

**Impact potential of the innovations in the insurance industry and their
main drivers worldwide**

By

Jovan Savicevic

Submitted to

Central European University

Department of Economics

*In partial fulfillment of the requirements for the degree of Master of Arts in Economic Policy
in Global Markets*

Supervisor: Alessandro De Chiara

Central European University

Budapest, Hungary

June 2017

Abstract

The aim of this thesis is to drill down into the world of innovations within the insurance industry to get the reader familiar with the current concepts, trends, technologies and business models. The theoretical part is meant to be a valuable contribution to any further study that is to be conducted in this field. It shows a complete overview of all innovations segmented into different categories, for better understanding. Main players within each trend are also named.

The second part of the thesis is methodological, and it focuses on the probable drivers behind insurance innovations worldwide. The analysis is very generic, grasping several variables to find potential correlations. Ordered Logit method is used for estimations of the effects that variables have on the level of technology development within the insurance industry. Factors showing significant effects, such as legal environment and digital literacy, are used for policy recommendation purposes. Profound research analysis is conducted to dig out other relevant factors that are potentially of great significance for innovations within insurance sector, and for entrepreneurship as a whole.

Table of Contents

Abstract	i
Table of Contents	ii
List of Tables.....	iv
List of Figures	v
Introduction	1
Chapter 1: “InsurTechs have the floor”	6
1.1. Definition of InsurTech company.....	7
1.2. InsurTechs as a hot topic	8
1.3. Mapping out InsurTechs	10
Chapter 2: Main trends	12
2.1. P2P insurance solution.....	12
2.2 Auto telematics	14
2.3. Wearables	16
2.4. IoT-Home	17
2.5. Insurance policy management platforms	18
2.6. Price comparison websites / Aggregators.....	20
2.7. Drones.....	21
2.8. Claims management	22
2.9. Cyber insurance	23

2.10. Health benefits exchange platforms	24
2.11. On-demand insurance providers	25
Chapter 3: Methodology and Analysis	26
3.1. Data and variables	26
3.1.1. Dependent variable	26
3.1.2. Explanatory variables.....	27
3.2. Evaluation method.....	31
3.3. Results	35
3.3.1. Data cleaning	35
3.3.2. Outcome.....	35
3.3.3. Interpretation.....	36
3.3.4. Ordered Logit Model Predicted Probabilities	38
3.4. Robustness check.....	43
3.4.1. Ordered Probit Model	43
3.4.2. Ordered Logit model with modified ranges	43
3.5. Limitations of the evaluation strategy	47
Conclusion and policy recommendations	49
Appendix	52
Stata codes.....	61
Bibliography.....	64

List of Tables

Table 1: Percentages of countries belonging to each category	35
Table 2 Ordered Logit Model Predicted Probabilities for “Internet users” variable	39
Table 3 Ordered Logit Model Predicted Probabilities for “Legal rights index” variable	40
Table 4 Ordered Logit Model Predicted Probabilities for “Legal system origin” variable	41
Table 5 Ordered Logit Model Predicted Probabilities for “Population ages 20-39” variable	42
Table 6 Ordered Logit Model Predicted Probabilities for “Internet users” variable (modified ranges)	45
Table 7 Ordered Logit Model Predicted Probabilities for “Start-up procedures” variable (modified ranges)	46
Table 8 Ordered Logit Model Predicted Probabilities for “Population ages 20-39” variable (modified ranges)	47

List of Figures

Figure 1 Number of InsurTechs founded all around the world, from 2010-2016.....	8
Figure 2 Number of rounds and total funding of InsurTechs from all around the world, from 2008-2016.....	9
Figure 3 Visualized image showing distribution of InsurTechs across the globe.....	10
Figure 4 Number of countries belonging to the ranges constructed based on the number of InsurTechs per country	34
Figure 5 Number of countries belonging to the ranges constructed based on the number of InsurTechs per country (slightly modified ranges)	44

Introduction

In the light of new technological trends and disruptions across various industries, this study will be focused on the ongoing changes within the insurance sector. New tendencies, facilitated by the technological development, happen to change the way insurance incumbents operate the business and to unleash new opportunities for end-customers.

We have all witnessed revolutions in many areas, all due to technological innovations. Just to name a few: newspaper companies reshaped their product and nowadays distribute it in the online form as well; the music industry suffered a significant loss after losing a huge portion of revenue from the sale of Compact Discs at the time when YouTube was launched; and banking is also getting transformed after appearance of online and mobile banking channels accelerated with the new players in the industry, so-called FinTech companies.¹

From the perspective of already established players, all the trends initially represent a threat for revenue streams to a certain extent, but at the same time open up new opportunities. Undoubtedly, incumbents have to learn how to tackle new trends, and possibly to utilize them and prosper. For instance, not that long ago, newspaper companies realized that they needed to grasp new trends at the cost of giving up a big chunk of their traditional sales revenue. They started publishing articles online and on mobiles apps, at the expense of the lower volume of their newsprint versions. However, this way they have managed to increase customer reach and consequently to release potential for more revenue from advertisements and subscription-based pricing model.²

¹ “Scales Dropped,” economist.com, *The Economist*, (April 16, 2016), <http://www.economist.com/news/business/21696962-more-people-are-paying-stream-music-industry-still-wobbly-scales-dropped>; PricewaterhouseCoopers, “Customers in the Spotlight: How FinTech Is Reshaping Banking,” pwc.com, *PwC*, accessed May 4, 2017, <https://www.pwc.com/gx/en/industries/financial-services/publications/fintech-is-reshaping-banking.html>.

² Jennifer Saba, “Specifics on Newspapers from ‘State of News Media’ Report,” web.archive.org, (March 20, 2009),

New trends are mainly targeting "millennials," which usually refers to generations born after 1980. These generations are more prone to use Internet, smartphones, mobile apps, wearables, IoT devices, etc.³ Typically, the number of millennials is constantly getting bigger, making the potential of new trends and companies utilizing them much greater, by every single day.

Unavoidably, innovations affect insurance industry as well. Not that matured, but still with a significant impact potential, these technologically powered ideas and products are about to disrupt the traditional insurance business models and ultimately change the way of doing insurance business.⁴ Namely, with some new companies in town, leveraging various technologies, the insurance industry is about to be dramatically changed. The last couple of years has shown a significant change in insurance business arising from start-ups tackling different parts of the value chain, or even acting as a fully digital, standalone insurance providers. These new players are all known as InsurTechs, symbolizing the use of technology in the insurance business.⁵ The number of insurance start-ups is steadily growing, with a massive financial support coming from investors realizing their potential.

Traditional insurance carriers are very much aware of the new trends, and they react accordingly. According to PwC report, incumbents develop similar in-house solutions, they partner with InsurTechs, participate in incubator and accelerator programs, launch VC fund to invest in InsurTechs, or to acquire them.⁶ Nevertheless, new digital/branchless insurance

https://web.archive.org/web/20090320033032/http://www.editorandpublisher.com/eandp/news/article_display.jsp?vnu_content_id=1003951616.

³ Goldman Sachs, "Millennials Infographic," goldmansachs.com, *Goldman Sachs*, accessed May 4, 2017, <http://www.goldmansachs.com/our-thinking/pages/millennials/>.

⁴ Anik Sen, "Insurtech: Disruptions and Opportunities in the Insurance Industry," pinebridge.com, (June 10, 2016), <https://www.pinebridge.com/insights/investing/2016/10/insurtech-disruptions-and-opportunities-in-the-insurance-industry>.

⁵ Andrew Beattie, "Insurtech," Investopedia.com, *Investopedia*, (October 12, 2016), <http://www.investopedia.com/terms/i/insurtech.asp>.

⁶ PricewaterhouseCoopers, "Opportunities await: How InsurTech is reshaping industry," pwc.com, *PwC*, accessed May 4, 2017, <http://www.pwc.com/ca/en/insurance/publications/pwc-how-insurtech-is-reshaping-insurance-2016-07-en.pdf>

providers are engaging as a new insurance companies and represent cost efficiency driven competitors on the market, ready to penetrate new and compete at old market niches.⁷

My aim is to identify the most impactful InsurTechs, to map out their geographical distribution, to analyze their business models, commonly used technologies, to estimate impact across the value chain, and to look at funding trends in the "industry." The very critical part of the thesis will be a discussion of InsurTechs' benefits for individuals, as well as for carriers, and resultantly for total economic wellbeing.

Core macro analysis is based on the number of InsurTechs per country, and its dependence on multiple variables. I try to pinpoint some of the most influential variables responsible for the establishment of InsurTechs and start-ups in general, with the aim to provide the relevant policy recommendations for the Serbian economy, all based on derived results. Namely, Serbia is a nation with only a few players within financial innovation area, and as such, it is a suitable subject for the analysis and potential improvement. It is currently lagging behind the other countries when it comes to the number of start-ups developed on the new technologies framework, despite its relatively big ICT sector potential according to the World Bank report.⁸ In my humble view, taking into account the ease of ICT services export, small developing economies, such as Serbia, should put more emphasize on the development of an environment that is supposed to facilitate the creation of new innovative solutions.

Ordered Logit Model is used for the analysis. Countries are assigned to different development status based on the number of InsurTechs registered in each of them. This way, dependent variable is transformed into categorical one, with five levels of development. Eight explanatory

⁷ Mark Breeding, "The Convergence of InsurTech and Traditional Insurance Technology," Text, *The OnBase Blog*, (December 6, 2016), <http://blog.onbase.com/insurance/the-convergence-of-insurtech-and-traditional-insurance-technology/>.

⁸ World Bank, "Start Your Engines: Unlocking the Potential of Serbia's Economy," Text/HTML, *World Bank*, (February 10, 2014), <http://www.worldbank.org/en/news/feature/2014/10/02/start-your-engines-unlocking-potential-of-serbian-economy>.

variables are used to estimate potential correlations, to figure out drivers behind innovations in insurance industry. Independent variables include: Individuals using the Internet (% of population), Strength of legal rights index, Legal origin, Start-up procedures to register a business (number), Insurance and financial services (% of service exports, BoP), Population ages 20-39 (% of male population), GDP - current \$USD (log) and Population, total (log). Data for dependent variable is downloaded from Tracxn Research report, while data for explanatory variables, except for legal origin, is downloaded from World Bank database. Data for Legal origin variable is manually extracted from the following link - <http://lawin.org/list-of-legal-systems-in-countries-around-the-world/>.

As of the literature review, apart from few studies done by PwC and Tracxn, this field seems to be relatively unexplored. In the report "Opportunities await: How InsurTech is reshaping industry," PwC mainly deals with trends in general showing different survey based graphs and figures related to insurance technology development. Tracxn has recently published report named "Tracxn Research – Insurance Tech Landscape, February 2017". The report briefly introduces leading players within each technology trend and discusses start-up funding segmented on multiple levels. There are also many short articles published by more and less InsurTech specialized journals such as the-digital.com, insurer.com, insurancejournal.com, dig-in.com, insurtechnews.com, insurtechtalk.com, forbes.com, fortune.com, wired.co.uk, bizjournals.com, reuters.com, bloomberg.com, etc. These articles mostly focus on specific start-up/trend/incumbent initiatives. However, I couldn't find any InsurTech related study grasping all types of innovations at one place, and explaining their business models and impact. Therefore, this thesis is meant to bring up some uniqueness, showing all of the main trends in one place, their short descriptions, business concepts, main players and effects on the insurance value chain. On the top of that, my aim is to reveal main drivers behind insurance technology innovations worldwide. Although omitted variable bias is present in the analysis due to lack of

data availability for all variables of interest, this report is supposed to serve as a helpful initial point for any further research done in respect to this topic.

The structure of the thesis is as follows. The first chapter is devoted to the basic understanding of InsurTechs, funding trends and their geographical distribution. In the second chapter, main types of InsurTechs are described in detail, together with technologies used, most popular companies and supposed impact on the insurance value chain. The third chapter presents the model used for the analysis, variables, data, results, limitations, and robustness check.

Chapter 1: “InsurTechs have the floor”

As the technology is progressing innovations are arising. Innovations are usually launched in forms of start-ups. A start-up company is an entrepreneurial venture which is typically a newly emerged, fast-growing business that aims to meet a marketplace need by developing or offering an innovative product, process or service.⁹

Recent years have featured better interest of investors for start-up financing. There are several drivers behind start-up investments. First of all, investors are interested in potentially uncorrelated returns for better portfolio diversification. Secondly, high risk profiled investors feature tendency to pick start-up promising to become a new hot trending topic. Investors are also motivated with the positive change start-ups to bring up, providing them feeling of being part of it.¹⁰

Funding is mainly provided by Venture Capital funds. These funds invest in start-ups and small to medium sized businesses. Besides investment, VC funds are paramount links for ventures, helping them in their endeavors to reach out the clients, get legal support, complete business model, etc. Some of the biggest VCs around the globe are Andreessen Horowitz, Khosla Ventures, SV Angel, Accel Partners, Sequoia Capital, Venrock, Founders Fund, ARCH Venture Partners, Thrive Capital, etc.¹¹

Undoubtedly, investments are facilitated with the launch of online equity crowdfunding concept. Before the evolution of equity crowdfunding, a form of online investing that has been legalized in several nations, start-ups didn't advertise themselves to the general public. The only

⁹ Natalie Robehmed, “What Is A Startup?,” *forbes.com*, *Forbes*, (December 16, 2013), <http://www.forbes.com/sites/natalierobehmed/2013/12/16/what-is-a-startup/>.

¹⁰ Tanya Prive, “How To Invest In Start-ups And Make Money,” *Forbes*, November 17, 2015, <http://www.forbes.com/sites/tanyaprive/2015/11/17/how-to-invest-in-start-ups-and-make-money/>.

¹¹ Tanya Benedicto Klich, “VC 100: The Top Investors in Early-Stage Startups,” *entrepreneur.com*, *Entrepreneur*, (February 19, 2015), 1, <https://www.entrepreneur.com/article/242702>.

way to do that was through initial public offering (IPO), after the approval of respective regulatory body. Nowadays, there are many alternatives enabling businesses to avoid mandatory periodic disclosures of financial information and other administrative actions that investors and potential investors regularly receive from registered public companies. Some of the most famous online crowdfunding platforms are Wefunder, SeedInvest, AngelList, Crowdfunder, Fundable, CircleUp, PeerRealty, EarlyShares, EquityNet, Localstake, etc.¹²

Still, regulations affecting equity crowdfunding are fairly different among countries. Although some legal systems are not constrained with general public start-up investments, there still might be some limitations regarding the maximum amount to be raised by a particular start-up. Nevertheless, positive development and change of crowdfunding concept "force" countries to continuously update regulations in regards to crowdfunding, for the sake of better functioning financial market.¹³

1.1. Definition of InsurTech company

InsurTech company symbolizes the business using new technologies to enter insurance sector and provide coverage/service to a more digital savvy customers or to serve insurance companies with more advanced and efficient IT solutions. Therefore, we spot two main types of InsurTech players. B2C InsurTechs deliver product directly to end-customer, which can be either individual or business customer. B2B InsurTechs serve incumbents, providing new ways of tackling traditional operations in a more efficient and smoother way.

