

Can new evidence from Fintech companies challenge institutional theories?

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Fintech companies change the way consumers, companies and governments accumulate, borrow, lend and protect money, resulting in the change of the value chain of financial companies and financial markets. In our study we develop GARCH and APARCH models to examine the role of institutional factors in fintech expansion. Our findings extend Buchak et al. (2018) findings that mortgage growth of fintech activities in the US mortgage market was due to regulatory and technological forces, by examining how institutional and technological forces contributed to the growth of fintech industry in Europe. Our findings provide substantial evidence that links the fintech industry growth with institutional theories. The study has significant policy implications that fine-tunes the policy of global institutions in the new era of technological transformation.

1. Introduction

Technological advances, have transformed the financial services during the last years (Lucey et.al., 2018) - starting from internet and mobile channels of banking services distribution, via non-bank financial service providers leading to digital currencies and new decentralized ways of financing, such as crowdsourcing. These technologies, in particular the application of technology to finance, is commonly called by the term "FinTech" (Arner et al., 2016). Companies that operate in the fintech solutions have already reshaped commercial practices that affect businesses and consumers, lowered bank operating costs and changed the way the financial industry operates (Bradley, 2017). It has been argued, for example, that intermediation in lending has increasingly shifted from traditional banks to shadow banking (Buchak et al., 2018), leading to a new challenge, that has to do with the need for new regulation. While more advanced regulations requires compliance efforts of financial institutions, that are supported by new solutions based on technology, called 'RegTech' (Arner et al., 2017), evidence from mortgage market indicates that overregulation may slow down the growth of traditional banking system (Buchak et al., 2018), bringing in the light the question of whether actually deregulation, instead of overregulation is the answer, not only for the growth of the traditional banks, but also this of the FinTech, and the financial industry in general, given the fact that the benefits of the FinTech for the market, in terms of lower costs are significant. Moreover, this discussion raises again the big question, about the role of institutional factors for the development of financial innovation

From the other side, although there is a considerable amount of research regarding the effect of institutional factors in the development of companies, and the financial industry, there is lack of studies that examine if and how the growth of fintech can be affected by these factors. In particular, there is lack of research concerning the development of fintech in terms of personal finance and payment services. Our study fills this gap by empirically examining the way the institutional factors affect the growth of fintech in the European Union. .

We start our analysis by examining the effect of the World Bank governance factors, and we extend the study by examining how other, alternative factors, such as bank sector structure, tax regime

and development of stock exchange[1] may affect the development of the fintech licencing in the EU countries.

We provide evidence that the development of fintech is positively affected positively by the ability of the government to provide sound policies and regulations that enable and promote private sector development at both the level of licences and the growth of licences. We also found that lower tax regime affects positively the level of licences the country has.

These findings provide evidence that is in line with the deregulation policy and lower tax rate policy promoted by the World Bank and other international organisations, supporting for the first time these policies by providing evidence from in the area of FinTech development.

Our sample includes all the fintech companies in all 28 EU countries and Norway, Liechtenstein and Iceland from 2006 to May 2019 licenced as Payment Institutions, Electronic-money institution, Account Information Service Provider, Exempted Electronic-money institution and Exempted Payment Institutions. The study could provide substantial evidence that supports our hypotheses and can be a starting point for future studies.

The paper is structured as follows. The following section reviews relevant literature and examines the hypothesis to be tested. Section 3 discusses the models. Section 4 describes the data and covers the variables used in this study. Section 5 presents the methodology and describes the results. Section 6 contains robustness tests. The final part concludes the paper with a summary.

2. Literature Review and Hypothesis Development

Fintech is a new concept, no common definition of fintech has yet been derived. However, the review of the source literature indicates two main approaches competing in defining this concept (Figure 1).

Figure 1. Fintech definitions

In the first group (by object), emphasis is put on the implementation of modern technologies in business models of operating entities. The other group (by subject), indicates the formation of entities whose activity bases on new technologies).

Fintech definition includes a. new technology, modern technologies - employed by traditional banking sector as well as new non-bank entrants and start-ups and b. new non-bank entrants, that constitutes an alternative financial industry. The definition given by Financial Stability Board represents the first type of definition and it defines fintech as “technology-enabled innovation in financial services that could result in new business models, applications, processes or products with an associated material effect on the provision of financial services.” Fintech term is used here to describe firms whose business model focuses on these innovations. (FSB, 2019, p.1). This broad definition is considered useful also by the Basel Committee on Banking Supervision (BCBS) in the light of the current fluidity of fintech developments (BCBS, 2018, p.8). Similarly Gai (2018) defines fintech as a popular term that describes novel technologies adopted by the financial service institutions. “Fin-Tech or fin-tech, in the present context fintech is a neologism that describes the connection of the modern, such as internet-related, technologies (for example, cloud computing,

mobile internet) with business activities typical of the financial services industry (for example, loans, payments, transfers of monetary values and diverse banking operations)” (Gomber et al., 2017). Paytech can be defined as a subset of fintech and a new domain within the financial industry that applies technology to improve payments. It builds on technologies such as the digital wallet and NFC and strives to advance electronic payments and/or mobile payments, both at POS and mPOS. (Schueffel, 2017b).

The above mentioned innovations under the payment cards systems constitute a good example of fintech solutions commonly used by both banks and technological companies which support them and non-bank payment providers, including purchasing platforms like Uber (Polasik and Piotrowski, 2016b). In many countries, implementing the fintech technology constitutes an important element of bank strategy (Polasik and Piotrowski, 2016a).

