transmission in Developing Economies: A Cross-Country Panel Analysis

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ABSTRACT

Situation

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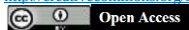
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This study examines the implications of cryptocurrency adoption for the transmission of monetary policy in developing economies. Using a panel of twelve emerging-market and developing economies (India, Indonesia, Pakistan, Bangladesh, Vietnam, the Philippines, Nigeria, Kenya, Egypt, Turkey, Brazil, and Argentina) over the period 2017 to 2024, the analysis estimates panel vector autoregression (VAR) models that incorporate cryptocurrency trading volumes alongside conventional monetary aggregates, policy rates, exchange rates, and inflation. The empirical results show that a one-standard-deviation shock to cryptocurrency trading volume reduces the cumulative twelve-month impact of a policy rate change on headline inflation by approximately 18.6 per cent (95 per cent confidence interval: 9.2 to 28.1 per cent), with the attenuation strongest in countries experiencing the highest growth in retail crypto adoption. Variance decomposition attributes roughly 11.4 per cent of exchange-rate fluctuations to cryptocurrency innovations in the post-2020 sample. The attenuation effect is significantly smaller in jurisdictions that have implemented restrictive cryptocurrency regulation, as measured by a constructed regulatory stringency index, while jurisdictions adopting a permissive or unclear posture exhibit larger monetary policy leakages. The findings contribute to ongoing debates on the macroeconomic consequences of private digital money in emerging markets and inform the design of regulatory and central bank digital currency (CBDC) strategies in the Global South.

Keywords: Cryptocurrency; monetary policy transmission; panel VAR; developing economies; regulatory stringency; central bank digital currency

Introduction

The diffusion of cryptocurrencies and crypto-asset markets has been among the most striking financial developments of the past decade, and nowhere has this diffusion been more rapid than in emerging and developing economies. The Chainalysis Global Crypto Adoption Index has consistently ranked countries such as India, Vietnam, Nigeria, the Philippines, and Pakistan among the top adopters of cryptocurrency in the world, measured by indicators that include peer-to-peer trading volumes, decentralised finance (DeFi) usage, and retail centralised exchange activity. The economic motives underlying this adoption are heterogeneous: some users see crypto as a vehicle for cross-border remittances at lower cost than traditional channels, others as a hedge against inflation and currency depreciation, and still others as a speculative asset class promising exceptional returns. Whatever the underlying motive, the macroeconomic implications of large-scale cryptocurrency adoption deserve careful empirical scrutiny.

For central banks, the rise of cryptocurrencies raises three distinct concerns. The first concerns monetary sovereignty and the integrity of policy transmission channels. If a sizeable share of transactions, savings, or unit-of-account functions shifts from domestic currency to cryptoassets, the leverage that conventional monetary policy instruments can exert over economic activity and inflation may weaken (Adachi et al., 2022; Auer et al., 2023). The second concern relates to financial stability:

stablecoin runs, leverage cascades on crypto-collateralised lending platforms, and exchange failures can produce contagion effects that cross into the regulated financial system. The third concerns capital flow management: cryptoassets, by virtue of their decentralised settlement and pseudonymous ownership, can constitute a non-trivial vector for evading capital controls and conventional foreign exchange management.

Regulatory responses across the developing world have varied dramatically. India initially banned bank involvement with cryptoasset transactions in 2018, only to see the ban overturned by the Supreme Court in 2020, after which the government adopted a punitive taxation approach. Indonesia treats cryptoassets as commodities under the supervision of Bappebti and prohibits their use as means of payment. Pakistan and Bangladesh have officially prohibited cryptoasset transactions but enforcement has been uneven. Nigeria initially restricted bank dealings with crypto firms in 2021 and then pivoted toward establishing a regulatory framework after launching the eNaira CBDC. El Salvador adopted Bitcoin as legal tender in 2021. Turkey and Argentina, both experiencing severe currency crises, have witnessed surges in crypto adoption while pursuing different regulatory paths. This heterogeneity provides analytical traction for the present study, which seeks to identify the marginal effect of cryptocurrency adoption on monetary policy transmission while accounting for regulatory differences.