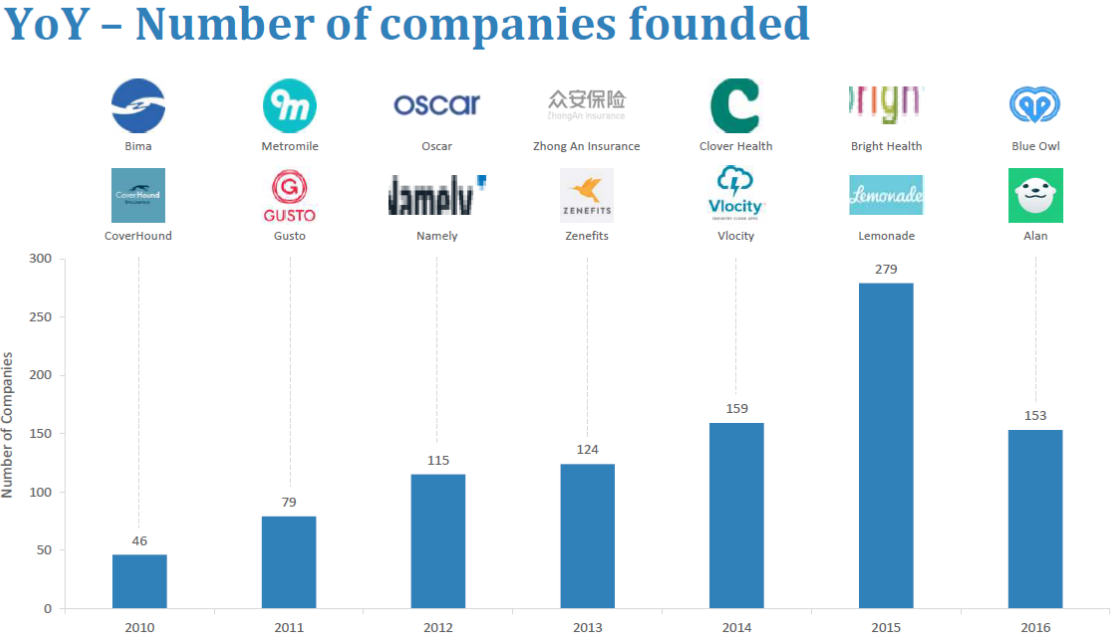
¹² Brian Martucci, "Top 10 Equity Crowdfunding Sites for Investors & Entrepreneurs," August 26, 2015, <http://www.moneycrashers.com/equity-crowdfunding-sites-investors-entrepreneurs/>; Wikipedia, "Startup Company," [Wikipedia.org](https://en.wikipedia.org/w/index.php?title=Startup_company&oldid=777871826), April 29, 2017, https://en.wikipedia.org/w/index.php?title=Startup_company&oldid=777871826.

¹³ Jay Akasie, "With New JOBS Act Rule, a New Era of Investment Banking?," [nasdaq.com](http://www.nasdaq.com/article/with-new-jobs-act-rule-a-new-era-of-investment-banking-cm279813), (September 24, 2013), <http://www.nasdaq.com/article/with-new-jobs-act-rule-a-new-era-of-investment-banking-cm279813>.

1.2. InsurTechs as a hot topic

The insurance industry is still stuck with traditional business processes and legacy IT systems, and as such, it is ripe for disruption. There is a need for better operational efficiency and more customer-centric solutions.¹⁴ As an answer to this issue, the number of founded InsurTech companies keeps rising as the time goes by (see Figure 1. below).

Figure 1 Number of InsurTechs founded all around the world, from 2010-2016



Source: Tracxn, “Tracxn Research - Insurance Tech Landscape, February 2017,” (Data & Analytics, 10:40:25 UTC), <https://www.slideshare.net/Tracxn/tracxn-research-insurance-tech-landscape-february-2017>.

Global investments in InsurTechs more than tripled in 2015, signaling a significant change in the scope and strategy of the insurance industry (see Figure 2).¹⁵ However, in the following year, 2016, investments dropped down, most probably as a result of the US presidential

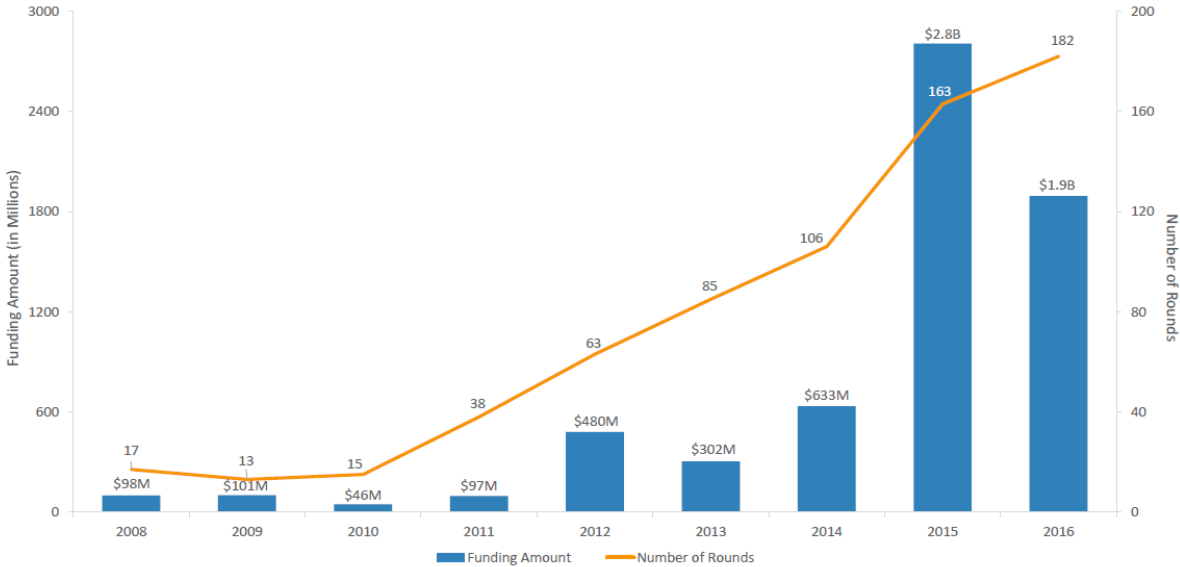
¹⁴ L.S. Howard, “Investments in InsurTech Expected to ‘Keep Booming’ in 2017: KPMG Report,” *Insurance Journal*, February 23, 2017, <http://www.insurancejournal.com/news/international/2017/02/23/442638.htm>.

¹⁵ Fintech Finance, “The Rise of InsurTech Investment,” <http://www.fintech.finance>, (October 31, 2016), <http://www.fintech.finance/01-news/the-rise-of-InsurTech-investment/>.

elections, Brexit vote in the UK, forecasted a slowdown in China, and exchange rate fluctuations across the globe.¹⁶ Here, I would add that in 2015 there was an outlier. Namely, so far the biggest funding round in InsurTech area took place in 2015. Zhong An was funded in Series A round with \$934 million.¹⁷ Thus, if we don't take into account this outlier, we will notice that investment trend will have upward trajectory even after 2015.

Figure 2 Number of rounds and total funding of InsurTechs from all around the world, from 2008-2016

YoY – Number of Rounds and Total Funding



Source: Ibid.

Overall, research from Accenture shows that almost a half of total global investments in InsurTechs comes from investments in start-ups functioning on the basis of artificial

¹⁶ L.S. Howard, “Investments in InsurTech Expected to ‘Keep Booming’ in 2017.”
¹⁷ Crunchbase, “ZhongAn | Crunchbase,” Crunchbase.com, accessed May 4, 2017, <https://www.crunchbase.com/organization/zhongan>.

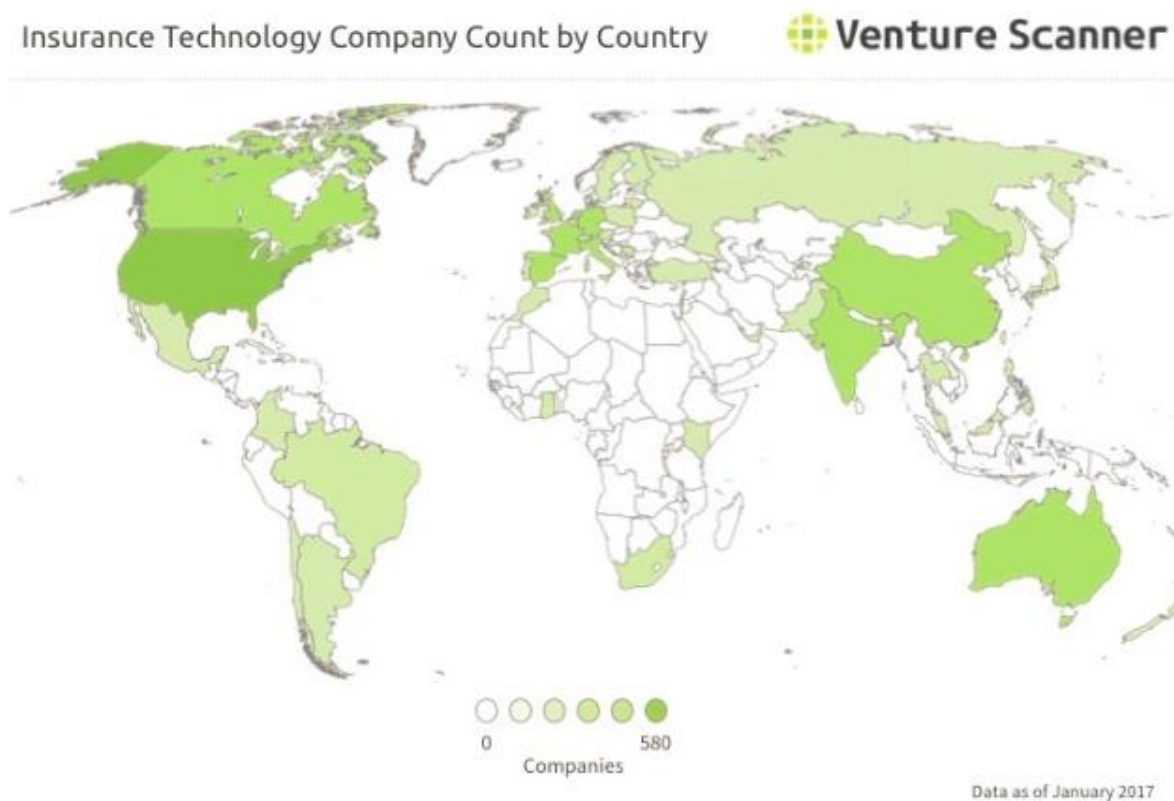
intelligence (AI) and the internet of things (IoT) technologies.¹⁸ These technologies turn up to be the main contributors to the rise of InsurTech ideas and new business models.

1.3. Mapping out InsurTechs

InsurTechs are present across the whole globe. However, some markets turned out to be better soil for their development and growth.

As it is shown in Figure 3, the most InsurTechs are present in the United States, then Canada, Australia, China, India, and Western Europe. Furthermore, regions that are lagging behind in this respect are Latin America, rest of Europe, Russia, and some parts of Africa and Asia.

Figure 3 Visualized image showing distribution of InsurTechs across the globe



¹⁸ Accenture, “Artificial Intelligence and Internet of Things Attract Almost Half of InsurTech Funding Globally in 2016, According to Accenture Research | Accenture Newsroom,” newsroom.accenture.com, (March 30, 2017), <https://accntu.re/2ozRKYo>.

Source: Venture Scanner, “Venture Scanner: Where in the World Are Insurance Technology Start-ups? - Q4 2016,” [venturescanner.com](https://www.venturescanner.com/blog/2016/where-in-the-world-are-insurance-technology-start-ups-q4-2016), (December 13, 2016), <https://www.venturescanner.com/blog/2016/where-in-the-world-are-insurance-technology-start-ups-q4-2016>.

The most funded InsurTechs are so called unicorns, start-up companies valued at over \$1 billion.¹⁹ InsurTech unicorns are Zhong An, Chinese first online insurer, with \$934 million raised, and US-based health insurance platform Oscar with \$727.5 million in equity. Most of the funding rounds took place in the United States. Most of the well-known InsurTechs with high equity funding are headquartered in the US. Some of these InsurTechs are Clover Health (\$295 million in equity), SquareTrade (\$247 million), Metromile (\$205.5 million), Zenefits (\$583.6 million), Bright Health (\$80 million), Greenroad (\$84.4 million), Gusto (\$176.1 million), Collective Health (\$119 million), iPipeline (\$104.49 million), etc. Top funded non-US companies are Indian BankBazaar with \$79.75 million raised, Chinese Ins110 with \$84 million, Swedish Bima, which raised \$65.4 million.²⁰

¹⁹ Salvador Rodriguez, “The Real Reason Everyone Calls Billion-Dollar Startups ‘Unicorns,’” *ibtimes.com*, *International Business Times*, (September 3, 2015), <http://www.ibtimes.com/real-reason-everyone-calls-billion-dollar-startups-unicorns-2079596>.

²⁰ Tracxn, “Tracxn Research - Insurance Tech Landscape, February 2017,” (Data & Analytics, 10:40:25 UTC), <https://www.slideshare.net/Tracxn/tracxn-research-insurance-tech-landscape-february-2017>; Crunchbase, “BankBazaar.com | Crunchbase,” *Crunchbase.com*, accessed May 4, 2017, <https://www.crunchbase.com/organization/bankbazaar>.

Chapter 2: Main trends

In this chapter, the focus will be on the hottest tech trends in the insurance industry, technologies used, impact potential, and the main players within these trends. Start-ups that are going to be part of the study are those targeting end-customers, but also usable to the certain extent by insurance carriers, for different business purposes.

Some of the most popular and impactful types of InsurTech start-ups are the following: P2P insurance platforms, Auto Telematics, Internet of Things (IoT)-Home, Wearables, Health benefits exchange platforms, solutions for claim processes, Policy Managers, On-demand insurance platforms, Comparison websites, Drones, and Cyber Security.²¹

2.1. P2P insurance solution

Sharing economy became a concept widespread around the world, across various industries. This principle is unleashed due to fast and innovative tech development. There are well-known platforms such as Airbnb and Booking.com, aiming to revolutionize hospitality industry. Or ones such as Uber and BlaBlaCar, both providing transportation sharing solution within the city and between cities, respectively.²² In the banking industry, there are many P2P lenders emerging, such as LendingClub, Funding Circle, etc.²³

²¹ Angela Scott-Briggs, "Top 10 Latest Insurtech Trends," techbullion.com, *TechBullion*, (February 6, 2017), <http://www.techbullion.com/top-10-latest-insurtech-trends/>; Roger Peverelli, "10 Insurtech Trends for 2017," banknxt.com/, *BankNXT*, (January 3, 2017), <http://banknxt.com/58984/10-insurtech-trends-2017/>; Venture Clash, "Top 10 Insurtech Trends for 2016," ventureclash.com, *VentureClash*, (June 22, 2016), <http://ventureclash.com/2016/06/22/top-10-insurtech-trends-for-2016/>; Colin Wu, "5 Insurtech Trends to Watch in Southeast Asia," *Tech in Asia*, March 21, 2017, <https://www.techinasia.com/5-insurtech-trends-watch-southeast-asia/>; Caitlin Bronson, "Will InsurTech Startups Take over Your Drone Insurance Business?," insurancebusinessmag.com, *Insurance Business*, (October 8, 2016), <http://www.insurancebusinessmag.com/us/news/breaking-news/will-insurtech-startups-take-over-your-drone-insurance-business-35970.aspx>; Daniel Taibelson, "The Most Disruptive Insurtech Companies to Watch in 2017 | Vertafore," vertafore.com, (May 1, 2017), <http://www.vertafore.com/Resources/Blog/The-5-Most-Disruptive-Insurtech-Startups-to-Watch-in-2017>.

²² Gérald Karsenti, "Uber, Airbnb, Booking.com ... These New Players Who Are Reshuffling the Cards," January 25, 2016, <https://www.linkedin.com/pulse/uber-airbnb-bookingcom-new-players-who-reshuffling-cards-karsenti>.

²³ LendingClub, "Lending Club Partners with Funding Circle and Prosper to Launch Marketplace Lending Association," <http://blog.lendingclub.com>, *LendingClub Blog*, (April 7, 2016), <http://blog.lendingclub.com/lending-club-partners-funding-circle-prosper-launch-marketplace-lending-association/>.

The main impact of all these platforms is the elimination of traditional business concepts, middlemen, and expensive infrastructure. Consequently, they all achieve to lower costs for end-customers.²⁴

Some of the most popular P2P insurance players worldwide are Friendsurance, Lemonade, Inspeer, PeerCover, Guevara, TongJuBao, etc. Products offered by these start-ups are present across all business lines, including Life, Health, and P&C. However, most of them specialize in only one product line.²⁵

They all feature similar business models, in slightly different formats. The main idea behind P2P insurance concept is to create a common pool funded by community members who are willing to share risk together. These groups of members are formed online. In some cases pool is created by community/family members, emphasizing the trust between them, while in some models pools are established by members having no personal relationships.²⁶ The second model is reasonably more scalable, but achieving a lower level of trust between members. Potentially, this can be a potential trigger for the problem of false claims. This issue seems to be one of the biggest challenges that non-community based P2P insurers are facing with.

