European Master in Law and Economics (EMLE)

Master Thesis

Warsaw School of Economics

SHOPPING FOR CONVENIENCE?

A L&E Analysis of FinTech Development in Europe

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Abstract: FinTech companies are increasingly encouraged by the EEA Member States as a key piece of their national innovation systems. However, the literature on the actual policies behind their development is still in its infancy. The present paper investigates the effectiveness of two policy instruments by examining their impact on FinTech's external equity funding from 2013 to 2021. Using fixed effects OLS regressions, it is found that there is a lagged relationship of the variable B-Index and External Equity Investments into FinTechs. Contrary to previous literature, no significant relationship is found for the effect of Regulatory Sandboxes, for which a theoretical account is developed.

Key Words: FinTech, Regulatory Sandbox, B-Index, External Equity Funding

JEL Classification: G23, K34, O38

List of Abbreviations

BERD	Business Expenditure in Research and Development
CRR	Capital Requirements Regulation
EBA	European Banking Authority
EBF	European Banking Federation
ECB	European Central Bank
EEA	European Economic Area
EIF	European Investment Fund
EMD	Electronic Money Directive
EP	European Parliament
EU	European Union
FinTech	Financial Technology
GDP	Gross Domestic Product
IP	Intellectual Property
ICT	Information and Communications Technology
IPO	Initial Public Offering
M&A	Mergers and Acquisitions
MiCA	Markets in Crypto-Assets Regulation
MIFID II	Second Markets in Financial Instruments Directive
MIFIR	Markets in Financial Instruments Regulation
MS	Member States
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
pc.	Per Capita
PSD2	Second Payment Services Directive
RegTech	Regulatory Compliance Technology
R&D	Research and Development

SMEs	Small and Medium Enterprises
SupTech	Supervisory Technology
TEEA	Treaty of the EEA
TFEU	Treaty on the Functioning of the European Union
VC	Venture Capital

Acknowledgment

My acknowledgement goes in the first place to my Thesis Director, Dr. Prof. Jarosław Bełdowski for his insight and corrections that helped me first to devise a suitable Thesis topic and then to structure my research plan. It is thanks to his guidance and knowledge that this research project has been able to fructify. I cannot either omit my gratitude to Mr. Łukasz Dąbroś for his disinterested help with the robustness and solidity of the empirical part of this Thesis.

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1. Introduction

The concept of FinTech stems from the combination of two words, financial and technology. Following the Financial Stability Board definition,[1] they are *"technologically enabled financial innovation that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions and the provision of financial services"*. Financial services are the core business of such companies and comprise activities like credit intermediation, risk management, compliance technology, foreign exchange services, insurance provision, asset management, financial advisory and payment services.

However, these companies differ from the legal category of financial institutions as considered by Art 4.26 of the Capital Requirements Regulation (CRR), as their main purpose is not to acquire holdings. Indeed, according to Elsaid (2021), FinTechs do not retain in their balance sheets funds from parties with which they operate, nor the intermediation risks derived thereof. In fact, their business model, unlike traditional financial institutions, is not based on the differential between cost of capital and return on assets. By contrast, they follow a fee-based model for revenues, and pursue a lean cost structure, which has been considered risky by some (Boot et al., 2021). Critically, their model does not depend on the margin of the operations but on their scale (Navaretti et al., 2018). A key difference with banks is that FinTech firms do not engage in maturity transformation (Boot et al., 2021). Moreover, there is no guarantee scheme backing the recoverability of funds transferred to them (Van Roosebeke & Defina, 2022). For this reason, FinTechs and banks may cooperate or compete, yet ultimately, neither can replace the other (Navaretti et al., 2018).

FinTechs' different function in the financial system (transaction enablers) and their supple structure have so far helped them to avoid prudential regulation requirements, as noted by Vives (2017). Whether FinTechs, as data intermediators, can alter the systemic risk level of the financial system is still highly debated, with experts arguing for (Qiu, Huang & Ji, 2018) and against (Haddad & Hornuf, 2022, Franco et al., 2020). At

[1] See http://www.fsb.org/what-we-do/policy-development/additional-policy-areas/monitoring-of-fintech/. Hereunder, all the references have been consulted on the 14/08/2023 for the last time.

present, prudential regulation reform is proposed to include these companies, not only with activity-based rules (based on sectors), but also with entity-based ones, tailored to FinTechs (Carstens et al, 2021).

The European Union has concerned itself so far with deploying facilitating legislation. First, the Second Payment Services Directive (PSD2, Directive 2015/2366, Art 36 and the Regulatory Technical Standards developed by the EBA on implementation thereof) that opened business sectors for FinTech, allowing these companies access to bank's proprietary data on client accounts upon their consent to provide payment transaction services. Also, upon the passing of the Crowdfunding Regulation and Directive (Regulation 2020/1503 and Directive 2021/2167), FinTech development was encouraged by facilitating cross-border credit brokerage without the need to assume operational risk by the platform. The Electronic Money Directive (EMD), 2009/110, allows the development of new products (e-wallets) which have less infrastructure requirements as previous payment instruments (credit and debit cards) and can be operated by these companies. The recent Markets in Crypto-Assets, MiCA Regulation (2023/1114) will attempt to stabilize the crypto market, while the Regulation 2022/858 on distributed ledger technology will open venues for their safer trading, thus increasing investor confidence. This regulation is also intended to extend the passporting regime. The trading of cryptocurrency is a lucrative business which is increasingly concentrating the Investments into FinTech firms (Cornelli et al., 2021). Finally, as was remarked by Kaja, Martino & Pacces (2021), FinTech companies have hitherto, fallen or strived to fall outside de scope of MIFID II (Directive 2014/65 as amended by Directive 2020/1504) and MIFIR, covering financial instruments markets (Regulation 2014/600). Nevertheless, reporting requirements established by these acts created the data pool necessary for FinTech companies to expand into the RegTech sector, advising companies with regulatory compliance (Zhang, Rohlfer & Rajasekera, 2020).

Looking to the future, the Digital Euro proposal incorporates explicitly the participation of FinTechs, regardless of whether their place of establishment is in the Eurozone or not. As registered payment services providers and electronic money institutions they may play a role in the distribution of the ECB's digital currency, should it be launched by the ECB (Mooij, 2022 Report for the EP). This is made possible by the choice of the European legislator which has been to use the legal base of Article 133 TFEU (primary

law provision allowing develop secondary law Regulation on the use of the euro and guaranteeing its single currency status) while considering 128(1) TFEU as a secondary legal base (another primary law provision, containing the concept of legal tender, which the co-legislators will expand to cover the Digital Euro). Finally in a second Regulation, the ECB will use its powers under 128(1) TFEU to issue technical framework governing the requirements for the design and issuance of the euro. Meanwhile using Article 127(2) TFEU, in its different combinations with ESCB Statute (Article 20 monetary policy instrument, Article 22 as a wholesale payment solution directly run by the ECB and Article 20, unintermediated distribution) would have made the Digital Euro a direct instrument of the ECB's monetary policy, completely under its control. This would have limited the role and income of FinTechs (ECB wholesale payment solution) or banks (unintermediated distribution), or even bypassed them. The proposed AML Regulation (2021/0239) ban on cash payments over 10.000 euros (in its amendments, the EP would even see the threshold reduced to 7.000 euros) will also provide a strong incentive for the development of FinTechs, specially in the payment sector.

However, this legislation at the European level can only be conceived as the foundation, while the different MS implemented dissimilar regulatory strategies to encourage FinTech ecosystems in their jurisdiction (Ringe & Ruof, 2020). The key point of enquiry of this dissertation will be whether these strategies are effective or not, and the extent to which they are shaping the development of FinTechs in the European Economic Area. Within this thesis the research question stresses two concrete regulatory strategies :

Do Regulatory Sandboxes and R&D tax incentives affect External Equity Investments in an EEA jurisdiction?

1.1 Scope of this Thesis

To answer it the scope of this work should be clarified. For the study at hand, the effect of the current regulatory and policy framework on the development of the FinTech sector is studied through its link to the level of external private equity capital raised, using a research design similar to Cornelli et al., (2021). In the context of FinTech, this

source of funding is especially relevant since most young companies require it for scaling up (Colombo, 2005), which is a critical sign of market maturity. It must be considered that the nature of these FinTech services (innovative *per se*, for which there is often no established business case yet) hampers access to debt financing, which compounds the importance of equity funding (Mention, 2019). In concrete, this paper examines how the introduction of a Regulatory Sandbox, and an advantageous R&D taxation regime impacts external equity funding. The paper presents two contributions.

First, a previously proposed accelerator of external equity funding, the Sandboxes (Cornelli et al., 2021) is tested against a sample of EEA countries, to provide for additional evidence. Secondly, a new approach is used to study the fiscal support for innovation and the development of the FinTech sector through the B-Index. This indicator, although not perfect (as it requires several strong assumptions and is not able to fully capture the support the tax system provides) is able to provide cross comparison of tax systems in a numerical, condensed form. This is fundamental to incorporating tax variables in the empirical analysis of FinTech development. The tax dimension is fundamental to ensure any L&E analysis does not lead to biased conclusions on the efficient legal system for FinTechs. As Heckman (1997) noted, any L&E analysis is necessarily incomplete if it fails to address redistribution by tax policy.

Conversely, the paper is subject to two types of limitations. To begin, data availability-imposed limitations: in our measurement of external equity capital Investment only the aggregated amount received through either Venture Capital, Private Equity, M&A or Public Listing (either Initial Public Offering or subsequent) was available. Hence, it was not possible to disaggregate the data by Investment vehicle or by FinTech sector. Due to gaps in the data for previous years, only data since 2013 are reported. Moreover, the results for Romania and Croatia are excluded due to lack of data points of the dependent variable. This limits the representativity of the sample but reduces the concern of non-random missing data bias (Wooldridge, 2010). Additionally, regressions were only controlled by the covariates that met the simultaneous condition of being consistently found in the previous literature (Polasik et al., 2020, Claessens et al., 2018, Rau, 2018, Haddad & Hornuf, 2019, Cornelli et al., 2021), and of being publicly available and comparable for all countries and periods, which might lead to omitted variable bias.

To continue, the legal limitations. By Equity Investment deals in European FinTechs, only the companies headquartered in the EEA have been included. As concerns

international investors, there is a strong protection to the freedom of movement of capital in the EU. The primary EU law base for this protection, is contained in Article 63 TFEU (which corresponds to Article 40 TEEA). To develop their activities, the entities studied possess the quality that they are also allowed to *passport* their services, that is, to export them from the Member State of their licensed activity to the other MS of the EEA, without applying for a license in the host country. This is derived from the fundamental freedom of movement of services (compiled in Articles 56 TFEU, 36 TEEA). Consequently, they can operate in other MS provided they have at least one national licence (Baba et al., 2020). This feature interplays with the fact that FinTechs are free to choose the Member States on which they want to be set up, which is granted by the freedom of establishment (Articles 49 TFEU, 31 TEEA). In the EEA, FinTechs and their investors are increasingly less likely to consider establishing themselves or investing where their potential clients are (Berg et.al 2020). Conversely, they are more likely to consider the regulatory support provided to them in the form of friendly policies as the passporting rights expand to cover new activities (Ahern, 2018). In the study Investment is assumed to move along with companies. The concept of Investment employed is that which equals the total value external capital inflows received by the FinTechs incorporated in a jurisdiction (which may change over time). Given this initial free choice of jurisdiction and the commitment of EEA States not to create barriers, these countries face higher regulatory and policy reform pressure than elsewhere for remaining attractive for FinTech companies and their investors.

1.2 Structure of this Thesis

The structure of this Thesis will follow the present order. To begin, section 1 introduces the topics. Section 2 will set the current state of the literature on the benefits of FinTechs and the determinants impacting the attractiveness of a given jurisdiction for FinTechs, along with a Law and Economics analysis of the key regulatory instruments where the research is focused. Then, section 3 will provide a hypothesis development on the base of the targeted policies, which will be summarised by Indexes. The purpose of section 4 is to provide a research design that introduces controls to isolate the effect of the regulatory policies deployed. Next, section 5 will provide information on the sample selection through data collection, preparation, and descriptive statistics. Finally,

section 6 presents the results, section 7 introduces robustness checks and section 8 provides policy implications and concludes.

