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# Insurance in the Digital Age

*A view on key implications for the economy and society*

September 2018

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# Insurance in the Digital Age

## *A view on key implications for the economy and society*

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# Contents



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# Abstract

This paper is concerned with the impact digital technologies have on insurance, and reflects on the contribution that insurance makes to the development of a digitalized economy. Technology and new data sources are changing fundamentally our economy and society, and promise to transform the insurance industry as well. New technology startup firms—or InsurTechs—are entering the industry to deliver some of the services typically provided by incumbent insurers and intermediaries. Industrial companies as well as established technology firms are eyeing opportunities in insurance. The new entrants present opportunities for mutually beneficial partnerships with insurers but they could also become direct competitors, putting pressure on profit margins and challenging the insurers, especially at their interface with customers.

Digitalization is widening the role of insurers from one primarily concerned with loss indemnification to a broader advisory service for insureds on how to prevent, mitigate and manage risks. That is to say, new technologies allow insurance to evolve from pure risk protection towards risk prediction and prevention. Underwriting, pricing, claims handling—all these processes could become more efficient thanks to digital technologies. But digital technologies also give rise to new challenges. For example, technology-driven personalised pricing could also mean that for some individuals who are exposed to a higher risk within any given risk pool, adequate insurance cover might come at too high a price. Societies need to reflect on this and on the risk that ethics and data protection may lag behind technological progress.

Insurance plays an important role in helping to address some of societies' greatest challenges. In the face of the ever increasing digitalization of the economy, and in spite of pervasive trends to personalise more and more aspects of our daily lives, risk pooling through insurance is likely to remain as the best response of the industry to the financial consequences of risk.

# Executive summary

**Digital technology is changing what risks insurers cover.**

The purpose of insurance is to enable risk-taking, support economic growth, encourage innovation and ultimately to enhance the resilience of society and the economy. Insurance plays an important role in helping to address modern society's greatest challenges, such as cyber risks, the effects of technology changes and societal changes driven by demographic trends.[1]

Digital technology—technological advances, and the availability of new data sources—is bringing about change in the insurance industry and reconfiguring the competitive landscape. The increasing use of (big) data analytics, artificial intelligence, and the Internet of Things (IoT), for instance, are expanding the role of data in the insurance business model. Technological advances will allow for more efficient and effective risk mitigation and prevention, and enable the development of powerful new business models.

Digital technology is changing what risks insurers cover and how insurers underwrite, distribute, administer and manage claims. Insurance is becoming more customer-centric. The role of insurers is widening from one concerned primarily with loss indemnification to a broader advisory service for customers on how to prevent, mitigate and manage their risks. The new possibilities introduced by real-time monitoring and visualisation are fundamentally changing the insurers' relationship with customers. For example, when insureds allow insurers to track their habits, this data can be shared and used by insureds to reduce risk by influencing their behaviour and consequently reducing premiums to the customers' benefit.

**Digital technology has the potential to generate substantial economic and societal benefits, but can also give rise to challenges and potential costs to customers.**

Digital technology has the potential to generate substantial economic and societal benefits. Better alignment of premiums and risks allows premiums to better reflect the underlying risk. Enhanced data facilitates risk management and early warning systems that allow for timely interventions to reduce losses and lead to additional benefits for policyholders. In particular in developing countries and emerging markets, digitalization and new technologies can help to improve access to insurance by making it more affordable, creating new markets and at the same time bringing the benefits of insurance to new customers.

New technologies present new opportunities but also give rise to challenges and potential costs that customers, the industry itself, and society as a whole will need to address. There are ethical and societal concerns, for example in the areas of privacy and data protection, or regarding the evolving access to insurance for high-risk individuals. Societies therefore need to reflect on these developments and on the risk that ethics may lag behind technological progress. There is also concern that established technology companies, like Amazon or Google, could

1 For an elaborated discussion of the socio-economic role of insurance, see Liedtke, P. (2007) What's insurance to a modern economy?, The Geneva Papers on Risk and Insurance-Issues and Practice, 32 (2): 211-221.

connect to the insurance sector, use their monopoly-like access to personal data to extract disproportionate value, discriminate against the insurance sector, and tip the competitive landscape. This could result in higher premium rates and lower product variety to the detriment of consumers.

