

Digitisation and E-commerce Impact on the Microeconomic Theory

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Abstract

The article is focused on the processes of digitisation and development of e-commerce seen from the perspective of microeconomics. The author's aim is to analyse selected changes in microeconomic theory caused by digitisation, in particular by e-commerce. In order to do so, the author looks at microeconomics textbooks and analyse changes in the behaviour and characteristics of the main market participants. In addition market structures are discussed. It is observed that not only theory but also statistical standards applied to measuring of economic activity should catch up with swift digital transformations of economy and market driven by rapid technological progress.

Key words: digitisation, e-commerce, microeconomics

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Introduction

Digitisation of the economy¹ is the introduction of data and the internet into production processes, products and consumption by households and governments, and the creation of capital and cross-border flows and finance (IMF 2018). Digitisation has transformed many activities. Thanks to the Internet, people around the world can work, teach, learn, meet, seek medical care and shop without leaving their homes. Public authorities, institutions, businesses, medical clinics, universities and schools have been able to provide their services even under conditions of closure. Digitisation is becoming a new reality leading to further progress.

One of the most important aspects of the digital economy is cross-border e-commerce (digital international trade; also referred to as e-commerce or digital trade). Cross-border e-commerce is the online sale of goods² to customers abroad. It includes sales ordered or delivered digitally, as well as transactions carried out on trading platforms (Śledziwska, Włoch 2020, 90). E-commerce does not only concern digital goods or digital sectors, but is spreading throughout the economy. It is changing the economic world, stimulating the creation of new goods, technologies, professions, production factors and forms of business organisation. The advent of digital trade marks a new era in the history of international trade.

Digitisation, especially the use of the Internet, is accelerating the process of globalisation. It is multiplying value and accelerating the speed of international transactions. It enables producers and suppliers around the world to sell their products and services easily by removing the barriers of time and distance. The Internet has become the largest and most differentiated global marketplace, open for transactions around the clock.

Digitisation affects not only economic processes, but also their theoretical underpinnings. In my view, digitisation challenges the very core of open economy microeconomics. However, theorists hardly notice this. The aim of this paper is to analyse selected changes in microeconomic theory caused by digitisation, in particular by e-commerce.

I start with a brief overview of the treatment of digitisation and e-commerce in the selected, mostly new and popular, microeconomics textbooks (Part 1). Then, in

¹ This analysis is performed in the framework of the project *International economic law in the era of digital transition: trends, regulatory models, and specific solutions concerning e-commerce and data* no 2019/35/B/HS5/02107 financed by the National Science Centre, Poland.

² I define goods as everything what satisfies human's needs. I divide goods into products (material, tangible) and services (immaterial, intangible). The subject of this analysis are goods produced or obtained from the nature for production or consumption.

parts 2 and 3, I analyse changes in the behaviour and characteristics of the main market participants: consumers (buyers, users) and producers (sellers, suppliers). Market structures are also discussed, as they have characteristics that distinguish them from traditional (stationary) markets (Part 4). Conclusions follow (Part 5).

1. Digitisation and e-commerce in textbooks on microeconomics

The textbooks under review do not provide any substantial coverage of the evolving understanding of digitisation and its implications. For instance, Roth (2021) fails to acknowledge any aspect of digitisation. Furthermore, he fails to mention any of the key terms associated with digitisation, such as ‘digital’, ‘electronic’ or ‘Internet’, in the index (Roth, 2021, 267-274). Pugel (2020) similarly fails to address digitisation and e-commerce. Neither the content nor the index includes any terms related to these phenomena (Pugel 2020, xxi-xxviii and 731-766). Pugel merely mentions the Internet only as a source of statistical information (Pugel, 2020, 657-660). Petri (2021, IX) acknowledges that his textbook lacks sufficient coverage of the economics of the Internet. It is accurate to note that a book of 725 pages does not include a chapter on the digital aspects of microeconomics. Furthermore, the chapter on capital (ch. 7, p. 529-600) does not discuss digital capital.