Normally, P2P companies charge a fee for its operation, For instance, Lemonade charges fixed fee of 20%. Part of the funds is used for reinsurance purposes. Namely, P2P insurance player has to stay protected against adverse scenarios when insurance pool happens to be empty. For

²⁴ John J. Horton and Richard J. Zeckhauser, "Owning, Using and Renting: Some Simple Economics of the 'Sharing Economy'" (National Bureau of Economic Research, February 2016), <http://www.nber.org/papers/w22029>.

²⁵ Rick Huckstep, "Peer 2 Peer Insurance Is Taking the Industry back to Its Roots!," *dailyfintech.com*, *Daily Fintech*, (December 23, 2015), <https://dailyfintech.com/2015/12/23/peer-2-peer-insurance-is-taking-the-industry-back-to-its-roots/>.

²⁶ Osi Momoh, "Peer-To-Peer (P2P) Insurance," *investopedia.com*, *Investopedia*, (October 27, 2016), <http://www.investopedia.com/terms/p/peertopeer-p2p-insurance.asp>.

example, Lemonade is reinsured at Lloyd's of London, paying for reinsurance approximately 20% from the pool's value.²⁷

Most probably, the most attractive element offered by P2P InsurTechs, is the possibility of getting refunds from the pool, in cases when there is still some money in the pool at the end of the year. Policyholders can use the money, or they can also extend their insurance policy for the following year without any transfer and corresponding transaction fee.²⁸ In the case of Lemonade, there is a "Giveback" policy, according to which money left in the pool is transferred to causes selected by members at the time when an insurance policy is bought.²⁹

In conclusion, P2P insurance platforms manage to bring mutual trust and transparent business and pricing model to community members and policyholders, to lower the need for expensive infrastructure and personnel, thus lowering fixed and operational costs, and to increase customer experience by offering new features and lowering total premium paid.

2.2 Auto Telematics

Auto telematics devices are small gadgets plugged into cars and usually connected with some application to transmit and present the data. These devices have sensors that enable them to track and monitor driving behavior, such as speed, distance covered, accelerations, and harsh braking. They are also capable of locating a car, analyzing fuel consumption, delivering maintenance alerts based on the vehicle diagnostics, registering crashes, providing roadside assistance, etc.³⁰ All these functionalities bring up the whole new level of experience for drivers.

²⁷ Lemonade, "Lemonade - Frequently Asked Questions," *Lemonade.com*, accessed May 7, 2017, <http://www.lemonade.com/faq>.

²⁸ Momoh, "Peer-To-Peer (P2P) Insurance."

²⁹ Lemonade, "Lemonade - Frequently Asked Questions."

³⁰ Bill Howard, "What Is Vehicle Telematics? - ExtremeTech," *extremetech.com*, (March 13, 2015), <https://www.extremetech.com/extreme/201026-what-is-vehicle-telematics>.

Nevertheless, auto telematics companies have enormous potential within the insurance industry. More precisely, these devices enable insurance companies to collect data on their customers, serving as valuable inputs for pricing and underwriting of motor insurance products. This way, insurance companies are in a position to partially abolish "one price" policy for all customers, and tailor insurance premiums to risk profiles of their customers. Moreover, auto telematics technology allows for premium discounts based on registered driving patterns.³¹

Functionality that many of these players offer is support in case of emergencies. Some of the auto telematics devices can register car crashes, and to automatically initiate emergency calls. This functionality may easily prevent fatal accidents from happening.³²

Some of the most popular players in this field are TrueMotion, Metromile, DriveWay, DriveSpotter, Telematic, Citymile, Accscore, Zubie, etc.³³ There are some examples of partnerships between auto telematics start-ups and insurance companies. Specifically, Progressive teamed up with Zubie to deliver reward based pricing model to its policyholders. It plans to leverage driving scores from Zubie, to offer premium discounts to safe drivers.³⁴

Auto telematics concept opens up space for usage based insurance products. Thus, there are examples such as TrueMotion, which offers an end-to-end platform to insurers to deliver usage-based insurance products.³⁵ However, there are examples like Cuvva, which manages to directly distribute usage-based car insurance policy without use of telematics device, but just with the mobile app.³⁶ Aviva, an insurance company, also built up Aviva Drive app to deliver

³¹ NAIC, "Usage-Based Insurance and Telematics," naic.org, (March 1, 2017), http://www.naic.org/cipr_topics/topic_usage_based_insurance.htm.

³² Howard, "What Is Vehicle Telematics? - ExtremeTech."

³³ Daily Fintech, "21 InsurTech Ventures Changing Auto Insurance," *dailyfintech.com*, *Daily Fintech*, (June 2, 2016), <https://dailyfintech.com/2016/06/02/21-insurtech-ventures-changing-auto-insurance/>.

³⁴ Progressive, "Progressive Auto Insurance - An Introduction," *progressive.com*, (April 9, 2014), <https://www.progressive.com/progressive-insurance/company-introduction>.

³⁵ TrueMotion, "Mobile Telematics | Smartphone UBI | Insurers," *gotruemotion.com*, accessed May 7, 2017, <https://gotruemotion.com/insurers/>.

³⁶ Cuvva, "Cuvva - Insurance You Control," *Cuvva*, accessed May 7, 2017, <https://cuvva.com>.

driving scores and offer premium discounts.³⁷ AXA also developed Drive Coach app to allow users to analyze, modify and improve their driving behavior. At the same time, it will allow for tailored pricing model.³⁸ All of these apps manage to monitor driving behavior using mobile sensors.

Aforementioned solutions potentially enable insurance carriers to price their products better, and as a result to decrease risk/capital costs. Namely, if the insurance company can do better risk management, at the beginning of the year, they will be able to allocate fewer resources to capital reserves intended for claims processing.

2.3. Wearables

Wearables are smart electronic devices (electronic device with microcontrollers) that can be worn on the body as implant or accessories. Wearables are a good example of IoT technology since "things" such as electronics, software, sensors, and connectivity are effectors that enable objects to exchange data through the internet with a manufacturer, operator and other connected devices, without requiring human intervention.³⁹ As such, wearables are quite applicable to the insurance business, along with the Health and Life product line.

Wearables are capable of tracking lifestyle utilizing embedded sensors. They typically connect with software to send rough data for further interpretation. Data collection and real-time health monitoring make wearables technology very utilizable in the insurance industry. This technology enables for better pricing and underwriting of insurance policies. It also allows for a premium discount offer, which is purely based on policyholder's lifestyle. Wearable devices

³⁷ Aviva, "Take the Aviva Drive Challenge - Aviva," accessed May 7, 2017, <http://www.aviva.co.uk/car-insurance/drive/>.

³⁸ AXA, "AXA |," axa.com, *AXA / The AXA Drive Coach App, an Innovative Contribution to Safer...*, accessed May 7, 2017, <https://www.axa.com/en/newsroom/press-releases/drive-coach-apple-watch-en>.

³⁹ Kiana Tehrani, "Wearable Technology and Wearable Devices: Everything You Need to Know," wearabledevices.com, *Wearable Devices*, (March 26, 2014), <http://www.wearabledevices.com/what-is-a-wearable-device/>.

connected to the mobile app are also suitable when it comes to fitness coaching, learning consumers what to do and how to live healthier.⁴⁰

Some of the well-known players in this area are FitSense and Sureify.⁴¹ A good example is FitSense, which acts as a white-label product enabling insurance companies to engage with customers and personalize their insurance policies by leveraging data collected via wearable devices and digested through the mobile app.⁴²

Insurance companies also aim to develop their own, in-house solution. AXA has developed Health Keeper platform that is distributed in the form of an app, designed to help customers to keep track of their activities, get access to health and wellness services, etc.⁴³

Similarly to auto telematics, wearables also facilitate better risk management and tailored policy pricing. Consequently, it drives the risk/capital costs down. Also, it also increases customer experience.

2.4. IoT-Home

Internet of Things technology for home is delivered in the form of security cameras and smart home devices, capable of detecting motions, sounds, smoke and water leak, embedding window/door sensors, etc. Devices are connected with the mobile app so that that customer can have real-time insights and control devices from within the app. Apps are also powered with emergency alerts so that consumer gets informed if the accident occurs.

⁴⁰ Daily Fintech, "Wearables Could Help to Heal Health & Life Insurance," *dailyfintech.com*, *Daily Fintech*, (October 6, 2016), <https://dailyfintech.com/2016/10/06/wearables-may-heal-health-life-insurance/>.

⁴¹ gprevodnik, "Future of Insurance: Breakdown of Underwriting and Client Data Connectivity," *Lynx-BPM*, April 26, 2016, <https://lynx-bpm.com/2016/04/26/future-of-insurance-breakdown-of-underwriting-and-client-data-connectivity/>.

⁴² Oliver Ralph, "Insurance Tech Start-up Investment Surges," *ft.com*, *Financial Times*, accessed May 7, 2017, <https://www.ft.com/content/53266de8-07e1-11e6-b6d3-746f8e9cdd33>.

⁴³ The Digital Insurer, "AXA's Digital Initiatives," *the-digital-insurer.com*, accessed May 7, 2017, <http://www.the-digital-insurer.com/dia/axas-digital-initiatives/>.

Some of the leading players in this field are Nest, Cocoon, August, etc.⁴⁴ They all deliver smart home devices with very similar functionalities.

Reasonably, IoT-home devices became a narrow area of interest for large insurance incumbents. Their main role in the insurance business is to serve as a risk prevention tool, eventually improving loss ratio for insurance carriers through the reduction of the total claimed amount. Smart home devices also positively affect customer satisfaction and safeness.

Therefore, insurance companies tend to partner with smart home device manufacturers. One of the examples is Zurich Insurance, which announced an exclusive partnership with Cocoon, to provide customers with increased peace of mind with an all-in-one home security system.⁴⁵ Next case is Liberty Mutual Insurance that partnered with Nest to deliver smart home devices to its end-customers.⁴⁶ Neos Insurance, the UK based company, is a type of insurance provider that partners with Hiscox to act as a front-end office solution, selling P&C - Home insurance policies, underwritten by Hiscox. It also partners with smart home device manufacturers, to deliver IoT technology to policyholders, offering a premium discount if the customer opts for the smart device as well.⁴⁷

2.5. Insurance policy management platforms

Some of the insurance policy management solutions are offered by Clark, GetSafe, Knip, FinanceFox, and Brolly. These solutions are solely oriented to consumers, enhancing

⁴⁴ Andrew Meola, "How IoT & Smart Home Automation Will Change the Way We Live," *businessinsider.com*, *Business Insider*, accessed May 7, 2017, <http://www.businessinsider.com/internet-of-things-smart-home-automation-2016-8>.

⁴⁵ Zurich, "Zurich Announces Partnership with Cocoon," *zurich.co.uk*, *Zurich UK*, accessed May 7, 2017, <https://www.zurich.co.uk/en/about-us/media-centre/general-insurance-news/2016/zurich-announces-partnership-with-cocoon>.

⁴⁶ Liberty Mutual, "Liberty Mutual Insurance and Nest Partner to Reward Customers For Protecting Their Homes With Innovative Technology," *libertymutualgroup.com*, (June 17, 2015), <https://www.libertymutualgroup.com/about-lm/news/news-release-archive/articles/liberty-mutual-insurance-and-nest-partner-to-reward-customers-for-protecting-their-homes-with-innovative-technology>.

⁴⁷ Neos, "Neos Connected Home Insurance - a Smart Way to Protect Your Home," *neos.co.uk*, *Neos - Insurance Reimagined*, accessed May 7, 2017, <https://neos.co.uk/>.

understanding of their current insurance coverage. On the other hand, insurance companies are enabled to lower their customer acquisition costs by distributing insurance products through insurance management platforms. They also can eliminate some of the day-to-day administrative expenses related to policy servicing.

Policy insurance managers aim to enable policyholders to manage their insurance contracts under the fingertips. Namely, these start-ups utilize app and web-based approach to allow end-customers to purchase new insurance policy (acting as a broker), to import their existing coverages, have an overview of all insurance policies, to renew contracts, terminate them, make modifications, get an access to prices, contacts, submit claims, etc.

Ultimately, they enable customers to potentially spot room for improvement of their existing coverage, allowing them to figure out whether they are over or under-insured. In other words, they help them to make sure they don't have a duplicate, or they don't miss coverage. This way, a customer is in a position to identify saving potential. This feature is known as a robo-advisory.⁴⁸

PolicyPal, another insurance management company, also uses data analytics to provide robo-advisory services to handle consumers' insurance needs. Data collected is digested through an algorithm to provide valuable insights and useful advice for the policyholder. It also leverages chat bot technology, to answer different questions and provide assistance on-the-go.⁴⁹ Some of these solutions even leverage consultant's expertise to advise their users free of charge, via phone call or email.

⁴⁸ FinSMEs, "Insurtech, Five Startups Disrupting Insurance Management in Europe," finsmes.com/, *FinSMEs*, (March 31, 2016), <http://www.finsmes.com/2016/03/insurtech-five-startups-disrupting-insurance-management-in-europe.html>.

⁴⁹ Fintechnews Singapore, "InsurTech Startup PolicyPal Wants to Help People Manage, Track and Understand Their Insurance Policies," <http://fintechnews.sg>, *Fintech Singapore*, (April 5, 2016), <http://fintechnews.sg/1848/insuretech/insurtech-startup-policypal-wants-help-people-manage-track-understand-insurance-policies/>.

All of the aforementioned solutions are freemium based, meaning that end-customer can download and use them for free. Insurance management companies make money by taking a fee from the insurance company for every policy sold through the platform.

2.6. Price comparison websites / Aggregators

Price comparison websites already became trendy for many market niches. People are using them to compare prices of various goods, financial services, credit cards, loans, flights, etc. These companies partner with retailers and serve them as affiliates / brokers. These partners are being charged for every buyer who browsed their website through price comparison website, or for every visitor, depending on the treaty compiled. In this respect, price comparison sites represent lead generators for a company which sells the product. Aggregators generate "hot traffic" for businesses that have their products listed on the particular price comparison website. "Hot traffic" stands for customers already looking for a specific product, who are, reasonably, more likely to buy it.⁵⁰

Nevertheless, these sites are fairly popular within insurance industry as well. Insurance price comparison websites enable end-customer to search for needed insurance product and get quotes from various insurance providers. Automatically, he can compare among multiple insurance policies and select the most suitable one. Through the website, a customer can even purchase a product, since aggregators redirect him directly to the insurance company/broker site selling particular insurance policy he opted for.

Some of the famous players in this area are Confused.com, GoCompare.com, Moneysupermarket, PolicyBazaar, BankBazaar.com, HealthCare.com, etc. These companies

⁵⁰ NicheHacks, "How To Make A Price Comparison Site In Untapped Niches," <http://nichehacks.com>, *NicheHacks*, accessed May 21, 2017, <http://nichehacks.com/niche-price-comparison-sites/>.

already achieved great success and volume, becoming some of the primary insurance distribution channels in modern ages.⁵¹

All these websites are used for free by the customers. They take a cut from the insurance company for every insurance product distributed through the platform.

Aggregators act as modern brokers, doing all the business online and aiming to turn into scalable solutions with a huge customer base, to become crucial sales partners for big insurance incumbents. Correspondingly, insurance companies can lower their customer acquisition and marketing costs, by utilizing these distribution platforms. At the same time, customers are provided with better transparency in the decision-making process.⁵²

2.7. Drones

Drones are unmanned aircraft operating either under remote control by a human operator or autonomously by onboard computers. As such, drones are widely usable across commercial, scientific, recreational, agricultural, and other applications.⁵³

Moreover, drone technology finds its application within insurance industry as well. Thus, there are drone companies specializing in the insurance area for claim adjustment processes. Given that drones are small and easy to maneuver they represent a cost-efficient solution for any claim adjustment related operation. Drones can easily be navigated to the place where an accident happens, even to places that are unsafe for humans. This way, drone technology allows insurers to bring faster decisions about claims being submitted.⁵⁴

⁵¹ Sofia, “80 Hottest InsuranceTech Companies Shaking up the Trillion-Dollar Insurance Industry,” letstalkpayments.com, *Lets Talk Payments*, (March 9, 2016), <https://letstalkpayments.com/80-hottest-insurancetech-companies-shaking-up-the-trillion-dollar-insurance-industry/>.