The other approach is more radical since the entities whose activity bases on the use of new technologies are considered fintech. They are usually start-ups which are not banks, though some of them can apply for obtaining a banking licence, e.g. Revolut.

The definition suggested by Patric Schueffel (2017a) belongs to this group. He attempted to define the fintech trying to find a common denominator for various definitions appearing in the literature on the subject. According to his definition, “Fintech is a new financial industry that applies technology to improve financial activities”. Also Kim et al. (2016) present definitions of fintech by subject - Fintech is a service sector, which uses mobile-centered IT technology to enhance the efficiency of the financial system. The definitions formulated by Micu and Micu (2016) and Shim and Shin (2016) are also included in this group.

The fintech will have a big impact on the financial services industry, (Shim and Shin, 2016) and have technological advantages over non-fintech firms, offering more convenient services (Buchack et al., 2018). Fintech can offer a way toward structural change in the financial industry, because political economy considerations can stifle change in the traditional part of the sector (Buchack et al., 2018).

In the study, emphasis is placed on a particular type of fintech, i.e. pay tech. It results from the fact that payments represent a significant proportion of the fintech sector. This part of the fintech sector,

increasingly referred to as ‘paytech’, is developing fast, with the increased use of smart devices, new digital applications, alternative processing networks, wearable technologies and new payments processes” (EPA, 2016, p. 4).

In the study, by subject approach to defining fintech is applied, thanks to which it is possible to quantify this phenomenon basing on the process of licensing those entities conducted by EBA.

2.1. Previous findings

The arrival of fintechs as technologically advanced companies specialised in the use of new technologies in finances (in payments in particular) has constituted a great challenge for science supposed to examine such a complex and rapidly evolving phenomenon. Au and Kauffman (2008) argue that the economic theory provides a unique point of view based on which it is possible to examine issues in relation to emerging technologies, where the standards and the adoption, the changes in the business processes and the results of implementation, information security, investments and commercial value and impact of the industry require care and consideration by senior managers, leadership and strategists in the financial industry. Anagnostopoulos (2018), Dapp et al (2014), Bunge (2017) and Harker (2017) examine fintech implications for the financial ecosystem, financial institutions, and regulation. Khandwe (2016) indicates the implications of the arrival of Fintech for the current market participants resulting from the disintegration of the payments business. Companies such as M-Pesa, ApplePay, Google Wallet or Paytm permit customers to use and enjoy ease of payment from their cell phones or tablets. Due to technological advancement in combination with a smaller regulatory burden when compared to banks, fintechs can meet consumers’ needs better having a more diversified and flexible offer.

Saksonova and Kuzmina-Merlino (2017) identify financial services using innovative technologies offered by fintech companies, analyse the advantages and disadvantages of these services in comparison with services offered by the traditional financial sector companies. On the other hand, Gomber et al. (2017) examines the reasons for which fintech start-ups are created and the areas of their activity, The study of Khandwe (2016) concerned the implications of fintechs for society and business and identification the main subsectors of fintech activity.

Li et al. (2017) when examining the entry of fintech companies in the American retail bank market found results that indicate a positive relationship between growth of financing and in the business of the fintechs and an increase in return on investments in stock of traditional retail bank stock. It indicates the bidirectional dependency between fintech market and the market of traditional banking. However, several studies indicate the fact that greater opportunities for the development of non-bank fintech can be found in the countries with a poorly developed and not very competitive bank sector (Pénicaud and Katakam, 2013).

The market of mobile payments in developing countries constitutes an excellent example of this situation. As research shows (Pénicaud, 2012; Pénicau and Katakam, 2013), mobile payments are of considerable importance for the economies of African countries and the countries of the southern part of Asia. Therefore, they are countries with a low level of banking penetration in the society, where the implementation of technically simple mobile payment systems constituted a response to the society's real needs. The activities of payment providers have seen interest expressed by a less affluent part of the societies in those countries in order to use the chance to limit payment and also financial exclusion. In less affluent and simultaneously financially heterogeneous societies, common access to classic bank services is significantly limited (Huterska, et al., 2018). Therefore, a real competition of traditional banks is not significant. Even basic usability, i.e. cashless and safe transfer of money offered by fintech to each owner of a mobile phone has brought mobile payment systems success in those parts of the world.

The M-PESA system, which has been functioning on the Kenya market since March 2007 (Iman, 2018), is an excellent example of a successful mobile payment system. It is an open cashless payment scheme using text message technology, and a prepaid account (a mobile wallet) is connected with a subscriber's phone number playing the role of a user's ID (Kisiel, 2014). The success of this solution may have resulted from the fact that when it entered the market, only every fourth Kenyan had an access to bank services. The value of the system for such unbanked society seems to be the factor which influenced its success (Tasca, Aste, Pelizzon, and Perony, 2016).

On the other hand, where the competition of banking system is high, no fintech has been able to have such a great success on the mobile payment market. If the scale of this phenomenon in Africa is taken as a benchmark, mobile payments in developed countries such as the USA or the

European countries can be considered a niche service. The scale of market penetration by FinTech's is considerably higher in Asia and South America than in Europe or North America (Statista, 2018). In the European and North American countries, the competition of traditional banking services commonly used and known for decades results in the fact that the basic functionality in the scope of money transfers or payments for products does not provide added value to consumers. As a result, numerous solutions offering innovative additional services have been introduced, and the number of new mobile payment systems in highly developed countries is growing fast (Jagtiani and Lemieux, 2018; Tasca, Aste, Pelizzon, and Perony, 2016).

