Alternative digital finance and its uses and abuses: an empirical study of challenges to traditional banking

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Abstract

What are the implications of the growing use of cryptocurrencies, and the finance they ease access to, for globalised firms, institutions and regulation? We show why and how cryptocurrencies are an increasingly attractive alternative to finance from traditional banks and financial institutions, both for credit and payments. We use quantitative analysis to evidence the link between growing cryptocurrency transactions and declining use of traditional sources of finance from the regulated banking system. This shift is underpinned by the tensions between financial regulation, geopolitics, and alternative finance. Our paper augments three areas of scholarship relating to the political economy of cryptofinance. One, the emancipatory potential of cryptocurrencies which allows us to make the argument that traditional banking has limitations for many businesses and that these can be at least partially overcome through cryptofinance. Two, debates about banking regulation demonstrate how the rules and requirements of global institutions make alternatives like crypto attractive. And three, the challenges that accompany United States dollar hegemony, and the growing weaponisation of the global reserve currency, draw attention to the challenges and benefits of cryptofinance.

Keywords: cryptocurrency, cryptofinance, financial constraints, financial access, banking regulations, dollar hegemony

Introduction

The idea that cryptocurrency is good for businesses because it can ease financial transactions in the real economy is underexplored and not thoroughly captured in regulatory debates. For instance, the Bank for International Settlements, possibly reflecting the scepticism of many central bankers and financial regulators, takes a negative view (BIS 2024, 19), claiming: 'Crypto remains largely self-referential and does not finance real economic activity'. In contrast, the World Economic Forum – while not explicitly endorsing cryptocurrencies – is exuberant about the advantages for small businesses from blockchain technology (WEF 2022).

The capacity of digital assets and blockchain technology to challenge traditional sources of finance, available through the regulated

banking system has gained salience in recent years, given inflationary pressures and financial tightening in the wake of the COVID-19 pandemic and geopolitical events. Cryptofinance which includes trading, investing, lending, and borrowing using Bitcoin, Ethereum, and others, can overcome many of the limitations of traditional banking. Traditional banks operate in a world of information asymmetry between themselves and their borrowers/ clients, but because of digital technology banks can no longer rely solely on the advantages of knowing more than their competitors, about their clients (Broby 2021). And as Brandl et al (2024) explain, payments, traditionally the least profitable business area in the financial sector, compared to investments and asset management, have become lucrative as they have entailed the replacement of public infrastructure by private infrastructure.

Tight monetary policies and 'the cashless revolution' – with its proclivity for monitoring and surveillance – underpin a growing appetite for cryptocurrencies and its capacity for anonymity. The diverse and vibrant literature on cryptocurrencies and banking transformations notes that aside from widening access to finance, the expanding use of cryptocurrencies offers fresh avenues for individuals and firms to reduce risks and earn profits through speculative transactions but also through concealment. For policymakers these are rapidly evolving challenges and there are vibrant discussions on how cryptocurrencies should be monitored and regulated (Ba & Sen, 2024, BCBS, 2019). The rapid, mostly unregulated, growth of digital currencies in certain nations has driven national authorities and international organisations to advise caution or restraint in their use, (United Nations, 2022, SEC, 2022).

Central banks and regulatory authorities, seen through the lens of the Bank for International Settlements, have been vociferously sceptical about cryptocurrencies because of the above reasons but particularly because of concerns around financial stability (BIS, 2024c). This has fuelled the political discourse on issues such as monetary sovereignty, decentralisation, financial inclusion, inequality, and privacy.

Missing from the discussion is a focus on businesses; particularly the question of how transformations in the banking system make cryptofinance more appealing for firms, when concealment or speculation is not the primary objective. Our empirical study, using World Bank Enterprise Surveys and other quantitative data highlights the emancipatory potential of cryptocurrencies and allows us to make the argument that traditional banking has limitations for many businesses which can be at least partially overcome through cryptofinance. Our study augments the scholarship on cryptocurrency by highlighting the constrained nature of the traditional banking system, and suggesting through quantitative evidence that greater acceptability of cryptocurrency relaxes these constraints for business managers.

The remainder of this paper comprises of four sections. Section 2 discusses how crypto has created benefits and challenges for financial actors, markets, and regulators, in the contemporary globalised financial system. Section 3 explains how the notion of a financial constraint is operationalised to understand the relationship between crypto and the various limitations on firms in the financial system. Section 4 presents the results of our multivariate analysis. A final section considers the wider implications of these findings.

When crypto beats banks

Cryptocurrency is a financial innovation intended to replace fiat money and challenge the global financial system that fiat money underpins. The creation of Bitcoin, the preliminary cryptocurrency, was a political act to undermine fiat money issued by governments; today, this is primarily electronic, created by banks through lending activities, which are influenced and regulated by national central banks (Nakamoto 2008). Cryptocurrency challenges the power of national governments, private banks and central banks, which create money and shape national monetary systems (Ba & Sen, 2024, BIS, 2024).

For the founders of cryptocurrency, traditional banking is constrained by its reliance on a trusted third party or a financial institution as intermediary (Nakamoto, 2008). Alternatives to this

system are debated in a wide grey literature (Gurguc & Knottenbelt 2018). To give a brief overview: in the traditional financial system, that is globalised, banks keep secure private ledgers of customer accounts and handle transfers through an automated clearing system managed by the central bank, for instance the Bank of England or the State Bank of Pakistan. International transfers are facilitated by debits and credits to correspondent accounts via messages on the SWIFT or Society for Worldwide Interbank Financial Telecommunication network. Cryptocurrency replaces these systems with an encrypted database on a decentralised network of voluntary nodes. This ledger, made up of blockchains, records encrypted buy/sell transactions. Cryptocurrency also replaces the role of governments and banks in money creation with an algorithmic and decentralised 'mining' process. Each cryptocurrency's algorithm determines its money supply differently, but all prevent governmental interference.

Mainstreamed, a new and alternative system based on cryptocurrency would diminish the power of governments and banks in the globalised economy. It would also generate more evenness in monetary power; this latter point has been the subject of debates around politics of US Dollar dominance. Chey (2023) draws attention to the tension between the state's preferences for cryptocurrency regulation and strong political support from private market actors aware of new opportunities. An example of this might be the 'secrecy seeking capital' drawn to Estonia's large cryptocurrency sector to counteract effective oversight firms engaged in illicit practices (Ylönen *et al.*, 2024). Links between cryptocurrency and – respectively –the informal economy, tax evasion, and capital controls, are demonstrated in a range of econometric studies (Goel & Mazhar 2024a,b; Berdiev *et al.* 2024).[3]

Cryptocurrency holdings complicate regulatory oversight because shadow economic activities are secretive, and cryptocurrencies operate globally, often outside the jurisdiction of individual countries. This issue is prominent in nations with weak institutional frameworks where cryptofinance can circumvent rules on foreign exchange transactions, including remittances: a reminder that financial systems

are restrictive but, often restrictions can be overcome using cryptocurrency (von Luckner *et al.* 2023).

