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CONTENTS

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Dear Readers,

We hereby commend the latest issue of *Argumenta Oeconomica Cracoviensia* to you. The current issue reflects the profile of the journal, which publishes original contributions in the field of economics and finance. This profile is a response to the global trend, especially pronounced since the last financial crisis, towards a broader and deeper strengthening of the achievements of economic theory in research on financial phenomena (financialization of the economy). If the importance of economic content in research on financial phenomena is diminished or removed altogether, economic theory and business practice can be led astray, as was demonstrated not only by the last financial crisis but also by earlier ones. Among the contributions in the current issue are papers on economic theory, papers on methodological issues in the study of economic and financial phenomena, and papers which present the results of empirical research. This formula provides a platform for the publication of papers in which economic theory and the theory of finance are given equal coverage.

An example of a methodological work is Emil Panek's article entitled *A Non-stationary Gale Economy with Limit Technology, Multilane Turnpike and General Form of Optimality Criterion*. The value of this article lies in the fact that it presents the author's latest achievements in his long-term research on, and critical analysis of, the issue of the turnpike properties of optimal growth processes in von Neumann-Gale-Leontief type economies, with particular emphasis on the so-called final state optimization growth problem.

The issue of the role of the state in the modern economy is the subject of lively debate among economists and politicians. This debate became even more intense after the financial and economic crisis that occurred in the first decade of this century. For these reasons, the article by Dominika Bochańczyk-Kupka and Renata Pęciak, *Some Reflections on the New Challenges Facing the Modern State*, deserves attention. Adopting a synthetic approach, the authors present the current state of the global debate on this subject, in which prominent economists are taking part.

The article discusses the new challenges for the role of the state in the economy. The source of these challenges is the deepening globalisation of the world economy, its instability, and the increasing unpredictability of phenomena that occur outside the borders of a given country. We are observing the weakening influence of national governments over economic phenomena, which are escaping the control of local (national) governments. This requires a new definition of the role of the state vis-à-vis the economy and finance in the supranational dimension. Greater engagement and closer cooperation between national governments is essential. New relations must be established between national governments and supranational institutions whose decisions affect national economies.

The high standard of living and prosperity of citizens of highly-developed countries are accompanied by various new phenomena, which are the subject of research across various disciplines, not only economics. These phenomena undoubtedly include the decreasing interest of couples in parenthood. This phenomenon has an individual, private dimension, but also a wider social and economic one. As a result of prosperity and advances in medicine – both in diagnosis and in treatment – we are witnessing a process of societal aging. The decreasing number of economically active people, combined with low fertility rates among the new generation, present a huge challenge for the economy, public finances, the health care system, the social welfare system, and so on. For these reasons, the results of research conducted by Marta Szklarska and presented in her article, *Economic Activity and Reproductive Behaviours in Poland*, may be considered interesting. Although Poland remains a relatively young society, unfavourable demographic phenomena such as a negative birth rate in certain years are a cause for concern and have inspired research into these phenomena. The author attempts to establish how the economic activity of partners affects the chance of having a first child. Her research covers various types of households and the different social, cultural, and religious conditions under which reproductive decisions are made.

For many decades, or even centuries, relatively little attention has been paid in the theory of economics and finance to households, which may be surprising given that the household is the central element of the economic system. Economists have tended to focus on companies, the state, markets, institutions, etc., but they are now making up for this omission. Anna Magdalena Korzeniowska's paper, *Heterogeneity of Households in the Euro Area, Hungary, and Poland in Terms of the Usage of Financial Assets and Debt on the Basis of the Household Finance and Consumption Survey*, is part

of this research trend. The value of this contribution is that it combines economic and financial aspects, focusing on the household as an entity that accumulates monetary savings whose micro- and macroeconomic importance does not require comment. Also noteworthy are the comparative results on the allocation of monetary savings (financial assets) of households operating in the Euro area as well as in two countries outside that area.

Issues related to the unequal distribution of income and excessive divergence in standards of living, both globally and at the national and regional levels, continue to be a subject of interest for economists, regionalists, sociologists, and social-minded politicians. The importance of these issues is aptly highlighted on the example of Poland in Grażyna Dehnel, Marek Walesiak, and Marek Obrębalski's article entitled *Comparative Analysis of the Ordering of Polish Provinces in Terms of Social Cohesion*. The article presents the results of research on social cohesion using classical metric data and interval-valued data. Three groups of variables are adopted: basic human needs, foundations of well-being, and opportunities. This work, apart from its substantive results, provides an opportunity to critically assess the method employed by the authors and the results obtained.

In the face of an increasingly complex financial world, someone even quite well-versed in the workings of the financial market and the financial instruments used is not able to fully comprehend this domain in order to make the most advantageous decisions (choices). Instead, they are forced to rely on the opinions of various individual or – more often – institutional experts connected with the financial market. Therefore, the legal status of such institutions and the credibility of the recommendations they provide to investors is important. In their article, *Trading Recommendations – A Long--term Analysis and the Evolution of Law*, Piotr Dąbrowski and Katarzyna Jarno investigate the quality of brokerage houses in Poland. The aim of their research was to identify the leading recommenders from among financial institutions publishing investment advice. The research shows that the overall quality of recommendations made by brokerage houses in Poland is very low, while the transaction costs included in the calculation, together with capital gains tax, worsen the results achieved when following the advice of brokerage houses. It is also interesting to note the authors' claim that despite the poor quality of recommendations issued, legal regulations that are meant to protect investors are not undergoing the changes that investors expect. However, it is not entirely clear which regulations are at issue here. In any case, the article sits perfectly within the current of institutional economics.

While commending the present issue to our readers, we would also like to invite contributions in the form of original texts, information about important academic events, and reviews of outstanding books. Texts in the field of economics and finance will be treated as most relevant to the journal's profile.

Prof. Stanisław Owsiak
Editor-in-chief

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Emil Panek

A NON-STATIONARY GALE ECONOMY WITH LIMIT TECHNOLOGY, MULTILANE TURNPIKE AND GENERAL FORM OF OPTIMALITY CRITERION

Abstract

The paper refers to my previous works: "«Słaby» efekt magistrali w niestacjonarnej gospodarce Gale'a z graniczną technologią i wielopasmową magistralą produkcyjną" (in: *Matematyka i informatyka na usługach ekonomii*, D. Appenzeller (ed.), 2017) and "Niestacjonarna gospodarka Gale'a z graniczną technologią i wielopasmową magistralą produkcyjną. «Słaby», «silny» i «bardzo silny» efekt magistrali" (*Przegląd Statystyczny* 2018, 65(4)), and contains proofs of weak and very strong turnpike theorems in a non-stationary Gale economy with limit technology and multilane turnpike. In contrast to the above-mentioned papers, the growth criterion is the maximization of discounted additive production utility over production in all periods of the economy's time horizon *T*.

Keywords: non-stationary Gale type economy, limit production space, discounted instantaneous utility, multilane turnpike.
JEL Classification: C6, O4.

1. Introduction

In many papers devoted to turnpike properties of optimal growth processes in von Neumann-Gale-Leontief type economies, maximization of

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the last period production utility in a planning horizon $T = (0, 1, \ldots, t_1)$[1] is a growth criterion – so in these papers we have to do with the so-called final state optimization growth problem. Turnpike properties of optimal growth processes in stationary and non-stationary von Neumann-Gale type economies with maximization of total value of production over the whole planning horizon (measured at von Neumann prices) and a unique production turnpike have been discussed in papers by Panek & Runka (2011, 2012) and Panek (2014, 2015).

The model we shall consider in the current paper is related to the model introduced in Panek (2017, 2018). The aim of the paper is to state and prove weak and strong turnpike theorems in a non-stationary Gale economy with limit technology and multilane turnpike with the sum of discounted production utilities serving as a growth criterion.

2. The Model

We are interested in a non-stationary economy with limit technology and multilane turnpike that has been presented in detail in the above-mentioned papers (Panek 2017, 2018), from which we also borrow the notation.

There are n goods used and/or produced in periods $t = 0, 1, \ldots$ The symbol $x(t) = (x_1(t), \ldots, x_n(t))$ denotes a vector of goods used in the economy (input vector) in period t, by $y(t) = (y_1(t), \ldots, y_n(t))$ we mean a vector of goods produced (output vector) in period t. If from input vector $x(t)$ one can produce output vector $y(t)$ in period t, we say that the pair $(x(t), y(t))$ is (describes) a feasible production process in period t. By $Z(t) \subset R_+^{2n}$ we denote the set of all feasible production processes in period t and we call the set Gale's production space in period t. So, if $(x, y) \in Z(t)$ (or equivalently, $(x(t), y(t)) \in Z(t)$), then it is possible to produce output vector y from input vector x in period t.

Gale production (technology) spaces $Z(t), t = 0, 1, \ldots$, satisfy the following conditions[2]:

(G1) $\forall (x^1, y^1), (x^2, y^2) \in Z(t) \; \forall \; \lambda_1, \lambda_2 \geq 0 (\lambda_1 (x^1, y^1) + \lambda_2 (x^2, y^2) \in Z(t))$
(homogeneity and additivity of production processes).

[1] Utility is usually identified with a value of a continuous, positively homogeneous of degree one, and concave function $u: R_+^n \to R_+^1$, of which a particular example is the linear functional measuring value of the last period T production measured at equilibrium (von Neumann) prices, see Lancaster (1968, Ch. 10–11), McKenzie (2005), Nikaido (1968, Ch. 4.12–13), Panek (2011), Takayama (1985, Ch. 7A) and references therein.

[2] $x \geqq 0$ means that $\forall i (x_i \geq 0)$, in contrast to $x \geq 0$ which means $(x \geqq 0 \wedge x \neq 0)$.

(G2) $\forall (x, y) \in Z(t)\,(x = 0 \Rightarrow y = 0)$
(no land-of-Cockaigne condition).
(G3) $\forall (x, y) \in Z(t) \forall x' \geqq x \ \forall\ 0 \leqq y' \leqq y((x', y') \in Z(t))$
(costless waste condition).
(G4) $Z(t)$ is a closed subset of R_+^{2n}.
(G5) $Z(0) \neq \varnothing$ and $Z(t) \subseteq Z(t+1)$.

We also assume that there exists the smallest (in the sense of inclusion) closed set $Z \subseteq R_+^{2n}$, called the limit production (technology) space, which satisfies the conditions:

(G6) (i) $Z(t) \subseteq Z, t = 0, 1, \ldots$
(ii) $(x, y) \in Z$ and $x = 0$, imply $y = 0$.
(iii) $\forall i\, \exists (x^i, y^i) \in Z(y_i^i > 0)$.
(each good can be produced under the limit technology).

It is not difficult to demonstrate that the set $Z \subset R_+^{2n}$ satisfies conditions (G1)–(G4) (Panek 2016b, Th. 1). Moreover, sets Z, $Z(t)$, $t = 0, 1, \ldots$, are closed convex cones in R^{2n} with vertices at $0 \in R^{2n}$. Let us observe that assumptions (G6)(ii)–(iii), due to the fact that the limit technology space is the smallest set, implicitly impose some additional conditions on almost all production sets $Z(t)$, $t = 0, 1, \ldots$. Writing $(x, y) \in Z$ means that it is possible to produce output vector y from input vector x in view of the limit technology. An economy with production space meeting conditions (G1)–(G6) is called a non-stationary Gale economy with limit technology.

If $(x, y) \in Z(t)$ and $(x, y) \neq 0$, then (by (G2)) $x \neq 0$ and we define:

$$\alpha(x, y) = \max\{\alpha \mid \alpha x \leqq y\},$$

and call it the technological efficiency rate of the (feasible) production process (x, y) in period t. We similarly define the technological efficiency rate of a non-trivial feasible limit production process $(x, y) \in Z$. Under assumptions (G1)–(G6) the function $\alpha(\cdot)$ defined on $Z \setminus \{0\}$ is positively homogeneous of degree zero and there exists a process $(\bar{x}, \bar{y}) \in Z \setminus \{0\}$ for which (Takayama 1985, Th. 6.A.1):

$$\alpha(\bar{x}, \bar{y}) = \max_{(x, y) \in Z \setminus \{0\}} \alpha(x, y) = \alpha_M > 0.$$

We call every such process an optimal production process in a non-stationary Gale economy with limit technology. The number α_M is said to

be the optimal (limit) technological efficiency rate. Let us observe that any positive multiple of an optimal process $(\bar{x}, \bar{y})$ is also an optimal process.

From now on we consider only non-trivial (non-zero) production processes belonging to $Z(t)$, $t = 0, 1, \ldots$, or to Z.

By Z_{opt} we denote the set of all optimal processes in a non-stationary Gale economy with limit technology:

$$Z_{\text{opt}} = \{(\bar{x}, \bar{y}) \in Z \setminus \{0\} \mid \alpha(\bar{x}, \bar{y}) = \alpha_M > 0\}.$$

If conditions (G1)–(G6) hold, then (Panek 2016a, Th. 1):
– the set Z_{opt} is a convex cone not containing 0,
– $\forall (\bar{x}, \bar{y}) \in Z_{\text{opt}} (\bar{x} \geq 0 \wedge \bar{y} \geq 0)$,
– $\forall (\bar{x}, \bar{y}) \in Z_{\text{opt}} ((\bar{x}, \alpha_M \bar{x}) \in Z_{\text{opt}} \wedge (\bar{y}, \alpha_M \bar{y}) \in Z_{\text{opt}})$.

Let us introduce the following notation[3]:

$$S = \left\{ s \in R_+^n \,\middle|\, \exists (\bar{x}, \bar{y}) \in Z_{\text{opt}} \left(s = \frac{\bar{y}}{\| \bar{y} \|} \right) \right\}$$

(the set of production structures $s = \dfrac{\bar{y}}{\| \bar{y} \|}$ of optimal production processes $(\bar{x}, \bar{y}) \in Z_{\text{opt}}$). It can be shown that the set S is non-empty, convex and compact (Panek 2016a, Th. 2(i)). For any $s \in S$, the half-line

$$N_s = \{ \lambda s \mid \lambda > 0 \}$$

is called a von Neumann ray (production turnpike) in a non-stationary Gale economy with limit technology. The set (bundle of turnpikes)

$$\mathbb{N} = \bigcup_{s \in S} N_s$$

is called the multilane turnpike in a (non-stationary) Gale economy with limit technology.

By $p = (p_1, \ldots, p_n) \geq 0$ we denote a price vector of goods. For $(x, y) \in Z \setminus \{0\}$, the number[4]:

$$\beta(x, y, p) = \frac{\langle p, y \rangle}{\langle p, x \rangle} \geq 0 \quad (\text{defined if } \langle p, x \rangle \neq 0)$$

[3] From here onwards: if $a \in R_+^n$, then $\| a \| = \sum_{i=1}^n a_i$.

[4] For $a, b \in R^n$, $\langle a, b \rangle = \sum_{i=1}^n a_i b_i$.

is called the economic efficiency rate of the process (x, y) at prices p. If there exist a price vector $\bar{p} \geq 0$ and a production process $(\bar{x}, \bar{y}) \in Z \setminus \{0\}$ such that:

$$\alpha_M \bar{x} \leqq \bar{y}, \tag{1}$$

$$\forall (x, y) \in Z \setminus \{0\} \left(\langle \bar{p}, y \rangle \leq \alpha_M \langle \bar{p}, x \rangle\right), \tag{2}$$

$$\langle \bar{p}, \bar{y} \rangle > 0, \tag{3}$$

then the triplet $\{\alpha_M, (\bar{x}, \bar{y}), \bar{p}\}$ is said to characterize (describe) an optimal von Neumann equilibrium in a non-stationary Gale economy with limit technology. The vector $\bar{p}$ is called a von Neumann price vector (or equilibrium price vector). Let us remark that the state of equilibrium is such a state of economy (production and price levels) in which the economic efficiency rate equals the technological efficiency rate at the highest possible level. This is due to the fact that by (1)–(3) we obtain:

$$\beta(\bar{x}, \bar{y}, \bar{p}) = \max_{(x, y) \in Z \setminus \{0\}} \beta(x, y, \bar{p}) = \alpha(\bar{x}, \bar{y}) = \alpha_M > 0. \tag{4}$$

The condition (1) is satisfied by any optimal production process $(\bar{x}, \bar{y}) \in Z_{\text{opt}}$. Further, for a non-stationary Gale economy with limit technology there exists a price vector $\bar{p} \geq 0$ fulfilling condition (2). By (4) it follows that the economic efficiency rate of an arbitrary process $(x, y) \in Z \setminus \{0\}$ never exceeds the optimal technological efficiency rate α_M.

The next condition (G7) states that if the technological efficiency rate of some production process is less than the optimal rate, then its economic efficiency (measured at von Neumann prices $\bar{p}$) is less than the optimal rate as well. In other words, any production process not attaining the maximum technological efficiency rate cannot attain the maximum economic efficiency rate:

(G7) $\forall (x, y) \in Z \setminus \{0\} \left(\alpha(x, y) < \alpha_M \Rightarrow \beta(x, y, \bar{p}) < \alpha_M\right)$.

Under condition (G7), every process $(\bar{x}, \bar{y}) \in Z_{opt}$ and price vector $\bar{p}$ is a state of von Neumann, that is, it meets conditions (1)–(3) (see Panek 2018, Th. 1) and, moreover,

$$\forall \varepsilon > 0 \, \exists \delta_\varepsilon \in (0, \alpha_M) \, \forall (x, y) \in Z \setminus \{0\} \left(d(x, \mathbb{N}) \geq \varepsilon \Rightarrow \beta(x, y, \bar{p}) \leq \alpha_M - \delta_\varepsilon\right), \tag{5}$$

where

$$d(x, \mathbb{N}) = \inf_{x' \in \mathbb{N}} \left\| \frac{x}{\|x\|} - \frac{x'}{\|x'\|} \right\|$$

is the (angular) distance of the vector from the multilane turnpike $\mathbb{N}$ (Panek 2017, Th. 5)[5].

Let us now fix a process $(x, y) \in Z \setminus \{0\}$ whose input structure $\frac{x}{\|x\|}$ or output structure $\frac{y}{\|y\|}$ differ from any turnpike structure:

$$\frac{x}{\|x\|} \notin S \vee \frac{y}{\|y\|} \notin S$$

or, equivalently,

$$x \notin \mathbb{N} \vee y \notin \mathbb{N}.$$

Hence, under the conditions (G1)–(G6), the technological efficiency rate of such a process is less than the optimal rate (Panek 2018, Lemma 1):

$$\alpha(x, y) < \alpha_M.$$

By this and the condition (G7) we conclude that if, in a production process $(x, y) \in Z \setminus \{0\}$, input vector x or output vector y do not belong to the multilane turnpike $\mathbb{N}$, the economic efficiency rate measured at some von Neumann price vector is less than the maximum efficiency rate.

3. Weak Multilane Turnpike Theorem

We are interested in a Gale economy satisfying conditions (G1)–(G7) and functioning within a (finite) time horizon $T = \{0, 1, \ldots, t_1\}, t_1 < +\infty$. Production dynamics obey the following simple condition:

$$x(t+1) \leqq y(t), \quad t = 0, 1, \ldots, t_1 - 1,$$

according to which a period's inputs stem from goods produced in the previous period[6]. For this reason and by the condition (G3) we get:

$$(y(t), y(t+1)) \in Z(t+1), \quad t = 0, 1, \ldots, t_1 - 1. \tag{6}$$

We assume that in the initial period $t = 0$ a production vector $y(0)$ is given:

$$y(0) = y^0 > 0. \tag{7}$$

Every sequence $\{y(t)\}_{t=0}^{t_1}$ satisfying conditions (6)–(7) is called a (feasible) (y^0, t_1) – growth process (production trajectory). In the papers by Panek

[5] It is a version of Radner's Lemma adapted to our model (Radner 1961).

[6] By this we mean a closed economy.

(2017, 2018), we investigated the properties of feasible growth processes and solved the following final state optimization problem (utility maximization of production obtained in the last period t_1 in horizon T):

$$\begin{gathered} \max u(y(t_1)) \\ \text{subject to (6)–(7)} \\ \text{with fixed } y^0. \end{gathered} \tag{8}$$

In the present work, we replace the final state optimization criterion (8) with the criterion of maximization of total discounted utility of production obtained in all periods of the horizon T:

$$\begin{gathered} \max \sum_{t \in T} (1-\gamma)^t u(y(t)) \\ \text{subject to (6)–(7)} \\ \text{with fixed } y^0. \end{gathered} \tag{9}$$

The instantaneous utility function $u: R^n_+ \to R^1_+$ is assumed to satisfy the following conditions:

(U1) $u(\cdot)$ is continuous, positively homogeneous of degree 1, concave and increasing,
(U2) $\exists a > 0 \; \forall y \in R^n_+ (u(y) \le a \langle \bar{p}, y \rangle)$,
(U3) $\forall s \in S(u(s) > 0)$.

Such conditions are satisfied e.g. by some functions of the CES class. Parameter $\gamma \in (0,1)$ is a discount rate (time preference) of production utility. Under the above assumptions, $\forall y^0 > 0 \; \forall t_1 < +\infty$ problem (9) possesses an optimal solution which will be denoted by $\{y^*(t)\}_{t=0}^{t_1}$ and called an (y^0, T, u) – optimal growth process (production trajectory).

While proving the weak turnpike effect (Theorem 1), we will need the following condition which guarantees that it is possible to attain the multilane production turnpike starting from the initial state y^0:

(G8) There exists a feasible $(y^0, \check{t}+1)$ – growth process $\{\check{y}(t)\}_{t=0}^{\check{t}+1}$, $\check{t} < t_1$, such that

$$\alpha(\check{y}(\check{t}), \check{y}(\check{t}+1)) = \alpha_M.$$

Let us discuss the economic meaning of (G8). To this end, we denote: $\check{y} = \check{y}(\check{t}), \check{s} = \dfrac{\check{y}}{\| \check{y} \|}$. If (G8) holds, then $(\check{y}, \alpha_M \check{y}) \in Z(t+1) \subseteq Z$ and thus $(\check{y}, \alpha_M \check{y}) \in Z_{\text{opt}}$, so:

$$\check{y}(\check{t}) \in N_{\check{s}} \in \mathbb{N},$$

where the half-line $N_{\check{s}} = \{\lambda \check{s} \mid \lambda > 0\}$ is a von Neumann ray determined by the production structure vector $\check{s}$ in the optimal process $(\check{y}, \alpha_M \check{y}) \in Z_{opt}$, and

$$\alpha_M^{t-\check{t}} \check{y} \in N_{\check{s}} \in \mathbb{N}, \quad t = \check{t}+1, \ldots, t_1. \tag{10}$$

Thus, condition (G8) entails that the economy, after having reached the multilane turnpike $\mathbb{N}$ (one of the rays), can continue its growth by staying on the turnpike and growing at the rate α_M. This growth rate is the optimal (highest attainable) production growth rate in a Gale economy, which accounts for calling the processes of the form (10) the optimal stationary growth processes in the literature. These optimal processes stay on the multilane turnpike $\mathbb{N}$.

□ *Theorem 1.* In a non-stationary Gale economy satisfying conditions (G1)–(G8), if the discounted optimal production growth rate $(1-\gamma)\alpha_M$ exceeds 1, then for any $\varepsilon > 0$ there exists a positive integer k_ε for which the number of periods in which the production structure of a (y^0, T, u) – optimal process $\{y^*(t)\}_{t=0}^{t_1}$ satisfies the condition:

$$d(y^*(t), \mathbb{N}) = \inf_{y \in \mathbb{N}} \left\| \frac{y^*(t)}{\|y^*(t)\|} - \frac{y}{\|y\|} \right\| = d(y^*(t), \mathbb{N}) \geq \varepsilon \tag{11}$$

is not greater than k_ε. The number k_ε is independent of the horizon T length.