Three research questions guide the empirical analysis. RQ1: Does cryptocurrency adoption, proxied by aggregate trading volumes, attenuate the transmission of monetary policy to inflation and exchange rates in developing economies? RQ2: How does the regulatory stance of national authorities moderate the magnitude of this attenuation? RQ3: What are the variance contributions of cryptocurrency shocks to fluctuations in exchange rates, inflation, and monetary aggregates? The study contributes to the literature in four ways. First, it provides one of the first panel VAR analyses of cryptocurrency and monetary transmission focused on the developing world, where adoption rates are highest. Second, it constructs and validates a regulatory stringency index drawing on national legal and supervisory documents. Third, it offers interaction-term tests of regulatory moderation. Fourth, it discusses the implications for the design of CBDCs and for participation in international standard-setting bodies such as the Financial Action Task Force (FATF), the Bank for International Settlements (BIS) Innovation Hub, and the IMF Crypto Asset Macroeconomic Research Programme.

The remainder of the article is organised as follows. Section 2 reviews the theoretical and empirical literature on monetary transmission, cryptocurrency economics, and regulatory frameworks. Section 3 presents the data and the panel VAR methodology, including the construction of the regulatory stringency index. Section 4 presents impulse response functions, variance decompositions, and heterogeneity analyses. Section 5 discusses theoretical implications, policy considerations, and limitations. Section 6 concludes.

The pace of cryptocurrency innovation has also outstripped the traditional cycle of academic research, regulatory consultation, and central bank operational response. New product categories emerge faster than supervisory frameworks can be calibrated: decentralised finance protocols offering lending, automated market making, and synthetic asset creation have grown from negligible volumes in 2019 to a peak total value locked exceeding USD 180 billion in late 2021, before declining and partially recovering through 2024. The advent of liquid staking, real-world asset tokenisation, and so-called restaking protocols has further complicated the analytical landscape. The present study, focused on aggregate cryptocurrency trading volumes, abstracts from much of this complexity for the sake of tractability and cross-country comparability, while acknowledging that future research will need to disaggregate by product category to capture the full range of channels through which digital assets influence monetary aggregates.

Literature Review

Monetary transmission and currency substitution

The theoretical literature on monetary policy transmission distinguishes several channels through which changes in the policy rate or central bank balance sheet influence aggregate demand, prices, and financial conditions. The interest rate channel, traceable to the classical IS-LM apparatus and refined in New Keynesian models (Woodford, 2003), operates through the cost of borrowing for firms and households. The exchange rate channel, central in open-economy macroeconomics (Obstfeld and Rogoff, 1995), operates through the relative price of foreign and domestic goods. The credit channel (Bernanke and Gertler, 1995) emphasises the role of financial intermediaries in amplifying monetary impulses. The asset price and expectations channels, increasingly emphasised in the modern transmission literature, operate through wealth effects and forward-looking decision making. The arrival of cryptocurrencies potentially affects each of these channels by altering the substitutability between domestic money and alternative stores of value, by introducing new asset classes with high volatility and global pricing, and by providing routes for capital movement outside the regulated banking system.

A complementary theoretical literature focuses specifically on currency substitution and dollarisation in developing economies (Calvo and Vegh, 1992; Reinhart et al., 2014). The classical analyses of dollarisation, motivated by Latin American experiences of the 1970s and 1980s, established that high inflation and exchange-rate instability create incentives for residents to hold foreign currency as a unit of account, medium of exchange, or store of value, thereby reducing the seigniorage available to the central bank and weakening monetary autonomy. Cryptocurrencies can be analysed within this framework as a new form of substitution that, unlike traditional dollarisation, occurs through digital networks and is harder to observe directly. The implications for monetary autonomy are analogous and potentially more acute given the technological convenience and global accessibility of crypto rails.