2. Literature Review of FinTech Development

2.1 Benefits of FinTech Development for Jurisdictions

Facilitating the entry of new financial services providers by lowering barriers of entry (Sánchez, 2022), can be considered a positive regulatory externality (Den Butter & Mallekoote, 2018). Indeed, the mere entry provides users with more choice at the customer level (Carbó Valverde, Cuadros-Solas & Rodríguez Fernández, 2021), often of more innovative services than the existing ones (Romanova et al., 2018). Following Haddad & Hornuf (2019), FinTech firms play a complementary role relative to banks, because they leverage their data processing advantages to provide services to consumers with a higher a priori level of risk (Jagtiani & Lemieux (2017). Because the services offered by FinTechs go beyond traditional banking sector, and generally imply lower transaction costs, FinTech development can promote onboarding new financial services users and thus, to increase financial inclusion (Demir, Altunbas & Murinde, 2022).

A larger FinTech presence can also be beneficial to regulators that need to exchange current market knowledge with participants to update the rules in place and build regulatory expertise (Fahy 2022). On the one hand, the regulators need to assess the impact of new technologies on financial processes or consumer needs, which is easier to do with younger companies. These companies admit regulatory experimentation more readily, and share more information than established supervised entities, according to Zetsche et al., (2020), and Fahy (2022). On the other hand, FinTechs are an enabler of SupTech, the application of information technology to financial regulatory monitoring and compliance (Butor-Keler & Polasik, 2020). This is the case when technical innovation feeds regulatory innovation because these technologies function as a “plug-in” feature to private solutions (Allen, 2020).

What is more, controlled testing of regulated subjects’ new, previously unauthorised solutions allows for a build-up of readiness for future security threats to the financial system (Brauchle & Krüger, 2021). For example, such threats arise because FinTechs predominantly use wire transactions, like SEPA transfers or employ digital currencies along with encrypted distributed ledger technology (Faccia et al., 2020). This complicates detection of possible AML risks (like flow through of funds scenarios, dealing with sanctioned individuals). It also precludes possible double checks through

the SWIFT system, which are a benchmark practice for banking institutions (Meinzer, et al., 2023). In the current context, in which no regulator can guarantee the integrity of their system to cyber-attacks and digital financial fraud, this has been considered a successful risk-based approach strategy (Dupont, 2019). More experienced regulators can readily engage in domestical production of SupTech that is customised to new sources of market risk (Enriques, 2017). Thus, it is interesting to investigate if these experimental policy approaches impact on the development of the domestic FinTech sector. For the purposes of illustration, Table 1 provides sources of FinTech risks.

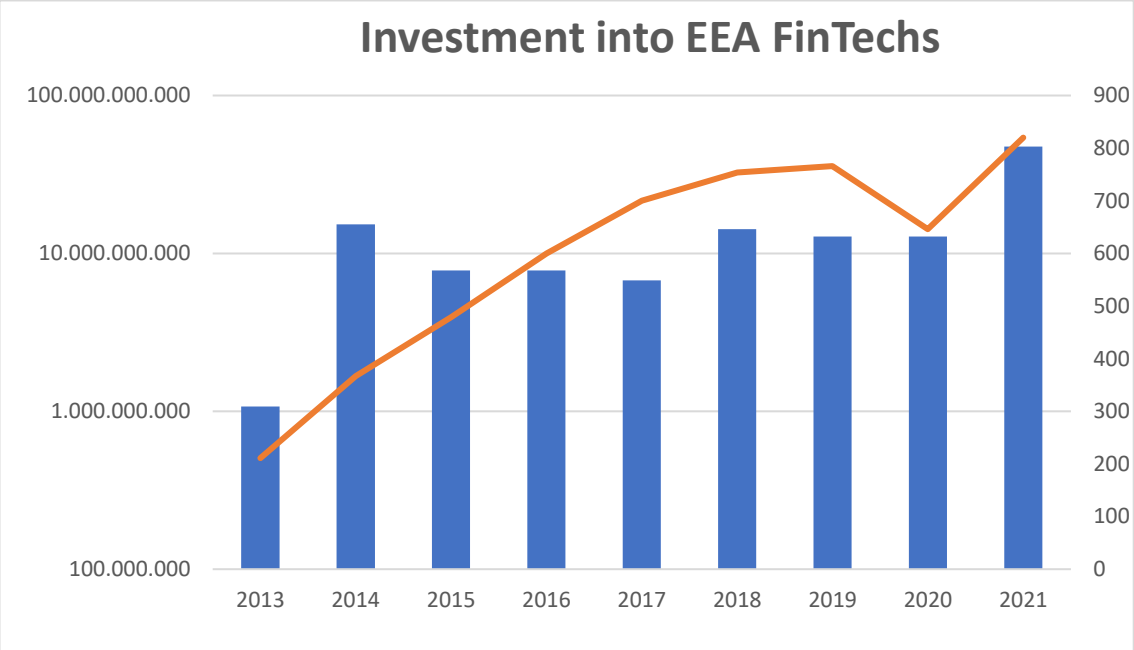
Table 1. Synoptic Table of Sources of Risks coming from FinTechs.

Table recovered from Risk Insights and Advisory FinTech Spotlight, Q2 2022 report. https://aite-novarica.com/report/risk-insights-and-advisory-fintech-spotlight-q2-2022. Consulted 14/8/2023 for the last time.

An illustration on the development of FinTech in the EEA, following their data, is presented in the Graph 1 (in logarithmic scale for the amount invested, and in arithmetic scale for the number of deals). The graph depicts an overall rising trend, both in the number of Investment rounds and in the amount of capital invested. However, three

periods can be defined. First, a strong increase from a very low starting point in 2013 can be noted. During this phase (2013-2014) Investment expanded to new sectors and new companies (Haddad & Hornuf, 2019). That is followed by a valley period (2015-2017). Nevertheless, the knowledge of investors of the opportunities in the EEA market increased (Teigland et al., 2018). This may explain the developments that have happened during this period, in which the number of Investment deals increased (Cornelli et al., 2021). Yet, the total value of Investments flatlined, indicating Investment into smaller companies and/ or earlier funding rounds (Teigland et al., 2018). Lastly, FinTech Investment rebounded strongly in the EEA after the first year of the COVID-19 pandemics, both in terms of number of deals and in the capital invested (Cornelli et al., 2021). Yet, this common picture is not very representative of the evolution of the individual players: strong shifts in Investment trends between the individual countries happened over the period of study, due to changing impact factors. Broadly, these factors can be classified into two groups, market development factors and regulatory factors. To begin, the market development factors. Such factors relate in turn to three distinct markets. The first is market demand for FinTech services. Next in relevance, the labour market supply of qualified professionals that FinTechs need to expand their output. Finally, as new players, FinTechs need to identify market entry opportunities to develop (Dorfleitner et al., 2017). Here, the dynamics of demand for substitutive or complementary financial services is key.

Graph 1. Investment into EEA FinTechs for the Period 2013-2021, both in Value of Invested External Equity and in Number of Deals.



Own elaboration based on data by Cornelli et al., (2021). The left-side legend refers to the Investment amounts data (in logarithmic scale, represented by blue bars), while the right-side legend refers to the number of deals concluded (in arithmetic scale, represented by the straight orange line).

2.2 Determinants for the Development of FinTech Companies in a Jurisdiction

Previous research has proposed several benchmarks to measure the expansion of FinTechs within national markets. Polasik et al., 2020 and Haddad & Hornuf, 2019 used as dependent variable the number of FinTechs established. Meanwhile, Cornelli et al., 2020 and Claessens et al., 2018, measured the FinTech credit to GDP ratio. Finally, Cornelli et al., 2021, studied the level of External Equity Investment provided to FinTechs. While the first variable allows counting the addition of new companies to the national FinTech ecosystems, it does not allow to measure how impactful these companies are as group. The second approach allows more cross-country comparability

but limits the study to only one sector of FinTechs (lending and crowdfunding). Finally, External Equity Investment is chosen for its theoretical properties hereunder described.

To continue, the dependent variable choice should be explained considering the literature. As it comes to it, the surge in the FinTech sector in an economy is driven increasingly by a strong availability of private external equity and specially, venture capital inflows to the jurisdiction (Cumming and Schwienbacher, 2018). VC-Funded companies tend to be more innovative, incorporating new products and services faster and achieve higher economic impact of developed R&D (Romain & Van Pottelsberghe, 2004). VC Investment was also studied as an anticipated indicator of innovation trends, which enables dynamic, anticipated regulation (Kaal, 2016). This in turn, allows regulators to learn and modify rules according to trends, avoiding the reform lags of traditional regulation (Kaal & Vermeulen, 2017).

On account of this, the more developed the surrounding Investment market is, the stronger the likelihood that this system can provide a meeting point between the capital raisers (be they equity investors or bondholders) and the entrepreneurs (Goo & Heo, 2020). It is interesting to highlight that in the case of European FinTechs, most of them are firms that are on their scaling-up phase of capital raising (Cornelli et al., 2020), where the prime sources of funding according to behavioural finance (own resources and debt) are constrained (Coleman, Cotei & Farhat, 2016). This is no trivial question.

On the one hand, the founders' own resources are limited, and overreliance on own funding can prove a risky strategy. According to Rzeszutek et al., 2021, it is difficult for the management of a company which does not have a proved business model, to estimate properly its cashflows, and consequently, to attract external capital.

On the other hand, access to banking credits for these types of companies is usually limited by their lack of collateral. For banks, this situation is perceived as increasing the risk of moral hazard (Blazy & Weill, 2013). Bank's monitoring functions are also complicated by the relative opacity in the valuation of their assets (highly innovative assets, patents, and IP). This leads to an adverse selection problem from the point of view of the lender (Giaretta & Chesini, 2021). Finally, investing in such infant companies requires assuming a level of risk that often only equity investors accept (Wonglimpiyarat, 2018).

As an alternative financing source, the overall availability of external equity funding plays a big role in the expansion of FinTech companies (Ahlers et al., 2015). Additionally, the fact that a firm has been chosen by a VC or private equity firm indicates that said investors consider the company to have met the due diligence criteria, or the screening phase (Buckley et al., 2020) and to have a high growth potential, which is a positive signal for the company (Kraljev, Flatten & Kindermann, 2021). VC and Private equity funds also offer reciprocal governance incentives (Jang & Kwak, 2022). Because having VC/ Private equity investors exit before the IPO is a bad signal for the company, its management is incentivized to maximise shareholder's profitability. Meanwhile for the investor, the profitability of the Investment depends on the growth (both in terms of sales and value of its assets) of the company, so they have incentive to ensure that the company is taking optimal decisions (Cavallo et al., 2019).

Now, the market development factors are discussed, along with their estimated effect on the dependent variable. The potential demand for FinTech services has been studied through several variables. The most important one, present in almost all the studies, is the GDP per capita (Frost et al., 2019, Claessens et al., 2018, Haddad & Hornuf, 2019). As a proxy for the level of economic development, this indicator correlates positively with the level of FinTech development of a jurisdiction. Richer economies provide more purchasing power, which makes them more attractive for FinTechs (Claessens et al., 2018). Yet, FinTechs are not an exclusive occurrence of these jurisdictions, as they are quite strong players in some developing economies as well (Cornelli et al., 2020). Additional variables frequently considered in the literature include mobile telephone subscriptions and internet (broadband) penetration, which share a direct relationship with the level of development of FinTechs in a jurisdiction (Polasik et al., 2020, Ivaschenko et al., 2018). A generic proxy for demand is the population base, which nevertheless, has ambiguous effects on the level of development of FinTech (Kolokas et al., 2022). In this respect, labour force size proved to be a more significant positive predictor (Haddad & Hornuf, 2019).