⁵² Lucy Warwick-Ching, “Price Comparison Websites Called into Question,” ft.com, *Financial Times*, (November 26, 2013), <https://www.ft.com/content/7281378a-55c9-11e3-b6e7-00144feabdc0>.

⁵³ International Civil Aviation Organization, *Unmanned Aircraft Systems: (UAS)*, ICAO Circular 328 (Montréal: International Civil Aviation Organization, 2011), https://www.icao.int/Meetings/UAS/Documents/Circular%20328_en.pdf.

⁵⁴ Marianne Bonner, “How Drones Will Change the Insurance Industry,” thebalance.com, *The Balance*, (March 2, 2017), <https://www.thebalance.com/how-drones-change-insurance-industry-4125242>.

Drones can be mainly used for different sort of inspections, like roof top damage inspections, warehouse damage, boilers and pressure vessels, post-disaster claims inspections, crop inspections, etc. Some of the well-known players in this field are Airware, PrecisionHawk, Betterview, and Skycatch. They all offer automated drone inspection service to insurance companies.⁵⁵

Drones become efficient tools for insurers fighting against false claims issue. They enable insurers to adjust and assess claims real fast with no need for human resources. This way the cost of adjusters is decreased significantly, as well as the cost for contractors, hired to perform the inspection. By incorporating drone technology, insurance companies can also prevent on-the-job injuries related to risky inspections and claim adjustments. As a result of more efficient and faster claim adjustment process, customers are more satisfied with the service provided.⁵⁶

2.8. Claims management

In the recent years, due to technology development, claim processes, as one of the crucial element within insurance business value chain, are becoming fully digitized. Numerous InsurTechs around the world aim to replace long-lasting traditional claims procedures with paperless and quicker solutions.

Some of the most powerful players are Assisto, ClaimDi, RightIndem, Claimable, etc.

Claims solutions' business models range from those distributed as Software-as-a-Service to insurance companies, to ones targeted directly at the end-customers. In both cases, so-called first notification of loss is usually reported via the mobile app. Customer-centric approaches put the claimant in a position to claim right after the accident occurs, on-the-go. Communication

⁵⁵ Nationwide, "4 Insurance Technology Trends Changing the Industry," blog.nationwide.com, *Now from Nationwide*, accessed May 21, 2017, <https://blog.nationwide.com/news/insurance-technology-trends/>.

⁵⁶ Bonner, "How Drones Will Change the Insurance Industry."

and accident reporting is facilitated with real-time videos, photos, live chat, etc. The customer is enabled to have access to the platform and to track claims workflow.

In some cases (e.g. RightIndem), claim management platforms form partnerships with repairers who can bid online in the event of car accidents. This way, the insurance company is directly connected with repairer shops, allowing a customer to choose the most trusted one. When bidding, repairers tend to offer fairer prices due to increased competition, thus lowering the claims cost down.

Indisputably, claim solutions bring various benefits to insurance companies. User-friendly and customer oriented solutions for claim reporting processes, positively affect customer retention rate while managing to ease one of the most sensitive and stressful procedures for insured clients. These start-ups eliminate paperwork, thus lowering operation and administration cost for insurance carriers.⁵⁷

2.9. Cyber insurance

Not that long time ago, hacker attacks became a real threat in the business world. Therefore, many insurance companies started including cyber insurance into their product offerings. However, exposures to cyber risk are still hardly measurable, thus requiring new technologies and expertise.

Here, there are two types of players presented. Companies, like Digital Risks, provide coverage to digital businesses for cyber liabilities, among other policies they offer. Another type of companies includes ThreatInformer that aim to provide cyber risk intelligence to the insurance industry, enabling all cyber insurance providers to better manage corresponding exposures.

⁵⁷ Rick Huckstep, "Claimable Put the Insurance Customer First," [the-digital-insurer.com/](https://www.the-digital-insurer.com/), (May 21, 2017), <https://www.the-digital-insurer.com/blog/insurtech-claimable-and-insurtech-putting-the-insurance-customer-first/>.

Aforementioned solutions open up new horizons for insurance carriers, enabling them to expand their product suite and to improve underwriting skills for cyber risk coverages.⁵⁸

2.10. Health benefits exchange platforms

Health benefits exchange platforms grasped opportunity arising due to Affordable Care Act (ACA) and steadily increase in health benefits. Namely, ACA requires that companies with more than 50 employees offer health plans to employees.

Therefore, health insurance exchange companies mainly target small and medium businesses, acting as brokers to distribute health plans to end-customer, in this case to an employee. Some of the players in this field are Zenefits, Collective Health, SimplyInsured, Lumity, etc.

These companies provide a personalized interface to employees, to communicate with the platform and get an insurance coverage. Platforms are directly connected to insurance carriers so that insurance policies are distributed and managed through the platform. Every single user has its profile to track and update his coverage. Some of these solutions even provide expert or automated assistance to the user, guiding him through the application process and advising him on the most suitable health plans. The platform is accessible from an employer as well, to coordinate and approve all the procedures and processes.

These solutions happen to have a positive impact on both counterparties, providers, and end-customers. Insurance companies are in a position to distribute insurance policies through newly established channels, and consequently to decrease customer acquisition costs. On the other

⁵⁸ Insurance Journal, “RIMS 2017: Why Cyber Should Be Treated as Standalone Insurance,” [insurancejournal.com](http://www.insurancejournal.com/news/national/2017/04/24/448737.htm), *Insurance Journal*, (April 24, 2017), <http://www.insurancejournal.com/news/national/2017/04/24/448737.htm>.

hand, the customer is provided with smoother purchasing processes with better transparency and customer support.⁵⁹

2.11. On-demand insurance providers

On-demand insurance start-ups enable users to insure their small items and devices, or to buy any other specific insurance product from within the mobile app. These InsurTechs typically serve as a front-end office of traditional insurance companies. From that perspective, they serve as agents specialized in a certain market niche.

Some of the on-demand insurance providers are Trov, Sure, and Slice Labs.⁶⁰ Trov, for example, enables users to buy insurance for electronic devices, musical instruments, and sports equipment. Entire purchasing and claims process are done online via a mobile app. The user can also switch on and off his current coverage whenever he wants to. Trov distributes insurance products underwritten by AXA.⁶¹

On-demand insurance solutions serve as distribution channels to partnering insurance companies. However, they develop their business model and operate independently. The main benefit for insurance carriers is larger customer base, due to the focus on specific and relatively new market niches (e.g. smartphone insurance).

⁵⁹ Amy Radin, “InsurTech Ventures Going After Big and Complex Health Insurance Pain Points,” [huffingtonpost.com, Huffington Post](http://www.huffingtonpost.com/amy-radin/insurtech-ventures-going-_b_11850042.html), (September 6, 2016), http://www.huffingtonpost.com/amy-radin/insurtech-ventures-going-_b_11850042.html.

⁶⁰ Nationwide, “4 Insurance Technology Trends Changing the Industry.”

⁶¹ John McCrank, “Insurtech Startup Trov Launches in UK, Offering On-Demand Coverage,” [insurancejournal.com, Insurance Journal](http://www.insurancejournal.com/news/international/2016/11/23/433123.htm), (November 23, 2016), <http://www.insurancejournal.com/news/international/2016/11/23/433123.htm>.

Chapter 3: Methodology and Analysis

As already discussed at numerous levels, InsurTechs, as well as many other technology innovations, seem to have a positive impact on individuals and economic efficiency itself. Therefore, I want to see what some of the potential drivers are, worldwide, behind innovations in insurance technology area. My objective is to identify favorable factors credited for InsurTech initiatives, and based on that to provide valid policy recommendations on how to create the most suitable environment for their development and growth. This chapter is devoted to a description of the data, evaluation model, results, and flaws of the evaluation strategy.

3.1. Data and variables

All the data are downloaded for the year 2015, except for the data for a dependent variable that is found available only for 2017. The rough assumption is that data on all variables do not vary to a significant extent as time goes by so that it can considerably affect the true estimated correlation. This way, the cross-sectional dataset is constructed with one dependent and eight independent variables.

3.1.1. Dependent variable

The dependent variable in this analysis is the number of InsurTechs per country. Data for this variable are manually extracted from the Tracxn Research Report – "Insurance Tech Landscape, February 2017" (<https://www.slideshare.net/Tracxn/tracxn-research-insurance-tech-landscape-february-2017>). Tracxn is one of the world's largest Research and Analytics platform tracking over 10 million start-ups globally, across 230+ sectors, and as such, it represents the largest and the most comprehensive database of start-ups, including insurance technology start-ups, which are the subject of the analysis.⁶²

⁶² Crunchbase, "Tracxn | Crunchbase," Crunchbase.com, accessed May 4, 2017, <https://www.crunchbase.com/organization/tracxn>; LinkedIn, "Tracxn," accessed May 4, 2017, <https://www.linkedin.com/company/tracxn>.

"This report covers companies operating in Insurance Tech sector which includes internet first insurers, distribution platforms, P2P insurance platforms and companies that enable insurance players regarding software solutions and data. It does not include traditional and offline insurance providers and multi-industry companies."⁶³ In other words, the report includes all the companies having some application within the insurance industry.

A number of InsurTech start-ups per country is supposed to show the current development of a country in this respect. InsurTech company is assigned to a country it has to headquarter in. After putting data together, I've got data on InsurTech presence in 62 countries. All the other countries are assumed not to have any insurance technology innovation yet.

3.1.2. Explanatory variables

This model is consisted of eight independent variables including Individuals using the Internet (% of population), Strength of legal rights index (0=weak to 12=strong), Legal origin, Start-up procedures to register a business (number), Insurance and financial services (% of service exports, BoP), Population ages 20-39 (%of male population), GDP - current \$USD (log) and Population, total (log).

3.1.2.1. Individuals using the Internet (% of population)

Some Internet users per 100 people are supposed to display the level of digital literacy in the nation. As such, it is expected to be one of the crucial determinants of technology improvement in a country, since it represents the capability of demand side (end-customers) to use innovative solution/product.

⁶³ Tracxn, "Tracxn Research - Insurance Tech Landscape, February 2017," (Data & Analytics, 10:40:25 UTC), <https://www.slideshare.net/Tracxn/tracxn-research-insurance-tech-landscape-february-2017>.

Data is downloaded from the World Bank Database. 203 countries are covered with information on the Internet usage. Theoretical range of the variable is from 0 (nobody uses the Internet) to 100 (everybody uses the Internet).⁶⁴

3.1.2.2. Strength of legal rights index (0=weak to 12=strong)

"Strength of legal rights index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. The index ranges from 0 to 12, with higher scores indicating that these laws are better designed to expand access to credit. Data are collected by the World Bank with a standardized survey."⁶⁵ This variable is expected to show the effect of the level of legal protectionism within a country, and thus ease of getting business financing for an entrepreneurial initiative. Moreover, Thorsten Beck and Demircuc-Kunt Asli (2006) describe that ease of getting external finance presents one of the crucial factors for small and medium business development.⁶⁶

Data for this index are downloaded from World Bank Database. 189 countries were part of the survey mentioned above conducted by a World Bank.

3.1.2.3. Legal origin

Within this framework, my aim is also to assess the effect of Common and Civil law systems on digital innovation within the insurance industry. Therefore legal system related variable is introduced. Namely, common-law countries enjoy certain advantages in the conduct of business which doesn't stand for civil-law societies. Civil-law countries exhibit heavier regulation, weaker property rights protection, more corrupt and less efficient government and less political freedom than do common-law countries. Financial markets are less developed, and just a few

⁶⁴ World Bank, "World Development Indicators | DataBank," <http://databank.worldbank.org>, accessed May 4, 2017, <http://databank.worldbank.org/data/reports.aspx?source=2&series=IT.NET.USER.ZS&country=>

⁶⁵ World Bank, "World Development Indicators | DataBank," databank.worldbank.org, accessed May 4, 2017, <http://databank.worldbank.org/data/reports.aspx?source=2&series=IC.LGL.CRED.XQ&country=>

⁶⁶ Thorsten Beck and Asli Demircuc-Kunt, "Small and Medium-Size Enterprises: Access to Finance as a Growth Constraint," *Journal of Banking & Finance* 30, no. 11 (November 2006): 2931–43, doi:10.1016/j.jbankfin.2006.05.009.

people own stocks and bonds, while companies are controlled by a few big holders. This kind of setup discourages investment and economic growth.⁶⁷ In my humble view, all the aforementioned features that are specific to Civil law, and not for Common law countries, should have a negative effect on entrepreneurship in general. Therefore, I expect to see a lower number of InsurTech initiatives in Civil law countries.

Also, relevant research conducted by La Porta, Lopez-De-Silanes and Shleifer (2008), shows that there is a certain correlation between the type of legal origin and economic growth.⁶⁸ As Beck, Levine, and Loayza (2000) find, the most important channel of influence of legal origins on growth is financial development.⁶⁹ Hence, Legal origin variable is supposed to be vital control element when estimating precise effects of all the other variables.

Data for legal systems are manually extracted from the following link - <http://lawin.org/list-of-legal-systems-in-countries-around-the-world/>. After compiling the list, information on the exact legal origins are found in 129 countries. The binary variable is created so that Civil law countries are denoted with 0, while Common law countries are denoted with 1. Mixed legal systems, having no prevailing legal origins, are excluded. Some other legal systems, such as Sharia and Customary law, are not in the scope of analysis.

3.1.2.4. Start-up procedures to register a business (number)

"Start-up procedures are those required to start a business, including interactions to obtain necessary permits and licenses and to complete all inscriptions, verifications, and notifications to start operations. Data are for businesses with specific characteristics of ownership, size, and

⁶⁷ David Wessel, "Economic Consequences of Common Law versus Civil Law," ncpa.org, (September 6, 2001), http://www.ncpa.org/sub/dpd/index.php?Article_ID=7818.

⁶⁸ Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer, "The Economic Consequences of Legal Origins," *Journal of Economic Literature* 46, no. 2 (May 2008): 285–332, doi:10.1257/jel.46.2.285.

⁶⁹ Ross Levine, Norman Loayza, and Thorsten Beck, "Financial Intermediation and Growth: Causality and Causes," *Journal of Monetary Economics* 46, no. 1 (2000): 31–77.

type of production."⁷⁰ In this setup, start-up procedures to register a business is equivalent to administration burden when establishing a business. Therefore, I want to check if, potentially, there is a certain negative correlation between the administrative paperwork, when registering a start-up, and a number of insurance start-ups established.

Data are downloaded from World Bank Database providing information about a number of start-up registering procedures for 189 countries globally. Number of procedures range from 1 to 20.

3.1.2.5. Insurance and financial services (% of service exports, BoP)

Data about the export of insurance and financial services are supposed to show the relative importance of the insurance and banking industry in the total service exports. Due to the lack of a data availability for some more relevant variable with a pure focus on the insurance sector, this variable is meant to represent the devotion of a particular country to financial and insurance business. In this setup, devotion would be an equivalent to the size of respective sectors. Logically, strong focus, or in other words high portion of financial services exports, is expected to drive more innovations in the respective field. Most importantly, this variable is expected to serve as an essential control variable when estimating other effects, since it controls for insurance industry importance within the economy.

Data are downloaded from World Bank Database and are available for 141 countries worldwide.