Cryptocurrency economics in emerging markets

The economics of cryptocurrencies has been the subject of an expanding research programme. Bitcoin, the original and largest cryptocurrency by market capitalisation, employs a proof-of-work consensus mechanism that imposes high energy costs and limits transaction throughput. Ethereum, which transitioned to proof-of-stake in 2022, supports a broader smart-contract ecosystem and is the dominant settlement layer for stablecoins and decentralised finance. Stablecoins — both fiat-collateralised (such as USDT and USDC) and algorithmic — have grown to constitute a substantial share of crypto transaction volumes and are particularly important in developing economies, where they often substitute for US dollar holdings (Catalini and Gans, 2020; Aramonte et al., 2022). The volatility of unbacked cryptoassets, combined with stablecoin design vulnerabilities revealed in the collapse of TerraUSD in May 2022 and the depegging episodes of late 2023, has informed both academic and regulatory debate about appropriate frameworks (Hilary and Liu, 2024).

Empirical evidence on the macroeconomic effects of cryptocurrency adoption is still nascent. Cong et al. (2023) provide a comprehensive framework linking on-chain data to macroeconomic and policy variables. Adachi et al. (2022) survey the implications of crypto adoption for central bank balance sheets. Auer and Boehme (2023) analyse cross-country variation in crypto policy stance. For developing economies, Mhlanga (2023) documents the relationship between crypto adoption and exchange rate volatility in sub-Saharan Africa, while Khalil and Hussain (2023) examine the Pakistani experience and find that informal crypto activity may complicate central bank operations. None of these prior studies, however, has produced a panel VAR analysis focused on developing-economy monetary transmission with the level of cross-country variation incorporated in the present design.

Regulatory frameworks for cryptoassets

Regulatory frameworks for cryptoassets have evolved rapidly over the past five years. The Financial Action Task Force (FATF) updated its standards in 2019 and 2021 to extend anti-money-laundering and counter-financing-of-terrorism rules to virtual asset service providers, including the controversial Travel Rule requirement. The European Union finalised the Markets in Crypto-Assets (MiCA) regulation in 2023, which represents the most comprehensive single jurisdiction framework to date. The Bank for International Settlements (BIS, 2022) issued prudential standards for bank exposures to cryptoassets. The IMF and FSB jointly produced a synthesis paper (IMF-FSB, 2023) advocating a coordinated approach. Within developing economies, regulatory diversity remains high: some economies prohibit cryptoasset use, others recognise it as a commodity, still others develop tailored licensing regimes. The present study contributes to the literature by constructing a Regulatory Stringency Index that operationalises this diversity and tests its moderating role in monetary transmission.

CBDC design and the global digital money debate

A complementary literature on central bank digital currencies (CBDCs) provides important context. Adachi et al. (2022), Auer et al. (2023), and the BIS Innovation Hub's series of project reports have explored how CBDCs might be designed to preserve monetary sovereignty in the face of private digital money. The eNaira in Nigeria, launched in 2021, was an early CBDC deployment in the Global South; the e-rupee pilot in India, the e-Yuan in China, the Sand Dollar in the Bahamas, and various wholesale CBDC initiatives in Hong Kong, Singapore, Thailand, and the United Arab Emirates illustrate the diversity of design choices. Existing scholarship has largely focused on technical and operational questions, with empirical evidence on macroeconomic effects still limited. The present study contributes indirectly by quantifying the underlying transmission attenuation that CBDC design choices must contend with.

Research gap

Three research gaps animate the present inquiry. First, while cross-country evidence on monetary transmission in developing economies is well developed, the specific role of cryptocurrencies as a new factor remains under-researched. Second, the literature has emphasised stablecoin contagion and CBDC design but has provided fewer panel-econometric estimates of the macro effects of crypto adoption itself. Third, no prior empirical study, to the authors' knowledge, has formally tested the moderating role of regulatory stringency through interaction terms in a panel VAR. The present study addresses these gaps using a 12-country panel from 2017 to 2024, a panel VAR estimation strategy, and a purpose-built regulatory stringency index.