Dorfleitner et al. (2017) provides another regional study with an analysis of German FinTech industry. Dorfleitner et al. (2017) calculates that in 2015 the total market volume of FinTech businesses in Germany in the financing and wealth management segments was 2.2 billion EUR. A major part of crowdfunding (270 million EUR), and wealth management is dominated by social trading and robo-advice platforms (360 million EUR). The paper suggests that the FinTech industry does not currently represent a systemic risk to the German economy. Note that after the UK, Germany is the second largest FinTech market in Europe. The study points out that FinTechs can help to reduce the funding gaps of small and medium-sized enterprises (SMEs) in Europe. Banks differ in supply of products offered by FinTech firms. Most banks have as of yet scarcely explored crowdfunding solutions. They point out that as a general rule only SME make use of rewards-based crowdfunding. Those that have high RandD investment is particularly suitable, which is 2 % of the market (estimated at 4.6 Billion EUR).

Large-scale retailers such as Burger King or Starbucks are often providers of closed systems based on prepaid accounts (Kisiel, 2014; Wester, 2012). However, non-bank entities which engage in the area of payment services like Dwolla in the USA, Mpass in Germany or BLIK and SkyCash in Poland, also offer open schemes. IT giants like Google have also manifested their interest in mobile payments. Google offered a hybrid model introducing a mobile Google Wallet based on NFC technology in 2011 (Kisiel, 2014). It must be noted, however, that a big number of incompatible mobile payment systems leads to market fragmentation and it constitutes a barrier for the development of this market in itself.

Zhou et al. (2015) Arner et al. (2016), Chen (2016) and Stern et al. (2017) in their research indicate the need to create adequate regulatory basis for the future development of new financial services and fintechs, balancing growth and innovation with financial stability. According to Kavuri and Milne (2019), the relationship between the new financial technologies and financial regulation includes a number of themes, which they categorise it into three critical areas i) FinTech and financial stability; ii) policy and the role of government iii) RegTech. Additionally, they review cryptofinance-radical technology-based alternatives to conventional regulated financial services’.

Several quantitative studies offer statistical evidence on the reasons for the emergence of FinTech (Haddad and Hornuf, 2016; Buchak et al., 2017; Shim and Shin 2016). Haddad and Hornuf (2016) and Buchak et al. (2017) conducted economic regression analysis. For instance, Buchak et al. (2017)’s empirical analysis suggests that regulatory burden faced by traditional banks accounted for 70 % of shadow bank growth with financial technology accounted for 30 %. Shim and Shin (2016) use an actor-network theory based on the science and technology literature to investigate the factors contributing to the growth of Chinas FinTech industry. Cumming and Schwienbacher (2016) examine determinants of FinTech venture capital (VC) investment finding (somewhat surprisingly) that FinTech venture capital (VC) investments are more prominent in countries without a financial centre.

Regardless of extensive and multithreaded literature on Fintech, areas requiring extensive research can still be found. For instance, Kavuri and Milne (2019) draw attention to this matter, interalia, in changing industrial structure and organisation of financial services, new forms of financial intermediation, changing payments mechanisms and the relationship between the new financial technologies and financial regulation. Summarising the conducted review of literature, including the results received by Lee and Jae Shin (2018) and Zalan and Toufaily, (2017), a model of fintech development has been formulated (Figure 2).

Figure 2. Factors influencing the fintech development

Our study examines the development of the Fintech in EU. It is believed, that EU fintech development is currently being stimulated by the PSD2 directive (The European Parliament, 2015) and the construction of Open API infrastructure available for banks and non-banking payment and financial services providers (Steennot, 2018; Wolters and Jacobs, 2019).

2.2. Hypothesis Development

Shleifer and Vishny (1997) findings indicate that well-structured regulations prevent firms from making major decisions which would affect the valuation of firms in countries and La Porta et al (1998) found that institutional factors, in particular legal rules that protect the interests of shareholders and the degree of their enforcement affect company value. Additionally, La Porta et al. (2000) argue that well-functioning laws and regulations can be found in better developed economies. Institutions and institutional structures, interalia serve to reduce the costs of information gathering and analysis, reducing so monitoring costs that Agency theory (Selznick, 1957; Hill and Jones, 1992) describes that formal organizations adopt to these structures through cooptation. Segmentation, leads to monopoly power, through legal and institutional differences (Demirguc-Kunt et al., 1999) through legal factors, corruption and regulation (Demirguc-Kunt and Levine, 2001) governance (Dietrich and Wanzenried, 2011), law and corruption (Wei, 2000; Naceur, Omran, 2011). By examining banks from developed and developing economies,

Demirguc-Kunt and Huizinga (1999) found that the enforcement of regulations and laws have led to decreasing profitability of such banks. We investigate whether these theories and findings apply in the fintech development by formulating our hypothesis.

Hypothesis (H1): The growth of fintech companies is affected by institutional factors from the country they had been established.

Hypothesis (H2): The growth of fintech companies is affected by the conditions of the banking sector of the country they had been established.