**A key challenge will be finding the balance between the risks and rewards of new technologies.**

The digital era brings a radical shift in the nature of risks to society. Growing interconnectedness will in many ways mitigate the risks within existing systems. However, accelerated digitalization and the growth of open and connected digital environments also create new vulnerabilities and potential consequences that are less predictable than they have been to date. As so often, a key challenge is to find the balance between the risks and rewards of new technologies.

Risk pooling and the harnessing of the law of large members will remain the cornerstone of the insurance business model. Regulators can ease the way by putting in place regulation that helps the industry innovate and expand its product variety and harness the benefits of technological progress.

This paper addresses the question whether the value of insurance will be maintained in a digitalized society, and discusses the challenges and the economic and societal benefits of the digital transformation process. It aims to contribute to an informed and fact-based public debate on the role of insurance in a digital economy.

# The impact of digital technology on the insurance value chain

## Digitalization is changing the nature of insurance products.

*Digital technology is reshaping the business model of the insurance industry. It is changing what insurers cover and the ways in which they design and distribute products, underwrite risks, and manage claims.*

There are numerous examples of how digitalization is changing the nature of insurance products. Three examples are on-demand insurance, usage-based insurance, and the sharing economy.

- On-demand insurance is a new business model specialising in covering only those risks faced at the moment. Consumers pay for insurance only when the asset is actually in use and, 'at risk'. It is an innovation that makes insurance coverage literally a simple swipe on a smartphone.[2]

- Another emerging form of on-demand insurance is usage-based or pay-as-you-go coverage. Metromile, for instance, sells car insurance on a pay-per-mile basis. These policies are tailored to people who drive very little.

- Insurance start-up companies tap opportunities opened up by the sharing economy.[3] For instance, Cuvva, a UK-based insurance start-up, lets customers borrow their friends' cars for as little as an hour and insures them for the time they drive them.

### Understanding the term 'digital technology and transformation'

The literature on the digital economy is characterised by many different expressions, many of which lack a clear or shared definition. This includes the expression 'digital technology and transformation'. This report loosely defines digital technology as a broader 'fourth industrial revolution' technology that enables new ways of communication, information sharing, and insuring. The expression, as it is used here, comprises a set of technologies such as cloud computing, the Internet of Things (IoT), telematics, wearables, mobile phones, and others. It also encompasses the increasing amount of available data, as well as advanced data analytics such as Artificial Intelligence (AI), which includes, for instance, machine and deep learning approaches as well as new data management.

Underwriting is becoming easier and more effective. High administrative costs and lengthy, invasive underwriting processes have long been an impediment to reaching and engaging with more of the un- and underinsured. Traditional underwriting techniques to differentiate and select risks may be effective, but the process is time consuming and involves high costs. New data sources,

2 Hall, S. (2018) Swipe right for on-demand insurance, CIPR Newsletter, March.
3 Forrester (2018) Disrupting finance: Digital insurers, January.

new platforms to store and analyse data, and fast, innovative technologies to mine the data or simply to automate existing processes will reduce the length and invasiveness of risk assessment, improve risk selection and allow for personalised pricing.

**Distribution channels are responding to changes in consumer preferences.**

Distribution channels are also evolving. While traditional intermediaries, such as agents and brokers, still dominate distribution for most insurance sectors around the world, an increasing amount of insurance is gradually moving over to mobile and Internet channels, especially in lines such as motor insurance, where the nature of cover has been increasingly standardised. E-commerce sales, including online sales, telemarketing, or targeted advertising activities are on the rise. In all likelihood, digital technology will eventually enable customers to arrange almost their entire insurance needs through remote digital channels.

Claims handling processes can be simplified and streamlined by technology. Automated loss notification, real-time processing of claims, predictive damage estimates, self-service capabilities and electronic payments are increasingly used to make claims management more efficient. Insurance technology start-up companies are using advanced analytics, such as machine learning, to create early warning systems and gather practical insights that also prevent accidents. Post-event estimation techniques using drones, sensors and satellite images for quick and easy claims handling (e.g. after natural catastrophes) are increasingly common. Technology applications can also be effective in identifying and mitigating insurance fraud.

**Digitalization can be a lever for insurers to develop more affordable, efficient and customer-centric products.**

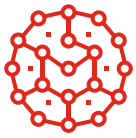
The biggest source of value creation through digitalization of insurance lies in the ability to develop new and more customer-centric products and solutions and at the same time reduce costs. By lowering the cost of information gathering and processing, digital technology and automation will enable insurers to administer, underwrite and price risk as well as settle claims more efficiently. In a competitive market, this will ultimately lead to lower premiums, boosting affordability and coverage.