Thus, the BIS (2024) has reason to claim that crypto is not fit for a 'significant role' in the monetary system. But what is it then that makes crypto appealing, particularly as Bernstein & Catalini (2022) show, for small and medium sized businesses? Set in the United States, their study observes that an expensive, outdated, and slow payment system is a substantial impediment for small firms that operate on razor-thin cash buffers and are increasingly doing business online.

This is reminiscent of claims made by Leyshon & Thrift (1995), writing three decades ago about the phenomenon of financial infrastructure withdrawal which emerged because of rapid liberalisation and technological shifts, resulting in the closure of swathes of bank branches. This was particularly acute in non-urban and less affluent areas. As financial practices and regulations changed drastically over the 1980s and 1990s individuals and households in many communities found that access to banking services became increasingly complicated and even non-existent. These individuals and businesses thus found themselves abandoned by the formal 'market-regulated' financial system.

More recent scholarship also connects financial exclusion to changing banking practices, particularly in the global South. For instance, Jafri (2019b,a) highlights how various regulatory constraints – akin to shadow banking -- limit financial access.[4] The drivers of shadow banking overlap with those of crypto. Three of these are especially prominent for complicating the use of the banking system for individuals and small business: (1) Basel related capital adequacy requirements, (2) Financial Action Task Force recommendations for anti-money laundering and combating of financing of terror, and (3) capital controls that limit cross border transactions.

Most national financial systems across the world are shaped by the recommendations of the Basel Committee for Banking Supervision. Banks comply with these recommendations to varying extents, as

shown through various country case studies (Jones, 2020). BCBS recommendations set capital requirements for banks.[5] Various iterations of these rules are reflected in the successive issuance of Basel I, Basel II, and most recently, Basel III recommendations. Gurrea-Martínez & Remolina (2019) note that two powerful arguments justify capital adequacy rules: (1) better capitalised banks enhance financial stability by reducing incentives to take risks and by augmenting buffers against losses, and (2) gaps in compliance and divergence from BCBS rules undermines confidence in a country's financial system. This 'one size fits all' approach is critiqued for making loans more expensive, for driving borrowers to use unregulated lenders, and for discouraging innovation and risk-taking from banks, especially in poor countries.[6]

In the global South, capital requirements restrain banks from credit issuance. Banks without enough capital must raise more by issuing new shares or retaining more earnings, and/or reduce lending to risky borrowers to lessen overall exposure and reduce the capital requirement. In many poor countries, borrowers are – by definition -- riskier than borrowers in wealthy jurisdictions. (Gurrea-Martínez & Remolina, 2019)

Other than capital adequacy rules, BCBS guidelines also shape how banks, and other financial institutions, mitigate money laundering and terror finance risks. These guidelines align with those from the Financial Action Task Force or FATF, a G-7 led intergovernmental body that gained prominence when the War on Terror began after 11 September 2001. Before then, the FATF had been mainly concerned with 'dirty money'; countering money laundering associated with narcotics sales (Sharman, 2011). Because of the 2001 USA PATRIOT Act, banks and financial institutions were pushed to the frontline of security practice, anchoring what De Goede (2017, 117) labels 'a finance–security assemblage'.[7] The Bush administration placed financial surveillance at the core of the fight against terrorism financing, compelling banks to adopt 'a risk-based approach' and simultaneously manage Basel II and FATF guidelines for AML or anti- money

laundering, and CFT or combating of financing of terrorists (Vlcek 2015; Favarel-Garrigues *et al.* 2011). This entailed day-to-day decisions on whether certain customers should be included in or excluded from banking operations, particularly through the requirements of KYC or know your customer (de Koker, 2014).

The finance-security assemblage also imposes restrictions on individuals and business by limiting cross border flows of money. In their frontline position, banks are one part of a chain of security which includes SWIFT, the Belgian-based Society for Worldwide Interbank Financial Telecommunication (De Goede, 2018). This entity provides a standardised communication platform for financial institutions to send and receive information about transactions in a secure, reliable, and efficient manner. An emerging literature notes how SWIFT can be, and is, used to further geopolitical objectives (De Goede & Westermeier, 2022, De Goede, 2020), and possibly creating the case for a Chinese-Russian alternative to SWIFT (Nölke, 2022).

Restrictions imposed through SWIFT are externally decided and geopolitically motivated, but for those seeking financial access, they can have the same effect as nationally imposed capital controls. Many countries, particularly in the global South are no longer reluctant to impose capital controls to limit external liabilities. Financial pressures driven by the COVID-19 pandemic which increased the public debt of many countries, combined with fuel and food price shocks have pushed interest rates up and increased the potential for debt defaults. The IMF, which had previously been committed to capital account liberalisation, now acknowledges that outflows of capital, particularly when they are large, can have devastating macroeconomic consequences (Korinek *et al.*, 2022). Grabel & Gallagher (2015) draw attention to how the views of organisations such as the IMF evolved rapidly after the GFC 2007-9. This had perceptible consequences for the management of international private capital flows.[8]

These features of a globalised financial system create the need for what von Luckner *et al.* (2023) label "crypto vehicle transactions" in which cryptocurrency is used to move capital across borders or

facilitate domestic transactions. Policymakers recognise the prowess of blockchain technology and acknowledge that it can make transactions easier and cheaper but evade monitoring. CBDCs or central bank digital currencies, are a possible solution but can potentially disrupt financial and monetary systems (Adrian & Mancini-Griffoli, 2021, Chia & Helleiner, 2024). But the examples used above – of BCBS rules, FATF, and capital controls – imply that CBDCs would be of limited use in circumventing restrictions, given that they would be centrally administered and could enhance surveillance. Individuals and firms who use crypto for financial transactions might do so anonymity, but there are other advantages too; we consider these in the next section.