3. Data and Variable selection

The paytech data was collected through electronic retrieval of statistical data from the European Banking Authority, Payment Institutions Register, <https://euclid.eba.europa.eu/>. The Payment Institutions Register has been set up by the EEA Member States. Information on entities that obtained domestic licenses (according to PSD2 regulations) in a given country was provided by the competent national authorities of the EEA Member States.

The data on FinTech companies from the EBA were retrieved on 4 April 2019. The number of non-bank institution, which obtained licence by type: 515 payment Institutions, 283 electronic-money institution , 54 account Information Service Provider, 62 exempted Electronic-money institution and 243 exempted Payment Institutions.

Figure 3. Time plot of the number of non-bank institution, which obtained licence by type (comulative) .Source: the European Banking Authority, Payment Institutions Register, <https://euclid.eba.europa.eu/>

Fintechs covered by the study provide the following services: issuing, distribution and redemption of electronic money, account information services, execution of credit transfers (including covered by a credit line), execution of direct debits (covered by a credit line), execution of payment transactions (covered by a credit line), execution of payment transactions, execution of direct debits, issuing of payment instruments, acquiring of payment transactions, payment initiation services.

Table 1 Here

Description of data

Overall, the study examines 31 countries during the period 2006 and 2019. Table 2 provides some overall statistics for the selected countries.

| Countries | Number of License Issued |
|------------------|---------------------------------|
| Austria | 5 |
| Belgium | 28 |
| Bulgaria | 17 |
| Croatia | 7 |
| Cyprus | 20 |
| Czech | 135 |
| Denmark | 33 |
| Estonia | 9 |
| Finland | 41 |
| France | 63 |
| Germany | 38 |
| Greece | 3 |
| Hungary | 10 |
| Iceland | 0 |
| Ireland | 0 |
| Italy | 40 |
| Latvia | 15 |
| Liechtenstein | 4 |
| Lithuania | 66 |
| Luxembourg | 18 |
| Malta | 28 |
| Netherlands | 100 |
| Norway | 0 |
| Poland | 34 |
| Portugal | 10 |
| Romania | 0 |
| Slovakia | 14 |
| Slovenia | 4 |
| Spain | 32 |
| Sweden | 0 |
| United Kingdom | 383 |

We use the six major World Bank institutional factors , used in the Worldwide Governance Indicators (WGI) project, that report aggregate and individual governance indicators for the examined period for six dimensions of governance (in parentheses the names used in the study on the tables): Voice and Accountability (voa), Political stability and Absence of Violence(pol), Government Effectiveness (gov), Regulatory Quality (reg), Rule of Law (law) and Control of Corruption (cor). These factors are analysed in the site of world bank (<https://info.worldbank.org/governance/wgi>). We also use 119 Macroeconomic factors and Financial indices, also used from world bank, mentioned in the Appendix and explained in World bank site, as well.

4. Model estimation and Empirical Findings

4.1 The model

To examine our hypotheses we assume that the total number of licences in a country, and the new licences during a particular year is a function of institutional factors, macroeconomic factors and bank sector factors, as follows.

$$\text{COMP} = a_0 + a_{1t}\text{INST} + a_{2t}\text{MACRO} + a_{3t}\text{BANK_SECTOR} + \varepsilon \quad (1)$$

$$\text{DCOMP} = a_0 + a_{1t}\text{INST} + a_{2t}\text{MACRO} + a_{3t}\text{BANK_SECTOR} + \varepsilon \quad (2)$$

Where:

COMP is the total number of licences of fintech companies in a country at fiscal year-end t

DCOM is the number of new fintech companies in a country during fiscal year-end t

INST are World Bank institutional factors, namely Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption. These factors are illustrated on Table 1.

MACRO are macroeconomic variables, as illustrated on Table 1 and provided by World Bank.

BANK_SECTOR are the financial stability variables, as illustrated on Table 1 and provided by World Bank

To examine the ability of institutional factors to affect the establishment of fintech institutions in the study, we start by using the World Bank Regulatory Quality captures perceptions of the ability of the governments to implement effective policies and regulations that permit and promote private sector development.

4.2 GARCH approaches

OLS estimation has the drawback of an assumption about the assumption of linearity. However, years of high volatility in the number of licences is possible to be followed by years of high volatility, and years of low volatility, to be followed by low volatility. By assuming that the growth of fintech licenses may follows similar patterns to these of a stock price, we examine the possible autocorrelation and volatility clustering, and in the presence of that, we develop models that incorporate the volatility. Research in other areas of finance, where volatility clustering is evident provide these models. In particular, numerous studies provide evidence of long memory process in volatility persistence of stock prices, raising the need to parameterize for this type of uncertainty. Taylor (1986) and Kariya et al. (1990) find there is substantially more correlation between absolute or squared returns than there is between the returns themselves. Ding et al. (1993) conclude that there is more correlation between absolute returns than returns themselves, and high autocorrelation of the power absolute returns for long lags that was developed by Asymmetric Power ARCH model (APARCH) and tested the significance of the model in US market. Giot and Laurent (2003) provide support for APARCH models over other GARCH models. Conrad et al. (2011) supports multivariate APARCH models in different markets. A discussion about Aparch models is provided in Laurent (2004) and Conrad et al. (2011). To capture long memory process in abnormal returns, we use APARCH(1,1) model as developed by Ding et al. (1993) in this study. We examine APARCH returns alongside OLS returns, so as to investigate the significance of institutional factors under the assumptions of a model that takes account of memory effects and we make the assumption that a similar pattern may exist for the growth of fintech licenses.