# The changing nature of risks to society

**The large benefits that new technologies can bring should be embraced while preparing for potentially unforeseen implications.**

*The digital era will bring a radical shift in the nature of risks to society. The growing interconnectedness in society will in many ways mitigate risks within existing systems. However, accelerated digitalization and the growth of open and connected digital environments create new vulnerabilities and potential consequences that are less predictable than before.*

Fully or partially self-driving cars, for instance, are emerging, leveraging smart sensors, connectivity and machine-to-machine communications, helping to reduce risk, and premiums. Forward collision avoidance, blind-spot assist, and adaptive cruise control are already fitted in many new cars, making vehicles safer. Already, 20 per cent of vehicles globally are expected to come with safety systems by 2020, reducing the number of accidents and thus the value of personal auto insurance policies. Entirely self-driving cars could become ubiquitous in the next two decades, at which point liability is likely to shift from individual drivers to manufacturers. Better risk prevention means lower insurance premiums: McKinsey estimates that the total volume of vehicle insurance premiums in the United States could decline by as much 25 per cent by 2035 due to the proliferation of safety systems and semi- and fully-autonomous vehicles.[4]



**New technologies allow the role of insurance to evolve from pure risk protection towards predicting and preventing risks.**

A similar shift towards risk reduction and prevention is also apparent in other sectors. In the home, sensors can send an alert to the owner if a risk of flood is detected, automatically shutting off the water system if there is no response, and in commercial properties interconnected manufacturing equipment could give owners early warning of maintenance needs. Smart devices that monitor health are also becoming increasingly popular. Glucose meters in contact lenses, for instance, can keep a record of the healthiness of the eating habits of patients. Data from connected devices can be a powerful tool to lower risk—to prevent accidents at home, reduce maintenance and downtime, or even improve health. The data allow insurers a dynamic risk assessment of policyholders and provide them with a continuous feedback, with limited or even no human interaction. By providing such risk insights to policyholders, 'digital monitoring' encourages behavioural change to reduce risks. As a consequence, these developments allow the role of insurance to evolve from pure risk protection towards predicting and preventing risks.[5]

Digital technology underpins almost every aspect of modern work, travel, leisure and health. A flipside of this digital connectivity and the increasing use of autonomous machines, such as driverless cars, medical assistance robots, or unmanned aircraft systems, is that structural shifts in the shapes of loss distribution may take place. Autonomous machines increasingly feature in daily business and customers' everyday lives. Almost all economic sectors

4 McKinsey (2017) Digital disruption in insurance: Cutting through the noise.
5 Geneva Association (2018) Big data and insurance: Implications for innovation, competition and privacy, February.

are affected, including manufacturing, transportation, the food industry, agriculture, health, education, finance and insurance. In minimising the human factor, which is usually the main cause of accidents, a shift from loss frequency to loss severity might take place, and losses may accumulate in new ways.[6] For example, the same programming error could be replicated on numerous machines, or one machine could repeat the erroneous activity several times, leading to an unforeseen accumulation of losses. A systemic malfunction of autonomous machines that control critical infrastructure systems (e.g. IT-networks, power supply) might even significantly affect the highly interconnected global economies and societies. With the potential of increased impact of losses/casualties, insurers could be required to set aside extra capital.

**In the digital era, some risks become less frequent, while others, like cyber, will gain in importance, and again others may cease to exist.**

Digital technology will increase the information and knowledge available in society. Some risks, like vehicle accidents, will become less frequent, while others, like cyber, will gain in importance, or newly emerge, whereas again others may cease to exist, insofar as individual future claims can be predicted perfectly. In the latter case, there would be demand for financing predictable claims, typically by taking out a loan, and concepts of loss-prevention would become much more effective. Insurers and society are far away from perfect prediction of individual future claims, but new developments in the area of digitalization could in future significantly reduce the claims volatility on the individual level, as a result of which policyholders' utility would not be increased via risk pooling to the extent it is today. Some genetic tests, for instance, have become so accurate that from taking a test the individual knows exactly—with 100 per cent accuracy—if and when he or she will develop certain diseases, e.g. a monogenic disease such as Huntington's disease. With other, more complex diseases, the certainty of prediction of genetic tests is less powerful, but likely to improve.[7] Google recently presented an algorithm that can detect retinopathy, the number one cause of blindness in some parts of the world, with over 90 per cent accuracy.[8]

Digital technology triggers new types of risk coverage that were previously not feasible due to information constraints. It can create new markets for risks that are currently underinsured (e.g. cyber) or uninsurable, and might thereby close some of the existing protection gaps. Also, the rise of autonomous machines is expected to spark new liability insurance products that match the demand from manufacturers, programmers and users.

