



*Routledge Studies in Public Economics and Finance*

# **PUBLIC GOODS AND THE FOURTH INDUSTRIAL REVOLUTION**

**INCLUSIVE MODELS OF FINANCE,  
DISTRIBUTION AND PRODUCTION**

Edited by  
Maria Płonka



# Public Goods and the Fourth Industrial Revolution

The fourth industrial revolution, characterized by digitization, artificial intelligence and augmented reality, and megatrends such as globalization, urbanization, demographic changes, and the knowledge-based economy, will trigger a series of profound technological, economic, social and environmental changes that will permanently and irreversibly change the role of the state in meeting social needs. Industry 4.0 will also change the type, nature, and scope of public goods and how they are produced, financed, delivered, and consumed.

This book redefines the current paradigm of public goods. It proposes a model of production and distribution of public goods that acknowledges the participation of entities from the public, private, and nonprofit sectors. The authors argue that these entities would participate in the production, financing, distribution, and consumption of such goods. From a theoretical point of view, such an inclusive approach involving the expansion of the classical state – market dichotomy with new entities, including citizens themselves, leads to a new conceptualization and approach towards public goods. The model assumes shared responsibility, subsidiarity, and paternalistic libertarianism, and it allows the state to create new entities of an educational or fiscal nature, while remaining the regulator of public services and distribution. Additionally, the book analyzes changes regarding the perception of public goods, in the era of the fourth industrial revolution, across selected sectors such as healthcare and pension systems, education, local public goods, and public utility services.

The book is primarily addressed to researchers, scholars, and students across social and technical sciences, and it will also be a useful guide for central and local administration bodies responsible for public policy.

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# Public Goods and the Fourth Industrial Revolution

Inclusive Models of Finance,  
Distribution and Production

**Edited by Maria Płonka**

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# Introduction

At the beginning of the 21st century, we are experiencing era of intense technical and technological changes, thanks to which the human-machine barrier is disappearing. As a result, there is a need to redefine the current paradigm of the functioning of modern society and economy. Economists use the term Fourth Industrial Revolution – Industry 4.0 (Schwab K., 2016, *The Fourth Industrial Revolution*, World Economic Forum, Davos), to describe the changes taking place. This concept refers directly to the three previous great industrial revolutions, marking the development of our civilization, whose milestones were the invention of steam, electricity and the Internet. The foundation of the Fourth Industrial Revolution (REV4.0 in this book) is progressive digitization, which results in a change in the previous rules of communication through the development of computer-human and computer-computer communication channels. As a result of the combination of technology and digitization providing unprecedented efficiency, an increasing number of decision-making problems are shifted from the discretion of people to the competence of machines, blurring the boundaries between what is biological and what is digital. It should also be noted that the scope and consequences of REV4.0 are much more extensive than those of previous revolutions. REV4.0 covers almost all spheres of functioning of individuals, societies and economies on a local and global scale. It also has a significant impact on the functioning of the public sphere and its role in financing, production and distribution of certain goods and services. The Fourth Industrial Revolution is characterized by digitization, artificial intelligence, augmented reality, Internet of Things, Smart Factory and the observed megatrends (e.g. globalization, urbanization, demographic changes, knowledge-based economy). It is triggering a series of profound technological, economic, social and environmental changes that will permanently and irreversibly change the role of the state in satisfying social needs. Moreover, today's public goods, the supply of which is also determined by the functioning of the market economy, are the product of an advanced phase of industrial civilization. As a consequence, there is a change not only in the nature and scope, but also in the catalogue of public goods and the ways in which they are financed, produced, delivered and consumed. In this context, it should be noted that although the terminology

## 2 Introduction

used for theorizing about public goods has not changed fundamentally, their content, delivery and consumption have notably evolved in recent decades.

Against this background, arises the question regarding the evolution of public good value and the change in the model of their functioning in the era of REV4.0, which underlies the research problem addressed in the monograph. Bearing in mind the research problem defined in such a manner, the main goal of this book is to identify changes in perception and delivery of selected public goods resulting from REV4.0 and to define new conditions for their financing, production and distribution, necessary to ensure sustainable socio-economic development and social and economic inclusion.