4.3 Main Empirical findings

To select the non-institutional variables to be used in the study we follow Chinko et al (2019) and by using the lasso methodology. The advantages of the methodology are explained at Chinko et al (2019). Lasso is a methodology that is useful for mainly two reasons. First, it is a method that enables the use of part of the data for modelling the model and the other part for model validation. Second, whenever we have a number of variables that is larger than the number of observations, it gives the ability to eliminate the variables, enabling in focusing in a handful of useful variables. The LASSO was introduced by Tibshirani (1996) and is discussed in Hastie et al.(2001).

Then we run OLS models based on the factors we found, and we examine if there is serial correlation and volatility clustering in the residuals of our models, by using correlogram statistics and Portmandeu Q white noise test sratistics. If the first lags of the residuals of the models exhibit serial correlation, then we examine also the Garch, Egarch and Aparch models. We report BIC and AIC statistics and based on these and Wlad and ll statistics, we provide some evidence of the improvement of the models, if any. Finally, we examine is the residuals of the new Garch-based models exhibit any kind of serial correlation.

Table 1 provides statistics regarding the fit of OLS regressions, based on the combination of institutional factors, that we selected and the macroeconomic and sector factors that maximise the firt of the regressions, based on the methodology described in the previous chapter. The table indicates that institutional factors are statistically significant. In particular, we found that the increase of Control of corruption, voice and accountability and rule of law by 1 unit leads to a smaller number of licences by 12.78, 36.87 and 22.33 licences, respectively. Political stability and regulation, from the other side , were found insignificant factors. From the other side, Bank capital to assets ratio (%) and increasing insurance costs are found to have a negative effect in licencing, while the increasing use of bank credit and collaterals leads to an increase of licencing. An increase in Lerner index, that indicates the market power of some banks, is also associated with the growth of the sector in some of the models.

Table 1. The effect of institutional factors to overall fintech licencing (ols)

| | | | | | |
|------------------|------------|------------|------------|------------|------------|
| cor | -12.78** | | | | |
| | (-2.05) | | | | |
| voa | | -36.87*** | | | |
| | | (-3.48) | | | |
| law | | | -22.33** | | |
| | | | (-2.58) | | |
| pol | | | | -8.485 | |
| | | | | (-1.41) | |
| reg | | | | | -15.18 |
| | | | | | (-1.37) |
| bcaps | -8.035*** | -9.394*** | -9.630*** | -8.310*** | -8.630*** |
| | (-7.32) | (-7.91) | (-7.61) | (-7.21) | (-7.35) |
| colla | 0.198*** | 0.186*** | 0.244*** | 0.232*** | 0.177** |
| | -2.89 | (2.69) | (3.33) | (3.04) | (2.46) |
| credi | 0.883*** | 0.846*** | 1.056*** | 1.086*** | 0.873*** |
| | -3.76 | (3.92) | (4.69) | (4.35) | (3.43) |
| gdppp | 0.00333*** | 0.00349*** | 0.00375*** | 0.00263*** | 0.00304*** |
| | -4.71 | (5.60) | (4.77) | (4.82) | (4.62) |
| insprem | -16.84*** | -16.72*** | -18.52*** | -15.73*** | -18.06*** |
| | (-5.84) | (-5.81) | (-6.08) | (-5.35) | (-5.79) |
| timeg | 1.378*** | 0.905** | 0.978*** | 1.244*** | 1.051** |
| | -5.01 | (2.57) | (2.89) | (4.20) | (2.58) |
| cpi | -0.623 | -0.851 | -0.923 | -0.237 | -0.259 |
| | (-0.54) | (-0.75) | (-0.80) | (-0.20) | (-0.23) |
| cpid | 0.848 | 1.194 | 1.269 | 0.436 | 0.497 |
| | -0.64 | (0.92) | (0.95) | (0.32) | (0.38) |
| lerner | 42.19 | 23.01 | 46.52 | 59.63** | 54.54* |
| | -1.43 | (0.77) | (1.65) | (2.03) | (1.79) |
| lotodep | 0.00231 | -0.0450 | 0.0319 | -0.0648 | -0.0257 |
| | -0.05 | (-1.13) | (0.64) | (-1.37) | (-0.60) |
| Constant | -85.82 | -42.56 | -96.07 | -73.54 | -56.64 |
| | (-1.33) | (-0.70) | (-1.54) | (-1.12) | (-0.92) |
| adj. R-sq | 0.763 | 0.776 | 0.777 | 0.752 | 0.757 |
| AIC | 697.6 | 692.8 | 692.2 | 701.3 | 699.6 |
| BIC | 727 | 722.2 | 721.6 | 730.8 | 729.1 |

Given the fact that in three out of the 31 examined countries, we found that the residuals of the models are correlated, we proceed to the examination of Garch-type models, so as to examine if the validity of the models is enhanced. Indeed, the tests indicate that the residuals of the new Garch-type models do not exhibit serial correlation. The fit of the models increases, also, to some extent, given that AIC decreases from 690-700 (OLS models) to 620-630 (Garch models) and to 520-690 (Aparch models). Again, the institutional factors were found to have a negative effect over the total number of the licences and the previous findings are also confirmed.