Financial constraints and firms: an empirical analysis

Firms need finance to cover operation costs and investment expenditures. This is captured in the notion of a financial constraint. Financially constrained firms are those that sacrifice profitability because of their inability to gather resources for optimal levels of inputs and technology in their external financing; financially unconstrained firms are those that enjoy favourable external financing conditions. Financial constraints are reflected in cash flow and investment decisions and their impact on firm growth; when firms are constrained in their ability to raise funds externally, investment spending may be sensitive to the availability of internal finance (de Guevara et al. 2021; Fazzari et al. 1987).

Studies on credit rationing and asymmetric information in markets are also relevant here. In their seminal work, Stiglitz and Weiss (1981) offer an alternative to the neoliberal push for financial globalisation characterised by open markets. In the efficient markets approach, credit rationing does not occur because lenders can clearly differentiate between borrowers who are, and are not, creditworthy at a given cost of funds. The assumption of asymmetric information allows for credit rationing theory to explain how lenders may limit the amount of credit they provide to borrowers due to imperfect information and market conditions (Dymski 2005).

The World Economic Forum (WEF 2022) offers a small case study in the story of Aminu, a hypothetical Nigerian artisan with a small business in Abuja. Because of COVID-19 restrictions Aminu began accepting digital payments for online sales and collectively – with other small Abuja businesses – entered a partnership with a mid-size retailer in Germany which trades with Aminu and other businesses. In exchange for Nigerian goods, Aminu's small business receives digital currencies from the German retailer. These payments are settled in Aminu's local bank account in Nigerian Naira. Using a stablecoin account, transactions are made through a digital wallet. Aminu can keep the stablecoins for investment purposes or settle a percentage of the amount to his Naira bank account.

We explore this type of arrangement with quantitative tools, focusing on how easier payments, particularly cross border, and an enhanced internal finance capacity makes firms less dependent on banks and thus face a relatively small financial constraint. Our empirical approach illustrates how crypto reduces the financial constraint of firms. Due to the nature of the globalised financial system, firms are faced with a number of impediments that make day-to-day transactions and investment decisions costly and complicated. Crypto makes these transactions and decisions easier and cheaper; the mechanisms through which this might occur are highlighted in recent research (e.g Bernstein & Catalini 2022; Adrian & Mancini-Griffoli 2021).

Our data, reflecting a sample of countries with WBESS data for 2023, shows that the prevalence of crypto is growing (Figure 1). There is also more awareness that banks are less efficient and relatively costly to use for businesses (e.g Entrepreneur, 2022). Partially, this is simple; banks have limited opening hours and identification requirements which might constrain online or remote business approaches. Crypto facilitates businesses that might prefer to process transactions outside of regular working hours and/ or from remote or overseas locations. Additionally, since banks charge interest and transaction fees, crypto can be a less costly alternative. Lower fraud risk and risk of chargebacks -- because cryptocurrency transactions are irreversible -- substantially lowers, and

possibly eliminates, some of the costs associated with credit cards (Forbes, 2022). The IMF also draws attention to the pressures of dollarisation, which are driven by weak central bank credibility and by inefficiencies in payment systems and limited access to financial services (IMF 2021). The implication is that in economies where dollarisation pressures are stronger, there are more incentives to use crypto.

We test the proposition that for firms, more crypto usage reduces dependence on the banking sector for credit and financial transactions. Hypotheses one and two are centred on capital. Traditionally this has been sought from banks in the form of credit. Our study considers whether credit constraints --- relating respectively to working capital and fixed assets – for short term and long-term financing needs might be overcome through crypto. In considering these relationships we engage with the notion of internal finance, as distinct from external finance; both are sources of finance for a business, but internal finance tends not to incur costs such as interest rates or banking charges as it is based on either owner's capital, retained profit, or the sale of assets. In contrast, external finance, tends to be provided by financial institutions and entails the issuance of debt or equity, As such, firms that have more access to internal finance have lower costs. The third hypothesis is about the efficiency of payments. Again, the banking system has tended to be pivotal to the processing of transactions, but the shortcomings of this system are becoming more prominent as crypto makes payments quicker and cheaper, even across national borders and financial system.

Our three hypotheses are as follows. One, more crypto usage increases access to internal finance for the firm. Two, more crypto usage lowers the proportion of fixed assets financed though banks. Three, more crypto usage decreases the firm's e-payment transaction costs. These are tested using the datasets and models explained below.

Data and Methodology

In our dataset, information on firm specific indicators is from the World Bank Enterprise Surveys. This dataset has been compiled since 2002 on a rolling basis in different countries to gather time-series cross-sectional data collecting manager's responses on issues like financial access, corruption, infrastructure, crime, market competition, and firm performance. The WBES employs a stratified random sampling technique and categorises firms by geography, industry, and sizes. Given our empirical objective, we use WBES to measure firm level variables using the surveys conducted in the years 2022 and 2023. The influences in external environment are captured by other sources as explained below.

Data

According to our hypotheses, the relevant population for our purposes includes all the private sector enterprises that are engaged in e-commerce, having broadband subscription, innovative in terms of introducing products in the market, and conducting e-payment transactions. As mentioned above, the responses of firms' managers are extracted from WBES surveys. The standardized questionnaire makes the responses comparable across firms and countries.

Our working sample comprises of 11,447 firms located across regions (East Asia and Pacific (EAP), Europe and Central Asia (ECA), Latin America and Caribbean (LAC), Middle East and North Africa (MNA), South Asia (SAR)). The broad coverage represents regional business environments in terms of financial, technological, and business regulation from the firm's perspective, offering global representation. Our sample is diverse in that the enterprises are in 14 countries representing lower-middle, upper-middle, and high-income groups. The diversity of enterprises in our sample does not stem from their location only. If classified based on their employees, our sample contains 5,111 small-size firms (having less than 20 employees), 3,920 medium-size firms (between 20 and 100 employees), and 2,277 large-size firms

(having more than 100 employees). The firms in our sample were surveyed in 2022 and 2023, providing comprehensive information on the relevant aspects that are the focus of our analysis.

We also utilise World Development Indicators to control for the relevant macroeconomic influences such as internet users and fixed broadband subscriptions. These indicators capture the ICT infrastructure which serves as enabling factors determining crypto adoption and prevalence.

We use the Statista Global Consumer Survey for data on the prevalence of cryptocurrency in various countries. This survey collects information from respondents aged between 18 and 65 years, specifically inquiring about their use and ownership of cryptocurrency as a financial product. The survey is based on a globally representative sample, covering 56 countries. The breadth and diversity of this sample provides a reliable measure of cryptocurrency prevalence across different economic and cultural contexts. Data on cryptocurrency use by firms is not available, which is why this dataset is used to help us understand the relationship between firm finance and cryptocurrency usage. As such, a core assumption of our analysis is that where crypto is prevalent in the population, it will be prevalent in firms as well.