3.1.2.6. Population ages 20-39 (% of male population)

This variable serves as an indicator of millennial participation in the whole population. Male population is used as a good approximation to the total millennial participation (male plus

⁷⁰ World Bank, "World Development Indicators | DataBank," <http://databank.worldbank.org>, accessed May 4, 2017, <http://databank.worldbank.org/data/reports.aspx?source=2&series=IC.REG.PROC&country>.

female). Data is downloaded from World Bank Database, separately for age groups between 20-24, 25-29, 30-34 and 35-39, and merged into one age group with a range between 20 and 39 years of age.

Although millennials are more likely to be users of new technologies, one can expect to see a negative correlation with respect to this variable since initiatives can cater to a relatively older population. Older population are more in need for two out of three insurance product lines, Health and Life insurance.

3.1.2.7. GDP - current \$USD (log)

GDP primarily serves as a control variable in this model, so that effects of other variables can be estimated more precisely. Nonetheless, I would also like to see the effect of the nation wealth, indicated by GDP, on the number of InsurTechs. Therefore, in order to simplify interpretation of the effect, I use logs.

Data for GDP are downloaded from World Bank Database and are available for 185 countries worldwide.

3.1.2.8 Population, total (log)

I control for population size as well. As for the previous variable, logs will be used here too. Data for the population are downloaded from World Bank Database and are available for 216 countries worldwide.

3.2. Evaluation method

In order to estimate the effects of aforementioned explanatory variables on the development of countries regarding insurance technology innovations, Ordered Logit Model will be used. This model is used in cases when there are more than two categories of the dependent variable, and the values of each category have a meaningful sequential order where a value is indeed higher

than the previous one.⁷¹ In this analysis, different categories are artificially created based on the number of InsurTechs in each country. Higher categories will be those having more InsurTechs, meaning that they are more developed in that sense than the previous ones. This way, a continuous variable is transformed into categorical one.

Regression model looks as it follows:

$$y_i^* = \mathbf{x}_i' \boldsymbol{\beta} + U_i$$

$y_i = j$ if $\alpha_{j-1} < y_i^* \leq \alpha_j$ (α stands for different thresholds for different categories; in this analysis for five categories we will have four thresholds)

$$i=1, 2, 3, 4, 5, 6, 7, 8$$

The probability that observation “i” will end up in category j is:

$$p_{ij} = p(y_i = j) = p(\alpha_{j-1} < y_i^* \leq \alpha_j) = F(\alpha_j - \mathbf{x}_i' \boldsymbol{\beta})$$

Here, magnitudes and values of coefficients are not going to be interpreted because they differ by a scale factor.⁷² I will just look at directions of the effects.

There are two main reasons standing behind decision to opt for Ordered Logit Model:

There are two main reasons standing behind the decision to opt for Ordered Logit Model:

1) First of all, for this sort of analysis, it is more convenient and reasonable to interpret results derived from the Ordered Logit Model. The only characteristic of the particular observation I am interested in is whether it is developed or not in this respect. However, to inject more value

⁷¹ UCLA, “Ordered Logistic Regression | Stata Data Analysis Examples,” stats.idre.ucla.edu, *IDRE Stats*, accessed May 21, 2017, <https://stats.idre.ucla.edu/stata/dae/ordered-logistic-regression/>.

⁷² A. Colin Cameron and Pravin K. Trivedi, *Microeconometrics: Methods and Applications* (Cambridge university press, 2005), <http://books.google.com/books?hl=en&lr=&id=TdlKAgAAQBAJ&oi=fnd&pg=PP1&dq=%22University+Press+has+no+responsibility+for+the+persistence+or+accuracy+of%22+%22Causal+and+Noncausal%22+%22Example:+Returns+to%22+%22Example:+ML+and+NLS%22+%22How+to+Use+This%22+&ots=yIlkS1czxm&sig=ecrHpBbkCKo1cVVvGf5nTuVxutc>.

in the whole model, I will create not two, but several categories, portraying different levels of evolution. From that perspective, Ordered Logit Model turns out to be the most suitable evaluation method, as it allows for observations assigning to various groups, displaying nations' advancement in the certain respect. Nevertheless, it is also important to mention here, that I am not willing to interpret results in nominal or relative values since it doesn't make much sense for the "Number of InsurTechs" variable.

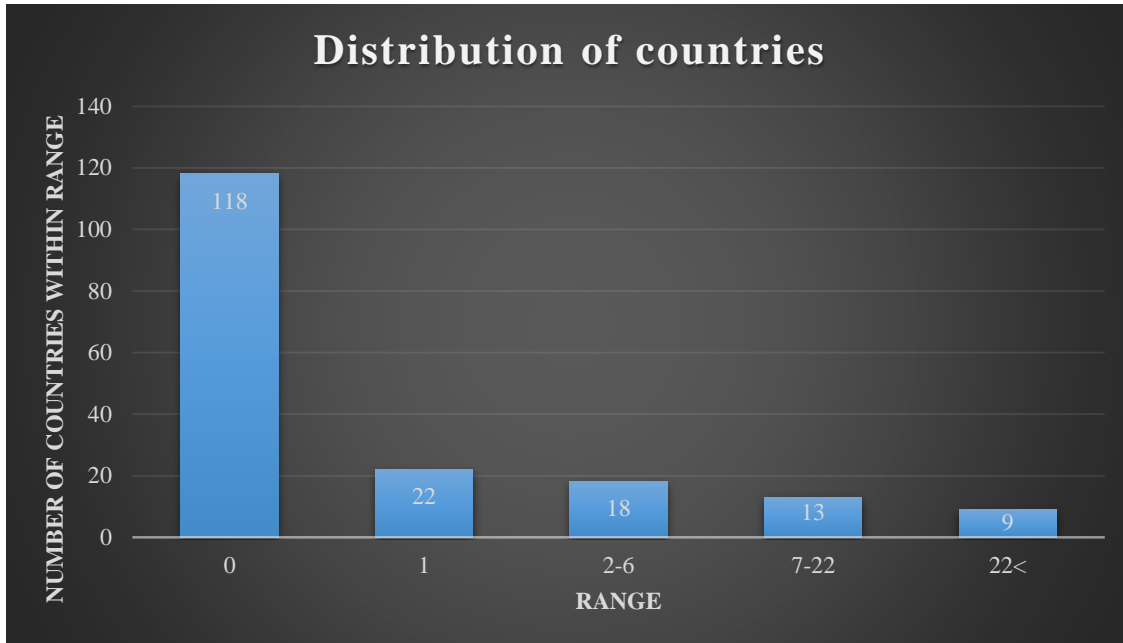
2) Although data source used for the explained variable is having global scope and is one of the largest in the world when it comes to start-ups covered, I still wouldn't dare to claim that it is not missing some InsurTechs in its database. Especially, if we take into account that new start-ups are being founded on a daily basis and that this industry is constantly being changed and reshaped. Thus, the numbers we have for dependent variable are a just good approximation of the number of InsurTechs per each country. Therefore, to get as usable results as possible, it is more reasonable to generalize to a certain extent and to create several categories of observations. As already mentioned, each category will express the certain level of development concerning insurance technology innovations. Thus, I will subjectively assign ranges of the number of InsurTechs to each group, in order to allocate countries accordingly.

Subsequently, I decide to construct five groups of countries. The first group is assigned to countries with no registered InsurTechs. This group is characterized by the lowest level of development. It will be denoted as "Poor" category. Countries with 1 registered InsurTech are allocated to the second group, portraying better progress than the first one, but still weaker than the third group. This group will be named as "Fair" group. Observations with more than 1 and less than 7 InsurTechs are allocated to the third group, expressing a medium level of the progress. It is going to have "Medium" label. Fourth and fifth groups are assigned with countries having between 7 and 22 InsurTechs, and more than 22 InsurTechs, respectively. These two groups represent the most developed countries regarding digital insurance innovations. The

fourth group is denoted as "Excellent", while the fifth one will be marked as "Extraordinary".

In figure 4, we can see some observations per each category

Figure 4 Number of countries belonging to the ranges constructed based on the number of InsurTechs per country



Source: Graph is derived from the Table 1 in Appendix 1.

Subjective assessment is applied when determining ranges. Nevertheless, there is a certain trade-off which is taken care of while doing this. Namely, I want each group to have at least 5% of total observations, in other words to be large enough so that results may be meaningful (note here that quite a few of 118 observations from the first group will be dropped out due to lack of data for other variables, since these are generally less developed countries with no data available in sufficient extent). However, I shouldn't neglect the importance of the differences in ranges, which are crucial for the analysis, taking into account that they portray the development difference.

To sum up, I need substantial sizes of the groups with distinctive differences in ranges. As a result, five groups are constructed with sufficient amount of observations and precise cuts featuring development differences.

3.3. Results

Data cleaning process, as well as all the results and interpretations, are presented in this section.

3.3.1. Data cleaning

As it is shown in table 1, numerous observations are excluded due to missing data for some variables, so that model ends up with 98 countries observed. After data cleaning, following frequencies pop up for respective categories.

Table 1: Percentages of countries belonging to each category

InsurTech development status	Codes for alternatives	Percent frequency
Poor	0	46%
Fair	1	18%
Medium	2	17%
Excellent	3	10%
Extraordinary	4	8%

Source: Derived with Stata

Even though frequencies differ to the certain extent, and the dataset is relatively unbalanced, I find these issues acceptable for the analysis, since every single category has more than 8% of total observations, which can be considered as a significant amount of observations for the number of categories chosen (subjective assessment).

3.3.2. Outcome

The model is run in Stata. Results are shown below.

thus facilitating business and economic growth.⁷⁴ Also, more millennials lead to fewer innovations in the insurance industry. Most probably this is a result of peculiarity insurance industry. Namely, the elderly population is more in demand for Health and Life insurance which makes it more attractive to InsurTechs specialized along these two lines of business. Lastly, better-performing countries, with higher GDP, expectedly have more innovations.

Interestingly enough, coefficients are not significant for Start-up procedures to register a business, Insurance and financial services, and log (population). The reasoning behind insignificant coefficient for Start-up procedures to register a business is that more procedures do not necessarily mean more obstacles for establishing a start-up. Rather, it can also be seen as a more secure legal instrument for establishing businesses. Regarding insurance and financial services variable, it is very possible that, as such, this variable doesn't adequately depict insurance and banking sector development for a specific country, since it is presented as a percentage of total exports. Thus, we can easily imagine nations with developed financial sector, without the focus on exports of financial and insurance services, or countries with very high exports in general. In these two cases, the value of the variable would be low, even though the country potentially has a highly developed financial sector. Finally, although one would expect more innovations in countries with more people, the coefficient for the population is not significant probably as a result of quite a few very populated underdeveloped countries, with weak performances regarding insurance technology innovations (e.g. Pakistan, Bangladesh, etc.).

3.3.4. Ordered Logit Model Predicted Probabilities

Predicted probabilities framework can be used with either continuous or categorical variable, and it shows the predicted probability for each of the values of the variable specified.⁷⁵ Here,

⁷⁴ Porta, Lopez-de-Silanes, and Shleifer, "The Economic Consequences of Legal Origins."

⁷⁵ UCLA, "Ordered Logistic Regression | Stata Data Analysis Examples."

the following variables are evaluated: "Internet users", "Legal rights index", "Legal system origin", and "Population ages 20-39".

As of "Internet users" variable, probabilities are predicted for levels of 20, 40, 60 and 80 percent.

The summary is shown below. It is derived from Table 2, 3, 4, 5 and 6 from Appendix.

Table 2 Ordered Logit Model Predicted Probabilities for "Internet users" variable

Variable / InsurTech development status	Predicted probabilities for poor category	Predicted probabilities for fair category	Predicted probabilities for medium category	Predicted probabilities for excellent category	Predicted probabilities for extraordinary category
Internet users (20%)	0.83***	0.12	0.02	0.003	0.0007
Internet users (40%)	0.62***	0.28***	0.08**	0.011	0.002
Internet users (60%)	0.34***	0.40***	0.20***	0.035**	0.007
Internet users (80%)	0.14**	0.34***	0.38***	0.099*	0.022

Significance – 10% (*), 5% (**), 1% (***)

As we can see in Table 2, for every single category there is certain pattern visible. For instance, within "Poor" category, we can see higher probabilities for lower levels of the respective variable. This means that countries with higher Internet user percentage are less likely to end up in the "Poor" development status. For instance, if all other variables are at their means, a country with 40% of Internet users has 62% of chance to end up in "Poor" group, while a country with 80% of Internet users has only 14% of chance. Analogously, in the "Medium",

"Excellent", and "Extraordinary" category nations with higher Internet user percentage are more likely to be in the respective group. For example, a country with 60% of Internet users is 3.5% likely to end up in "Excellent" development group, while a country with 80% of Internet users is 9.9% likely to be in "Excellent" category if all other variables are at their means.

Regarding "Legal rights index", probabilities are predicted for index levels of 2, 5, 8 and 11. Results are derived from Table 7, 8, 9, 10 and 11 from Appendix, and shown in Table 3.

Table 3 Ordered Logit Model Predicted Probabilities for "Legal rights index" variable

Variable / InsurTech development status	Predicted probabilities for poor category	Predicted probabilities for fair category	Predicted probabilities for medium category	Predicted probabilities for excellent category	Predicted probabilities for extraordinary category
Legal rights index (=2)	0.47***	0.36***	0.13**	0.02*	0.004
Legal rights index (=5)	0.39***	0.39***	0.17***	0.029**	0.006
Legal rights index (=8)	0.31***	0.41***	0.22***	0.04**	0.008
Legal rights index (=11)	0.24**	0.40***	0.28***	0.05	0.011

Significance – 10% (*), 5% (**), 1% (***)

Here, we also see patterns within different segments. In the first group, we get higher probabilities for observations with lower legal rights indices. Thus, taking into account that all other variables are at their means, a country with legal rights index equaling 5 is 15 percentage points more likely to end up in "Poor" group, comparing to a country with an index of 11.

Similarly, starting from "Medium" category, countries having higher legal rights indices are more likely to belong to a respective category. This way, a state with legal rights index 2 has a likelihood of 13% to end up in "Medium" category, while a country with index 11 has 28% of chance to be in the same category.

Results in Table 4 are shown for the categorical variable, "Legal system origin". The summary is extracted from Table 12, 13, 14, 15 and 16 from Appendix.

Table 4 Ordered Logit Model Predicted Probabilities for "Legal system origin" variable

Variable / InsurTech development status	Predicted probabilities for poor category	Predicted probabilities for fair category	Predicted probabilities for medium category	Predicted probabilities for excellent category	Predicted probabilities for extraordinary category
Civil law	0.46***	0.34***	0.14***	0.02**	0.005
Common law	0.18**	0.35***	0.34***	0.09*	0.021

Significance – 10% (*), 5% (**), 1% (***)

From the results above, it is clear that Common law countries are performing better in this sense. Comparing to Civil law countries, Common law countries are less likely to end up in "Poor" development status, and more likely to be in "Medium", "Excellent", and "Extraordinary" category. All other variables at their means, Civil law country has 46% of chance to end up in "Poor" group and 2% of chance for "Excellent" group, while Common law country has 18% of chance to end up in "Poor" and 9% for "Excellent" category.

Here, results are summarized for "Population ages 20-39" variable for levels of 25, 30, 35 and 40 percent. Results are derived from Table 17, 18, 19, 20 and 21 from Appendix, and presented in Table 5.

Table 5 Ordered Logit Model Predicted Probabilities for "Population ages 20-39" variable

Variable / InsurTech development status	Predicted probabilities for poor category	Predicted probabilities for fair category	Predicted probabilities for medium category	Predicted probabilities for excellent category	Predicted probabilities for extraordinary category
Population ages 20-39 (25%)	0.20**	0.39***	0.31***	0.06*	0.014
Population ages 20-39 (30%)	0.36***	0.40***	0.19***	0.03**	0.006
Population ages 20-39 (35%)	0.55***	0.32***	0.10**	0.01	0.003
Population ages 20-39 (40%)	0.73***	0.20*	0.05	0.006	0.001

Significance – 10% (*), 5% (**), 1% (***)

The summary shows that countries having a higher percentage of the male millennial population are more likely to end up in "Poor" group, and less likely to end up in "Medium", "Excellent" and "Extraordinary" category. For instance, all other variables at their means, a country with 30% of male millennials has the likelihood of 36% to be in the first group, while a nation with 40% of male millennials has 73% of chance to be in the same group. Analogously, a country with 30% of male millennials has 19% of chance to be in "Medium" category, while a country

with 35% of male millennials has 10% probability to be in the same category, assuming that all the other variables are at their means.