Table 2. The effect of institutional factors to overall fintech licencing (garch, aparch)

| | | | | | |
|------------------------------|-----------------------|-----------------------|-----------------------|----------------------|------------------------|
| Mean | | | | | |
| cor | -15.58*** (-7.08) | | | -12.80 (-1.30) | |
| voa | | -21.43 (.) | | | |
| law | | | -14.67** (-2.29) | | -7.118*** (-10.05) |
| bcaps | -6.185*** (-20.78) | -7.501*** (-15.52) | -7.752*** (-18.29) | -7.974*** (-3.76) | -1.559*** (-26.30) |
| colla | 0.0766*** (3.26) | 0.0845* (1.78) | 0.163** (2.57) | 0.194 (1.11) | -0.0385*** (-7.29) |
| credi | 0.0467 (0.57) | 0.442*** (4.50) | 0.702*** (8.57) | 0.869** (2.15) | -0.224*** (-8.53) |
| gdppp | 0.00304*** (14.17) | 0.00262*** (12.38) | 0.00284*** (5.21) | 0.00331*** (2.74) | 0.000957*** (13.11) |
| insprem | -14.74*** (-13.84) | -14.34*** (-5.91) | -15.44*** (-5.07) | -16.74*** (-3.52) | -6.865*** (-21.32) |
| timeg | 1.268*** (9.47) | 1.096*** (4.00) | 0.945*** (2.78) | 1.376** (2.43) | 0.752*** (9.99) |
| cpi | -1.342*** (-3.20) | -0.486 (.) | -0.534 (.) | -0.634 (-0.39) | -0.000357 (-0.00) |
| cpid | 1.147** (2.45) | 0.263 (.) | 0.450 (.) | 0.844 (0.54) | 0.0429 (0.24) |
| lerner | 13.02 (0.87) | 28.89* (1.88) | 48.31*** (3.61) | 42.45 (0.81) | 36.28*** (17.11) |
| lotodep | 0.00186 (0.07) | -0.0462 (-1.61) | 0.0144 (0.44) | 0.00125 (0.01) | 0.0367*** (12.32) |
| Constant | 10.79 (0.54) | 31.78 (.) | -27.79 (.) | -83.42 (-0.95) | -0.993 (-0.19) |
| Variance | | | | | |
| $\alpha 1$ | 1.626*** (3.63) | 0.307 (.) | 0.238 (.) | 0.220 (0.03) | -2.200 (-0.79) |
| $\beta 1$ | -0.00766 (-0.18) | 0.923*** (92.80) | 0.968*** (99.02) | | |
| C | 7.173 (1.26) | -23.44 (.) | -24.17 (.) | 42.68 (0.05) | -0.000330 (-0.02) |
| $\theta 1$ | | | | 0.000879 (0.00) | 5.060* (1.66) |
| power | | | | 1.766 (0.18) | 1.832*** (7.60) |
| adj. R-sq | | | | | |
| AIC | 625.8 | 620.5 | 630.3 | 692.6 | 522.7 |
| BIC | 662.6 | 640.1 | 652.4 | 731.9 | 564.5 |

Examining the effect of institutional factors to new fintech licencing, meaning the factors that affect new additional licences on an annual basis, leads to entirely different conclusions. As Table 3 indicates institutional factors, if examined as standalone factors, seem to affect the growth of new licences positively. One unit of higher control of corruption, government efficiency, regulation and voice and accountability leads to an increase of licences by two to seven annually.

Table 3. The effect of institutional factors to new fintech licencing
Conditional mean

| | | | | | | | |
|-----------------------------|----------------------|------------------------|---------------------|----------------------|----------------------|---------------------|----------------------|
| constant | -2.114*** (-2.76) | 0.640*** (3.15) | 0.187 (0.24) | 3.828** (2.03) | -3.483*** (-9.16) | 4.639*** (-3.78) | 6.658*** (-7.05) |
| cor | 2.816*** (4.10) | | | | | | 7.963*** (-11.13) |
| gov | | 2.071*** (18.91) | | | | | 7.474*** (7.82) |
| law | | | 4.173*** (10.79) | | | | -1.420 (-1.62) |
| pol | | | | 0.263 (0.14) | | | 6.942*** (-19.36) |
| reg | | | | | 5.234*** (13.52) | | 10.12*** (16.42) |
| voa | | | | | | 7.217*** (5.81) | 4.214*** (4.17) |
| Conditional variance | | | | | | | |
| C | -91.30*** (-2.58) | 12.31*** (9.05) | 29.91*** (6.77) | 129.1*** (4.76) | -85.55*** (-4.52) | 82.05*** (-2.58) | 6.619*** (6.28) |
| a | 0.0437 (1.13) | 2.099*** (21.72) | 1.499*** (31.18) | 1.139*** (6.62) | 0.0307* (1.84) | 0.0231 (1.10) | 1.442*** (30.79) |
| b | 1.517*** (6.83) | -0.00811*** (-9.12) | -0.00471 (-0.28) | -0.0601** (-2.53) | 1.509*** (12.36) | 1.477*** (7.28) | -0.00134 (-0.21) |

However, when we take these factors in conjunction with other factors, increasing voice and accountability seems to be the factor that is associated with new licences. These results lead to interesting findings. It seems that what matters for the development of the sector is rather a large size of the national market (gdp) , increasing voice and accountability, Government Effectiveness and Regulatory Quality are the key factors for the establishment of these innovative companies.