Proof. We will use the fact that problem (9) is equivalent to

$$\begin{gathered} \max \textstyle\sum_{t=1}^{t_1} (1-\gamma)^t u(y(t)) \\ \text{subject to (6)–(7)} \\ \text{with fixed } y^0 \end{gathered} \tag{12}$$

(a trajectory $\{y^*(t)\}_{t=0}^{t_1}$ solves the problem (9) if and only if it solves (12)). According to (G6), (2), (6), we have

$$\begin{aligned} &\langle \bar{p}, y^*(1) \rangle \leq \alpha_M \langle \bar{p}, y^0 \rangle, \\ &\langle \bar{p}, y^*(2) \rangle \leq \alpha_M \langle \bar{p}, y^*(1) \rangle \leq \alpha_M^2 \langle \bar{p}, y^0 \rangle, \\ &\ldots\ldots\ldots \\ &\langle \bar{p}, y^*(t_1) \rangle \leq \alpha_M \langle \bar{p}, y^*(t_1 - 1) \rangle \leq \alpha_M^{t_1} \langle \bar{p}, y^0 \rangle. \end{aligned} \tag{13}$$

Assume that in some periods $0 \le \tau_1, \tau_2, \ldots, \tau_k < \tau_1$ the condition (11) is fulfilled. Then, by (5),

$$\beta(y^*(t), y^*(t+1)) \le \alpha_M - \delta_\varepsilon, \quad t = \tau_1, \ldots, \tau_k,$$

or, equivalently,

$$\langle \bar{p}, y^*(t+1) \rangle \le (\alpha_M - \delta_\varepsilon) \langle \bar{p}, y^*(t) \rangle, \quad t = \tau_1, \ldots, \tau_k, \tag{14}$$

where $\delta_\varepsilon \in (0, \alpha_M)$. From (U2), (13), (14) we obtain

$$(1-\gamma) u(y^*(1)) \le a(1-\gamma) \langle \bar{p}, y^*(1) \rangle \le a(1-\gamma) \alpha_M \langle \bar{p}, y^0 \rangle,$$

$$(1-\gamma)^2 u(y^*(2)) \le a(1-\gamma)^2 \langle \bar{p}, y^*(2) \rangle \le a(1-\gamma)^2 \alpha_M^2 \langle \bar{p}, y^0 \rangle,$$

……..

$$(1-\gamma)^{t_1-k} u(y^*(t_1-k)) \le a(1-\gamma)^{t_1-k} \langle \bar{p}, y^*(t_1-k) \rangle \le a(1-\gamma)^{t_1-k} \alpha_M^{t_1-k} \langle \bar{p}, y^0 \rangle$$

$$(1-\gamma)^{t_1-k+1} u(y^*(t_1-k+1)) \le a(1-\gamma)^{t_1-k+1} \langle \bar{p}, y^*(t_1-k+1) \rangle \le$$

$$\le a(1-\gamma)^{t_1-k+1} \alpha_M^{t_1-k} (\alpha_M - \delta_\varepsilon \langle \bar{p}, y^0 \rangle,$$

……..

$$(1-\gamma)^{t_1} u(y^*(t_1)) \le a(1-\gamma)^{t_1} \langle \bar{p}, y^*(t_1) \rangle \le a(1-\gamma)^{t_1} \alpha_M^{t_1-k} (\alpha_M - \delta_\varepsilon)^k \langle \bar{p}, y^0 \rangle,$$

and finally we get

$$\begin{gathered} \sum_{t=1}^{t_1} (1-\gamma)^t u(y^*(t)) \le \\ \le a \langle \bar{p}, y^0 \rangle \Big[\sum_{t=1}^{t_1-k} (1-\gamma)^t \alpha_M^t + (1-\gamma)^{t_1-k} \alpha_M^{t_1-k} \sum_{\tau=1}^{k} (1-\gamma)^\tau (\alpha_M - \delta_\varepsilon)^\tau \Big]. \end{gathered} \tag{15}$$

On the other hand, due to (G8), the process $\{\tilde{y}(t)\}_{t=0}^{t_1}$ defined by

$$\tilde{y}(t) = \begin{cases} \{\check{y}(t),\ t = 0, 1, \ldots, \check{t}. \\ \sigma \check{s} \alpha_M^{t-\check{t}},\ t = \check{t}+1, \ldots, t_1 \end{cases}$$

$\left(\check{s} = \dfrac{\check{y}(\check{t})}{\| \check{y}(\check{t}) \|} \in S, \sigma = \| \check{y}(\check{t}) \| > 0 \right)$ is (y^0, t_1) – feasible, and in view of (12), we have

$$\begin{gathered} \sum_{t=1}^{t_1} (1-\gamma)^t u(y^*(t)) \ge \sum_{t=1}^{t_1} (1-\gamma)^t u(\tilde{y}(t)) \ge \sigma \sum_{t=\check{t}+1}^{t_1} (1-\gamma)^{t-\check{t}} u(\check{s}) = \\ = \sigma u(\check{s}) \sum_{\tau=1}^{t_1-\check{t}} (1-\gamma)^\tau > 0. \end{gathered} \tag{16}$$

By (15), (16) we have

$$a\langle \bar{p}, y^0\rangle\Big[\sum_{\tau=1}^{t_1-k}(1-\gamma)^{\tau}\alpha_M^{\tau}+(1-\gamma)^{t_1-k}\alpha_M^{t_1-k}\sum_{\tau=1}^{k}(1-\gamma)^{\tau}(\alpha_M-\delta_\varepsilon)^{\tau}\Big]\geq$$
$$\geq \sigma u(\check{s})\sum_{\tau=1}^{t_1-\check{t}}(1-\gamma)^{\tau}>0,$$

and

$$\sum_{\tau=1}^{t_1-k}(1-\gamma)^{\tau}\alpha_M^{\tau}+(1-\gamma)^{t_1-k}\alpha_M^{t_1-k}\sum_{\tau=1}^{k}(1-\gamma)^{\tau}(\alpha_M-\delta_\varepsilon)^{\tau}\geq$$
$$\geq \frac{\sigma u(\check{s})}{a\langle \bar{p}, y^0\rangle}\sum_{\tau=1}^{t_1-\check{t}}(1-\gamma)^{\tau}>0$$

or, equivalently,

$$(1-\gamma)\alpha_M\frac{(1-\gamma)^{t_1-k}\alpha_M^{t_1-k}-1}{(1-\gamma)\alpha_M-1}+(1-\gamma)^{t_1-k+1}\alpha_M^{t_1-k}(\alpha_M-\delta_\varepsilon)\frac{(1-\gamma)^{k}(\alpha_M-\delta_\varepsilon)^{k}-1}{(1-\gamma)(\alpha_M-\delta_\varepsilon)-1}\geq$$
$$\geq \frac{\sigma u(\check{s})}{a\langle \bar{p}, y^0\rangle}(1-\gamma)\alpha_M\frac{(1-\gamma)^{t_1-\check{t}}\alpha_M^{t_1-\check{t}}-1}{(1-\gamma)\alpha_M-1}>0.$$

Taking $\delta_\varepsilon\in(0,\alpha_M)$ such that $(\alpha_M-\gamma)(1-\delta_\varepsilon)>1$, after simple transformations we get

$$\forall t_1<+\infty\,\forall\, k\leq t_1\left(A(t_1,k)+B(t_1,k)\geq C=\frac{\sigma u(\check{s})}{a\langle \bar{p}, y^0\rangle}>0\right), \tag{17}$$

where

$$A(t_1,k)=\frac{(1-\gamma)^{t_1-k}\alpha_M^{t_1-k}-1}{(1-\gamma)^{t_1-\check{t}}\alpha_M^{t_1-\check{t}}-1},$$

$$B(t_1,k)=\frac{(1-\gamma)^{t_1-k}\alpha_M^{t_1-k-1}(\alpha_M-\delta_\varepsilon)\left[(1-\gamma)^{k}(\alpha_M-\delta_\varepsilon)^{k}-1\right]\left[(1-\gamma)\alpha_M-1\right]}{\left[(1-\gamma)^{t_1-\check{t}}\alpha_M^{t_1-\check{t}}-1\right]\left[(1-\gamma)(\alpha_M-\delta_\varepsilon)-1\right]}.$$

But for $k\to+\infty\,(t_1\geq k)$:

$$A(t_1,k)\to 0^+ \text{ and } B(t_1,k)\to 0^+,$$

which contradicts (17). Hence, there exists a positive integer k_ε (independent of t_1) such that the number of periods for which (11) holds is not greater than k_ε. ■

If a Gale economy satisfies conditions (G1)–(G8), then, independently of the horizon T length, the production structure in any (y^0, T, u) – optimal process (solution of (9)) differs arbitrarily from a production structure on the multilane turnpike. The economy achieves its highest growth rate on the turnpike.

4. Very Strong Multilane Turnpike Theorem

In this section, we have to do with a special situation when there is a (y^0, T, u) – optimal process $\{y^*(t)\}_{t=0}^{t_1}$ which reaches the multilane turnpike $\mathbb{N}$ at some period $\check{t} < t_1$, and if property (U2) of the instantaneous utility function changes to

(U2') $\exists\, a > 0\ \forall s \in S(u(y) = a\langle \bar{p}, y\rangle)$[7].

Under the just mentioned conditions we have:

□ *Theorem 2*. Under conditions (G1)–(G7) and (U1), (U2′) and if a (y^0, T, u) – optimal process $\{y^*(t)\}_{t=0}^{t_1}$, for some $\check{t} < t_1$, reaches the multilane turnpike $\mathbb{N}$, that is, it meets the condition

$$\alpha(y^*(t), y^*(t+1)) = \alpha_M, \tag{18}$$

then

$$\forall t \in \{\check{t}+1, \ldots, t_1 - 1\}(y^*(t) \in \mathbb{N}).$$

Proof[8]. If the (y^0, T, u) – optimal process $\{y^*(t)\}_{t=0}^{t_1}$ satisfies (18), then the process $\{\tilde{y}(t)\}_{t=0}^{t_1}$ defined by

$$\tilde{y}(t) = \begin{cases} y^*(t), & t = 0, 1, \ldots, \check{t}, \\ \sigma s^* \alpha_M^{t-\check{t}}, & t = \check{t}+1, \ldots, t_1, \end{cases}$$

where $\sigma = \| y^*(\check{t}) \| > 0, s^* = \dfrac{y^*(\check{t})}{\| y^*(\check{t}) \|}$, is a feasible (y^0, t_1) – growth process. Since, for $t = 0, 1, \ldots, \check{t}, \tilde{y}(t) = y^*(t)$,

$$\sum_{t=\check{t}}^{t_1} (1-\gamma)^t u(y^*(t)) \geq \sum_{t=\check{t}}^{t_1} (1-\gamma)^t u(\tilde{y}(t)) = \sigma u(s^*) \sum_{t=\check{t}}^{t_1} (1-\gamma)^t \alpha_M^{t-\check{t}} > 0. \tag{19}$$

[7] A linear form with the vector of cofficients $a\bar{p}$ approximating the function $u(\cdot)$ from above is tangent to the graph of $u(\cdot)$ along the multilane turnpike $\mathbb{N}$.

[8] The condition (G8) is redundant in the proof, since the optimal process $\{y^*(t)\}_{t=0}^{t_1}$ meets this condition by formula (18).

But, by the conditions (G6), (2) (6), it holds

$$\begin{aligned}
&\langle \bar{p}, y^*(\check{t})\rangle = \sigma\langle \bar{p}, s^*\rangle,\\
&\langle \bar{p}, y^*(\check{t}+1)\rangle \le \sigma\alpha_M\langle \bar{p}, s^*\rangle,\\
&\ldots\ldots\ldots\\
&\langle \bar{p}, y^*(t_1)\rangle \le \sigma\alpha_M\alpha_M^{t_1-\check{t}}\langle \bar{p}, s^*\rangle.
\end{aligned} \tag{20}$$

Suppose that for some $\tau \in \{\check{t}+1, \ldots, t_1-1\}$:

$$(y^*(\tau) \notin \mathbb{N}),$$

that is, $\exists\, \varepsilon > 0 (d(y^*(\tau), \mathbb{N}) \ge \varepsilon)$. Then, according to (5), there is $\delta_\varepsilon \in (0, \alpha_M)$ for which

$$\langle \bar{p}, y^*(\tau+1)\rangle \le (\alpha_M - \delta_\varepsilon)\langle \bar{p}, y^*(\tau)\rangle. \tag{21}$$

By conditions (20) and (21), in view of (U2′), we obtain:

$$\begin{aligned}
&(1-\gamma)^{\check{t}} u(y^*(\check{t})) \le a(1-\gamma)^{\check{t}}\langle \bar{p}, y^*(\check{t})\rangle = \sigma a(1-\gamma)^{\check{t}}\langle \bar{p}, s^*\rangle = \sigma(1-\gamma)^{\check{t}} u(s^*),\\
&(1-\gamma)^{\check{t}+1} u(y^*(\check{t}+1)) \le a(1-\gamma)^{\check{t}+1}\langle \bar{p}, y^*(\check{t}+1)\rangle \le \sigma a(1-\gamma)^{\check{t}+1}\alpha_M\langle \bar{p}, s^*\rangle =\\
&\qquad = \sigma(1-\gamma)^{\check{t}+1}\alpha_M u(s^*),\\
&\ldots\ldots\ldots\ldots\\
&(1-\gamma)^{\tau} u(y^*(\tau)) \le a(1-\gamma)^{\tau}\langle \bar{p}, y^*(\tau)\rangle \le \sigma a(1-\gamma)^{\tau}\alpha_M^{\tau-\check{t}}\langle \bar{p}, s^*\rangle =\\
&\qquad = \sigma(1-\gamma)^{\tau}\alpha_M^{\tau-\check{t}} u(s^*),\\
&(1-\gamma)^{\tau+1} u(y^*(\tau+1)) \le \alpha(1-\gamma)^{\tau+1}\langle \bar{p}, y^*(\tau+1)\rangle \le\\
&\qquad \le \sigma a(1-\gamma)^{\tau+1}\alpha_M^{\tau-\check{t}}(\alpha_M - \delta_\varepsilon)\langle \bar{p}, s^*\rangle = \sigma(1-\gamma)^{\tau+1}\alpha_M^{\tau-\check{t}}(\alpha_M - \delta_\varepsilon) u(s^*),\\
&\ldots\ldots\ldots\ldots\\
&(1-\gamma)^{t_1} u(y^*(t_1)) \le a(1-\gamma)^{t_1}\langle \bar{p}, y^*(t_1)\rangle \le \sigma a(1-\gamma)^{t_1}\alpha_M^{t_1-\check{t}-1}(\alpha_M - \delta_\varepsilon)\langle \bar{p}, s^*\rangle =\\
&\qquad = \sigma(1-\gamma)^{t_1}\alpha_M^{t_1-\check{t}-1}(\alpha_M - \delta_\varepsilon) u(s^*),
\end{aligned}$$

which leads to

$$\begin{aligned}
&\textstyle\sum_{t=\check{t}}^{t_1}(1-\gamma)^t u(y^*(t)) \le\\
&\le \sigma u(s^*)\Big[\textstyle\sum_{t=\check{t}}^{t_1}(1-\gamma)^t\alpha_M^{t-\check{t}} - \delta_\varepsilon\sum_{t=\tau}^{t_1-1}(1-\gamma)^{t+1}\alpha_M^{t-\check{t}}\Big].
\end{aligned} \tag{22}$$

By (19) and (22) we see that

$$\sigma u(s^*)\Big[\sum_{t=\check{t}}^{t_1}(1-\gamma)^t\alpha_M^{t-\check{t}}-\delta_\varepsilon\sum_{t=\tau}^{t_1-1}(1-\gamma)^{t+1}\alpha_M^{t-\check{t}}\Big]\geq$$
$$\geq\sigma u(s^*)\sum_{t=\check{t}}^{t_1}(1-\gamma)^t\alpha_M^{t-\check{t}}>0.$$

Hence, $\delta_\varepsilon\leq 0$. This contradiction ends the proof. ■

Let us note the above proof does not require the discounted optimal growth rate to be greater than 1.

5. Final Remarks

Obviously, Theorems 1 and 2 remain true for a stationary Gale economy with multilane turnpike and time-invariant production space, that is, when $\forall t(Z(t)=Z=\text{const})$. In this case, in Theorem 1, as well as in Theorem 2 (but for some other reason), condition (G8) becomes redundant. It easy to show that if the initial production vector y^0 is positive (see (7)) and production technology is constant in time, then condition (G8) is satisfied with $\check{t}=1$.

An interesting, but much more difficult, research problem would be to investigate turnpike properties of optimal growth processes in non--stationary von Neumann-Gale type economies with multilane turnpike without assuming the existence of limit technology space. The hypothesis that there exists a limit technology might cause some controversy, and it is certainly not a testable restriction imposed on the economy.

Bibliography

Lancaster, K. (1968) *Mathematical Economics*. New York: Macmillan.

McKenzie, L. W. (2005) "Optimal Economic Growth, Turnpike Theorems and Comparative Dynamics" in K. J. Arrow, M. D. Intriligator (eds) *Handbook of Mathematical Economics*, vol. 3. Amsterdam: North Holland.

Nikaido, H. (1968) *Convex Structures and Economic Theory*. New York: Academic Press.

Panek, E. (2003) *Ekonomia matematyczna*. Poznań: Wydawnictwo Akademii Ekonomicznej w Poznaniu.

Panek, E. (2011) "O pewnej prostej wersji «słabego» twierdzenia o magistrali w modelu von Neumanna". *Przegląd Statystyczny* 58 (1–2): 75–87.

Panek, E. (2014) "Model gospodarki Gale'a ze zmienną technologią, rosnącą efektywnością produkcji i szczególną postacią kryterium wzrostu. «Słaby» efekt magistrali". *Przegląd Statystyczny* 61 (4): 325–34.

Panek, E. (2015) "A Turnpike Theorem for Non-stationary Gale Economy with Limit Technology. A Particular Case". *Economics and Business Review*, Vol. 1 (15), No 4, 3–13, https://doi.org/10.18559/ebr.2015.4.1.
Panek, E. (2016a) "Gospodarka Gale'a z wieloma magistralami. «Słaby» efekt magistrali". *Przegląd Statystyczny* 63 (4): 355–74.
Panek, E. (2016b) "«Silny» efekt magistrali w modelu niestacjonarnej gospodarki Gale'a z graniczną technologią". *Przegląd Statystyczny* 63 (2): 109–21.
Panek, E. (2017) "«Słaby» efekt magistrali w niestacjonarnej gospodarce Gale'a z graniczną technologią i wielopasmową magistralą produkcyjną" in D. Appenzeller (ed.) *Matematyka i informatyka na usługach ekonomii*. Poznań: Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu.
Panek, E. (2018) "Niestacjonarna gospodarka Gale'a z graniczną technologią i wielopasmową magistralą produkcyjną. «Słaby», «silny» i «bardzo silny» efekt magistrali". *Przegląd Statystyczny* 65 (4): 373–93.
Panek, E. and Runka, H. (2011) "Efekt magistrali w gospodarce Gale'a. Wersja szczególna". *Zeszyty Naukowe Uniwersytetu Ekonomicznego w Poznaniu* 211: 220–31.
Panek, E. and Runka, H. (2012) "Dwa twierdzenia o magistrali w modelu von Neumanna". *Przegląd Statystyczny* 59 (2): 125–37.
Radner, R. (1961) "Path of Economic Growth that are Optimal with Regard to Final States: A Turnpike Theorem". *Review of Economic Studies* 28 (2): 98–104, https://doi.org/10.2307/2295707.
Takayama, A. (1985) *Mathematical Economics*. Cambridge: Cambridge University Press.

Abstract

Niestacjonarna gospodarka Gale'a z graniczną technologią, wielopasmową magistralą i ogólną postacią kryterium wzrostu

Artykuł nawiązuje do publikacji autora: „«Słaby» efekt magistrali w niestacjonarnej gospodarce Gale'a z graniczną technologią i wielopasmową magistralą produkcyjną" (w: *Matematyka i informatyka na usługach ekonomii*, D. Appenzeller (ed.), 2017) oraz „Niestacjonarna gospodarka Gale'a z graniczną technologią i wielopasmową magistralą produkcyjną. «Słaby», «silny» i «bardzo silny» efekt magistrali" (*Przegląd Statystyczny* 2018, 65 (4)) i zawiera dowód „słabego" oraz „bardzo silnego" twierdzenia o magistrali produkcyjnej w niestacjonarnej gospodarce typu Gale'a z graniczną technologią i wielopasmową magistralą, w której – w odróżnieniu od wskazanych prac – rolę kryterium wzrostu pełni zdyskontowana, addytywna funkcja użyteczności zdefiniowana na wektorach produkcji wytworzonej we wszystkich okresach horyzontu.

Słowa kluczowe: niestacjonarna gospodarka typu Gale'a, graniczna przestrzeń produkcyjna, zdyskontowana użyteczność chwilowa, magistrala wielopasmowa.

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SOME REFLECTIONS ON THE NEW CHALLENGES FACING THE MODERN STATE

Abstract

The debate among economists over the scope of state intervention in economic processes has a long history. After periods in which laissez-faire theories were dominant, views that promoted the active participation of the state in economic life increasingly came to the fore. Economic theory and business practice, both subject to fluctuations, have sometimes preferred the first approach and sometimes the second. The modern state operates in an increasingly globalized, dynamic, and turbulent environment. This changeable environment, the diversity of development levels, and the emergence of new institutions urge a redefinition of its role in modern economies. This paper contributes to the debate on the challenges and economic role of modern state and identifies some of those challenges.

Keywords: economic role of the state, theory of economics, institutions, contemporary economics.
JEL Classification: E02, H1, O43.

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Everywhere that economists and their ilk mingle
we see them reaching for new answers

G. Akerlof and R. Shiller, *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism*

1. Introduction

The scope and power of the state's influence on economic processes are issues that are widely discussed both in the field of economic theory and in business practice. These issues are also the focus of social thought. The state's place and its tasks in the economy have been discussed for centuries. Since mercantilism people have been arguing over the role of this institution in economic life and the scope of its functions in the economy. Many arguments concerning the range and tools of a state's economic activity still are not widely accepted among members of the academic community. While there is consensus concerning the classical functions of the state, no clear delimitation of the areas and the extent of the impact on business processes has been made. Meanwhile, dynamic changes in social and economic space have changed the scope of the state's impact.

Economics has not kept pace with explaining modern socio-economic phenomena. Therefore, it is necessary to identify the modern social and economic challenges faced by the institution of the state. This identification can help to indicate new tasks, new areas of regulation, and new tools to be considered in the modern economy (Tanzi 2009).

The need for such an indication stems from the fact that many changes have taken place in a turbulent and dynamic environment. Additionally, modern states are fragile and frail with regard to economic policy (which is neither a counterweight not a solution to emerging challenges). The rules which nowadays apply to states were created many years ago under different economic conditions. These conditions have been constantly changing and thus the lack of consensus is understandable. However, many politicians and economists (even Nobel prize winners in the economic sciences) have been searching for solutions which would allow nations to restore equilibrium in the global economy and redefine the role of the state.

The main goal of this article is to present the fluctuation of economic points of view concerning the role of the state in the economy and then to identify and specify some of the challenges facing the modern state. The hypothesis is that the tasks of the modern state exceed the traditional

approach adopted in the theory of economics and that new challenges require broadening its scope. In the first part of the article, different points of view concerning the role of the state are presented. It is necessary to understand the fluctuation of ideas. Then the authors describe some new challenges facing the modern state which are determined by a turbulent and dynamic environment.

2. The Fluctuation of Views Concerning the Role of State

There is widespread agreement among social scientists that development is a multi-dimensional phenomenon, with economic, political and social aspects, and that the different dimensions of the role of the state are interconnected with one another in complex ways. The understanding of the role of the state in the economy is strictly connected with a belief or disbelief in a perfectly-functioning market mechanism. Over the centuries, economic theory and business practice have been under the influence of opposing ideas. Opinions concerning the role of the state in the economy have been constantly evolving, and the idea of the state's power, as Milton Friedman noticed, has fluctuated (de Vroey & Malgrange 2011, Hoover 2003, Wakatabe 2009, Wray 2011).

The process of changes within socio-economic life, sometimes evolutionary, sometimes revolutionary, has accompanied humankind since the dawn of time. But nowadays these changes are more and more dynamic and therefore bring uncertainty, risk, and instability (Friedman & Friedman 1989).

From a historical perspective, the functioning of the institution of the state, and the scope and tools of its intervention, have been constantly evolving – from the Sumerian city-states and Greek polis, through the medieval state and the notion of absolute monarchy reflected in Louis XIV's famous dictum *L'État c'est moi*, to the Smithian liberal state, the interventional Keynesian state, and up to the present day. Throughout all of this history, the role of the state and the scope of its intervention and instruments of interaction have undergone numerous modifications. At the same time, changes in the socio-economic situation have shown a peculiar recurrence of views.

More than 250 years ago during the industrial revolution, a market system based on entrepreneurship, innovation, and a self-regulating mechanism began to spread. This system led to rapid economic and social development and civilizational progress, and then contributed to huge changes in the

quality of life for people in the economies which had implemented it. Thus, the market became the *spiritus movens* of all changes.

The theoretical basis of this system was classical doctrine with the invisible hand of the market. While the list is rather arbitrary, a majority of economists would agree that the foundations of the market economy are: freedom of individual economic agents, private ownership of the means of production, and the existence of a market mechanism understood as an essential controller of all economic processes. This system, however, has been subject to strong evolutionary forces, although its foundations are based on the dominance of private property and the market mechanism function has remained relatively stable.

Nowadays, the list of basic assumptions and requirements of the market system is longer. Also noteworthy is the political system ensuring the stability of the legal order and democracy, which allows societies and social groups to achieve collective goals with the help of the state as the main representative of their interests and aspirations.

This elementary system, based on the doctrine of Adam Smith, was destroyed by the Great Depression that began in 1929, then by the New Deal implemented by F. D. Roosevelt, and finally after the publication in 1936 of John Maynard Keynes's *General Theory of Employment, Interest and Money*. Among the many reasons for its collapse, worth mentioning are the monopolization of developed economies, human greed, and excessive consumption in the years immediately preceding the Great Depression (Chang 2010, Snowdon 2015). The new and unexpected economic situation needed a redefinition of the place and role of the state in the economy and the exemplification of new tools of economic policy. The new ideas were very successful, and during that period the new tools of intervention policy helped stimulate the economy and overcome the worst depression in world economic history.

The main goal of the Keynesian revolution, which advocated an interventionist role for the state, resulted in the prevention of defects and market failures without changing the systemic foundation of the market economy. The success of Keynesian economic doctrine was legitimized by the taming of business cycles after the Second World War, which was possible thanks to the pursuit of economic policy explained by the Philips curve.

The adoption of the orthodox Keynesian interpretation of the Philips curve explained the constant, inverse relationship between the rate of inflation and the rate of unemployment to realize short-term economic policy goals (Snowdon, Vane & Wynarczyk 2005).

