Opportunities and Risks of Big Data for the Economy

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Abstract: With the development of the internet and information technology, big data has already entered people's normal life and made a non-negligible influence on different area in the society. This study aims to summarize the significant opportunities and potential risks big data brings to the individuals, firms and governments in economy life. By analysing detailed data and lots of examples, this research has found that making a good use of big data can bring people more convenient life, help firms run more efficiently as well as support government to construct cities wisely. However, if people don't realize the risks raised from the application of big data, an increasing number of problems like data leakage or commerce monopoly will occur in a high frequency. In the end this essay gives some suggestions for different groups to carry forward the advantages of big data and control the risks of big data.

Keywords: economic; big data; benefit; risk

Introduction

Nowadays, many disciplines are intertwined and develop together through the similar algorithms dealing with the information, like the study of the stars and the fight against cancer, which is started by astronaut Dr Nicholas Walton and James Brenton [1] simultaneously, we are also more concerned about our privacy and personal information than ever before. These are all results of one technology appeared in the late 20th century: big data. Big data has already become closely linked to our life as we are creating data all the time—shopping, chatting, web scanning and searching. And Patrick Morrissey views big data as the starting of a revolution which will make a big difference to lives each individual and entrepreneur on the earth rather than a fad. With the development of internet and better use of computer technology to collect data and process data information, we are entering the era of big data—a term that refers to the explosion of available information. Big data is a term for massive data sets having large, more varied and complex structure with difficulties of storing. Data with many entries offer greater statistical power, while data with higher complexity (more attributes or columns) may lead to a higher false discovery rate. Big data is important today and is the direction of future development because it will benefit individuals, firms, governments and society simultaneously if they can effectively collect, store, and analyse the big data. Harvard Business Review also mentions that the value of big data is the analytics instead of just the big data itself. To the contrary, if we don't standardize the access to the big data or set clear regulations to regulate them, it can cause the privacy problems, security risks and market monopoly. There has been much relative research shed light on big data in several specific areas. 2015, Emmanuel Letouze examines the potential of big data to address social and economic development challenges, and the author also argues that big data can provide valuable insights into poverty, health, education, and other issues [2]. This essay aims to argues the opportunities and risks brought by big data for economy from the perspectives of companies and government to remind them to have a better use of big data to maximize their value.

The Application of Big Data in Reality

Till now the big data has already been widely applied in many different areas and made a big difference to people's life. In this section, the essay will introduce IOT-enabled data, blockchain-enabled data, and intelligent systems data, three major types of big data used in society, which are the most widely used and are the closest to people's life. Firstly, internet of things (IOT) was first proposed by Kevin Ashton in 1999 when he talked about the supply chain management. IOT refers to the smart world in which every object relates to others through the Internet. It is an important application of big data which is based on big data. In IOT, all the entities including smart furniture have digital identities and been well organized, classified, managed also long-distance controlled, which reduce the space constrains. IOT can create vast amounts of IOT-enabled data and used in IOT based systems, providing a wealthy information which can be analysed to get the hidden value

in them. For example, in agriculture, IOT based systems help farmers to monitor the light, temperature, humidity, soil moisture, and can also automatically irrigate. Besides, the IOT-based applications are applied for data acquisition and sharing, which enable farmers to real-time monitor the crop growth as it can provide information at any time. It also contributes to the energy management area, IOT devices can be used to optimize energy consumption in factories, homes, and public buildings. For example, the Italian energy company which called Enel, implements the IOT-based smart grid system that monitor the usage of electricity and then make the optimal distribution plan to improve the allocation of resources. The second application is blockchain-enabled data and Satoshi Nakamoto first explains blockchain in his white paper 'Bitcoin: a peer-to-peer electronic cash system' in 2008. It is a digital ledger which hold the same copy of the data in each peer among the huge number of peers. If someone wants to add new data into the chain, all the validators should agree with this action, so in this case the blockchain-enabled data stored in it will remain secure. Case study in the financial domain indicates that blockchain based platforms and applications in banking sectors have better results both secure issue and processing speed. One of the applications of blockchain is the pharmaceutical cold chain. The freshness of fruits and flowers is very important, so they need cold chain to manage the environment change. The information and communication technology systems can control the fluctuations of environment conditions, but they are vulnerable against manipulation and hacking. In this case, the decentralized and autonomous blockchain is essential to protect the security and organize information more efficiently at the same time. The last example is the intelligent systems data. The intelligent systems data refers to the data that is used to train and operate intelligent systems which can collect, process, and explore data and share them with others. One famous example for this is the AlphaGo, an artificial intelligence computer program, who beat the best Go player in the world in a tournament (2018). AlphaGo program used artificial neural networks which simulate the mammalian neural architecture to study thousands of millions of competitions from human experts and played against itself to improve its skill for countless times, these processes formed mass of intelligent data stored in the intelligent system. So, the victory of AlphaGo is mainly because its powerful database, which may also the shortage of human compared with the intelligent robots. In conclusion, the big data has closely linked with us, and we are entering the big data era step by step. The following part will have a deeper insight into the advantages and disadvantages of big data in economy life.