When it comes to the labour market, the ready supply of two types of professionals is of relevance for the literature. On the one hand, there is the supply of unemployed Investment bankers, which has been measured by indices that control for the effects of banking crises (Cumming and Schwienbacher, 2018, Haddad & Hornuf, 2019). The link here is positive, meaning FinTechs proliferate specially in countries heavily impacted

by financial crises (Cumming and Schwienbacher, 2018). This follows from the labour economics interpretation: the indicator has been interpreted in the previous literature as the market availability and quality of ex-bankers, the entrepreneurial component of the FinTech sector, who provide the directive capacity and market knowledge necessary to set up the enterprise (Brandl & Hornuf, 2020). As for the availability of ICT experts, Kliber et al., (2021) and Wintermeyer & Basit (2017) show, for different countries, its strong positive correlation with the development of FinTechs. Theoretically, this also follows from general labour economics, where increasing the supply of labour reduces the wage premium and subsequently, the level of fixed costs of the companies (Oi & Idson, 1999), which is positive for their long-term competitiveness.

Finally, authors who have dealt with the financial market impact factors explain how FinTechs interact with banks. This interaction may be cooperative or competitive, depending on the sector (Navaretti et al., 2018). In case of complementarity, higher demand for bank services would drive up the demand of FinTech services. As an example, it can be mentioned the development of payment FinTechs, wherein the FinTechs earn fees by providing a solution, but the banks retain ownership over the final transaction (Vives, 2017). Interaction can also be competitive. Here, stressed banks were found to benefit FinTech development (Koetter & Blaseg, 2015). In the funding sector, Navaretti et al., (2018) made the point that higher bank loan interest rates correlate with higher Investment in FinTechs. These authors argue that banks request high interest rates to borrowers perceived as riskier. Since FinTech business behave as matching agents they do not retain lending risks, nor do they engage in maturity transformation, which generates liquidity risks. Because FinTechs are better shielded from risks, they are more willing to channel credit to these riskier borrowers (Haddad & Hornuf, 2019). Alternatively, small borrowers present high perceived transaction costs relative to volume lent. That makes the analysis of the credit history of borrowers and the accumulation soft information unprofitable for banks (Vives, 2017). In this case, FinTechs have an opportunity because they excel in the processing of hard data and have smaller per transaction costs (Buckley & Webster, 2016). This analytical finding was contested as FinTech risk pricing was shown to be akin to that of banks (Johnson et al., 2023), proving that FinTech do not use better credit evaluation indicators than traditional financial intermediaries. Besides competitive dynamics, other financial market factors can push the adoption of FinTech by the users of financial services. For example, lower accessibility to services of the existing financial sector can encourage

companies and clients to try FinTech services (Claessens et al., 2018). Haddad & Hornuf (2019) provide empirical evidence that higher accessibility due to more bank branches per 100.000 citizens (here defined as physical retail locations) is correlated with more FinTech startup foundations in a jurisdiction.

The second group is the policy variables, which measure the incentives the regulatory system provides to the development of FinTechs. These have been measured by different variables. A crucial one is whether the country in question disposes of one or more dedicated financial Innovation Hubs or Regulatory Sandboxes (Cornelli et al., 2021). Without going into a developed conceptual exposition of what the Sandboxes or Innovation Hubs are, which will be treated in the next section, it should be noted here that these two institutions serve at least two powerful economic functions, which lead to a positive effect on the establishment of FinTechs in a jurisdiction (Goo and Heo, 2020):

First, because they cure or at least alleviate the regulatory information disadvantage between established firms and new entrants (Cornelli, Gambacorta & Merrouche, 2020). This is done either by the direct provision of information, which reduces regulatory information costs (Innovation Hubs) or by an experimentalist approach (Zetzsche et al., 2017) in which regulatory compliance rules are suspended or flexibilized (Sandboxes).

Second, because they provide a signalling function. Through their establishment, regulators show that they are amicable to financial innovation (Buckley et al., 2020). In particular, for Regulatory Sandboxes, the signal is considered stronger since their implementation costs make them hard to copy by competing jurisdictions (Allen, 2020).

3. A Law & Economics Analysis of Instrumental Policies in the FinTech Sector

3.1 Introduction to Regulatory Competition

Regulatory Competition in Europe has been mainly studied in company and labour law (Enriques & Gelter, 2006, Héritier, Knill & Mingers, 1996). More recently the phenomenon has been studied in financial regulation, because of the benefits it can provide (Ringe, 2016). The particularity of this phenomenon in the case of FinTech is that the competition has not developed only by the amendment of the laws themselves, but also through non-conventional regulatory instruments, such as the Regulatory Sandboxes and Innovation Hubs (Ahern, 2022). Two lines of action provided by the European regulators that promote the development of FinTechs in their jurisdiction are of interest for the purposes of this study. Those are Regulatory Sandboxes and Innovation Hubs and the fiscal regime for R&D.

3.2 Regulatory Sandboxes and Innovation Hubs

First, Regulatory Sandboxes and Innovation Hubs will be dealt with separately, as their Law and Economics analysis grants specificities.

Regulatory Sandboxes can be considered the most advanced form of experimental regulation for FinTechs (Ranchordás, 2021). Sandboxes are a policy instrument that was initially specifically conceived for FinTechs, but which is currently expanding into other sectors (Sherkow, 2022). They were conceived to provide qualifying FinTechs with a time screen during which appliable financial regulation or licensing requirements were partly waived (Buckley et al., 2020). This temporary waiver gives FinTech companies the opportunity of customising their solutions to levels not expressly permitted by the law, even though they must remain aligned with the general purpose of the law (Ahern, 2021). At the same time, they provide a positive signalling function (Zetzsche et al., 2017). This function is fundamental to build trust for bringing in the necessary capital for the FinTechs serving a national market (Klingler, 2019). This

signalling is double, as it goes from regulators to FinTechs (Buckley et al., 2020, Fenwick, Vermeulen and Corrales 2018), by conveying flexibility, and from participating FinTechs to investors (Klingler, 2019), by communicating less regulatory uncertainty (Crane, Meyer & Fife, 2018). However, it might be the case that not all Sandboxes provide equally effective signals (Fahy, 2022). A formal analysis of this theory, inspired on the Spence (1978), model, can clarify when Sandboxes are successful. Namely, this requires meeting two constraints.

For:

θ_H = benefits a highly experienced regulator can claim to provide investors with.

θ_L = benefits regulators with lesser experience can claim to provide investors with.

$c(u(RS)|_H)$ = cost of upkeep (not only financial, also reputational, and prudential related) of a Regulatory Sandbox conditional on being a country with high regulatory quality.

$c(u(RS)|_L)$ = cost of upkeep of a Regulatory Sandbox conditional on being a country with low regulatory quality.

Costs of upkeep decrease with regulatory quality.

$c(u(RS)|_L) > c(u(RS)|_H)$

Investors only observe whether there is a stable Sandbox or not, e.g., whether u (RS) = 0 or not.

When no Sandbox is established, $c\,(0|_L) = c\,(0|_H) = 0$

These constraints must be met simultaneously.

1) Participation Constraint. For both groups of countries to exist,

$\theta_H - c(u(RS)|_H) \geq 0$

$\theta_L - c(0|_L) \geq 0$

2) Separation Constraint:

$\theta_L \geq \theta_H - c(u(RS)|_L) \cap \theta_H - c(u(RS)|_H) \geq \theta_L$

Firstly, a peculiarity of applying the model to public bodies is that for the separating equilibrium to function well, regulators are required to follow the public interest. No budget maximising bureaucratic behaviour *à la Niskanen* (Niskanen, 1968) is allowed.

Awareness of their expertise requires regulators to take the decision which yields higher societal net benefit. For inexperienced regulators that implies abstaining from establishing Sandboxes. Meanwhile, experienced regulators would always prefer to establish a Regulatory Sandbox. According to Ahern (2019), this can be justified by self-interest, as establishing a Sandbox yields more net benefits than not establishing it. This would happen if the Sandbox's benefits, in terms of innovations incorporated and seconded firm's success is superior to the cost of the upkeep of the organism and the increase in risk (systemic risk for regulators and fair competition risk for firms). This assumption is difficult to test, because it entails trade-offs (Yadav & Brummer, 2019).

Secondly, because of the high cost of running and maintaining a Regulatory Sandbox, investors can credibly rely on their existence to consider a jurisdiction is prepared for accommodating more FinTech funding (Parenti, 2020). Authors like Zetzsche et al., (2017), conclude that the mere existence of a Sandbox is insufficient for reaching a separating solution and propose focusing on qualitative aspects of their regime. Meanwhile, Buckley et al., 2020, defend that maintaining a Sandbox is only possible for experienced regulators, while highlighting the diminishing effects of *"copycat"* Regulatory Sandboxes (Buckley et al., 2020). Ringe & Ruof, 2020, taking stock of the previous literature, contend that it is premature to discard Sandboxes. An EU-wide coordinating institution can improve the regime over time, encouraging national institutions to focus on niches.

From FinTechs to investors the signalling effect comes from the fact that the company was able to pass the screening by the financial authority for admission to the Sandbox (Kraljev, Flatten & Kindermann, 2021). Passing the screening proves that the company is proposing a truly innovative product (Ahern, 2019) and, at the same time, that there is a reduced likelihood of regulatory liability (Knight & Mitchell, 2022).

Indeed, Sandboxes are not only a signalling instrument, but they also serve several governance functions (Brown & Piroska, 2022). The discussion focuses on investor related ones as dealt by Ringe & Ruof (2020). To begin, the Sandbox regime requires an exit strategy, so the company is pushed to preestablish the conditions in which it wants to access the market after leaving the program, which provides assurance to its investors

against contingencies. They also shorten the time-to-market cycle, lowering the regulatory compliance disadvantage and the risk of copy vis à vis incumbent firms. By making firms' projected cash flows appear sooner (even before licencing), Investments turn more liquid and easier to amortise (Gelis, 2016). Finally, early interaction between the regulator and the Sandboxed firm makes technological adaption costs assumable and simplifies investors decision for bringing their capital to the FinTech (Pearse, 2016).

The negative aspects of this regime are twofold. First, there is a problem with the screening of which proposals are truly innovative and therefore qualify for inclusion in the Sandbox (Buckley et al., 2020). Second, following Omarova (2020), there is the problem of not enforcing enough transparency on the conditions applying to the company when it exchanges information with third parties (notably prospective users).

Innovation Hubs provide dedicated information points for FinTech start-ups to develop and discuss proposed innovations (Buckley et al., 2020). Contrary to Sandboxes, Innovation Hubs are more prescriptive than dialogical in nature (Ahern, 2019). Their main added benefit is reducing the regulatory information costs, while still allowing a learning process by regulators on the needs of FinTech companies (Allen, 2020). Because their design is simpler and less resource intensive, Innovation Hubs allow to reach a much wider segment of the FinTech crowd (Alaassar et al., 2023). Additionally, these institutions have been organized also at a supranational level. Both the ECB and the BIS have launched their own programmes (Chobanov, 2019). Innovation Hubs also help spread information on regulatory issues faster. Thus, they homogenise the level of information of all players, reducing information asymmetry (Fáykiss et al., 2018).

In addition, Innovation Hubs can also facilitate cross-border activity (Ng & Kwok, 2017). This is made via bilateral cooperation agreements which allows for the exchange of information between financial regulators and for an eased clearing of an approved (referred) FinTech of one jurisdiction to carry business in the other jurisdiction (Fahy, 2022). Currently, virtually all EEA countries have developed at least one Innovation Hub, if not several, as reported by the EBA[2]. Finally, Innovation Hubs also serve to involve capital to invest in firms that are yet in the development stage (Wonglimpiyarat, 2018). They can do so by actively leveraging investment by private actors (for example by promoting crowdfunding platforms).

[2] See https://digital-finance-platform.ec.europa.eu/efif/cross-border-testing/participants for a list of Innovation Hubs.

3.3 R&D Tax Regime

The R&D regime focuses more on the *tech* component of the FinTech duo. R&D is a powerful factor to consider for small and highly innovative firms like FinTechs (Goo & Heo, 2020). Furthermore, there is an established literature to corroborate the relocation effect that R&D tax regimes (Arundel et al., 2008, Billings, 2003), have for innovative companies. There are at least two mechanisms that may explain why a generous R&D regime attracts the establishment of FinTechs.