The Golden Age of Capitalism (the post-war economic expansion) was a period of strong economic growth and economic prosperity in highly--developed countries which lasted from the end of the Second World War until the early 1970s. Then, in the late 1960s and early 1970s, the emergence of concurrent high inflation and unemployment caused this relationship to be rejected.

In the 1970s, the supply shock on the raw materials market and the crisis of Keynesian economic policy contributed to a revival of the ideas and principles of classical economics and economic liberalism. The economic problems of the 1970s halted the triumphant march of Keynesian theory and facilitated a monetary counter-revolution (Snowdon, Vane & Wynarczyk 2005).

Then, the failure of the socialist model of economics contributed to a Washington revival of liberal trust in the need for deregulation. However, the problems of transition economies and the failures in realizing this Washington consensus revealed the shortcomings of this point of view (Stiglitz 2004). The crisis of 2007 was the next reason which questioned faith in the market mechanism.

Examples from the real-world economy show that the automatic resolution of economic problems by the market mechanism, which the proponents of neoliberal ideas believed in the past and continue to believe nowadays, is a dogma, and market failure is a reason for state interference. The existence of externalities, the growing importance of public goods, and the lack of perfect information are considered the main market failures that justify state interference. In addition, the economic literature mentions socially unacceptable income inequality, which fosters the need to redistribute income in society, and the occurrence of destabilizing macroeconomic phenomena such as high inflation, rising unemployment, and fluctuations in economic activity. Also, state inefficiencies can be found in the existence of shortages (Daoud 2011), the lack of institutional elasticity (Meiklejohn *et al.* 1999), the lagging process of institutional reforms in response to dynamic changes in the socio-economic environment, and the changing expectations of social groups. Market failures legitimize the introduction of legal, administrative and economic regulations, and therefore state interference.

On the other hand, the state as an institution is not able to guarantee the full effectiveness of the market. So both market and state failures expose society to numerous problems. Nowadays, society is forced to function in an insecure environment without any guarantee of effective action against

increasing problems. One example of this is the recent financial crisis being strongly associated with market deregulation, uncontrolled and insatiable greed, and a propensity for excessive enrichment (Akerlof & Shiller 2009). The experiences of that crisis show that, just as in previous decades, future prospects seem to be very unstable and unpredictable (Roubini & Mihm 2011).

To sum up: the evolving conditions of the capitalist economy influence opinions about the role of the state, especially as history has evidenced many failures of economic doctrine, both liberal and Keynesian. There has been a recent wave of criticism of the dominant economic theories and their inability to explain certain mainstream economic phenomena as well as the obvious imperfections of the proposed models in explaining the impact of institutional solutions on economic growth and development. New studies have been undertaken based on a novel, institutional approach. The results of this research (often interdisciplinary in nature and related to the property rights theory of Harold Demsetz and Armen Alchian, developed by Douglass Cecil North, and to the transaction cost theory proposed by Ronald Coase and Oliver Williamson as well as contract theory and agency theory) have emphasized the importance of institutions, including the state, for economic growth and socio-economic development. At the turn of the century, the works of many authors have supported the hypothesis that institutions and the state determine the importance of long-term economic growth and explain the observed differences in per capita incomes across countries (North 1990, 1991, Hall & Jones 1999, Acemoglu, Johnson & Robinson 2001, 2004, Rodrik 2013).

Theoretical considerations require a broader approach, extending beyond contemporary analysis and taking into account a diversity of views. To explain complex economic realities as well as many the interdependencies in a market economy implies a need for methodological convergence and a need to consider not only the economic point of view but also interpretations of results from other social sciences (philosophy, sociology, political science, etc.). Mainstream economics is not able to explain, by itself, economic reality. This is the main reason for the development of heterodox economics.

3. Some New Challenges Facing the Modern State

Identifying problems that the modern state must face has exposed new areas where regulation is needed. It is impossible to list all the factors which

influence the modern state or to sort them according to their importance or other aspects, but some are particularly noteworthy.

Nowadays, economists can identify many challenges that affect the current role of the state. It is very difficult to evaluate them, however, because states are very different. Modern states operate in diverse political, economic, social, cultural, and ecological environments. They have achieved various levels of development, experience different economic growth trends, and participate in different multinational agreements and organizations, etc. They have a variety of historical, cultural and even religious experiences and different hierarchies of social and economic goals. But some challenges seem to be important for the majority of states. These include: globalization, the rapid development of information and communication technologies, regionalization vs internationalization, and the appearance of new agents and unfavourable demographic changes, especially in highly-developed countries (Bloom & Williamson 1998).

Accelerated globalization has appeared as a sign of the times. This is a process of greater economic interdependence among countries, which is manifested in an increasing amount of cross-border trade in goods and services, an increasing volume of international financial flows, and increasing flows of labour. Globalization as a multi-dimensional and multi--level phenomenon affects all levels of socio-economic life, and its most important consequence is the formation of a global economy (Dunning 1992). Its main feature is the transformation of the modern market economy. This process takes place with great force and generates multi-dimensional effects, both in the lives of individuals and nations, and in the world as a whole. An evaluation of globalization is not straightforward, since both positive and negative consequences can be identified. Some of these negative aspects can be easily compensated for by the state using appropriate measures; in relation to others, the state is powerless or at least not very effective (Stiglitz 2003).

The progress of globalization processes has emphasized certain social and economic problems for the governments of well-developed countries. These include: rising unemployment, ageing societies, the high cost of social security incurred by the state, economic instability and income stratification, fiscal policy which is unable to simultaneously guarantee the effectiveness and implementation of the state's objectives, a more expensive state vs richer, more powerful and more influential transnational corporations, deficiencies in the functioning and implementation of basic state tasks, and a need to adapt to rapidly changing internal and external conditions. The effects

of rapid globalization also call into question whether its gains are fairly distributed among all economic agents: individuals, organizations, nations, and regions (Intriligator 2004). This process of internationalization has also led to the strong interdependence of economies, including the transmission of local or regional cyclical fluctuations across borders. Globalization is conducive to the dynamic development of services thanks to a knowledge-based economy, but it slows the development of the industrial sector. It also pushes national economies into the background (Mrak 2000). All of the aforementioned problems create specific conditions under which the modern state operates, and the state as an institution has to face new challenges.

Future shocks, which in the 1970s were observed by Alvin Toffler (1970), resulted from rapid technological development. In contrast, increasing consumerism has become a part of societal life and an inherent feature of modern economies, entailing serious economic and social consequences. Psychophysical barriers related to the increasing inability of human beings to accommodate and adapt to rapid transformation are growing. Problems of knowledge absorption can potentially create situations where an unadjusted and unprepared society faces difficult moral and intellectual choices.

The rapid development of information and communication technologies, globalization, the dominance of the service sector over manufacturing, and the growing importance of knowledge (itself an independent factor of production) all generate new conditions for the functioning of the market economy (Noland, Park & Estrada 2012). A post-industrial period of scientific and technological revolution is changing the composition of economic forces. The triad model (households, businesses, and the state) in the new environment is complemented by economic agents whose importance changes the traditional balance on the social and economic stage.

Deepening processes of integration and regionalization and, consequently, the increasing role and importance of institutions and supranational organizations weaken nation-states. Transnational corporations have power over consumers, but also to some extent over the state apparatus (Bremmer 2010). Globalization dethrones the state and a majority of its tasks are acquired by transnational corporations (*Leviathans*… 2005, Herkenrath & Bornschier 2003).

Decentralization as a process of redistributing or dispersing the functions and powers of the state is becoming a common phenomenon in the modern world. This process assumes that the competence and ability to act are attributed primarily to social actors, in other words, non-governmental organizations.

The changing role and importance of economic agents reduces the role of the state in some aspects and reorganizes its activities. In other areas, the state itself relinquishes its rights to other economic agents. The control of economic policy is no longer the exclusive domain of the state, especially as regards monetary policy.

It is also necessary to consider the supranational and worldwide legal order and the role of the state in such structures, especially the process of internationalization of supranational interests and private-sector interests, mainly financial. The creation of new infrastructure on a global level entails formulating strong national foundations. Transition from a national to a global order requires careful analysis of the place and importance of the state in the market economy and its special role in protecting property and intellectual property rights.

The dynamic development of civilization over the past few decades has changed our understanding of the social and economic role of the state. In terms of turbo capitalism, which has accelerated social and economic changes within the scope of social expectations, a closer relationship with the world economy has taken place. The growing role of transnational corporations along with increasingly close vertical and horizontal integration has led to a loss of some part of national sovereignty and changed the perception of the traditional role of states in social and economic life.

The modern state is also involved in many new contradictions. On the one hand, globalization, the growing role of supranational institutions such as the IMF, WTO or World Bank (Stiglitz 2002), and the importance of transnational organizations reduce the role of the state and significantly weaken its strength as an economic agent (Rodrik 2009, Tonnaer 2013). On the other hand, the state is still a special participant in economic life: it acts as the organizer of the legal and institutional order and also as a buyer and producer. The state seems to be the only entity which can effectively limit the destructive operations of other economic actors and ensure social and economic equilibrium. However, the difficulties with how the state functions in turbulent times necessitate changing its place and role because, at the very least, its tasks are mismatched. In many cases, national institutions indicate weaknesses in the realization of social goals – evidenced by citizens' lack of economic security and the progressive polarization of incomes. Additionally, intergenerational responsibility remains a very important issue. New processes weaken the institution of the state and its interventionist tools. Meanwhile, the need for a strong state should be indisputable, since state weakness can undermine the protection of

societal interests. New phenomena are changing the nature of the state and necessitate a redefinition of the state and its role and tasks.

It is also worth mentioning that the history of the greatest crises shows that they are preceded by antisocial behaviour on the part of economic agents. George Ackerlof and Robert Shiller, Nobel Prize winners in the economic sciences, have pointed to a wide range of antisocial behaviours. These derive from animal instincts and understanding them can allow us to better comprehend the modern economy and the behaviour of public and private agents, including the state, which is not an impartial institution because it is managed by people (Akerlof & Shiller 2009).

It is impossible to mention all the challenges facing the modern state. Some are constant and their importance and influence can be observed over decades, while the importance of others is changing rapidly. Finally, it is worth mentioning some of the most urgent and imminent challenges for the modern state: the erosion of trust in institutions, climate change, the growing number of military conflicts, and migration.

The financial crisis of 2008 was a systemic crisis related to the breakdown of the neoliberal model of capitalism. This crisis was a symptom of a larger erosion of the contemporary capitalist system and its main institutions (Colander *et al.* 2009, Kołodko 2010, Lawson 2009, Petras & Veltmeyer 2012, Posner 2009). This erosion is caused by several modern phenomena. Most important among them is the economic potency of "big players", especially transnational corporations and capital groups on one hand, and transnational organizations such as the WTO, World Bank, and OECD on the other. These institutions are public and private, so their goals have to be different because they represent different interests. Additionally, climate problems seem to be increasingly important and can only be solved at the international level. Military conflicts likewise do not only have a regional impact but influence many actors (states, international organizations) and cause anxiety and uncertainty in many markets.

One of the challenges of the modern state is its future evolution. This is because it is not just the working conditions of the state, but the state itself, which is constantly changing. In the traditional model (following the views of Napoleon and Hegel), the state and its civil servants are all-wise and all-powerful and should therefore decide what is best for the society as a whole. An extreme example of such a model was communism, which proved to be inefficient. The solution was state withdrawal from the market and the transfer of its prerogatives to the private sector and free market. This point of view was wrong, too, because people forgot that only the state

could guarantee the free market and respect for the law, standards, and contracts (Fukuyama 2004). Nowadays, the power of the state does not derive from administrative excellence and a perfect system of hierarchy and supervision. It derives from the ability to solve problems for civil society and entrepreneurs (Goldsmith & Eggers 2004). A different perspective on the future of the state is presented by Micklethwait & Wooldrige (2015). The authors of *The Fourth Revolution* warn decision-makers and societies that if the state is not radically reformed and reduced, then Western democracy could suffer and the role of more innovative authoritarian regimes, notably in Asia, could increase.

Alternatively, Martinez (2009) describes how the flawed myth of the "invisible hand" distorted our understanding of how modern capitalist markets developed and actually worked. Martinez draws from history to show that political processes and the state are not only instrumental in making capitalist markets work but that there would be no capitalist markets or wealth creation without state intervention.

Such differences in how the future role of the state is perceived have led to many problems and therefore challenges. In the past, decision-makers and societies had a choice between a strong or a weak state. But both these concepts fail to explain current economic problems and seem to be wrong when thinking about the future. Also noteworthy is Tanzi's book, *Government versus Markets: The Changing Economic Role of the State* (2014). It addresses the fundamental question of what governments should do, or have attempted to do, in economic activities in past and recent periods, and also speculates on what they are likely or may be forced to do in future years. The investigation assembles a large set of statistical information that should prove useful to policy-makers and scholars in the perennial discussion of government's optimal economic roles. It has become an essential reference work on the analytical borders between the market and the state in the future.

4. Conclusions

The modern world is changing rapidly. Many new factors are influencing the conditions under which the state functions, and the modern state exemplifies many contradictions. Additionally, contemporary economics is unable to keep pace with a rapidly-changing environment and immediately react when new challenges appear. But the state is stable, and because of its tasks and functions, is the most important and crucial economic agent.

It is also the institution which can successfully influence other agents by regulating different social and economic spheres. Thus, the need for a strong state should be indisputable, since state weakness can undermine the protection of a society's interests. New solutions for modern states should, on the one hand, include a plan of action for market failures and, on the other, counteract institutional imperfections, especially public ones. Therefore, measures are necessary which can help to identify these factors and strengthen the state's position. The adopted solutions should comply with macroeconomic stabilization, which has to be accompanied by microeconomic and institutional policies focused on correcting failures in the market mechanism. Properly operating public institutions create a structure of incentives that are conducive to raising national competitiveness.

The new approach to the tasks of the state should respect the new challenges of the era. The state, in turn, should be equipped with new tools. A modern and efficient state has to be able to adapt to complex challenges in an unstable, global world. Therefore, the economic, political, social, and ecological dimensions must be taken into account.

This article is a contribution to the general debate on the challenges facing the modern state and the tools at its disposal. A change in the traditional perception of the role of the state in the economy is necessary. On the one hand, the volatile and changeable environment determined by dynamic social and economic processes requires a new definition of the state's place in the economy and a new specification for its tools. On the other hand, economists are unable to explain all the processes taking place in the modern economy and to define the role of state and exemplify its tools.

During the past few decades, we have observed fluctuations in how the role of the state in the economy is understood. Many theories have been created and implemented, and while some of these have helped to combat depression and stagnation in particular periods of economic history, none are universal or provide the right tools over longer periods. These theories are not able to predict the role of the state in future – they can only adapt to the present economic situation.

In order to find adequate and efficient tools, it is necessary to identify areas in which the state's intervention seems to be necessary. It is impossible to identify and describe all the factors influencing the role of the modern state, and that is not the aim of this article. Very often, the wide variety of factors does not allow one to draw clear conclusions, or the right ones.

Therefore, this article briefly describes the main challenges. It concludes that the current role of the state has to be redefined and that the traditional tools used by monetary and fiscal policy are at the very least insufficient.

Bibliography

Acemoglu, D., Johnson, S. and Robinson, J. (2001) "The Colonial Origins of Comparative Development: An Empirical Investigation". *American Economic Review* 91 (5): 1369–1401, https://doi.org/10.1257/aer.91.5.1369.

Acemoglu, D., Johnson, S. and Robinson, J. (2004) *Institutions as the Fundamental Cause of Long-run Growth*. NBER Working Paper 10481. Cambridge: National Bureau of Economic Research, http://www.nber.org/papers/w10481.pdf (accessed: 10 May 2019).

Akerlof, G. and Shiller, R. (2009) *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism*. Princeton: Princeton University Press.

Bloom, E. D. and Williamson, G. J. (1998) "Demographic Transition and Economic Miracles in Emerging Asia". *The World Bank Economic Review* 12 (3): 419–55, https://doi.org/10.1093/wber/12.3.419.

Bremmer, I. (2010) "The End Of The Free Market: Who Wins the War between States and Corporations?". *European View* 9 (2): 249–52, https://doi.org/10.1007/s12290-010-0129-z.

Chang, H. (2010) *23 Things They Don't Tell You about Capitalism*. London: Allen Lane.

Colander, D., Goldberg M., Haas, A., Juselius, K., Kirman, A., Lux, T. and Sloth, B. (2009) "The Financial Crises and the Systematic Failure of the Economics Profession". *Critical Review* 21 (2): 249–67.

Daoud, A. (2011) *Scarcity, Abundance and Sufficiency. Contributions to Social and Economic Theory*. Göteborg Studies in Sociology 46. Göteborg: University of Gothenburg.

Dunning, J. H. (1992) "The Global Economy, Domestic Governance, Strategies and Transnational Corporations: Interactions and Policy Implications". *Transnational Corporations* 1 (3): 7–45.

Friedman, M. and Friedman, R. (1989) "The Tide in the Affairs of Men" in A. Anderson, D. L. Bark (eds) *Thinking about America: The United States in the 1990s.* Stanford: Hoover Institution Press.

Fukuyama, F. (2004) *State-building: Governance and World Order in the 21st Century*. New York: Cornell University Press.

Hall, R. E. and Jones, Ch. I. (1999) "Why Do Some Countries Produce Much More Output per Worker than Others". *The Quarterly Journal of Economics* 114 (1): 83–116, https://doi.org/10.1162/003355399555954.

Herkenrath, M. and Bornschier V. (2003) "Transnational Corporations in World Development – Still the Same Harmful Effects in an Increasingly Globalized World Economy?". *Journal of World-Systems Research* 9 (1): 105–39, https://doi.org/10.5195/jwsr.2003.246.

Hoover, K. D. (2003) "A History of Postwar Monetary Economics and Macroeconomics" in W. J. Samuels, J. E. Biddle, J. B. Davis (eds) *A Companion to the History of Economic Thought*. Malden: Blackwell Publishing, pp. 411–27.

Intriligator, M. D. (2004) "Globalization of the World Economy: Potential Benefits and Costs and a Net Assessment". *Journal of Policy Modeling* 26 (4): 485–98, https://doi.org/10.1016/s0161-8938(04)00050-x.

Kołodko, G. W. (2010) "Neoliberalizm i światowy kryzys gospodarczy" [Neoliberalism and the world economic crisis]. *Ekonomista* 1: 117–125.

Lawson, T. (2009) "The Current Economic Crises: Its Nature and the Course of Academic Economics". *Cambridge Journal of Economics* 33 (4): 759–77, https://doi.org/10.1093/cje/bep035.

Leviathans: Multinational Corporations and the New Global History (2005) eds A. Chandler, B. Mazlish. Cambridge–New York: Cambridge University Press.

Martinez, M. (2009) *The Myth of the Free Market: The Role of State in a Capitalist Economy*. Sterling: Kumarian Press.

Meiklejohn, R. (1999) *State Aid and the Single Market*. Luxembourg: Office for Official Publications of the European Communities, Lanham, MD, Bernan Associates.

Micklethwait, J. and Wooldridge, A. (2015) *The Fourth Revolution. The Global Race to Reinvent the State*. London: Penguin Press.

Mphalala, D. (2004) "Governing by Network: The New Shape of the Public Sector, by Stephen Goldsmith and William D. Eggers, reviewed by Dumisani Mphalala". *Innovation Journal* 14 (2), article 6.

Mrak, M. (2000) *Globalization: Trends, Challenges and Opportunities for Countries in Transition*. Vienna: United Nations Industrial Development Organization.

Noland, M., Park, D. and Estrada, G. B. (2012) *Developing the Service Sector as Engine of Growth for Asia: An Overview*. ADB Economics Working Paper 320. Manila: Philippines Asian Development Bank.

North, D. C. (1990) *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.

North, D. C. (1991) "Institutions". *Journal of Economic Perspectives* 5 (1): 97–112, https://doi.org/10.1257/jep.5.1.97.

Petras, J. and Veltmeyer, H. (2012) "The Global Capitalist Crisis: Whose Crisis, Who Profits?". *International Review of Modern Sociology* 38 (2): 199–219.

Posner, R. A. (2009) *A Failure of Capitalism: The Crisis of '08 and the Descent into Depression*. Cambridge–London: Harvard University Press.

Rodrik, D. (2009) *One Economics, Many Recipes: Globalization, Institutions, and Economic Growth*. Princeton: Princeton University Press.

Rodrik, D. (2013) *The Past, Present, and Future of Economic Growth*. Global Citizen Foundation Working Paper 1. Cambridge: National Bureau of Economic Research, Global Citizen Foundation.

Roubini, N. and Mihm, S. (2011) *Crisis Economics: A Crash Course in the Future of Finance*. London: Penguin Books Ltd.

Snowdon, B., Vane, H. and Wynarczyk, P. (2005) *Modern Macroeconomics: It's Origins, Development and Current State*. Northampton: Edward Elgar Publishing Ltd.

Snowdon, Ch. (2015) *Selfishness, Greed and Capitalism: Debunking Myths about the Free Market.* London: The Institute of Economic Affairs.

Stiglitz, J. E. (2002) *Globalization and Its Discontents*. London: W. W. Norton & Company.

Stiglitz, J. E. (2003) "Globalization and the Economic Role of the State in the New Millennium". *Industrial and Corporate Change* 12 (1): 3–26, https://doi.org/10.1093/icc/12.1.3.
Stiglitz, J. E. (2004) *The Post Washington Consensus*. The Initiative for Policy Dialogue, http://policydialogue.org/files/events/Stiglitz_Post_Washington_Consensus_Paper.pdf (accessed: 25 October 2017).
Tanzi, V. (2009) *The Economic Role of the State before and after the Current Crisis*, http://www.iipf.org/speeches/Tanzi_2009.pdf (accessed: 17 November 2017).
Tanzi, V. (2014) *Government versus Markets: The Changing Economic Role of the State*. New York: Cambridge University Press.
Toffler, A. (1970) *Future Shock*. New York: Bantam Books.
Tonnaer, E. (2013) *The State as a Key Driver of Economic Globalization*. The Globalized World Post Research Paper, www.thegwpost.com (accessed: 28 October 2017).
Vroey, M. de and Malgrange, P. (2011) *The History of Macroeconomics from Keynes's General Theory to the Present.* Paris: IRES, Louvain University and CEPREMAP.
Wakatabe, M. (2009) "Understanding the Evolution of Macroeconomic Thinking since 1717: An International Monetary System Perspective". *The History of Economic Thought* 51 (2): 18–32.
Wray, L. R. (2011) *The Dismal State of Macroeconomics and the Opportunity for a New Beginning*. Levy Economics Institute of Bard College Working Paper 652. Annandale-on-Hudson: Levy Economics Institute.

Abstract

O nowych wyzwaniach współczesnego państwa

Spór ekonomistów dotyczący zakresu interwencji państwa w procesy gospodarcze trwa od dawna. Po okresach dominacji teorii leseferystycznych następuje wzrost znaczenia nurtów promujących aktywny udział państwa w życiu gospodarczym. Teoria ekonomiczna i praktyka gospodarcza, poddawane fluktuacjom, preferują raz jedno, raz drugie podejście. Współczesne państwo działa w coraz bardziej zglobalizowanym, dynamicznym i turbulentnym otoczeniu. Konieczność redefinicji roli państwa wynika z dynamiki współczesnych procesów gospodarczych, zróżnicowania poziomów rozwoju społeczno-gospodarczego czy też wyłaniania się nowych instytucji. Artykuł stanowi głos w dyskusji dotyczącej dylematów związanych z ekonomiczną rolą państwa, a także wskazuje niektóre wyzwania stające przez współczesnym państwem.

Słowa kluczowe: ekonomiczna rola państwa, teoria ekonomii, instytucje, współczesna ekonomia.

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ECONOMIC ACTIVITY AND REPRODUCTIVE BEHAVIOURS IN POLAND*

Abstract

Poland is a country with one of the lowest fertility rates in Europe. Many researchers have attempted to explain the reasons for this state of affairs. In the literature, the situation on the labour market is considered to be one of the determinants of low fertility – difficulty in finding work, job insecurity, and the high expectations of employers vis-a-vis employees. Young people often postpone their decision to become parents in order to receive a better education, find a job, and establish their position on the labour market. Studies on the impact of economic activity on reproductive behaviours have produced ambiguous results, depending on the country. Differentiation is related to the situation on the labour market (employment, wages), institutional support, and the division of roles within the family. In countries with high wages (e.g. Denmark), the unemployment of one parent does not have to limit fertility. In countries with relatively low-wages, the effects of unemployment may contribute to the postponement of parenthood (e.g. Spain). The aim of this paper is to examine the impact of the economic activity of both partners on the chance of having a first child in Poland. The analysis covers the socio-economic characteristics of both partners, such as place of residence, type of relationship, type of household, woman's age, partner's education level, and religiosity. The following hypotheses are tested: (1) the employment of both partners increases the chance of having a first child; and (2) the unemployment of one of the partners decreases the chance of having a first child. To verify these hypotheses, the random effect logit model was used. The data originate from the Social Diagnosis 2003–2013.

Keywords: fertility, reproductive behaviours, economic activity, panel data models, random effect logit models.
JEL Classification: J10, J12, J13, C23.

