Borkowski, Mateusz

**Article**

# Institutional equilibrium in EU economies in 2008 and 2018: SEM-PLS models

Statistics in Transition new series (SiTns)

**Provided in Cooperation with:**
Polish Statistical Association

*Suggested Citation:* Borkowski, Mateusz (2022) : Institutional equilibrium in EU economies in 2008 and 2018: SEM-PLS models, Statistics in Transition new series (SiTns), ISSN 2450-0291, Sciendo, Warsaw, Vol. 23, Iss. 2, pp. 107-127, https://doi.org/10.2478/stattrans-2022-0019

This Version is available at:
https://hdl.handle.net/10419/266310

*STATISTICS IN TRANSITION new series, June 2022*
*Vol. 23, No. 2 pp. 107–127, DOI 10.2478/stattrans-2022-0019*
Received – 22.07.2021; accepted – 21.03.2022

# Institutional equilibrium in EU economies in 2008 and 2018: SEM-PLS models

**Mateusz Borkowski**[1]

## ABSTRACT

The aim of the research is to identify the strength and direction of the development of the relationship between formal and informal institutions and to assess the institutional equilibrium of modern economies. The structural equations modelling based on partial least squares (SEM-PLS) is applied to achieve the purpose of the article. It is an econometric method that allows the measurement and analysis of the dependencies between latent variables (measures that cannot be directly observed). The study included 27 EU economies and the research period covered the years 2008 and 2018. The results of the study demonstrate that the quality of informal institutions strongly, positively determines the quality of formal institutions. The conducted analyses indicate that modern economies are diversified in terms of the quality of informal and formal institutions and, consequently, in institutional equilibrium. Considerable institutional disparities also translate into a large diversification in economic development. The article proposes a different meaning of institutional equilibrium, understood as the achieved state of institutional structure characterised by high quality informal institutions which interact with each other to improve the efficiency of formal institutions. The article presents a comprehensive model of the institutional structure and a unique method of measuring institutional equilibrium.

**Key words:** institutional equilibrium, SEM-PLS, economic growth and development.

## 1. Introduction

The institutional approach is gaining popularity today. For many years, institutions in macroeconomic models have been covered by the ceteris paribus assumption, or treated as an undoubted pro-development factor. However, an increasing number of researchers have taken up the topic of institutional structure in search of the sources of economic failures. It turns out that the inefficiency of the system may be the cause of development disparities and their increase in the world.

[1] Doctoral School in the Social Sciences (economics and finance), University of Bialystok, Bialystok, Poland, E-mail: m.borkowski@uwb.edu.pl, ORCID: https://orcid.org/0000-0003-0644-4764.

In modern economic theory there is a noticeable gap in the modelling of institutions. Existing models that take into account institutional variables are based mainly on simple correlation and regression analyses. Most often they concern the quality of only one selected institution. There is a noticeable lack of econometric models of the entire institutional system in the social literature. Moreover, the measurement of institutional equilibrium is rare. This article is an attempt to complement institutional theory with tools measuring institutional quality and levels of institutional equilibrium.

The problem of institutional equilibrium is gaining interest among scholars from all over the world. Interestingly, the understanding of institutional equilibrium varies. The most common assumption is that institutions themselves are a kind of equilibrium in a game (Hindriks & Guala, 2015). This paper proposes that institutional equilibrium can be understood as an achieved state of institutional structure that is characterized by high quality informal institutions that interact to improve the efficiency of formal institutions.

The purpose of the research is to identify the strength and direction of the relationship between formal and informal institutions and to assess the institutional equilibrium of modern economies. The problem addressed is the differentiation of EU economies in terms of the quality of institutional systems. The paper adopts three research hypotheses:

**$H_1$**: Informal institutions positively and strongly influence the quality of formal institutions in the EU countries.

**$H_2$**: The relationship between informal and formal institutions is getting weaker over the time (from 2008 to 2018).

**$H_3$**: Countries of a higher level institutional equilibrium feature economies with a higher level of GDP per capita.

This paper applies structural equation modelling using the partial least squares method (SEM-PLS). The years 2008 and 2018 were selected as the period of research, as these are the most recent statistical data available. The study covered 27 EU economies.