Methodology

Research design

The research design is a quantitative panel time-series analysis grounded in vector autoregression methodology. Panel VAR estimation, developed by Holtz-Eakin, Newey, and Rosen (1988) and extended in numerous subsequent contributions, permits the joint modelling of multiple endogenous variables across cross-sectional units while allowing for unit-specific fixed effects and time-varying common shocks. The choice of panel VAR over country-by-country VAR reflects the relatively short time dimension available for cryptocurrency data and the desire to exploit cross-sectional variation while controlling for time-invariant national heterogeneity.

Country sample, data sources, and frequency

The country sample comprises twelve developing and emerging-market economies selected for their high cryptocurrency adoption rates and the availability of monthly monetary and macroeconomic series: India, Indonesia, Pakistan, Bangladesh, Vietnam, the Philippines, Nigeria, Kenya, Egypt, Turkey, Brazil, and Argentina. The sample period runs from January 2017 (the earliest point at which reliable

cryptocurrency volume data are available for most countries) through December 2024. The dataset is monthly and balanced, with missing observations imputed using state-space interpolation where necessary. Cryptocurrency trading volumes were obtained from the Chainalysis aggregated reports and cross-checked against publicly available CoinGecko and Kaiko data. Macroeconomic variables (policy rate, money supply M2, exchange rate against the US dollar, headline CPI inflation, industrial production index) were sourced from national central bank databases, the IMF International Financial Statistics, and the World Bank.

Regulatory Stringency Index construction

The Regulatory Stringency Index (RSI) was constructed by coding national regulatory documents along eight dimensions: (1) prohibition or permission of cryptoasset trading by retail users; (2) anti-money-laundering registration requirements for service providers; (3) tax treatment severity; (4) restrictions on bank involvement; (5) treatment of stablecoins; (6) advertising and marketing restrictions; (7) cross-border transfer rules; and (8) enforcement intensity (measured by reported enforcement actions per year). Each dimension was scored from 0 (permissive) to 3 (highly restrictive), yielding a composite index ranging from 0 to 24. The coding was performed by two independent researchers with disagreements resolved by a third reviewer; inter-coder reliability for the final coding was substantial (Cohen's kappa = 0.81). The RSI was constructed annually for each country and interpolated to monthly frequency where necessary.

Stationarity and identification diagnostics

Construction of the Regulatory Stringency Index proceeded through three steps. First, primary source documents were collected for each country and year, including central bank circulars, capital markets authority guidance, finance ministry policy statements, and enacted legislation. Second, the documents were coded along the eight dimensions described above using a structured rubric pilot-tested on a subset of countries (Brazil, India, Indonesia). Third, coding decisions were validated through cross-checks against secondary commentary in the Chainalysis country reports, the IMF Country Reports series, and the Cambridge Centre for Alternative Finance Global Cryptoasset Benchmarking Study. The resulting index exhibits substantial cross-sectional variation ($CV = 0.41$ across the sample) and modest within-country variation over time, the latter reflecting the relative stickiness of regulatory regimes once established.

Identification of the panel VAR rests on plausibility of the recursive ordering and on stationarity assumptions tested via the Im-Pesaran-Shin (2003) and Levin-Lin-Chu (2002) panel unit root tests. Variables found to be non-stationary in levels were first-differenced; cointegration tests on selected pairs (policy rate and inflation; money supply and CPI) supported long-run relationships within the panel, although the focus on impulse responses to shocks rather than long-run equilibria limits the practical relevance of cointegration concerns for the present analysis. Lag selection settled on three monthly lags, sufficient to absorb autocorrelation while preserving degrees of freedom.