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1. Introduction

The transformation of reproductive behaviours in Poland shares the general tendencies observed in other European countries. Typical features of the changes in progress include: postponing first births, subsequently leading to the postponing or even lack of further children, postponing births in connection with education, the increasing percentage of cohabitations and LAT relationships (living apart together) as well as the increasing frequency of extramarital births. A particularly disturbing phenomenon is the decreasing level of fertility. Currently, Poland is one of the countries with a fertility rate determined as the lowest among the low (the total fertility rate is 1.3). The long-term maintenance of fertility at such a low level risks entering the so-called the low-fertility trap (Lutz & Skirbekk 2005, Lutz, Skirbekk & Testa 2006), as the changes in the age structure of the population caused by this phenomenon can consequently lead to a situation where the increase in the total fertility rate up to 1.5 becomes very difficult or even impossible.

Demographers tend to consider the observed phenomena within the Second Demographic Transition theory formulated by Lesthaeghe (1991, 2010) and van de Kaa (1987, 1997, 1999). In Poland, the symptoms of the Second Demographic Transition appeared together with the systemic transformation of the 1990s (Lesthaeghe and Surkyn 2004, Speder and Kapitany 2009, Frejka 2008, Kotowska *et al.* 2008, Sobotka 2008). Initially, demographers were rather sceptical about explaining the changes taking place within the Second Demographic Transition, arguing that they resulted mainly from the limitations in daily life that emerged in the wake of the transformation. Over time, however, they began to admit the influence of the combination of determinants of the Second Demographic Transition (see Lesthaeghe and Surkyn 2004). Kotowska and others (2008) claim that the development of post-industrial society in Poland is similar to that taking place in West European countries. What they emphasize, however, is that the main influence on the phenomena in question is the structural ingredient of modernization, which accentuates the significance of economic limitations (see Kurkiewicz 1998). Therefore, of crucial importance are the situation on the labour market, difficulties in combining professional life with family responsibilities, and the high costs of supporting children (see *Nowe wzorce…* 2014). Young people postpone their decision to start a family in favour of gaining employment and establishing their position on the labour market. Additionally, insufficiently developed institutional

support is another factor which undermines the reconciliation of work with family responsibilities.

Fertility decline is also considered in the context of the New Home Economics formulated by Becker (1960, 1981, 1990). Becker points to the influence of two factors in explaining the transformation of reproductive behaviour – the income effect and the price effect. The income effect means that with the increase of family income (usually associated with a higher level of education) one should expect an increase in demand for children who, according to Becker's theory, are treated as goods. In fact, the decline in fertility coincided with an increase in income. Becker put this phenomenon down to the "quality" of the child, which depends directly on the spending incurred on his upbringing and education. Hence, higher-income families tend to rather increase the quality of children than to increase their number. The price effect is associated with the opportunity costs of childbearing. These costs are understood as any lost benefits resulting from reproductive decisions. The time that an individual could devote to his or her personal development and paid work is invested in the family. Therefore, people with higher incomes lose more than people with lower incomes. Becker's theory has been formulated for the traditional division of roles within a family – the man provides financial support, while the woman takes care of the house and brings up the children. The increased activity of women on the labour market leads to a conflict between professional and family roles. This conflict can be further exacerbated by insufficient institutional support. Hence, the income effect primarily concerns men, while the price effect mainly concerns women. In the situation where both partners share their family duties, the income effect can also relate to women.

Research on the influence of economic activity on reproductive behaviour was conducted for several European countries. Vignoli, Drefahl and De Santis (2012) analysed Italian couples and showed that the chance of having a first child was higher for couples where both partners had a permanent employment contract than for couples where one of the partners had a temporary contract. E. Santarelli (2011) found that the risk of having a first child was higher in the case of Italian couples with a single breadwinner than in the case of couples where both partners worked. Baizán (2005) showed that couples' behaviour could vary. In the UK and Italy, the chance of having a second child was higher if the man had a permanent job and the woman was inactive (the single breadwinner model) in comparison to couples where both partners had a permanent employment contract (the dual-earner model). In Denmark, however, the chance was higher if

both partners worked. The observed differences are related to, for instance, the different situation on the labour market (employment levels, wages), different institutional support, and cultural determinants.

Research on the relationship between economic activity and fertility in Poland is conducted mainly in the context of female economic activity (see *Strukturalne*… 2009, Matysiak 2009, 2011, Matysiak & Vignoli 2010). The resulting conclusion is that women's employment has no influence on the first birth, but it has a negative impact on second births (Matysiak 2009, 2011, Matysiak & Vignoli 2010). An approach which takes into account the qualities of both partners is not common (see, e.g., Soja 2005, Mynarska 2011, *Nowe wzorce*… 2014). Such an approach is justified as reproductive decisions are made by both partners and it expands knowledge about the conditions of contemporary reproductive behaviours in Poland. According to the research conducted by Mynarska (2011), having a job and a stable position on the labour market are the key factors in the process of making reproductive decisions.

The aim of this paper is to examine how the economic activity of both partners in Poland affects the chance of having a first child. In addition, a secondary aim was set – to identify the factors conducive to the increase in childless families. Therefore, the analysis takes into account the socio-economic qualities of couples, such as place of residence, type of relationship, type of household, woman's age, partners' education level, and religiosity. Taking into consideration the results of previous research, the following hypotheses have been tested: (1) the employment of both partners increases the chance of having a first child; (2) the unemployment of one of the partners decreases the chance of having a first child. To verify these hypotheses, the random effect logit model was used. The data originate from the Social Diagnosis 2003–2013.

2. Description of Data and Variables

The analysis of the influence of couples' economic activity on the chance of having a first child was conducted on the basis of data derived from Social Diagnosis[1]. All the information contained there is of a panel character and refers to numerous aspects of the way households function and the lives of their members. The analysis included couples that participated in at least two rounds of the research. The procedure was as follows: among the childless couples who took part in the research conducted in 2003, those in which the

[1] Date of data download: 23.03.2014.

woman was of reproductive age (15 to 49 years) were selected. Then it was determined whether in the next round of the study (2005) a child was born or not. The couples that participated in the surveys conducted in 2005, 2007, 2009, and 2011 were selected in the same way[2].

Table 1 presents the characteristics of the analysed population structure according to the variables applied in the research.

Considering the aim of this paper, the main explanatory variable was the economic activity of partners. Four models of couples' economic activity were constructed (variable: *economic model of family*): in the first model, both partners are employed; in the second model, the man is employed and the woman is unemployed; in the third model, the man is unemployed and the woman is employed; and in the fourth model, both partners are unemployed. During the period under consideration, relationships in which both partners were working dominated among childless couples. Depending on the round of research, they constituted 65–74% of all childless couples (see Table 1). The profile with the man as the breadwinner of the family accounted for 15–21% of childless couples. The smallest group consisted of couples in which neither partner was employed (less than 10% of couples).

Additionally, the analysis takes into account control variables which, due to the examined phenomenon (the chance of having a first child), are of major importance. These are: education level, place of residence, type of household, type of relationship, religiosity, and woman's age.

The *education level* variable was divided into three levels: primary (basic, lower secondary, basic vocational), secondary (secondary, secondary vocational, post-secondary), and higher. This variable was determined on the basis of information on the level of education completed at the time of the research. In the population structure of the analysed couples according to partner education level, the following regularities deserve attention: an increase in the level of education of women was observed. This reflects the increase in the share of couples in which the woman had higher education. In 2003, such couples accounted for 36%, and in 2011 – 47%. On the other hand, the share of relationships in which the woman had secondary or basic

[2] Determining the actual number of children was only possible for the couples who participated in the 2011 study. Hence, for couples who did not participate in this round of the research, a potential error might have been introduced regarding the actual number of children they have. This situation also occurred in a study carried out by Vignoli, Drefahl and Santis (2012). However, the researchers noticed that they were analysing women at a relatively young age (16–49 years), the mortality of newborns and children was very low, parenting and leaving the family home were deferred, and hence the potential error was probably irrelevant (see Vignoli, Drefahl & Santis (2012, pp. 49). A similar approach is therefore adopted in the paper.

Table 1. Structure of Childless Couples

Variable	Structure of childless couples (%)				
The panel round	2003	2005	2007	2009	2011
Economic model of family					
both partners are employed	65.7	64.7	72.3	67.5	74.4
man is employed and woman is not employed	15.7	19.1	20.5	18.8	15.4
man is not employed and woman is employed	10.8	11.8	2.7	10.7	6.2
neither partner is employed	7.8	4.4	4.5	3	4
Woman's education level					
primary	22.5	19.1	27.7	17.5	18
secondary	41.2	48.5	32.1	37.6	35.2
higher	36.3	32.4	40.2	44.9	46.7
Man's education level					
primary	43.2	42.6	39.3	36.8	32.2
secondary	28.4	32.4	33	35	33.9
higher	28.4	25	27.7	28.2	33.9
Place of residence					
urban	65.7	63.2	61.6	64.1	59
rural	34.3	36.8	38.4	35.9	41
Type of household					
single-family	53.9	55.9	54.5	66.7	60.8
multifamily	46.1	44.1	45.5	33.3	39.2
Type of relationship					
marriage	96.1	89.7	83.9	81.6	79.3
cohabitation	3.9	10.3	16.1	18.4	20.7
Woman's religiosity					
religious	48	44.1	48.2	35.9	34.8
averagely religious	16.7	16.2	21.4	26.1	24.2
irreligious	28.4	27.9	25	30.8	34.8
undisclosed	6.9	11.8	5.4	7.2	6.2
Man's religiosity					
religious	36.3	29.4	34.8	30.8	24.7
averagely religious	24.5	22.1	28.6	26.1	26
irreligious	33.3	32.4	25.9	34.1	33.9
undisclosed	5.9	16.1	10.7	9	15.4

Table 1 cnt'd

Variable	Structure of childless couples (%)				
The panel round	2003	2005	2007	2009	2011
Woman's age					
15–24	20.6	14.7	13.4	15.8	10.6
25–29	41.2	38.2	34.8	35	37.4
30–34	6.9	16.2	23.2	25.6	23.8
35–39	7.8	11.8	10.7	8.1	12.8
40–44	8.8	7.3	3.6	7.4	10.1
45–49	14.7	11.8	14.3	8.1	5.3
N	102	68	112	234	227

Source: author's own elaboration.

education decreased. Until 2005, couples in which the woman had secondary education, and since 2007, couples in which the woman had a university degree, were dominant. Taking into account the man's level of education, an increase in the percentage of childless couples in which the man had secondary or higher education was observed, with a simultaneous decline in the share of couples in which the man had primary education (from 43% in 2003 to 32% in 2011). Except for the last panel (2011), couples in which the man had basic education were dominant.

For the *place of residence* variable, two levels were distinguished: rural and urban areas. Most of the childless couples lived in towns and cities, but their share decreased from 66% in 2003 to 59% in 2011.

The *type of household* variable was divided into two levels: the single--family household and the multifamily household. In the period under consideration, childless couples living in single-family households were dominant. They constituted from 54% to 67%, depending on the survey round.

For *the type of relationship* variable, two states were distinguished: marriage and cohabitation. There was a significant increase in the share of childless couples cohabiting. In the second round of the research, they constituted 4% of couples, while by 2011 this figure had risen to 21%. Nevertheless, marriage was still the dominant type of relationship.

The *religiosity* variable was divided into four groups: religious, averagely religious, irreligious, and undisclosed. When analysing the structure of childless couples with respect to the religiosity of partners, attention was paid to the decline in the share of couples in which both the man and the

woman were religious in favour of an increasing share of couples in which partners were averagely religious or irreligious. In the male population, the scope of change was greater.

Let us now turn to the structure of couples in relation to the *woman's age* in childless couples. In the period under consideration, the largest group were couples in which the woman was aged from 25 to 29 years. Their share, however, gradually decreased from 41% in 2003 to 37% in 2011. A decrease in the share was also recorded in two extreme age groups, i.e. in the youngest, aged 15–24 years, and in the oldest, aged 44–49 years. On the other hand, the share of couples in which the woman was aged 30–34 or 35–39 years increased.

The use of panel data made it possible to analyse the dynamics of processes. Therefore, a time variable (*year*) was introduced, indicating the time at which individual research rounds were conducted (2003, 2005, 2007, 2009, and 2011).

3. Model

The birth of a child is an event to which two states can be ascribed – it either occurred or it did not. Hence, we are dealing with a binary variable, for the modelling of which a special class of models is used. In the literature on the subject, various specifications can be found for the binomial variable model (see, e.g. Baltagi 2005, *Mikroekonometria*… 2012, Maddala 2006). In the presented case, the latent variable $y_i^* (i = 1, 2, \ldots, n)$ is used, which reflects the tendency or ability of an individual to make a decision y_i. If the tendency y_i^* is positive, we observe $y_i = 1$, and in other cases we observe $y_i = 0$, which is written as:

$$y_i = \begin{cases} 1, \text{ if } y_i^* > 0 \\ 0, \text{ if } y_i^* \leq 0 \end{cases}. \tag{1}$$

It is assumed that the latent variable y_i^*, which is the object of modelling, is a function of explanatory variables:

$$y_i^* = x_i \beta + u_i, \tag{2}$$

where $x_i = (1, x_{1i}, x_{2i}, \ldots, x_{ki})$ is a covariate vector, $\beta = (\beta_0, \beta_1, \beta_2, \ldots, \beta_k)^T$ is a vector of parameters and u_i is the error distributed by the standard logistic distribution which leads to the logit model or distributed by the standard normal distribution which leads to the probit model. As in the empirical part

of the paper, a logit model was used. From this moment we assume that that error term has the standard logistic distribution.

Marginal effects can be used to interpret the results[3]. They are equal for the logit model:

$$\frac{\partial p_i}{\partial x_{ji}} = \beta_j \frac{\exp(x_i\beta)}{[1+\exp(x_i\beta)]^2} = \beta_j p_i (1 - p_i), \tag{3}$$

where $p_i = \frac{\exp(x_i \beta)}{1+\exp(x_i \beta)}$ is the probability of taking the value 1 by the explained variable.

Because $p_i(1-p_i) > 0$ a sign of β_j shows the direction of the influence of variable x_{ji} on the explained variable as follows:

– if $\beta_j > 0$ then, if x_{ji} increases by (one) unit, then the probability that the explained variable will take the value 1 increases;

– if $\beta_j < 0$ then, if x_{ji} increases by (one) unit, then the probability that the explained variable will take the value 1 decreases.

The specification (1), (2) is used to define the model for panel data. This is done by introducing the individual effects α_i into the model and adding the second dimension *t*. Therefore, the binominal variable model for panel data is written as (see, e.g., *Mikroekonometria*… 2012):

$$y_{it}^* = x_{it}\beta + \alpha_i + u_{it} \tag{4}$$

$$y_{it} = \begin{cases} 1, \text{ if } y_{it}^* > 0 \\ 0, \text{ if } y_{it}^* \leq 0 \end{cases}, \tag{5}$$

where:

$i = 1, 2, \ldots, N$ – individual dimension,
$t = 1, 2, \ldots, T$ – time dimension,
y_{it}^* – latent variable,
y_{it} – dependent variable,
x_{it} – covariate vector,
u_{it} – error term,
β – vector of parameters.

Treating individual effects α_i as fixed (assuming that objects differ and these differences are constant over time and are not accidental) leads to the fixed effects logit model, while treating them as random variables gives the

[3] The odds ratio can also be used (see, e.g., *Mikroekonometria*… 2012).

random effects logit model. The conditional maximum likelihood is used to estimate parameters of the fixed effects logit model, whereas to estimate parameters of the random effects logit model the maximum likelihood is used. The necessity of applying the conditional maximum likelihood causes the fixed effects logit model to have some disadvantages. Firstly, the conditional likelihood function, with any number of periods ($T > 1$), creates a product of conditional likelihood functions only of those individuals for which the value of the dependent variable has changed at least once. Secondly, explanatory variables constant over time are not included. Moreover, it is not possible to estimate individual effects. Therefore, it is not possible to calculate the probability of taking the value 1 or 0 by the explained variable. The random effects logit model does not have such limitations, but a strong assumption of independence of individual effects from explanatory variables should be made[4]. The disadvantages of the fixed effects logit model meant that it was not used in the empirical part of this paper.

4. Results

When constructing the models, various sets of explanatory variables were taken into account. The final set of explanatory variables was determined by the substantives considerations and the Akaike information criterion (AIC).

The obtained results indicate that couples in which the man is the breadwinner are less likely to give birth to a first child when compared with couples in which both partners work. When analysing the relationship between economic activity and fertility, A. Matysiak (2009) formulated the view that women are characterized by an unobserved tendency to have a job before the birth of a child. What is striking is the result obtained for couples in which the woman is the breadwinner (the man is unemployed, the woman is employed) and for couples in which neither partner works. The probability of having a child for such couples does not differ statistically significantly from the probability for couples in which both partners work. In terms of economic conditions, one could assume that such couples treat the lack of work as a temporary state or can rely on some kind of external support. Other explanations (e.g. having a child to satisfy parental feelings) require additional research.

[4] More about the models can be found in e.g. Baltagi (2005) and *Mikroekonometria*… (2012).

Table 2. Estimation Results

Variable	The random effects logit model		
	estimate	*p*-value	standard error
Economic model of family			
both partners are employed (ref.)			
man is employed and woman is not employed	–0.684**	0.018	0.289
man is not employed and woman is employed	–0.075	0.841	0.375
neither partner is employed	–0.211	0.671	0.497
Place of residence			
rural (ref.)			
urban	–0.013	0.956	0.231
Type of household			
single-family (ref.)			
multifamily	0.460*	0.055	0.240
Type of relationship			
marriage (ref.)			
cohabitation	–1.579***	0.000	0.372
Man's religiosity			
religious (ref.)			
averagely religious	–0.327	0.191	0.250
irreligious	–0.297	0.239	0.252
undisclosed	–0.143	0.651	0.317
Woman's age	–0.135***	0.000	0.023
Woman's education level			
primary (ref.)			
secondary	0.345	0.251	0.301
higher	0.793**	0.013	0.321
Year			
2003 (ref.)			
2005	0.584	0.191	0.446
2007	0.844**	0.028	0.384
2009	1.192***	0.001	0.359
2011	0.823**	0.027	0.372
lnL	–367.036		
Rho	0.014		
AIC	766.072		
N	743		

Notes: $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Source: author's own elaboration.

Taking into account the *place of residence* variable, the probability of having a first child for couples living in rural areas is not statistically different from the probability of having a first child for couples living in urban areas. This means that place of residence (urban or rural) does not differentiate the reproductive behaviours of childless couples, although in older generations such a differentiation did occur, as evidenced by the results of the analysis conducted by B. Osiewalska (2015)[5], who showed that couples living in rural areas were less likely to remain childless than couples living in urban areas.

The probability of having a first child for couples living in multifamily households is higher compared to couples living in single-family households. It can be assumed that couples in multifamily households that can rely on direct help from other family members are more likely to decide on having a first child.

In the case of the *type of relationship* variable (marriage, cohabitation), the results showed that the probability of the birth of a first child was lower for cohabiting couples than for married couples. This shows that for childless couples it is important that prior to the birth of a first child their relationship is formal (marital). M. Mynarska and M. Styrc (2014) obtained the same result for childless women intending to have a first child.

In light of the obtained results, it turns out that male religiosity does not differentiate the reproductive behaviours of childless couples. The formation of families in the context of religiosity was considered by, among others, M. Mynarska and M. Styrc (2014). The results they obtained indicate that religiosity is important at the stage of planning parenthood. Its significance changes when it comes to realizing reproductive plans.

The probability of having a first child is significantly related to a woman's age. Some negative connections have been observed – the probability of the birth of a first child decreases with age.

The estimated model indicates that in couples in which the woman has higher education, the probability of having a first child is higher compared to couples in which the woman has primary education. The explanation for this can be formulated in the context of economic conditions. A higher level of education is often associated with better career prospects and these, in turn, may justify the expectation of higher income. According to Becker's theory, an increase in income contributes to an increase in the demand for children, and therefore the obtained results can be interpreted as revealing the income effect. M. Mynarska and M. Styrc (2014) came to similar

[5] The analysis covered the couples in which a woman at the time of the research, i.e. in 2011, was at least 40 years old.

conclusions as regards the connections between education and the intention of having a first child.

The reproductive behaviours of couples can be considered in the context of conditions that occurred in a given calendar period. This approach was made possible by the introduction of the *year* variable into the model. It turned out to be statistically significant. The exception in this respect was the year 2005. Compared to the year 2003, the probability of having a first child was higher in 2007, 2009, and 2011. The conditions that existed in those years had a positive effect on the likelihood of expanding a childless family.

5. Conclusions

The aim of the research was to investigate how the economic activity of partners affects the probability of having a first child. In addition, the goal of the paper was to identify the factors conducive to the execution of the reproductive plans of childless couples. The results obtained allow the following general conclusions to be made:

1. The reproductive behaviours of the analysed couples are varied,

2. This diversity is mainly connected with cultural conditions. In the model, these were expressed by the following variables: place of residence (rural or urban areas), type of household (single- or multifamily), type of relationship (marriage or cohabitation) and religiosity,

3. The economic activity profiles of partners were found to have a significant impact on the expansion of families.

Among the more detailed arrangements for first-order births, the following statements deserve attention:

1. Childless couples in which both partners are employed have a higher chance of a first child than couples in which the man is the breadwinner. When attempting to explain these results, the situation of childless families should be considered. According to research carried out by M. Mynarska and M. Styrc (2014), when planning a first child it is important to achieve a stable financial position. This stability mainly consists of both partners having a job and owning a flat. Having achieved a good standard of living, which gives them a sense of material stability, the couple decide to have their first child. Therefore, both partners being employed is a determinant of first--order births.

2. The place of residence (rural or urban) does not differentiate the reproductive behaviours of childless couples. Having at least one child is desirable for the vast majority of families regardless of where they live.

Similar results regarding older generations (1942–1966) were obtained by E. Soja (2005).

3. The type of relationship significantly differentiates the reproductive behaviour of childless couples. Cohabiting couples are less likely to have a first child compared to couples in formal relationships. This suggests that for childless couples it is important that prior to the birth of a first child they live in a marital relationship. This conclusion is supported by the results of research conducted by M. Mynarska and M. Styrc (2014). The type of relationship is important already at the stage when childless couples are planning parenthood.

4. Living in a multifamily household is conducive to extending a childless family. This is perhaps connected with the lack of experience in caring for and raising a child, with the possibility of benefiting directly from the assistance of other household members who have a child, and also with insufficient institutional support.

5. The insignificant impact of a man's religiosity supports the view expressed above that having at least one child is desirable for the vast majority of families. The structure of couples according to religiosity shows that both partners have a similar level of religiosity. Thus, one can assume that the religiosity of one of partners reflects the religiosity of the family.

6. The higher a woman's level of education, the more positively it affects the chance of having a first child. This result can be explained in reference to Becker's economic theory of households. The higher the level of education, the higher the potential earnings. Thus, the impact of the income effect was revealed.

7. The conditions that were present in 2007, 2009, and 2011, in comparison to 2003, favoured the extension of childless families. In the period under consideration, there were changes in the economic sphere that had an impact on the creation and development of families in Poland. Most important in this respect is the situation on the labour market. The analysed years saw a rise in the employment rate and decrease in the unemployment rate.

Summing up, it should be stated that there are no grounds to reject the hypotheses that the employment of both partners increases the chance of having a child and the unemployment of one of the partners reduces that chance. The probability of having a first child is lower for couples in which the man is the breadwinner compared to couples in which both partners work.

The above-mentioned findings on the reproductive behaviours of childless couples with different socio-demographic characteristics enrich our knowledge of the unrecognized conditions underlying the formation of

families in Poland. In addition, they can help formulate recommendations for social policy as regards the creation of conditions on the labour market that would facilitate the reconciliation of work and family responsibilities. The conducted analysis can be the basis for further research on reproductive behaviours, with particular emphasis on the determinants conditioning the formation and extension of families in Poland.

Bibliography

Baizán, P. (2005) "Couples' Career and Fertility. An Event History Analysis of the ECHP Samples of Denmark, Italy, Spain and United Kingdom". Paper presented at the XXV International Population Conference, Tours, France, July 18–23, 2005, http://iussp2005.princeton.edu/papers/51001.

Baltagi, B. H. (2005) "Econometric Analysis of Panel Data". Third edition. Chichester: John Wiley & Sons.

Becker, G. S. (1960) "An Economic Analysis of Fertility" in G. B. Roberts (ed.) *Demographic and Economic Change in Developed Countries*, Universities–National Bureau Committee for Economic Research Conference Series 11. Princeton: Princeton University Press, pp. 209–40.

Becker, G. S. (1976) *The Economic Approach to Human Behavior*. Chicago: University of Chicago.

Becker, G. S. (1981) *A Treatise on the Family*. Cambridge: Harvard University Press.

Becker, G. S. (1990) *Ekonomiczna teoria zachowań ludzkich* [The economic approach to human behaviour]. Warszawa: PWN.

Frejka, T. (2008) "Overview Chapter 5: Determinants of Family Formation and Childbearing during the Societal Transition in Central and Eastern Europe". *Demographic Research* 19 (7): 139–70, https://www.demographic-research.org/volumes/vol19/7/19-7.pdf.

Kotowska, I., Jóźwiak, J., Matysiak, A. and Baranowska, A. (2008) "Poland: Fertility Decline as a Response to Profound Societal and Labour Market Changes?". *Demographic Research* 19 (22): 795–854, https://www.demographic-research.org/volumes/vol19/22/19-22.pdf.

Kurkiewicz, J. (1998) *Modele przemian płodności w wybranych krajach europejskich w świetle drugiego przejścia demograficznego* [Models of Fertility Changes in Selected European Countries in the Light of the Second Demographic Transition]. Zeszyty Naukowe. Seria specjalna: Monografie 131. Kraków: Wydawnictwo Akademii Ekonomicznej w Krakowie.