## 2. Literature review

Defining institutions is not a simple task. The reason for the difficulty in conceptualizing this term is its multidimensional and interdisciplinary nature. Differences in explaining the meaning of institutions arise not only in different social science disciplines, but also within those disciplines (Godłów-Legiędź, 2010, p. 65). Within the economic sciences there are three main approaches to defining institutions (Gancarczyk, 2002, p. 82). The first assumes that institutions are norms or customs that are embedded in the economy (processes). Second, institutions are identified with organizations. The third one equates institutions with a state of equilibrium in a game – a strictly model-based approach.

This article uses the definition by G. M. Hodgson. Institutions are a system of embedded and well-established both formal and informal norms, rules, customs, which influence economic, social and political interactions among individuals in the economy (Hodgson, 2006, p. 18). The work uses a process approach, which means that institutions (processes) and organizations (entities) are related concepts, although not identical.

Institutions are characterized by the following features:

- universality (Vitola & Šenfelde, 2015, p. 278) – they are universal in nature, affecting all relations in the economy,
- variability over time – they change, evolve; changes depend on the type of institution and the elasticity of the institutional system; change can take the form of: complete displacement, layering, drift or conversion (Mahoney & Thelen, 2010, p. 16),
- immateriality and direct immeasurability – the quality of institutions cannot be directly observed, institutions cannot be seen (Ostrom, 2008, p. 822),
- heterogeneity – each institution is unique, original,
- endogenous nature – they arise within the society/economy – either created by people consciously or unconsciously,
- internal complexity – the institutional system consists of many institutions, which also have components, and components have elements and so on,
- internal interdependence, which can take the form of:
  a) complementary relationships – institutions function in the environment of other institutions, they can complement and strengthen each other (Höpner, 2005, p. 333),
  b) mutual exclusion, competitive relationships (Amable, 2016, p. 79) – institutions can also be an obstacle for the functioning of other institutions, they can mutually limit each other, weaken incentives for interaction (Helmke & Levitsky, 2004, p. 729),
  c) relationships of substitutability – outdated institutions are replaced by new ones, better suited to the conditions of the present (Gruszewska, 2011, p. 55),
- dependence on the past – new institutions are the product of past socio-economic processes, they are ideally suited to past conditions, but will never be in line with the conditions of the present (Veblen, 2016, s. 88).

Institutions are of undeniable importance in the economy. All relations, whether economic, social or political, are regulated by institutions. They give a sense of action to all units in the economy, create a safe area for functioning, and thus contribute to increasing the predictability of participants in socio-economic processes. It would seem that the most important task of institutions in modern economies is to determine the possible solutions, create opportunities, and also to set the rules for all units in the economy (Gruszewska, 2013, p. 136).

When studying the institutions in modern world economies, one should focus on the analysis of the institutional system. In institutional theory there are many divisions of the institutional system of the economy. The most widely used in the literature is the division proposed by D. C. North (1992; 1994), according to which the institutional system consists of three elements: formal institutions, informal institutions and the mechanisms for their enforcement. It is this view of the institutional system that was applied in this paper. Special attention has been paid especially to formal and informal institutions.

Formal institutions have a statutory character, and are the result of the activities of the governance. Most often they are written down in the form of normative acts. They can also take the form of actions – for example, markets' regulations. Their specificity makes their variability over time much greater than in the case of informal constructions (Fuentelsaz et al., 2019, pp. 6–8). Their boundaries of change are determined by informal institutions, which are the core of the entire institutional system. The components of the formal institutional environment include the institutions of (Rodrik, 2007, pp. 150–161): legal order, property rights, macroeconomic stability, regulation, social security, and conflict management.

Informal institutions are the second main component of the institutional system. In contrast to formal ones, they arise spontaneously, endogenously (Seidler, 2011). They are not written down, but deeply rooted in the mentality of society. They change very slowly, thus conditioning changes in the entire institutional system (Mohmand, 2015, p. 7). Changes in formal rules, which can be introduced by the governance in a relatively short time, are limited by informal institutions. New formal norms are not immediately aligned with social norms. There is a dissonance between formal and informal institutions. The community, only after some time, adapts to the new formal structures (Gruszewska, 2017, p. 41). The informal institutions include (Fiedor, 2015, p. 94): culture (including economic culture), attitudes towards religion, behavioural patterns, social trust, and the so-called "mental models", i.e. established behavioural patterns.