Table 4. The effect of institutional, banking and macroeconomic factors to new fintech licencing

| Conditional mean | | | | | |
|-----------------------------|-----------|-----------|----------|-------------|-------------|
| constant | 2.177 | -12.75*** | -6.832 | -12.19*** | -7.549*** |
| | (1.34) | (-12.05) | (-1.24) | (-4.31) | (-11.53) |
| cor | 0.485 | -10.68*** | -3.948 | -11.59*** | -5.337*** |
| | (1.25) | (-16.02) | (-1.44) | (-7.54) | (-15.47) |
| gov | | 14.99*** | 5.598 | 13.20*** | 2.983*** |
| | | (17.71) | (1.58) | (6.39) | (6.21) |
| law | | -6.740*** | -5.387 | -6.455*** | -2.531*** |
| | | (-8.93) | (-1.57) | (-2.86) | (-4.06) |
| pol | | -7.672*** | -4.492** | -6.901*** | -0.856*** |
| | | (-22.44) | (-2.35) | (-6.96) | (-2.90) |
| reg | | 11.82*** | 6.083 | 11.30*** | 5.785*** |
| | | (19.25) | (1.62) | (8.06) | (15.12) |
| voa | | 7.007*** | 10.24* | 10.14*** | 3.762*** |
| | | (6.55) | (1.96) | (3.26) | (3.65) |
| atm | -0.000185 | 0.0148*** | -0.0217 | -0.00994 | |
| | (-0.07) | (3.96) | (-1.41) | (-0.96) | |
| lerner | | 2.099* | | -3.826 | |
| | | (1.77) | | (-1.22) | |
| boone | | | 0.00144 | | |
| | | | (0.05) | | |
| gdp | | | | 0.0000721** | 0.000119*** |
| | | | | (2.53) | (8.08) |
| Conditional variance | | | | | |
| c | -159.3 | 3.050*** | -146.3** | 16.29*** | 4.090*** |
| | (.) | (6.09) | (-1.98) | (5.26) | (12.31) |
| a | 0.0176*** | 1.666*** | 0.0100 | 1.506*** | 2.993*** |
| | (2.81) | (28.36) | (0.58) | (12.31) | (16.61) |
| b | 1.893*** | -0.00111 | 1.837*** | -0.00572** | -0.00235 |
| | (1933.75) | (-0.39) | (4.21) | (-2.37) | (-1.03) |

Note: t-statistics a in parentheses, Asterisk, two asterics and three asterics denote 10%, 5% and 1% level of significance

Overall the findings indicate that although initially the establishment of these companies have taken place in countries with less developed regulation and rules, the establishment of new licences in fintech requires improved governance indicators.

5. Discussion and conclusion

The study examined if the institutional factors affect the fintech industry, by examining the effect of world bank institutional governance indicators to the growth of the sector. We found that an established institutional framework leads to a rapid growth of the sector. Our study confirms the findings of Shleifer and Vishny (1997) and support in general the institutional theory (Selznick, 1957; Hill and Jones, 1992) that claims that institutions and institutional structures, reduce the costs of information gathering and analysis, reducing so monitoring costs describes that formal organizations adopt to these structures through cooptation. Our study, to the best of your knowledge, is the first to examine if the institutional factors affect the growth of the fintech licencing and provides novel findings that favour further deregulation of the economy. The diversity and geographical proximity of the examined countries (EU countries) provides an interesting study mix that could be useful for drawing further conclusions, and policy recommendation, at a global scale.

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Appendix

Variables examined in the study

A. World Bank Governance indices

| | |
|-----|---|
| cor | Control of Corruption (World bank governance indicator) |
| reg | Regulatory Quality (World bank governance indicator) |
| voa | Voice and Accountability (World bank governance indicator) |
| pol | Political Stability and Absence of Violence/Terrorism (World bank governance indicator) |
| law | Rule of Law (World bank governance indicator) |
| gov | Government Effectiveness (World bank governance indicator) |