In addition, we use Basel AML Index (2024) developed by International Centre for Assets Recovery. The index, based on 18 indicators, measures a country's vulnerability to money laundering and illicit financing (ML). The utilization of the AML Index aims to verify the robustness of our baseline findings regarding firms' financial constraints. By integrating this index, we ensure that our analysis accounts for the broader financial environment, which can significantly impact transaction costs and the financial behaviour of firms.

Methodology and Empirical Specification

We employ regression analysis carefully designing the specification to control for as many of the relevant factors as possible using the enterprise sample. In general form, our model can be represented as:

$$Financial\ Constraints_{itc} =$$
$$f(Prevalence\ of\ digital\ currency_{ct},\ Institutional\ Weakness_{itc},$$
$$Technology\ Use_{ict},\ Firm\ Attributes_{ict}, ML\ Risk_{ct})\quad (1)$$

Above, subscript *i* represents a firm, *t* is for time, and *c* stands for the firm's location which is identified with the country. The next section explains the indicators that feed into each class of the factors in equation (1).

Main Variable of Interest

Our main variable of interest is the proportion of the population using cryptocurrency *(CryptoPrevalence)*. In our sample, its value has increased over the years: from 10.26 in 2019 to 18 in 2023. There are significant differences across countries too. For instance, cases like Hungary and Mexico have a small percentage of the population claiming to have employed cryptocurrency in their transactions. While on the other side, we have countries like Vietnam and Philippines where large numbers of people are using cryptocurrency. Given this diversity, a one standard deviation changes in crypto use in our sample amounts to (approximately) 5 percentage points change in crypto using population.

Outcome Variables

The first outcome variable of the study is the proportion of working capital financed through banks (labelled *Constraint1*), directly related to firms' reliance on the banking channel for the operations of their business. If the firm is facing a higher cost of financing from banks, it is more likely to look for cheap alternatives (Banerjee & Duflo, 2014). In our sample, a typical firm finances less than 12 percent of its working capital requirements from banking sources. However, the variation is high, suggesting that this number may exceed 30 percent in some cases.

As the second outcome variable (*Constraint2*), we consider the percentage of fixed assets financed through the banking channel.

Investment in fixed assets is an indicator of long-term business expectations of firms. Firms are more likely to explore other avenues of long-term financing if they are expecting increasing costs of borrowing from banks (e.g. Chernenko, Erel, Prilmeier, 2022).

Finally, the short-term dimension of the firm's financial constraint is captured by the magnitude of e-transaction costs (*Constraint3*). Given the tech-driven nature of digital payments, we believe that firms can exploit opportunities that save them transaction costs when purchasing or selling electronically (Huberman, Leshno, & Moallemi 2021). We assume that those firms that face lower costs from digital avenues will make more e-payments. In our sample, majority of the firms report up to 20 percent e-payment cost per transaction, while 38 percent of firms bear zero percent e-payment transaction cost. Firms incurring significant e-payment transaction costs are more likely to exploit less costly avenues for electronic payment transactions.

Control Variables

The vector of control variables includes the factors that can affect firms' preference for a particular mode of financing. Our vector of control variables can be divided into three categories: institutional constraints; those capturing market competitiveness; and those capturing other firm-specific attributes (see Brancati, Di Maio, and Rahman 2024).

Businesses aiming to expand their operations often face the risk of being targeted by corrupt government officials. To avoid this, many companies choose to conceal their financial plans from government agencies, even when seeking funding. Instead, they opt for informal financing methods to maintain a low profile. Similarly, if international transactions increase there are chances that customs officials will find it easier to demand a bribe from the firm. Another variable that captures institutional weakness, though from a somewhat different angle, is informal competition. Greater competition can put a firm in a disadvantageous position by raising its input costs or decreasing profit margins.

Technological factors also determine the preference of firms for different modes of financing. For example, greater prevalence and accessibility of digital means of transactions create an incentive for profit-making firms to exploit this opportunity. This is especially so if these transactions are not subject to excise taxes. Our model captures the effect of technology, firstly, through the firm's past record as an innovator of new processes. A firm that has introduced a new process in the last three years is more likely to opt for new processes that help ease transactions. The second indicator is the availability of a broadband connection at the location of a firm (in the last two years). This suggests that the firm is linked with and aware of global happenings and is not an isolated enterprise. Finally, the variable e-commerce or firms' presence as an entity on the worldwide web is an indicator of the firm's link and awareness of the international markets and regulatory standards.

Firm attributes play a crucial role in decision-making processes (Coad, 2018). We have accounted for the influence of firm age, which captures the effects of reputation and the stock of practical knowledge a firm possesses. Additionally, we consider the impact of international linkages on firm preferences and performance. To this end, a binary variable identifies firms earning at least 10 percent of their revenues from international markets. Firms with significant revenue from international markets are arguably more sensitive to their customers' transaction requirements. Furthermore, the ownership structure and firm size can affect the available financing options (Zhang and Lucey, 2022). Larger firms typically have privileged access to bank finance, all else being equal. Firms managed by a diverse board of directors are more likely to adopt modern means of transactions and financing.

Enterprises operating in countries with higher risk of ML are more likely to face financial constraints, primarily due to stringent regulatory framework designed by FATF regime and Basel Committee. These regulations, such as Basel framework, are framed to mitigate risk of financial crimes, but indirectly restricting access to finance, especially for private sector firms, resulting financial constraints (Jafri,

2019b). To account for the implication of ML risk in our analysis, the AML Index is employed as control variable, highlighting the impact of regulatory pressure on firm financial constraints. Arguably, enterprises are more likely to opt for decentralised sources of financing if there is an incentive for them to circumvent monitoring and regulatory oversight.

Findings

Our findings indicate that a higher prevalence of cryptocurrency is linked to a decrease in constraints faced by firms. The key coefficient of interest, α_1 (CryptoPrevalence), is negative and statistically significant at the 1% level across all models. This indicates that higher cryptocurrency adoption is associated with reduced financial constraints for firms. A one standard deviation increase in cryptocurrency adoption is linked to a 0.02% decrease in working capital requirements. Specifically, we observed a correlation between increased cryptocurrency use and a shift away from traditional bank financing and payment methods.

Firms face fewer financial constraints when cryptocurrency use increases, suggesting that crypto provides alternative avenues for financing and payments, reducing reliance on traditional banks. Our analysis is based on three types of financial constraints: Constraint1 captures working capital requirements (short-term financing), Constraint2 reflects long-term financing challenges, and Constraint3 measures the cost of e-transactions.