The continuous adjustment processes of formal institutions to informal ones show that the institutional system is in a constant disequilibrium. The degree of institutional disequilibrium varies. As J. Wilkin points out, institutional equilibrium is a state, not a point, at which: various needs of the members of society are balanced; there is an inclination of the members of society to follow the established rules of conduct, which have been considered socially beneficial, with the possibility of choosing to achieve their goals; the continuity of prevailing rules and social mechanisms is guaranteed and a high degree of predictability of other members of society is ensured (Wilkin, 2011, p. 32).

The relationship between informal and formal institutions and the enforcement mechanisms that support them can be the basis for defining institutional equilibrium. B. Fiedor (2019, p. 176) defines institutional equilibrium as a state in which informal

institutions strengthen and positively influence the enforcement of formal rules, and strengthen the enforcement mechanisms. Institutional equilibrium is of a higher importance than other equilibrium found in the economy. Institutions are considered to be the foundations of the economy, they are a form of security and a stabilizer for the economy (Wilkin et al., 2019, p. 662–663). J. Platje distinguishes five levels of institutional equilibrium depending on the efficiency of formal and informal institutions and enforcement mechanisms (Table 1).

**Table 1.** Levels of institutional equilibrium according to J. Platje

| No. | Efficiency of*: | | | Level of institutional equilibrium |
|---|---|---|---|---|
| | formal institutions | informal institutions | institutional governance | |
| 1. | + | + | + | ideal institutional equilibrium |
| 2. | + | + | – | weak institutional equilibrium |
| 3. | + | – | + | institutional disequilibrium |
| 4. | + | – | – | |
| 5. | – | + | + | |
| 6. | – | + | – | |
| 7. | – | – | + | strong institutional disequilibrium |
| 8. | – | – | – | ideal institutional disequilibrium |

* "+" – high, "–" – low.

Source: own work on the basis of: (Platfje, 2008, p. 147).

This paper applies the institutional equilibrium matrix, proposed and then empirically used by C. R. Williamson (2009, p. 373), to assess the institutional balance of modern economies. The institutional system is divided into formal and informal institutions. Their quality determines the level of institutional equilibrium. Strong informal and formal rules create conditions, which allow obtaining benefits to be obtained by all individuals functioning in society.

This paper assumes that institutional equilibrium is defined by the quality of both formal and informal institutions. The state of institutional equilibrium can take three forms: strong institutional equilibrium (high quality of both formal and informal rules); weak formal institutional equilibrium (high quality of formal institutions, low of informal ones) and weak informal institutional balance (low quality of formal institutions, high of formal ones). When both formal and informal institutions are characterized by low quality, this implies institutional disequilibrium.

## 3. Research method – SEM-PLS

The assumptions of the paper were met using partial least squares structural equation modelling (SEM-PLS or PLS-SEM), which was created by H. Wold (1980). SEM-PLS is an econometric method for studying phenomena that are not directly observable

(Ciborowski & Skrodzka, 2020, p. 1355). SEM-PLS is one of two structural equation modelling techniques – the other, a more restrictive one, is covariance-based structural equation modelling (CB-SEM). SEM modelling strongly combines empirics with theory (Skrodzka, 2016, p. 283). The use of SEM-PLS, rather than CB-SEM, seems appropriate for the topic under study. Several arguments support this, including (Hair et al., 2011, pp. 139–141): (1) institutions do not have an elaborated theory of econometric modelling, so the aim of the study is not to test theory but to create a new one; (2) the number of observations is rather small (27 EU countries); (3) the data do not follow a normal distribution (characteristics of macroeconomic data); (4) it is planned to use the values of latent variables to linearly order the objects in terms of the level of directly unobservable phenomena.