3.4. Robustness check

Robustness check is conducted using Ordered Probit Model with the same cuts and Ordered Logit Model with modified ranges.

3.4.1. Ordered Probit Model

Ordered Probit Model is ran for comparison analysis. Coefficient estimates are shown in the table below.

```
Ordered probit regression                Number of obs   =          98
                                         LR chi2(8)      =        105.29
                                         Prob > chi2     =         0.0000
Log likelihood = -85.52937              Pseudo R2       =         0.3810
```

Insurtechs_categorized	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Internet_users_per_100_people	.0321437	.0092802	3.46	0.001	.0139549	.0503326
Strength_of_legal_rights_index_	.0710556	.0509507	1.39	0.163	-.0288059	.1709171
Startup_procedures_to_register_	.0542585	.0552466	0.98	0.326	-.0540228	.1625397
Insurance_and_financial_services	.0111231	.0159114	0.70	0.485	-.0200627	.0423089
1.legal_system	.6958898	.3499141	1.99	0.047	.0100707	1.381709
Malepopulation2039	-.0896994	.0434587	-2.06	0.039	-.1748769	-.0045218
log_gdp	.7828287	.3662149	2.14	0.033	.0650608	1.500597
log_pop	.8183304	.4620542	1.77	0.077	-.0872791	1.72394
/cut1	14.27638	2.691352			9.001428	19.55133
/cut2	15.24963	2.734249			9.890598	20.60866
/cut3	16.40273	2.803217			10.90852	21.89693
/cut4	17.43093	2.860293			11.82486	23.037

Note: 1 observation completely determined. Standard errors questionable.

As it is presented in the table, we have the same significant coefficients as in the Ordered Logit Model, plus log (Population), which is significant at 10% level at Ordered Probit Model.

3.4.2. Ordered Logit model with modified ranges

The reasoning behind this model and results it gives are shown below.

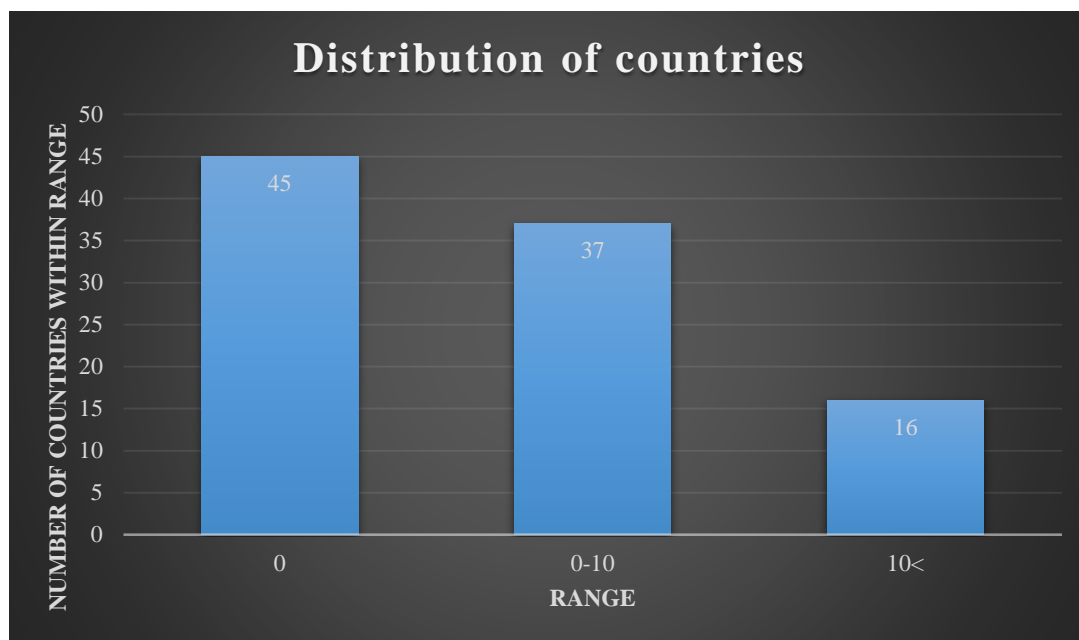
3.4.2.1. The setup and results

Ordered Logit Model is rerun in this section with slightly modified ranges. Namely, I decided to increase the average size of the range by lowering the number of categories from 5 down to

3. Ranges' boundaries are changed accordingly. Newly constructed categories are named as "Poor", "Medium" and "Excellent", in terms of insurance technology progress.

Consequently, new country distribution, relative to a number of InsurTechs, looks as it is shown in Figure 5.

Figure 5 Number of countries belonging to the ranges constructed based on the number of InsurTechs per country (slightly modified ranges)



Source: Graph is derived from the Table 31, Appendix 1.

Results from this setup are presented below.

```
Ordered logistic regression          Number of obs =          98
LR chi2(8)                          =          93.14
Prob > chi2                          =          0.0000
Pseudo R2                            =          0.4654
Log likelihood = -53.492043
```

Insurtechs_categorized_v2	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Internet_users_per_100_people	.0508372	.0236179	2.15	0.031	.004547	.0971273
Strength_of_legal_rights_index_	.1274705	.0973353	1.31	0.190	-.0633031	.3182442
Startup_procedures_to_register_	.1961064	.1072183	1.83	0.067	-.0140376	.4062504
Insurance_and_financial_services	.0262065	.033903	0.77	0.440	-.0402421	.0926551
1.legal_system	1.059325	.7107126	1.49	0.136	-.3336466	2.452296
Malepopulation2039	-.1923868	.0921067	-2.09	0.037	-.3729126	-.011861
log_gdp	1.973103	.9795771	2.01	0.044	.0531673	3.893039
log_pop	.5619484	1.10128	0.51	0.610	-1.59652	2.720417
/cut1	24.64849	5.986837			12.9145	36.38247
/cut2	28.85107	6.358466			16.38871	41.31344

As it is shown, results are more or less the same, except for variable "Start-ups procedures to register business" which is now significant at 10% level, and "Legal system" variable, which doesn't show significance anymore.

3.4.2.2. Predicted Probabilities

Here, for predicted probabilities, only variables significant at 10% level are evaluated.

Results are shown in Table 6 for "Internet users" variable, derived from Table 22, 23 and 24 from Appendix.

Table 6 Ordered Logit Model Predicted Probabilities for "Internet users" variable (modified ranges)

Variable / InsurTech development status	Predicted probabilities for poor category	Predicted probabilities for medium category	Predicted probabilities for excellent category
Internet users (20%)	0.80***	0.19	0.003
Internet users (40%)	0.59***	0.39***	0.01
Internet users (60%)	0.34***	0.62***	0.027*
Internet users (80%)	0.16*	0.76***	0.071

Significance – 10% (*), 5% (**), 1% (***)

Again we can see that countries with higher Internet user percentage are less likely to end up in "Poor" group, and more likely to end up in higher development groups.

Summary for "Start-up procedures" variable is extracted from Table 25, 26 and 27, and shown in Table 7.

Table 7 Ordered Logit Model Predicted Probabilities for "Start-up procedures" variable (modified ranges)

Variable / InsurTech development status	Predicted probabilities for poor category	Predicted probabilities for medium category	Predicted probabilities for excellent category
Start-up procedures (=3)	0.55***	0.43***	0.011
Start-up procedures (=8)	0.31***	0.65***	0.031*
Start-up procedures (=13)	0.14	0.77***	0.079
Start-up procedures (=18)	0.06	0.75***	0.186

Significance – 10% (*), 5% (**), 1% (***)

As it is shown in the table above, countries having more Start-up procedures to register a business are less likely to end up in "Poor" and more likely to end up in "Medium" and "Excellent" category. All other variables at their means, a country with 3 procedures is 55% likely to be in "Poor" group, while a country with 8 procedures is 31% likely to be in the same group. Similarly, a system with 8 procedures has 65% of chance to be in "Medium" category, while a system with 18 procedures has 75% probability to be in "Medium" group.

Results for "Population ages 20-39" variable are derived from Table 28, 29 and 30, and presented in Table 8.

Table 8 Ordered Logit Model Predicted Probabilities for "Population ages 20-39" variable (modified ranges)

Variable / InsurTech development status	Predicted probabilities for poor category	Predicted probabilities for medium category	Predicted probabilities for excellent category
Population ages 20-39 (25%)	0.17**	0.75***	0.06
Population ages 20-39 (30%)	0.35***	0.61***	0.02*
Population ages 20-39 (35%)	0.59***	0.39***	0.01
Population ages 20-39 (40%)	0.79***	0.20	0.003

Significance – 10% (*), 5% (**), 1% (***)

As in the first model, countries with more male millennials are more likely to end up in "Poor" and less likely to end up in better development groups.

3.5. Limitations of the evaluation strategy

Although all the drawn variables are highly relevant for the analysis, I would still be interested to look at some other, more specific variables in respect to this market niche. That way I would probably come up with more grounded and comprehensive conclusions. Previous analysis certainly helps in understanding needed general environment setup for the development of InsurTechs and all the other tech start-ups. However, conducted analysis features potential omitted variable bias.

Namely, due to the lack of global availability for some indicators, I was not able to include some reasonably suitable factors in the analysis. Here, at first place, I refer to the number and size of VC funds among countries, number of start-up incubators / accelerators, government

expenditures for research and technology sectors, and some technology oriented higher education programs. All of the mentioned indicators, in my view, would have significant positive correlation with the number of tech start-ups founded.

Furthermore, I missed to include variable purely portraying current insurance sector volume. Although "Insurance and financial services" and "GDP" variables are most likely in a very high correlation with insurance sector volume, potential variable precisely estimating the size of insurance sector within a country would be the most relevant control variable in this setup.

After all, taking into account that InsurTechs and all the other technological start-ups are quite new trends emerging around the world, data availability constraints are something researcher has to deal with while doing this sort of study.

Conclusion and policy recommendations

Theoretical part, explaining different trends and business models within insurance technology field, is considered to be the main contribution of the thesis. A full overview of the main innovations is presented at one place, digging deeper into impact potential across the insurance value chain. There are many presented pieces of evidence and logical reasoning pointing out the importance and economic benefits of these initiatives. Therefore, I consider this part of the thesis as a valuable starting point for any further research conducted in respect to insurance technologies.

This part is also crucial taking into account that it provides importance to methodological part of the study. Multiple variables are taken into consideration to check for some of the favorable factors influencing the development of InsurTechs. Ordered Logit model has performed well, and it has given a few significant correlations. However, omitted variable bias is present due to lack of the data for some other variables that could have potentially been of interest for the study.

Analysis, as well as research conducted while working on the study, helped me to compile some of the very relevant policy recommendations for developing economies like Serbian economy. Although it has relatively high ICT sector potential, entrepreneurship in Serbia hasn't shown much progress when it comes to financial technology innovations. This is probably the case because entrepreneurs do not see much potential in Serbian market. Namely, all the InsurTech solutions are hardly exportable, so consequently they target countries where they originate from.

However, Serbian economy needs to find ways to keep pace with the other developed economies and to establish an environment for the start-ups, which turn up to have a positive impact on the society and economy. Well established start-ups targeting global markets, such

as PlayerHunter and Frame, decided to move their headquarters from Serbia to Vienna and San Francisco, respectively.⁷⁶ These start-ups could have been first touch points, transferring expertise and experience to all the other ventures. Nevertheless, Serbia as a country would be able to build up its reputation in ITC sector around two companies, and eventually get tax revenues from their operations. These negative actions should be prevented through a well thought strategic plan.

Strategic plan tackling start-up industry as a whole should be divided into different segments. Before that, environment to be sought needs to be well understood and presented. First part should focus on the environment for start-ups either operating in Serbia or targeting Serbian market. Here, I would like to put emphasize on the demand side. The population needs to be more educated with the latest trends and technology. With more knowledgeable customers, entrepreneurs will be more willing to launch their ideas and try to penetrate a market. Nonetheless, new companies should get some incentives in first years of operations, to keep up and succeed later on. Incentives might be in the form of donations, tax exemptions, free legal support, etc. Most of the start-ups cease operations in first two years although having huge market potential. These companies mainly lack enough funds and are burdened with regulations and according to expenditures. Thirdly, specialized investment funds should come to the scene as well. These investment funds should either be venture capital or private equity funds, focus on certain technological trends to act as one-stop-shop for all of the new ventures. Besides funds that they provide by default, they should also be a source of all connections and expertise needed for early stage companies to speed up their progress. Venture capital funds are one of the main backbones for start-ups in the developed economies. Besides VC funds, more attention should

⁷⁶ Taylor Bloom, "Playerhunter Is A Sports Recruitment Platform That Helps Aspiring Athletes Get Discovered," sporttechie.com, *SportTechie*, (May 19, 2017), <https://www.sporttechie.com/playerhunter-is-a-sports-recruitment-platform-that-helps-aspiring-athletes-get-discovered/>; Crunchbase, "Frame | Crunchbase," *Crunchbase.com*, accessed May 29, 2017, <https://www.crunchbase.com/organization/mainframe2>.

be driven to online crowdfunding concept which turns out to have a positive effect on start-up development due to smoother financing. Nonetheless, the government should adopt the program facilitating the creation of start-up incubator and accelerator programs around different market niches. Accelerators and incubators are supposed to educate business founders and to provide all the needed support for early stage businesses. It would also be very beneficial to create a special board tracking technology trends in the world to implement them in Serbian economy. Most of the InsurTech concepts are widespread across the globe, without any patent rights. Business models and technologies used by InsurTech companies can easily be copied and applied in the other environment. Lastly, the government should pay special attention to legal environment and protection of the legal rights, in order to reduce country related and legal risks for new companies. Better legal rights will facilitate entrepreneurship and start-up financing, and more importantly, they will preserve established and already successful ventures.

In conclusion, it is important to have clear leads, priorities, structure and initiative to put all the missing parts together, to establish clear paths for further tech innovations in any industry. Since it doesn't require much resources and infrastructure, ICT sector represents a huge opportunity for small and underdeveloped economies like Serbia. Digital services are easily exportable, enabling its supplier to be competitive on global markets. Thus, all the small economies should follow the example of Israel and seize the chance to improve overall economic health. Objective cost-benefit analysis needs to be presented, and based on that strategical and implementation actions.

Appendix

Table 1.

Range	Number of Insurtechs within range
0	118
1	22
2-6	18
7-22	13
22<	9

Table 2.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.8383829	.1172018	7.15	0.000	.6086716 1.068094
2	.6233524	.1150492	5.42	0.000	.3978601 .8488447
3	.3455538	.0696886	4.96	0.000	.2089667 .482141
4	.1441694	.0689967	2.09	0.037	.0089382 .2794005

Table 3.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.1291627	.0916216	1.41	0.159	-.0504124 .3087379
2	.2815122	.0863757	3.26	0.001	.112219 .4508055
3	.406583	.0784318	5.18	0.000	.2528595 .5603064
4	.347731	.0950001	3.66	0.000	.1615343 .5339277

Table 4.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.1291627	.0916216	1.41	0.159	-.0504124 .3087379
2	.2815122	.0863757	3.26	0.001	.112219 .4508055
3	.406583	.0784318	5.18	0.000	.2528595 .5603064
4	.347731	.0950001	3.66	0.000	.1615343 .5339277

Table 5.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.0037314	.003864	0.97	0.334	-.0038418 .0113047
2	.0115665	.0079221	1.46	0.144	-.0039605 .0270935
3	.0350333	.0166604	2.10	0.035	.0023795 .0676871
4	.0991567	.0527146	1.88	0.060	-.0041621 .2024755

Table 6.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.0007498	.0008723	0.86	0.390	-.0009598 .0024594
2	.0023465	.0019834	1.18	0.237	-.0015409 .0062339
3	.0073182	.0048371	1.51	0.130	-.0021624 .0167988
4	.0225856	.0160977	1.40	0.161	-.0089653 .0541366

Table 7.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.474351	.1086505	4.37	0.000	.2613999 .6873021
2	.3915756	.0736707	5.32	0.000	.2471837 .5359675
3	.3145998	.0802576	3.92	0.000	.1572977 .4719018
4	.2466221	.1048793	2.35	0.019	.0410625 .4521817

Table 8.