The analysis indicates that cryptocurrency adoption helps address both short-term financing needs and payment-related costs: Constraint1 and Constraint3 show significant negative coefficients. Results for Constraint2 (long-term financing) are also significant, but the effect of institutional weaknesses is less pronounced. This suggests that firms may switch to alternative forms of financing (e.g., decentralized finance) over time.

Our findings imply that while corruption and informal competition affect short-term and payment-related constraints, firms

eventually adapt by seeking alternative funding sources. Institutional weaknesses, such as corruption and informal competition, have a significant joint effect on financial constraints, except in the case of long-term financing (Constraint2).

Our analysis also suggests that technological innovation and firm characteristics enhance financial access for firms, giving them more flexibility in funding options. Technological advancement and firm-level attributes enhance the ability of firms to navigate financial challenges, reinforcing the effect of cryptocurrency adoption. Technology use and firm attributes (such as firm size, age, and foreign income) show joint significance in all models.

An important result is the coefficient of the ML Index which is positive and significant in all the cases. It suggests that, with greater risk of money laundering comes greater regulations and monitoring which exacerbate the financial constraints faced by formal sector firms. This is consistent with the claim that that cryptocurrency threatens the international political and economic status quo *less* than many speculate because regimes most likely to be at odds with the global financial architecture face a strong incentive to ban the technologies in their own countries to retain monetary control (Ba and Sen, 2024).

As money laundering risks increase, financial regulations tighten, making it harder for firms to access capital through traditional financial systems. This reinforces the appeal of cryptocurrency as an alternative, as it provides a means for firms to bypass restrictive financial regulations.

The following specification derived from the general form in (1) serves as the baseline specification in our analysis:

$$Constraint(k)_{itc} = \alpha_0 + \alpha_1 (CryptoPrevalence)_{ct} +$$
$$\beta(InstitutionalWeaknesses)_{itc} +$$
$$\gamma(TechnolgyUse)_{itc} +$$
$$\lambda(FirmAttributes)_{itc} + \theta(ML)_{ct} + \xi i_s +$$
$$\varepsilon_{itc} \quad (2)$$

where k varies from 1 to 3. It is the number of the constraint that we assigned to differentiate our outcome variables. The subscripts are as explained in (1) above, while Greek letters represent regression coefficients.

The details of these variables and their sources are given in Table 1 and summary statistics are given in Table 2. The list of countries in our sample are given in Table 3. The baseline regression results using equation (2) are reported in Table 4. From the diagnostics reported in the lower part of the table, we can see that all models are significant at 1 percent.

Table 1: Definitions and sources of variables

Table 2: Summary statistics

Table 3: Number of economies and enterprises, ES year, and crypto prevalence

Table 4: Firm financial constraint and crypto prevalence: baseline least squares estimates

Conclusion

For many businesses, the use of crypto is an alternative to the use of the traditional banking system. Our empirical evidence confirms that greater prevalence of crypto makes firms less dependent on banks and they borrow less from them. The firms also face lower costs and higher efficiencies as they pay less for transactions, receive payments sooner and need to use traditional channels less frequently. These are valuable insights for policymakers seeking to bolster the productivity and profitability of businesses. Our findings also illuminate the future of enterprise banking, particularly in emerging economies. This is evident through the contributions we make to three different sets of literature.

One of these is the literature on financial constraints which we augment through our empirical finding that crypto is a means to overcome such constraints. As such we draw attention to how the mainstream banking system can undermine economic growth by

aggravating the financial constraint of firms. While similar commentary has been offered by global organisations such as the World Economic Forum, our analysis examines not only the potential benefits of cryptocurrency, but also the factors that contribute to its appeal.

Critiques of the banking system are incomplete without implicating the role of regulation and this is the second set of literature that we contribute to. The economic implications of banking and financial regulation are expressed through the financial constraints such regulations generate. The specific regulations we engage with in this paper are the requirements set by FATF for countries that seek to avoid increased monitoring or grey listing. We also note that the standards set by the BCBS can also aggravate financial constraints.

This is perhaps our most substantial contribution; the argument that when governments, set out to adhere to global regulations and standards enterprises limit their engagement with the banking system and use crypto instead. Policies that restrict bank lending and financial access, including through anti-money laundering requirements create a dilemma for policymakers. Firms are attracted to digital currencies because they are regulated; we present empirical evidence for this claim through our analysis of the payments effect and financial constraint effect respectively. But if pressures to regulate crypto bear fruit, or central banks start offering their own digital currencies, crypto would lose its appeal.

This may be construed as a basis for banks to reconsider alternative models of lending. These might entail a reduction in profits and greater risk taking to satisfy the needs of small and medium enterprises. As Dymski (2005: 450) observes of contemporary banking practice, 'credit relations increasingly do not involve risk-taking by lenders, but instead risk classification and risk neutralization'. Our analysis shows the implications of shifts in banking strategies.

A third set of literature that we contribute to relates to USD dominance which has created opportunities for the United States government to assert their influence through economic sanctions and

the operations of FATF. Crypto is a means to avoid the monitoring and regulation that accompany the imposition of such strategies. And while governments in countries vulnerable to this weaponisation have sought alternatives to the USD, individuals and businesses remain willing to substitute this for their local currency given that the later is prone to losing value because of inflationary pressures and weak central bank credibility. To suppress this urge, governments seek to use capital controls; while this deepens the allure of crypto, our study shows that it also has the effect of making crypto less viable for reducing costs.

Notes

1. Key components include decentralized finance (DeFi), initial coin offerings (ICOs), security token offerings (STOs), and the use of stablecoins to facilitate transactions.

2. A vibrant scholarship on DeFi or decentralised finance includes proposals to overhaul the existing financial system with decentralised records and anonymous and unrestricted access (Makarov & Schoar, 2022).

3. Another problem with increased crypto usage is energy usage, with Bitcoin mining consuming electricity, that is at peak demand, equivalent to the installed capacities of Denmark and Finland combined (Küfeoglu & Özkuran, 2019).

4. See Nesvetailova (2017) for definitions and explanations of shadow banking.

5. See Strange (1998) for early critiques of capital adequacy rules.

6. Many financial institutions in the global South respond to BCBS rules by allocating large portions of their lending portfolios to risk-free government paper which facilitates government borrowing (Jones 2020)

7. USA PATRIOT is the acronym for Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act.

8. The permissibility of capital controls aligns with the view, of the IMF's intellectual founders, Keynes and White, that international capital mobility undermined financial instability.