Varian’s textbook (2020, chapter 36, pp. 689-715) represents a notable exception. The author published the entire chapter on information technology. He has written about the interconnections between hardware and software. He has also described Google’s advertising programs, the switching cost of IT components and their complementarity, network externalities in computer software and sharing intellectual property. Nevertheless, he did not address, for instance, the changes in markets as well as consumer and producer behaviour resulting from digitisation and e-commerce.

In their Glossary (2020, G-1-G-7), Browning and Zupan do not mention the terms “digital” or “electronic.” Similarly, in their Index, one can find references to eBay, digital readers, e-commerce, Internet advertising, and the Internet, as well as cartelization (Browning, Zupan, 2020, I-3 and I-6). Further information on this subject can be found in the accompanying “Applications” sections of some chapters in the book (see Browning, Zupan, 2020, Applications: 4.6; 6.1; 13.4; 14.9; 20.1; 100, 145-146, 349, 386, 511). While illustrative examples are provided, a more compre-

hensive examination of the subject matter is still lacking. The reader may find information about the benefits of exchange on eBay, network effects in the context of communication technologies, and the potential impact of platformization on market structures, online dating, hardware and software. Additionally, an analysis of Stephen King's attempt to publish his book online is presented.

Piga (2022, pp. 15-16) has written a brief discussion on the feedback and reputation of eBay players, as well as on the impossibility of free content theft on YouTube.

Overall, microeconomics textbooks still fail to acknowledge the phenomenon of digitisation, despite its increasing influence on economic activities. Consequently, this contemporary phenomenon is overlooked when lecturers teach students about the actors of economic life and markets, where they are active with the aforementioned textbooks.

2. Consumers in the digital world

Digitisation offers consumers a wealth of new opportunities. It provides them with enhanced access to information about products, services, their substitutes, complements, producers and purchasing options. It also facilitates the emergence of new purchasing modes, sources of information and even new goods. The most significant new form of consumption is e-services, which are provided using information and communication technologies (ICT), particularly the Internet. These services are offered by a diverse range of providers, including private and public sector organisations³.

E-commerce increases the availability of products and services, facilitates comparison of their prices and terms of purchase, and enables their purchase directly from home. Thanks to the Internet, buyers can access not only local and national markets but also the global market. The variety of goods is much greater than it was in the times of traditional (stationary) trade. Competition among producers and suppliers from all over the world allows for individualisation of goods through deep product differentiation⁴. The consequence of this is a better adjustment of goods to consumers' preferences. The ease of access to electronic information makes markets more transparent, which in turn helps to reward the optimal types of products and the cheapest suppliers (the highest quality/price ratio).

³ Digital activities of institutions and organizations other than companies as well as activity of e-government go beyond the scope of this paper.

⁴ This is a reverse trend than observed in traditional international trade with its progressive standardization of products.

The existence of digital goods creates new needs (e.g., the expansion of smartphones' functionalities). Some of these developments are the result of new marketing methods, such as behavioural algorithms based on past transactions, data-mining or data profiling, which encourage consumers to purchase. Priddat (2022, 229n) discusses this phenomenon in the context of the economy of persuasion.

Digitisation has the potential to empower consumers who were previously excluded from market participation, including mothers of young children, individuals with disabilities, and those residing in remote areas. In the context of e-commerce, the geographic location of buyers becomes less significant. To some extent, it facilitates consumption opportunities in urban centers and in rural areas.

Not all consumers can benefit from digitisation and e-commerce. The intensity of participation is influenced by a number of factors, including income, level of education, and availability of electronic infrastructure. Individuals with higher levels of education tend to have greater ease in navigating computers. They utilise the Internet more effectively to optimise their decisions regarding consumption, investment, employment or entertainment. Young, affluent and educated individuals with near-unrestricted access to the Internet appear to be the most significant beneficiaries of digitisation and the most active participants in e-commerce.

Nevertheless, national borders still exert an influence on e-commerce, albeit in a manner distinct from that observed in traditional trade. They divide buyers into two distinct categories: those who possess the requisite electronic infrastructure and those who do not⁵. Furthermore, the use of regulatory systems with differing national constraints on the content permitted based on legal restrictions is also a factor⁶.