The research puts forward the thesis that, along with civilizational changes and REV4.0, the perception of public goods and, consequently, the ways of their definition and delivery are changing. Assuming that the key distinguishing feature of public goods from other goods (e.g. market goods) is collective consumption and externalities in the form of indivisible consumption available to more than one person (Samuelson P.A., Nordhaus W.D., 2009, *Economics*. 19th ed. McGraw-Hill/Irwin), their systems of financing, distribution and consumption may take a market or collective character. Understood in this way, the essence and characteristics of public goods imply a variety of their functioning models.

The review part of the book characterizes the concept of public goods in detail and examines how modern megatrends and REV4.0 affect their perception and distribution. Fundamental cognitive analyses were carried out for global and supranational, national and regional and local goods. The empirical part includes an analysis of changes in the financing, production and distribution of public goods in the era of the REV4.0, based on selected examples (healthcare system, local public goods, education). In each case, a proposal was formulated for an inclusive model for the financing, production and distribution of public goods.

New technologies not only change the perception of public goods, but also create new goods. As a consequence, public institutions face new challenges in determining their role in the process of financing, producing and distributing these goods. The socio-economic changes taking place are the source of growing social inequalities and the cause of social exclusion of individuals and social groups not only from financing, but also from the consumption of certain goods. Hence, a new definition of the role of the state in REV4.0 conditions is necessary. In particular, this need stems from the need to ensure inclusive socio-economic development that guarantees social cohesion through the full participation of citizens in economic and social life.

In this regard, the following research questions were posed:

- Q1 What phenomena and megatrends determine changes in the way public goods are produced and delivered under REV4.0 conditions?
- Q2 What challenges does REV4.0 pose to the current theory of public goods?

- Q3 How do REV4.0 and megatrends contribute to the evolution of public goods and the ways in which they are delivered?
- Q4 What conditions in the area of discussed public goods must be met in order to be able to talk about inclusive socio-economic development in the era of REV4.0?

The questions thus posed set out the following specific objectives of the study:

- C1 Identification of key megatrends and phenomena important from the point of view of REV4.0.
- C2 Defining the directions of evolution of the concept of public goods.
- C3 An attempt to assess the impact of selected megatrends on public goods in the era of REV4.0.
- C4 Identification of the conditions for financing, production and ways of delivering selected public goods necessary to ensure inclusive socio-economic development.

The book consists of six chapters. The first three chapters are theory-cognitive in nature and are the implementation of objectives 1–3. The basic research methods used in these chapters are literature reviews, analysis of existing data and case studies. The next three chapters present the results of empirical research and are the implementation of Objective 4. The empirical part, based on the results of secondary and primary (own) research, presents the development of changes in financing, production, supply and consumption of selected public goods: health care, local public goods and services of general interest and education. The work made it possible to identify the conditions necessary to ensure the sustainable development of the fourth generation economy based on social inclusion.

The substantive content of the individual chapters is as follows.

Chapter 1 outlines the context of the problems being studied. It is assumed that REV4.0 is realized in the conditions of megatrends defining the directions, strength, dynamics and trajectory of civilization development and their socio-economic consequences. The following were selected as key megatrends inducing technological, economic, social and environmental changes:

- 1 Digitization,
- 2 Globalization,
- 3 Urbanization and suburbanization,
- 4 Demographic changes,
- 5 Sustainable development and green transformation of the economy,
- 6 Knowledge-based economy.

Chapter 2 is epistemological in nature, and analyses earlier achievements in the field of public goods theory and undertakes a critical revision of the concept of public goods and the current classification of these goods. The chapter presents

#### 4 *Introduction*

the latest directions of research in this area as well as a classification of dilemmas and challenges posed by REV4.0 consequences and by the megatrends. In subject literature, there is a lively discussion regarding the qualification of goods to the category of public goods and their constitutive features, and consequently the determination of what gives factual legitimacy to call them public. This chapter is a voice in the discussion on the need to revise the current theory of public goods.