9. Grey literature refers to online sources including reports, and multimedia content, often disseminated by tech platforms focused on the USA. We test some of these claims with econometric tools.

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Table 1: Definitions and sources of variables		
Variables	Description	Data Sources
CryptoPrevalence	Percentage of country's population using or owning cryptocurrency as a financial product.	Statista (1)
Constraint1	The proportion of working capital financed by bank, which directly related to firm reliance on banking finance. Firms facing higher cost of banking finance are more likely to exploit alternate avenue for financing.	WBES (2)
Constraint2	The proportion of total fixed assets financed by bank, showing long term financing demand by firms.	WBES (2)
Constraint3	The magnitude of e-transactions cost. The indicators measure a firm's cost per transaction (percentage of transaction) e-payments from banks.	WBES (2)
Constraint4	Binary variable representing firms that consider access to finance is a major/severe obstacles.	WBES (2)
Constraint5	Binary variable representing firms that consider complex application procedures, unfavorable interest rate, high collateral requirement, insufficient maturity, and no approval perception as constraint.	WBES (2)
Corruption	Binary variable representing firms claim corruption as the biggest obstacle affecting operations.	WBES (2)
InformalCompetition	Binary variables representing firms facing informal sector competition as the major/sever obstacle.	WBES (2)
Innovation	Binary variable representing firms that have introduced new/significantly improved process during the last three years.	WBES (2)
BroadBandConnection	Binary variable representing firms that have applied to obtain fixed broadband internet connection in the last two years, otherwise 0.	WBES (2)
Ecommerce	Binary variable representing firms engaging in e-commerce using own website for business activities.	WBES (2)
ExportingFirm	Binary variables representing firms directly exporting at least 10 percent of sales.	WBES (2)
FirmOwnrshpForeign	Percent of firm owned by private foreign individuals, companies, or organizations.	WBES (2)
FirmAge	The total number of years since establishment began formal operations.	WBES (2)
LargeFirm	Binary variable representing large firms (i.e., those having number of employees equal to or greater than 100).	WBES (2)

PoliticalInstability	Binary variable taking value 1 if firm reporting political instability as major/severe obstacle, otherwise 0	WBES (2)
ML Index	Basel Anti Money laundering index measures risk of Money Laundering/ Terror Financing (ML/TF). The index values range between 0 to 10, where 0 mean lower and 10 mean higher risk of ML/TF.	ICAR (3)
FixedBroadbandSub	Fixed broadband subscriptions (per 100 people) refer to fixed subscriptions to high-speed access to the public Internet (a TCP/IP connection).	WBI (4)
InternetUser	Individuals using the Internet (% of population). Internet users are individuals who have used the Internet (from any location) in the last 3 months	WBI (4)

Note:
(1) Statista Global Consumer Survey: https://www.statista.com/statistics/1202468/global-cryptocurrency-ownership/ Accessed 22 September 2022. The survey cover years 2019-2023. In case of data un-availability, immediate year data are utilized.
(2) World Bank Enterprise Survey: https://www.enterprisesurveys.org/en/enterprisesurveys Accessed 03 April 2024. For indicators description, see
https://www.enterprisesurveys.org/content/dam/enterprisesurveys/documents/methodology/Indicator-Description.pdf
(3) International Centre for Asset Recovery (ICAR) at the Basel Institute of Governance:
https://index.baselgovernance.org/ranking
(4) World Bank Indicators: https://databank.worldbank.org/source/world-development-indicators
Accessed 15 April 2024

Table 2: Summary statistics			
Variables	Obs.	Mean	Std. Dev.
CryptoPrevalence	11447	17.60	4.90
Constraint1	10991	1.58	1.30
Constraint2	3998	1.81	1.58
Constraint3	7448	1.08	0.47
Constraint4	11,256	0.36	0.48
Constraint5	11,345	0.49	0.49
Corruption	11447	0.07	0.26
InformalCompetition	11093	0.16	0.37
Innovation	11374	0.13	0.33
BroadBandConnection	11447	0.18	0.38
Ecommerce	11433	0.72	0.44
ExportingFirm	11087	0.16	0.37
FirmOwnrshpForeign	11399	1.05	1.06
FirmAge	11447	23.25	16.07
LargeFirm	11447	0.19	0.39
PoliticalInstability	11,143	0.301	0.459
ML Index	11,447	4.99	0.82
FixedBroadbandSub	7695	26.10	15.67
InternetUser	7,695	73.86	24.49
Note: See Table 1 for variables description and data source.			

Table 3: Number of economies and enterprises, ES year, and crypto prevalence				
No.	Country	Enterprises	Survey Year	Crypto Prevalence (%)
1	Colombia	911	2023	16
2	Greece	596	2023	18
3	Hong Kong SAR China	564	2023	16
4	Hungary	827	2023	12
5	Mexico	940	2023	13
6	Morocco	515	2023	16
7	New Zealand	333	2023	14
8	Pakistan	1263	2022	18
9	Peru	966	2023	14
10	Philippines	938	2023	29
11	Portugal	1002	2023	15
12	Romania	944	2023	14
13	Singapore	622	2023	25
14	Viet Nam	1026	2023	27

