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The geography of initial coin offerings

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Abstract Initial coin offerings (ICOs) are a rapidly growing phenomenon wherein entrepreneurial ventures raise funds for the development of blockchain-based businesses. Although they have recently sprouted up all over the world, raising millions of dollars for early-stage firms, few empirical studies are available to help understand the emergence of ICOs across countries. Based on the population of 915 ICOs issued in 187 countries between January 2017 and March 2018, our study reveals that ICOs take place more frequently in countries with developed financial systems, public equity markets, and advanced digital technologies. The availability of investment-based crowdfunding platforms is also positively associated with the emergence of ICOs, while debt and private equity markets do not provide similar effects. Countries with ICO-friendly regulations have more ICOs, whereas tax regimes are not clearly related to ICOs.

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1 Introduction

With the continuous increase in the popularity of cryptocurrencies, a new opportunity to use them as a way to raise funds and finance new projects has risen through initial coin offerings (ICOs). We define an ICO as a decentralized method of financing, whereby a firm calls for funding by issuing coins to online investors. Coins (or tokens) are digital medium of value exchange based on the blockchain, which can operate independently and can be traded between investors.[1] The two main premises of ICOs are therefore that (1) the company can create a digital coin, which can be then offered for sale to the public through an initial offering and (2) these coins

[1] ICOs and cryptocurrencies are only one of the many applications of blockchain technology, which is expected to have economically significant uses in virtually every industry (Böhme et al. 2015; Davidson et al. 2018). Blockchain is a decentralized validation protocol shared by all parties in which no one individual entity has complete control of the process or information. The transparent and decentralized nature of the blockchain network enables the development of a non-refutable and unbreakable record of data, which is a fundamental feature in many markets. Blockchain can revolutionize organizations (e.g., supply chain management) as well as markets, with applications such as cryptocurrencies, records of ownership of intellectual property, or smart contracts. This is not limited to goods or currencies, as a blockchain-based system can redesign the treatment of personal data, with strong impacts on sectors such as healthcare or education.

can be exchanged among investors or converted into other currencies. Therefore, ICOs share, on the one hand, some characteristics of the secondary market created with traditional initial public offerings (IPOs), where firms sell a fraction of their equity to the public in a stock market and, on the other hand, of the primary market of crowdfunding, where proponents raise money from a heterogeneous set of investors through online platforms.

ICOs provide digital entrepreneurs with the opportunity to raise funding while avoiding costs of compliance and intermediaries. Blockchain technologies provide indeed accurate record-keeping and ownership transparency, which improves information flows, and accurate tracking of asset ownership (Yermack 2017). As with any other financial deal, however, an ICO is the outcome of the matching between supply and demand of capital. For this particular means of financing, the demand for capital consists of digital entrepreneurs eager to raise capital to launch a new business or to foster the growth of their entrepreneurial ventures, typically based on the use of their technical, programming, or finance skills. The supply of capital is highly heterogeneous, consisting in small "crowd" investors alongside institutionals, such as venture capitalists and hedge funds.

Despite their potential game-changing role in entrepreneurial finance, very few papers have so far investigated the emergence of ICOs. Most studies discuss the legal or managerial aspects of this phenomenon, without an empirical analysis. Few exceptions are the papers by Fisch (2018), Adhami et al. (2018), Amsden and Schweizer (2018), and Momtaz (2018). Fisch (2018) investigates the signals that increase the chances of success in a sample of 456 ICOs completed between March 2016 and March 2017. He finds that, while patents are insignificant, technical white papers are an effective signal in ICOs. Additionally, ICOs with a high-quality code can raise more capital. Adhami et al. (2018) document that an ICO's success is positively related to the presence of codes for the blockchain project and the availability of pre-sale ICOs. They also find a significant and positive effect of token bonus scheme (i.e., grant token holders the right to access platform services) on the ICO success rate. Using a sample of 1009 ICOs from 2015 to March 2018, Amsden and Schweizer (2018) document that better-connected CEOs and larger team size are positively correlated with the success chances of ICOs. With regard to the short-run performance, Momtaz (2018) finds that first-day returns on investments in ICOs range from 6.8 to 8.2%.

Our paper investigates the geographic distribution of the ICO phenomenon, by shedding light on the reasons why ICOs are more pervasive in some countries relative to others. In other words, we try to answer the research question of why some countries have more ICOs than others. We consider four country-level perspectives that have a potential influence on the evolution of digital entrepreneurial activities and new creation of digital services in important ways. Specifically, we include the development of financial systems, distinguishing between debt, public and private equity, the information and communication technology (ICT) development, the status of regulating ICOs, and the growth of online crowdfunding platforms. These aspects are in line with studies in entrepreneurship and venture capital areas (see Groh et al. 2010). As highlighted in King and Levine (1993), innovative activities co-evolve with capital markets, financial systems, and the legal environment. These four perspectives are expected to impact on the propensity to launch an ICO. We also examine whether taxation is a pivotal driver to the formation of this new marketplace for the demand and supply of capital and an incentive for new entrepreneurial creation. It is often believed that digital entrepreneurs locate their ICOs in countries with favorable taxation. This belief, however, is questioned (Dumienski and Smith 2018) and not empirically substantiated.

Our predictions are tested by using a sample of 915 ICOs between January 2017 and March 2018. The sample includes 187 countries, member states of the United Nations, and British territories (namely Bermuda, Cayman Islands, Gibraltar, Guernsey, Isle of Man, and Jersey). Our empirical evidence provides important insights. ICOs occur more frequently in countries with well-developed financial systems and equity markets, advanced ICT investments in infrastructure and human capital skills, and providing regulation for ICOs. Moreover, the population of ICOs in a country is positively associated with its development of crowdfunding markets. On the contrary, we do not find ICOs having such similar relations with other traditional alternative finance means such as debt, venture capital, and private equity funds. The complementary relationship between ICOs and crowdfunding platforms testifies that digital fundraising technologies are favored by new innovative ventures and meet the investment needs of small investors. The more direct and disintermediated means for fundraising, the more ICOs. Further, our preliminary evidence points to the fact that the decision on where

to launch an ICO is not crucially determined by tax considerations.

The remainder of this paper is structured as follows. In Section 2, we elaborate the research hypotheses. Section 3 describes our sample, data, and the methodology. Section 4 presents our empirical tests, interprets the results, and performs robustness checks. Section 5 provides concluding remarks.

2 Hypothesis development

2.1 Financial systems

A well-developed capital market might prompt demand for entrepreneurship because a larger financial market offers greater potential to change existing business models through innovative services and digitalization. This is in line with Schumpeter (1934), stating that "well-functioning banks spur technological innovation by identifying and funding those entrepreneurs with the best chances of successfully implementing innovative products and production processes." Successful innovative investments would bring imitators to appear and follow in the original sectors or elsewhere. Fundamentally, advanced financial markets would naturally call for innovative tech-enhanced entrepreneurship.

Several studies have verified a positive relationship between financial systems and economic growth, both theoretically and empirically (Bencivenga et al. 1995; Demirgüç-Kunt and Maksimovic 1998). In King and Levine's (1993) model, good financial systems boost economic development by supporting prospective entrepreneurs and financing promising innovative projects. From this perspective, a better-developed financial system goes hand in hand with the growth of high-quality entrepreneurs and projects in order to enhance and accelerate the rate of productivity improvements (King and Levine 1993). Investments in technological innovation are an important channel for the finance-growth nexus (Levine 1997). Levine and Zervos (1998) provide empirical evidence to support that better financial systems facilitate investments in high-return projects.

For these arguments, in the interest of new start-ups formation, an elaborated financial system as a whole helps increase the likelihood that these firms receive funds from ICOs. This leads to our first hypothesis.

Hypothesis 1a: *ICOs occur more frequently in countries with more developed financial systems*.

Generally speaking, industrial sectors that demand more external finance would grow relatively faster in countries with better-developed financial systems because good financial systems help reduce the costs of external finance (Rajan and Zingales 1998). In fact, financial systems are made of different constituents and high-tech start-ups may face different financing decisions. A stream of studies on financial systems and firm growth primarily focus on whether there exist country-level distinct effects between bank-based financial systems and market-based financial systems on firm growth and financing patterns (Allen and Gale 1999). We now distinguish between debt and equity and, within equity, between public and private equity.

Levine and Zervos (1998) and Demirgüç-Kunt and Maksimovic (2002) find that both market-based and bank-based financial systems provide positive effects on firm growth, but affect the firm's ability to obtain external funds differently. Based on cross-country empirical analyses, Demirgüç-Kunt and Maksimovic (2002) highlight the distinct role of the development of market-based and bank-based financial systems in firms' financing patterns. To illustrate, the bank-based financial system supports firms' access to short-term financing to a relatively large extent, while the market-based financial system improves firms to obtain long-term external financing. Lemmon et al. (2008) show that bank capital is an important element for start-ups to grow. Robb and Robinson (2014) examine newly founded firms' capital structure decisions and highlight the importance of the reliance on bank debt for start-ups' success. As such, a more developed debt market increases the likelihood of new start-ups receiving more ICOs. Indeed, receiving bank debt signals the quality of the innovative project's quality and the credit record approved by banks (Diamond 1991), which reduces information asymmetry. We therefore propose the following hypothesis.

Hypothesis 1b: *ICOs occur more frequently in countries with more developed debt markets*.

In a Modigliani and Miller (1958) world without taxes, bankruptcy costs, informational asymmetries, or agency costs, capital structure is irrelevant to total firm value. However, in a world with taxes and bankruptcy

costs, capital structure matters and an important question to companies in need of new finance is whether to raise capital internally or externally, and whether to raise debt or equity. Although banks play a major role in the reduction of agency costs (Diamond 1984), they may fail to provide debt when the degree of asymmetric information is too high. The existence of public equity markets is often considered central to the development of newly established financing channels, especially for highly innovative firms (Michelacci and Suarez 2004). Developed equity markets create liquidity for investors and firms, which in a way promotes economic growth and increases the demand for investment opportunities (Levine and Zervos 1999).