Kurowska, A. and Słotwińska-Rosłanowska, E. (2013) „Zatrudnienie a pierwsze i drugie urodzenia wśród kobiet w Polsce" [The role of employment status for first and second childbirths of women in Poland]. *Studia Demograficzne* 1 (163): 37–51.

Lesthaeghe, R. (1991) *The Second Demographic Transition in Western Countries: An Interpretation*. IPD Working Paper 12. Brussels: Interuniversity Programme in Demography, https://pl.scribd.com/document/251019867/The-Second-Demographic-Transition-in-Western-Countries-and-Interpretation-by-R-Lesthaeghe-1991-1992.

Lesthaeghe, R. (2010) "The Unfolding Story of the Second Demographic Transition". *Population and Development Review* 36 (2): 211–51, https://deepblue.lib.umich.edu/bitstream/handle/2027.42/79230/j.1728-4457.2010.00328.x.pdf?sequence=1.

Lesthaeghe, R. and Surkyn, J. (2004) "When History Moves on: The Foundations and Diffusion of a Second Demographic Transition". Seminar on Ideational Perspectives on International Family Change. Ann Arbor: Population Studies Center, Institute for Social Research (ISR), University of Michigan, https://sdt.psc.isr.umich.edu/pubs/online/WhenHistoryMovesOn_final.pdf.

Lutz, W. and Skirbekk, V. (2005) "Policies Addressing the Tempo Effect in Low-fertility Countries". *Population and Development Review* 31 (4): 669–720, https://doi.org/10.1111/j.1728-4457.2005.00094.x.

Lutz, W., Skirbekk, V. and Testa, M. R. (2006) "The Low-fertility Trap Hypothesis: Forces that May Lead to Further Postponement and Fewer Births in Europe". *Vienna Yearbook of Population Research* 2006 (4): 167–92, http://www.austriaca.at/0xc1aa500d_0x00144e25.

Maddala, G. S. (2006) *Ekonometria*. Warszawa: Wydawnictwo Naukowe PWN.

Matysiak, A. (2009) "Employment First, Then Childbearing: Women's Strategy in Post-socialist Poland". *Population Studies* 63 (3): 253–76, https://doi.org/10.1080/00324720903151100.

Matysiak, A. (2011) *Interdependencies between Fertility and Women's Labour Supply.* Dordrecht: Springer, https://link.springer.com/content/pdf/bfm%3A978-94-007-1284-3%2F1.pdf.

Matysiak, A. and Vignoli, D. (2010) *Employment around the First Birth in Two Adverse Institutional Settings: Evidence from Italy and Poland*. SPaDE Working Paper 2010/3. Stockholm: Stockholm University, Linnaeus Center on Social Policy and Family Dynamics in Europe.

Mikroekonometria. Modele i metody analizy danych indywidualnych (2012) ed. M. Gruszczyński. Expanded second edition. Warszawa: Wolters Kluwer Polska.

Mynarska, M. (2011) „Kiedy mieć dziecko? Jakościowe badanie procesu odraczania decyzji o rodzicielstwie" [When to have a child? A qualitative study of postponement of childbearing]. *Psychologia Społeczna* 6 (3): 226–40, http://www.spoleczna.psychologia.pl/pliki/2011_3/Mynarska_PS_3_2011.pdf.

Mynarska, M. and Styrc, M. (2014) „Preferencje i ograniczenia. Czynniki determinujące intencje posiadania pierwszego i drugiego dziecka" in A. Matysiak (ed.) *Nowe wzorce formowania i rozwoju rodziny w Polsce. Przyczyny oraz wpływ na zadowolenie z życia*. Warszawa: Wydawnictwo Naukowe Scholar, pp. 54–76.

Nowe wzorce formowania i rozwoju rodziny w Polsce. Przyczyny oraz wpływ na zadowolenie z życia (2014) ed. A. Matysiak. Warszawa: Wydawnictwo Naukowe Scholar.

Osiewalska, B. (2015) "Couples' Socioeconomic Resources and Completed Fertility in Poland". *Studia Demograficzne* 1 (167): 31–60.

Santarelli, E. (2011) "Economic Resources and the First Child in Italy: A Focus on Income and Job Stability". *Demographic Research* 25 (9): 311–36, https://www.demographic-research.org/volumes/vol25/9/25-9.pdf.

Sobotka, T. (2008) "Overview Chapter 6: The Diverse Faces of the Second Demographic Transition in Europe". *Demographic Research* 19 (8): 171–224, https://www.demographic-research.org/volumes/vol19/8/19-8.pdf.

Soja, E. (2005) *Hipoteza Easterlina w świetle zachowań prokreacyjnych generacji urodzonych w latach 1942–1966 w Polsce*. Warszawa: Polskie Towarzystwo Ekonomiczne.
Spéder, Z. and Kapitány, B. (2009) *Ideational Actors and Parenthood. A Gender- and Parity Specific Analysis in a Post-communist Society*. Working Papers on Population 9. Budapest: Family and Welfare, Demographic Institute Hungarian Statistical Office.
Strukturalne i kulturowe uwarunkowania aktywności zawodowej kobiet w Polsce (2009) ed. I. Kotowska. Warszawa: Wydawnictwo Naukowe Scholar.
Van de Kaa, D. J. (1987) "Europe's Second Demographic Transition". *Population Bulletin* 42 (1): 3–24.
Van de Kaa, D. J. (1997) "Options and Sequences: Europe's Demographic Patterns". *Journal of the Australian Population Association* 14 (1): 1–30.
Van de Kaa, D. J. (1999) "Europe and Its Population: The Long View" in D. J. Van de Kaa, H. Leridon, G. Gesano, M. Okólski (eds) *European Populations: Unity in Diversity*. Dordrecht: Kluwer Academic Publishers, pp. 1–49.
Vignoli, D., Drefahl, S. and De Santis, G. (2012) "Whose Job Instability Affects the Likelihood of Becoming a Parent in Italy? A Tale of Two Partners". *Demographic Research* 26 (2): 41–62, https://www.demographic-research.org/volumes/vol26/2/26-2.pdf.

Abstract

Aktywność zawodowa a zachowania prokreacyjne w Polsce

Polska jest krajem o jednej z najniższych dzietności w Europie. Wielu badaczy podjęło próbę wyjaśnienia przyczyn tej sytuacji. W literaturze przedmiotu za jedną z determinant niskiej płodności uznaje się sytuację panującą na rynku pracy – trudności w znalezieniu pracy, niepewność zatrudnienia, wysokie oczekiwania pracodawców wobec pracowników. W związku z tym młodzi ludzie mogą odkładać decyzje o rodzicielstwie na rzecz zdobycia lepszego wykształcenia, znalezienia zatrudnienia i ustabilizowania swojej pozycji na rynku pracy. Badania wpływu aktywności zawodowej na zachowania prokreacyjne dają niejednoznaczne rezultaty w zależności od kraju. Zróżnicowanie związane jest z sytuacją na rynku pracy (poziom zatrudnienia, wysokość płac), wsparciem instytucjonalnym oraz podziałem ról w rodzinie. W krajach o wysokich płacach bezrobocie jednego z rodziców nie musi ograniczać płodności (np. Dania). W krajach o relatywnie niskich płacach wpływ bezrobocia może przyczyniać do odraczania urodzeń (np. Hiszpania). Celem pracy jest zbadanie, jak w przypadku Polski aktywność zawodowa obojga partnerów wpływa na szanse posiadania pierwszego dziecka. W analizie uwzględniono cechy społeczno-ekonomiczne par takie jak miejsce zamieszkania, rodzaj związku, rodzaj gospodarstwa domowego, wiek kobiety, poziom wykształcenia partnerów oraz ich religijność. Weryfikacji poddano następujące hipotezy: (1) Zatrudnienie obojga partnerów zwiększa szanse na posiadanie pierwszego dziecka; (2) Bezrobocie jednego z partnerów zmniejsza szanse urodzenia pierwszego dziecka. Do weryfikacji tych hipotez wykorzystano model logitowy z efektami losowymi. Dane dla populacji polskiej pochodzą z Diagnozy Społecznej 2003–2013.

Słowa kluczowe: płodność, zachowania prokreacyjne, aktywność zawodowa, modele danych panelowych, modele logitowe z efektami losowymi.

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Anna Magdalena Korzeniowska

HETEROGENEITY OF HOUSEHOLDS IN THE EURO AREA, HUNGARY, AND POLAND IN TERMS OF THE USAGE OF FINANCIAL ASSETS AND DEBT ON THE BASIS OF THE HOUSEHOLD FINANCE AND CONSUMPTION SURVEY

Abstract

This article analyses areas where there are differences in household behaviour in selected countries in terms of financial assets and debt held. The author hypothesizes that although the Euro Area countries share a common monetary policy – which defines some of the financial market conditions and activity of financial institutions – the behaviour of households on financial markets differs considerably. The subject of analysis is the structure of financial instruments held by households and the activity of households on financial markets by age and income. The author also analyses the heterogeneity of households using hierarchical cluster analysis, which shows significant diversity in the percentage of households holding financial assets together with debt as well as diversity in the value of the financial products held by them.

Keywords: household finance, financial assets, household debt, distribution of assets.
JEL Classification: D14, D31, E21.

1. Introduction

In order to assess and compare behaviours and the situation of households in the European Union, a specific survey was conducted. Referred to as

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the Household Finance and Consumption Survey (HFCS), it was run in the form of questionnaire research in all the Euro Area countries (wave 1). Additionally, in the second wave, the Survey was completed with new additions to the Euro Area and two other entries – Hungary and Poland. The first wave data were released in April 2013 (Bover *et al.* 2016). The second wave was completed in the autumn of 2016 and only partial data are generally available. In this article only the second wave will be analysed, as the period of data collection was shorter and more organised which allowed greater comparability of results. The other reason is the addition of Poland into the survey. The main aim of the article is to compare the usage of financial instruments by households in different countries as well as entanglement of their financial assets and debt. The author hypothesizes that although the Euro Area countries share a common monetary policy, which defines some of the financial market conditions and activity of financial institutions, the behaviour of households on the financial markets differs.

2. Financial Assets of Households

As stated in the existing research, there are significant differences in asset behaviours between European countries in relation to each other and to the USA (Arrondel *et al.* 2016). Research carried out to date implies that the heterogeneity of household behaviours in asset allocation is indicated, among others, by incomes and differences in intergenerational transfers (Arrondel, Roger & Savignac 2014). It also depends on the economic and institutional environment of households (Arrondel & Savignac 2016, Christelis, Ehrmann & Georgarakos 2015). The same can be said of the latest research. The results of the Household Finance and Consumption Survey show that at least 82% of households in Euro Area countries have financial assets (Table 1), although the share of financial assets in total household assets ranges from 4.6% in Poland to 24.9% in the Netherlands, with 17.8% being the average for the Euro Area. Apart from Poland, the share of financial assets in total household assets is lower by 10% in Slovenia, Greece, Slovakia, Latvia, and Cyprus, and it is higher by 20% in Germany, Belgium, and the Netherlands.

Deposits in credit institutions should be considered the most popular financial instrument as they are held by at least 88.1% of households in Hungary up to 100% in Finland. The second most popular instruments are voluntary pensions and whole life insurance held by 23.6% of households on average, but because this position comprises two different instruments, the interpretation of the results requires further thorough and careful study.

Table 1. Households Holding Financial Assets (% of households)

Type of financial assets	Euro Area	BE	DE	EE	IE	GR	ES	FR	IT	CY	LV	LU	HU	MT	NL	AT	PL	PT	SI	SK	FI
Financial assets	97.2	97.9	99.4	98.8	94.1	74.6	99.6	99.6	93.3	82.7	80.2	97.1	82.8	95.4	99.2	99.8	88.9	96.3	94.6	88.7	100
Deposits	96.9	97.5	99	98.6	93.9	73.9	99.6	99.6	93.2	76.3	78.5	96.7	81.1	95.2	98.6	99.7	82.8	96.1	93.3	88.2	100
Mutual funds	9.4	21	13.1	3.2	3.3	0.5	5.7	8.6	5.9	1.4	0.1	14.6	7.4	7.8	13.3	10	4.2	3	5.6	2	27
Bonds	4.6	7.8	4.2	0.1	4.5	0.3	2.1	1.2	13	0.6	0.3	2.6	7.3	22.4	3.8	4	1	0.7	0.7	0.3	0.9
Shares (publicly traded)	8.8	11	9.6	3.6	13.1	0.8	11	11.7	3.7	20.4	0.8	9	1.3	16.4	8	5.4	3.5	5.7	8	2.1	21.4
Money owed to household	7.9	6.7	13.3	12.4	5.4	3.4	11.7	5	0.9	8.6	8	7.4	9.5	2.9	8.6	8.3	5	9.4	7	5.4	nd
Voluntary pensions/whole life insurance	30.3	44.4	46.3	19.8	10	1.3	24.5	38.5	9.3	19.5	8.9	32	15.3	26	35.3	14.5	51.3	17.2	14	15.5	23.6
Other types of financial assets	7.5	3.4	14.5	3.6	1.5	0.3	2.3	9.9	2.7	1	1	4.4	0.5	2.1	4.1	1.5	2.2	1.5	0.9	3.6	15.8

nd – no data.

Source: HFCS, https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html.

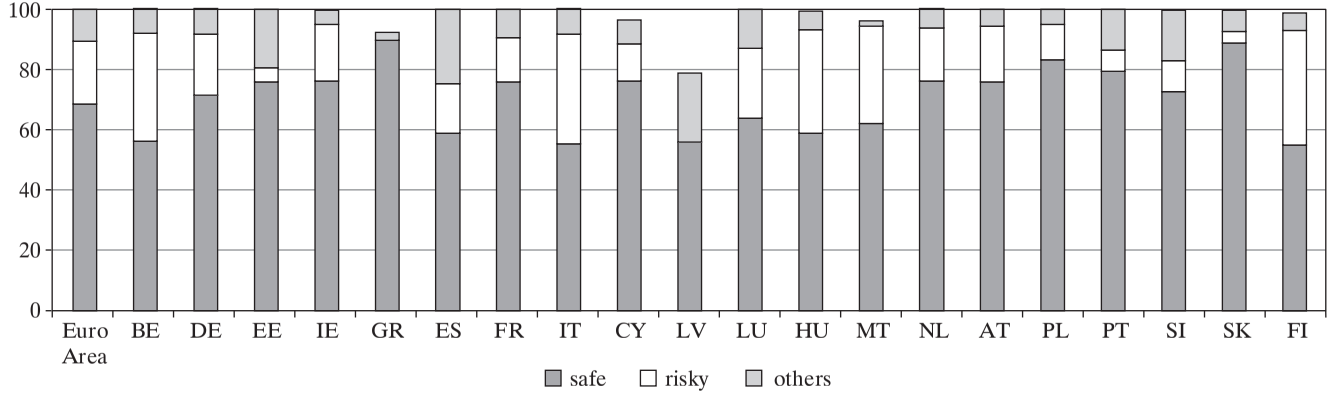

Fig. 1. Share of Financial Assets Types in Total Financial Assets

Note: Where a country's share did not add up to 100%, missing data were observed.

Source: author's own calculations on the basis of the HFCS, https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html.

If the share of financial asset types in total financial assets is taken into consideration, the differences between the analysed countries are more pronounced (Figure 1). Safe financial assets consist of deposits and voluntary pension plans with life insurance contracts, while risky assets include mutual funds, bonds, and shares. In total, 68.7% of household financial assets in the Euro Area is located in safe instruments, 20.8% in risky ones, and 10.5% in others. In the twelve out of the twenty researched countries, more than 70% of the financial assets comprise safe instruments. In Italy, Latvia, and Finland the share of safe assets in total financial assets is the lowest, ranging from 55.3% to 55.8%.

3. Households Debt

In life cycle theory, households tend to stabilise their consumption through the use of credit, topping up their income when the latter is too low – thus allowing consumption to be maintained at its existing level – or by saving and paying off debt in periods when income is higher than that required for satisfactory consumption. But consumers are not always rational in their behaviour (Du Caju *et al.* 2014). It has been shown at the micro level that there are different factors which influence household debt, such as social interactions (Georgarakos, Haliassos & Pasini 2014). There is also some limited research linking debt levels with saving (Kukk 2014).

The HFCS analysed several types of debt: mortgage on household main residence (HMR), mortgage on other properties, credit card debt, credit line/overdraft, and other non-mortgage debt. About 85.8% of household liabilities in the Euro Area is linked to mortgage debt (Figure 2). The highest shares of this type of debt are recorded in Estonia, Ireland, and Portugal.

Within non-mortgage debt, the biggest share is taken up by loans other than credit cards and credit lines/overdrafts.

4. Use of Financial Assets and Debt – a Country Comparison

Both financial assets and debt products are provided to households by financial institutions, mostly banks. Very often a household simultaneously has assets in the form of saving or investments and debt in the form of credits or loans. So, the question arises whether households in different countries become involved in the same way in various financial products. To answer that question, some analyses were undertaken. The first was the

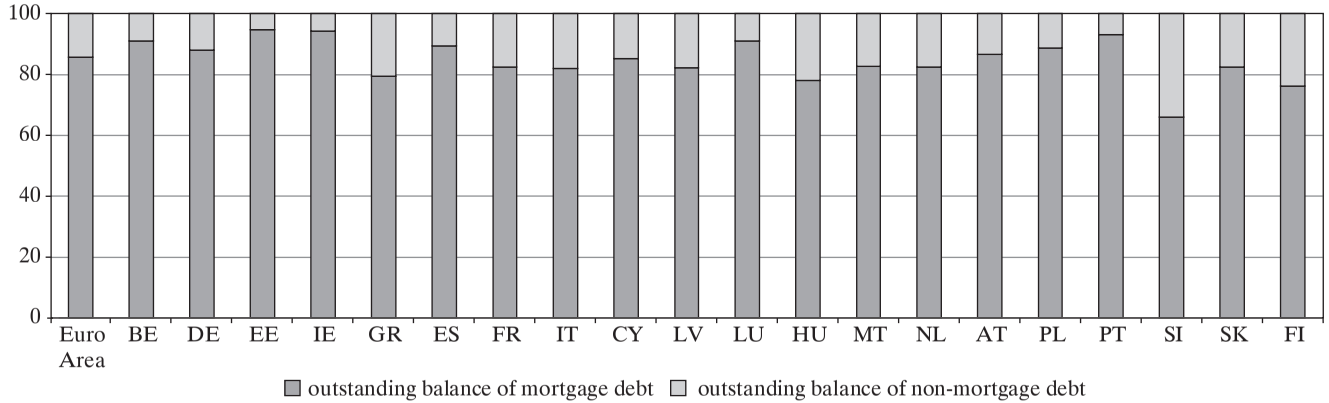

Fig. 2. Share of Debt Types in Total Liabilities

Source: author's own calculations on the basis of HFCS, https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html.

dispersion of the use of financial assets and debt in households, as presented in Figures 3 and 4 (these figures present only selected countries as examples of the general trends).

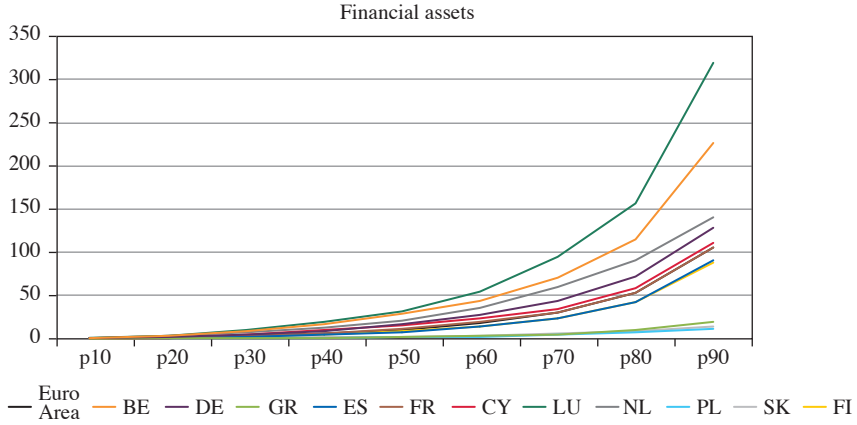

Fig. 3. Dispersion of Financial Assets in Households by Income Level

Source: author's own calculations on the basis of the HFCS, https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html.

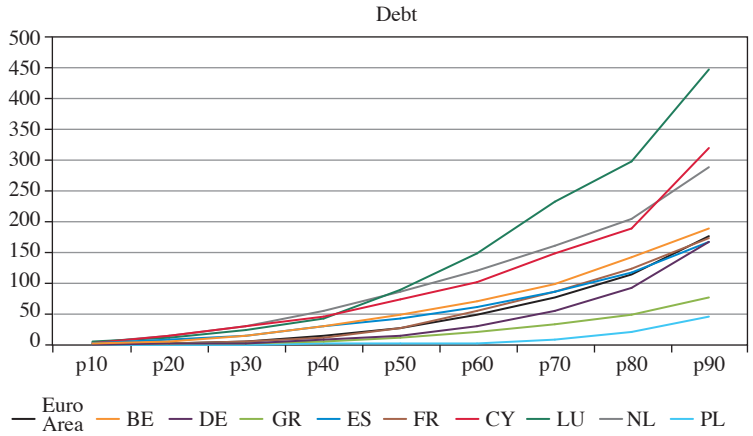

Fig. 4. Dispersion of Debt in Households by Income Level

Source: author's own calculations on the basis of the HFCS, https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html.

As can be seen, there are noticeable differences between households of varying income level in terms of involvement in financial assets. In some countries, such as Greece, Poland or Slovakia, the rise in asset value follows the change in income very slowly, while in others, such as Luxembourg and Belgium, the value of assets grows exponentially with rising household income. In the case of debt, its growth with income is rather linear. Also, the dispersion of debt between households of different income levels is higher and more distinct.

The second analysis refers both to the share of financial assets in total assets and to the value of debt in accordance with respondents' ages and income levels. It was observed that the highest share of financial assets in total assets in eight out of the twenty analysed countries is enjoyed by respondents from the 75+ age group. In three countries (Belgium, Spain, and Cyprus), the highest share of financial assets in total assets is enjoyed by people aged 65 to 74. This is also the case for the youngest respondents in six countries, i.e. Germany, Italy, Austria, Poland, Slovakia, and Slovenia. As for household income, it seems that those households with the highest share of financial assets usually come from the highest earning groups, except in Germany, Ireland, and the Netherlands, where the statement holds true for the group with the smallest income, while in Austria, Cyprus, Belgium, and Malta the other income groups are those most involved.

In contrast to the above, in the case of debt value the most active group in the thirteen countries and in the Euro Area as a whole is people aged 35 to 44. In Belgium, Spain, Malta, and Portugal, even younger groups hold the highest value of debt. And in another three countries, i.e. Germany, Greece, and the Netherlands, the most indebted are 45–54 year-olds. As for income level, only in two countries – Belgium and Cyprus – is most debt accumulated by households in the 80–90% range. In the remaining countries, the most indebted households are those with the highest incomes.

The third analysis gives a direct comparison of countries in terms of the simultaneous use of financial assets and debt by households. This analysis was carried out by means of both dispersion diagrams and dendrograms, which present the concentration of groups of countries.

The dispersion diagram in Figure 5 illustrates the use of both financial assets and debt by percentage of households involved in these products, whereas the diagram in Figure 8 shows the dispersion of countries by the value of financial products actually held. What is worth noting is the fact that the number of households involved in financial products is relatively high both in terms of assets and debt. This is shown by the concentration

of countries in the upper part of the diagram in Figure 5. There are a few exceptions, and these are:

a) Italy, with a lower household preference for debt,

b) Greece, with a significantly lower involvement in both types of financial products,

c) Cyprus, with a clearly higher involvement in debt in relation to financial assets than the average,

d) Poland, Slovakia, Hungary, and Latvia, where the relationship between involvement in assets and debt is similar to the average, although the percentage of households involved in both types of products is lower.

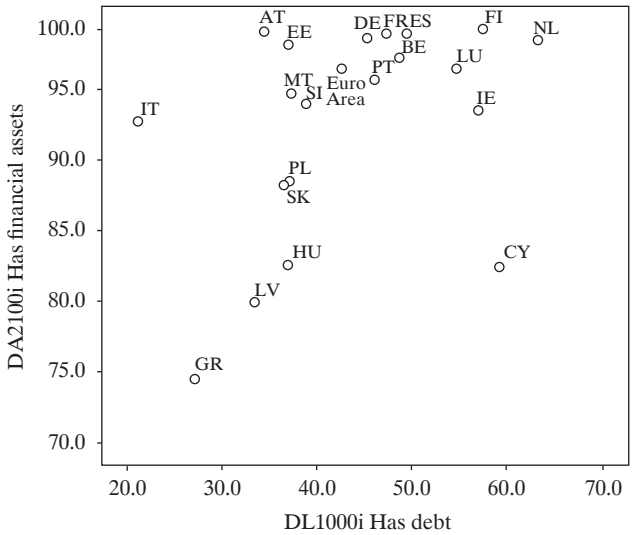

Fig. 5. Dispersion of Countries by Percentage of Households Holding Financial Assets and Debt

Source: author's own calculations on the basis of the HFCS, https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html.