	Delta-method					[95% Conf. Interval]	
	Margin	Std. Err.	z	P> z			
_at							
1	.3639982	.0809197	4.50	0.000	.2053985	.5225978	
2	.3956007	.0770829	5.13	0.000	.244521	.5466805	
3	.4105159	.0794048	5.17	0.000	.2548852	.5661465	
4	.4063145	.0810276	5.01	0.000	.2475034	.5651256	

Table 9.

	Delta-method					[95% Conf. Interval]	
	Margin	Std. Err.	z	P> z			
_at							
1	.1364273	.058226	2.34	0.019	.0223064	.2505482	
2	.1778116	.0539709	3.29	0.001	.0720305	.2835927	
3	.2264738	.0669853	3.38	0.001	.0951851	.3577626	
4	.2804807	.0991971	2.83	0.005	.086058	.4749034	

Table 10.

	Delta-method					[95% Conf. Interval]	
	Margin	Std. Err.	z	P> z			
_at							
1	.0209285	.0125034	1.67	0.094	-.0035778	.0454348	
2	.0290002	.0143218	2.02	0.043	.0009299	.0570705	
3	.0400013	.0202807	1.97	0.049	.0002518	.0797508	
4	.0548314	.0339159	1.62	0.106	-.0116424	.1213052	

Table 11.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.004295	.0032667	1.31	0.189	-.0021076 .0106977
2	.0060119	.0040718	1.48	0.140	-.0019687 .0139924
3	.0084092	.0057907	1.45	0.146	-.0029402 .0197587
4	.0117513	.0092717	1.27	0.205	-.0064209 .0299235

Table 12.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.4698336	.0794952	5.91	0.000	.3140259 .6256413
2	.1874625	.0897742	2.09	0.037	.0115083 .3634167

Table 13.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.3494499	.0730014	4.79	0.000	.2063698 .49253
2	.3538754	.0914964	3.87	0.000	.1745457 .5332051

Table 14.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.1486652	.0465366	3.19	0.001	.057455 .2398753
2	.3458237	.1104914	3.13	0.002	.1292645 .5623829

Table 15.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.0262701	.0133226	1.97	0.049	.0001582 .0523819
2	.0909907	.0510523	1.78	0.075	-.00907 .1910514

Table 16.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.0057812	.0040221	1.44	0.151	-.002102 .0136644
2	.0218477	.0151687	1.44	0.150	-.0078823 .0515777

Table 17.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.2049305	.0825219	2.48	0.013	.0431905 .3666704
2	.3634273	.070604	5.15	0.000	.225046 .5018086
3	.5584121	.1193999	4.68	0.000	.3243925 .7924316
4	.736908	.1599289	4.61	0.000	.4234532 1.050363

Table 18.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.3920558	.0847819	4.62	0.000	.2258862 .5582253
2	.4029851	.0779687	5.17	0.000	.2501691 .555801
3	.3206313	.0871435	3.68	0.000	.1498331 .4914295
4	.2046027	.118291	1.73	0.084	-.0272435 .4364488

Table 19.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.3199446	.0978658	3.27	0.001	.1281312 .511758
2	.1942937	.0560779	3.46	0.001	.084383 .3042045
3	.1028257	.0493123	2.09	0.037	.0061752 .1994761
4	.0502214	.0413316	1.22	0.224	-.030787 .1312299

Table 20.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.0681918	.0367175	1.86	0.063	-.0037732 .1401567
2	.0325219	.0156472	2.08	0.038	.0018541 .0631898
3	.0150622	.0099998	1.51	0.132	-.004537 .0346614
4	.0068801	.0067158	1.02	0.306	-.0062827 .0200428

Table 21.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.0148774	.0105189	1.41	0.157	-.0057393 .0354941
2	.006772	.0045106	1.50	0.133	-.0020686 .0156126
3	.0030688	.0025395	1.21	0.227	-.0019085 .008046
4	.0013878	.0015389	0.90	0.367	-.0016283 .004404

Table 22.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.8035549	.1459101	5.51	0.000	.5175764 1.089533
2	.5967447	.1224607	4.87	0.000	.3567262 .8367632
3	.3486852	.0752527	4.63	0.000	.2011926 .4961778
4	.162252	.0867019	1.87	0.061	-.0076806 .3321846

Table 23.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.1928019	.1424593	1.35	0.176	-.0864133 .4720171
2	.3932492	.1186949	3.31	0.001	.1606114 .625887
3	.624136	.079164	7.88	0.000	.4689774 .7792945
4	.7660583	.0794987	9.64	0.000	.6102436 .921873

Table 24.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.0036432	.0043415	0.84	0.401	-.004866 .0121523
2	.0100061	.0080763	1.24	0.215	-.0058231 .0258353
3	.0271788	.0155334	1.75	0.080	-.0032662 .0576238
4	.0716897	.0457139	1.57	0.117	-.017908 .1612874

Table 25.

	Delta-method					[95% Conf. Interval]	
	Margin	Std. Err.	z	P> z			
_at							
1	.552713	.1270843	4.35	0.000	.3036323	.8017936	
2	.3167185	.0756609	4.19	0.000	.1684258	.4650111	
3	.1481196	.0940031	1.58	0.115	-.036123	.3323623	
4	.0612286	.0718513	0.85	0.394	-.0795973	.2020545	

Table 26.

	Delta-method					[95% Conf. Interval]	
	Margin	Std. Err.	z	P> z			
_at							
1	.4353278	.1232531	3.53	0.000	.1937563	.6768994	
2	.6520226	.0797099	8.18	0.000	.4957941	.8082511	
3	.7726726	.0769375	10.04	0.000	.6218778	.9234674	
4	.7522278	.1345742	5.59	0.000	.4884673	1.015988	

Table 27.

	Delta-method					[95% Conf. Interval]	
	Margin	Std. Err.	z	P> z			
_at							
1	.0119592	.0092174	1.30	0.194	-.0061066	.030025	
2	.0312589	.0177983	1.76	0.079	-.003625	.0661429	
3	.0792078	.0591256	1.34	0.180	-.0366762	.1950918	
4	.1865436	.1885377	0.99	0.322	-.1829835	.5560707	

Table 28.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.1767882	.085809	2.06	0.039	.0086057 .3449708
2	.3597782	.0746708	4.82	0.000	.2134261 .5061303
3	.5952247	.1290106	4.61	0.000	.3423685 .8480809
4	.7937273	.1546769	5.13	0.000	.4905662 1.096888

Table 29.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.7581002	.0815738	9.29	0.000	.5982185 .9179819
2	.6142963	.0784758	7.83	0.000	.4604865 .768106
3	.3947065	.1248724	3.16	0.002	.149961 .6394519
4	.2024008	.1509405	1.34	0.180	-.0934372 .4982388

Table 30.

	Delta-method				
	Margin	Std. Err.	z	P> z	[95% Conf. Interval]
_at					
1	.0651116	.0397228	1.64	0.101	-.0127436 .1429668
2	.0259256	.0149029	1.74	0.082	-.0032836 .0551347
3	.0100688	.0083087	1.21	0.226	-.0062159 .0263535
4	.0038719	.0046693	0.83	0.407	-.0052798 .0130237

Table 31.

Range	Number of Insurtechs within range
0	45
0-10	37
10<	16

Stata codes

```
import excel "C:\Users\Administrator\Desktop\thesis_data_J.xls", sheet("Sheet1") firstrow
clear

save "C:\Users\Administrator\Desktop\Thesis _J_data.dta"

use C:\Users\Administrator\Desktop\Thesis_J_data.dta

global $ylist Insurtechs_categorized

global xlist Internet_users_per_100_people Strength_of_legal_rights_index_
Startup_procedures_to_register_ Insurance_and_financial_services legal_system
Malepopulation2039 log_gdp log_pop

ologit $ylist $xlist

margins, at(Internet_users_per_100_people=20 Internet_users_per_100_people=40
Internet_users_per_100_people=60 Internet_users_per_100_people=80) predict(outcome(0))
atmeans

margins, at(Internet_users_per_100_people=20 Internet_users_per_100_people=40
Internet_users_per_100_people=60 Internet_users_per_100_people=80) predict(outcome(1))
atmeans

margins, at(Internet_users_per_100_people=20 Internet_users_per_100_people=40
Internet_users_per_100_people=60 Internet_users_per_100_people=80) predict(outcome(2))
atmeans

margins, at(Internet_users_per_100_people=20 Internet_users_per_100_people=40
Internet_users_per_100_people=60 Internet_users_per_100_people=80) predict(outcome(3))
atmeans

margins, at(Internet_users_per_100_people=20 Internet_users_per_100_people=40
Internet_users_per_100_people=60 Internet_users_per_100_people=80) predict(outcome(4))
atmeans

margins, at(Strength_of_legal_rights_index_=2 Strength_of_legal_rights_index_=5
Strength_of_legal_rights_index_=8 Strength_of_legal_rights_index_=11)
predict(outcome(0)) atmeans

margins, at(Strength_of_legal_rights_index_=2 Strength_of_legal_rights_index_=5
Strength_of_legal_rights_index_=8 Strength_of_legal_rights_index_=11)
predict(outcome(1)) atmeans

margins, at(Strength_of_legal_rights_index_=2 Strength_of_legal_rights_index_=5
Strength_of_legal_rights_index_=8 Strength_of_legal_rights_index_=11)
predict(outcome(2)) atmeans

margins, at(Strength_of_legal_rights_index_=2 Strength_of_legal_rights_index_=5
Strength_of_legal_rights_index_=8 Strength_of_legal_rights_index_=11)
predict(outcome(3)) atmeans
```

```
margins, at(Strength_of_legal_rights_index_=2 Strength_of_legal_rights_index_=5
Strength_of_legal_rights_index_=8 Strength_of_legal_rights_index_=11)
predict(outcome(4)) atmeans
```

```
margins, at(legal_system=(0/1)) predict(outcome(0)) atmeans
```

```
margins, at(legal_system=(0/1)) predict(outcome(1)) atmeans
```

```
margins, at(legal_system=(0/1)) predict(outcome(2)) atmeans
```

```
margins, at(legal_system=(0/1)) predict(outcome(3)) atmeans
```

```
margins, at(legal_system=(0/1)) predict(outcome(4)) atmeans
```

```
margins, at(Malepopulation2039=25 Malepopulation2039=30 Malepopulation2039=35
Malepopulation2039=40) predict(outcome(0)) atmeans
```

```
margins, at(Malepopulation2039=25 Malepopulation2039=30 Malepopulation2039=35
Malepopulation2039=40) predict(outcome(1)) atmeans
```

```
margins, at(Malepopulation2039=25 Malepopulation2039=30 Malepopulation2039=35
Malepopulation2039=40) predict(outcome(2)) atmeans
```

```
margins, at(Malepopulation2039=25 Malepopulation2039=30 Malepopulation2039=35
Malepopulation2039=40) predict(outcome(3)) atmeans
```

```
margins, at(Malepopulation2039=25 Malepopulation2039=30 Malepopulation2039=35
Malepopulation2039=40) predict(outcome(4)) atmeans
```

```
global $ylist Insurtechs_categorized
```

```
global xlist Internet_users_per_100_people Strength_of_legal_rights_index_
Startup_procedures_to_register_ Insurance_and_financial_services legal_system
Malepopulation2039 log_gdp log_pop
```

```
oprobit $ylist $xlist
```

```
global $ylist Insurtechs_categorized_v2
```

```
global xlist Internet_users_per_100_people Strength_of_legal_rights_index_
Startup_procedures_to_register_ Insurance_and_financial_services legal_system
Malepopulation2039 log_gdp log_pop
```

```
ologit $ylist $xlist
```

```
margins, at(Internet_users_per_100_people=20 Internet_users_per_100_people=40
Internet_users_per_100_people=60 Internet_users_per_100_people=80) predict(outcome(0))
atmeans
```

```
margins, at(Internet_users_per_100_people=20 Internet_users_per_100_people=40
Internet_users_per_100_people=60 Internet_users_per_100_people=80) predict(outcome(1))
atmeans
```

```
margins, at(Internet_users_per_100_people=20 Internet_users_per_100_people=40  
Internet_users_per_100_people=60 Internet_users_per_100_people=80) predict(outcome(2))  
atmeans
```

```
margins, at(Malepopulation2039=25 Malepopulation2039=30 Malepopulation2039=35  
Malepopulation2039=40) predict(outcome(0)) atmeans
```

```
margins, at(Startup_procedures_to_register_=3 Startup_procedures_to_register_=8  
Startup_procedures_to_register_=13 Startup_procedures_to_register_=18)  
predict(outcome(0)) atmeans
```

```
margins, at(Startup_procedures_to_register_=3 Startup_procedures_to_register_=8  
Startup_procedures_to_register_=13 Startup_procedures_to_register_=18)  
predict(outcome(1)) atmeans
```

```
margins, at(Startup_procedures_to_register_=3 Startup_procedures_to_register_=8  
Startup_procedures_to_register_=13 Startup_procedures_to_register_=18)  
predict(outcome(2)) atmeans
```

```
margins, at(Malepopulation2039=25 Malepopulation2039=30 Malepopulation2039=35  
Malepopulation2039=40) predict(outcome(1)) atmeans
```

```
margins, at(Malepopulation2039=25 Malepopulation2039=30 Malepopulation2039=35  
Malepopulation2039=40) predict(outcome(2)) atmeans
```

Bibliography

- Accenture. "Artificial Intelligence and Internet of Things Attract Almost Half of InsurTech Funding Globally in 2016, According to Accenture Research | Accenture Newsroom." Newsroom.accenture.com, March 30, 2017. <https://accntu.re/2ozRKYo>.
- Akasie, Jay. "With New JOBS Act Rule, a New Era of Investment Banking?" Nasdaq.com. *NASDAQ.com*, September 24, 2013. <http://www.nasdaq.com/article/with-new-jobs-act-rule-a-new-era-of-investment-banking-cm279813>.
- Anik Sen. "Insurtech: Disruptions and Opportunities in the Insurance Industry." Pinebridge.com, June 10, 2016. <https://www.pinebridge.com/insights/investing/2016/10/insurtech-disruptions-and-opportunities-in-the-insurance-industry>.
- Aviva. "Take the Aviva Drive Challenge - Aviva." Accessed May 7, 2017. <http://www.aviva.co.uk/car-insurance/drive/>.
- AXA. "AXA |." Axa.com. *AXA / The AXA Drive Coach App, an Innovative Contribution to Safer...* Accessed May 7, 2017. <https://www.axa.com/en/newsroom/press-releases/drive-coach-apple-watch-en>.
- Beattie, Andrew. "Insurtech." Investopedia.com. *Investopedia*, October 12, 2016. <http://www.investopedia.com/terms/i/insurtech.asp>.
- Beck, Thorsten, and Asli Demirguc-Kunt. "Small and Medium-Size Enterprises: Access to Finance as a Growth Constraint." *Journal of Banking & Finance* 30, no. 11 (November 2006): 2931–43. doi:10.1016/j.jbankfin.2006.05.009.
- Bloom, Taylor. "Playerhunter Is A Sports Recruitment Platform That Helps Aspiring Athletes Get Discovered." Sporttechie.com. *SportTechie*, May 19, 2017. <https://www.sporttechie.com/playerhunter-is-a-sports-recruitment-platform-that-helps-aspiring-athletes-get-discovered/>.
- Bonner, Marianne. "How Drones Will Change the Insurance Industry." Thebalance.com. *The Balance*, March 2, 2017. <https://www.thebalance.com/how-drones-change-insurance-industry-4125242>.
- Breading, Mark. "The Convergence of InsurTech and Traditional Insurance Technology." Text. *The OnBase Blog*, December 6, 2016. <http://blog.onbase.com/insurance/the-convergence-of-insurtech-and-traditional-insurance-technology/>.
- Bronson, Caitlin. "Will InsurTech Startups Take over Your Drone Insurance Business?" Insurancebusinessmag.com. *Insurance Business*, October 8, 2016. <http://www.insurancebusinessmag.com/us/news/breaking-news/will-insurtech-startups-take-over-your-drone-insurance-business-35970.aspx>.
- Cameron, A. Colin, and Pravin K. Trivedi. *Microeconometrics: Methods and Applications*. Cambridge university press, 2005. <http://books.google.com/books?hl=en&lr=&id=TdlKAgAAQBAJ&oi=fnd&pg=PP1&dq=%22University+Press+has+no+responsibility+for+the+persistence+or+accuracy+of%22+%22Causal+and+Noncausal%22+%22Example:+Returns+to%22+%22Example:+ML+and+NLS%22+%22How+to+Use+This%22+&ots=yIlkS1czxm&sig=ecrHpBbkCKo1cVVvGf5nTuVxutc>.
- Colin Wu. "5 Insurtech Trends to Watch in Southeast Asia." *Tech in Asia*, March 21, 2017. <https://www.techinasia.com/5-insurtech-trends-watch-southeast-asia>.
- Crunchbase. "Frame | Crunchbase." *Crunchbase.com*. Accessed May 29, 2017. <https://www.crunchbase.com/organization/mainframe2>.
- . "Tracxn | Crunchbase." *Crunchbase.com*. Accessed May 4, 2017. <https://www.crunchbase.com/organization/tracxn>.