Chapter 3 begins with considerations on the impact of megatrends on public goods and the selection of those megatrends whose long-term effects are significantly reflected in the analyzed area. Then, the issue of the impact of selected megatrends on the production and distribution as well as financing and consumption of public goods is considered, taking into account the various types of public goods discussed in Chapter 2. The chapter ends with predictions about the expected impact of megatrends and REV4.0 on the sphere of public goods. Not all identified megatrends have an equal impact on the sphere of public goods. The influence of some is substantial and it can be assumed that in the future they will significantly change the way in which public goods will be produced, distributed and financed, and will affect the form and scope of their consumption. On the other hand, other megatrends, globally significant and important from the perspective of the entire socio-economic life, affect public goods only to a limited extent. In particular, the subject of the study is the process of evolution of public goods from private to global goods (e.g. internet, cybersecurity), from local to global goods (e.g. healthcare, as shown by the Covid-19 pandemic), from domestic goods to global goods (e.g. environmental protection, security) and the process of evolution of ways of producing and delivering such goods (e.g. e-information, e-consultations, applications, e-services).

Chapter 4 presents original research on key social risks (current and anticipated) and the corresponding public goods, on the example of the healthcare system. The research assumes that, on the one hand, the changes taking place affect the ways of producing, financing and distributing goods traditionally considered to be public, and on the other hand, these changes affect the emergence of new needs, for which new goods are created with the characteristics of public goods. In the first part of original research, traditional and modern public goods were distinguished, detailing social goods among them. Then results are presented of research on the role of the state in providing social goods and the hierarchy of importance of support for selected social goods by the state and other institutions. The second part examines the impact of REV4.0 and the Covid-19 pandemic on the need for health security and the state's ability to ensure this security, under which universal healthcare is a fundamental public good. The chapter ends with the concept of inclusivity in the area of healthcare.

Chapter 5 presents the results of research on local public goods, in particular the implementation of REV4.0 solutions in different systems of public service delivery in cities. The socio-economic metropolitan space is an autarkic good

independent of globalization and local community processes fit into the unique concepts of *smart city* or *idea city*. The chapter presents original research on local public goods, on the example of public services in urbanized areas. In the first part of the chapter, the models of production and distribution of public utility services in selected European Union countries were reviewed, then the impact of REV4.0 solutions on the quality of provided public utility services in cities was examined on the basis of surveys conducted in 12 large Polish cities. The study makes the assumption that REV4.0 technological advances enable public utility enterprises to improve the quality of services provided and increase operational efficiency. As a result of the use of a multi-stage zero unitarization method, a ranking was created of municipal economies of the surveyed cities according to the assessment of the quality of public utility services provided. The chapter concludes with an inclusive system for distributing local public goods and services in a smart city.

Chapter 6 presents original research on the education system and social capital. The research assumption was made that REV4.0 and the accompanying changes have a significant impact on the education system. The study hypothesizes that the socio-economic changes resulting from REV4.0 require a redefinition of education policy due to the lack of adaptation of competences to the requirements of the modern labor market. Based on the educational policy objectives set at EU level, the research authors worked to identify competence gaps in the area of digital, cognitive and social competences, examined the impact of digital transformation on cooperation, trust and interpersonal relations, i.e. on social capital. An attempt was also made to determine the impact of digitization on the education system and to identify the risks associated with this process. The original survey pursued two goals: methodological and application. The methodological goal of the research was to develop a methodology and assessment of the level of digital, social and cognitive competences in the group of young adults (18–30 years old) and the degree of use of digital tools in the education process. In turn, the application nature was an attempt to determine the competence gaps of young adults. The chapter concludes with an model perspective on the inclusive education system in REV4.0 conditions.

The changes triggered by REV4.0 are global in nature and trigger scientific, political and social discussion about the value and new distribution of public goods. Undoubtedly, new technological possibilities and global megatrends define new areas of research and implementation.

Although the original research contained within this book was conducted among respondents from Poland, the problems raised are universal in nature, because they concern problems common to Humanity in the 21st century, which implies the possibility of research repetition and their possible comparison and continuation.

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