On the other hand, the countries illustrated in Figure 6 are highly concentrated in the lower left-hand corner, which points to similarities in their behaviour in terms of the value of both financial assets and debt. In this case, the exceptions concern:

a) Luxembourg, with households holding very high values of financial assets and debt, while the relation of one to the other maintains a general trend,

b) Cyprus and the Netherlands as well as Finland, Spain, Portugal, and Ireland, where the value of debt in relation to the value of financial assets is higher than the average,

c) Belgium as well as Malta, Germany, and Austria, where the relationship of asset and debt values is the reverse of that in point b).

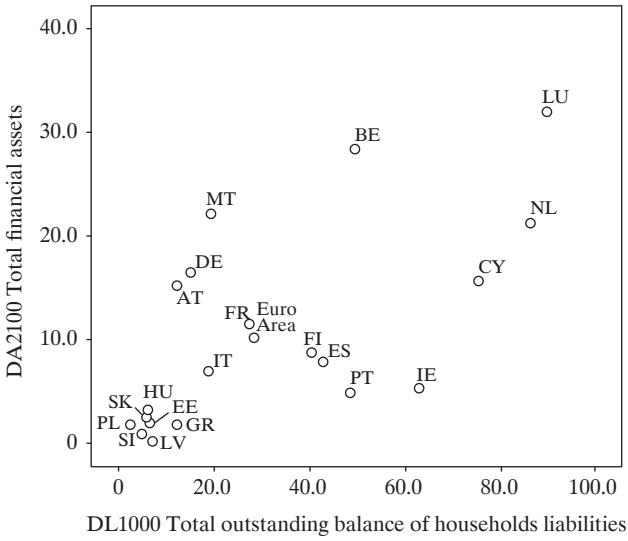

Fig. 6. Dispersion of Countries by Value of Financial Assets and Debt Held by Households

Source: author's own calculations on the basis of the HFCS, https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html.

More accurate research on the heterogeneity of household behaviour in the analysed countries is provided by hierarchical cluster analysis. Dendrograms compiled by the centroid clustering method with square Euclidean distance, with the use of SPSS, are presented in Figures 7 and 8. As in the case of the dispersion diagrams, there are two dendrograms. The first presents the heterogeneity of countries by the percentage of countries holding financial assets and debt, while the second presents the value of both types of products held by households in the countries analysed.

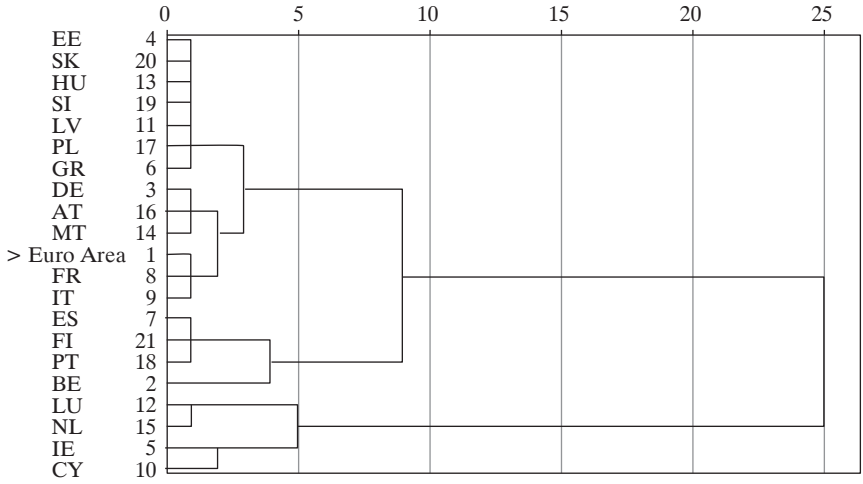

Fig. 7. Clusters by Percentage of Households Holding Financial Assets and Debt (Clusters Combined, Distances Adjusted)

Source: author's own calculations on the basis of the HFCS, https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html.

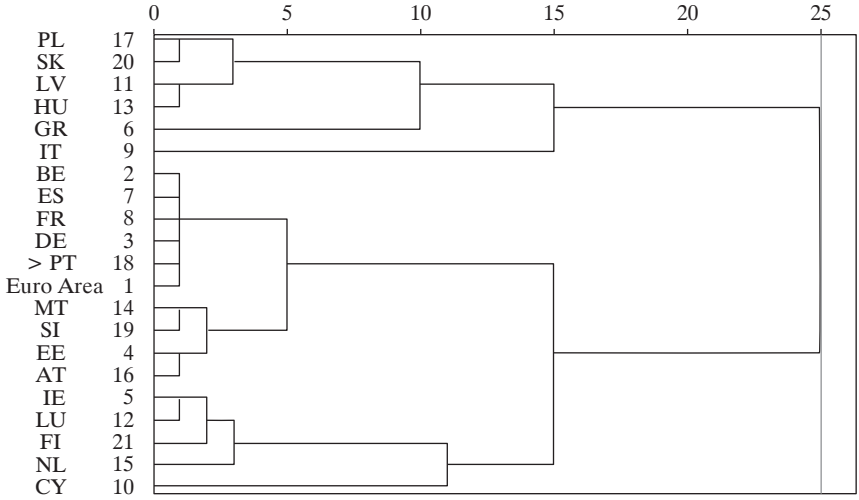

Fig. 8. Clusters by Value of Financial Assets and Debt Held (Clusters Combined, Distances Adjusted)

Source: author's own calculations on the basis of the HFCS, https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html.

In terms of the percentage of households holding financial products, France and Italy seem to be most similar to the average for the Euro Area, although the biggest cluster of countries consists of Estonia, Slovakia, Hungary, Slovenia, Latvia, Poland, and Greece. Close to the average is a group of three countries: Germany, Austria, and Malta. The other group of clusters is more diversified. It consists of a cluster containing three countries: Spain, Finland, and Portugal, which are joined with Belgium. The second part of this group of clusters consists of two two-member groups, the first comprising Luxembourg and the Netherlands, and the second Ireland and Cyprus, but their heterogeneity is higher.

If we analyse the heterogeneity of countries by the value of financial assets and debt held by households, it should be pointed out that the biggest cluster consists of the Euro Area and five countries: Belgium, Spain, France, Germany, and Portugal. At the same time, there are three countries – Greece, Italy, and Cyprus – which are so different from the others that each of them makes up a separate group. We also have a two-country cluster comprising Poland and Slovakia, which at the higher level can be compared with Latvia and Hungary. The same is true of Malta and Slovenia, which connect with the cluster consisting of Estonia and Austria. Finally, there is a two-country cluster of Ireland and Luxembourg, which is joined by Finland and the Netherlands.

5. Conclusions

From the analyses presented above one can draw several conclusions. All of them show that there is distinct heterogeneity between household behaviour on some parts of the financial market. The main differences are in the value and structure of financial assets held by households in particular countries as well as in the value and structure of their debt. The basic distinction is that households from the wealthier countries are more active on financial markets and have more opportunities to invest their money in financial instruments or a broader choice of lending products. However, wealth is not the only factor influencing households behaviour. The heterogeneity in the structure of financial assets and liabilities in the portfolio of households is not strictly correlated with wealth and financial market development. Another area of differences is the relationship between financial assets and debt held by households. The trends presented in the analysis of the percentage of households holding particular products differ considerably from the results of the analysis of the value of assets and debt.

In both cases some regularities can be observed, but they are not the same for the number of households and for the value of instruments. The other field of variation between countries is the ages and incomes of the most active households. These are different for households holding financial assets compared to those with debts, which can be explained by life cycle theory. Nevertheless, it would be interesting to conduct further analysis by focusing on households which hold both types of instruments simultaneously.

The final part of the article presents clusters that show in which countries households behave in a similar way. This, in turn, raises many questions about the sources of similarities and differences, which should be a subject for further research.

Bibliography

Arrondel, L., Bartiloro, L., Fessler, P., Lindner, P., Mathä, T. Y., Rampazzi, C., Savignac, F., Schmidt, T., Schürz, M. and Vermeulen, P. (2016) "How Do Households Allocate Their Assets? Stylized Facts from the Eurosystem Household Finance and Consumption Survey". *International Journal of Central Banking* 2 (12).

Arrondel, L., Roger, M. and Savignac, F. (2014) *Wealth and Income in the Euro Area: Heterogeneity in Households' Behaviours*. Direction Générale des Études et des Relations Internationales.

Arrondel, L. and Savignac, F. (2016) "Households' Real Estate and Financial Asset Holdings: What Differences in Investment Behaviour within the Euro Area?". *Rue de la Banque* 19: 1–2.

Bover, O., Schürz, M., Slacalek, J. and Teppa, F. (2016) "Eurosystem Household Finance and Consumption Survey: Main Results on Assets, Debt, and Saving". *International Journal of Central Banking* 12 (2): 1–13.

Christelis, D., Ehrmann, M. and Georgarakos, D. (2015) "Exploring Differences in Household Debt Across Euro Area Countries and the United States". *Working Papers*, Bank of Canada (2015–16).

Du Caju, P., Roelandt, T., Van Nieuwenhuyze, C. and Zachary, M. D. (2014) "Household Debt: Evolution and Distribution". *Economic Review*, September, 61–80.

Georgarakos, D., Haliassos, M. and Pasini, G. (2014) "Household Debt and Social Interactions". *Review of Financial Studies* 27 (5): 1404–1433, https://doi.org/10.1093/rfs/hhu014.

Kukk, M. (2014). *Distinguishing the Components of Household Financial Wealth: the Impact of Liabilities on Assets in Euro Area Countries.* Eesti Pank. Working Paper Series No. 2.

Abstract

Zróżnicowanie gospodarstw domowych w strefie euro, na Węgrzech oraz w Polsce w zakresie wykorzystania aktywów finansowych i zadłużenia na podstawie Household Finance and Consumption Survey

W artykule przedstawiono analizy koncentrujące się na obszarach, w których występują różnice w zachowaniach gospodarstw domowych w wybranych krajach pod względem posiadania aktywów finansowych i długu. Autorka stawia hipotezę, że chociaż kraje strefy euro mają wspólną politykę monetarną, która określa niektóre warunki rynku finansowego i działalność instytucji finansowych, zachowanie gospodarstw domowych na rynkach finansowych znacznie się różni. Przedmiotem analiz była struktura instrumentów finansowych posiadanych przez gospodarstwa domowe oraz aktywność gospodarstw domowych na wybranych rynkach finansowych z uwzględnieniem ich wieku i dochodów. Autorka przeprowadziła także analizę heterogeniczności gospodarstw domowych za pomocą hierarchicznej analizy skupień, która wykazała znaczną różnorodność odsetka gospodarstw domowych posiadających aktywa finansowe wraz z długiem oraz różnorodność wartości posiadanych przez nie produktów finansowych.

Słowa kluczowe: finanse gospodarstw domowych, aktywa finansowe, zadłużenie gospodarstw domowych, dystrybucja aktywów.

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Marek Walesiak
Marek Obrębalski

COMPARATIVE ANALYSIS OF THE ORDERING OF POLISH PROVINCES IN TERMS OF SOCIAL COHESION

Abstract

The article describes an assessment of the social cohesion of Polish provinces. The assessment was based on classical metric and interval-valued data using a hybrid approach combining multidimensional scaling with linear ordering. In the first step, after applying multidimensional scaling, the objects of interest were represented in a two-dimensional space. In the second step, the objects were linearly ordered based on the Euclidean distance from the pattern object. Interval-valued variables characterize the objects of interests more accurately than do metric data. Classic data are of an atomic nature, i.e. an observation of each variable is expressed as a single real number. By contrast, an observation of each interval-valued variable is expressed as an interval. Interval-valued data were derived by aggregating classic metric data on social cohesion at the level of districts to the province level. The article describes a comparative analysis of the results of an assessment of the social cohesion of Polish provinces based on classical metric data and interval-valued data.

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Keywords: social cohesion, composite indicators, interval-valued data, multidimensional scaling, R software.
JEL Classification: C38, C43, C63.

1. An Overview of Social Cohesion Concepts

Social cohesion is a term which is mainly used in the context of policies conducted by the European Union, the Council of Europe, and OECD. It is frequently invoked in various initiatives and analyses, both in the area of political activities and in research. Assessment of social cohesion is made difficult by the absence of one, unequivocal definition which captures all aspects of this concept. Existing definitions differ in terms of areas of life they focus on, periods they refer to, political ideas they represent, and methods they employ to foster cohesion (*Concerted Development…* 2005, p. 23).

Multi-faceted social cohesion conducted at different levels of territorial organization, including national and regional, is aimed at narrowing spatial development disparities, particularly significant disparities in various social areas. Modern territorial units (e.g. regions) make up a mosaic characterised by varying levels of cohesion. This is clearly confirmed by the results of the 7th cohesion report prepared by the European Commission (*My Region, My Europe, Our Future* 2017). The report refers to three dimensions of cohesion, namely, economic, social and territorial. Each cohesion aspect is defined and measured according to a multi-disciplinary approach.

To track changes in the level of social cohesion across regions, the European Commission also measures social progress. This is defined as "a society's capacity to meet the basic human needs of its citizens, to establish the basis for people and communities to improve and sustain their quality of life and to create the conditions for people to reach their full potential" (*My Region, My Europe, Our Future* 2017, p. 91). In EU practice, one of the indicators used to measure the level of social cohesion is the EU Regional Social Progress Index (EU-SPI). This index comprises three dimensions of social progress (Annoni & Dijkstra 2016, p. 2):

– basic human needs (nutrition and basic medical care, water and sanitation, shelter (housing), personal safety),

– foundations of well-being (access to basic knowledge, access to information and communication, health and wellness, environmental quality),

– opportunity (personal rights, personal freedom and choice, tolerance and inclusion, access to advanced education).

The range of variables taken into consideration in the measurement based on the regional EU-SPI index is a significant example of multi-disciplinary research of social cohesion at the regional level.

The subject literature includes studies describing applications of multivariate statistical methods to measure social cohesion across territorial units at different levels. In the Polish literature, for example, one can mention a study conducted by Balcerzak (2015), which analyzed social cohesion in EU countries based on the development measure proposed by Hellwig (1972). Other studies carried out by Dickes and Valentova (2013), Dickes, Valentova and Borsenberger (2010), and Bottoni (2018) made use of multidimensional scaling, structural equation modelling (SEM), multilevel models, and an aggregate index to measure social cohesion in 47 and 33 European countries, respectively. Rajulton, Ravanera and Beaujot (2007) used the results of factor analysis and standardization to create an aggregate index to measure social cohesion in 49 census metropolitan areas in Canada.

The purpose of this article is to present a comparative analysis of the results of the social cohesion measurement produced for Polish provinces on the basis of classical metric data and interval-valued data. This latter type of data has not been used so far for measuring social cohesion. The assessment of social cohesion in Polish provinces based on these two types of data was conducted by means of a hybrid approach, which combines multidimensional scaling (MDS) and linear ordering to visualize results in a two-dimensional space.

2. Research Methodology

To order objects of interest in terms of their social cohesion, the authors used a two-step procedure proposed by Walesiak (2016), which makes it possible to visualize the results of linear ordering. In the first step, after applying multidimensional scaling, objects of interest are visualized in a two-dimensional space. In the second step, the set of objects is linearly ordered.

The extended research procedure, conducted separately for metric data and interval-valued data, consists of the following steps (cf. Walesiak & Dehnel 2018):

1. Select a complex phenomenon which cannot be measured directly (the level of social cohesion).

2. Select a set of objects and a set of variables (metric and interval-valued), which are substantively related to the complex phenomenon of interest. Add a pattern object (upper pole of development) and an anti-pattern object (lower pole of development) to the set of objects. Identify preference variables (stimulants, destimulants, and nominants) in the set of the variables.

3. Collect data and construct data matrix $\mathbf{X}=[x_{ij}]_{nxm}$ (value of j-th variable for i-th object, $i, k = 1, \ldots, n, j = 1, \ldots, m$) for metric variables or in the form of data table $\mathbf{X}=[x_{ij}]_{nxm}$ $(x_{ij}=[x_{ij}^{l}, x_{ij}^{u}])$, where $x_{ij}^{l} \leq x_{ij}^{u}$) for interval-valued variables. The pattern object (upper pole) includes the most favourable variable values, whereas the anti-pattern (lower pole) – the least favourable values of the preference variables. In the case of interval-valued variables, coordinates are determined separately for lower and upper limits of the interval.

4. Normalize variable values and arrange the data in the form of a normalized data matrix $\mathbf{Z}=[z_{ij}]_{nxm}$ for metric data or in the form of a normalized data table $\mathbf{Z}=[z_{ij}]_{nxm}$ $(z_{ij}=[z_{ij}^{l}, z_{ij}^{u}]$, where $z_{ij}^{l} \leq z_{ij}^{u}, z_{ij}$ – normalized observation) for interval-valued variables. The purpose of normalization is to ensure comparability of variables. This is achieved by removing measurement units from the results and standardizing their orders of magnitude. Interval-valued data require a special normalisation treatment. The lower and upper limits of the interval of j-th variable for n objects are combined to form one vector containing $2n$ observations. This approach enables the application of normalization methods suitable for classic metric data. Metric data were normalized using the `data.Normalization` function, and interval-valued data using the `interval_normalization` function from the `clusterSim` package (Walesiak & Dudek 2018a).

5. Select a distance measure for metric data (Manhattan, Euclidean, Chebyshev, Squared Euclidean, GDM1[1] – see, e.g., Everitt *et al.* 2011, pp. 49–50), calculate distances and create a distance matrix $\boldsymbol{\delta}=[\delta_{ik}(\mathbf{Z})]_{nxn}(i,k=1,\ldots,n)$. Select a distance measure for interval-valued data (Ichino-Yaguchi, Euclidean Ichino-Yaguchi, Hausdorff, Euclidean Hausdorff – see Billard & Diday 2006, Ichino & Yaguchi 1994), calculate distances and create a distance matrix $\boldsymbol{\delta} = [\delta_{ik}(\mathbf{Z})]_{nxn}$.

6. Perform multidimensional scaling (MDS): f: $\delta_{ik}(\mathbf{Z}) \rightarrow d_{ik}(\mathbf{V})$ for all pairs (i, k), where f denotes a mapping of distances from m-dimensional

[1] See Jajuga, Walesiak & Bąk (2003).

space $\delta_{ik}(\mathbf{Z})$ into corresponding distances $d_{ik}(\mathbf{V})$ in q-dimensional space ($q < m$). To enable graphical presentation of results, $q = 2$. Distances $d_{ik}(\mathbf{V})$ are unknown. The iterative procedure implemented in the `smacof` algorithm, which makes it possible to find a configuration $\mathbf{V}$ (given q dimensions) and calculate a distance matrix $d_{ik}(\mathbf{V})$, is described in a work by Borg & Groenen (2005, pp. 204–205). To ensure an optimal procedure of multidimensional scaling, we selected methods of normalising variable values, distance measures, and scaling models according to the procedures (for metric and interval-valued data) available in the `mdsOpt` package (Walesiak & Dudek 2018b), which employ the `smacofSym` function from the `smacof` package (Mair *et al*. 2018). More details about the selection of the optimal procedure of multidimensional scaling can be found in Walesiak & Dudek (2017).

7. Finally, after applying multidimensional scaling, a data matrix in 2-dimensional space $\mathbf{V} = [v_{ij}]_{nxq}$ ($q = 2$) is generated. Depending on the location of the pattern and anti-pattern object in the dimensional scaling space $\mathbf{V} = [v_{ij}]_{nx2}$, the coordinate system needs to be rotated by an angle of φ according to the formula:

$$[v'_{ij}]_{nx2} = [v_{ij}]_{nx2} \times D, \tag{1}$$

where: $[v'_{ij}]_{nx2}$ – data matrix in 2-dimensional scaling space after rotating the coordinate system by an angle of φ,

$D = \begin{bmatrix} \cos\varphi & -\sin\varphi \\ \sin\varphi & \cos\varphi \end{bmatrix}$ – rotation matrix.

The rotation does not change the arrangement of objects relative to one another, but it makes it possible to position the set axis connecting the pattern and anti-pattern, along the identity line, which improves the visualisation of results.

8. Present graphically and interpret the results (of multidimensional scaling – MDS) in a 2-dimensional space. Two points, representing the anti-pattern and pattern, are joined by a straight line to form the so-called set axis in the diagram drawn in the two-dimensional space. Isoquants of development (curves of equal development) are drawn from the pattern point. Objects located between the isoquants represent a similar level of development. The same development level can be achieved by objects located at different points along the same isoquant of development (owing to a different configuration of variable values).

9. Order objects according to the values of aggregate measure d_i based on the Euclidean distance from the pattern object (Hellwig 1981):

$$d_i = 1 - \frac{\sqrt{\sum_{j=1}^{2} (v_{ij} - v_{+j})^2}}{\sqrt{\sum_{j=1}^{2} (v_{+j} - v_{-j})^2}}, \tag{2}$$

where: v_{ij} – j-th coordinate for i-th object in the 2-dimensional MDS space, $v_{+j}(v_{-j})$ – j-th coordinate for the pattern (anti-pattern) object in the 2-dimensional MDS space.

The values of the aggregate measure d_i are included in the interval [0; 1]. The higher the value of d_i, the higher the level of social cohesion of the objects of interest. Target objects are ranked according to the descending values of the aggregated measure (2).

3. Results of the Empirical Study

According to the approach used for the purposes of measuring social cohesion based on the regional EU-SPI index, three dimensions are considered: basic human needs, foundations of well-being, and opportunities. Given this 3-dimensional frame of reference, the social cohesion of Polish provinces was measured using 26 metric variables:

1. Basic human needs (7 variables):

$x1$ – mean monthly wage (in PLN) – stimulant,

$x5$ – total unemployment rate in % – destimulant,

$x9$ – mean useful floor area of a dwelling per inhabitant in m^2 – stimulant,

$x10$ – average number of persons per room – destimulant,

$x11$ – length of the sewerage network in relation to the length of the water supply network in % – stimulant,

$x14$ – number of doctors and dentists per 10,000 of the population – stimulant,

$x25$ – crimes reported (criminal offences, against life and health, and against property) per 10,000 of the population – destimulant.

2. Foundations of well-being (11 variables),

$x12$ – people using water treatment services (% of the total population) – stimulant,

$x13$ – percentage of all dwellings equipped with central heating – stimulant,

$x16$ – children enrolled in day-care centres per 1000 children up to the age of 3 – stimulant,

$x17$ – children enrolled in nursery schools per 1000 children aged 3–5 – stimulant,

$x18$ – students taking obligatory English classes in primary and intermediate schools (% of all students) – stimulant,

$x19$ – number of students per class in secondary schools – destimulant,

$x20$ – members of sports clubs per 1000 of the population – stimulant,

$x21$ – users of public libraries per 1000 of the population – stimulant,

$x22$ – people participating in cultural events (organised by cultural centres and clubs) per 1000 of the population – stimulant,

$x23$ – area of public green space (parks, residential green space) per 10,000 of the population (in ha) – stimulant,

$x24$ – length of district and municipal improved hard surface roads per 10,000 of the population (in km) – stimulant.

3. Opportunities (8 variables):

$x2$ – persons in households (below the income threshold) relying on social assistance per 1000 of the population – destimulant,

$x3$ – age dependency ratio (number of people aged 0–14 and those aged 65 and older per 100 people of working age) – destimulant,

$x4$ – share of women in the labour force in % – nominant (with a nominal value of 50%),

$x6$ – share of young people (up to the age of 25) in the population of registered unemployed in % – destimulant,

$x7$ – share of long-term unemployed (over 12 months) in the population of registered unemployed in % – destimulant,

$x8$ – number of job offers for disabled people per 1000 registered disabled unemployed – stimulant,

$x15$ – places in stationary social welfare facilities per 10,000 of the population – stimulant,

$x26$ – voter turnout in local elections (for municipal authorities and town councils with district rights) in 2014 in % – stimulant.

The statistical data come from the Local Data Bank maintained by the Statistics Poland. The reference year is 2016, except for variable $x26$, which contains data for 2014 (the last local government elections). The $x4$ nominant variable was converted into a stimulant according to the following formula:

$$x_{ij} = -\left| x_{ij}^{N} - \mathrm{nom}_{j} \right|, \tag{3}$$

where: x_{ij}^{N} – value of j-th nominant observed in i-th object, nom_{j} – nominal level of j-th variable.