⁵ People in developing countries and economically disadvantaged regions are still excluded from e-commerce (the so-called digital divide). They have also been excluded from traditional trade because of their low income. But their participation in e-commerce seems even more problematic. Relatively high incomes are needed to provide individuals not only with a computer, but also with its operating system and applications. It costs money to set up and maintain a network and to access the Internet. Even the cost of charging the battery can be high where there is no electricity grid. All the components that make up digital devices can be treated as compliments. In the case of e-commerce, the barriers to entry appear to be higher. They include not only poverty, but also lack of access to digital equipment, infrastructure and skills. Another barrier is the language of the information available on the Internet. More than 50% of web pages are published in English, and no other language comes close to the next 10%. For comparison, only 20% of the world's population speaks English (mostly as a second language) – Kende (2021, 154). Today, almost 50% of the world's population is still passive online (Kende 2021, 155).

⁶ Governments can impose restrictions on the free flow of information and ideas to censor access to various information sources.

Many digital and digitally purchased goods are not exchanged for money, but for personal data⁷ and the attention (time) of consumers. They don't have a monetary price, even if they are valuable to the user.

Every user leaves behind specific information about his or her habits, preferences and spending on the Internet. This is the so-called digital footprint. This information is valuable and free for network managers, producers and suppliers as it allows them to increase sales efficiency⁸. The information derived from the digital footprint can be seen as a hidden price paid by consumers for their activity on the Internet⁹.

The use of the information contained in the digital footprint is not controlled by a single user who has any influence on who, how, when and for what purpose uses it. In such a case, it is difficult to apply consumer protection rules. Under asymmetric information, one side of a transaction (in this case: producer, trading platform, etc.) has better knowledge about the transaction than the other side (consumer, user)¹⁰. It can expose consumers to the opaque actions of unknown entities operating on the Internet. The misuse or abuse of data is one of the main threats to consumers engaged in e-commerce. It can lead to financial loss, identity theft, disclosure of personal information or damage to reputation. It can lead to a loss of confidence in the Internet. At the same time, it is impossible to block or restrict information when someone is benefiting from Internet services¹¹. In general, the digital databases created by the digital footprints of Internet users lead to new challenges for the protection of civil rights and freedoms. Harari (2018) exaggeratedly writes in this context about a possible digital dictatorship¹².

Leaked and shared documents and data become public, e.g., along with the detection of cases of secret surveillance of citizens not only by private firms but also by the authorities. Governments may not only safeguard online activities and security of

⁷ Personal data is any information related to an identified or identifiable individual. Its owner is the concerned person or its transaction partner like the recipient of someone's service (Kende 2021, 85).

⁸ Selecting messages aimed at the specific target groups is of special importance in the face of a flood of information. With AI detailed personal profile of everyone active in the Internet can be created and misused.

⁹ It can be expressed in aphorism "privacy is dead".

¹⁰ A client of an online bank can't know whether this bank has really invested into protection or it has only declared to do so. Moreover, if users are not able to test the level of security, the bank can ensure only insufficient security.

¹¹ E.g., a client of Uber can hardly keep her location secret.

¹² The importance of access to data was especially visible in 2020 during the coronavirus pandemic. The U.S. companies (e.g., Apple, Google) refused request of European governments to get them data of Europeans, which were expected to facilitate combating the disease (Ramge, Mayer-Schönberger 2020, 13).

citizens, but also can misuse the online data¹³ (Kende 2021, 86).

3. Producers and sellers in the digital world

After discussing the changes in consumers' characteristics and behaviour, I will analyse the specificity of the production of digital and digitally traded goods and their producers and sellers¹⁴.

Digitisation represents a revolution in technology and in the organisation of companies. Enterprises can better coordinate even complex production processes or processes carried out over long distances. Production is no longer divided into single stages or tasks but, thanks to digital systems, becomes unified, which facilitates automatic response to shocks. The use of digital substitutes for production processes (digital twins) allows for rapid adaptation to changes in the production environment and order execution. Digital twins facilitate modifications to the product life cycle and the shortening of production stages, such as design or implementation. Physical products are enhanced by the incorporation of digital components or bundles that combine digital products and services with physical ones. Computer-based checking has become a common method of controlling the availability and location of goods, as well as of identifying the most effective forms of organisation, which has resulted in a reduction in costs. New forms of sale are created, including multi-channel business.