Each SEM-PLS model consists of two sub-models: an internal (structural) one and an external (measurement) one (Skrodzka, 2016, pp. 282–283). The first one describes the relationships between latent variables, while the second one presents the relationships between latent variables and their diagnostic variables. The general form of the internal model is presented in Formula 1.

$$\xi_j = \alpha_{0j} + \sum_{j \to p} \alpha_{qj} \xi_q + \varepsilon_j \tag{1}$$

where: $\xi_j$ –j-th endogenous latent variable; $\xi_q$ –q-th exogenous latent variable; $\alpha_{0j}$ – location parameter of the internal relationship for the endogenous variable; $\alpha_{qj}$ – structural parameter of the internal model showing the link between the q-th exogenous variable and the j-th endogenous variable; $\varepsilon_j$ – random error of the internal relation for j-th endogenous variable.

There are two types of relationships between latent structures and their explanatory variables in the external model: weighting (2) and reflective (3). The first one assumes that the latent variables are linear combinations of their explanatory indicators. Reflective relations represent the strength of the "reflection" of an unobservable feature by its explanatory variables (Rogowski, 1990, pp. 36–37).

$$\xi_{tj} = \sum_{i=1} w_{ij} x_{tij} \tag{2}$$

where: $\xi_{jt}$ – t-th value of the j-th latent variable; $x_{ijt}$ – t-th value of i-th indicator explaining j-th latent variable; $w_{ij}$ – weight of i-th indicator explaining j-th latent variable.

$$x_{ij} = \pi_{ij0} + \pi_{ij} \xi_j + \mu_{ij} \tag{3}$$

where: $\pi_{ij0}$ – location parameter of reflective relationship; $\pi_{ij}$ – factor loading, the relationship of reflecting the j-th latent variable by the i-th indicator; $\mu_{ij}$ – random element whose expected value is equal to zero.

Latent variables can be determined in two ways: deductively and inductively. In the deductive approach, the explanatory indicators are reflective, whereas in the inductive analysis they are formative. The reflective indicators should be highly correlated with

each other, while the formative ones are not (Hair et. al., 2014, pp. 46–47). Depending on the approach used, different measures of statistical validation are used. SEM-PLS proceeds in steps (Lohmöller, 1989, pp. 30–31): (1) First, the values of the weights are estimated. The estimation of weights is iterative. Estimation of internal values of weights can be done using the centroid, factorial or path scheme (preferred, used in this article). (2) Next, the values of the latent variables are calculated according to Formula 2. (3) The next step is to calculate the values of factor loadings for the external model and the parameters of the internal model using OLS. (4) The final step is to determine the location parameters for the reflective and internal relationships (optional step in cross-sectional models).

The estimated SEM-PLS model needs to be verified. The validation starts with the substantive analysis. It is assessed whether the model is consistent with the initial assumptions and theory. It is also necessary to check the signs of the model parameters. Statistical verification involves the use of appropriate measures to assess specific properties of the model. Table 2 presents the measures and verification criteria divided into those appropriate for a structural model, an external model defined inductively (formative indicators) and an external model defined deductively (reflective indicators).

**Table 2.** Verification measures and criterions of SEM-PLS model

| **Versification measure** | **Brief description** | **Verification criterion** |
|---|---|---|
| validation of structural model | | |
| variance inflation factor (VIF) | By using the VIF measure, collinearity of exogenous variables is checked. | VIF < 5.00 |
| coefficient of determination ($R^2$) | A classic measure of econometrics, it determines how much of the variation in an endogenous latent variable is explained by exogenous latent structures. | lack of standard |
| standard deviation of parameter ($S_\alpha$) | The standard errors of the parameters are obtained using the bootstrapping procedure. The full evaluation of the significance of the parameters proceeds as in classical econometrics - t-student test. Alternative measure: standard deviations calculated using Tukey's Jackknifing method - the "2s" rule for significance testing. | p-value < significance level |
| Stone-Gaisser test value (S-G) | Assessment of predictive ability. The S-G test value is obtained from the blindfolding procedure. Data for the model are blindfolded L times. Every L-th element is blindfolded and replaced by, for example, the arithmetic mean of the others. Based on the substitution relationships, predictions are determined from the SEM-PLS model, which can be used to calculate S-G test value. (L should belong to the interval <5,10>). | S-G ≥ 0.00 |