6 CRO Forum (2017) Autonomous machines, November.
7 The Geneva Association (2017) Genetics and life insurance: A view into the microscope of regulation.
8 Burt, A. and Volchenbaum, S. (2018) How health care changes when algorithms start making diagnoses, Harvard Business Review, May.

# The insurers' moving customer relationship

**The sharing of information with the insurer can be beneficial for both the insurer and the insured.**

*The use of real-time monitoring and visualisation are fundamentally changing the insurers' relationship with customers. Policyholders who agree to let an insurer track their habits, for example by using wearable technology, can learn more about themselves, and can use the information to adapt behaviour and reduce risks.*

By 2021, 10 per cent of people who use wearable technology will have changed their lifestyle to some extent, in turn lengthening their lifespan by an average of six months,[9] which in its own right generates issues and opportunities for the insurance industry. Corporate wellness programmes are emerging. Employers can engage with health insurance companies and wearable vendors like Fitbit to provide special programmes to employees. Those who choose to participate can earn rewards and discounts and help to reduce healthcare insurance costs for the employer. In vehicle insurance, telematics are being used to monitor consumer driving habits in real time. By harnessing the resulting insights, insurers can offer personalised policies and determine claims liability more easily and accurately.

### Medical-grade wearables and insurance

Wearables are already being incorporated into the value chain of many insurers to encourage general fitness. The next generation of wearables will feature medical-grade technology that will open the door to personalised health advice, goals and targeted interventions.[10] Biovotion, for instance, a Swiss-based startup company, offers measurement devices that can make users aware of their sleep patterns, of the effects of food and drink, of stress levels and exercise. They can provide a personalised report on how individuals can change their behaviour to influence their overall health outlook, and take users beyond generic goals to a nuanced picture of their daily behaviour and its effects on their fitness and well-being. Moreover, some platforms available today can provide tangible support to users for conditions that require constant management, such as mental health, obesity and diabetes. Building on such developments, a number of insurance companies are seeking to create more accurate models and build correlations between the health readings and the impact on mortality or morbidity. Insurers will increasingly seek to build more detailed feedback loops for issues of health and wellbeing which go beyond general fitness. They will aim to use apps and wearables in intelligent ways for better risk selection and offer game-changing health insights and improvements.

Digital technology will increase access to insurance. This is particularly relevant for low-income markets, where technology such as a robust mobile payment infrastructure can significantly facilitate the provision of many types of insurance by lowering transaction costs.

9 ITPRO (2018): How wearable tech is helping save lives, April 30th.
10 Swiss Re (2017) The integration of wearables and insurance, July 12th.

**Insurers are becoming the insured's personal risk manager.**

The role of insurers is widening, from primarily loss indemnification to a broader advisory service for insureds on how to prevent, mitigate and manage risks. For example, in Brazil, Porto Seguro helps car insurance customers finance cars, maintain them and enjoy them. Axa's smart-home applications in Switzerland connect homeowners remotely to sensors and cameras that can spot intruders, control lighting, detect smoke and monitor water leaks. Union Life, a Chinese life insurer, guarantees policyholders a place in an old people's home and advises them on activities in retirement. Providing risk management and prevention services is likely to better connect the policyholder to the insurer, enhancing this relationship. In a recent survey, 61% of UK insurance customers said they would consider moving to a new insurer if the current insurer does not offer the services they want.[11]

## Anti-selection in life and health insurance

On the flipside of the insurer-customer relationship, life insurers are susceptible to rising risks of anti-selection as customers gain better understanding of their own health status.[12] These innovations are forcing a shift towards prevention, early diagnosis and more efficient treatment outcomes, which could also have significant influence on health risks. With the spread of genetic testing, for example, individuals who discover they are at higher risk of disability or death may disproportionately seek to purchase insurance, complicating actuarial risk assessments.