First, from a supply side perspective, FinTechs serve as creditors and payment facilitators to R&D intensive industries (Kowalewski & Pisany, 2022). Indeed, in these industries FinTechs face lower competition from banks, which are traditionally more reticent to finance such companies (Schneider & Veugelers, 2008). Hence, encouraging the development of these complementary industries will also provide for an attractive environment for FinTechs themselves to develop (Piga & Atzeni, 2007). In this respect, an R&D regime in which the collaboration between universities and private business predominates is strongly recommended (Kowalewski & Pisany, 2022). What is more, also enabling property rights for university researchers' findings has a positive spillover effect, encouraging also private R&D efforts (Hvide & Jones, 2018).

Second, from a demand side perspective, FinTechs carry on their own research efforts, which can be facilitated by the State reducing the costs of these investments (Olsson & Hallberg, 2018). In the FinTech sector the previous authors have highlighted that there is no such a thing as a patent hold up problem (that is, companies not incurring R&D expenses in anticipation that there will be another competitor who will patent first and capture the whole rent from the innovation), yet Ahern (2022), has countered the argument by suggesting that fast track patenting procedures enhance the attractiveness of a jurisdiction for a FinTech, because it allows companies to internalise the positive externality of their innovative activity (Cassiman & Veugelers, 2002).

Additionally, R&D grants and procurement play an important role in the funding of the first stages of FinTechs (Stojčić, Srhoj & Coad, 2020). Indeed, financial constraints and R&D subsidy application are plausibly correlated, especially for young companies (Busom, Corchuelo, & Martínez-Ros, 2014). Direct subsidy policies present, however,

the concern that the subsidies may not be reaching the companies presenting a more innovative proposal (Czarnitzki et al., 2011). They may even dissipate the already small resources of these companies in efforts to achieve these subsidies (Guisado-González et al., 2018). Meanwhile the possibility to have corporate tax benefits on R&D expenses is also a good way to increase the profitability of FinTechs, reducing their tax base (Kliber et al., 2021). Tax breaks have been shown to be negatively correlated with financial constraint (Busom, Corchuelo, & Martínez-Ros, 2014). Yet, tax breaks are general, such that they are less prone to distort economic behaviour than subsidies, which are discretionary (Sykes, 2005). Nevertheless, access to an R&D tax incentive, requires specialized knowledge on the tax law of a jurisdiction, which leads to short-term information asymmetry between entrants and firms which already performed R&D in the jurisdiction (Wasserman & Bornman, 2020). However, information asymmetry cannot be discarded in the case of subsidies either. What is more, Dimos et al., 2022 have found that the impact of corporate tax incentives on R&D expenses of high-tech firms is stronger than the impact of subsidies.

4. Hypothesis Development

To answer the research question, two indicators will be tested, the Sandbox Indicator and the B-Index indicator.

$$FinTechInvest = f(Sandbox, BIndex)$$

Hypothesis 1: Regulatory Sandboxes have a positive impact on FinTech development.

This hypothesis is supported by the positive signalling argument (Fenwick, Vermeulen and Corrales, 2018), as well as from the corporate governance arguments of Ringe & Ruof (2020). This hypothesis will be operationalised by a dummy variable taking the value 1 in case a jurisdiction approved a Sandbox in any point during a year and thereafter, and 0 otherwise. No case was found of a Sandbox being dissolved. Innovation Hubs will not be empirically examined. Since most European jurisdictions already have one, the possibility to look at their added benefit is excluded (thus they cannot generate a valid dummy variable, because there are not enough counterfactuals).

$$\frac{\partial \text{FinTechInvest}}{\partial \text{RSandbox}} > 0$$

Hypothesis 2: Tax Incentives for R&D have a positive impact on FinTech development.

Our second hypothesis requires previously introducing the concept expressed by the B-Index.

$$\text{B} = \frac{1 - zt}{1 - t}$$

This study follows the definition of the B-Index as developed by Warda (1996)[3]. The Index measures the level of after-tax cost of a marginal unit of expenditure on R&D divided by 1 less the corporate income tax rate. It can also be interpreted as the present value of pre-tax income necessary to cover the initial R&D outlay and to pay corporate income tax, so that the company breaks even. The variable z measures the level of Incentivization that an R&D expenditure enjoys over the normal tax treatment of expenditures. The model assumes the default is full deductibility of R&D outlays from the base of their corporate tax, as they generally receive the consideration of expenditures (Guellec & Van Pottelsberghe, 2003). This default mean value holds for the condition z = 1 which gives a B-Index of 1. If R&D is favoured by incentives on due tax beyond mere deduction, z > 1, B < 1 and conversely if it is not fully deductible then z < 1, and B > 1. The Index summarises a country's legal Tax Incentivization under the additional assumption of no tax exhaustion, that is, firms have sufficient taxable income to fully claim all the R&D tax incentives possible in the current year (Guellec & Van Pottelsberghe, 2003).

This hypothesis is supported by the argument that the innovation that FinTechs carry on and which is sought to be stimulated is characteristically readily marketable and has a short development period, which is more appropriately encouraged through tax incentives (Bloom, Van Reenen, and Williams, 2019). This thesis will operationalise it through a continuous variable, which we expect will have a negative sign. In concrete, this study takes the average between the R&D tax treatment for SMEs and non-SMEs so as not to prejudge the size of the FinTechs companies under study.

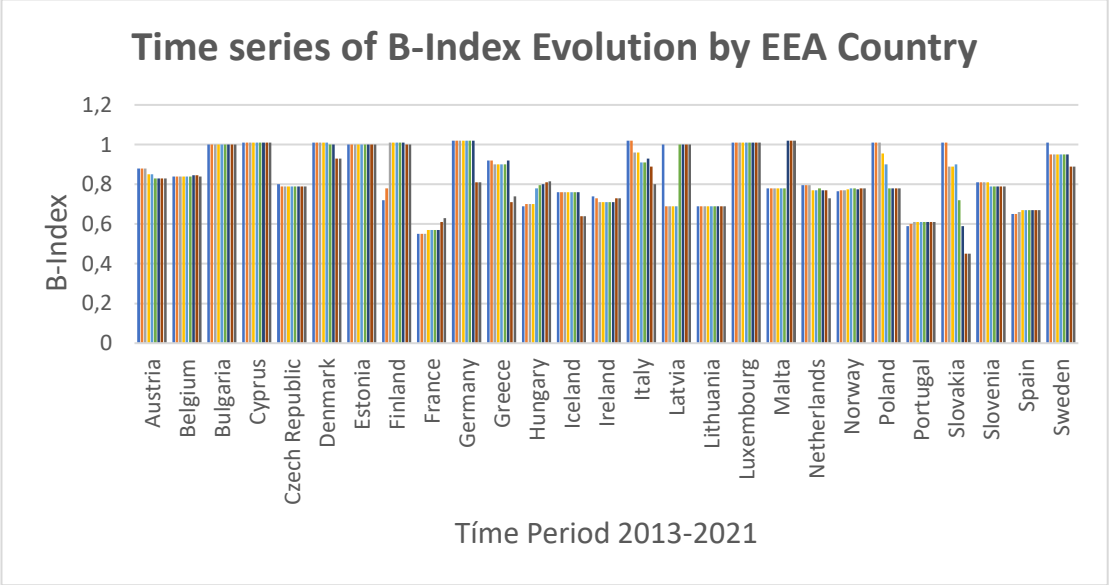
$$\frac{\partial \text{FinTechInvest}}{\partial \text{BIndex}} < 0$$

To further illustrate on the development of this indicator, Graph 2 provides an overview of the B-Index data for the EEA. As it can be seen the trend is a rising B-Index, with countries like Germany, Italy, Slovakia, and Poland introducing R&D tax incentives

[3] Several considerations are pertinent when employing this indicator. First the indicator employs deductible R&D expenses and extraordinary depreciations, other tax incentives and allowances, but excluding other potential regimes like patent boxes. Second, the indicator must be interpreted as an upper bound on the effective Incentivization of R&D since some countries introduce ceilings and thresholds to these incentives.

over the last decade. Meanwhile, countries like Greece, Austria and The Netherlands strengthened their tax incentives significantly. There remain some countries which have not adopted R&D expenses tax incentives, which show a B-Index of one or even larger than one (which happens for cases in which R&D capital costs cannot immediately be amortised): Cyprus, Estonia, Luxembourg, and Malta.

Graph 2. Evolution of the Level of Tax Incentivization of R&D in the EEA (2013-2021).



Own elaboration based on data by the implied Tax Incentivization Rates of the OECD https://stats.oecd.org/Index.aspx?DataSetCode=RDSUB.

5. Research Model

The dependent variables or variables of interest are the RSandbox indicator (which as previously announced is operationalised through a dummy variable taking the value 1 when there is a Sandbox present, otherwise 0) and the B-Index indicator.[4] Meanwhile the B-Index indicator is studied as a continuous variable, where smaller values of the B-Index indicate a stronger degree of Tax Incentivization.

The controlling variable for nominal GDP per capita was included in US dollars to follow more closely the data provided in the Cornelli et al., (2021) study, which was calculated in current dollars. The second control is labour force size, LF (to account for different market dimensions which gives an idea for potential demand for FinTech Services). Then, this study has included the share of E-banking users (EBankingS, or users who connected to their bank using the internet in the last 3 months) and broadband access shares by households both through fixed and mobile connections (BroadBandS) as a proxy for the material and practical technological ability of users in these countries. Finally, controls for the relative availability of qualified ICT professionals, measured as the share of ICT professionals in the total labour force (ICTS) and the accessibility of banks in the jurisdiction, through the number of bank branches (here as physical retail offices per 100.000 inhabitants, which provide an alternative source of financial services). With that description in mind, the following specifications are proposed:

1) $lnFinTechInvest_t = \alpha_t + \beta_1 RSandbox_{t-1} + \beta_2 lnGDP_{pc\ t-1} + \beta_3 lnLF_{t-1} + \beta_4 lnEBankingS_{t-1} + \beta_5 lnICTS_{t-1} + \beta_6 lnBroadbandS_{t-1} + \beta_7 lnBankBranches_{t-1} + \epsilon i,t$

2) $lnFinTechInvest_t = \alpha_t + \beta_1 BIndex_{t-1} + \beta_2 lnGDP_{pc\ t-1} + \beta_3 lnLF_{t-1} + \beta_4 lnEBankingS_{t-1} + \beta_5 lnICTS_{t-1} + \beta_6 lnBroadbandS_{t-1} + \beta_7 lnBankBranches_{t-1} + \epsilon i,t$

3) $lnFinTechInvest_t = \alpha_t + \beta_1 RSandbox_{t-1} + \beta_2 BIndex_{t-1} + \beta_3 lnGDP_{pc\ t-1} + \beta_4 lnLF_{t-1} + \beta_5 lnEBankingS_{t-1} + \beta_6 lnICTS_{t-1} + \beta_7 lnBroadbandS_{t-1} + \beta_8 lnBankBranches_{t-1} + \epsilon i,t$

[4] The Sandbox dummy is presented alone, as its interaction effects with the other relevant variables (GDPpc, E-Banking Share and B-Index) were all non-significant.

6. Data Collection, Preparation and Summary Statistics

6.1 Data Collection

For the study of external equity investment, the data is sourced from Pitchbook Inc., which studies public and private companies and has a worldwide coverage. This database registers investments in FinTechs extensively, which makes it suitable for the research strategy (Kassner, Cajias & Zhu, 2022). Additionally, the database has a focus on data on VC deals, which is interesting from the theoretical part of our study design (Hidayat et al., 2022). Most concretely, the dependent variable data was aggregated by Cornelli et al., (2021) for the studied period, with a linear extrapolation for 2021 data. Data on the remaining variables is sourced from the EBA webpage (Sandboxes), OECD (B-Index), Eurostat, the ECB Data Warehouse and World Bank's Global Financial Development Database (Controls). No data was excluded from the sample. However, there were missing data for some of the country-year pairs, leading to a slightly unbalanced panel. The analysis assumed a random distribution of missing datapoints, through their listwise deletion for computing the regressions (Little & Rubin, 1987).

6.2 Data Preparation

Our data treatment has abstained from removing outliers. Since the size of our dataset is already small, this would have reduced our datapoints further, compromising our analysis. Instead, on account of sample size constraints, priority was given to the reliability of the collected data (Gnecco, Nutarelli & Selvi, 2020). Therefore, the strategy was to reduce outliers' impact by obtaining the variables' natural logarithms, since none of the control variables takes negative values. This procedure follows the approach of the previous literature (see Cornelli et al., 2021, Polasik et al., 2020). Thus, the study design follows a log-log[5] transformation to the OLS model, except for the regressor for Sandboxes (which is a dummy variable) and the B-Index regressor (the B-

[5] The Log-Log OLS model follows this interpretation for the Beta coefficients: the expected percentual increase in the dependent variable (FinTech investment) for every one percent increase of the independent variables, holding the other variables constant.