Opportunities of Big Eata for Economy

As big data stores and gathers mass of information from various sources, individuals and firms can make a good use of the big data in many areas, so big data is important in the economy life these days. For firms and individuals, one of the main opportunities big data brings is the more accurate consumption behaviour prediction and advertising. By collecting all kinds of consumers' information and analysing the vast amount of data, such as consumption record and browsing history, firms can have a better understanding of social fashion, mainstream as well as the different consumer preference. By this, firms have the more sufficient information to form client's portrait, then they can formulate their products face to the public and the more efficient advertise to the individuals personally. Sophisticated algorithms not only allow marketers to serve up the suitable product or services, but also cut down the time consumers spending on searching and difficult trade-offs [3]. Market, researchers, and policy makers generally assume that lowering search transaction and decision-making costs empowers consumers and increase the consumer welfare, which will also stimulate the economy growth. This is widely used in online shopping platforms such as Amazon, and some share economy platforms also applicate this in their operation, like Uber and Airbnb. They collect the information of social recourses usage conditions and then allocate the surplus resources, which let them quickly match the social demand and make the resources more efficiently participate in economic activities, improving the utilization rate of the whole social resources. Another opportunity for business and individuals is about customer matching in financial credit audit. Big data can characterize fine portraits of each consumer through the correlation of multidimensional information, which can be used to cross-validation of a certain type of consumer's information. This allows the financial institutions reveal the nature of data and then thoroughly describe the different features of consumers' preferences, behaviour patterns, habits and creditworthiness, and finally they can provide their clients precise and fair service. For example, within the scope of supervision, the bank can provide different clients different credit rating and financial product, like the students' loans for college students and mortgages to homebuyers, which improves the whole efficiency of socioeconomic activities. Besides, credit applicants no longer need to handle the complex application process as well as prolix filling, and they can also finish this online which simplify the whole applica-

tion process.

As for governments, the application of big data has a significant contribution to the construction of smart city which can stimulate the economics growth and improve the quality of life for citizens. In the transportation efficiency aspect, the big data will play a key role in easing congestion in future smart cities as the cities are becoming overcrowding. Through the big data, people can monitor the transport flows to identify areas and times of high congestion so that they can develop effective solutions. For example, the algorithm optimization scheme of traffic lights, through the collection of road traffic data in different conditions to change the signal light settings. In this case, citizens will spend less time on the way to work and will increase the productivity, and the whole social operation efficiency and overall economic activities will be improved a lot. In a preliminary test on some roads in China, the city brain has improved vehicle speeds by up to 11 percent by intelligently adjusting traffic lights (wired on transport 2018). The big data application can also improve the allocation efficiency of resources. Like the electricity, big data allows for careful analysis of energy use, from individual streetlights to individual power grids, so the utilities can predict how much electricity will be needed at a given time, allowing more efficient allocation of resources. Besides, the application of big data can also help improve the urban security. Government has started to deploy big data technologies to process mass of data sets to prevent bad actors like waste, fraud, and abuse, and till now big data has improved the solving rate and efficiency of criminal cases by face analysis, suspect contact analysis and behaviour trajectory analysis. It can even allow research on crime in priority areas and form prevention models to forecast the future crimes patterns. For example, the Social Security Administration of the Unite States analyses massive amount of unstructured big data in the form of disability claims using the big data technology. As a result, it can better replicate the decision-making procedure and more accurately pinpoint potentially fraudulent claims. In conclusion, big data can improve individuals' and firms' working efficiency and help government build better smart cities.

Risks in the Era of Big Data

The previous section shows that the big data brings deep positive influence on human society, however, the big data also adds to peoples' worries because of its the privacy, security, and monopoly. This section focuses on the new problems arising from the emergency of big data. One of the most significant problems is the excess snooping on personal privacy. Privacy refers to the guarantee of an appropriate level of protection regarding information attributed to an individual. Many people concern the website tracking, information sharing, and the mishandling information in daily life universally, and they are also afraid the firms may overuse their data during work. These worries are not out of thin air, the data can come from many sources, like the social media platforms, E-commerce website, internet of things or government agencies. So, it is hard to figure out who use their data that they may not want to share or have made public. More seriously, if the data falls into the wrong hand, it is likely to cause identity theft, fraud or other improper conduct. One significant example is the simple anonymized data sets which can be easily attacked. In one research organized by De Montjoye et al in 2021, they collected the mobility data set from around 1.5 million people, and obtained the data base which can identify a person accurately. [4] More shockingly, they just used the simple anonymization operation, which indicates that the data is at great risk of theft as it is quite easy for people to implement this operation. Another example is the Yahoo data breach, it is reported that from 2018 the company allowed the hackers to access Yahoo users' personal information, which seriously violated the users' privacy. This indicates that some businesses will be unscrupulous, getting illicit money made at the expense of user privacy in order to get more profits. Additionally, when the privacy of large number of citizens is comprised, social and even national security problems can also arise. If many people find that their privacy has been seriously violated, or the privacy leakage has brough great negative impact on them such as fraud, it will cause the social unrest. This will also lead to protests or other forms of civil disobedience, like all the victimized citizens gather to protest their government. This tough situation can also lead to a loss of trust in government agencies responsible for the national security, making it more difficult for them to take actions and get the people to cooperate. In 2018, some people infiltrated Aadhaar, which comprised more than 1.1 billion citizens' information, including names, photos, phone numbers, address and even the fingerprints and iris scans. This not only influenced the interest of citizens, but also plunged the country into a crisis of distrust and security, seriously damaged the country's image. In terms of the overall economic market, improper use of big data can fuel commercial monopolies. The continuously application of big data will form data sets as the organizations always store the data in a central repository, the