The purpose of the empirical study was to compare alternative measurements of social cohesion in Polish provinces. In the classical approach, the second part of the measurement procedure was applied to a data matrix consisting of 17 objects (16 provinces and the average

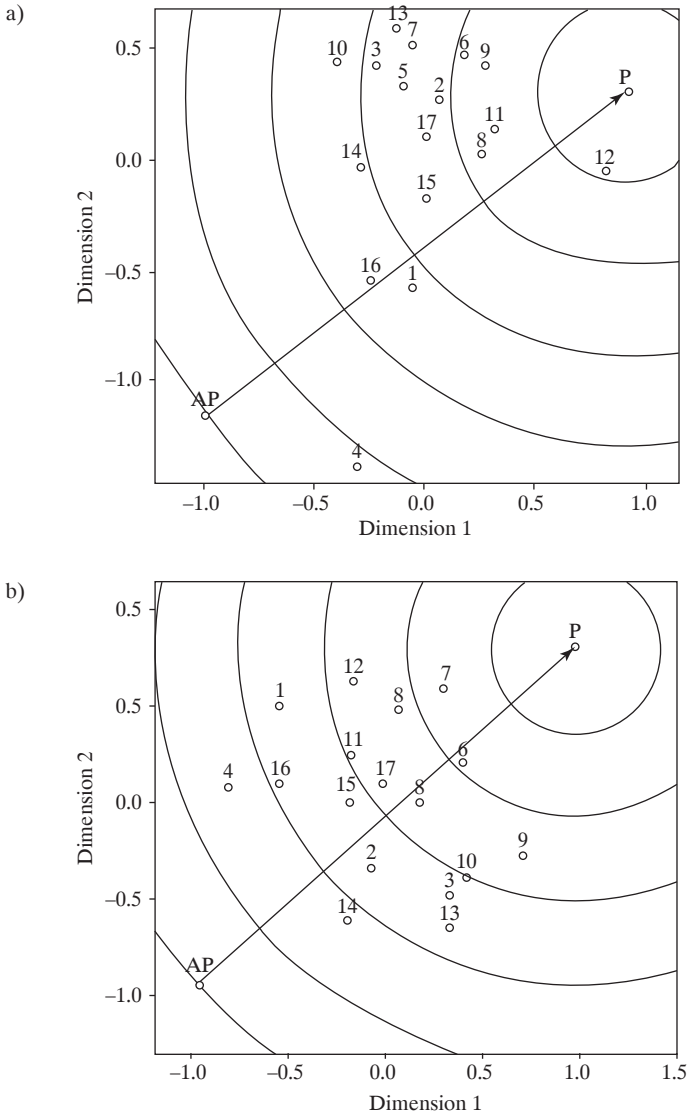
province) described in terms of 26 metric variables. The second approach was based on interval-valued data, which had to be prepared in two steps. First, we collected classical metric data on social cohesion at the district level (380 districts described in terms of 26 variables), which were then aggregated at the province level to obtain interval-valued data. The lower limit of the interval for each variable in the province was obtained by calculating the first quartile based on district-level data. The upper limit was obtained by calculating the third quartile.

For metric data, the optimal scaling procedure was selected after testing 6 normalisation methods (n1, n2, n3, n5, n5a, n12a – cf. Walesiak & Dudek 2018a), 5 distance measures (Manhattan, Euclidean, Squared Euclidean, Chebyshev, GDM1) and 4 MDS models (ratio transformation, interval transformation, and second and third degree polynomial – Borg & Groenen 2005, p. 202), which amounted to a total of 120 procedures of multidimensional scaling. After applying the `optSmacofSym_mMDS` function from the `mdsOpt` R package, the optimal procedure of multidimensional scaling was selected, which uses the normalisation method n2 (positional standardization), the ratio scaling model, and the Manhattan distance.

For interval-valued data, the optimal scaling procedure was selected after testing 6 normalisation methods (n1, n2, n3, n5, n5a, n12a), 4 distance measures (Ichino-Yaguchi, Euclidean Ichino-Yaguchi, Hausdorff, Euclidean Hausdorff) and 4 MDS models (ratio transformation, interval transformation, and second and third degree polynomial), which produced a total of 96 procedures of multidimensional scaling. After applying the `optSmacofSym_mMDS` function from the `mdsOpt` R package the optimal procedure of multidimensional scaling was selected, which uses n2 normalisation (positional standardization), the ratio scaling model, and the Euclidean Hausdorff distance.

Figure 1a shows the results of multidimensional scaling of 17 objects (16 provinces and the average province) in terms of the level of social cohesion in 2016 for interval-valued data, whereas Figure 1b shows the corresponding results obtained on the basis of metric data.

In Figures 1a and 1b, the anti-pattern (AP) object and the pattern (P) object are linked by a straight line, known as the set axis. Six isoquants of development were identified by dividing the set axis into 6 equal parts. A longer distance from the isoquant represents a lower level of social cohesion.



1. Dolnośląskie, 2. Kujawsko-Pomorskie, 3. Lubelskie, 4. Lubuskie, 5. Łódzkie, 6. Małopolskie, 7. Mazowieckie, 8. Opolskie, 9. Podkarpackie, 10. Podlaskie, 11. Pomorskie, 12. Śląskie, 13. Świętokrzyskie, 14. Warmińsko-Mazurskie, 15. Wielkopolskie, 16. Zachodniopomorskie, 17. Average province, AP – anti-pattern, P – pattern

Fig. 1. Results of Multidimensional Scaling of 17 Objects in Terms of the Level of Social Cohesion in 2016: a) for interval-valued data, b) for metric data

Source: calculations performed using R software.

Table 1. Ranking of 16 Polish Provinces and the Average Province, Based on Metric and Interval-valued Data, According to the Level of Social Cohesion in 2016 (Values of Measure d_i)

Province	No.	Interval-valued approach		Classical (metric) approach		Δd_i
		d_i	rank	d_i	rank	
Śląskie	12	0.8473	1	0.5534	6	0.2939
Pomorskie	11	0.7420	2	0.5086	8	0.2334
Podkarpackie	9	0.7313	3	0.5755	4	0.1557
Opolskie	8	0.7082	4	0.6251	3	0.0831
Małopolskie	6	0.6856	5	0.6806	2	0.0050
Kujawsko-Pomorskie	2	0.6472	6	0.4042	13	0.2430
Average province	17	0.6150	7	0.5356	7	0.0793
Mazowieckie	7	0.5869	8	0.7269	1	–0.1400
Łódzkie	5	0.5784	9	0.5667	5	0.0117
Wielkopolskie	15	0.5766	10	0.4614	10	0.1152
Świętokrzyskie	13	0.5533	11	0.3934	14	0.1600
Lubelskie	3	0.5252	12	0.4507	11	0.0745
Warmińsko-Mazurskie	14	0.4806	13	0.2983	16	0.1823
Dolnośląskie	1	0.4565	14	0.4051	12	0.0514
Podlaskie	10	0.4524	15	0.4975	9	–0.0452
Zachodniopomorskie	16	0.4018	16	0.3534	15	0.0484
Lubuskie	4	0.1323	17	0.2570	17	–0.1246
Parameters		Value		Value		Difference
Mean		0.5718	×	0.4878	×	0.0840
Standard deviation		0.1591	×	0.1252	×	0.0339
Median		0.5784	×	0.4975	×	0.0809
Median absolute deviation		0.1589	×	0.1370	×	0.0219
Pearson correlation coefficient		0.6780				
Kendall rank correlation coefficient		0.4853				

Source: calculations performed using R software.

Table 1 presents the ranking of 17 objects (16 provinces and the average province) according to the level of social cohesion in 2016 obtained after applying the classical and interval-valued approach. All calculations were performed using the `clusterSim` package (Walesiak & Dudek 2018a) developed for R software (R Core Team 2018).

Based on the results of the study, it was possible to assess the level of social cohesion in Polish provinces. The assessment is based on two measurements: one involving metric data, and the other based on interval-valued data. This approach made it possible to demonstrate how the assessment of social cohesion changes when one moves from mono-parametric measurement (the classical approach) to interval measurement (the interval-valued approach). The consistency of the ranking of provinces according to the values of measure d_i (measured by Kendall rank correlation coefficient $r_{tau} = 0.4853$) is much lower than the correlation of provinces according to the values of measure d_i (measured by the Pearson correlation coefficient $r = 0.6780$). Hence, the ranking of provinces changed to a greater degree than did the values of measure d_i.

Figure 2 shows the spatial distribution of actual differences in measure d_i (Δd_i from Table 1) for Polish provinces between the results for interval-valued data and for metric data.

The proposed modification of the method made it possible to conduct a more in-depth assessment of the multidimensional phenomenon of social cohesion in comparison with the classical approach based on metric data. Provinces were not assessed merely on the basis of the variables' mean values, but also taking into account how the variables varied across districts. After applying the alternative method of measurement, the position of objects changed significantly:

1. The dispersion of objects (provinces) measured by standard deviation and median absolute deviation changed. If the Lubuskie province is excluded from the analysis (outlier No. 4 in Figure 1), the variability in measure d_i in both approaches is at a similar level: $S_{d_i} \approx 0.12$.

2. If the arrangement of provinces is assessed not only in terms of d_i values but also on the basis of their position relative to the set axis, one notices that the dispersion of objects measured using the interval-valued approach is considerably smaller. This is the result of eliminating the impact of extreme values of target variables.

3. The majority of objects (13 provinces and the average province) moved towards the pattern object (see Figure 1). The mean level of social cohesion and the median both increased. Provinces with the highest actual difference in measure d_i include: Śląskie, Pomorskie, and Kujawsko-Pomorskie (the last column in Table 1 and Figure 2). A reverse change – a shift towards the anti-pattern object – was observed in the case of another three provinces: Mazowieckie, Lubuskie, and Podlaskie. This means that the level of social

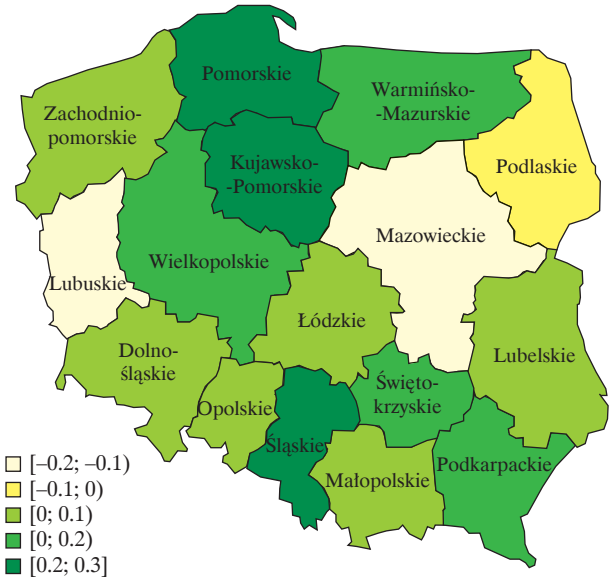


Fig. 2. Spatial Distribution of Actual Differences in Measure d_i (Δd_i) for Provinces of Poland

Source: calculations performed using R software.

cohesion measured using the modified approach is lower compared to the classical approach.

4. The mean, which is the only parameter used in the classical approach, is very sensitive to outliers. In the case of territorial units, the spatial poles of growth behave like extreme observations and can strongly influence the measurement for the entire region to which they belong. Examples of this phenomenon identified in the study involve measurements for the Mazowieckie province (7) strongly affected by the district of Warsaw, and the Lubuskie province (4) being influenced by the district of Zielona Góra. The switch from the classical approach, in which the provinces were assessed exclusively on the basis of the mean values of the target variables, to the interval-valued approach, which accounts for the inter-district variation in these variables, caused these two objects to shift towards the anti-pattern. In the case of Mazowieckie and Lubuskie, this shift, expressed in terms of negative values of the actual difference in measure d_i, was the biggest (see Figure 2).

5. Another change in the position of the objects is their location in relation to the set axis. The measurement based on interval-valued data resulted in 8 provinces shifting above the set axis. Only three provinces remained below the set axis (see Figure 1). This change is mainly due to the fact that the measurement accounted for the asymmetrical distributions of the variables of interest, which were skewed right for the majority of provinces. The provinces located above the set axis are the ones where such right-skewed variables prevailed. It should be added that when evaluating the arrangement of objects on both sides of the set axis, one takes into account not only the direction but also the degree of asymmetry. In the classical approach, such a detailed assessment that accounts for the asymmetry of distributions is not possible.

4. Conclusions

The measurement of the level of social cohesion is a complex task and requires a multi-dimensional approach. In order to rank objects of interest in terms of the level of social cohesion, the authors used a two-step research procedure (multidimensional scaling and linear ordering), which enabled the results to be visualized in a two-dimensional space. By analysing two approaches, it was possible to demonstrate how the assessment of social cohesion changes when one switches from mono-parametric measurement (metric data) to interval measurement (interval-valued data).

The proposed modification made it possible to assess social cohesion in provinces not only on the basis of the variables' mean values, but also by taking into account 50% of districts within each province (the interval between the first and third quartile).

This approach helps to eliminate the influence of outliers on the assessment of social cohesion in Polish provinces.

All the calculations were conducted using scripts written by the authors in R software.

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Bibliography

Annoni, P. and Dijkstra, L. (2016) *The EU Regional Social Progress Index: Methodological Note*. Brussels: European Commission.

Balcerzak, A. P. (2015) "Wielowymiarowa analiza spójności społecznej w krajach Unii Europejskiej w kontekście strategii Europa 2020" in B. Bartniczak and K. Trzeciak (eds) *Aktualne trendy w zarządzaniu środowiskiem*. Jelenia Góra: Wydawnictwo AD REM.

Billard, L. and Diday, E. (2006) *Symbolic Data Analysis: Conceptual Statistics and Data Mining*. Chichester: John Wiley.

Borg, I. and Groenen, P. J. F. (2005) *Modern Multidimensional Scaling: Theory and Applications*. New York: Springer Science+Business Media.

Bottoni, G. (2018) "A Multilevel Measurement Model of Social Cohesion". *Social Indicators Research* 136 (3): 835–57, https://doi.org/10.1007/s11205-016-1470-7.

Concerted Development of Social Cohesion Indicators: Methodological Guide (2005) Strasbourg: Council of Europe Publishing.

Dickes, P. and Valentova, M. (2013) "Construction, Validation and Application of the Measurement of Social Cohesion in 47 European Countries and Regions". *Social Indicators Research* 113 (3): 827–46, https://doi.org/10.1007/s11205-012-0116-7.

Dickes, P., Valentova, M. and Borsenberger, M. (2010) "Construct Validation and Application of a Common Measure of Social Cohesion in 33 European Countries". *Social Indicators Research* 98 (3): 451–73, https://doi.org/10.1007/s11205-009-9551-5.

Everitt, B.S., Landau, S., Leese, M. and Stahl, D. (2011) *Cluster Analysis*. Chichester: Wiley.

Hellwig, Z. (1972) "Procedure of Evaluating High-level Manpower Data and Typology of Countries by Means of the Taxonomic Method" in Z. Gostkowski (ed.) *Towards a System of Human Resources Indicators for Less Developed Countries: Papers Prepared for UNESCO Research Project*. Wrocław: Ossolineum, The Polish Academy of Sciences Press.

Hellwig, Z. (1981) "Wielowymiarowa analiza porównawcza i jej zastosowanie w badaniach wielocechowych obiektów gospodarczych" in W. Welfe (ed.) *Metody i modele ekonomiczno-matematyczne w doskonaleniu zarządzania gospodarką socjalistyczną*. Warszawa: PWE.

Ichino, M. and Yaguchi, H. (1994) "Generalized Minkowski Metrics for Mixed Feature-type Data Analysis". *IEEE Transactions on Systems, Man, and Cybernetics* 24 (4): 698708, https://doi.org/10.1109/21.286391.

Jajuga, K., Walesiak, M. and Bąk, A. (2003) "On the General Distance Measure" in M. Schwaiger and O. Opitz (eds) *Exploratory Data Analysis in Empirical Research*. Berlin–Heidelberg: Springer-Verlag.

Mair, P., De Leeuw, J., Borg, I. and Groenen, P. J. F. (2018) smacof: Multidimensional Scaling. R package, version 1.10-8, https://CRAN.R-project.org/package=smacof.

My Region, My Europe, Our Future: Seventh Report on Economic, Social and Territorial Cohesion (2017). Brussels: European Commission.

Rajulton, F., Ravanera, Z. R. and Beaujot, R. (2007) "Measuring Social Cohesion: An Experiment Using the Canadian National Survey of Giving, Volunteering, and Participating". *Social Indicators Research* 80 (3): 461–92, https://doi.org/10.1007/s11205-006-0011-1.

R Core Team (2018) *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Vienna, Austria, https://www.R-project.org.
Walesiak, M. (2016) "Visualization of Linear Ordering Results for Metric Data with the Application of Multidimensional Scaling". *Ekonometria* 2 (52): 9–21, https://doi.org/10.15611/ekt.2016.2.01.
Walesiak, M. and Dudek, A. (2017) "Selecting the Optimal Multidimensional Scaling Procedure for Metric Data with R Environment". *Statistics in Transition: New Series* 18 (3): 521–40, https://doi.org/10.21307/stattrans-2016-084.
Walesiak, M. and Dudek, A. (2018a) clusterSim: Searching for Optimal Clustering Procedure for a Data Set. R package, version 0.47-2, https://CRAN.R-project.org/package=clusterSim.
Walesiak, M. and Dudek, A. (2018b) mdsOpt: Searching for Optimal MDS Procedure for Metric and Interval-valued Symbolic Data. R package, version 0.3-2, https://CRAN.R-project.org/package=mdsOpt.
Walesiak, M. and Dehnel, G. (2018) "Evaluation of Economic Efficiency of Small Manufacturing Enterprises in Districts of Wielkopolska Province Using Interval-valued Symbolic Data and the Hybrid Approach" in M. Papież and S. Śmiech (eds) *The 12th Professor Aleksander Zeliaś International Conference on Modelling and Forecasting of Socio-economic Phenomena. Conference Proceedings*. Cracow: Foundation of the Cracow University of Economics.

Abstract

Analiza porównawcza uporządkowania województw Polski ze względu na spójność społeczną

Ocenę spójności społecznej województw Polski przeprowadzono na podstawie klasycznych danych metrycznych oraz symbolicznych interwałowych z wykorzystaniem podejścia hybrydowego łączącego zastosowanie skalowania wielowymiarowego z porządkowaniem liniowym. W pierwszym kroku w wyniku zastosowania skalowania wielowymiarowego otrzymano wizualizację badanych obiektów w przestrzeni dwuwymiarowej. Następnie przeprowadzono porządkowanie liniowe zbioru obiektów na podstawie odległości Euklidesa od wzorca rozwoju. Zmienne symboliczne interwałowe opisują badane obiekty precyzyjniej niż metryczne dane klasyczne. Dane klasyczne mają charakter atomowy. Obserwacja na każdej zmiennej wyrażona jest w postaci jednej liczby rzeczywistej, z kolei dla zmiennych symbolicznych interwałowych obserwacja na każdej zmiennej ujęta jest w postaci przedziału liczbowego. W celu otrzymania danych symbolicznych interwałowych zastosowano dwustopniowe gromadzenie danych. Najpierw zgromadzono dane klasyczne dotyczące spójności społecznej według powiatów Polski, a następnie poddano je agregacji do poziomu województw, otrzymując dane symboliczne interwałowe. W artykule przeprowadzono analizę porównawczą wyników badania spójności społecznej województw Polski uzyskanych na podstawie klasycznych danych metrycznych oraz danych symbolicznych interwałowych.

Słowa kluczowe: spójność społeczna, miary agregatowe, zmienne symboliczne interwałowe, skalowanie wielowymiarowe, program R.

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TRADING RECOMMENDATIONS – A LONG-TERM ANALYSIS AND THE EVOLUTION OF LAW

Abstract

The aim of this paper is to assess the profitability of strategies based on the recommendations made by brokerage houses and to identify the so-called reco-leaders from among financial institutions publishing investment advice. The authors focus on the quality of brokerage recommendations for companies listed on the Warsaw Stock Exchange. They investigate whether there has been an improvement in the quality of recommendations over recent years and whether regulations have been evolving to provide investors with a reliable source of recommendations. The analysis covers all stock recommendations for companies listed on the Warsaw Stock Exchange released between January 2006 and the end of October 2017. The equity curve presents the results of the calculations and covers both transaction costs and capital gains tax. The analysis of the recommendations shows that their overall quality is extremely low and the problem is affected further by taxation. Despite poor recommendations, the research identifies leaders amongst the recommenders. Unfortunately, the overall weak performance of the recommendations issued does not entail any changes to regulations.

Keywords: stock market recommendation, individual investor, capital gains tax, investment, Warsaw Stock Exchange.
JEL Classification: G11, G12, G24, H21.

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1. Introduction

On the financial market, trading recommendations prepared by brokerage houses and other financial institutions are common publications for individual investors. However, they arouse ambivalent feelings among traders because, on the one hand, they suggest potentially profitable market set-ups free of charge (gratuitously?) and, on the other, their historical results are rather poor and discredit the skills of analysts. Due to unfavourable opinions, recommendations should evolve towards improving their efficiency. Similarly, regulations should be changed to force better quality in recommending investments. That is why the authors focused their research on assessing the quality of recommendations for companies listed on the Warsaw Stock Exchange (WSE). They checked whether quality changed and improved over time and whether regulations evolved towards providing investors with a reliable source of recommendations. Additionally, the profitability of various recommendation-based actions carried out on the Polish stock market was assessed as well.

The authors verified the following hypothesis: The quality of recommendations is low and is not improving on the basis of historical results. They also tested two subsidiary hypotheses: (1) among recommenders are leaders who are able to achieve stable and satisfactory long-term results, and (2) legal regulations concerning recommendations have not changed despite long-term mediocre quality.

2. Brokerage Recommendation Types and Efficiency and Legal Regulation

The term "Brokerage Recommendation" was introduced in 2005 in the Regulation of the Minister of Finance. It defines the term "recommendations" as well as brokers' responsibility and all financial instruments that are subject to recommendations (Rozporządzenie… 2005). It is worth noting that despite the poor quality of recommendations as shown by research since 2008, the law has so far not changed.

According to the regulations, any report, analysis and/or information that either encourages or suggests a certain investment-related behaviour, affecting one or several financial instruments or issuers, can be called a recommendation. If an opinion about present or future costs includes a direct suggestion to take an investment-related action, it can also be called a recommendation (Rozporządzenie… 2005).

The law defines who is allowed to issue a brokerage recommendation: licensed stockbrokers, licensed financial advisors, and financial institutions authorized to publish such recommendations.

Recommendations prepared by financial analysts should be based on at least two methods of financial instrument assessment. These two methods include discounted cash flow (DCF) and comparative analysis. Discounted cash flow analysis provides an estimation of all present and future cash flows and also their present net value. Its main benefit is the fact that it includes all future financial results. However, its weakness is that it relies too much on the analyst's subjective opinion and various parameters within it. As it turns out, even the slightest fluctuation in one of the parameters (e.g. rate of risk, projected revenue growth, future price of raw materials) can result in a huge change in the share's final assessment. By comparison, comparative analysis offers an estimation of the company's shares based on how well the company fares on the market when compared to similar companies. Nonetheless, all analysts provide an estimate based on both DCF and comparative analysis as the two methods are part of the Fundamental analysis. Technical analysis is not taken into account when a recommendation is given, which might be the reason why the quality of brokerage recommendations is so poor. Behavioural finance describing an investor's actions is also not considered; in some cases these actions can be questioned and deemed irrational, for instance: overreaction (Fama 1998, Armir & Ganzach 1998, Marsden, Veeraraghavan & Ye 2008), herding behaviour (van Campenhout & Verherstraeten 2010), confirmation bias (Park *et al.* 2013), overconfidence, loss aversion, and anchoring (Singh 2012).

The main goal behind each recommendation is to identify companies whose market value significantly differs from current market values, however their type indicates that the financial instrument's cost will most likely change.

In 2013, Dąbrowski divided brokerage recommendation into three types (Dąbrowski 2013):

– Purchase recommendation: buy, accumulate, hold, overweight,
– Sale recommendation: sell, avoid, reduce, underweight,
– Dubious recommendation: estimation, above/below market, neutral.

After each published recommendation it is mandatory to familiarize oneself with every explanation located at the end of each financial report. This must be done as each brokerage provides its own interpretation of the given analysis. For instance, a buy recommendation indicates that the analyst assumes that the profit gained will be at least 15%. In the case of an

accumulate recommendation, the return is between 5% and 15%, whereas a hold recommendation indicates that it is between –5% and 5%. Sell recommendations are issued when analysts anticipate a loss of over 15%. In the case of a reduce recommendation, the loss might be between 5% and 15%. Both sale and purchase recommendations are absolute, which means that the analyst is completely sure about the price itself. Dubious (sometimes called relative) recommendations are connected to the investment portfolio and its usage, and therefore should not be the only way of taking an investment decision. After investigating historical data it is easy to see that brokerage houses use trends in their favour, i.e. if the share price is rising the brokerage house issues a buy recommendation, while a sell recommendation might appear only if the security belongs to a breaking down-trend and the brokerage house previously issued a buy recommendation (Żelazek 2014).

Recent research shows that analysts provide more purchase recommendations (Papakroni 2012, Barber *et al.* 2001, Loh & Mian 2006) than sale recommendations (Ertimur, Zhang & Muslu 2010, Papakroni 2012). This may be due to such things as not wanting to risk a business opportunity or face the legal consequences of issuing a negative recommendation. Therefore, it is easier for stockbrokers to issue positive recommendations even if the financial instrument does not act according to the analyst's predictions. As a result there will not be any conflict between the brokerage house and the company being assessed. The differences in recommendations issued by various brokers result from the way each broker estimates assets. However, in order to assess the accuracy of published recommendations, investors must take a look at the estimation model, and this includes the calculation assumptions as well.

3. Accuracy of Brokerage Recommendations in Poland

In 1933, Arthur Cowles began research on the accuracy of brokerage recommendations in the USA. The research showed that investors could achieve above-average rates of return on the basis of the recommendations issued. Furthermore, Womack (1996) noticed positive rates of return after purchase recommendations and negative ones after sale recommendations. Both negative and positive rates of return persisted for a few months straight. Barber *et al.* (2001) stated that a strategy that involved investing in companies for which the overall forecast was positive resulted in an average return of 9.4% a year. However, including transaction costs in the same investment strategy resulted in a loss of 3.1%.