Transformations in production have the effect of enhancing productivity. The advent of digital trade has enabled enterprises to capitalise on international price discrepancies pertaining to production factors. E-commerce has prompted participation in global value chains (GVCs) or even stimulated their formation. This phenomenon is also evident in regional value chains, which exhibit shorter geographic and distance parameters than GVCs¹⁵. The establishment of regional value chains is accompanied by

¹³ According to the "privacy paradox" the Internet users often worry about privacy, but they don't stop participating in e-commerce. The situation is all the more complicated because it is difficult to follow user's agreements. E.g., an agreement for the Amazon Kindle Voyage e-reader consists of 8 documents with over 73000 words; an actor reading these documents spent 9 hours doing this (Page 2017)).

¹⁴ I write about producers and sellers to stress their distinct role in the market. If they behave similarly I just write about producers having in mind both categories.

¹⁵ Digitisation and coronavirus pandemic have encouraged creation of regional or continental value chains and substitution of GVCs with them. Intercontinental value chains are treated as relatively unsafe not only due to the poor reputation of contractors but also because of epidemic risks. Also wars and tensions in many parts of the world incline investors to constrain internationalization of production. Short distance reduces transportation cost, especially the last mile cost (cost of delivery to the final user).

the reindustrialisation of developed countries, which, in conjunction with production automation, are assuming responsibility for even labour-intensive stages of production.

The Internet facilitates the entry of producers into new markets and the formation of new business relationships with customers and suppliers. Suppliers can attract a large number of purchasers simultaneously, following their previous transactions and adjusting offers to individual needs. This supports the production of differentiated or even tailor-made goods. The availability of more information about buyers reduces uncertainty and the cost of market entry.

The production of digital goods reveals increasing returns to scale (IRS). It is typically costly to commence production, as it necessitates a significant initial investment in infrastructure or processing capacity. For instance, networks must be constructed and connected on a national and international scale, and specialists must be employed. Software must be developed. These costs are not dependent on the number of users or quantity produced¹⁶. Conversely, the marginal cost of manufacturing an additional unit is minimal, approaching zero. It is relatively straightforward to produce an additional copy of a text or a movie. In essence, providers of digital services do not require significant investments to increase production capacity (at least in the short term). Conversely, when demand is declining, there are no empty buildings or deteriorating machines. Consequently, the scope and scale of production can be broadened without enlarging the office space or employment. Furthermore, as the average cost declines, the production series can be extended.

Digitisation has transformed the nature of innovation. It is no longer solely the introduction of a new product. Online transactions have led to the emergence of process and business model innovations (Sorescu, Schreier 2021, 627). Artificial intelligence (AI) has enabled the substitution of human capital with machines, which is a technological innovation used in product search, online service provision, categorisation, fraud detection, forecasting demand, and other applications (Mucha, Seppälä 2020, 4f).

A distinctive form of innovation is the creation, processing and evaluation of data¹⁷. Data are composed of information units, or bits, which are digital components. These are unlimited in their content, connections, processing and dissemination (Varian 2009). Thanks to the inflow of new information, the advancement of its processing and the creation of new combinations of bits, data can be developed and modified infinitely and used for new purposes. Consequently, the process of innova-

¹⁶ Wilhelm (2022, 62n) writes in this context about fix costs economy.

¹⁷ Data themselves are not creative as they just document the past, but they build a base for humans' creativity.

tion is not limited to the implementation of a new product. One of the key advantages of digital innovation is that the operational costs associated with processing, storage, copying and transmission of data are low, while the efficiency is high. This supports progress and accelerates the creation of further innovations.

Digital components are not physically stored and do not deteriorate. Some digital components are available for free on the Internet, while others can be financed through market participants other than producers, such as through crowdsourcing.

Databases constitute a novel type of production factor. They represent digital capital, comprising information about property, incomes, expenditures, habits and other characteristics of consumers (users). This information enables the identification of their preferences and needs. Additionally, databases contain data about the characteristics of cooperants and the specifics of production processes.