Index takes values under one, which logged, would turn negative, thus obscuring the interpretation of the second hypothesis). Neither of these two variables was logged.

Addressing the reverse causality concern that FinTech companies might have captured national regulators, it is worth considering the case that the EEA financial market is still dominated by and large by banks (Macartney, Howarth & James, 2020), which have an opposed regulatory agenda to FinTech's. In this sense, as Magnusson (2018) recalls, they want to promote rules on financial regulation that assimilate FinTech's treatment to banks', thus increasing their stringency (Same risks, same rules principle). The banking sector enjoys a much stronger influence when compared to FinTechs. This holds at the European Level. Tellingly, the budget of the lobby group of the EBF (4.000.000-4.500.000 euros) is more than twenty times that of the European FinTech Association (100.000-199.999 euros).[6] It holds as well at the national level (banking concentration is quite strong across the EEA, with the five biggest banks in each jurisdiction holding on average 68,27% of total assets).[7] For what concerns EEA countries, this study follows Tran (2023) in considering that FinTechs are unlikely to be a powerful lobby and that measures that facilitate FinTech activity, such as Innovation Hubs or Sandboxes, have not been introduced as a result of the FinTechs lobby. However, to further allay the concerns of reverse causality it has been opted to lag the independent variables by one period. This is in line with previous research (Haddad & Hornuf, 2019, Claessens et al., 2018). No contemporaneous variables have been included as this would have increased bias (McKinnish, 2002). Lagging is also supported by established patterns of investor behaviour (Fazzari et al., 1987). External equity funds perform due diligence before signing an investment deal with a company, as well as to evaluate the fiscal regime of the country in which they are investing. Hence, the closing of a deal may take many months, which supports the one-year lag approach of our study (Colombo et al., 2019).

[6] See https://ec.europa.eu/transparencyregister/public/consultation/displaylobbyist.do?id=514240237898-38 and https://ec.europa.eu/transparencyregister/public/consultation/displaylobbyist.do?id=4722660838-23. Consulted 14/8/2023 for the last time.

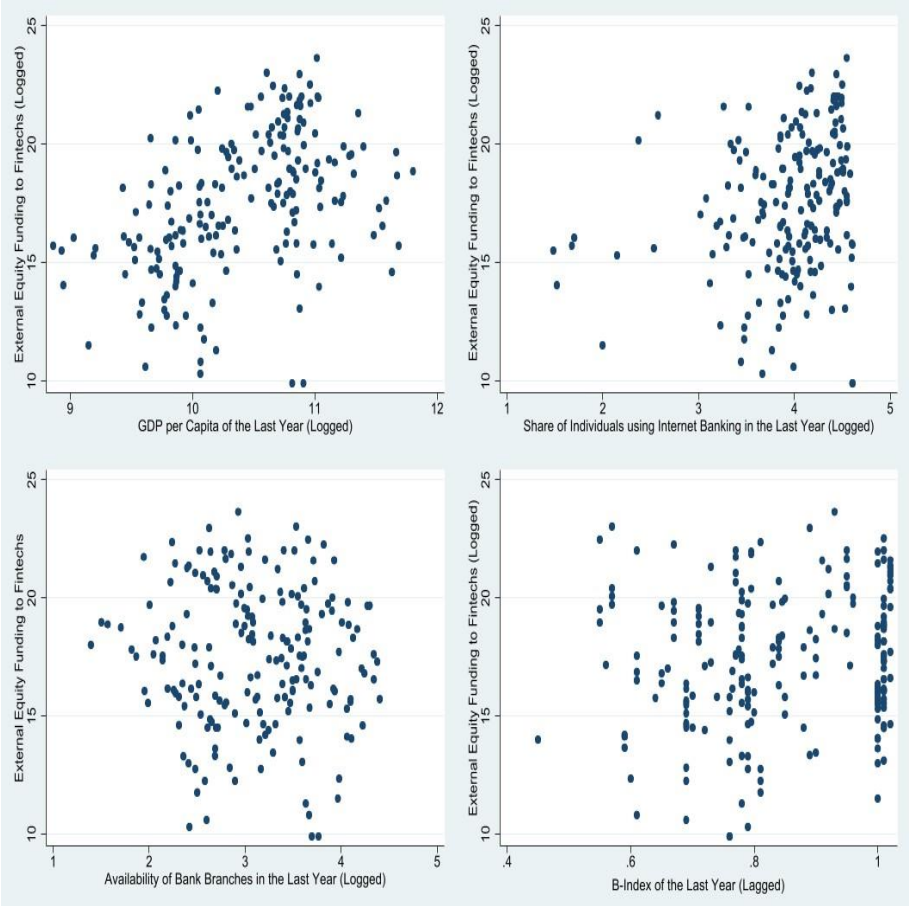
[7] See https://www.ecb.europa.eu/press/pr/date/2023/html/ecb.pr230601~1a54c64d97.en.html Consulted 14/8/2023 for the last time.

6.3 Descriptive Statistics

Descriptive Statistics are provided in Panel A of the Table 2 in the Annex, for easier consultation. Panel A shows the mean, standard deviation, minimum, mean, maximum, skewness and kurtosis of the sample. The share of country-years for which Regulatory Sandboxes are present covers only 13,6% of the sample (10,6% for the lagged estimator) as these institutions are a recent occurrence in the EEA countries. However, this limited number might cause sample selection bias. The EEA average (overall) B-Index value was 0,838 which compares unfavourably with the UK's average (0,81 overall and 0,724 for large companies) which is the most advanced jurisdiction in terms of FinTech investment comparable with Europe, even if such jurisdiction is way ahead in terms of FinTech investment relative to GDP (Claessens et al., 2018). US' and China's markets are highly developed, but their data is highly influenced by the relative weight of major technological firms, who often engage in killer acquisitions, which biases the interpretation of their investment data (Gabison, 2022).

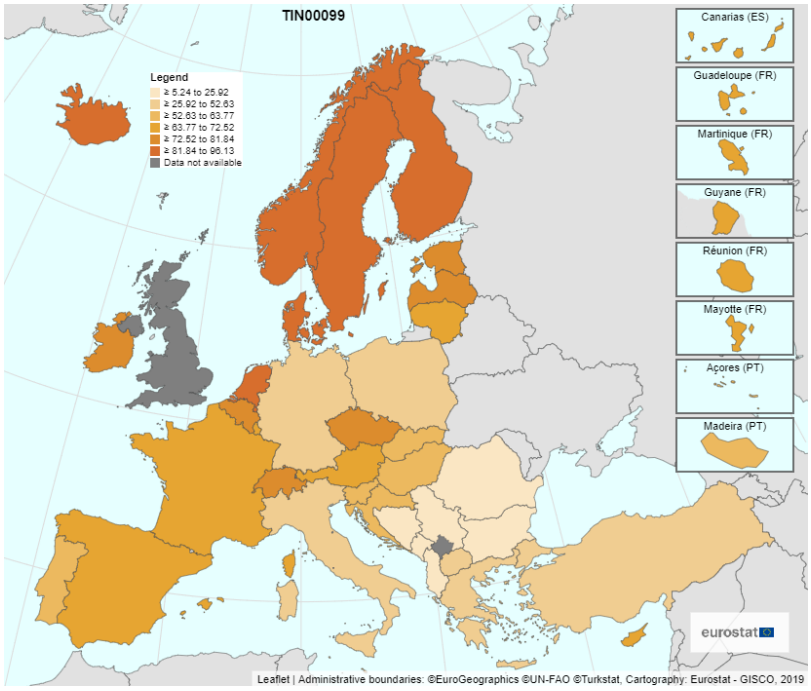
It is also worthy of note that the share of individuals who engage in E-Banking services in the EEA varies widely, with shares ranging from 4,4% from some country-years to 100% in others. Bank Branches per 100.000 inhabitants also show a widespread variation. Finally, the skewness and kurtosis indicators shrink after the log transformation, which reflects that variables become closer to a normal distribution. This improves the reliability of the OLS models (Munir & Rahman, 2016). To better understand the variability of the data, Graph 3 covers 4 scatterplots for the distribution of the variables that turned out to be significant against the dependent variable (FinTechInvest), along with maps to illustrate the cross-country contrasts in access to internet banking services (Graph 4) and broadband networks (Graph 5).

Graph 3. Scatterplots of the Variables GDPpc, E-Banking, Bank Branches and B-Index against FinTechInvest.



Own elaboration based on data by Cornelli et al., (2021).

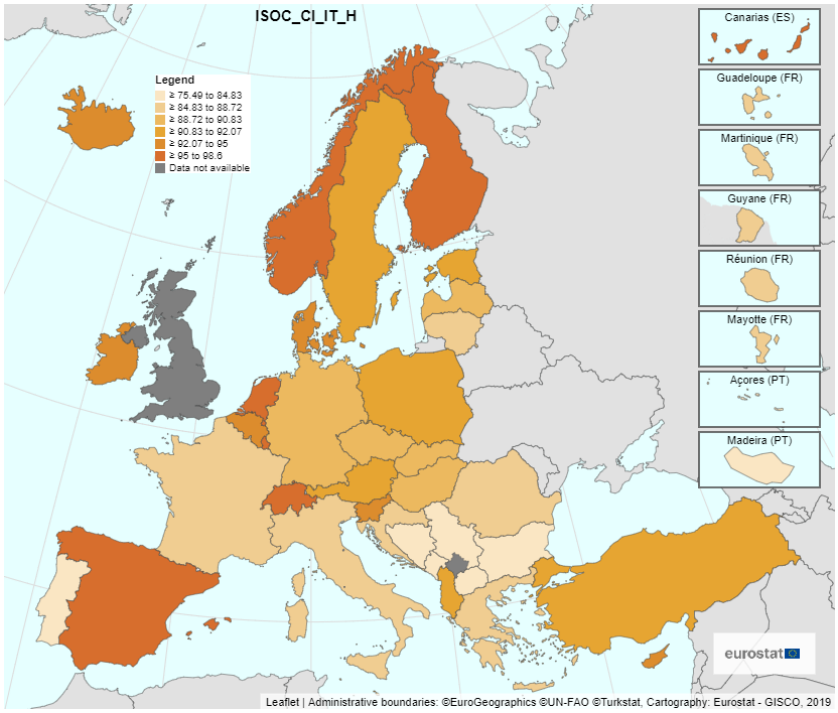
Graph 4. Map of the Share of Individuals using Electronic Banking in 2021.



Source: Eurostat

https://ec.europa.eu/eurostat/databrowser/view/tin00099/default/table?lang=en

Graph 5. Map of the Share of Households with Broadband Access in 2021.



Source: Eurostat

https://ec.europa.eu/eurostat/databrowser/view/ISOC_CI_IN_H/default/table?lang=en

7. Results

7.1 Significant Variables

Results for the initial three regressions, as well as for the robustness ones (which are dealt with in the following section), are compiled in Table 3 of the appendix, to facilitate and centralize their consultation. It has been opted not to include such table in the main text. This study confirms GDPpc is the most relevant macro variable in line with the general results in the literature (Cornelli et al., 2021, Claessens et al., 2018, Haddad & Hornuf, 2019). The GDPpc is a general proxy variable for the development of an economy and the amount of disposable income. Both factors are in turn fundamental for attracting investment to FinTech firms. In our model, a 1% increase in the GDPpc of a country leads to an expected increase of 4-4,5% in its external equity funding, holding other variables constant and independent of the country or year considered. This means FinTech investment grows more than proportionally to GDPpc.

Both the physical availability of bank branches and the share of the population that uses electronic banking services reduce external equity funding for European FinTechs. This might be interpreted as a retention or lock-in effect of electronic banking. Indeed, electronic services increase the bundling of bank services, which makes FinTech penetration more difficult (Navaretti et al., 2018). Also, it has been observed that a denser network of bank branches allows for more direct personal contact between banks and their customers, which forecloses the market for FinTechs, especially in the payments sector (Haddad & Hornuf, 2019).