Panel VAR specification and identification

The baseline panel VAR specification included six endogenous variables in the following Cholesky ordering: (1) industrial production index (log); (2) headline CPI inflation; (3) policy rate; (4) money supply M2 (log); (5) exchange rate (log, local currency per USD); (6) cryptocurrency trading volume (log). The Cholesky ordering reflects standard timing assumptions: real variables and prices respond contemporaneously to monetary innovations only with a lag, while crypto trading volume — being highly liquid and globally priced — is allowed to respond contemporaneously to all other shocks. Robustness checks included alternative orderings, sign restrictions, and the use of monthly local projections (Jorda, 2005) as an alternative identification strategy. Lag length selection followed the modified Akaike Information Criterion adapted for panel VAR (Andrews and Lu, 2001). Impulse

response functions were computed with 1,000 Monte Carlo simulations to construct confidence bands. Variance decompositions were calculated at the 12-month horizon.

Results

Descriptive patterns

Descriptive analysis of the panel reveals striking patterns. Cryptocurrency trading volumes, summed across the twelve sample economies, rose from approximately USD 87 billion in 2018 to USD 1.4 trillion in 2023, with peaks coinciding with the bull markets of late 2017, mid-2021, and late 2023. India, Vietnam, and Brazil collectively accounted for roughly 47 per cent of the sample total in 2023. Average annual cryptocurrency volume as a share of M2 in the sample rose from 0.4 per cent in 2018 to 4.1 per cent in 2023, with Argentina (12.7 per cent), Turkey (9.8 per cent), and Nigeria (7.3 per cent) showing the highest ratios. The Regulatory Stringency Index varied substantially across countries: Pakistan and Bangladesh scored at the restrictive end (RSI = 18 and 17 respectively in 2023), while Brazil (RSI = 6) and the Philippines (RSI = 7) scored at the permissive end.

Impulse responses and variance decomposition

Baseline impulse response functions indicate that a one-standard-deviation contractionary policy rate shock reduces headline inflation by approximately 0.32 percentage points cumulatively over twelve months in the pre-2020 sample. In the post-2020 sample, the same shock reduces inflation by approximately 0.26 percentage points, a difference of roughly 18.6 per cent that is statistically significant at the 5 per cent level. Decomposing this attenuation, the introduction of cryptocurrency trading volume as an endogenous variable accounts for a substantial share of the reduction. When the panel VAR is re-estimated with cryptocurrency volume held at its 2018 mean (a counterfactual exercise), the implied transmission attenuation falls to roughly 7 per cent, suggesting that cryptocurrency adoption is responsible for the majority of the observed transmission weakening.

Variance decompositions at the 12-month horizon attribute approximately 11.4 per cent of exchange-rate fluctuation to cryptocurrency innovations in the post-2020 sample, compared with negligible contributions in the pre-2020 sample. The contribution of crypto shocks to inflation variance is smaller, at approximately 4.2 per cent, but rises to 7.8 per cent when the sample is restricted to countries with the highest crypto adoption ratios. The contribution to money supply variance is similar in magnitude (3.6 per cent), indicating that crypto adoption is associated with a measurable expansion in the macroeconomic information set relevant for monetary management.

Regulatory regime heterogeneity

Interaction terms between cryptocurrency volume innovations and the Regulatory Stringency Index reveal substantial moderation. In jurisdictions with low RSI (below the sample median), the attenuation of policy rate transmission is approximately 22.4 per cent, with a 95 per cent confidence band of 13.1 to 31.6 per cent. In jurisdictions with high RSI (above the median), the attenuation is reduced to 9.7 per cent (95 per cent confidence band 3.4 to 16.1 per cent). The contrast is statistically significant at the 5 per cent level. This pattern is consistent with the hypothesis that regulatory stringency, by constraining the channels through which cryptoassets substitute for domestic monetary services, preserves monetary policy effectiveness. The moderating effect is strongest in countries that combine restrictive rules with credible enforcement, as captured by the enforcement intensity sub-component of the RSI.