If individuals are able to conceal from the carrier the fact that they are a high risk, the insurer cannot fully distinguish the low-risk from the high-risk individuals. High-risk or riskier parties to the insurance contract tend to sign on to the contract more frequently than low-risk individuals.[13] In this case, the market outcome entails cross-subsidisation of high risks by the low. Anti-selection thus leads to inefficient market outcomes, and impedes the application of the principle of equality between policyholders that everyone should pay a premium proportionate to the risk that they bring to the insurance fund, and that equal risks should be treated equally.

## Data protection and privacy

A core principle of insurance is that the insurer may ask any relevant question and insureds are obliged to disclose all they know about their risk. The insurer thus obtains a large amount of risk-specific private information. In the context of a digitalized society, granular data available to insurers is expanding exponentially from a broad range of sources—not only from traditional data providers, but also public entities and enterprises generating data 'exhaust' from business activities. Issues of data privacy loom much larger with granular, in many cases personalised, data.

11 Bain & Company (2017) Customer behavior and loyalty in insurance: Global edition 2017.
12 Swiss Re (2015) Life insurance in the digital age: fundamental transformation ahead, sigma Nº 6/2015.
13 Munich Re (2011) How life insurers combat anti-selection.

Insurers have always held responsibility for safeguarding data privacy. In a digitalized world, in order to preserve customers, trust but also to ensure compliance with data protection requirements, it is essential for insurers to ensure transparency in their use of (big) data, and to process personal data responsibly, in ways strictly compatible with the specific purpose(s) for which it was collected. Companies will need to reflect on the ethical use of data in their processes. They should carefully consider the legal and reputational dimensions of processing data from social media, including how individuals may feel if they knew social media content about them was being used, and weigh up the potential efficiency benefits of using the data.

**Digitalization is expected to reduce the scope for subsidising high-risk individuals.**

## The declining scope for cross-subsidisation in private insurance

Regulators and policymakers will need to come to terms with the efficiency benefits of increased individualisation in private insurance and the potential consequences for affordability of insurance for individuals considered to be high-risk. Private (or mutual) insurance is distinct from social insurance, where solidarity means deliberate cross-subsidisation within a mandatory scheme. In social insurance, high-risk individuals often contribute the same premium as low-risk individuals, perhaps according to salary, but not in accordance with the risk the individuals bring with them. In many jurisdictions, equity considerations are at the root of social health insurance programmes and public health systems.

Governments are directly involved in insurance activities in many fields, apart from regulating them.[14] They provide or mandate personal insurance coverage, for example for accidents, healthcare, pensions and unemployment; they mandate liability insurance to make sure that the injured are compensated; and in some countries, like in the United States, they are also heavily engaged in the private provision of property insurance. As a result, the dividing line between private and social insurance sometimes becomes blurred, and private insurance tends to be perceived by the public not as an actuarial mechanism to protect against risk (which it is), but rather as a commonly accessible financial instrument with little or no regard to risk (which it is not).

Some in the industry argue that the cross-subsidisation in private insurance causes frictional cost. It may not be desirable for society to maintain this friction. In some business lines, in particular in health insurance, there is a public policy goal to cross-subsidise, but it should be clearly differentiated from the business of private insurance. In any case, the emergence of the digital economy is likely to spur open discussions about who should be subsidised by whom and by how much.

## Affordability and the scope for price differentiation

The diffusion of digital technology will ultimately reduce existing cost inefficiencies as well as providing insurers with better information and a more accurate picture of the risks they underwrite. Policyholders and their insurers will be able to discern good from poor risks more clearly. Insurance thereby becomes more attractive for good risks, whose loss probability directly translates into more favourable personalised pricing. The notion of cross-subsidisation within a portfolio of 'similarly exposed' risks used for rate-making is thus losing acceptance; consumers are generally not inclined (unless

14 Swiss Re (2011): State involvement in insurance markets, sigma Nº 3/2011, pp. 9.

compelled) to knowingly subsidise others who are perceived to be a clear or significantly greater risk.

## At the same time, digital technology raises different issues of 'fairness'

**High-risk individuals might be denied insurance cover.**

The increased scope for personalised, fully individual risk-based insurance might mean that some high-risk individuals will be denied cover or face prohibitively high insurance costs. That is not new in the insurance industry, but it is likely to become more accentuated in an increasingly digitalized economy. Concerns may arise for risks which individuals cannot avoid, where the costs of reduction would be unacceptably high, where the premium represents a large fraction of disposable income, or where insurance cover is mandatory. Societal choices are at the core of this particular issue, and governments should drive the debate, although the insurance sector should continue to act responsibly to provide adequate cover.