Initial public offerings are perhaps the natural term of a comparison of initial coin offerings. They indeed share many characteristics. First, these offerings are typically the first time in which entrepreneurial firms raise capital from external public investors. This implies that they appeal to entrepreneurs that consider dealing with a diverse set of investors. Contrary to what happens in private equity deals, entrepreneurs do not individually interact with public investors. Second, the coins, like the shares of listed firms, can be traded by investors in secondary markets. This means that, similarly to IPOs, ICOs offer an exit option that can attract small investors.

Sharing many traits of external equity markets, ICOs are, therefore, expected to flourish in contexts where the demand and supply of external equity is high. For these reasons, we expect the importance of the developed public capital markets for the creation of ICOs and propose the following hypothesis.

> Hypothesis 1c: *ICOs occur more frequently in countries with more developed public equity markets*.

The activity of financing entrepreneurs has naturally existed almost as long as entrepreneurs themselves. Private equity investors not only provide financial support but also supply experienced management assistance, have intensive monitoring and control incentives, and act as a certification of the quality of the entrepreneurial venture (Hellmann 1998; Gompers and Lerner 2001; Kaplan and Stromberg 2001). Private equity represents therefore one established solution to financing high-risk and high-reward ventures. Hellmann and Puri (2002), for instance, highlight a positive relationship between the market success of new innovative firms and the type of financing obtained (in particular whether they obtain venture capital or not). Gompers and Lerner (2001) have identified the important role that venture capital plays in financing young and innovative firms in the USA.

Indeed, private and public equity markets are linked. Active and developed public capital markets provide an exit option to venture capital-backed startups in order to hold back the business control. IPOs have thus been mentioned as one of the most important factors that positively influence the raising of new venture capital funds (Gompers and Lerner 1998). As Black and Gilson (1998) point out, the existence of a well-developed stock market, which permits exits through IPOs, is critical to the existence of a vibrant venture capital market. In fact, they found a significant relationship between the number of venture-backed IPOs and new capital commitments to venture capital funds in the following year.

The above arguments in support of the complementarity between IPOs and private equity markets can be extended to ICOs. Currently, VC funds invest high amounts in new digital finance markets. For instance, Signori and Vismara (2018) document that traditional VCs are among the main investors in UK equity crowdfunding platforms. They seem to have high screening capacity in these markets, as none of the equity crowdfunded companies in which they have invested have so far failed. Cumming et al. (2018) investigate the role of professional investors, such as VC and other private equity funds, in equity crowdfunding offerings. They find that these institutional investors are sensitive to interest alignment and to concentrated share ownership, as they only invest in equity crowdfunding offerings to achieve significant voting rights. If VCs invest after the offering, they report the preference to repay small investors and provide them with an exit opportunity, so as not to have to deal with them in shareholders meetings.

The literature has yet to investigate the interaction between VCs and ICO firms. As an exception, Boreiko and Sahdev (2018) document that 15% of firms in their sample raising capital in ICOs are VC-backed. This evidence points to a certain level of complementarity between private equity and ICO markets. Hence, we propose the following hypothesis.

> Hypothesis 1d: *ICOs occur more frequently in countries with more developed private equity markets*.

Different sources of funding may be substitutes or complements (Berger and Udell 1998).[2] On the one hand, for instance, VC contracts are written in anticipation of going public (Cumming 2008), suggesting that venture capital and public equity are complements. On the other hand, the demand of capital of a start-up is limited and companies might tap one source over another. Although these micro-level decisions can explain the prevalence in a region of particular means of financing, how this translates in terms of regional economics is unclear. For instance, Audretsch and Lehmann (2004) document the importance of VCs in financing high-tech ventures in the bank-centered Germany. Substitutability among alternative sources of finance needs to depend on the context and is therefore a complex issue.

Blockchain is a new technology that has the potential to change many markets. As a parallelism, the emergence and rapid growth of e-commerce has been commonly explained with reference to the advantages in the information environment. Accordingly, e-commerce should be a substitution of traditional marketplaces. While this is certainly true in some markets and for certain types of products or services, the substitution effect does not regard every market. Fabel and Lehmann (2002) argue that if seller-contingent quality uncertainty induces persistent adverse selection, a competitive equilibrium with parallel segments in both electronic and traditional marketplaces may arise. They conclude that e-commerce and traditional marketplaces co-exist despite dominant search means available in the Internet.

With regard to ICOs, while as previously discussed, there are mechanisms facilitating a common growth, others tend to have a substitution effect. At the firm level, the easy to raise fresh capital through ICOs might undermine the demand for traditional finance. Indeed, the amount of capital raised by ICOs and token sales bypassed investment in blockchain technology by traditional VCs in 2017 (Catalini and Gans 2018). As this blockchain and other distributed ledger technologies evolve, the related development of ICOs might put in question the traditional VC model.

It is unclear whether ICOs can provide an economically significant substitute or addition to the current equity and debt markets. For these reasons, we cannot eliminate the possibility that ICOs and existing financing channels play a substitutional role in young and innovative ventures' financing decisions. For this concern, we list the following hypotheses.

> Hypothesis 1e: *ICOs occur less frequently in countries with more developed debt markets.*
> Hypothesis 1f: *ICOs occur less frequently in countries with more developed public equity.*
> Hypothesis 1g: *ICOs occur less frequently in countries with more developed private equity.*

2.2 Information and communication technology development

Prior studies have documented that ICT development positively affects economic growth because of reduced transaction costs (Lichtenberg 1995; Colecchia and Schreyer 2002; Roller and Waverman 2001). Greenstein and Spiller (1996) model the role of investments in digital infrastructure to local telephone networks. Corresponding to their model, their empirical evidence shows that the absence of investments in new technologies is associated with lower levels of welfare. Investments in digital technology not only affect the sensitivity of consumer demand for telecommunications but also encourage localities to establish businesses. While technology improves the business environment, more business models and services appear in the market. This, in turn, delivers entrepreneurial opportunities.

Indeed, a more advanced digital economy is more likely to increase the demand for entrepreneurship. While a country increases its ICT investments aiming to enhance economic growth and social interactions, it provides opportunities for entrepreneurs, who are with sufficient digital knowledge skills, to start new businesses. For instance, the invention of cryptocurrencies is planning to replace, or supplement, the traditional payment systems. The demand for well-functional digital payment systems would be higher in countries with a well-developed ICT environment for the digital society than in those less-developed ICT economies. Most importantly, the more developed the ICT, the more specialized the demand in order to keep up the technology value chain by improving and updating software, digital services, or network equipment (Zhou and Xin 2003).

[2] A definition of complementarity is given by Roberts 2007, p. 34): A pair of variables are complements when doing (more of) one of them increases the returns to doing (more of) the other. If one of a pair of complements is instituted or increased, it will be more attractive than before to introduce or increase the other. The opposite holds for substitutional effects.

With regard to the nature of ICT, technological change is persistent (Vivarelli 2013). Several studies document that new ICT brings in more skilled human capital (Berman et al. 1998; Bresnahan et al. 2002; Chun 2003) to tackle current issues and invent new tools and means to strengthen the digital environment, also resulting in a demand for pursuing higher education and specialized training. Another stream of studies, however, emphasizes that new ICT capital and advanced-skilled human capital are complements (Acemoglu 2002; Ketteni et al. 2011). In other words, a high level of human capital creates a productive ICT market, while a high level of ICT would also require high-skilled labor. Nevertheless, there is a positive association between advanced ICT and high levels of human capital. Most importantly, universities play an important role in developing new technologies and fostering human capital of a region as a hub for knowledge spillover and also as a bridge to connect regional established firms, as well as graduates to create innovative products or services (Spigel 2017).

Furthermore, tech-related enterprises and research and development facilities strengthen local firms' learning capacity (Zhou and Xin 2003). A more advanced ICT environment is more favorable for new technology innovation to some extent, because of more investments in training, education, and scientific concentration. Innovation potentials are greater in such advanced ICT environment, and tech-based entrepreneurial businesses are more likely to be proposed and launched. In principle, a well-established ICT environment is a hotbed of ongoing entrepreneurial activities through exchanging ideas, sharing information, and the competition of new products and services (Czernich et al. 2011). This line of argument applies broadly to the blockchain technology, whose very existence—and chances of development—requires technological capabilities from ventures.

Taken all together, the development of ICT embracing well-functioning infrastructure facilities and tech-skilled human capital can accelerate the demand for digital entrepreneurship. In particular, ICOs require a technological infrastructure, as their whole business model rests on ICT. Since ICT is rarely as important as for blockchain ventures, we expect that the ICO market grows fast to meet the competitive and burgeoning high-tech ventures when ICT is sustainably evolving. We summarize the following hypothesis.

Hypothesis 2: *ICOs occur more frequently in countries where the ICT is more advanced.*

2.3 The relationship between ICOs and their regulation

Countries with stronger regulation can lower the cost of entry and ensure contractual certainty, thus encouraging development of financial technology firms. On the other hand, a strong investor protection may harm financial innovations. Unlike traditional capital markets that have been developing over years, the ICO market is relatively loosely regulated. With few regulation barriers and limited accreditation standards, ICOs provide entrepreneurs with less costly access to external finance than other financing approaches. The blockchain bypasses traditional principal-agent dilemmas of organizations, thereby creating decentralized governance and smart contracts to serve as a trust mechanism (Shermin 2017). Audretsch et al. (2018), for instance, show that trust is important in the study of digital entrepreneurship, as it facilitates knowledge spillover and innovation activity.

Several warnings regarding risky ICO investments have been issued in the last year. For instance, although the UK is open and positive about the new form of fundraising through ICOs, Financial Conduct Authority (FCA) has issued warnings on ICOs, as the proposed business models are in early-stage developments or are experimental projects, alerting investors to be aware of potentially high risk. The European Securities and Markets Authority (ESMA) has also issued investor warnings on the nature of high-risk ICOs, as well as company rules to require ICO firms to meet relevant regulatory requirements (see ESMA press released on 13 November 2017). Similarly, ICOs that issue equity and securities (such as coin-based property) in the USA are required to be registered and licensed by the US Securities and Exchange Commission (SEC). As such, relevant trade transactions are subject to SEC's ruling. Other numerous investor warnings and alerts heavily emphasize the risk of potential fraud projects (see, for instance, BaFin 2017; SEC 2017). With the relatively large scale of uncertainty in regard to the regulation formation of ICOs, the ambiguity of current ICO regulation development is likely to restrict the freedom of issuing an ICO and thus reduce the number of ICOs. This leads to the following testable hypothesis.