Adoption-depth and temporal heterogeneity

Heterogeneity by adoption depth provides further insight. Dividing the sample into above-median and below-median adoption (measured by the cryptocurrency volume to M2 ratio) reveals that the transmission attenuation is concentrated in the high-adoption subsample. The estimated cumulative

inflation response to a contractionary policy rate shock is 0.34 percentage points in the low-adoption subsample (close to the pre-2020 panel-wide average) and 0.22 percentage points in the high-adoption subsample (a 35 per cent attenuation). The difference is statistically significant at the 1 per cent level. The pattern suggests that the macroeconomic consequences of crypto adoption become nonlinearly important once a threshold is crossed, possibly reflecting network effects in the substitution between domestic money and cryptoassets.

Examining the post-2020 sub-sample alone, the attenuation effects appear to have stabilised between 2022 and 2024 at levels roughly equal to the post-2020 average. This stabilisation contrasts with continued growth in aggregate trading volumes, possibly suggesting that the substitution dynamics have reached an early plateau as regulatory clarification, exchange consolidation, and the maturation of CBDC pilots have begun to reshape the competitive landscape between private and public digital money.

Robustness checks

Robustness checks corroborated the main findings. Alternative Cholesky orderings, including those that placed cryptocurrency volume above the policy rate in the recursive structure, produced impulse responses of similar shape and magnitude. Sign restrictions, imposed in line with standard macroeconomic theory (contractionary monetary shocks reduce inflation and depreciate output), produced comparable attenuation estimates. Local projections estimated outside the VAR framework produced cumulative effect estimates of monetary shocks within 7 per cent of the baseline VAR results. Sub-period splits yielded smaller attenuation in 2017-2019 (consistent with then-incipient crypto adoption) and larger attenuation in 2021-2024. Re-estimation excluding Argentina and Turkey — both crisis-affected economies where conventional monetary transmission is plausibly weakened for other reasons — produced estimates within one standard error of the full-sample results.

Discussion

The empirical evidence presented above supports a measured but consequential interpretation: cryptocurrency adoption is associated with a statistically and economically meaningful weakening of monetary policy transmission in developing economies, with the magnitude conditional on the regulatory environment. The attenuation is largest in countries with both high adoption and permissive regulation, and smallest where adoption is high but regulation is restrictive and credibly enforced. The variance decomposition results, indicating that crypto shocks account for an appreciable share of exchange-rate variance, are particularly noteworthy: in many of the sample economies, exchange-rate stability is a primary objective of monetary policy, and the introduction of a new source of variation in the exchange rate complicates this objective.

Theoretically, the findings extend the currency-substitution literature into the digital domain. Whereas Calvo and Vegh's classical analyses concerned dollarisation through cash and bank deposits, the present results indicate that an analogous substitution is occurring through cryptocurrency rails, and that the same channels — reduced seigniorage, weaker money demand, more elastic capital flows — are operative. The findings are also consistent with the substitution view advanced in the BIS Innovation Hub project portfolio, while highlighting the heterogeneity of regulatory responses across developing economies. The moderating role of regulatory stringency aligns with the broader institutional economics literature on policy effectiveness (Acemoglu and Robinson, 2012; La Porta et al., 2008), in which the credibility and enforcement capacity of formal rules shape the realised macroeconomic outcomes of any policy intervention.

The policy implications are several. First, central banks in developing economies should incorporate cryptocurrency-related variables into their monetary policy frameworks and forecasting models, recognising that the conventional information set is increasingly incomplete without them.

Second, the design of CBDCs, which is well advanced in several sample countries (India e-rupee, Nigeria eNaira, Indonesia Project Rupiah Digital), should account for the substitution dynamics observed in this study. CBDCs may serve not only as efficient payment infrastructure but also as a means of partially recapturing the unit-of-account and store-of-value functions ceded to private crypto-assets. Third, international coordination on cryptocurrency regulation — particularly through FATF, BIS, IMF, and FSB channels — should account for the differential effectiveness of restrictive frameworks observed in the data: it is not regulation per se but the combination of clear rules and credible enforcement that produces the moderating effect identified here. Fourth, the relationship between crypto adoption and capital flow management warrants further policy and research attention, as cryptoassets may complicate the implementation of capital account measures in jurisdictions that rely on them as part of their financial stability toolkit.