Databases or their components can be purchased, used, processed, transformed and analysed. Digital capital exerts an influence not only on the operational efficiency of the company but also on the development of new products and production processes, the company's organisation, trade connections, and the range and scope of the network of cooperating entities.

Digital capital differs from other types of capital¹⁸ in that it does not create bottlenecks in production, such as those caused by transportation failure. Individual databases are not fungible; they do not have close substitutes. Their stock is uncompetitive as one database can be employed by many users simultaneously without any loss of its quality. Digital capital is an experience good, as its value can only be determined in the course of use (for further details, please refer to Śledziwska and Włoch 2020, 69-79).

The increasing importance of digital capital as an asset is accompanied by a difficulty in evaluating and assessing the value of businesses based on their possession of it¹⁹. Consequently, asset measures undervalue digital companies, and at a macroeconomic level, GDP of countries with a large proportion of such companies in their national economies.

Digitisation also causes other measurement problems. This results in the productivity paradox: it is difficult to determine the value of free e-products, despite their obvious value (Śledziwska, Włoch, 2020, 86-88). Furthermore, their value increases with the advancement of digitisation, as more and more subjects become active in e-commerce and the number of e-transactions increases. Free e-goods are not inc-

¹⁸ Uber, broker in the transport of people, doesn't possess any cars and Alibaba – one of the most important trade platform – doesn't have stored products (Goodwin 2015).

¹⁹ E.g., financial audit of Facebook in 2011 showed value of its databases equal to zero (Mayer-Schönberger, Cukier 2013).

luded in GDP. Consequently, the greater the number of such goods produced by a country, the greater the underestimation of its GDP. This phenomenon is particularly prevalent in developed countries. In reality, the discrepancy between the GDP of developed and developing countries is greater than what is observed statistically.

Furthermore, the characteristics of companies' assets are undergoing a transformation, not only due to the incorporation of digital capital. The growing prevalence of remote work has rendered a significant portion of large office spaces obsolete. This has led to a locational decentralisation of companies and the restructuring or acquisition of their real estate.

The structure of employment is also undergoing a transformation. Various forms of AI are replacing workers, particularly those without the requisite qualifications. Digital trade is eliminating direct contact between the seller and the buyer. Consequently, some sellers' or consultants' abilities become obsolete or redundant. Concurrently, new specialisations of human capital with digital competences are in demand. Companies are seeking computer and digital capital specialists, programmers, analysts, as well as data scientists²⁰. Additionally, employees who can provide information in a form understandable for management, shareholders, or the general audience are required.

Previously, specialists employed in the provision of services were excluded from international competition due to the unity of place and time of their production and consumption. However, technological progress, especially digitisation, has enabled the separation of acts of purchase and sale. Consequently, competitors, especially from developing countries, are willing to accept lower wages, less restrictive health and safety rules or legal standards in order to gain employment.

In the context of digitisation, it is evident that segmentation of customers remains an important element of the strategy and tactics employed by producers with market power. However, the criteria used to divide buyers into groups have evolved significantly from those employed in traditional trade. In both types of trade, age and income continue to influence group membership. However, the reasons for the continued importance of these criteria are quite different. Traditionally, young and affluent individuals were the expected buyers of branded products, especially those considered fashionable. In the contemporary era, important are individuals who utilise the Internet to a greater extent than their counterparts, possess digital skills and equipment.

²⁰ Data scientists deal mainly with ordering and analysing of big (giga) data. These data differ from those collected by statistical offices or other specialized institutions. Big data are varied, complex and disordered. Ability to process them is the more important, the less transparent and trustworthy they are

The concept of market segmentation in e-commerce is evidenced by the case of personal pricing²¹ (Krämer et al., 2016, 28). Objective criteria for differentiating buyers are based on their electronic equipment, browser or type of smartphones, whereas subjective criteria are based on the buyer's history of transactions, web sites visits, location, sex, ethnic group or age (Hainz, 2022, 52)²².