Hypothesis 3a: *ICOs occur less frequently in countries with more developed digital regulation environment.*

Despite these warnings, Kaal and Dell'Erba's (2018) comparative analysis of regulatory responses of 25 ICO

jurisdictions reveals ICOs are permitted or not explicitly prohibited by most of the countries. As such, legal system development is essential for shaping regulations of the ICO market and helps stabilize the formation of this relatively new financing tool. Ultimately, a well-regulated digital economy is more likely to encourage start-ups to propose and generate new digital services and business models as it reduces systemic risk. In addition, ICO regulation may potentially reduce the moral hazard and free-riding behavior, which filters low-quality ICOs and strengthen the evolution of the ICO market by developing an effective ICO-related legislation system. Adhami et al. (2018) examine the determinants of ICO success and find a positive relation between jurisdiction and ICO success, suggesting that the legal protection plays a security guard to screen out cases of scams and frauds. More importantly, the exemption of legalizing ICO tokens as securities may enhance economic value and the value of innovation, given that one of the ICO functions is to foster communities and build network effect through tokens (Li and Mann 2018). For this reason, a well-developed digital regulation environment is more likely to accommodate the special need from the ICO market. Thus, we propose the following alternative hypothesis.

> Hypothesis 3b: *ICOs occur more frequently in countries with more developed digital regulation environment.*

2.4 The relationship between ICOs and crowdfunding

Over the last decade, equity crowdfunding platforms grew all over the world (Block et al. 2018). Studying the activities of investment-based crowdfunding platforms in France, Italy, Germany, and the UK, Rossi and Vismara (2018) show that equity crowdfunding platforms are intensively located in the financial centers. Venture capital firms and angel investors also contribute to the growth of the equity crowdfunding market by investing directly through these platforms or being in partnership with them.

These online platforms directly connect start-ups and individual investors together, which makes financing and investment activities more efficient. Technology-based online platforms are continuously evolving and will enhance both existing and new models to create new tools in order to improve communication between investors and entrepreneurs (World Bank 2013). These funding platforms, thus, play a necessary role in shaping a new entrepreneurial finance environment, because more innovative ventures will be created to meet the demand. The supply of profitable technology projects would grow steadily to adopt digital projects. With the growing and intensive use of technologies, an increase in demand for new financial technology (FinTech) projects is more likely to lead to propose more solutions for technical change or improving technology efficiency.

Both ICOs and crowdfunding essentially occur on internet-based platforms but do not have conflicting objectives. ICOs contribute by providing digital tokens and accommodating the market, especially with respect to those investors who would prefer digital investment and high returns. These tokens may provide a unique function, in that token holders have entry to the invested ICO-founded services, which serves as a unique non-financial utility. Adhami et al. (2018) also find a positive relation between ICO's success and the bonus scheme of access to project services. Differently, the nature of equities issued from the crowdfunding market is to provide ownership, such that investors have the voting power (Ahlstrom et al. 2018). Thus, the objective of ICOs is not in conflict with that of equity crowdfunding.

Moreover, many ICO projects propose a preliminary stage of a business and funds from ICOs are meant to support for forming a venture to a decent shape. Equity crowdfunding, however, supports for early-stage businesses to grow steadily. Both ICOs and crowdfunding aim to help a business to grow but at different stages. As pointed out by Bruton et al. (2015), alternative sources of finance for entrepreneurs differ at macro and individual levels. A widespread acknowledgement of FinTech and a common use of internet for raising capital potentially affects the availability, cost, and performance of alternative forms of financing. The availability of strong local markets is one of the crucial attributes to open new opportunities for new ventures within the entrepreneurial ecosystem (Spigel 2017). Therefore, compared to countries which lack experience in financing online, countries with a well-evolved online capital raising should be able to offer and better accommodate multiple financing stages of high technology ventures. From these ideas, we summarize the following alternative hypothesis.

> Hypothesis 4a: *ICOs and crowdfunding play complementary roles in the financing of ventures.*

ICOs and crowdfunding share similar features. Since the Internet-based crowdfunding platforms were introduced to the public, young innovative firms or early-stage start-ups have less restricted barriers to access to financing. New and more ventures grow with the amount of innovative financial instruments (Block et al. 2018). A number of online platforms for fundraising were created, which can be categorized to donation-based, reward-based, debt-based (lending), and equity-based crowdfunding platforms. Among these typologies, ICOs are more in line with equity crowdfunding platforms in terms of investor motivation and the perception of risk. We discuss these two aspects in more details as follows.

First, equity crowdfunding is primarily driven by investors' financial motives, such that investors expect to receive returns on their investment, differently from donation-based and reward-based crowdfunding, where investors are less eager to ask for financial returns, given that, instead, they follow their intrinsic motives such as help others and be a part of community to support founders (Vismara 2016). ICOs and equity crowdfunding share similar characteristics in that both are return-based investment tools and have the value of tokens (shares).

Second, as to the perception of risk, equity crowdfunding offers equity shares to investors, such that investors can only redeem returns when they sell their shares, while investors in debt crowdfunding markets receive interests periodically before the contract maturity (Signori and Vismara 2018). The former investment, therefore, is considered riskier than the latter. ICOs are similar to equity crowdfunding in this case in that ICO investors have to bear all the uncertainties until they sell their tokens on secondary markets.

Walthoff-Borm et al. (2018) identify equity crowdfunding as a last financing solution in entrepreneurs' financing decisions when internal sources are exhausted and debt capacity reaches its limit. From this perspective, ICOs possess similar functions to those that characterize equity crowdfunding. ICOs and equity crowdfunding might, therefore, play competing roles in the financing of innovative ventures. One may even argue whether start-ups may choose to raise funds through ICOs instead of crowdfunding portals. The lack of strong regulation on ICO portals makes indeed raising funds easier than on crowdfunding platforms. Moreover, ICO market is more liquid than the crowdfunding market as ICO investors can sell their tokens on the secondary market. Hence, we cannot neglect the possibility that the lower (higher) the amount of crowdfunding, the higher (lower) the ICOs for start-ups. Thus, we propose the following hypothesis.

> Hypothesis 4b: *ICOs and crowdfunding play substitutional roles in the financing of ventures*.

3 Research design

3.1 Sample and data

To enhance our understanding of why ICOs are rocketing in some countries and not in others, we place our focus on the countries where the ICOs are originated. The key information in this study is indeed relevant to the demand side of digital entrepreneurial ventures in an economy. Identifying a list of ICOs for our empirical analysis has been a major challenge, given that no official source exists, and a scarce literature is currently available. First, we started by scrutinizing one by one all available lists of ICOs we identified on the Internet. In line with existing studies, we mainly rely on ICObench.com, which is the ICO listing website with the most detailed ICO information.[3] As of 31 March 2018, ICObench.com listed 1012 ICOs. We cross-checked information with other websites, including coinmarketcap.com, cointrends.top, coinschedule.com, cryptoslate.com, icodrops.com, coinmarketcap.com, tokendata.io, and tokenmarket.net. ICOs listed in ICObench.com but not presented in any other lists were excluded, as well as if we could not link the ICO to a specific country. These criteria and the validation process filtered 81 ICOs out from the list. Given the concentration in time of the phenomenon, our analysis is cross-sectional in nature. For this reason, in our empirical analysis, we also dropped 16 ICOs that started before 2017. After excluding observations with missing data, we identified a final sample for our analysis that covers 915 ICOs finalized between 1 January 2017 and 31 March 2018, in 73 countries. In total, our sample covers 187 countries worldwide in which the effective number of countries with ICOs larger than zero is 73 economies.

[3] Comparing different data sources, Amsden and Schweizer (2018) find that this platform provides the greatest accuracy. Using a different data source (tokendata.io), Howell et al. (2018) find a similar country distribution in a sample of 453 ICOs.

Figure 1 maps countries by the number of ICOs. Since ICOs provide digital services and products, they are not restricted by physical boundaries and borders. Their location can also be chosen in consideration of the tax exposure. This is, however, not new and less a concern than in other traditional financial markets (see Howell et al. 2018, for a comparison between ICOs and IPOs). Table 1 shows the distribution of ICOs, with a comparison of the number of IPOs issued on London's Alternative Investment Market (AIM) between 1995 and 2017. The top five countries with the highest number of ICOs are the USA, Russia, the UK (the domestic market), Singapore, and Switzerland. It is worth noting that British territories (namely, Bermuda, Cayman Islands, Gibraltar, Guernsey, Isle of Man, and Jersey) occupy only 2% of the ICO market around the world. By directly comparing the distribution of IPOs with that of ICOs, British territories make up 27% of non-domestic IPOs, arguably because of tax reasons. At first glance, therefore, the tax havens are as attractive for ICOs than they are for IPOs.

3.2 Methods

The dependent variable of interest in our study is the aggregate number of ICOs launched in a country between 1 January 2017 and 31 March 2018, showing the propensity for ICO-backed entrepreneurial ventures from a geographical perspective. We collected information for the 187 countries that are member states of the United Nations.[4] We set the observation of all regressors at the beginning of 2017 (when possible, otherwise the nearest previous data point has been used, as detailed in Table 2).

We use negative binomial regressions with robust standard errors to conduct our country-level analyses. In order to test the four hypotheses presented in Section 2, we employ the following model:

$$\begin{aligned}\text{No.of ICOs} = \alpha &+ \beta_1 \times \text{Financial Development Index} \\ &+ \beta_2 \times \text{ICT Market Development} \\ &+ \beta_3 \times \text{ICO Regulation} \\ &+ \beta_4 \times \text{Crowdfunding Platforms} \\ &+ \gamma \times \text{Controls} + \varepsilon\end{aligned} \quad (1)$$

where the dependent variable, *No. of ICOs*, is defined as the number of ICOs identified in each country from 1 January 2017 to 31 March 2018, and four primary explanatory variables are considered.

[4] British territories (namely, Bermuda, Cayman Islands, Gibraltar, Guernsey, Isle of Man, and Jersey) are also considered. When data were unavailable for British territories, the UK data were used.