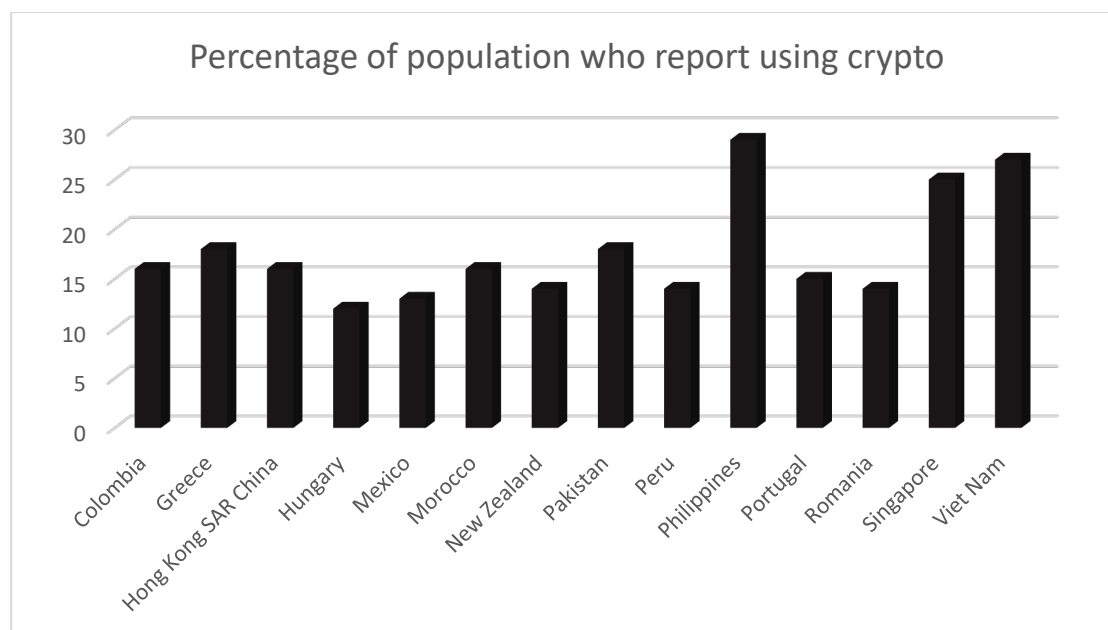| Table 4: Firm financial constraint and crypto prevalence: baseline least squares estimates						
	(1)	(2)	(3)	(4)	(5)	(6)
Ind.Variable(s)↓/Dep.Va →	Constraint1	Constraint1	Constraint2	Constraint3	Constraint3	Constraint3
Variable of Interest						
CryptoPrevalence	-0.022***	-0.042***	-0.016***	-0.027***	-0.013***	-0.018***
	(0.002)	(0.003)	(0.005)	(0.006)	(0.001)	(0.001)
Institutional Weaknesses						
Corruption	0.147***	0.071*	0.121	0.068	0.252***	0.204**
	(0.039)	(0.038)	(0.123)	(0.124)	(0.020)	(0.020)
InformalCompetition	0.158***	0.121***	0.089	0.072	0.096***	0.085**
	(0.034)	(0.034)	(0.069)	(0.070)	(0.017)	(0.017)
Technology Use						
Innovation	0.600***	0.596***	0.447***	0.448***	-0.065***	-0.050**
	(0.043)	(0.042)	(0.067)	(0.068)	(0.020)	(0.020)
BroadBandConnection	0.172***	0.199***	0.203***	0.195***	0.131***	0.121**
	(0.034)	(0.034)	(0.066)	(0.066)	(0.020)	(0.020)
Ecommerce	0.105***	0.153***	-0.041	-0.002	0.049***	0.047**
	(0.027)	(0.027)	(0.068)	(0.070)	(0.013)	(0.013)
Firm Characteristics						
ExportingFirm	0.182***	0.235***	0.162**	0.212***	-0.110***	-0.104***
	(0.038)	(0.039)	(0.066)	(0.070)	(0.015)	(0.015)
FirmOwnrshpForeign	-0.043***	-0.032**	-0.110***	-0.110***	0.004	0.009*
	(0.013)	(0.013)	(0.024)	(0.024)	(0.005)	(0.005)
FirmAge	-0.002**	-0.000	-0.003	-0.002	-0.001**	-0.000
	(0.001)	(0.001)	(0.002)	(0.002)	(0.000)	(0.000)
LargeFirm	0.401***	0.309***	0.394***	0.340***	0.080***	0.053**
	(0.034)	(0.035)	(0.067)	(0.069)	(0.014)	(0.014)
ML Risk						
MLIndex		0.269***		0.160***		0.100**
		(0.021)		(0.038)		(0.007)
Time FE	YES	YES	YES	YES	YES	YES
Sector FE	NO	YES	NO	YES	NO	YES
Observations	10,300	10,300	3,577	3,577	6,967	6,967

R-squared	0.119	0.148	0.045	0.055	0.075	0.117
(1) Joint Sig. F-stat	231.28**	115.23**	25.35**	28.26**	68.33***	54.49****
(2) Wald χ^2 Test	*	*	*	*	99.79***	64.56****
(3) Wald χ^2 Test	18.08***	8..15***	1.34	0.68	20.45***	16.69***
(4) Wald χ^2 Test	90.83***	102.96**	20.19**	19.55**	22.67***	15.96***
	10.63***	*	*	*		
		13.03***	8.07***	8.32***		

Note: See Table 1 for variables description and source. In column 2, 4, and 6, we add ML Index and sector FE capturing the impact of ML risk and sectoral heterogeneity, respectively. The reported standard errors are robust against heterogeneity. The un-reported VIF results ensure no detection of multicollinearity.

(1) Overall model significance. (2) Joint significance of the variables in *Institutional Weaknesses* set. (3) Joint significance of the variables in *Technology Use* set. (4) Joint significance of the variables in *Firm Characteristics*. Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Figure 1: How prevalent is crypto usage in the population? (Source: Statista Global Consumer Survey)

Appendix

Simultaneity and Related Concerns

To validate the robustness of our baseline statistical findings asserting the association between crypto adoption and dwindling credit constraints of enterprises, it is crucial to address statistical concerns in our baseline models. The chief among them is the simultaneity issue. For instance, financially constrained firms are more likely to opt for virtual currency rather than compromising their financial health (Symss 2023). Firms seeking alternate and inclusive sources of finance, such as technology-driven financial services, see (Goutte et al. 2019), can potentially influence cryptocurrency adoption. To address the simultaneity and bidirectional association between firm credit limitations and crypto prevalence, we utilize instrumental variables and employ the IV-GMM estimator which helps address measurement and omitted variables issues (Wooldridge, 2010). The use of this estimator also serves as a robustness test to affirm if the statistical linkages between crypto ownership and firm credit constraint stand valid, as

asserted in baseline results. The IV models are based on the following econometric specification in line with the baseline specification described in equation (2).

$$Constraint(k)_{isct} = \alpha_0 + \alpha_1 (IVs)_{ct} +$$
$$\beta (InstitutionalWeaknesses)_{isct} +$$
$$\gamma (TecchonolgyUse)_{isct} +$$
$$\lambda (FirmAttributes)_{isct} + \xi i_s + \varepsilon_{isct} \quad (3)$$

The IVs include the broadband subscription (*FixedBroadbandSub*) and individuals using internet (*InternetUsers*). The rationale for employing these as instrumental variables is that each one of these enables crypto ownership and usage and is thereby correlated with our main variable of interest (e.g., Goel & Mazhar, 2024b). At the same time, these variables have no direct bearing on the financial constraints faced by firms. For instance, there is no theoretical ground to claim that greater use of internet in a society directly affects the financial constraint faced by a typical firm. Admittedly, the greater prevalence of internet in a society can affect firm preference for intangible assets but the channel of this affect is indirect, if it exists at all.