Companies are increasingly reliant on open standards and permissionless innovations. Prior to the advent of digital technologies, innovations were protected by intellectual property rights, which resulted in imperfectly competitive markets. However, the advent of digitisation has led to a shift in this paradigm, with many companies sharing their achievements with one another or continuing the work of their predecessors. This represents a step towards market transparency, which in turn facilitates perfect (workable?) competition²³. Nevertheless, it is important to recognise that markets are coordinated by digital platforms that are imperfectly competitive. This is a topic that will be explored in greater depth in the subsequent section. Their dominant market position is largely attributable to the possession of extensive databases, which are rarely shared.

In the context of digitisation, the distinction between consumers and producers is becoming increasingly blurred. This phenomenon has led to the emergence of a new category of individuals, known as 'prosumers'. These individuals engage in the production of digital content, such as e-films for YouTube. They assume some of the functions previously performed by service providers, such as real estate agents or travel agencies, by offering commentary on the location of properties or the quality of tourist destinations. At the same time, producers become consumers of digital information supplied by their cooperants and customers.

²¹ Personal pricing means paying different prices for the same good at the same time based on evaluation of consumers' propensity to pay. Willingness to pay is evaluated based on many individual characteristics of buyer. It can be used in traditional trade as well as in e-commerce, however in the last form of trade it seems more popular because of lack, e.g., of direct contact between the buyers and hidden methods of consumers' evaluation.

²² It was proved that Head and Shoulders – Shampoo was in Amazon-shops sold at different prices when the buyers entered Internet from the rural and the urban areas (the last was more expensive – Krämer et al., 2016).

²³ It does not mean that digitisation makes markets perfectly competitive. Firstly, long production series allow to produce cheaper than the shorter ones and IRS contradict with perfect competition model. Secondly, buyers distinguish between producers and make choices according to experience (information). In effect, costs structures of many e-products and product differentiation make competition imperfect.

4. Markets

Digitisation has changed the meaning of the term “market”. Traditional markets for goods are being replaced by sets of interconnected transactions. The differences between products, services and production factors are narrowing. Their production, sale and even use are increasingly interlinked²⁴.

In the age of e-commerce, many markets automatically become international. It is no longer possible to delimit national markets. Melitz’s (2003) argument about differences in the effectiveness of internationally and locally operating companies has – at least partly – lost its relevance. Many companies not only operate in the global market, but are even created for it (so-called born globals). Competition is fierce as companies from all over the world become involved. The costs of participating in global markets, such as transaction costs, are lower than in the past, and the lower they are, the greater the number of electronic transactions.

In the age of the Internet, the role of information and communication is becoming increasingly important. Markets are more transparent than in the past. Differences in the prices offered by different forms of sales are becoming smaller. Consumers and investors know more about products, semi-products and services, their prices, producers and suppliers. Companies have knowledge of buyers’ preferences and tailor products to their needs. Greater individualisation (differentiation) of products and services leads to greater price differentiation, especially in the case of vertically (qualitatively) differentiated products. One reason is product differentiation, while the other may be market segmentation.

The material structure of business and trade is changing. Many traditional products are being digitised. Films are a good example of this trend. Services such as concerts become products when they are registered. New e-services are being provided (distance learning, telemedicine). There is a decline of some industries (e.g. newspapers, books) and an expansion of others (e.g. e-books).

Producers usually meet on digital platforms²⁵, which are service systems in which data are generated from transactions and interactions at both individual and aggregated levels (Alt 2021, 233). The platforms function as representatives of many dif-

²⁴ A good example of connection of products, services and production factors is a car (product) bought on credit (banking service) to operate the plant (real capital) and its purchase is accompanied by purchase of a maintenance service.

²⁵ Platforms play important role not only in trade. Cusumano, Gauer and Yoffie (2019) write about innovation, transaction and hybrid platforms.

ferentiated markets. Thanks to them, even small companies can break through with their offer on the world market and find new business partners. Contractors are automatically connected.