**Table 2.** Verification measures and criterions of SEM-PLS model (cont.)

| Versification measure | Brief description | Verification criterion |
|---|---|---|
| validation of outer model (formative approach) | | |
| variance inflation factor (VIF) | In formative outer models indicators forming a latent variable should not be highly correlated with each other. | VIF < 5.00 |
| standard deviation of weight ($S_\alpha$) | Same as for testing the significance of the internal relationship parameter. | |
| validation of outer model (reflective approach) | | |
| Cronbach's α composite reliability (pc) | Internal consistency verification. Reflective indicators should be highly correlated with each other. | 0,95 > Cb's α and pc > 0.70 |
| $\pi_{ij}$ – factor loading value average variance extracted (AVE) | Convergent reliability validation. Variables that have less than 0.40 strength of correlation with the latent variable should be removed. Latent construct should extract more than 50% of total variability. | $\pi_{ij} \geq 0.40$ AVE ≥ 0.50 |
| standard deviation of factor loading ($S_\alpha$) | Same as for testing the significance of the internal relationship parameter and weights. | |
| cross loadings analysis | Discriminatory validity assessment. Indicators of a given latent variable should be the ones that correlate most strongly with that variable. Alternatives: Fornell-Larcker criterion or Heterotrait-monotrait ratio (HTMT). | - |

Source: own work on the basis of: (Hair et al., 2014; Rogowski, 1990).

Two computational packages from the R environment will be used to estimate the SEM-PLS model: cSEM (Rademaker & Schuberth, 2021) and SEMpls (Monecke & Leisch, 2012).

## 4. Data

A precise quantitative analysis of the quality of institutions is, and probably will always be, impossible. This is mainly because institutions are deeply embedded in society. Contemporary attempts to assess the quality of institutions are based on measures prepared by inter-national statistical organizations. Many institutional researchers deny the use of such indicators. They believe that the study of institutions can only have a qualitative dimension (Skarbek, 2020, p. 409).

**Table 3.** Selected measures of quality of institutions

| Statistical organization | Report/ roup of measures | Formal or informal | Range values |
|---|---|---|---|
| World Bank | The Worldwide Governance Indicators (WGI) | formal | <-2.5;2.5> |
| | Doing Business (DB) | formal | varied |
| Heritage Foundation | Index of Economic Freedom | mainly informal | <0;100> |
| Fraser Institute | Economic Freedom in the World (EFW) | formal | <0;10> |
| Fraser Institute & Cato Institute | Human Freedom in the World (HFW) | informal | <0;10> |
| Freedom House | Freedom in the World (FIW) | mainly informal | varied |

Source: own work.

Doubts about the use of these types of metrics seem justified. The greatest objections arise for methodological reasons. Institutional indicators are more often created on the basis of surveys or experts' opinions rather than on the basis of "hard" data. Although such measures do not reflect the reality in a one-to-one ratio, they give some general approximation of the quality of institutions. However, in the opinion of many researchers of institutions (Balcerzak, 2020; Miłaszewicz & Nermend, 2020; Nifo & Vecchione, 2015), such measures can be used to assess the quality of institutions. Nevertheless, the interpretation of the results should be approached carefully. Table 3 presents a brief description of the indicators used.

## 5. Specification of the SEM-PLS model

Figure 1 shows the specification of the SEM-PLS model that will be estimated in this paper. The model consists of two latent variables: quality of informal institutions (INF) and quality of formal institutions (FOR). The explanatory variables of the latent constructs are defined deductively (reflective indicators).

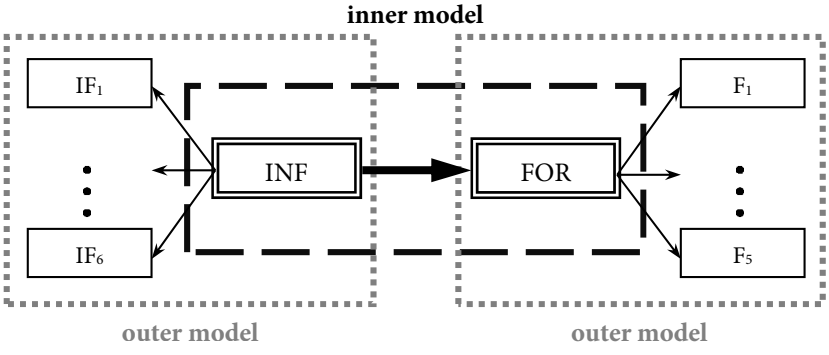


**Figure 1.** Specification of SEM-PLS model applied in the article

Source: own work.