### Balancing fairness, regulation and accuracy in insurance pricing: UK flood insurance

In the UK, cover against flood damage is available to residential customers and small businesses as part of the standard terms of property insurance. Flooding is recognised as the most common and costliest kind of natural disaster in the country. Over the past two decades, insurers have markedly improved their ability to assess flood risk because of the rapid development of detailed hydrological flood models. The result of this process has been an increasingly segmented home insurance market, with an informal cross-subsidy between low- and high-risk homes of GBP 180 million a year.[15]

The increasing affordability problems for those at high risk ultimately lead to a debate about fairness: should those at high risk pay a premium to match, even if unaffordable, or should they be supported by cross-subsidy from the rest of the population? Eventually, Flood Re was developed. Flood Re seeks to satisfy the dual objectives of market autonomy and insurance affordability. The main idea is a continuation of the provision for households under low to normal risk with standard insurance, while giving insurers the option to cede any properties to Flood Re at a discounted price. The subsidy for the latter is claimed from a levy taken from all insurers according to their overall home insurance market share, which is expected to be passed on to policyholders. By limiting the insurers' risk in such a way, the insurers can in turn limit the premiums they charge to policyholders in high flood-risk areas.[16]

15 Cullen, M. (2015) The ABI view: Sharing risk or smoothing bad luck, Insurance Times, 19 October.

16 Surminski, S. (2017) Fit for purpose and fit for the future? An evaluation of the UK's new flood reinsurance pool, Discussion Paper 17-04.

# Changing competitive landscape

**Industrial and technology firms are eyeing opportunities in insurance.**

*The competitive landscape is changing. New technology start-up firms—or InsurTechs—are entering the industry to deliver some of the services typically provided by incumbent insurers and intermediaries. Industrial companies, including vehicle manufacturers and other data collectors as well as established technology companies are also eyeing opportunities in insurance.*

The new entrants present opportunities for mutually beneficial partnerships, but they can also become direct competitors, putting pressure on profit margins and challenging the insurers' interface with customers. Insurance startups and other market entrants have not had a major disruptive impact on the insurance industry so far. Instead, they have played a rather complementary role, as incumbent (re)insurers themselves are making strategic investments in startup firms, allowing them to have a stake in these developments while at the same time providing the capital for such enterprises to develop their own business. The trends in funding indicate that many InsurTech companies are considered by investors to be commercially viable on a mass scale. InsurTech funding totalled USD 2.3 billion in 2017, a 36 per cent increase from USD 1.7 billion recorded in 2016.[17] According to a recent survey, 84 per cent of insurers expect to increase partnerships with tech-led start-ups in the next three to five years.[18]

As established technology companies such as Google or Amazon and other platform operators expand their footprint by exploiting increasing returns to scale, network effects and feedback loops through machine learning, an increasing number of industrial and financial sectors, supply chains and their incumbent firms are being reorganised. As digital platforms carry more economic transactions, the economic power of these networks, which connect consumers, firms and even industries to one another, expands. The outcome is that the traditional boundaries across industry sectors and jurisdictions become blurred, and competition is concentrated.

**Traditional boundaries across industry sectors and jurisdictions blur, and competition is concentrated.**

For example, the Alibaba (a retailer) spin-off of Ant Financial, officially founded in October 2014, builds on data from Alibaba's already vast user base to commoditise traditional financial services and reorganise the Chinese financial sector around the Ant Financial platform. It has over half a billion users and provides payment services in the name of Alipay, wealth management (Yu'e Bao), lending (MYbank) and insurance, hosting around 80 insurance companies and selling more than 2,000 products, growing premiums at 43 per cent year after year. Ant Financial recently raised funds valuing the company at USD 150 billion.[19]

Vehicle manufacturers have been installing wireless connections in vehicles and collecting data for decades. But now the sheer volume of software and sensors in new vehicles, combined with artificial intelligence, can sift through

17 Willis Towers Watson Securities (2018) Quarterly InsurTech Briefing Q4 2017, January.
18 PWC (2017) Redrawing the lines: FinTech's growing influence on financial services.
19 Financial Times (2018) Ant Financial valued above Goldman Sachs in $14 bn funding, June 8.