Polish literature includes research on the problem of the accuracy of brokerage recommendations, but the findings of this research are not promising, unfortunately. Biedrzyński (2008) estimated that only 57% of analysts were right in their assessments, whereas Czyżycki and Klóska (2010), who used regression analysis to estimate the accuracy of issued recommendations, stated that the recommendations were not as accurate as they could have been. Dąbrowski (2013) used a statistical method to build his investment portfolio over short (3 months), medium (6 months), and long (over 6 months) periods of time in order to properly assess the recommendations issued. His findings clearly indicated that public recommendations for buying and selling shares were of poor quality and that the institutions authorized to issue them had no incentive to ensure that such recommendations were not only free of charge but also positive and likely to come to fruition. Zaremba and Konieczka (2014) used the cash asset pricing model and a market model based on short/long-term investment portfolios in order to provide assessments for all companies active on the Warsaw Stock Exchange between 2005 and 2012. According to their research, brokerage recommendations have absolutely no value for individual investors. Long--term analysis for the best-rated companies resulted in negative rates of return, and the same was true of short-term analysis for the worst-rated companies.

Despite the authors using different methods to assess the quality of brokerage recommendations, the results of their research were nearly identical. The research suggests that the accuracy of recommendations issued by specialized and authorized institutions is extremely poor. However, none of the research covered transaction costs and taxation, which are essential for individual investors.

Individuals are obliged to pay taxes for allocating funds on the capital market as long as the allocated funds enable them to make a profit. Capital gains tax was introduced in Poland on 21 November 2001 and has a flat rate of 19% (Personal Income Tax Act of 2001 – Ustawa… 2001). Unlike the lump-sum tax, this method allows income earned to be reduced by the cost of generating that income (Pogoński 2012). In the literature, this kind of method is called a tax shield (James 2012) and is the most commonly used legal tool among investors (Jarno 2017).

When estimating the accuracy of brokerage recommendations it is crucial to include both taxation and transaction costs as this allows the profitability of the investment to be revealed. A recommendation-based investment strategy may turn into a loss, even though a minimal positive

return is achieved, because taxation and transaction costs need to be taken into account too. Therefore, the authors included those parameters in their estimation when building a model to assess the accuracy of recommendations.

4. Methodology

The analysis covers all stock recommendations for companies listed on the Warsaw Stock Exchange released since 2006. Main Market and NewConnect are included, for which a total of 5645 recommendations (after validation) were published. The database was provided by Money.pl. (www.money.pl, access: 30.10.2017). However, the data had to be investigated and validated. Finally, the parameters of the recommendations had to be normalized:

– doubled or false records were deleted,

– recommendations without a target price or other important parameters were excluded,

– every type of recommendation was classified as a buying or selling recommendation on the basis of the target price and closing price on the day of publication ("buy" for targets higher than current price, and "sell" for targets lower than current price),

– short-positions for selling recommendations were allowed,

– the price on the day of the recommendation was always the closing price of the session,

– all the recommendations were short-term, which is why the time--horizon was set to 50 sessions,

– splits, dividends, and other stock operations were included and recalculated.

The quality assessment process involved statistical analysis and equity curve analysis. The authors focused especially on the following parameters:

– number of recommendations,

– general accuracy and target accuracy,

– normalized expected value,

– visual assessment of the equity curve compared with the WIG stock index.

The recommendations are divided into two groups depending on the regularity of publications. The first and main group comprises recommendations from financial institutions that publish regularly, that is, at least 6 times a year (on average) and consecutively in every year of their

activity. The second group, statistically less important, consists of occasional and sporadic recommendations.

The general accuracy is the number of positive recommendation divided by the total number of recommendation issued by every financial institution. A positive recommendation means that the target price was hit or the closing price after 50 sessions is better than the starting price on the day of publication. The target accuracy only checks whether the target price was hit, which has to happen within a 50-session period.

The expected value is normalized by using the *P/L* ratio instead of the separated average profit and average loss of the transaction based on the recommendation. The calculation is as follows:

$$Ex = PLr \cdot Acc - (1 - Acc),$$

where:

Ex – expected value,
PLr – Profit/Loss Ratio ($PLr = avgProfit/avgLoss$),
Acc – accuracy (general accuracy).

The equity curve is made on the basis of the simulated portfolio. The authors assume that every recommendation is traded and for every trade 1000 PLN is engaged. Fractional volume is allowed in order to provide precise comparability among different stocks whose price level is strongly diffused. The final results of every recommendation depend on hitting the target or (if the target is not hit) the closing price of the 50th session after starting day. Profits and losses include a commission of 0.39% for both buying and selling orders, which is the standard fee for individual investors trading on the WSE in Poland.

Moreover, the results of all recommendations (as a portfolio) are tested in respect of taxation. In Poland, capital gains tax is settled annually on the basis of closed orders only. Losses may be deducted from profits and the tax rate is 19%. Taxation is included in the equity curve calculation, which means that periodically (after the previous tax-year closes) the value of the portfolio diminishes.

5. Results of Empirical Research

Since 2006, financial institutions have published more than 5,500 recommendations for companies listed on the Warsaw Stock Exchange. There were 55 recommenders, of which 31 encouraged their readers to trade very regularly and intensively and 24 advised trading sporadically

Table 1. Recommenders' Performance (Regular)

Recommender	#recos	Accuracy (%)	*P*/*L* ratio	*Ex*	Target (%)
Noble Securities	82	59.8	1.21	0.32	32.9
BGŻ BM	67	61.2	1.12	0.30	34.3
BOŚ DM	256	63.3	1.05	0.30	36.7
Haitong Bank	96	63.5	0.91	0.22	49.0
BPS DM	93	61.3	0.93	0.19	35.5
Ipopema	101	64.4	0.77	0.14	44.6
Trigon DM	132	59.1	0.92	0.13	36.4
PKO BP DM	344	62.5	0.81	0.13	46.8
BZ WBK DM	353	59.2	0.90	0.13	35.7
Millennium DM	416	63.2	0.75	0.11	46.6
KBC Securities	268	60.1	0.74	0.05	45.1
Goldman Sachs	79	65.8	0.59	0.05	34.2
Investors DI	62	54.8	0.89	0.03	25.8
IDMSA DM	537	59.2	0.73	0.02	42.3
Erste Securities DI	263	62.0	0.64	0.01	49.0
BDM	230	57.4	0.76	0.01	41.3
DM mBank	610	60.5	0.65	0.00	47.5
Citigroup	83	63.9	0.53	–0.03	33.7
Wood Company	155	57.4	0.67	–0.04	39.4
DB Securities DM	119	57.1	0.61	–0.08	42.9
Raiffeisen	159	58.5	0.55	–0.09	46.5
DM Vestor	65	53.8	0.63	–0.12	35.4
AmerBrokers DM	56	50.0	0.71	–0.14	39.3
Societe Generale	63	54.0	0.58	–0.15	46.0
BESI	162	50.6	0.68	–0.15	34.6
UniCredit CA IB	198	53.0	0.60	–0.15	35.9
ING Securities	141	45.4	0.79	–0.19	31.9
UBS	78	57.7	0.36	–0.22	41.0
JP Morgan	58	46.6	0.67	–0.22	32.8
ING Wholesale Bank	27	48.1	0.47	–0.29	25.9
Credit Suisse	65	49.2	0.40	–0.31	35.4
Average	175	59.0	0.73	0.02	41.4

Source: authors' own calculations.

(non-regular recommenders are not fully taken into consideration in the ranking).

Only half of the recommenders generate profits (with positive expected value), which is very disappointing if one considers that all the recommenders are so-called professionals who should have the knowledge and skills to achieve long-term profits. However, even among gainers, only 10 of them can be seen as successful recommenders with a normalized expected value exceeding 0.1. Analysing the other statistics, such as accuracy or *P*/*L* ratio, it is apparent that many financial institutions tend to have employees with low qualifications and poor analytical or trading skills.

The most active institution is the brokerage house of mBank (DM mBank) with 610 recommendations over 10 years. Unfortunately, its results are not satisfactory for clients due to the neutral expected value, which means no gains and no losses. The other most active recommenders perform better. It is especially worth mentioning the results of BOŚ DM, which is one of the top three Polish recommenders with an impressive expected value (*Ex*) of 0.3 and an accuracy of 63.3%, which is better than the average (59%), and one of the best *P*/*L* ratios (1.05) in this ranking. Similar performance to BOŚ DM is achieved by Noble Securities and BGŻ BM, although they are rather restrained recommenders and publish buying or selling incentives for investors only a few times a year. That is why BOŚ DM should be treated as a top reco-performer among the other financial institutions.

The crucial parameter for individual investors is accuracy, which informs how often the recommender gives positive trading suggestions and is simply right. It must be admitted that accuracy is generally at a pretty high level, and among gainers (positive expected value) it usually exceeds 60%. The highest accuracy is offered by Goldman Sachs. Nevertheless, this bank's overall performance is rather mediocre due to the lowest *P*/*L* ratio among gainers.

The *P*/*L* ratio turned out to be the most negatively surprising parameter in the whole research. It is commonly known that financial institutions aim at mid-term trends in their recommendations. Such an approach in investments usually causes low accuracy (below 50%) with a *P*/*L* ratio above 2. In the presented results, none of the recommenders even comes close to these values. Only the top 3 institutions exceed a *P*/*L* ratio of 1, with an overall average value of 0.73 and only 0.61 among losers. A low *P*/*L* ratio in trending strategies is most commonly responsible for negative results.

It is worth noticing that a poor *P*/*L* ratio cannot be hidden even by an impressively high accuracy. The best example of this is Citigroup – they are

right in almost 64% of cases (more often than the winners), but their profits on every trade are far too low in comparison to the losses when they are not right. Naturally, a *P*/*L* ratio below 1 with accuracy under 50% is bound to lead to disaster.

Besides general accuracy, the results of this research also present target accuracy. In this field, the majority of the financial institutions have nothing to be proud of. On average, only 41.4% of the proposed targets are achieved by the stock price, none of the recommenders has an accuracy above 50%, and there are even recommenders that are right in only a quarter of their publications. The target price is the weakest point of any analyst that prepares recommendations.

Non-regular recommenders should not be compared directly with financial institutions that provide trading setups on daily, weekly or even monthly basis. That is why their performance is presented separately. Nevertheless, some interesting results can be found here.

First of all, due to the low number of recommendations, all the statistics should be treated with caution, because even a single positive or negative trade can change performance dramatically when the number of investment suggestions is small. Nevertheless, there are two extremely interesting cases to analyse. The first is Barclays, which published only 13 recommendations between 2012 and 2014. Barclays was right in 76.9% of cases and targets were hit in an incredible 69.2% of trades. It is a great pity that Barclays recommends so rarely, because it could be a strong player on the WSE. The second interesting case, in the statistical aspect, is Dr Kalliwoda, which perfectly suits the trending strategy model. With 45.8% accuracy and a 1.73 *P*/*L* ratio, investors are encouraged to follow Dr Kalliwoda's suggestions.

Every trading strategy needs repetitions and regular trading to demonstrate true statistical value. Otherwise, a proper assessment cannot be carried out. The performance of non-regular recommenders is actually a result of good or bad luck.

In general, the quality of recommendations is really poor. This is clearly represented on the equity curve, which represents the portfolio behaviour based on trading every published recommendation.

The rate of return is 29% (23% after taxation). However, this represents only the starting and ending points of the equity. It should also be mentioned that 29% was achieved over more than 11 years, which is actually lower than the profits gained on risk-free instruments during the same period.

Table 2. Recommenders' Performance (Non-regular)

Recommender	#recos	Accuracy (%)	*P*/*L* ratio	*Ex*	Target (%)
Barclays	13	76.9	1.52	0.94	69.2
ABN AMRO Securities	7	85.7	1.23	0.91	14.3
East Value Research	8	62.5	1.62	0.64	37.5
BPH BM	16	68.8	1.08	0.43	56.3
Dr Kalliwoda	24	45.8	1.73	0.25	25.0
Merrill Lynch	6	66.7	0.76	0.17	33.3
CDM Pekao	48	64.6	0.75	0.13	45.8
Renaissance	10	70.0	0.51	0.06	60.0
DnB NORD BM	2	50.0	0.82	–0.09	0.0
HSBC Securities	34	50.0	0.62	–0.19	44.1
Bank of America	9	55.6	0.43	–0.21	44.4
Concorde	4	50.0	0.10	–0.45	50.0
Raiffeisen DM	10	30.0	0.55	–0.54	10.0
NWAI DM	3	33.3	0.36	–0.55	0.0
Morgan Stanley	10	30.0	0.37	–0.59	10.0
Nomura	7	28.6	0.32	–0.62	28.6
Capital Partners DM	1	100.0	nd	nd	100.0
Copernicus DM	4	100.0	nd	nd	100.0
Cyrrus	1	0.0	nd	nd	100.0
Exane	5	100.0	nd	nd	80.0
FIO	1	100.0	nd	nd	100.0
Mercurius DM	1	0.0	nd	nd	0.0
Ventus AM	1	0.0	nd	nd	0.0
WDM SA	2	0.0	nd	nd	0.0

nd – no data

Source: authors' own calculations.

Moreover, the maximum draw down is 77% (78% after taxation), which is unacceptable for the majority of investors.

The equity curve that includes the tax paid by investors makes the results even worse. Between 2015 and 2017, the capital gains are smaller because investors were forced to pay tax. Consequently, the equity tax curve is located below the equity curve. Between 2006 until 2014, the equity tax curve follows the equity curve because investors could use the tax shield

method. Individuals could deduct losses over five consecutive tax years (but no more than 50% of the loss generated in previous years) to reduce tax. These deductions reduced a taxpayer's taxable income for a given year or deferred income tax to future years.

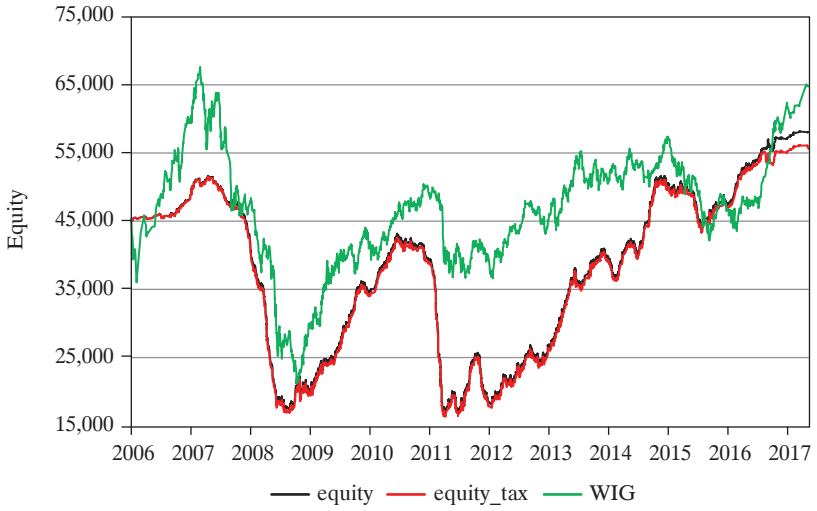

Fig. 1. Equity Curve (with and without Taxation) and the WIG

Source: authors' own calculations.

Comparing the equity curve of recommendations with the WIG index also exposes the weakness of reco-following strategy. The WIG usually performs better, especially during down-trends and, obviously, following the WIG passively does not generate additional costs and does not require any time commitment.

In the market reality, investors do not usually follow every recommendation. They have their favourite recommenders or they just use the analysis of the brokerage house which provides them with trading services. That is why some analysts are followed more often than others. And for that reason, the equity curves of the top-five recommenders are analysed.

Analysis of the equity curves shows BOŚ DM to be the leader among recommenders. Its first place in the equity comparison is due to the high number of recommendations – three times higher than the other top-five recommenders, which strongly confirms the statistical edge of BOŚ DM. Other recommenders – Noble, BGŻ, Haitong and BPS DM – do not flood

the market with a large number of analyses and publish them somewhat rarely.

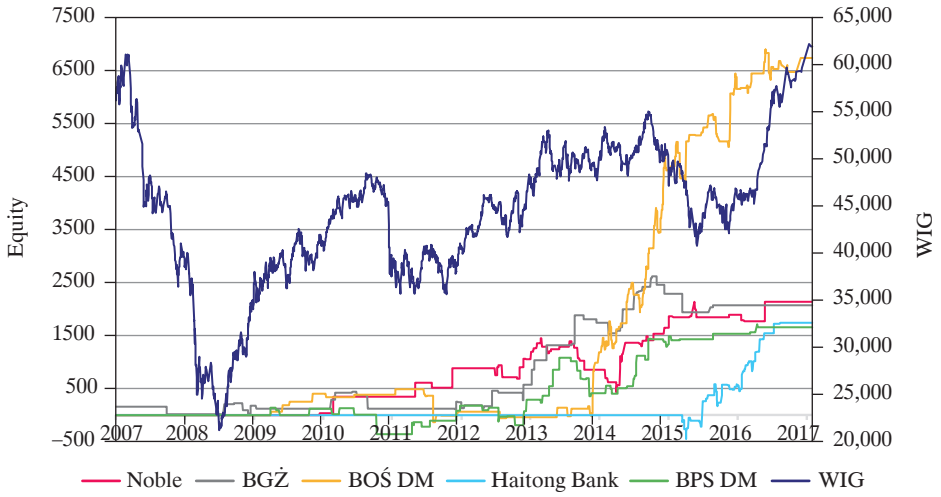

Fig. 2. Equity Curve of Top-five Recommenders and the WIG

Source: authors' own calculations.

One of the most important findings of the equity analysis is that the top--five recommenders are conservative during a recession. Even BOŚ DM, which was the most active, did not publish trading suggestions for the bear markets of 2007–2008 and 2011. An increase in activity is visible from 2013, which accounts for the excellent performance and dynamic growth of equity curves. Although the WIG fell in 2015 by 20%, the top-five recommenders were able to resist the unfavourable market situation.

6. Conclusions

The research positively verified the hypothesis that the overall quality of recommendations is extremely low (and, naturally, the problem is getting worse after imposition of the tax). Trading based on the suggestions published by so-called professionals (analysts of financial institutions) can lead to disaster, caused not only by the poor rate of return but particularly by the extremely high value of drawdowns. However, among the 55 recommenders there are a few whose suggestions may be taken seriously. Stable and satisfactory long-term results are delivered by five institutions:

Noble Securities, BGŻ BM, BOŚ DM, Haitong Bank, and BPS DM (and a few more, but their performance is not fully satisfactory). These reco--leaders can be followed successfully by individuals.

Unfortunately, the overall weak performance does not entail any changes to regulations. The rules for preparing and publishing recommendations have remained unchanged for many years and there are no restrictions on financial institutions which consistently underperform. Many analysts (or their superiors) do not learn from their mistakes and do not make any improvements on the basis of historical results. Perhaps in these cases the only reason to publish any kind of recommendations is simply to encourage customers to place orders and to charge them the trading commission.

Bibliography

Amir, E. and Ganzach, Y. (1998) "Overreaction and Underreaction in Analysts' Forecasts". *Journal of Economic Behavior and Organization* 37 (3): 333–47, https://doi.org/10.1016/s0167-2681(98)00092-4.

Barber, B., Lehavy, R., McNichols, M. and Trueman, B. (2001) "Can Investors Profit from the Prophets? Security Analyst Recommendations and Stock Returns". *The Journal of Finance* 56 (2): 531–63, https://doi.org/10.1111/0022-1082.00336.

Biedrzyński, R. (2008) *Wycena w rekomendacjach sporządzanych przez biura maklerskie a cena rynkowa spółek notowanych na Giełdzie Papierów Wartościowych w Warszawie*. Praca magisterska. Szczecin: Uniwersytet Ekonomiczny w Szczecinie.

Campenhout, van G. and Verhestraeten, J. F. (2010) *Herding Behavior among Financial Analyst: A Literature Review*. HUB Research Paper 39. Brussels: HUB.

Cowles, A. (1933) "Can Stock Market Forecasters Forecast?". *Econometrica* 1 (3): 309–24.

Czyżycki, R. and Klóska, R. (2010) "Rekomendacje giełdowe jako źródło wiedzy dla inwestora indywidualnego" in *MEK 2010 Company Processes and Market Requirements*. Hradec Kralove: MEK, pp. 2371–78.

Dąbrowski, P. (2013) "Huraoptymizm rekomendacji maklerskich w okresie giełdowej dekoniunktury" [Excessive optimism of recommendations during market downturn]. *Studia Ekonomiczne Uniwersytetu Ekonomicznego w Katowicach* 174 (2): 88–104.

Ertimur, Y., Zhang, F. and Muslu, V. (2010) "Why Are Recommendations Optimistic? Evidence from Analysts' Coverage Initiations". *Review of Accounting Studies* 16, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=993563 (accessed: 14 September 2017).

Fama, E. F. (1998) "Market Efficiency, Long-term Returns and Behavioral Finance". *Journal of Financial Economics* 49 (3): 283–306.

James, S. (2012) *A Dictionary of Taxation.* Second edition. Cheltenham: Edward Elgar Publishing.

Jarno, K. (2017) "Efektywność tarczy podatkowej z dochodów kapitałowych z wykorzystaniem metody realizacji strat papierowych w portfelu inwestycyjnym inwestorów indywidualnych" [The efficiency of the tax shield from the capital gains on shares using the paper losses method in the individual investor's portfolio]. *Nauki o Finansach* 3 (32): 77–88, https://doi.org/10.15611/nof.2017.3.05.

Loh, R. K. and Mian, G. M. (2006) "Do Accurate Earnings Forecasts Facilitate Superior Investment Recommendations?". *Journal of Financial Economics* 80 (2): 455–83, https://doi.org/10.1016/j.jfineco.2005.03.009.

Marsden, A., Veeraraghavan, M. and Ye, M. (2008) "Heuristics of Representativeness, Anchoring and Adjustment, and Leniency: Impact on Earnings' Forecasts by Australian Analysts". *Quarterly Journal of Finance and Accounting* 47 (2): 83–102.

Papakroni, J. (2012) "The Dispersion Anomaly and Analyst Recommendations", www.be.wvu.edu/phd_economics/cvs/Papakroni_Jobmarket.pdf (accessed: 14 September 2017).

Park, J., Konana, P., Gu, B., Kumar, A. and Raghunathan, R. (2013) "Information Valuation and Confirmation Bias in Virtual Communities: Evidence form Stock Message Boards". *Information Systems Research* 24 (4): 1050–67, https://doi.org/10.1287/isre.2013.0492.

Pogoński, M. (2012) *Podatek od zysków kapitałowych. Giełda, odsetki, dywidendy, fundusze, IKE oraz inne przychody kapitałowe*. Wrocław: Oficyna Wydawnicza „Unimex".

Rozporządzenie Ministra Finansów z dnia 19 października 2005 r. w sprawie informacji stanowiących rekomendacje dotyczące instrumentów finansowych, ich emitentów lub wystawców, Dz.U. nr 206, poz. 1715.

Sing, S. (2012) "Investor Irrationality and Self-defeating Behavior: Insights from Behavioral Finance". *Journal of Global Business Management. Beaverton* 8 (1): 116–22.

Ustawa z dnia 21 listopada 2001 r. o zmianie ustawy o podatku dochodowym od osób fizycznych oraz ustawy o zryczałtowanym podatku dochodowym od niektórych przychodów osiąganych przez osoby fizyczne, Dz.U. nr 134, poz. 1509.

Womack, K. L. (1996) "Do Brokerage Analysts' Recommendations Have Investment Value?". *Journal of Finance* 51 (1): 137–67, https://doi.org/10.2307/2329305.

Zaremba, A. and Konieczka, P. (2014) "Skuteczność rekomendacji maklerskich na polskim rynku akcji" [Effectiveness of stock recommendations on the Polish market]. *Zeszyty Naukowe Uniwersytetu Szczecińskiego. Finanse, Rynki Finansowe, Ubezpieczenia* 66: 573–581.

Żelazek, K. (2014) "Raporty domów maklerskich dla spółek giełdowych". *Rzeczpospolita* May 15th.

Abstract

Rekomendacje maklerskie – długoterminowa analiza opłacalności oraz ewolucja przepisów prawa

Celem artykułu jest ocena opłacalności strategii inwestycyjnych opartych na wydawanych przez domy maklerskie rekomendacjach i wyłonienie tzw. liderów rekomendacji spośród instytucji finansowych publikujących sugestie inwestycyjne. Autorzy sprawdzili również, czy w związku z pojawiającymi się nie najlepszymi wynikami badań dotyczących wydawanych rekomendacji przepisy prawa ewoluują w celu poprawy ich jakości. Analizą zostały objęte wszystkie rekomendacje akcji dla spółek notowanych na Giełdzie Papierów Wartościowych w Warszawie opublikowane w okresie od 2006 r. do końca października 2017 r. Krzywa kapitału prezentująca wyniki badań obejmuje zarówno koszty transakcji, jak i podatek od zysków kapitałowych. Przeprowadzone badania

nad jakością wydawanych przez domy maklerskie rekomendacji dowodzą, że ogólna jakość zaleceń jest bardzo niska, a uwzględnione przy kalkulacji koszty transakcyjne wraz z podatkiem od zysków kapitałowych tylko pogarszają osiągnięte wyniki. Jednakże pomimo niskiej jakości wydawanych rekomendacji można dostrzec liderów wśród domów maklerskich publikujących rekomendacje regularnie. Badania pokazują również, że mimo słabej jakości rekomendacji przepisy prawa nie uległy żadnej zmianie.

Słowa kluczowe: rekomendacje maklerskie, inwestor indywidualny, podatek od zysków kapitałowych, inwestycje, Giełda Papierów Wartościowych w Warszawie.

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