First, when testing hypothesis 1a, we employ a composite index, computed by the World Economic Forum from its Executive Opinion Survey, as a measure for the development of financial markets (*Financial Development Index*). This index stands for the efficiency of financial services meeting business needs and the availability of financing through local equity markets, and the trustworthiness and confidence of banking systems. When testing hypotheses 1b, 1c, and 1d, we replace *Financial Development Index* with the following three measures, respectively: (i) *Banking Index*—an aggregate value of demand, time, and saving deposits in banks, as a percentage of GDP; (ii) *Equity Market Index*—the market capitalization of listed companies in a country, as a percentage of GDP; and (iii) *VC Index*—the Venture Capital and Private Equity Attractiveness Index provided by Groh et al. (2018).

For the second explanatory variable in Eq. (1), *ICT Market Development*, we use a composite index measured by the Information Telecommunication Union, which covers three scopes of a country's developments in ICTs: ICT capability (skills and knowledge), ICT infrastructure, and ICT intensity of use.

The third explanatory variable in Eq. (1) is to identify whether ICOs have been regulated to some extent in a country. We construct a dummy variable (*ICO Regulation*) that is set to one when a country has acted or is acting to regulate bitcoin, zero for those countries that either have banned bitcoin, are undecided in respect of digital currencies, or do not regulate bitcoin. Based on existing light regulations of ICOs and digital token sales, Pinsent Masons (2017) groups regulatory regimes for the ICO market to three types: (i) open and liberal: Estonia, Russia, Singapore, and Switzerland, for instance, are regulation-friendly for ICOs. They allow ICOs but subject to future regulations, (ii) cautious but still open: the US, for instance, allow ICOs but heavily regulate them with various levels of rules across states, and (iii) strictly ban ICOs: such as China and South Korea. In this study, we assign a dummy value of 1 for countries in types 1 and 2 and of 0 for countries either in type 3 or unregulated.

The fourth exploratory variable aims to capture the scope of ventures that rely on external finance through online platforms. We use the number of crowdfunding platforms (*Crowdfunding Platforms*) from the World Bank Global Marketplace and Alternative Finance Data (2017) constructed by the Cambridge Centre for Alternative Finance to identify this phenomenon. Finally, we

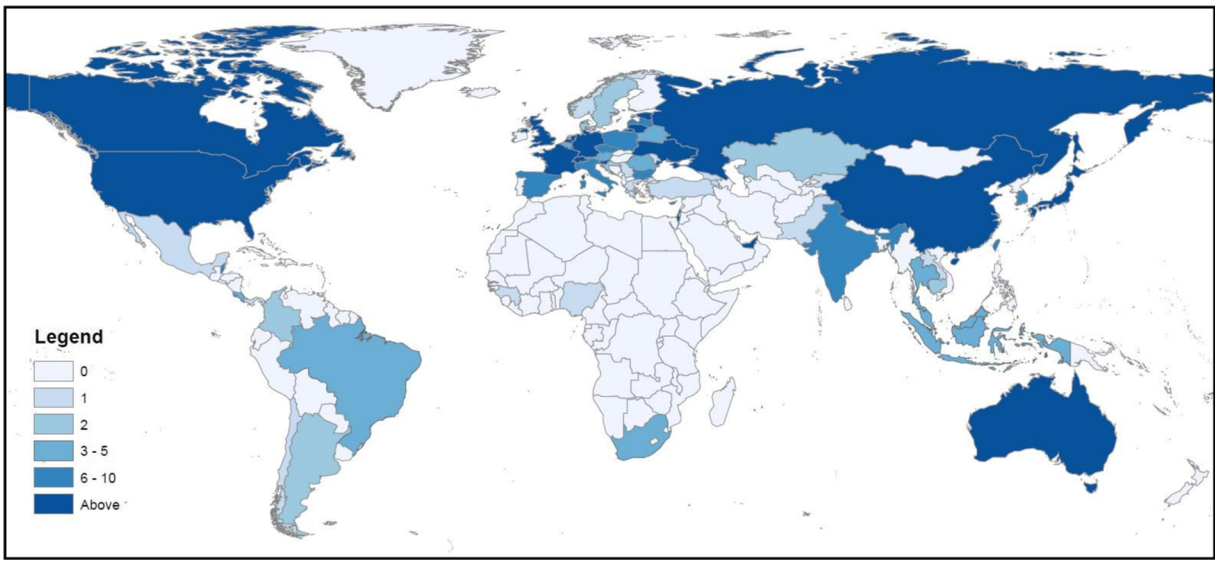

Fig. 1 Map of the world with the number of ICOs per country

Table 1 Distribution of ICOs among countries

Country	ICOs		IPOs on London's AIM	
	No.	%	No.	%
USA	178	19.5	69	10.4
Russia	111	12.1	30	4.5
UK	80	8.7	2709	Excluded
Singapore	75	8.2	7	1.1
Switzerland	46	5.0	8	1.2
Canada	29	3.2	43	6.5
Estonia	29	3.2	1	0.2
Hong Kong	20	2.2	4	0.6
Slovenia	18	2.0	0	0.0
Australia	16	1.7	40	6.0
China	15	1.6	2	0.3
Germany	15	1.6	4	0.6
Ukraine	15	1.6	0	0.0
France	13	1.4	3	0.5
Israel	13	1.4	35	5.3
Japan	13	1.4	1	0.2
Netherlands	12	1.3	24	3.6
British territories	18	2.0	181	27.3
Other countries	199	21.7	212	31.9
Total	915	100	3373	100 (for 664 IPOs)

The number of ICOs in 2017 and in the first quarter of 2018 per country (limited to countries with at least 12 ICOs) is reported. As a term of comparison, we report the number of IPO per country on London's AIM, since its inception in 1995 to the end of 2017. The percentages of IPOs by country are calculated excluding domestic IPOs. British territories (Bermuda, Cayman Islands, Gibraltar, Guernsey, Isle of Man, and Jersey) are included in our analysis. In this table, they are reported as a single entity

control for several fundamental macro-level variables that have the potential to influence entrepreneurial ventures and the formation of ICOs. This set of controls include a natural logarithm of GDP per capita in 2010 US dollar (*GDP per Capita*), a natural logarithm of a country's population level at the end of 2016 (*Population*), the density of people living in a country (*Density*), and the number of students enrolled in higher education (*Tertiary Education*). Detailed definitions for all our variables and data sources are summarized in Table 2.

Table 3 reports average values, standard deviations, minimum, and maximum values of our main variables, calculated over the whole sample, and referred to the five countries with the largest number of ICOs during the sample period (i.e., the USA, Russia, the UK, Singapore, and Switzerland). On average, there are four ICOs issued in our sample mainly in 2017. On the same year we observe less than one crowdfunding platform (mean value 0.88) established per country. This comparison highlights that the liquidity and efficiency of financing through this new financing channel has been highly recognized by new digital ventures. Of course, the premature ICO regulations also contribute to the record high phenomenon in such a relatively short period. Furthermore, we observe several distinct country characteristics. First, the phenomenon is strongly asymmetric, with the top 5 countries by the number of ICOs representing more than 50% of the sample (490 out of 915 ICOs). Indeed, the standard deviation of the number of ICOs is 16.58, indicating a

Table 2 Variable definition

Panel A. Dependent variable	
No. of ICOs	Number of initial coin offerings identified in each country, from 1 January 2017 until 31 March 2018.
Panel B. Explanatory variables	
Financial Development Index	Index based on 8 survey questions on financial services meeting business needs, affordability of financial services, financing through local equity market, ease of access to loans, venture capital availability, soundness of banks, regulation of securities exchanges, legal rights. Standardized in regression analyses. Source: Schwab 2016.
Banking Index	Aggregate value of demand, time and saving deposits in banks, as a percentage of GDP. Source: World Bank 2017 (Citing International Financial Statistics and International Monetary Fund).
Equity Market Index	Market capitalization of listed companies, as a percentage of GDP. Source: World Bank, World Development Indicators 2017, and World Federation of Exchanges database 2017.
VC Index	Venture Capital and Private Equity Attractiveness Index. Standardized in regression analyses. Source: Groh et al. (2018).
ICT Market Development	ICT development index is a composite index of a country's developments in ICTs. The index includes three scopes of digitalization: ICT capability (skills and knowledge), ICT infrastructure, and ICT use of intensity. Standardized in regression analyses. Source: The 2017 edition of the Measuring the Information Society Report, the Information Telecommunication Union.
ICO Regulation	Dummy variable equal to 1 for countries and territories that have acted or are acting to regulate bitcoin, or that have stopped short of regulating bitcoin, but have imposed taxes; it is equal to 0 for countries that have banned bitcoin, that are undecided in respect of digital currencies or do not regulate bitcoin. Source: Pinsent Masons (2017).
Crowdfunding Platforms	Number of crowdfunding platforms per country. Source: CCAF (Cambridge Centre for Alternative Finance) World Bank Global Marketplace and Alternative Finance Data, 2017.
Panel C. Control variables	
GDP per Capita	GDP per capita, in 2010 US dollar. Natural logarithms in regression analyses. Source: World Development Indicators.
Population	Country population at the end of 2016. Natural logarithms in regression analyses. Source: World Bank.
Density	Thousands of people living in each country, divided by the total territory surface, in square kilometers. Source: World Bank.
Tertiary Education	Gross enrolment in tertiary education (ISCED5 or higher), as a percentage of the population in the age group officially correspondent to the level of education. Source: World Bank.
Panel D. Explanatory variables in robustness tests/additional tests	
Financial Market Development Index	Index developed on several measures of four broad characteristics of financial markets: financial depth (size), access (degree to which individuals can and do use financial markets), efficiency (in providing financial services), stability. Standardized in regression analyses. Source: International Monetary Fund 2017.
Access to Banking	Proportion of the population with access to an account or financial service, either in the form of a financial institution or mobile money-service provider. Source: World Bank's Global Findex 2017.
Listed Firms/Population	Number of listed firms on all stock markets available in a certain country, divided by population in millions. Source: World Bank 2017.
Venture Capital Availability	Answer to the question (on a 1–7 Likert scale): "In your country, how easy is it for start-up entrepreneurs with innovative but risky projects to obtain equity funding?" Standardized in regression analyses. Source: Schwab, 2016 (Also a constituent of the Global Entrepreneurship & Development Index).
ICT Skills	An index for ICT capability (skills and knowledge), reflecting the capacity to use ICTs effectively. Standardized in regression analyses. Source: The 2017 edition of the Measuring the Information Society Report, the Information Telecommunication Union.
Data Blocks	The number of types of data blocked by a country that has enacted data-localization policies (laws or regulations). There are six types of data: (1) accounting, tax, and financial; (2) personal; (2) telecommunications; (3) emerging digital services; (4) government and public; and (5) other (mainly for specific processes or services, e.g., apps that provide services over the Internet, online gambling, financial transaction processing). Source: Cory (2017).