In our case the expected decrease in FinTech Investment when the number of bank branches per 100.000 inhabitants increased by 1% was plausibly ~ -0.9%. On the investment market side investors might read the entrenchment of bank products as a reduced market case for FinTech challenger firms, which would explain why investment falls (Kolokas et al., 2022). Yet in the case of bank branches, the indicator also indicates a deeper financial system, with stronger availability of debt funding for FinTechs (Haddad & Hornuf, 2019). In such a case, they would require less external equity investments (Kolokas et al., 2022). This hypothesis could not be tested away. The regression results show that the expected decrease in FinTech Investment when the

share of individuals in the population using E-banking services increases by 1% ranges between 2,3% and 2.7% (again more than proportional to the increase of users share).

7.2 Variables of Interest for the Analysis (Policy Variables)

Contrary to previous studies (notably Cornelli et al., 2021), no evidence that Regulatory Sandboxes have a significant effect on the investment into EEA FinTech companies is found. There are two possible causes for this. First, the scope of this study is exclusively EEA focused, while the previous studies were globally focused (hence, a smaller sample with less Sandbox datapoints is used). Second, it might be interpreted that the mere fact of implementing Regulatory Sandboxes in EEA countries is not sufficient to increase FinTech Investment. In this case, and if the governments decide to carry forward with their operation even if they are not recovering costs, they will produce a weak signal, which explains why they are unable to raise investment.

Table 4 Panel A Levene's Test yielding Unequal Variance (Sandbox Dummy).

RSandbox	Mean	Std	Freq.
Regular Jurisdictions	0.002	0.004	18
Sandboxed Jurisdictions	0.007	0.015	9
Total	0.004	0.009	27

W0 = 4.8813315 df(1, 25) Pr > F = 0.03653396
W50 = 1.3831254 df(1, 25) Pr > F = 0.25064758
W10 = 5.1993832 df(1, 25) Pr > F = 0.03138796

Table 4 Panel B Welch Contrast of Means for Sandbox Dummy

Variable	Mean Regular	Mean Sandbox	dif	St. err	Std.err 1	Std.err 2	t	p value
FinTechInvest/GDP	.002	.007	-.005	.005	.001	.0051	-.85	.422

Table 4. STATA visualizations of the dispersion and means of the ratios of FinTech Investment to GDP in 2021, comparing countries with active Sandboxes and those without. Own elaboration based on data by Cornelli et al., (2021).

An inspection of this result is carried using a Welch test (Welch, 1938) after checking the unequal variance of the subsamples using Levene's test (Levene, 1960). It can be consulted in the Annex in Panels A and B of Table 4. They explore the difference in variability between the regular jurisdictions and the ones with a Regulatory Sandbox using the coefficient of investment to GDP of 2021 as benchmark. This table allows us to observe that variability (and median value) is higher in the Sandboxed group. Because the hypothesis of equal mean cannot be rejected (the p-value is 0.422), it cannot be established that Sandboxes function as an accurate signalling device. Yet, since the mean of the Sandboxing group is higher, the view that not all Sandboxes are equally effective should still be considered. Indeed, more attention should be given to particularities of their design, which can raise investment. This falls into place for the conjecture that there is indeed an investment premium on some regulators, but it is related to other more concrete factors (that is the investment premium condition, $\theta_H - c(u(RS)|_H) \geq \theta_L$ holds, but Sandbox existence is not the determining factor).

The Labour Force Indicator presents high coefficients with the expected sign, but no statistical significance. It shall be borne in mind that the indicator is used as a proxy for the number of potential Fintech users, as well as the supply of work. As a result, this high variability of the indicator may be due to the passporting regime and the freedom to provide services (36 TEEA) granted to FinTechs in the EU eroding the nexus between the potential of the market (LF is a measure of the aggregate demand in our study) and the level of External Equity attractiveness that FinTechs operating locally have, as the Estonian example illustrates (Avarmaa et al., 2022).

The present results allow to note hinting evidence of the correlation between the R&D tax incentives and the development of private equity investment which was previously disregarded by researchers. The B-Index variable has negative sign as jurisdictions providing tax incentives to R&D perceive more investments, which is significant in all seven of our models. The interpretation of its regressor, which is not logged, differs

slightly from the previous regressors.[8] Moreover, the regressor is economically significant, with an expected decrease in FinTech investment between approximately 93,87% and 99.9% for an increase of one unit in the B-Index. It is worth reminding here that the B-Index is a value that mostly oscillates between 0 and 1.

Therefore, such a change would imply moving from the strongest Incentivization possible (0) to zero Incentivization (1). Empirically, the Tax Incentivization (which is defined as 1-B-Index), values in our dataset do not go beyond 0,55 (strongest Incentivization found), so such a change would never materialise in fact. Nevertheless, it is telling that even small increases (small decreases in B-Index) in the Tax Incentivization measure can attract considerable amounts of Investment, and that even when controlling for country and time fixed effects. To provide for stronger internal validity, the results for the B-Index will be evaluated for each of the robustness check regressions specifications. The causes of this finding are expanded on in the conclusion section.

[8] The calculation is done by taking the inverse of the natural logarithm, which is the e-based exponential function: $f'(x) = e^{x}$. Thus $e^{-2.8} = 0{,}061$ and $e^{-7} = 0.0009$. In the second step, one should subtract 1 and get the expected percentual decreases by multiplying by a hundred, as reflected above.

8. Robustness Checks

8.1 Study of the OLS Model Assumptions

We do not test for the stationarity of the data since our panel has a small number of time periods (Baltagi, 2008). Additionally, stationarity tests were not performed because the number of cross-sectional entries is considerably bigger than the number of time periods, which does not suit well the properties of unit root tests (Wooldridge, 2010).

Following Brüderl & Ludwig (2015), in our models the use of clustered robust standard errors (Rogers, 1993) by default are recommended. We clustered at the level of countries for running the regressions (at which the policy variables, B-Index and RSandbox are assigned). Subsequently, we test to check whether we should specify a fixed effects or a random effects model with a robust version of the Hausman test (Schaffer & Stillman, 2006). The null hypothesis of that test is rejected (p-value is close to 0 and the Sargan- Hansen statistic is 33.561) which leads us to adopt a fixed effects approach.

Next, we run the test for heteroscedasticity, through the Wald modified test (Greene, 2001). We reject the null hypothesis of homoskedasticity and thus we confirm the evidence on the presence of heteroskedasticity (The p-value for this test is negligible, and the Wald statistic is 5282.57).

Regarding the presence of multicollinearity, it has been analysed through the correlation matrix. This matrix can be consulted in Panel B of the Table 2 in the Appendix. Several correlation coefficients took a value higher than 0,6 in absolute terms. The variables affected are $lnGDP_{pc\ t-1}$, $lnEBankingS_{\ t-1}$, $lnICTS_{\ t-1}$ and $lnBroadbandS_{t-1}$. The variables affected by these high Pearson coefficients are not our policy variables. Therefore, the analysis has proceeded, but it should be noted that the standard deviations of these variables are inflated, which may explain their reduced significance.

We also run for serial correlation by using the Wooldridge (2002) and Verardi & Jochmans (2019) tests for autocorrelation, with the last one being a "portmanteau" test which cover all orders possible. This allowed us to discard the presence of serial correlation of any type (our p-values are 0,211 and 0,4638, the null hypotheses of no autocorrelation cannot be rejected). The short time span (2013-2021) at hand makes the

serial correlation a minor concern (Akel, & Torun, 2017). This finding, along with the presence of observation gaps, suggests focusing the approach on Fixed Effects models, instead of going for First Differences models, which would reduce the degrees of freedom even further (Cameron & Trivedi, 2010).

The assumptions of the OLS model are completed with an examination of the normality of the residuals. We run the Jarque & Bera (1980) test for the normality of the residuals, which does not yield normality for the systematic residuals (e, p-value = 0.000) while it accepts it for the non-systematic residuals (u, p-value = 0.4437).

One last check that was performed was the functional form test or Ramsey test (Ramsey, 1969). This test's null hypothesis couldn't be rejected (p value = 0.3351) which allowed us to confirm the model has a proper functional specification.

8.2 Checking for Outlier Jurisdictions

First, in the 4th regression, we run a check excluding the countries that can be considered the outliers of the EEA in terms of FinTech Investment relative to their economic weight, which are Sweden and Estonia. In the first market several factors make it stand out from the general trend in Europe. First, the Swedish private external equity market is characterised by a very active business angel sector, longstanding relationships with UK and US VC firms as well as the early adoption of FinTech facilitating habits (cashless payments, digital IDs) (Teigland et al., 2018). Estonia's particularities (Avarmaa et al., 2022) include the special role of bankers and their related private communities of investors and the State fund for financing digital companies (KredEx). Finally, the reduced dimension of the local economy, which pushes Estonian companies to be mostly export oriented is a decisive growth factor. In fact, Estonia's investors do not enter the market for gaining access to Estonia, but mainly to expand internationally throughout the internal market (Larsson & Rolandsson, 2022).

Remarkably, neither of these countries has approved a Regulatory Sandbox yet. The results reflect very similar coefficients and significance regarding the regressions are including or excluding these countries. When it comes to Sandboxes, only one regime

shows outstanding performance, the Danish regime. Therefore, a 5th regression excluding Danish datapoints is run. Again, all results remain consistent, both in sign and coefficient size and significance, and the within R-Squared increases (from 0,2631 to 0,2905). In that regression, once more, the significant variables are B-Index, GDP_{pc} and E-Banking Share.

8.3 Checking for Abnormal Investment Periods

We also run a check excluding the years 2020 and 2021 which were especially anomalous. Indeed, the 2020 study by Mason for the EC proved that venture capital allocation for European firms stems mainly from outside the EU (only 36% of venture capital provided to European Startups came from VC funds located in Europe). Thus, the EU's companies are specially exposed to the availability of foreign capital. This availability was specially curtailed in the case of the Asian funds (Mason, 2020). Additionally, there is evidence of a weakening of the market sentiment at the time among EU investors provided by the EIF's new survey tool, the EIF VC Survey, the EIF Business Angels Survey (EIF BA Survey) and the new EIF Private Equity Mid-Market Survey (EIF PE MM Survey as analysed by Kraemer-Eis et al., 2020).

Here, in the 6th regression, the results of the regression show a strong increase in the absolute value of the B-Index coefficient. It becomes significant at the 1% level, with a predicted decline of roughly 99,9% in the external equity funding for FinTechs in a country when the B-Index increases by one unit, controlling for the variation between countries and time period effects. Of note, also the variables for the share of the population who uses E-Banking and the number of Bank Branches per 100.000 inhabitants increase the coefficient with the last one becoming significant at the 1% threshold. These two variables were plausibly affected by COVID-19 since access to physical branches was forbidden during 2020 and 2021, which eliminated the social contact between clients and banks, a determinant of the ability of the latter to lock-in customers against FinTech competition. Access to electronic banking services before the pandemics was deliberately chosen whereas it was a necessity in 2020-2021, which explains why it is significant in the model excluding those years versus the baseline.

8.4 Checking for the Effectiveness of Subsidies

And finally, the last robustness check, even though we control for the tax incentives, we did not previously control for subsidies. Thus, we reran the 7th regression including a control variable of the availability of subsidies, OECDs by country shares of publicly funded business Expenditure in R&D (BERD). Of note, the B-Index regressor significance holds for the new control (the coefficient, at -2.953 is very similar to previous regressions). An increase in the B-Index of one unit leads to expected reduction of 95% in the external equity funding for FinTechs, controlling for country particularities and for their public subsidies. Subsidies do not show significant relevance of their own. GDP_{pc} however, holds economic and statistical significance. With a 1% increase GDP_{pc} leading to a 4,37% increase in the investment into FinTechs. Lastly, the effect of a 1% increase in the share of E-banking users leads to a 2,6% decrease in the investment into FinTechs.