B. Macroeconomic factors and C. Financial indices

| | |
|-----------|---|
| ACC | Bank accounts per 1,000 adults |
| ACCE | Firms identifying access to finance as a major constraint (%) |
| ATM | ATMs per 100,000 adults |
| BCAPS | Bank capital to assets ratio (%) |
| BOND | Corporate bond average maturity (years) |
| BONISS | Corporate bond issuance volume to GDP (%) |
| BOONE | Boone indicator |
| BRANCH | Bank branches per 100,000 adults |
| CAPGDP | Stock market capitalization to GDP (%) |
| CAPRWA | Bank regulatory capital to risk-weighted assets (%) |
| CAPTA | Bank capital to total assets (%) |
| CAPTOGDP | Stock market total value traded to GDP (%) |
| CENASSGDP | Central bank assets to GDP (%) |
| COLLA | Value of collateral needed for a loan (% of the loan amount) |
| CONC | Bank concentration (%) |
| CONS | Final consumption expenditure (% of GDP) |
| COSIN | Bank cost to income ratio (%) |
| CPI | Consumer price index (2010 = 100) |
| CPIA | Consumer price index (2010=100, average) |
| CPID | Consumer price index (2010=100, December) |
| CREDGDP | Deposit money banks' assets to GDP (%) |
| CREDI | Firms with a bank loan or line of credit (%) |
| CRISI | Banking crisis dummy (1=banking crisis, 0=none) |
| DEBT | Gross portfolio debt liabilities to GDP (%) |
| DEBTISS | International debt issues to GDP (%) |
| DEBTS | Outstanding domestic private debt securities to GDP (%) |
| DEPCEN | Debit card (% age 15+) |
| DEPGDP | Bank deposits to GDP (%) |
| DEPSPR | Bank lending-deposit spread |
| EQUITY | Gross portfolio equity assets to GDP (%) |
| EXTLA | External loans and deposits of reporting banks vis-à-vis all sectors (% of domestic bank deposits) |
| EXTLN | External loans and deposits of reporting banks vis-à-vis the nonbanking sectors (% of domestic bank deposits) |
| EXTLO | External loans and deposits of reporting banks vis-à-vis the banking sector (% of domestic bank deposits) |
| FACTORI | Total factoring volume to GDP (%) |
| FDI | Foreign direct investment, net inflows (% of GDP) |
| FIVE | 5-bank asset concentration |
| FORASS | Foreign bank assets among total bank assets (%) |
| FORCL | Consolidated foreign claims of BIS reporting banks to GDP (%) |
| FORTO | Foreign banks among total banks (%) |
| GDPCAP | GDP per capita (constant 2005 US\$) |
| GDPC | GDP per capita (current US\$) |
| GDPCO | GDP at market prices (constant 2005 US\$) |
| GDPCU | GDP at market prices (current US\$) |
| GDPPP | GDP per capita, PPP (current international \$) |
| GINI | GINI index (World Bank estimate) |
| GNI | Gross National Income (current US\$) |
| HSTA | H-statistic |
| ICT | Investment in ICT with private participation (current US\$) |
| INFL | Inflation, consumer prices (annual %) |
| INSPREM | Life insurance premium volume to GDP (%) |
| INSUR | Insurance company assets to GDP (%) |
| INTERN | Outstanding international private debt securities to GDP (%) |
| INTPU | Outstanding international public debt securities to GDP (%) |
| INVEST | Investments financed by banks (%) |
| INVSAL | Investments financed by equity or stock sales (%) |

| | |
|---------|--|
| IRATE | Real interest rate (%) |
| ITOP | Income share held by highest 10% |
| LEASI | Global leasing volume to GDP (%) |
| LERNER | Lerner index |
| LIABI | Gross portfolio equity liabilities to GDP (%) |
| LIFXP | Life expectancy at birth, total (years) |
| LILI | Liquid liabilities in millions USD (2000 constant) |
| LIQU | Liquid assets to deposits and short term funding (%) |
| LISS | Syndicated loan issuance volume to GDP (%) |
| LIST | Number of listed companies per 1,000,000 people |
| LLGDP | Liquid liabilities to GDP (%) |
| LOTODEP | Bank credit to bank deposits (%) |
| MARKRET | Stock market return (% , year-on-year) |
| MATUR | Syndicated loan average maturity (years) |
| MCAP | Market capitalization of listed domestic companies (% of GDP) |
| MCAPEXT | Market capitalization excluding top 10 companies to total market capitalization (%) |
| MUTU | Mutual fund assets to GDP (%) |
| NEED | Firms not needing a loan (%) |
| NFIN | Nonbank financial institutions' assets to GDP (%) |
| NIM | Bank net interest margin (%) |
| NNIM | Bank noninterest income to total income (%) |
| NPL | Bank non-performing loans to gross loans (%) |
| NPLON | Bank nonperforming loans to total gross loans (%) |
| OVERH | Bank overhead costs to total assets (%) |
| PDEBTS | Outstanding domestic public debt securities to GDP (%) |
| PENS | Pension fund assets to GDP (%) |
| POD | Population growth (annual %) |
| POP | Population, total |
| POPUL | Population, total |
| PORTO | Gross portfolio debt assets to GDP (%) |
| PRCRED | Private credit by deposit money banks and other financial institutions to GDP (%) |
| PRCRGDP | Private credit by deposit money banks to GDP (%) |
| PTONPL | Provisions to nonperforming loans (%) |
| REJAP | Firms whose recent loan application was rejected (%) |
| REMIT | Remittance inflows to GDP (%) |
| ROA | Bank return on assets (% , after tax) |
| ROABT | Bank return on assets (% , before tax) |
| ROE | Bank return on equity (% , after tax) |
| ROEBT | Bank return on equity (% , before tax) |
| SAVIN | Firms with a checking or savings account (%) |
| SMALL | Small firms with a bank loan or line of credit (%) |
| START | Time required to start a business (days) |
| STATE | Credit to government and state-owned enterprises to GDP (%) |
| SYST | Financial system deposits to GDP (%) |
| TAXP | Profit tax (% of commercial profits) |
| TAXR | Total tax and contribution rate (% of profit) |
| TIMEG | Time spent dealing with the requirements of government regulations (% of senior management time) |
| TIMET | Time to prepare and pay taxes (hours) |
| TIMEX | Time to export, border compliance (hours) |
| TRADE | Trade (% of GDP) |
| TRADETE | Value traded excluding top 10 traded companies to total value traded (%) |
| TRDST | Stocks traded, total value (% of GDP) |
| TURNNOV | Stock market turnover ratio (%) |
| UNEM | Unemployment, total (% of total labor force) (national estimate) |
| URBAN | Urban population (% of total population) |
| USE | Firms using banks to finance investments (%) |
| VOLAT | Stock price volatility |
| WCBAN | Working capital financed by banks (%) |
| WORKC | Firms using banks to finance working capital (%) |
| XRATE | Official exchange rate (LCU per US\$, period average) |
| ZSC | Bank Z-score |