Table 2 (continued)

Crowdfunding Amount	Volume of activity on all crowdfunding platform by country, in million $. Natural logarithms in regression analyses. Source: CCAF (Cambridge Centre for Alternative Finance) World Bank Global Marketplace and Alternative Finance Data, 2017.
Taxation	Taxes on income, profits, and capital gains on the actual or presumptive net income of individuals, on the profits of corporations and enterprises, and on capital gains, whether realized or not, on land, securities, and other assets. Intergovernmental payments are eliminated in consolidation. Source: World Bank, Doing Business project, 2017.
Tax Burden	Composite measure of the tax burden, which includes direct taxes, in terms of the top marginal tax rates on individual and corporate incomes, and overall taxes, including all forms of direct and indirect taxation at all levels of government, as a percentage of GDP. The variable is defined as a 100-tax burden scale, such that highest values correspond to lower tax burden and vice versa. The variable is standardized in regression analyses. Source: The Heritage Foundation, 2017.
Tax Havens	Dummy variable equal to 1 for countries identified by the EU as non-cooperative tax jurisdictions. Source: ec.europa.eu/taxation_customs/tax-common-eu-list_en, accesed on 5 December 2018.

Variables are collected for 187 countries that are member states of the United Nations and British territories (namely, Bermuda, Cayman Islands, Gibraltar, Guernsey, Isle of Man, and Jersey). Missing data in sources provided below were filled in by accessing to country-specific databases, and converting currencies where needed. When data were unavailable for British territories, the UK data were used

substantial variation among countries. Differences among countries are strong both with respect to fundamental macro-level differences (such as *GDP* per Capita, *Population*, *Tertiary Education*) and the main variables used in our study. In particular, top countries by number of ICOs perform much better than the average in terms of *Financial Development Index*, *Banking Index*, *Equity Market Index*, and *VC Index* (with the exception of Russia, below the average with respect to the first and second variable). One common feature among these countries is that the development of their ICT market (*ICT Market Development*) is relatively strong and far above the average. All of these top 5 economies except Russia are characterized by a positive ICO regulation and excel in terms of the availability of crowdfunding platforms.

A correlation matrix is available in the Appendix (Table 9). The coefficients show that some correlations are weak and some are moderate. Indeed, multicollinearity is a potential issue. Our concerns are mitigated by the variance inflation factors (VIFs) and by the diagnostic recommended by Belsley et al. (1980), suggesting that multicollinearity should not be an issue to make our results sensitive (see footnote 6).

Table 3 Descriptive statistics for the main variables employed in the analysis referred to the full sample and to the top 5 countries for the number of ICOs between January 2017 and March 2018

	Full sample				Top 5 countries for the number of ICOs				
	Mean	Std	Min	Max	USA	Russia	UK	Singapore	Switzerland
No. ICOs (No.)	4.19	16.58	0	178	178	111	80	75	46
Financial Development Index (score)	4.00	0.75	2.07	5.79	5.56	3.43	4.93	5.69	5.26
Banking Index (%)	55.99	43.51	9.26	377.65	81.35	49.48	170.93	120.11	172.98
Equity Market Index (%)	47.55	27.48	2.70	92.70	92.70	67.90	91.60	84.20	80.60
VC Index (score)	71.48	13.95	44.30	100.00	100.00	63.50	94.40	90.70	82.20
ICT Market Development (score)	5.12	2.23	0.96	8.98	8.18	7.07	8.65	8.05	8.74
ICO Regulation (%)	10.50	30.79	0	1	1	0	1	1	1
Crowdfunding Platform (No.)	0.88	5.16	0	46	34	4	21	14	15
GDP per Capita (K$)	20.27	21.77	0.70	125.00	58.70	22.54	42.10	85.19	63.66
Population (Million)	34.14	134.15	0.00	1378.70	323.10	144.30	65.60	5.60	8.40
Population Density (K people/km^2)	0.45	2.05	0	20.20	0.03	0.01	0.27	7.90	0.21
Tertiary Education (%)	75.68	16.01	2.45	95.40	74.45	81.81	57.29	82.10	57.86

4 Results

Table 4 reports our main empirical results respectively for each hypothesis (models 1a–d to 4) and a joint assessment for all hypotheses (model 5). In model 1a, we find a positive and significant coefficient on *Financial Development Index* (coefficient 0.243, p value < 0.05), in line with our hypothesis 1a, supporting that ICOs occur more often in countries with well-developed financial markets. In models 1b, 1c, and 1d, we test for the role played by the specific market and find a significant positive coefficient only with reference to the variable *Equity Market Index* (coefficient 0.033, p value < 0.05), supporting hypothesis 1c, while no statistical significance supports hypotheses 1b, 1d, 1e, 1f, and 1g. We notice, however, that both coefficients for *Banking Index* and *VC Index* have a negative sign, coherently with hypotheses 1e and 1g, supporting the expectation of a negative effect of debt and private equity market on the number of ICO, though no statistical significance is found.

In model 2 of Table 4, we find a positive and statistically significant coefficient on *ICT Market Development* (coefficient 0.640, p value < 0.01), providing evidence in support of our hypothesis 2, in that ICOs occur more frequently in countries where the ICT is more advanced. In model 3, we analyze the role of regulation. The results show that ICOs occur more frequently in countries providing a clear regulatory framework for ICOs, which supports our hypothesis 3b. This is confirmed by the positive and statistically significant coefficient of our ICO regulation dummy variable *ICO Regulation* (coefficient 1.444, p value < 0.01),[5] while the same results lead to the rejection of the alternative hypothesis 3a. In model 4, we find a positive and significant coefficient on *Crowdfunding Platforms* (coefficient 0.046, p value < 0.05), supporting our hypothesis 4a, in that ICOs and crowdfunding play complementary roles, and therefore ICOs occur more frequently in countries with more developed equity crowdfunding markets. The same result leads to reject the alternative hypothesis 4b.

Lastly, in model 5, we jointly test for the significance of the four hypotheses, finding that our four main variables are all statistically significant, with p values lower than 5% in all cases.[6] As far as the control variables are concerned, we find that GDP per capita increases the number of ICOs, although the coefficient is not statistically significant in the full specification provided in model 5.[7] *Population* also plays a positive role, while we do not find any significant effect of the variable *Density* on ICOs and weak significance for the enrolment level of higher education (*Tertiary Education*).

4.1 Robustness tests

In this section, we aim to provide empirical support for the robustness of our results, testing our findings with respect to (i) definitions of variables used to test our hypotheses, (ii) taxation as a potential alternative explanation, (iii) alternative strategies to identify the reference sample, and (iv) alternative methodological settings.

First, in Table **5**, we report the results of our models when changing the variable employed for the tests of each hypothesis.[8] In model 1a, *Financial Market Development Index* replaces *Financial Development Index*; in model 1b, *Listed firms/Population* replaces *Equity Market Index*; in model 1c, *Access to banking*[9] replaces *Banking Index*; and in model 1d, *VC Availability* replaces *VC Index*. In model 2, we replace the variable *ICT Market Development* with one of its main components, ICT human capital skills (*ICT Skills*), reflecting the human capacity to use ICTs effectively.[10] In model 3, we replace

[5] Our *ICO Regulation* dummy takes the value of 1 for countries and territories that have acted or are acting to regulate bitcoin, or that have stopped short of regulating bitcoin, but have imposed taxes; it is equal to 0 for countries that have banned bitcoin, that are undecided in respect of digital currencies or do not regulate bitcoins. In Table 10 in the Appendix, we disaggregate such cases, we find positive significant coefficients for "Regulation" and "Taxation" and a negative coefficient for "No regulation" that are consistent with our findings in Table 4.

[6] We obtain the VIFs from a linear regression with the same specification as in our model, identifying a maximum level of 8.9, and an average level of 2.6, even in the full specification setting, below the classical threshold of 10 used to identify the multicollinearity concern. Given the non-linear nature of our model, we also calculate the Belsley, Kuh, and Welsch (1980) diagnostic on multicollinearity, which refers to both linear and non-linear models, reporting us a conditioning index for the matrix of independent variables of 24.93 (the authors set 30 as the threshold of the multicollinearity concern).

[7] In the Appendix, we report the results of our analysis when dropping the GDP variable (Table 11) and when repeating all regressions on the sample of 133 countries with full information available (Table 12). Our results are qualitatively unchanged.

[8] All our main variables replaced with alternative measures significantly correlated, at less than 1% significance, to the original value. Correlation coefficients are reported in the Appendix Table 9.

[9] This variable is available only for 90 of the countries covered by our analysis. Still, the variable is available for 51 out of the 73 countries with at least one ICOs, covering more than 80% of the total number of deals.

[10] We do not report an additional test fulfilled replacing the ICT development index with its component measuring the ICT infrastructure development. Results are qualitatively similar to our main findings.