The selected explanatory indicators for each latent variable are presented in Table 4. The FOR variable (quality of formal institutions) is reflected by five variables, which represent the quality of law system, property rights, regulatory institutions and institutions for macroeconomic stabilization. While INF (quality of informal institutions) is explained by six variables pertaining to freedom (personal, political and economic) and culture (religion, social behaviour).

**Table 4.** Measures of the quality of institutions (outer model specification)

| Symbol | Variable | Source of data |
|---|---|---|
| the quality of formal institutions (FOR) | | |
| $F_1$ | Rule of Law | World Bank (WGI) |
| $F_2$ | Legal enforcement of contracts | Fraser Institute (EFW) |
| $F_3$ | Business regulations | |
| $F_4$ | Regulation | |
| $F_5$ | Property Rights | Heritage Foundation |
| the quality of informal institutions (INF) | | |
| $IF_1$ | Media Freedom | Fraser Institute & Cato Institute (HFW) |
| $IF_2$ | Expression & Information | |
| $IF_3$ | Association, Assembly, & Civil Society | |
| $IF_4$ | Freedom of Expression and Belief | Freedom House (FIW) |
| $IF_5$ | Personal Autonomy and Individual Rights | |
| $IF_6$ | Business Freedom | Heritage Foundation |

Source: own work.

The presented set of diagnostic variables was selected on the basis of substantive and statistical (classical coefficient of variation higher than 5% and positively verified SEM-PLS model) evaluation. Variables: $IF_2$ and $IF_3$ are characterized by a slightly lower coefficient of variation than 5%. Nevertheless, the variables remained in the study because of their substantive relevance.

The internal sub-model is in the form of a single equation (Formula 4). The formula represents the dependence of informal institutions (INF) on formal ones (FOR). The relationship was determined on the basis of theoretical analysis. It is the informal norms that are of fundamental importance in the economy, they affect the entire institutional system, but also are the basis for the establishment of formal institutions.

$$\mathrm{FOR}_t = \alpha_1 \mathrm{INF}_t + \alpha_2 + \varepsilon_t \tag{4}$$

The values of the latent variables will be used to construct an institutional equilibrium matrix to divide economies into four typological groups of equilibrium levels (Figure 2). Countries will be divided into those with: institutional equilibrium, weak formal equilibrium, weak informal equilibrium and institutional disequilibrium.

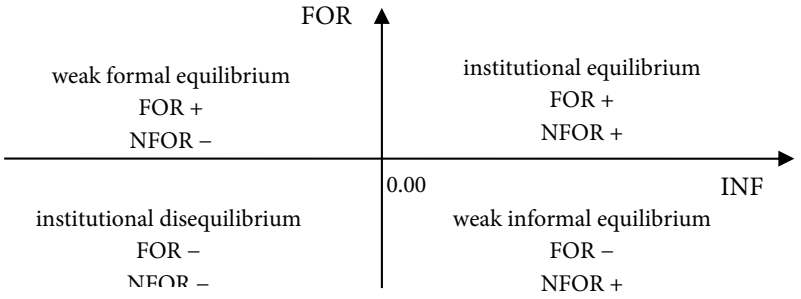


**Figure 2.** Institutional equilibrium matrix

Source: own work.

## 6. Research findings and discussion

### 6.1. Institutional equilibrium in the EU countries in 2008 – SEM-PLS results

Table 5 presents the estimates of the external sub-model of SEM-PLS model for 2008. The significance of the factor loadings was checked using the bootstrapping procedure. The number of samples was set at 5 000. At a significance level of 5% ($p < 5\%$), it can be concluded that all parameters are significantly different from zero. All indicators, both of the INF and FOR latent variables, are consistent in sign – they are all stimulants, which is consistent with the initial assumptions and economic theory.

Post-measurement convergent reliability is also observed – the values of factor loadings are greater than 0.4000. In addition, variables with a loading factor value of less than 0.7000 were examined in detail. Moreover, latent variables explain over 50% of total variability of unobservable phenomena. Based on the results, the internal consistency of the latent variables can be concluded (internal consistency measures takes values above 0.7000 and under 0.9500).