**Digitalization affects the wider insurance ecosystem. Non-insurers are gaining access to customer data.**

data at ever-quickening speeds, leading to the emergence of new services and revenue streams. The ultimate objective of vehicle manufacturers is to build a database of consumer preferences that could be aggregated and sold to outside vendors (data collector companies) for marketing purposes, much like Google and Facebook do today. If manufacturers offer the right incentives, customers might be willing to share the data. Discounted car insurance could be such an incentive. Vehicle manufacturers or data collector companies that receive data from car sensors could then either cooperate with incumbent insurers or be inclined to sell insurance themselves. Insurers therefore run the risk of being disintermediated from the risks they have always insured. Several vehicle manufacturers (for example, Tesla [20]) have already started offering insurance or made announcements regarding their plans to begin providing liability insurance (including Volvo and Mercedes) with their autonomous vehicles.[21]

## Control of massive amounts of data and market power

The increasing importance of data for value creation can spur concerns about the role of data in economic partnerships and in the emergence of a number of firms that achieve significant turnover based on business models that rely on big data technologies. The lack of access to certain data sets could act as a barrier to new institutions entering the market or even affect existing ones in the market. De-facto entry barriers would reduce innovation and competition among products and services. As a result, consumers could face higher prices, poorer quality of services, and reduced product choices.

This raises the question of whether legal rules against monopolistic behaviour, written more than a century ago, are still well-suited to address the network effects that allow a platform to control the customer interface. Some global technology companies have a very large market share in their specific market segment, which provides them with unique access to customers and their data. Such dominant positions could be used to extend monopoly to insurance markets, extract disproportionate value, discriminate against the insurance sector, and tip the competitive landscape.

It is an open question what in the longer term will happen to traditional suppliers of financial products once companies, whose main sources of income lies outside the financial arena, offer financial products with the prime motivation to generate data, and without the need to generate income from the financial business. Such a framework may temporarily lead to lower prices for consumers, but could induce an excessive supply of financial products, and potentially a massive misallocation of capital.

20 Muoio, D. (2017) Tesla wants to sell future cars with insurance and maintenance included in the price", Business Insider, February 23.

21 Ballaban, M. (2015) Mercedes, Google, Volvo to accept liability when their autonomous cars screw up, October 7.

# Conclusions

**Digitalization will mitigate risks and create new vulnerabilities.**

The digital era brings a radical shift in the nature and scope of risks to society. Although an increase in interconnectivity will certainly be able to mitigate many of the risks that exist with today's systems, the growth of open and connected digital environments will also create new vulnerabilities and potential consequences that are less predictable.

An increase in the amount of information and knowledge available to society will lead to a decrease in the frequency of some risks, such as vehicle accidents, and may even cause some risks to disappear altogether if they become totally predictable. On the other hand, other newly emerging risks, such as cyber, will increase.

Digital technology provides insurers with the opportunity to use real-time monitoring and visualisation that will fundamentally change the insurers' relationship with customers. As an example, if customers let insurers track their habits via wearable monitoring devices, insurers can use the data to influence behaviour and reduce risks. The flipside of insurers gaining more data about their customers is a rising risk of anti-selection, especially in life and health insurance.

Digital technology can raise issues of 'fairness': the increased scope for personalised, fully individual risk-based insurance might mean that some high-risk individuals will be denied cover or face prohibitively high insurance costs. Those who find insurance unaffordable as a result of the use of big data can be expected to suffer significant financial losses if the event they cannot afford to insure actually happens. That is not new in the insurance industry, but it is likely to become more accentuated in an increasingly digitalized economy. Societies need to reflect on these developments and on the risk that ethics may lag behind technological progress. Governments may want to step in and provide them with support, particularly if the risk could not have been reasonably avoided or mitigated.

**Risk pooling is likely to remain as the insurance industry's best response to new risks.**

Insurance is a key component of economic development. Risk pooling through insurance is a remarkably modern response to the challenges facing our society. In contrast to some hyper-personalisation models, insurers will need to build on systems that promote social cohesion. Insurers are challenged to create value for customers by focusing on activities that build their own trustworthiness. The provision of risk management services as a complement to risk protection is likely to be one key to achieving that goal.

Technology and new data sources are changing our economy and society fundamentally, and promise to transform the insurance industry as well. Digitalization is changing the role of insurance, from pure risk protection towards predicting and preventing risks. The risks insurers cover and the ways they underwrite, distribute, and manage claims are also changing. In an increasingly digitalized world some risks will become less frequent, while others, like cyber, will gain in importance, and again others may cease to exist.

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