Table 4 Determinants of ICOs localization

	(1a)	(1b)	(1c)	(1d)	(2)	(3)	(4)	(5)
Financial Development Index	0.243**	–	–	–	–	–	–	0.610***
	(0.109)	–	–	–	–	–	–	(0.207)
Banking Index	–	−0.002	–	–	–	–	–	–
	–	(0.004)	–	–	–	–	–	–
Equity Market Index	–	–	0.033**	–	–	–	–	–
	–	–	(0.014)	–	–	–	–	–
VC Index	–	–	–	−0.086	–	–	–	–
	–	–	–	(0.298)	–	–	–	–
ICT Market Development	–	–	–	–	0.640***	–	–	1.306***
	–	–	–	–	(0.225)	–	–	(0.243)
ICO Regulation	–	–	–	–	–	1.444***	–	1.150***
	–	–	–	–	–	(0.473)	–	(0.424)
Crowdfunding Platforms	–	–	–	–	–		0.046**	0.035**
	–	–	–	–	–		(0.023)	(0.018)
GDP per Capita	1.758***	2.023***	0.659	1.631***	0.615	1.563***	1.568***	0.213
	(0.343)	(0.406)	(0.753)	(0.310)	(0.470)	(0.247)	(0.251)	(0.491)
Population	0.451***	0.362***	0.628***	0.317**	0.274**	0.276**	0.272**	0.852***
	(0.114)	(0.090)	(0.177)	(0.137)	(0.127)	(0.116)	(0.119)	(0.154)
Population Density	0.067	0.074	0.231***	−0.019	0.028	−0.047	−0.014	0.245***
	(0.074)	(0.073)	(0.080)	(0.110)	(0.120)	(0.103)	(0.109)	(0.069)
Tertiary Education	−0.004	−0.014	0.032	−0.007	−0.027	−0.030	−0.013	−0.029*
	(0.020)	(0.022)	(0.024)	(0.019)	(0.017)	(0.019)	(0.020)	(0.017)
Constant	−17.147***	−18.640***	−7.019	−15.203***	−7.795***	−13.243***	−14.177***	−9.986**
	(2.746)	(3.093)	(6.056)	(3.011)	(3.022)	(1.957)	(1.926)	(3.909)
Observations	137	161	117	187	169	187	187	133
Log-likelihood	−254.4	−244	−170.5	−299.7	−281.9	−295.4	−299.2	−228.2

The results of negative binomial regressions on the number of ICOs by country are reported. Models 1a–d, 2, 3, and 4 test separately for hypotheses 1a–g, 2, 3, and 4, while model 5 provides for a joint test (excluding 1b, 1c, and 1d). In each model, we use all observations available, depending on the different sources. Robust standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels

the variable *ICO Regulation* with the number of data blocked (*Data Blocks*) by a country's enacted data-localization policies (laws or regulation). Lastly, in model 4, we replace the variable *Crowdfunding Platforms* with the volume of activity on all crowdfunding platforms by country (*Crowdfunding Capitalization*). As found by Vismara (2018), investments in an equity crowdfunding platform attract further demand. Details on all measures are available in Table 2. All models confirm our previous findings, with statistical significance below 1% (in models 2, 3, and 4) or below 5% (in models 1a and 1c).

Second, in Table 6, we test for an alternative interpretation possibly challenging our hypotheses and namely for the role of taxation. We first include a measure of total taxation in a country (*Taxation*), as available from the Doing Business Project of World Bank, for a parsimonious setting (model 1) and a full specification (model 2), respectively. In both cases, we do not find any statistical coefficient on *Taxation*, such that we do not have statistical significance to support the alternative explanation that ICOs are attracted by fiscal conditions. Next, we include a measure of the tax burden (*Tax Burden*) imposed by a government, including direct taxes and overall taxes, as a percentage of GDP, for a parsimonious test (model 3) or a full specification test (model 4). In this case, under the full specification, we find a statistically significant and positive coefficient. Given that the

Table 5 Robustness test with alternative measures for the main independent variables

	(1a)	(1b)	(1c)	(1d)	(2)	(3)	(4)
Financial Development Index	1.186**	–	–	–	–	–	–
	(0.880)	–	–	–	–	–	–
Access to Banking	–	0.029	–	–	–	–	–
	–	(0.022)	–	–	–	–	–
Listed Firms/Population	–	–	0.038**	–	–	–	–
	–	–	(0.015)	–	–	–	–
VC Availability	–	–	–	0.060	–	–	–
	–	–	–	(0.291)	–	–	–
ICT Skills	–	–	–	–	0.500***	–	–
	–	–	–	–	(0.124)	–	–
Data Blocks	–	–	–	–	–	0.501**	–
	–	–	–	–	–	(0.229)	–
Crowdfunding Amount	–	–	–	–	–	–	0.012**
	–	–	–	–	–	–	(0.006)
Financial Development Index	–	–	–	–	0.542***	0.715***	0.669***
	–	–	–	–	(0.207)	(0.231)	(0.208)
ICT Market Development	0.468**	0.728**	0.688**	1.195***	–	1.095***	1.066***
	(0.197)	(0.360)	(0.329)	(0.224)	–	(0.241)	(0.257)
ICO Regulation	1.132***	1.132***	1.132***	1.132***	1.132***	–	1.113***
	(0.431)	(0.431)	(0.431)	(0.431)	(0.431)	–	(0.404)
Crowdfunding Platforms	0.036**	0.036**	0.034**	0.034**	0.035**	0.039**	–
	(0.018)	(0.017)	(0.015)	(0.016)	(0.017)	(0.016)	–
GDP per Capita	1.363***	1.313**	2.023***	1.899***	0.778**	1.431***	1.768***
	(0.272)	(0.607)	(0.406)	(0.379)	(0.361)	(0.282)	(0.321)
Population	0.137	0.468***	0.362***	0.393***	0.290***	0.199	0.110
	(0.147)	(0.106)	(0.090)	(0.119)	(0.109)	(0.125)	(0.111)
Population Density	− 0.090	0.220**	0.074	0.033	0.053	0.019	0.069
	(0.105)	(0.088)	(0.073)	(0.069)	(0.114)	(0.111)	(0.055)
Tertiary Education	− 0.016	0.018	− 0.014	− 0.013	− 0.004	− 0.006	− 0.027
	(0.024)	(0.029)	(0.022)	(0.020)	(0.017)	(0.020)	(0.021)
Constant	− 12.045***	0.461	− 18.640***	− 17.975***	− 10.538***	− 13.361***	− 14.805***
	(2.317)	(5.385)	(3.093)	(2.513)	(2.568)	(1.975)	(2.349)
Observations	176	90	111	147	169	187	126
Log-likelihood	− 286.5	− 172.9	− 244	− 260.2	− 279.6	− 298.3	− 233.3

The results of negative binomial regressions on the number of ICOs by country are reported. Each model replicates a model in Table 4, with a change in the variable used for hypothesis validation: In model 1a, Financial Market Development Index replaces Financial Development Index; in model 1b, Listed Firms/Population replaces Equity Market Index; in Model 1c, Access to Banking replaces Banking Index; in model 1d, VC Availability replaces VC Index; in model 2 ICT Skills replaces ICT Market Development; in model 3, Data Blocks replaces ICO Regulation; and in Model 4, Crowdfunding Capitalization replaces Crowdfunding Platforms. In each model, we use all observations available, depending on the different sources. Robust standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels

tax burden indicator is higher when the taxation conditions are better (less burden), we have evidence that ICOs are also attracted by general better conditions in terms of taxation. Still, this result does not conflict with our former findings, which are all confirmed. In models 5 and 6, we include a dummy variable that

Table 6 Robustness test on the role of taxation

	(1)	(2)	(3)	(4)	(5)	(6)
Taxation	− 0.010	− 0.022	–	–	–	–
	(0.017)	(0.016)	–	–	–	–
Tax Burden	–	–	0.019	0.023**	–	–
	–	–	(0.017)	(0.011)	–	–
Tax Havens	–	–	–	–	− 0.839	0.314
	–	–	–	–	(1.014)	(0.771)
Financial Development Index	–	0.141**	–	0.528***	–	0.144**
	–	(0.069)	–	(0.198)	–	(0.067)
ICT Market Development	–	1.174***	–	1.347***	–	1.216***
	–	(0.233)	–	(0.238)	–	(0.249)
Crowdfunding Platforms	–	0.039**	–	1.319***	–	0.035**
	–	(0.017)	–	(0.438)	–	(0.017)
ICO Regulation	–	1.380***	–	0.040**	–	1.100**
	–	(0.460)	–	(0.019)	–	(0.454)
GDP per Capita	1.633***	− 0.092	1.722***	0.178	1.594***	− 0.253
	(0.266)	(0.485)	(0.266)	(0.464)	(0.250)	(0.514)
Population	0.307***	0.576***	0.312***	0.808***	0.292***	0.587***
	(0.104)	(0.105)	(0.113)	(0.142)	(0.107)	(0.133)
Population Density	− 0.043	0.074	− 0.089	0.175**	− 0.033	0.126*
	(0.108)	(0.074)	(0.116)	(0.069)	(0.100)	(0.072)
Tertiary Education	− 0.012	− 0.049***	− 0.006	− 0.034**	− 0.009	− 0.035**
	(0.018)	(0.016)	(0.019)	(0.016)	(0.018)	(0.016)
Constant	− 14.619***	− 3.233	− 17.590***	− 11.277***	− 14.615***	− 3.631
	(1.880)	(3.392)	(2.717)	(3.747)	(1.872)	(3.451)
Observations	187	133	175	133	187	133
Log-likelihood	− 299.5	− 230.9	− 286.2	− 226.5	− 299.3	− 233.8

The results of negative binomial regressions on the number of ICOs by country when taxation is taken into account are reported. We consider three types of taxation: (i) taxation—total income taxes of individuals, (ii) tax burden imposed by government, and (iii) tax havens—countries identified by the EU as non-cooperative tax jurisdictions. Detailed definitions of taxation variables are given in Table 2 panel D. We test each type of taxation respectively by adding it to our baseline specification and to the specification of model 5 in Table 4. Models 1 and 2 are based on total taxation. Models 3 and 4 are based on tax burden, while models 5 and 6 are based on tax havens. In each model, we use all observations available, depending on the different sources. Robust standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels

identifies tax havens, i.e., countries identified by the EU as non-cooperative tax jurisdictions.[11] The coefficient of this variable is not significant, once again pointing to a lack of evidence of the assumption that taxes are among the main drivers of ICOs.

Third, in Table 7, we test our full specification when recurring to alternative definitions for the sample of ICOs. In model 1, we limit our sample to the 578 ICOs that took place in 2017 (therefore excluding from our count variable the 337 cases occurred in the first quarter of 2018). In model 2, we repeat our analysis using 1129 ICOs from 2015 to March 2018, obtained from the website tokendata.io. In model 3, we repeat our analysis on the full sample, after excluding Switzerland. Up to 2017, this country, and in particular one of its Canton (Zug), has been viewed as a jurisdiction amenable to ICOs (Chohan 2017). Lastly, we exclude from our list the countries that are considered as tax havens, i.e., countries

[11] The list is periodically revised. At the time when our sample was identified, i.e., at the end of the first quarter of 2018, the most updated list was dated on 5th December 2017 and was available online at the following: https://ec.europa.eu/taxation_customs/tax-common-eu-list_en.