In Graphics 6 and 7 we can see the evolution of the number of FinTech Investment Deals (not of their amount). If we compare the share of investment deals obtained by the three jurisdictions with a higher change in their B-Index data (thus who have significantly strengthened their R & D tax incentives) which are Poland, Slovak Republic and Germany, the effect of these incentives can better be contrasted. Poland moved from 1,4% in 2013 to 2% in 2021 (from 3 to 14 deals), Greece from 0 to 0,2% and Germany from 18% to 19% (with a growth in the number of deals 37 to 156). Even though the general trend in the number of deals has been a strongly rising, the case of the countries who introduced tax incentives and improved their B-Index shows that they have gone ahead of the trend. *A contrario*, countries that not only did not introduce tax incentives, but rolled them back, like Finland, lagged behind, with their share declining from 2% to 0,7% (deals only increased from 4 to 6).

Graph 6. Investment Deals into EEA FinTechs for the Year 2013.

Own elaboration based on data by Cornelli et al., (2021).

Graph 7. Investment Deals into EEA FinTechs for the Year 2021.

Own elaboration based on data by Cornelli et al., (2021).

9. Conclusions

As for the B-Index data, implications can be drawn for the behaviour of external equity investors in the FinTech sector. First, their demand for investment projects is highly elastic. This is realistic to assume given the strong protection to the freedom of capital in the area under study (which excludes favouring national investors, even over investors of third-party countries, and offers a wide range of investment avenues to choose from). A high elasticity leads to substantial investment shifts both because investors react more strongly to differences in after-tax returns and because the presence of such tax incentives becomes more salient to them (Chetty, Looney & Kroft, 2009). To continue, the nature of external equity capital operations involves a significant participation (even a controlling one) in the deal company (Kupp, Schmitz, & Habel, 2019). Even if a given deal does not represent a big share of the portfolio of the investor, the main source of income for the investor is the premium between the deal price and the exit price (Jain & Kini, 1995).

Therefore, these investors commit resources for the proper management of the company and monitor information on its financial results (Manigart & Sapienza, 2017). Because of this longstanding involvement, a tax-incentive is less likely to be disregarded by them by comparison with retail investors (Saez, 2004). These conclusions help us understand that tax law and economics is a fundamental dimension of any desirable FinTech policy. Competitiveness in attracting Investment depends on countries improving their R&D tax regimes. Indeed, over the period of study, EEA R&D tax incentive regimes have become more generous (average B-Index went down by 4,75% from 2013 to 2021). B-Index indicators in the EEA show less dispersion, a trend which is more noticeable for larger firms (their variance went down by -8,5% from 2013 to 2021).[9] Table 5, panels A and B expand on these findings.

Finally, investment (and to a lesser extent, the success of funding rounds) for FinTech services (including through venture capital) is strongly correlated with R&D tax

[9] This data, however, does not allow to assert clearly that the overall variance and mean are significantly different from each other from a statistical perspective, as shown in the annex Table 5, Pannels A and B. The mean Tax Incentivization would have to keep rising and the levels of Tax Incentivization would need to converge further to be able to provide statistically conclusive information that the regulatory competition is producing an equalizing effect in the EEA.

incentives which shows the strong encouragement of an R&D base both favours the development of FinTech innovation and creates a sophisticated market demand for FinTech services. Therefore, it is recommended to look at FinTech and R&D policies jointly. As previously noted, the most favourable innovation market for FinTech firms is one in which the university-firm nexus is strong (Kowalewski & Pisany, 2022). These authors conclude FinTechs Investments thrive in an environment in which research is carried by small, specialized and R&D intensive firms who develop readily appliable technologies. In this context, tax incentives showed better results than subsidies.

Table 5. Panel A Contrast of Variance of B-Index between 2013 and 2021

Time	Mean	Std.	Freq.
B-Index 2013	0.145	0.151	27
B-Index 2021	0.186	0.149	27
Total	0.165	0.150	54

W0 = 0.54120998 df(1, 52) Pr > F = 0.46523721
W50 = 0.52802239 df(1, 52) Pr > F = 0.47069805
W10 = 0.40574279 df(1, 52) Pr > F = 0.52693273

Table 5. Panel B Contrast of Means for B-Index between 2013 and 2021

Variable	BIndex2013	BIndex2021	Mean1	Mean2	dif	St Err	t value	p value
BIndex by Time	27	27	0.145	.185	-.041	.041	-1	.324

Table 5. STATA visualization of the dispersion of the Tax Incentivization (1-B-Index) Scores in 2013 and 2021. Own elaboration based on implied Tax Incentivization Rates of the OECD https://stats.oecd.org/Index.aspx?DataSetCode=RDSUB.

The weak effects of the RSandbox indicator provided information that the mere existence of such an institution does not suffice for the positive signalling to work

properly (Ringe & Ruof, 2020). Further research is needed on which concrete qualitative aspects of the institution yield practical results, achieving credibility for investors. It can be concluded that experienced, resourceful regulators (such as the Dutch and Danish authorities in our sample) are the ones most likely to profit from experimenting with Sandboxes (they may indeed meet the $\theta_H - c(u(RS)|_H) \geq \theta_L$ condition, but crucially H and L are not determined by the mere existence of the Sandbox). These institutions might provide awarded companies with shorter time-to-market cycles (Ringe & Ruof, 2020). What is more, firm feedback will be advantageous to deal with upcoming regulatory risks (Dupont, 2019).

Yet, these institutions entail high set up and maintenance costs (Allen, 2020). Hence, those regulators who are more modest in expertise do not seem to break even (that is $c(u(RS)|_L)$ is higher than either θ_L, θ_H or any intermediate results for them), at least if promoting External Equity Investments is considered the main goal. Considering EEA countries will need to pay more attention to the concrete features of their envisaged Sandbox. This would open the avenue for more detailed research on which of those features attract Investment, as more information becomes available on best practices for the development of the current Sandboxes in place. These best practices can be streamlined by a European-wide coordinating institution, which reconciles the findings of this Thesis with the policy proposals of Ringe & Ruof (2020).

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Appendixes

A. TABLE SECTION

Table 1. Synoptic Table of Sources of Risks coming from FinTechs

Table recovered from Risk Insights and Advisory Fintech Spotlight, Q2 2022 report. https://aite-novarica.com/report/risk-insights-and-advisory-fintech-spotlight-q2-2022

Panel A of Table 2

Summary Statistics

Variable	Obs	Mean	Std.dev	Min	Max	Skewness	Kurtosis
FinTechInvest	211	635,000,000	1.85e+9	20000	1.86e+10	5.947	48.93
lnFinTechInvest	211	17.40533	2.912092	9.9035	23.64632	-.221	2.58
RSandbox	243	0.1358	.343	0	1	2.126	5.521
RSandboxL1	216	.106	.309	0	1	2.552	7.510
BIndex	243	.838	.142	.45	1.02	-.268	2.098
BIndexL1	243	.845	.142	.45	1.02	-.298	2.002
GDPpc	243	38216.404	24192.37	0	133590.1	1.314	4.835
lnGDPpc	243	10.329	.903	0	11.803	-6.125	71.4554
lnGDPpcL1	216	10.361	.617	8.862	11.803	.0003	2.409
LF	243	7232907.4	9965807	165400	40606000	1.94	5.796
lnLF	243	14.911	1.438	12.016	17.519	-.178	2.457
lnLF L1	216	14.909	1.441	12.016	17.519	-.183	2.461
EBankingS	242	58.252	23.72	4.4	100	-.1455	2.310
LnEBankingS	242	3.941	0.5798	1.4816	4.60517	-1.904	7.784
lnEBankingL1	215	3.912	.595	1.482	4.605	-1.835	7.419
ICTS	243	3.976	1.32	1.231	7.778	.451	2.878
lnICTS	243	1.317	.36	0	2.051	-.582	3.582
lnICTSL1	216	1.29	.359	0	2.024	-.587	3.538
BroadBandS	240	85.273	9.528	53.71	99.18	-.763	3.186
lnBroadBandS	240	4.439	.119	3.984	4.597	-1.086	4.183
lnBroadBandSL1	213	4.428	.12	3.984	4.597	-.98	3.943
BankBranches	239	27.119	16.965	4.02	81.72	1.059	3.663
lnBankBranchesL1	213	3.124	.643	1.391	4.403	-.196	2.463
lnBankBranches	239	3.103	.649	1.391	4.403	-.199	2.437

Panel B of Table 2

Matrix of Correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) lnFinTechInvest	1.000									
(2) lnGDPpc_L1	0.436	1.000								
(3) lnEBankingShar~1	0.253	0.663	1.000							
(4) BIndex_L1	0.119	0.051	-0.129	1.000						
(5) lnICTS_L1	0.297	0.645	0.631	0.134	1.000					
(6) RegulatorySand~1	0.215	0.045	0.191	-0.07	0.136	1.000				
(7) lnBroadBandS_L1	0.41	0.734	0.831	0.067	0.755	0.243	1.000			
(8) lnBankBranches~1	-0.057	-0.073	-0.447	-0.049	-0.311	-0.172	-0.338	1.000		
(9) lnBERDS_L1	0.056	0.111	-0.146	-0.236	0.001	0.024	0.131	0.041	1.000	
(10) lnLF_L1	0.513	-0.106	-0.158	-0.167	-0.142	0.091	-0.065	0.004	0.242	1.000

Table 3

Summary Results of the Model

Variable	(1)[10]	(2)	(3)	(4)	(5)	(6)	(7)
Constant	-77.959	-102.89	-104.271	-131.456	-95.629	-125.493	-106.483
$RSandbox_{t-1}$	.163		.08	.286	-.0205	-.141	0.0856
$BIndex_{t-1}$		-2.986*	-2.948*	-2.792*	-2.894*	-6.943***	-2.953*
$lnGDPpc_{t-1}$	3.858**	4.101**	4.078**	4.138**	4.283**	4.813**	4.37**
$lnLF_{t-1}$	3.537	4.983	5.083	6.496	4.452	6.771	5.144
$lnEBankingS_{t-1}$	-2.421*	-2.71*	-2.693*	-2.273	-2.726*	-4.492**	-2.622*
$lnICTS_{t-1}$	-.474	-.568	-.575	-0.929*	-.528	-0.609	-.636
$lnBroadBandS_{t-1}$	2.777	4.292	4.299	5.3	3.88	5.39	4.036
$lnBankBranches_{t-1}$	-.255	-.898	-.896	-1.15	-.812	-2.825***	-1.029
$lnBERDS_{t-1}$							-.238
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered Standard Errors	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (Within)	0.2655	0.2741	0.2742	0.2631	0.2905	0.1910	0.2751

Panel A of Table 4

Levene's Test yielding Unequal Variance for RSandbox

RSandbox	Mean	Std	Freq.
Regular Jurisdictions	0.002	0.004	18
Sandboxed Jurisdictions	0.007	0.015	9
Total	0.004	0.009	27

W0 = 4.8813315 df(1, 25) Pr > F = 0.03653396
W50 = 1.3831254 df(1, 25) Pr > F = 0.25064758
W10 = 5.1993832 df(1, 25) Pr > F = 0.03138796

Panel B of Table 4

Welch Contrast of Means for the RSandbox

Variable	Mean Regular	Mean Sandbox	dif	St. err	Std.err 1	Std.err 2	t	p value
FinTechInvest/GDP	.002	.007	-.005	.005	.001	.0051	-.85	.422

Panel A of Table 5

Levene's Test yielding Equal Variance for Average Tax Incentivization Rate in 2013 and 2021

Time	Mean	Std.	Freq.
Tax Incentivization 2013	0.145	0.151	27
Tax Incentivization 2021	0.186	0.149	27
Total	0.165	0.150	54

W0 = 0.54120998 df(1, 52) Pr > F = 0.46523721
W50 = 0.52802239 df(1, 52) Pr > F = 0.47069805
W10 = 0.40574279 df(1, 52) Pr > F = 0.52693273