The growing importance of platforms is due to their high efficiency, which is based on the large possibilities of data collection, processing and analysis. Platformisation covers more and more sectors of the economy and accelerates the process of datafication. It makes offers better adapted to the needs of the recipients, which induces the next customers to participate. Platformisation promotes competition between producers. Platforms help to remove some traditional barriers to trade. They reduce the risk of blocking participation in the global exchange, especially for small and unknown producers, whose lack of credibility is replaced – at least in part – by the credibility of the platform²⁶. As platforms use multi-channel ways to reach customers, even if one channel is blocked, the others are still permeable.

However, it is becoming increasingly challenging to compete with the leading digital platforms. These platforms are far from being competitive. The trade platforms are concentrated, creating a quasi-oligopolistic market. The largest platforms are in possession of eight companies. Three of them originate from China (Alibaba, Tencent, Baidu), while the remainder are American (Apple, Alphabet/Google, Facebook, Amazon, Microsoft) – see Śledziewska, Włoch, 2020, 84. Concentration in the digital business sector is driven by network effects²⁷ on both the demand and supply sides, as well as IRS on the supply side of the market.

²⁶ Even if platforms are seen as guarantors of the credibility of e-commerce participants, their responsibility for transactions is in fact unclear, which may favor liability shirking.

²⁷ Network effects mean that the value of a product or service depends on the number of its users. The positive direct network effects arise with the growing number of users of one network what makes it more beneficial for the others to join. These effects are visible, when with an increase of the number of offers average costs of intermediation decrease. On the demand side, with growing number of participants, value of goods and services sold on the platform increases. Indirect effects arise when changes of one element (e.g., one market) bring benefits to participants of other markets as in the case of complementary services such as software, where everyone benefits if more people use similar software. Network effects are a distinctive feature of the most platforms. Success depends less on production factors or even technology than on the timing of a firm's entry and on the size of the market that they are able to serve (Deardorff 2017, 42). There are also negative external effects connected with digitisation. The most important are data breaches which can be disastrous for the customers as the organization concerned does not bear the full cost of the damage it has caused. The other subjects can suffer, e.g., because they lose clients and reputation. Identity theft is hard to be linked to a particular data breach and – consequently – difficult to prove e-company guilt.

The digital giants continue to expand. They are able to successfully purchase companies and enter adjacent markets, which may result in the exclusion of competitors²⁸. In the second decade of the 21st century, Google has overtaken more than 120 companies, Facebook almost 80 and Amazon approximately 90 (Ramge, Mayer-Schönberger 2020, 75). Since 2008, Google has announced spending of 25 billion USD for the purchase of start-ups. A significant proportion of the total expenditure, amounting to over 75% of the total, has been directed towards the acquisition of direct competitors (Ramge, Mayer-Schönberger 2020, 77).

It has been demonstrated that a concentrated and imperfectly competitive market structure facilitates greater transparency within participating markets, thereby rendering them more competitive. However, platforms, like other imperfect competitive structures, can also be detrimental. Many transactions concluded on these platforms are not included in official statistics, particularly when they are not accompanied by financial transactions. Furthermore, they may not be subject to any national or international supervision.

It has been demonstrated that platforms can illegally use personal data and business information belonging to their customers in order to gain a competitive advantage in the provision of their services (see the case of Facebook described in Schechner 2021). It is not necessary for them to have the most favourable offers in order to successfully extend their advantages, as the most comprehensive databases can perform this function. Mayer-Schönberger and Ramge (2017, 7n) discuss the phenomenon of data capitalism, which is transforming a range of markets, including energy, transportation, logistics, labour, industrial production, and healthcare.

In light of this, it appears that a novel approach to measuring market power is required to assess the position of trade platforms. Traditionally, an increase in price was deemed an effective measure. However, in the context of numerous e-services being provided at no cost, a different strategy is necessary. The dominant market position is derived from the possession of extensive and diverse databases. It may be beneficial to assess the capacity to generate profitable data and their beneficial utilisation.