Table 7 Robustness test with alternative sample definitions

	(1)	(2)	(3)	(4)
Financial Development Index	0.161**	0.147**	0.138**	0.128**
	(0.067)	(0.062)	(0.066)	(0.063)
ICT Market Development	1.308***	1.543***	1.170***	1.469***
	(0.277)	(0.333)	(0.235)	(0.274)
ICO Regulation	0.848**	0.875**	1.054**	1.130**
	(0.398)	(0.348)	(0.472)	(0.457)
Crowdfunding Platforms	0.042**	0.042**	0.039**	0.041*
	(0.019)	(0.019)	(0.018)	(0.019)
GDP per Capita	− 0.399	0.140	− 0.163	− 0.723
	(0.587)	(0.633)	(0.496)	(0.508)
Population	0.583***	0.451***	0.580***	0.579***
	(0.143)	(0.157)	(0.129)	(0.136)
Population Density	0.126	0.126*	0.120	0.191***
	(0.090)	(0.076)	(0.076)	(0.073)
Tertiary Education	− 0.033*	− 0.065**	− 0.034**	− 0.042**
	(0.018)	(0.027)	(0.016)	(0.018)
Constant	− 3.289	− 8.661*	− 4.259	− 0.145
	(4.072)	(4.484)	(3.465)	(3.370)
Observations	133	133	132	124
Log-likelihood	− 198.4	− 140.2	− 228.9	− 219.6

The results of negative binomial regressions on the number of ICOs by country are reported. Model 1 refers to a sample of ICOs that took place in 2017 (i.e., excluding those occurred in the first quarter of 2018). Model 2 refers to a sample identified with an alternative approach that we obtained from the website tokendata.io. Model 3 excludes Switzerland. Model 4 excludes tax havens, i.e., countries identified by the EU as non-cooperative tax jurisdictions and listed at the following, on 5th December 2017: https://ec.europa.eu/taxation_customs/tax-common-eu-list_en. In each model, we use all observations available, depending on the different sources. Robust standard errors are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels

identified by the EU as non-cooperative tax jurisdictions. In all cases, our results are qualitatively confirmed, with limited changes in the significance of control variables.

Lastly, we address two methodological concerns, using two alternative specifications. First, we acknowledge that our hypothesis 4 about the complementarity between ICOs and crowdfunding platforms is related to our hypothesis 1 about financial market development. Crowdfunding markets are indeed a constituent of financial development. To address this concern, we replace the variable *Crowdfunding Platforms* with the residuals of a negative binomial model where *Crowdfunding Platforms* is regressed against *Financial Market Development*, *GDP per Capita*, *Population*, *Population Density*, and *Tertiary Education*. Results presented in model 1 of Table 8 confirm the validity of hypothesis 4. Second, only 73 countries out of 187 listed at least one ICO in our sampling period. This means that we have 114 zeros in our cross-sectional regression. As a robustness test to our results obtained from standard negative binomial models, we use a zero-inflated negative binomial model, where natural logarithm of a coun-

Table 8 Robustness test with alternative methodological specifications

	(1)	(2)
Financial Development Index	0.195**	0.148**
	(0.090)	(0.069)
ICT Market Development	1.171***	1.184***
	(0.234)	(0.218)
ICO Regulation	1.060**	1.013**
	(0.451)	(0.441)
Crowdfunding Platforms	0.035**	0.036**
	(0.017)	(0.017)
GDP per Capita	− 0.473	− 0.184
	(0.563)	(0.465)
Population	0.525***	0.549***
	(0.111)	(0.102)
Population Density	0.290***	0.120
	(0.100)	(0.124)
Tertiary Education	− 0.030*	− 0.037*
	(0.017)	(0.019)
Constant	− 1.132	− 3.859
	(3.910)	(3.216)
Observations	133	133
Log-likelihood	− 233.9	− 232.7
Vuong's test (z value)	–	1.48
Vuong's test (p value)	–	(0.098)

The results of two alternative specifications for model 5 in Table 4 are reported. In Model 1, we replace the variable *Crowdfunding Platforms* with the residuals of a negative binomial model where *Crowdfunding platforms* are regressed against *Financial Market Development*, *GDP* per Capita, *Population*, *Population Density*, and *Tertiary Education*. Model 2 is a zero-inflated model, where natural logarithm of a country GDP (2010 US$) is used in the logit specification (i.e., to discriminate zeros from positive values), and all other variables are used in the outcome specification. A Vuong test on the difference between the zero-inflated and the standard negative binomial specification is reported. Robust standard errors for model 1 and standard errors for model 2 are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels

try GDP (2010 US$) is used in the logit specification (i.e., to discriminate zeros from positive values), and all other variables are used in the outcome specification. A Vuong test on the difference between the zero-inflated and the standard negative binomial specification reveals indeed a weak difference between the two models (p value < 10%). Results reported in model 2 of Table 8 confirm our previous findings.

5 Conclusions

In choosing their location, digital ventures may not be driven by the same factors as more traditional entrepreneurship (Lehmann et al. 2018). Digitalization, indeed, allows for remote-based forms of organization and disintermediation, especially in the area of entrepreneurial finance. A well-established financial system consists of multiple layers of intermediations. Because of these administrative burdens, it creates ample space for entrepreneurs to propose new ventures of using technology (blockchain) to improve the efficiency of transactions. Our study highlights how important the development of an economy's financial system is for ICOs as it brings out the creation of digital innovative services with a strong impact on economic growth and productivity improvement. The data also demonstrates the importance of support from ICT investments in both digital infrastructure and human capital. As to the hotly debated topic discussed in the press, regulations on ICOs, there is a positive association between the enactment of ICOs and the emergence of ICOs, suggesting that countries that actively present their intentions on regulating ICOs, instead of banning ICOs or having no actions, attract more ICOs. Moreover, ICOs exist more in an economy wherein there are more crowdfunding platforms. We find no empirical evidence of a connection between ICOs and venture capital and private equity funds. We believe this finding reveals an important insight of a rise of formation of alternative capital markets that feature a direct and decentralized fundraising for meeting the demand and supply of capital in the coming future. Lastly, the impact of taxation is not as clear-cut as often assumed and should be more carefully addressed in future studies to reach a better understanding.

As a broader comment, when looking at the map of countries with the highest number of ICOs, one finds several countries that clearly perform well in terms of well-developed financial markets, ICT, and regulation, as in the case of most developed Western economies. On the other hand, there are a few apparent surprises. This is the case, for instance, of Russia which is the second country issuing most of the ICOs around the world, right after the USA. Among the five countries with the highest number of ICOs, Russia shows the minimum value for all our explanatory and control variables, with the exception of population and tertiary education. In particular, given that the traditions of mathematical education in Russia on both school and university levels, enormous unique and valuable research done by Russian scientists has been globally recognized to have substantial influence and impact on the development of mathematics, documented in the world cultural heritage (Hans 2012). In addition, it is testified by the continuous achievements in math competitions, such as the International Mathematics Olympiad, where Russian students classified second, behind the USA, in 2018. This fact may suggest future research on the hypothesis that an additional factor enhancing the success of ICOs in a given country may be the large availability of human capital especially skilled in mathematical knowledge.

This is one of the first empirical studies on ICOs. As for that, we expect it to be of interest for practitioners and policy-makers interested in this emerging financial market. For entrepreneurs, understanding the geography of ICOs is indeed useful to decide where to launch an ICO by identifying the most suitable regulatory, economic, and fiscal environment to raise funds through the issuance of tokens. For policy-makers, this offers fresh insights that can be used to draw comparisons across various types of early-stage capital markets, such as crowdfunding and (to a lesser extent) IPOs. The findings of the econometric analysis should also be of interest for researchers in entrepreneurial finance as well as in regional economics, as new insights are offered about the drivers of the ICO activity across countries.

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Appendix

Table 9 Descriptive statistics for all variables in use and a correlation matrix table

		Mean	Std	1	2	3	4	5	6	7	8
1	No. ICOs (No.)	4.19	16.58	1.00							
2	Financial Development Index (score)	4.00	0.75	*0.31*	1.00						
3	Banking Index (%)	55.99	43.51	0.16	0.24	1.00					
4	Equity Market Index (%)	47.55	27.48	*0.38*	*0.62*	*0.28*	1.00				
5	VC Index (score)	71.48	13.95	*0.39*	*0.75*	*0.35*	*0.68*	1.00			
6	ICT Market Development (score)	5.12	2.23	0.18	*0.33*	0.28	0.20	*0.62*	1.00		
7	ICO Regulation (%)	10.50	30.79	*0.42*	*0.43*	0.20	*0.40*	*0.41*	*0.47*	1.00	
8	Crowdfunding Platform (No.)	0.88	5.16	*0.47*	0.24	0.02	*0.41*	*0.42*	0.26	*0.35*	1.00
9	GDP per Capita (K$)	20.27	21.77	0.29	*0.54*	*0.40*	*0.40*	*0.63*	*0.62*	*0.42*	0.23
10	Population (Million)	34.14	134.15	0.19	0.06	− 0.05	0.22	0.08	*− 0.64*	0.04	0.09
11	Population Density (K people/km^2)	0.45	2.05	0.07	0.28	0.23	0.23	*0.29*	0.18	0.05	− 0.03
12	Tertiary Education (%)	75.68	16.01	0.18	*0.48*	0.26	0.23	*0.49*	*0.82*	*0.42*	0.17
13	Financial Market Development Index (score)	0.20	0.26	*0.35*	*0.44*	*0.47*	*0.69*	*0.47*	*0.66*	*0.42*	*0.37*
14	Access to banking (score)	84.55	17.06	0.19	*0.41*	*0.52*	*0.33*	*0.57*	*0.71*	*0.45*	0.24
15	Listed Firms/Population (No.)	26.48	43.53	0.12	0.31	0.16	*0.44*	0.24	0.30	*0.18*	− 0.10
16	VC Availability (score)	2.95	0.79	*0.35*	*0.61*	0.21	*0.58*	*0.62*	*0.32*	*0.33*	0.24
17	ICT Skills (score)	5.85	2.18	0.25	0.05	0.01	0.02	*0.37*	*0.88*	*0.39*	0.23
18	Data Blocks (No.)	0.24	0.63	*0.36*	− 0.09	− 0.09	0.28	0.12	*0.54*	*0.32*	− 0.13
19	Crowdfunding Amount (million$)	1009	9243	*0.68*	0.23	0.02	*0.29*	*0.32*	*0.57*	0.03	*0.45*
20	Taxation (%)	29.88	13.66	0.12	0.21	*0.22*	*0.35*	*0.34*	0.08	0.08	0.05
21	Tax burden (score)	76.68	13.41	0.25	− 0.01	− 0.07	− 0.30	− 0.27	*− 0.40*	*− 0.33*	*− 0.29*
22	Tax havens (%)	7.34	26.13	− 0.05	0.03	0.01	0.03	0.01	0.11	− 0.07	− 0.05