- . “ZhongAn | Crunchbase.” Crunchbase.com. Accessed May 4, 2017. <https://www.crunchbase.com/organization/zhongan>.
- Cuvva. “Cuvva - Insurance You Control.” Cuvva. Accessed May 7, 2017. <https://cuvva.com>.
- Daily Fintech. “21 InsurTech Ventures Changing Auto Insurance.” Dailyfintech.com. *Daily Fintech*, June 2, 2016. <https://dailyfintech.com/2016/06/02/21-insurtech-ventures-changing-auto-insurance/>.
- . “Wearables Could Help to Heal Health & Life Insurance.” Dailyfintech.com. *Daily Fintech*, October 6, 2016. <https://dailyfintech.com/2016/10/06/wearables-may-heal-health-life-insurance/>.
- Daniel Taibelson. “The Most Disruptive Insurtech Companies to Watch in 2017 | Vertafore.” Vertafore.com, May 1, 2017. <http://www.vertafore.com/Resources/Blog/The-5-Most-Disruptive-Insurtech-Startups-to-Watch-in-2017>.
- FinSMEs. “Insurtech, Five Startups Disrupting Insurance Management in Europe.” Finsmes.com/. *FinSMEs*, March 31, 2016. <http://www.finsmes.com/2016/03/insurtech-five-startups-disrupting-insurance-management-in-europe.html>.
- Fintech Finance. “The Rise of InsurTech Investment.” [Http://www.fintech.finance](http://www.fintech.finance), October 31, 2016. <http://www.fintech.finance/01-news/the-rise-of-insurtech-investment/>.
- Fintechnews Singapore. “InsurTech Startup PolicyPal Wants to Help People Manage, Track and Understand Their Insurance Policies.” [Http://fintechnews.sg](http://fintechnews.sg). *Fintech Singapore*, April 5, 2016. <http://fintechnews.sg/1848/insuretech/insurtech-startup-policypal-wants-help-people-manage-track-understand-insurance-policies/>.
- Goldman Sachs. “Millennials Infographic.” Goldmansachs.com. *Goldman Sachs*. Accessed May 4, 2017. <http://www.goldmansachs.com/our-thinking/pages/millennials/>.
- gprevodnik. “Future of Insurance: Breakdown of Underwriting and Client Data Connectivity.” *Lynx-BPM*, April 26, 2016. <https://lynx-bpm.com/2016/04/26/future-of-insurance-breakdown-of-underwriting-and-client-data-connectivity/>.
- Horton, John J., and Richard J. Zeckhauser. “Owning, Using and Renting: Some Simple Economics of the ‘ Sharing Economy.’” National Bureau of Economic Research, February 2016. <http://www.nber.org/papers/w22029>.
- Howard, Bill. “What Is Vehicle Telematics? - ExtremeTech.” Extremetech.com, March 13, 2015. <https://www.extremetech.com/extreme/201026-what-is-vehicle-telematics>.
- Huckstep, Rick. “Claimable Put the Insurance Customer First.” [The-digital-insurer.com/](http://www.the-digital-insurer.com/), May 21, 2017. <https://www.the-digital-insurer.com/blog/insurtech-claimable-and-insurtech-putting-the-insurance-customer-first/>.
- . “P2P Start-Ups From Around the World.” Insurancethoughtleadership.com. *Insurance Thought Leadership*, February 11, 2016. <http://insurancethoughtleadership.com/p2p-start-ups-from-around-the-world/>.
- . “Peer 2 Peer Insurance Is Taking the Industry back to Its Roots!” Dailyfintech.com. *Daily Fintech*, December 23, 2015. <https://dailyfintech.com/2015/12/23/peer-2-peer-insurance-is-taking-the-industry-back-to-its-roots/>.
- Insurance Journal. “RIMS 2017: Why Cyber Should Be Treated as Standalone Insurance.” Insurancejournal.com. *Insurance Journal*, April 24, 2017. <http://www.insurancejournal.com/news/national/2017/04/24/448737.htm>.
- International Civil Aviation Organization. *Unmanned Aircraft Systems: (UAS)*. ICAO Circular 328. Montréal: International Civil Aviation Organization, 2011. https://www.icao.int/Meetings/UAS/Documents/Circular%20328_en.pdf.
- Karsenti, Gérald. “Uber, Airbnb, Booking.com ... These New Players Who Are Reshuffling the Cards,” January 25, 2016. <https://www.linkedin.com/pulse/uber-airbnb-bookingcom-new-players-who-reshuffling-cards-karsenti>.

- Klich, Tanya Benedicto. "VC 100: The Top Investors in Early-Stage Startups." *Entrepreneur.com*. *Entrepreneur*, February 19, 2015. <https://www.entrepreneur.com/article/242702>.
- Lemonade. "Lemonade - Frequently Asked Questions." *Lemonade.com*. Accessed May 7, 2017. <http://www.lemonade.com/faq>.
- LendingClub. "Lending Club Partners with Funding Circle and Prosper to Launch Marketplace Lending Association." [Http://blog.lendingclub.com](http://blog.lendingclub.com). *LendingClub Blog*, April 7, 2016. <http://blog.lendingclub.com/lending-club-partners-funding-circle-prosper-launch-marketplace-lending-association/>.
- Levine, Ross, Norman Loayza, and Thorsten Beck. "Financial Intermediation and Growth: Causality and Causes." *Journal of Monetary Economics* 46, no. 1 (2000): 31–77.
- Liberty Mutual. "Liberty Mutual Insurance and Nest Partner to Reward Customers For Protecting Their Homes With Innovative Technology." *Libertymutualgroup.com*, June 17, 2015. <https://www.libertymutualgroup.com/about-lm/news/news-release-archive/articles/liberty-mutual-insurance-and-nest-partner-to-reward-customers-for-protecting-their-homes-with-innovative-technology>.
- LinkedIn. "Tracxn." Accessed May 4, 2017. <https://www.linkedin.com/company/tracxn>.
- L.S. Howard. "Investments in Insurtech Expected to 'Keep Booming' in 2017: KPMG Report." *Insurance Journal*, February 23, 2017. <http://www.insurancejournal.com/news/international/2017/02/23/442638.htm>.
- Martucci, Brian. "Top 10 Equity Crowdfunding Sites for Investors & Entrepreneurs," August 26, 2015. <http://www.moneycrashers.com/equity-crowdfunding-sites-investors-entrepreneurs/>.
- McCrank, John. "Insurtech Startup Trov Launches in UK, Offering On-Demand Coverage." *Insurancejournal.com*. *Insurance Journal*, November 23, 2016. <http://www.insurancejournal.com/news/international/2016/11/23/433123.htm>.
- Meola, Andrew. "How IoT & Smart Home Automation Will Change the Way We Live." *Businessinsider.com*. *Business Insider*. Accessed May 7, 2017. <http://www.businessinsider.com/internet-of-things-smart-home-automation-2016-8>.
- Momoh, Osi. "Peer-To-Peer (P2P) Insurance." *Investopedia.com*. *Investopedia*, October 27, 2016. <http://www.investopedia.com/terms/p/peertopeer-p2p-insurance.asp>.
- NAIC. "Usage-Based Insurance and Telematics." *Naic.org*, March 1, 2017. http://www.naic.org/cipr_topics/topic_usage_based_insurance.htm.
- Nationwide. "4 Insurance Technology Trends Changing the Industry." *Blog.nationwide.com*. *Now from Nationwide*. Accessed May 21, 2017. <https://blog.nationwide.com/news/insurance-technology-trends/>.
- Neos. "Neos Connected Home Insurance - a Smart Way to Protect Your Home." *Neos.co.uk*. *Neos - Insurance Reimagined*. Accessed May 7, 2017. <https://neos.co.uk/>.
- NicheHacks. "How To Make A Price Comparison Site In Untapped Niches." [Http://nichehacks.com](http://nichehacks.com). *NicheHacks*. Accessed May 21, 2017. <http://nichehacks.com/niche-price-comparison-sites/>.
- Peverelli, Roger. "10 Insurtech Trends for 2017." *Banknxt.com*. *BankNXT*, January 3, 2017. <http://banknxt.com/58984/10-insurtech-trends-2017/>.
- Porta, Rafael La, Florencio Lopez-de-Silanes, and Andrei Shleifer. "The Economic Consequences of Legal Origins." *Journal of Economic Literature* 46, no. 2 (May 2008): 285–332. doi:10.1257/jel.46.2.285.
- PricewaterhouseCoopers. "Customers in the Spotlight: How FinTech Is Reshaping Banking." *Pwc.com*. *PwC*. Accessed May 4, 2017. <https://www.pwc.com/gx/en/industries/financial-services/publications/fintech-is-reshaping-banking.html>.

- “Opportunities await: How InsurTech is reshaping industry,” pwc.com, PwC, accessed May 4, 2017, <http://www.pwc.com/ca/en/insurance/publications/pwc-how-insurtech-is-reshaping-insurance-2016-07-en.pdf>
- Prive, Tanya. “How To Invest In Startups And Make Money.” *Forbes*, November 17, 2015. <http://www.forbes.com/sites/tanyaprive/2015/11/17/how-to-invest-in-startups-and-make-money/>.
- Progressive. “Progressive Auto Insurance - An Introduction.” Progressive.com, April 9, 2014. <https://www.progressive.com/progressive-insurance/company-introduction>.
- Radin, Amy. “InsurTech Ventures Going After Big and Complex Health Insurance Pain Points.” Huffingtonpost.com. *Huffington Post*, September 6, 2016. http://www.huffingtonpost.com/amy-radin/insurtech-ventures-going-_b_11850042.html.
- Ralph, Oliver. “Insurance Tech Start-up Investment Surges.” Ft.com. *Financial Times*. Accessed May 7, 2017. <https://www.ft.com/content/53266de8-07e1-11e6-b6d3-746f8e9cdd33>.
- Robehmed, Natalie. “What Is A Startup?” Forbes.com. *Forbes*, December 16, 2013. <http://www.forbes.com/sites/natalierobehmed/2013/12/16/what-is-a-startup/>.
- Rodriguez, Salvador. “The Real Reason Everyone Calls Billion-Dollar Startups ‘Unicorns.’” Ibtimes.com. *International Business Times*, September 3, 2015. <http://www.ibtimes.com/real-reason-everyone-calls-billion-dollar-startups-unicorns-2079596>.
- Saba, Jennifer. “Specifics on Newspapers from ‘State of News Media’ Report.” Web.archive.org, March 20, 2009. https://web.archive.org/web/20090320033032/http://www.editorandpublisher.com/ean_dp/news/article_display.jsp?vnu_content_id=1003951616.
- “Scales Dropped.” Economist.com. *The Economist*, April 16, 2016. <http://www.economist.com/news/business/21696962-more-people-are-paying-stream-music-industry-still-wobbly-scales-dropped>.
- Scott-Briggs, Angela. “Top 10 Latest Insurtech Trends.” Techbullion.com. *TechBullion*, February 6, 2017. <http://www.techbullion.com/top-10-latest-insurtech-trends/>.
- Sofia. “80 Hottest InsuranceTech Companies Shaking up the Trillion-Dollar Insurance Industry.” Letstalkpayments.com. *Lets Talk Payments*, March 9, 2016. <https://letstalkpayments.com/80-hottest-insurancetech-companies-shaking-up-the-trillion-dollar-insurance-industry/>.
- Tehrani, Kiana. “Wearable Technology and Wearable Devices: Everything You Need to Know.” Wearabledevices.com. *Wearable Devices*, March 26, 2014. <http://www.wearabledevices.com/what-is-a-wearable-device/>.
- The Digital Insurer. “AXA’s Digital Initiatives.” The-digital-insurer.com. Accessed May 7, 2017. <http://www.the-digital-insurer.com/dia/axas-digital-initiatives/>.
- Tracxn. “Tracxn Research - Insurance Tech Landscape, February 2017.” Data & Analytics, 10:40:25 UTC. <https://www.slideshare.net/Tracxn/tracxn-research-insurance-tech-landscape-february-2017>.
- TrueMotion. “Mobile Telematics | Smartphone UBI | Insurers.” Gotruemotion.com. Accessed May 7, 2017. <https://gotruemotion.com/insurers/>.
- UCLA. “Ordered Logistic Regression | Stata Data Analysis Examples.” Stats.idre.ucla.edu. *IDRE Stats*. Accessed May 21, 2017. <https://stats.idre.ucla.edu/stata/dae/ordered-logistic-regression/>.
- Venture Clash. “Top 10 Insurtech Trends for 2016.” Ventureclash.com. *VentureClash*, June 22, 2016. <http://ventureclash.com/2016/06/22/top-10-insurtech-trends-for-2016/>.

- Venture Scanner. "Venture Scanner: Where in the World Are Insurance Technology Startups? - Q4 2016." Venturescanner.com, December 13, 2016. <https://www.venturescanner.com/blog/2016/where-in-the-world-are-insurance-technology-startups-q4-2016>.
- Warwick-Ching, Lucy. "Price Comparison Websites Called into Question." Ft.com. *Financial Times*, November 26, 2013. <https://www.ft.com/content/7281378a-55c9-11e3-b6e7-00144feabdc0>.
- Wessel, David. "Economic Consequences of Common Law versus Civil Law." Ncpa.org, September 6, 2001. http://www.ncpa.org/sub/dpd/index.php?Article_ID=7818.
- World Bank. "Start Your Engines: Unlocking the Potential of Serbia's Economy." Text/HTML. *World Bank*, February 10, 2014. <http://www.worldbank.org/en/news/feature/2014/10/02/start-your-engines-unlocking-potential-of-serbian-economy>.
- . "World Development Indicators | DataBank." Databank.worldbank.org. Accessed May 4, 2017. <http://databank.worldbank.org/data/reports.aspx?source=2&series=IC.LGL.CRED.XQ&country=>
- . "World Development Indicators | DataBank." [Http://databank.worldbank.org](http://databank.worldbank.org). Accessed May 4, 2017. <http://databank.worldbank.org/data/reports.aspx?source=2&series=IT.NET.USER.ZS&country=>
- . "World Development Indicators | DataBank." [Http://databank.worldbank.org](http://databank.worldbank.org). Accessed May 4, 2017. <http://databank.worldbank.org/data/reports.aspx?source=2&series=IC.REG.PROC&country=>
- Zurich. "Zurich Announces Partnership with Cocoon." Zurich.co.uk. *Zurich UK*. Accessed May 7, 2017. <https://www.zurich.co.uk/en/about-us/media-centre/general-insurance-news/2016/zurich-announces-partnership-with-cocoon>.