Nowadays, the role of money is undergoing a transformation. For centuries, money has served as a means of assessing the value of goods, facilitating market transac-

²⁸ Large companies are entering new markets horizontally – adding new products/services to complement the existing ones. They also develop vertically into an upstream input or downstream market. Following the transactions the platform managers know, what is the most profitable good and develop their activity in this field or buy the successful company from this branch.

tions. However, the advent of digital services with zero pricing has introduced a new paradigm²⁹. These services provide data about goods, producers, and consumers, which enables informed decision-making without the need for time-consuming and resource-intensive search and comparison processes. The abundance of data and the diversity of its sources have the potential to mitigate the limitations of information asymmetry and deficiency. While money continues to be utilized in payment processing, its role in decision-making has diminished.

In essence, in the context of the digital economy, banks and other financial intermediaries will be compelled to reorient their business models. They will be compelled to adopt a more expedient approach to financial technology (fintech), as elucidated by Mayer-Schönberger and Ramge (2018, 11).

Conclusions

The advent of data and digitisation has enabled companies to work more efficiently, while consumers have gained the ability to purchase more individualised and cheaper products. Public authorities have also benefited from greater transparency and reliability, as well as more trustworthy information about citizens. After decades of changes in international trade, which were largely driven by protection, industrial policy and technological progress, we are now facing changes that are being driven by digitisation. The last type of change is often more unexpected and less predictable than before, making it less controllable.

Despite being latecomers to global digitisation, Europeans are generally satisfied with their economic position. However, not one of the eight largest trade platforms belongs to a European company. Remote work was widespread in the USA and Asia for a long time, whereas in Europe it became common only during the Covid-19 pandemic. It is notable that the development of remote work and e-commerce did not result from a planned form of economic modernisation, but rather emerged as a byproduct and necessity in the context of the pandemic. The absence of European digital giants has a significant consequence: non-European companies possess databases that enable them to occupy leading positions in digital business. Furthermore,

²⁹ A hundred years ago in the U.S.A. the largest companies mainly provided inputs like oil or steel (AT&T was an exception). Fifty years ago there was an output, what counted. The most valuable companies made and sold tangible products or services. Now the successful giants (Facebook, Alphabet) offer free services – more see Kende (2021, 194).

American companies possess a greater understanding of European consumers and investors than European companies.

Although in theory everyone can enter the global market more easily than in the past, the digital divide still exists. Its causes are lack of digital skills, equipment, network, online content, national legal restrictions and unfavourable geographical and economic conditions. After decades of progressive globalisation and the inclusion of developing countries in international production processes, we observe that e-commerce excludes the least developed countries. Participants in e-commerce have relatively high incomes and sophisticated needs. This is the case for the populations of developed and catching-up countries. Many LDCs fall into the digital passivity trap and lose opportunities to participate in digital globalisation. They don't have the necessary infrastructure and suffer from the fact that the global division of labour processes are halted as a result of the covid pandemic. Global value chains are replaced – at least in part – by intra-continental or regional ones.

Data-based markets will prevail as they can find quick and effective solutions. At the same time, they are susceptible to concentration and can endanger competition.

Digitalisation is changing the role of public authorities in the economy. First, it enables public oversight. New digital services are changing the way citizens communicate with government (e.g. digital vaccination cards). Secondly, more and more activities are slipping out of the control of public authorities. New regulations are being introduced to meet the challenges and to protect society from crimes committed in cyberspace. However, they do not seem to keep pace with solutions that are compatible with the current state of technical knowledge.

The changes brought about by e-commerce are important because many companies are already involved in this type of trade and others intend to do so. More and more consumers are taking advantage of e-commerce by abandoning traditional shopping.

Digitisation is forcing new ways of valuing a company's assets and its market power. Indirectly, it should lead to changes in national statistics. Measures such as GDP are no longer appropriate for measuring economic activity because they don't value free goods and databases, which are treated as digital capital. In countries with developed e-sectors (especially the US), this leads to an underestimation of their GDP. Similar problems arise with price indices (CPI, PPI). Their construction doesn't allow free goods to be taken into account because they don't have non-zero prices. In fact, both indices don't reflect the true structure of consumption and production. The indices overvalue the costs of consumption and production by not taking into account free goods (or not realising their lower prices paid on the Internet).

E-commerce also seems to be undervalued. In addition to the problem of free goods, there may be a problem of missing trade. As statistical offices only record transactions with a value above a certain threshold, many relatively small transactions are ignored.

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