	9	10	11	12	13	14	15	16	17	18	19	20	21
1													
2													
3													
4													
5													
6													
7													
8													
9	1.00												
10	− 0.05	1.00											

Table 9 (continued)

	9	10	11	12	13	14	15	16	17	18	19	20	21
11	*0.38*	−0.03	1.00										
12	*0.67*	*− 0.47*	0.09	1.00									
13	*0.48*	0.07	0.12	*0.38*	1.00								
14	*0.70*	−0.30	0.13	*0.66*	*0.53*	1.00							
15	0.27	−0.19	*0.36*	0.21	0.27	*0.34*	1.00						
16	*0.57*	0.18	0.25	*0.39*	*0.45*	*0.41*	0.16	1.00					
17	0.27	*− 0.50*	0.01	*0.56*	0.18	*0.48*	0.19	0.01	1.00				
18	*0.35*	−0.21	−0.03	*0.37*	*0.32*	0.07	−0.07	0.22	−0.10	1.00			
19	0.18	0.19	*− 0.05*	0.01	0.26	0.09	−0.06	*0.34*	0.12	0.17	1.00		
20	−0.01	0.24	−0.17	−0.04	*0.37*	0.06	*0.32*	0.16	0.10	0.20	0.11	1.00	
21	−0.25	0.08	0.20	*− 0.42*	*− 0.39*	*− 0.37*	0.11	−0.06	*− 0.40*	*− 0.38*	−0.07	*− 0.37*	1.00
22	0.09	−0.06	0.15	0.18	−0.00	−0.01	−0.07	−0.02	−0.09	−0.02	−0.17	*− 0.41*	*0.31*

Coefficients statistically significant at less than 1% are in italic

Table 10 Determinants of ICO localization

	(1)	(2)	(3)	(4)	(5)	(6)
ICO Regulation: Regulation	1.449***	–	–	–	–	2.319***
	(0.472)	–	–	–	–	(0.380)
ICO Regulation: Taxation	–	0.499*	–	–	–	1.761***
	–	(0.289)	–	–	–	(0.577)
ICO Regulation: Ban	–	–	− 0.922	–	–	− 0.698
	–	–	(1.787)	–	–	(1.434)
ICO Regulation: Undecided	–	–	–	1.353	–	1.055
	–	–	–	(0.892)	–	(0.641)
ICO Regulation: No regulation	–	–	–	–	− 0.544*	–
	–	–	–	–	(0.300)	–
GDP per Capita	1.576***	1.569***	1.560***	1.499***	1.665***	1.322***
	(0.261)	(0.255)	(0.254)	(0.272)	(0.263)	(0.236)
Population	0.297***	0.299***	0.305***	0.244**	0.310***	0.144
	(0.108)	(0.107)	(0.104)	(0.100)	(0.103)	(0.094)
Population Density	− 0.079	− 0.021	− 0.028	0.001	− 0.018	0.027
	(0.098)	(0.107)	(0.105)	(0.107)	(0.103)	(0.123)
Tertiary Education	− 0.022	− 0.010	− 0.008	− 0.002	− 0.014	− 0.026*
	(0.019)	(0.019)	(0.018)	(0.018)	(0.019)	(0.015)
Constant	− 13.791***	− 14.425***	− 14.409***	− 14.357***	− 15.012***	− 11.380***
	(1.986)	(1.846)	(1.871)	(1.977)	(1.886)	(1.896)
Observations	187	187	187	187	187	187
Log-likelihood	− 296.5	− 299.5	− 299.6	− 296.5	− 299.2	− 285.7

Replication of Table 4, model 3, replacing *ICO Regulation* dummy with a set of dummies for (i) countries and territories that have acted or are acting to regulate bitcoin (*ICO Regulation: Regulation*); (ii) countries that have stopped short of regulating bitcoin, but have imposed taxes (*ICO Regulation: Taxation*); (iii) countries that have banned bitcoins (*ICO Regulation: Ban*); (iv) countries that are undecided in respect of digital currencies (*ICO Regulation: Undecided*); and (v) countries that do not regulate bitcoin (*ICO Regulation: No regulation*), according to classification by Pinsent Masons (2017). In models 1 to 4, we test each dummy separately, while in model 5, a joint test is conducted (*ICO Regulation: No regulation* is the reference case). *, **, and *** indicate significance at the 10%, 5%, and 1% levels

Table 11 Determinants of ICO localization

	(1a)	(1b)	(1c)	(1d)	(2)	(3)	(4)	(5)
Financial Development Index	0.237**	–	–	–	–	–	–	0.620***
	(0.104)	–	–	–	–	–	–	(0.202)
Banking Index	–	− 0.001	–	–	–	–	–	–
	–	(0.006)	–	–	–	–	–	–
Equity Market Index	–	–	0.035**	–	–	–	–	–
	–	–	(0.015)	–	–	–	–	–
VC Index	–	–	–	0.437	–	–	–	–
	–	–	–	(0.282)	–	–	–	–
ICT Market Development	–	–	–	–	0.876***	–	–	1.366***
	–	–	–	–	(0.111)	–	–	(0.203)
ICO Regulation	–	–	–	–	–	1.597***	–	1.132***
	–	–	–	–	–	(0.416)	–	(0.431)
Crowdfunding Platforms	–	–	–	–	–	–	0.046**	0.056**
	–	–	–	–	–	–	(0.022)	(0.024)
Population	0.575***	0.472***	0.579***	0.328***	0.269*	0.354***	0.363***	0.855***
	(0.113)	(0.101)	(0.167)	(0.103)	(0.145)	(0.094)	(0.090)	(0.153)
Population Density	0.222***	0.262***	0.263***	0.109	0.079	0.125	0.237**	0.253***
	(0.086)	(0.069)	(0.077)	(0.116)	(0.116)	(0.089)	(0.097)	(0.069)
Tertiary Education	0.069***	0.061***	0.045***	0.049***	− 0.022	0.044***	0.056***	− 0.026*
	(0.015)	(0.012)	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)	(0.015)
Constant	− 5.135***	− 4.003***	− 1.682**	− 3.222***	− 3.543***	− 3.213***	− 3.830***	− 8.459***
	(1.133)	(0.986)	(0.835)	(1.096)	(1.263)	(1.018)	(0.966)	(1.575)
Observations	137	161	117	187	169	187	187	133
Log-likelihood	− 254.4	− 244	− 170.5	− 299.7	− 281.9	− 295.4	− 299.2	− 228.2

Replication of Table 4 when dropping the variable *GDP per Capita*. *, **, and *** indicate significance at the 10%, 5%, and 1% levels

Table 12 Determinants of ICO localization

	(1a)	(1b)	(1c)	(1d)	(2)	(3)	(4)	(5)
Financial Development Index	0.245**	–	–	–	–	–	–	0.610***
	(0.111)	–	–	–	–	–	–	(0.207)
Banking Index	–	− 0.004	–	–	–	–	–	–
	–	(0.005)	–	–	–	–	–	–
Equity Market Index	–	–	0.033**	–	–	–	–	–
	–	–	(0.014)	–	–	–	–	–
VC Index	–	–	–	− 0.628	–	–	–	–
	–	–	–	(0.391)	–	–	–	–
ICT Market Development	–	–	–	–	1.243***	–	–	1.306***
	–	–	–	–	(0.211)	–	–	(0.243)
ICO Regulation	–	–	–	–	–	1.422***	–	1.150***
	–	–	–	–	–	(0.489)	–	(0.424)
Crowdfunding Platforms	–	–	–	–	–	–	0.039*	0.035**
	–	–	–	–	–	–	(0.020)	(0.018)
GDP per Capita	1.722***	1.802***	0.659	2.101***	− 0.212	1.658***	1.704***	0.213
	(0.345)	(0.398)	(0.753)	(0.430)	(0.501)	(0.311)	(0.322)	(0.491)
Population	0.452***	0.423***	0.628***	0.657***	0.545***	0.457***	0.434***	0.852***
	(0.114)	(0.111)	(0.177)	(0.148)	(0.093)	(0.130)	(0.132)	(0.154)
Population Density	0.073	0.092	0.231***	0.164**	0.211**	0.076	0.072	0.245***
	(0.075)	(0.072)	(0.080)	(0.067)	(0.086)	(0.065)	(0.071)	(0.069)
Tertiary Education	− 0.003	− 0.005	0.032	0.011	− 0.026	− 0.025	− 0.005	− 0.029*
	(0.020)	(0.022)	(0.024)	(0.019)	(0.017)	(0.021)	(0.023)	(0.017)
Constant	− 16.875***	− 17.328***	− 7.019	− 22.033***	− 4.506	− 15.099***	− 16.512***	− 9.986**
	(2.755)	(3.077)	(6.056)	(3.973)	(3.308)	(2.432)	(2.445)	(3.909)
Observations	133	133	117	133	133	133	133	133
Log-likelihood	− 254.4	− 244	− 170.5	− 299.7	− 281.9	− 295.4	− 299.2	− 228.2

Replication of Table 4 when limiting the sample to 133 observations only. *, **, and *** indicate significance at the 10%, 5%, and 1% levels

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