more data they collected and analysed, the newer insight they will gain, and then form a larger and more complex data sets. A few big companies and organizations have controlled most of the data, and they use this advantage to improve them become more competitive. So, it is easy to make the small, medium-sized enterprises lose their competitiveness compared with the large one and break down at last, forming the monopoly risks. Some companies may want to maintain the monopoly position of the industry based on data monopoly, they can take actions like hindering competitors' access to data resources, preventing competitors from entering the market through the centralized means of operators to get their purpose. However, this undermines the industry ecology and market competition, and can reduces the competitive pressure and cut down the incentive to innovation of products and services. For instance, since 2015, Alibaba Group has been implementing the 'two get one free' approach, requiring many brand merchants settled in Tmall Mall not to operate on platforms other than Tmall Mall. This action constitutes an abuse of market dominance to obtain an unfair competitive advantage.

As Abdollahzadeh mentioned in 2016, an information revolution is taking place and changing the world politics, countries that are leading in information technology will have more power while countries which are lagging IT will in lower status. It is important to clear out who can have the access to the big data and how to regulate the big data in order to reduce the risk of harm caused by nig data mentioned before. People are aware of the problem and some countries and organizations have set some regulations about the data permission.

Table 2.3 Laws About Big Data in Different Countries

Country/organization	The regulations/actions
Germany	requires the localization of telecom metadata from multinational tech giants
France	requires medical and communications data to be restricted from leaving the country
Australia	has implemented the Personally Controlled Electronic Health Records Act to prohibit the export of personally identifiable health data
European Union	has adopted the General Data Production Regulation, which sets high standards on the protection of personal data and could curb the misuse of Europeans' personal data by American internet giants.

Source: China News Serves

However, there is still no universal rule around the world as it is hard to get all countries who have different laws and different cultures to reach an agreement, and it is only on the initial stage to settle this problem. As for individuals, we need to have the awareness to protect personal data, learn to use the law to ensure our rights and interests. We can also read some relevant books to equip ourselves, like <How to Protect Yourself in a World Full of Scammers, Phishers, and Identity Thieves> written by Adam Levin (2016), which provides insight into the bad behaviours including fraud or identity theft and provides suggestions on how citizens can protect themselves facing these risks. The firms should abide by the law as well as stick to the moral bottom line, protecting the customer's data, do not use the data for improper trading or other bad business practices for profit. In addition to the legal definition, the government should take the lead in conducting government affairs in an open and transparent way, focusing on protecting citizens' data privacy, or in the future, setting up a dedicated agency to manage data. Besides, the government can strengthen data privacy and proper data use education so that future generation have a stronger awareness of data. Education on big data protection equips individuals with knowledge about security measures like encryption and intrusion detection systems, it can also raise awareness about the ethical considerations, warning people not to misuse data. The era of big data will be brighter with the efforts of many parties.

Conclusion

The project undertakes to figure out the opportunities and risks of big data for the economy nowadays. The study has shown that the big data has already made a big influence on people's life with the wide application of techniques used big data. Based on the definition and applications, this research further summarise some significant opportunities big data brings to the different groups, highlighting the benefits and values of big data. After discussing the opportunities big data creates, the essay then identified that the big data also brings about some negative impacts on economy, the risks part follows some existing laws aiming to deal these problems, and future suggestions for governments, firms and individuals. However, as the technology develops rapidly and the world is experiencing renovation every day, the big data technology is also improving at a high speed, there can be more unknown and new opportunities or other different risks soon. Besides, as the

protection of the big data is just on the initial stage, it is difficult for people to totally avoid them, and the suggestion may not so effective in the short run, it takes time for people to optimize the solutions towards these problems. Though this essay has some limitations, it still important significance for different groups nowadays. This essay introduces the main application of big data in the society recently, which can show people that the big data is beneficial to the economy, it gives people a glimpse of big data and rise peoples' interest in big data. Then the essay analysis the advantages of big data clearly, supported by scientific theory and some examples in the reality, which can incentive people to develop big data in the future. The essay also enumerates the risks to arise people's attention when they use the big data technology, noticing them don't only focus on the benefits the big data brings. The following advice give different groups some solutions to make the best of avoiding the risks in this social context and lay the foundation for a better solution in the future. All in all, this study reminds people that like other factors of production, big data not only plays a role in boosting economic growth, but also has certain risks. Everything has two sides, so people should pay attention to the play and application of technology like big data when they enjoy the benefits they bring, to ensure the development of big data plays a positive role in social and economic life.

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