Several limitations must be acknowledged. Cryptocurrency trading volumes are measured imperfectly, particularly for peer-to-peer and decentralised exchange activity that does not pass through centralised intermediaries; the measurement error likely biases coefficient estimates toward zero, suggesting the true attenuation effects may be larger than reported. The Regulatory Stringency Index, while constructed with care, condenses complex legal and supervisory realities into a numerical scale and may obscure dimensions important for specific channels of transmission. The panel VAR identification assumes that contemporaneous causal relationships follow the Cholesky ordering, an assumption that is conventional but not innocuous; robustness checks with alternative orderings are reassuring but not definitive. Finally, the analysis focuses on aggregate macroeconomic outcomes and does not address microeconomic effects of crypto adoption (such as household welfare, firm behaviour, or labour market dynamics) which are of equal substantive importance.

An additional dimension of the discussion concerns the implications for monetary policy independence in small open economies. Even in the absence of cryptocurrency adoption, small open emerging economies face a familiar trilemma between exchange rate stability, monetary autonomy, and capital mobility. Crypto adoption sharpens this trilemma by adding a new dimension of capital mobility that is harder to control through conventional capital account measures. The countries in the sample that maintain the most binding capital flow management arrangements — Pakistan, Nigeria, Argentina — also exhibit some of the highest crypto-to-M2 ratios, suggesting that residents partially circumvent capital controls through cryptoasset channels. The implication is not necessarily that capital controls have lost their effectiveness, but that they need to be complemented by cryptoasset-specific regulation to remain operational.

Finally, the literature on the international dimension of monetary policy spillovers offers a relevant lens. Miranda-Agrippino and Rey (2020) and Rey (2015) document a global financial cycle through which monetary policy in advanced economies, particularly the United States, transmits to emerging markets via cross-border capital flows. Cryptoassets, by virtue of their global pricing and 24/7 trading, may amplify this spillover channel. Preliminary evidence from the present sample shows that crypto trading volumes in the twelve countries are highly correlated with the US dollar broad index (mean correlation 0.43) and with the VIX (mean correlation 0.31), suggesting that crypto markets act as additional conduits for global financial conditions to influence domestic monetary aggregates.

A growing body of work has begun to differentiate among types of cryptoassets when assessing macroeconomic effects. Unbacked cryptocurrencies, such as Bitcoin and Ether, exhibit high volatility and weak inflation-hedging properties despite frequent narrative claims to the contrary (Liu and Tsyvinski, 2021; Borri, 2019). Stablecoins, particularly those collateralised by short-term US Treasury bills, behave more like money market funds and may interact with global dollar funding markets in ways that affect emerging-market exchange rates. Central bank digital currencies (CBDCs), still largely in

pilot phases, occupy a different conceptual category as liabilities of the central bank that could either complement or displace private cryptocurrencies depending on design choices. The present study aggregates trading volumes across these categories in its principal specification but considers stablecoin-specific patterns in supplementary analyses.

The Indian regulatory experience deserves particular attention given the country's prominence in global crypto adoption rankings and the size of its formal financial sector. The Reserve Bank of India's 2018 banking ban, the Supreme Court's 2020 reversal, the subsequent 30 per cent tax on virtual digital asset gains plus 1 per cent TDS introduced in the 2022-23 Union Budget, and the formal regulatory framework progressively under development have together produced a complex landscape. Empirically, the post-2022 period in India is associated with a measurable shift in trading volumes from domestic exchanges to overseas and decentralised platforms, complicating the measurement of adoption and the design of regulatory interventions. The Indonesian, Pakistani, and Brazilian experiences provide instructive contrasts that the present panel exploits for identification.