Panel B of Table 5

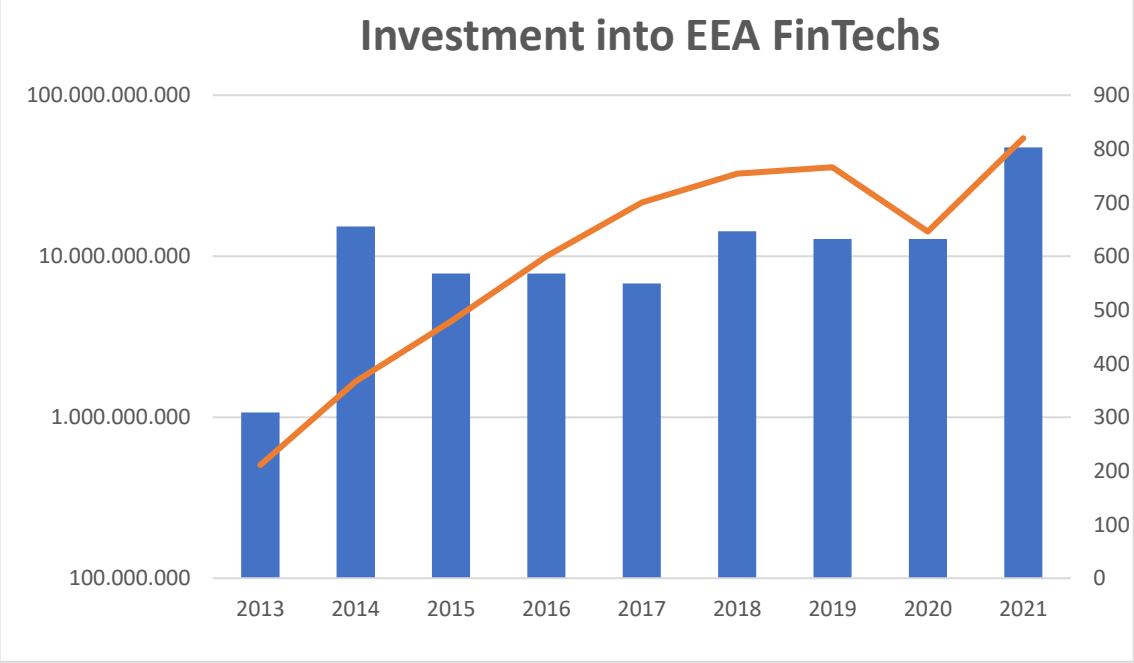
T-test Contrast of Means for Average Tax Incentivization Rate in 2013 and 2021

Variable	BIndex2013	BIndex2021	Mean1	Mean2	dif	St Err	t value	p value
BIndex by Time	27	27	0.145	.185	-.041	.041	-1	.324

Table 5. STATA visualization of the dispersion of the Tax Incentivization (1-B-Index) Scores in 2013 and 2021. Own elaboration based on implied Tax Incentivization Rates of the OECD https://stats.oecd.org/Index.aspx?DataSetCode=RDSUB.

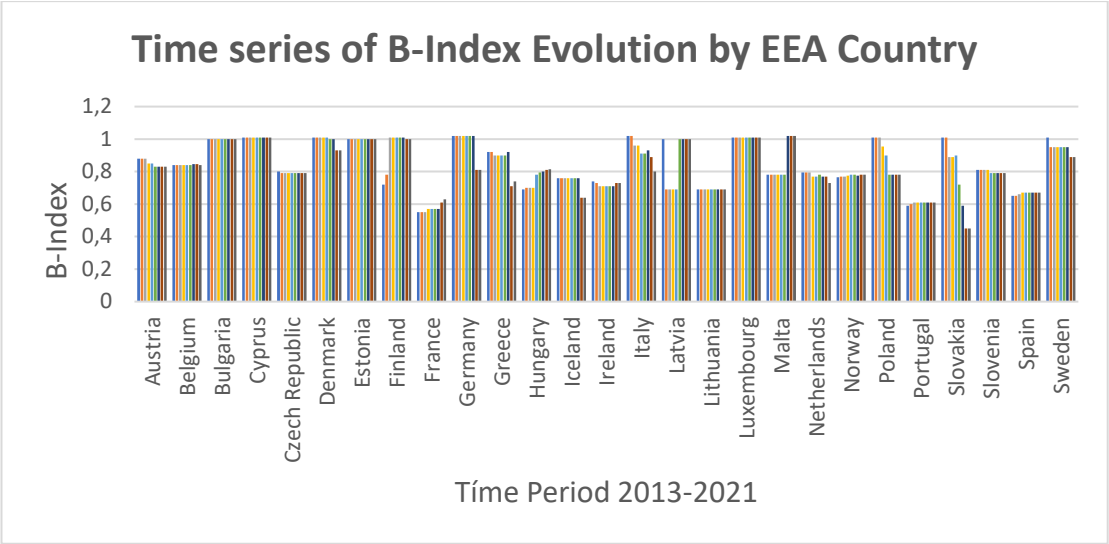
B. GRAPH SECTION

Graph 1. Investment into EEA FinTechs for the Period 2013-2021, both in Value of Invested External Equity and in Number of Deals.



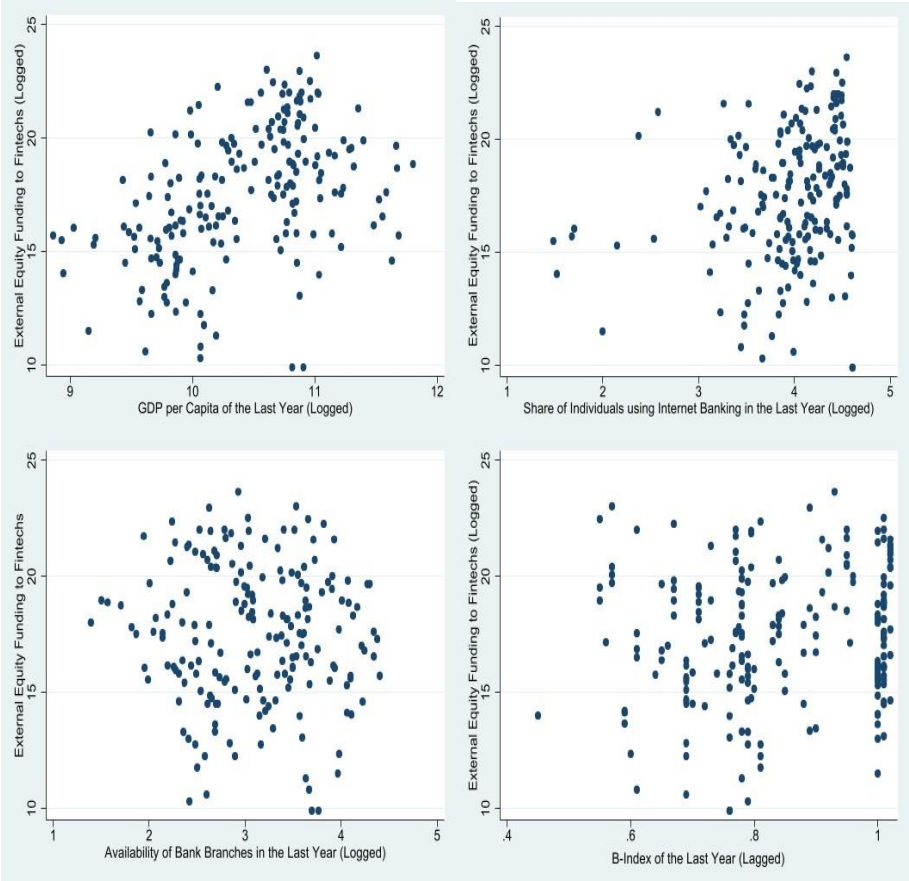
Own elaboration based on data by Cornelli et al., (2021). The left-side legend refers to the investment amounts data (in logarithmic scale, represented by blue bars), while the right-side legend refers to the number of deals concluded (in arithmetic scale, represented by the straight orange line).

Graph 2. Evolution of the Level of B-Index for R&D in the EEA (2013-2021).



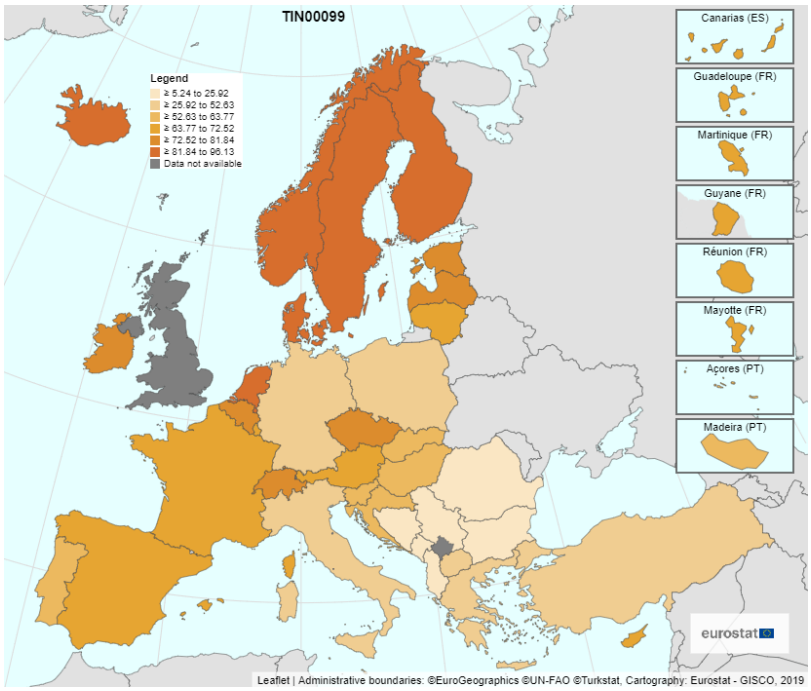
Own elaboration based on data by the implied Tax Incentivization Rates of the OECD https://stats.oecd.org/Index.aspx?DataSetCode=RDSUB.

Graph 3. Scatterplots of the Variables GDPpc, E-Banking, Bank Branches and B-Index against FinTechInvest.



Own elaboration based on data by Cornelli et al., (2021).

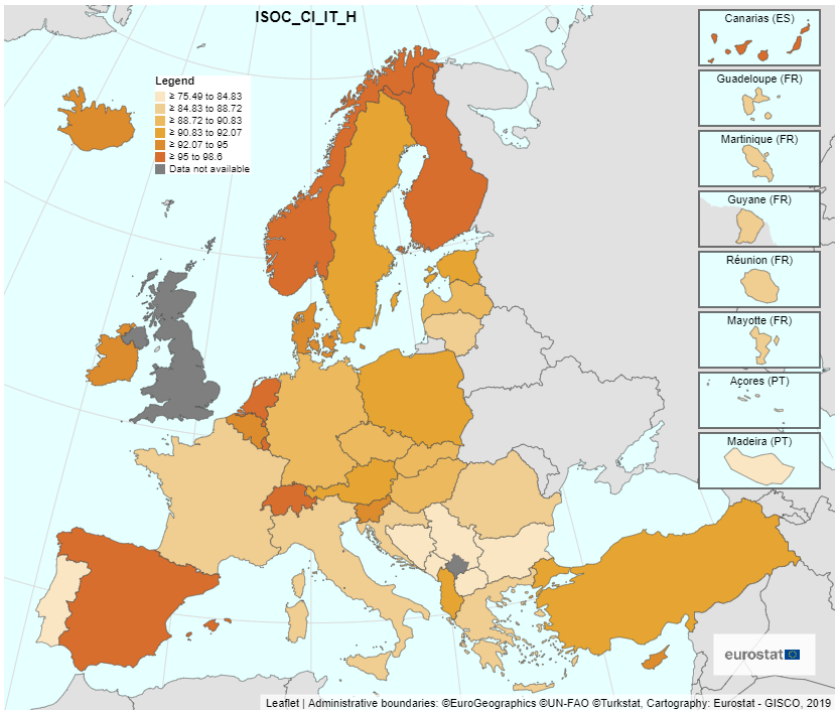
Graph 4. Map of the Share of Individuals using Electronic Banking in 2021.



Source: Eurostat

https://ec.europa.eu/eurostat/databrowser/view/tin00099/default/table?lang=en

Graph 5. Map of the Share of Households with Broadband Access in 2021.



Source: Eurostat

https://ec.europa.eu/eurostat/databrowser/view/ISOC_CI_IN_H/default/table?lang=en

Graph 6. Investment Deals into EEA FinTechs for the Year 2013.

Own elaboration based on data by Cornelli et al., (2021).

Graph 7. Investment Deals into EEA FinTechs for the Year 2021.

Own elaboration based on data by Cornelli et al., (2021).