The reported results in Table 5 are based on specifications given in model (3). The first stage F-stat is given towards the bottom of the table, the higher values indicating the robustness of the instrumental variables in explaining the variation in the endogenous variable. The significant p-value of the Anderson-Rubin Wald test indicates the validity and correct specification of the models. The insignificance of the Hansen J-statistic suggests that the instruments are exogenous and not correlated with the error term. The Kleibergen-Paap rk LM test statistic indicates that IV models are correctly identified.

Table 5: Firms financial constraint and crypto usage: IV results

Given the validity of instrumental variables, the reported results in column 1 of Table 5 are in line with the baseline results in Table 4, implying that the crypto prevalence can significantly affect enterprise financial constraints. These IV-GMM results support and authenticate the hypothesis that crypto prevalence can significantly address enterprises' short- and long-term financial constraints. We also carried out additional robustness checks using alternative measures of firm level financial constraints. These further confirmed the results above. Because of space constraints we have not reported these results, but they are available upon request.

Omitted variable bias

To limit the possibility of our analysis being weakened by an omitted variable problem we use a variable for macroeconomic risk, for instance an exchange rate shock. In such an event there is a devaluation of the firm's domestic currency relative to foreign currencies. If firms in a country face an exchange rate shock, their financial constraint tightens, that is, their cost of borrowing increases, leading them to look for alternatives to traditional finance. This raises the possibility of a variable that is omitted from our analysis being responsible for an increase in the use of crypto currency which we assume affects financial constraints. There is a likelihood then that the estimates from our empirical analysis arise not because of the effect of crypto on financial constraint but the effect of some type of macroeconomic risk on both crypto use and financial constraint. To overcome this, we use a measure of political instability. In the WBES firms were asked about political instability being their biggest obstacle. This allows us to use firm level data from the WBES. The coefficient for the political instability variable is positive and significant in all cases as shown in Table 6.

Table 6 Firm financial constraint and crypto prevalence: baseline least squares estimates

Table 5: Firms financial constraint and crypto usage: IV results		
(1)	(2)	(3)

Ind.Variables▼ /Dep.Var →	Constraint1	Constraint 2	Constraint3
Variable of Interest			
CryptoPrevalence	-0.423***	-0.260***	-0.229***
	(0.036)	(0.045)	(0.019)
Institutional Weaknesses			
Corruption	-0.106*	-0.019	-0.030
	(0.062)	(0.165)	(0.045)
InformalCompetition	0.106**	0.104	0.117***
	(0.047)	(0.087)	(0.029)
Technology Use			
Innovation	0.528***	0.553***	0.087*
	(0.064)	(0.090)	(0.051)
BroadBandConnection	0.038	0.136	0.095***
	(0.054)	(0.086)	(0.032)
Ecommerce	0.116***	-0.127	-0.025
	(0.045)	(0.092)	(0.026)
Firm Attributes			
ExportingFirm	0.163***	0.227***	-0.150***
	(0.056)	(0.085)	(0.028)
FirmOwnrshpForeign	0.118***	-0.036	0.101***
	(0.029)	(0.038)	(0.016)
FirmAge	-0.003**	-0.004*	-0.001**
	(0.001)	(0.002)	(0.001)
LargeFirm	0.303***	0.389***	0.021
	(0.057)	(0.086)	(0.029)
Time FE	YES	YES	YES
Sector FE	YES	YES	YES
Observations	6,948	2,585	4,899
(1) First Stage F Stat	231.68	188.29	148.26
(2) Anderson-Rubin Wald χ^2	173.93***	66.07***	312.61***
(3) Hansen J statistic χ^2 P	0.238 451.77***	276.453	0.903 339.12

(4) Kleibergen-Paap rk LM χ^2			

Note: See note to Table 1. Each specification allows for sector fixed effects. *CryptoPrevalence* is instrumented using fixed broadband subscription and percentage of individuals using internet.
(1) First stage F stat greater than 10 indicate robustness of IVs. (2) The null hypothesis is that the endogenous regressors impact is equal to zero. (3) The null hypothesis is that the instruments are valid. (4) The null hypothesis is that the models are under-identified. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Firm financial constraint and crypto prevalence: baseline least squares estimates

Ind.Variable(s)↓ / Dep.Var →	(1) Constraint1	(2) Constraint2	(3) Constraint3
Variable of Interest			
CryptoPrevalence	-0.019***	-0.010*	-0.009***
	(0.002)	(0.005)	(0.001)
Institutional Weaknesses			
Corruption	0.135***	0.095	0.245***
	(0.039)	(0.124)	(0.020)
InformalCompetition	0.120***	0.060	0.089***
	(0.035)	(0.072)	(0.017)
Technology Use			
Innovation	0.584***	0.439***	-0.071***
	(0.043)	(0.069)	(0.019)
BroadBandConnection	0.221***	0.198***	0.122***
	(0.035)	(0.067)	(0.020)
Ecommerce	0.127***	-0.032	0.032**
	(0.027)	(0.070)	(0.014)
Firm Characteristics			
ExportingFirm	0.180***	0.193***	-0.127***
	(0.039)	(0.070)	(0.015)
FirmOwnrshpForeign	-0.042***	-0.109***	0.002
	(0.013)	(0.024)	(0.005)
FirmAge	-0.002**	-0.003*	-0.001**
	(0.001)	(0.002)	(0.000)
LargeFirm	0.352***	0.375***	0.077***
	(0.035)	(0.069)	(0.014)
Macro Factor Risk			
PoliticalInstability	0.066**	0.102*	0.046***

	(0.028)	(0.060)	(0.012)
Time FE	YES	YES	YES
Sector FE	YES	YES	YES
Observations	10,300	3,577	6,967
R-squared	0.134	0.052	0.102
(1) Joint Sig. F-stat	106.07***	23.43***	37.75***
(2) Wald χ^2 Test	12.07***	0.64	91.04***
(3) Wald χ^2 Test	95.58***	18.14***	16.27***
(4) Wald χ^2 Test	9.81***	8.21***	28.69***

Note: See note to Table 1. The reported standard errors are robust against heterogeneity. The un-reported VIF results ensure no detection of multicollinearity.
(1) Overall model significance. (2) Joint significance of the variables in *Institutional Weaknesses* set.
(3) Joint significance of the variables in *Technology Use* set. (4) Joint significance of the variables in *Firm Characteristics*. Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$.