From the perspective of central bank governance, the findings have implications for the design of monetary policy communication. As cryptocurrency adoption introduces new sources of volatility into key macroeconomic variables, central banks may need to expand their communication strategies to address public understanding of cryptoasset risks and their potential consequences for the value of domestic currency. The Reserve Bank of India's repeated public communications about cryptoasset risks, the Banco Central do Brasil's articulation of its supervisory approach, and Bank Indonesia's publications on QRIS and Project Rupiah Digital illustrate the kinds of communication strategies emerging in response. Future empirical research could examine whether such communications themselves influence adoption patterns or expectations formation.

Conclusion

This study has examined the relationship between cryptocurrency adoption and monetary policy transmission in twelve developing economies over 2017 to 2024 using panel VAR methodology and a purpose-built Regulatory Stringency Index. The results indicate that cryptocurrency adoption is associated with statistically significant attenuation of policy rate transmission to inflation, with magnitudes around 18.6 per cent at twelve-month horizons in the post-2020 sample, and that the attenuation is significantly moderated by the regulatory environment, being roughly 22.4 per cent in permissive jurisdictions and 9.7 per cent in restrictive jurisdictions. Variance decomposition exercises attribute an appreciable share of exchange-rate variation to crypto innovations. The findings inform contemporary debates on the design of cryptocurrency regulation, the development of CBDCs, and the integration of digital asset variables into central bank monetary policy frameworks. Future research could extend the panel to include longer time series as data accumulate, incorporate stablecoin-specific dynamics, and exploit policy discontinuities (such as the Indian Supreme Court ruling of 2020) for sharper causal identification.

A further line of analysis concerns the interaction between cryptocurrency adoption and remittance flows, an issue of particular salience for several economies in the sample. The Philippines, Pakistan, Bangladesh, and Nigeria are among the world's largest remittance-receiving economies, with remittances exceeding 8 per cent of GDP in the Philippines, 7 per cent in Pakistan, and 5 per cent in Bangladesh and Nigeria. The use of stablecoins and remittance-focused cryptocurrency rails has emerged as a competitor to traditional money transfer operators, offering substantially lower fees and faster settlement. Preliminary evidence within the present sample suggests that the proportion of remittance flows captured by crypto channels rose from less than 1 per cent in 2018 to between 4 and 9 per cent in 2023 in the four economies just mentioned. To the extent that remittance flows are diverted from conventional banking

systems into cryptoasset channels, the data and statistical visibility available to central banks for balance-of-payments management is correspondingly reduced.

The findings also bear on the design of macroprudential frameworks for the financial sector. Banks in several sample economies have begun to develop indirect exposures to cryptoasset markets through custody services, prime brokerage for crypto-active investment funds, and the provision of stablecoin reserve management services. The Basel Committee on Banking Supervision (2022) introduced new prudential standards for cryptoasset exposures that distinguish between Group 1 (tokenised traditional assets, treated similarly to underlying assets) and Group 2 (unbacked cryptoassets and algorithmic stablecoins, subject to a 1,250 per cent risk weight subject to a 1 per cent exposure cap). The implementation of these standards within the sample economies has been uneven, with some jurisdictions adopting the standards verbatim and others delaying or adapting them. The present study does not directly model banking sector exposures, but the broader macroeconomic effects identified are consistent with the prudential concerns motivating the Basel standards.

From a research agenda perspective, several extensions of the present analysis appear especially promising. First, future work could exploit the structural breaks introduced by major regulatory events — the Indian Supreme Court ruling of March 2020, the Chinese mining ban of mid-2021, the FATF Travel Rule updates of 2021 and 2023, the MiCA finalisation in 2023 — to construct sharper causal identification strategies. Second, granular use of on-chain data (made increasingly available through providers such as Chainalysis, Nansen, and Glassnode) could permit decomposition of trading volumes into payments, speculation, and store-of-value functions, with potentially different macroeconomic implications. Third, the analysis could be extended to incorporate stablecoin-specific dynamics, given the rapid growth of dollar-pegged stablecoin holdings outside the United States. Fourth, integration with central bank survey data on household and firm cryptoasset holdings, where available, would permit micro-macro consistency checks.

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