The strongest correlated indicator with the latent variable INF is $IF_1$ (0.9212), which is the media freedom variable. The least correlated is $IF_3$ (0.5530) – an indicator describing Association, Assembly & Civil Society in the economy. The values of the FOR variable are most strongly reflected by $F_1$ (0.9412) – a synthetic measure of the rule of law. The lowest factor loading of the FOR variable is found with $F_4$ (0.4027), a variable describing the general quality of regulation.

**Table 5.** Parameters of the outer sub-model (SEM-PLS model for 2008)

| Symbol | Factor loading *(st. dev.)* | t stat | p-value | AVE | α-Cb | pc |
|---|---|---|---|---|---|---|
| the quality of formal institutions (FOR) | | | | | | |
| $F_1$ | 0.9412 *(0.0231)* | 40.6819 | 0.0000 | 0.6437 | 0.8485 | 0.8947 |
| $F_2$ | 0.8134 *(0.0697)* | 11.6706 | 0.0000 | | | |
| $F_3$ | 0.8005 *(0.0880)* | 9.0936 | 0.0000 | | | |
| $F_4$ | 0.4027 *(0.1963)* | 2.0513 | 0.0402 | | | |
| $F_5$ | 0.9318 *(0.0187)* | 49.8499 | 0.0000 | | | |
| **the quality of informal institutions (INF)** | | | | | | |
| $IF_1$ | 0.9212 *(0.0237)* | 38.9112 | 0.0000 | 0.5716 | 0.8440 | 0.8859 |
| $IF_2$ | 0.6619 *(0.1040)* | 6.3661 | 0.0000 | | | |
| $IF_3$ | 0.5530 *(0.1932)* | 2.8620 | 0.0042 | | | |
| $IF_4$ | 0.8049 *(0.0679)* | 11.8502 | 0.0000 | | | |
| $IF_5$ | 0.8721 *(0.0427)* | 20.4331 | 0.0000 | | | |
| $IF_6$ | 0.6545 *(0.1198)* | 5.4634 | 0.0000 | | | |

Source: own work.

Table 6 presents cross loadings between FOR and INF variables in SEM-PLS model for 2008. The model has good discriminative abilities - the indicators were properly assigned to the latent structures in the model. The measurement model is considered to be positively validated.

**Table 6.** Cross loadings between latent variables in SEM-PLS model (2008)

| Symbol | FOR | INF |
|---|---|---|
| $F_1$ | **0.9412** | 0.8833 |
| $F_2$ | **0.8134** | 0.6162 |
| $F_3$ | **0.8005** | 0.6182 |
| $F_4$ | **0.4028** | 0.3077 |
| $F_5$ | **0.9317** | 0.9003 |

| Symbol | FOR | INF |
|---|---|---|
| $IF_1$ | 0.8371 | **0.9212** |
| $IF_2$ | 0.4458 | **0.6619** |
| $IF_3$ | 0.3873 | **0.5531** |
| $IF_4$ | 0.6765 | **0.8049** |
| $IF_5$ | 0.7886 | **0.8721** |
| $IF_6$* | 0.6834 | 0.6546 |

* Variable IF6 – Business Freedom – correlates a bit stronger with FOR than INF. Nevertheless, this variable remained in the modelling due to its substantive relevance

Source: own work.

The quality of informal institutions strongly, positively determine (0.8771) the quality of formal institutions (Formula 5). This is consistent with theory. Informal institutions are the core of every institutional system. The parameter at the latent variable

INF is statistically significant at the 1% level ($p < 1\%$). The variability of FOR is explained in more than 77% by the variability of INF – the result should be considered satisfactory. The SEM-PLS (2008) model also has fairly good predictive ability (S-G test for the FOR variables at 10 folds is equal to 0.45).

$$\widehat{\text{FOR}}_{2008} = \underset{(0.0376)}{0.8771^{***}} \text{INF}_{2008} - 8.7850 \tag{5}$$

The SEM-PLS model estimated for data from 2008 is considered to be positively verified both substantively and statistically. The estimated SEM-PLS model allowed to estimate the values of the latent variables of the quality of formal institutions (FOR) and informal institutions (INF) for the 27 EU economies. Figure 3 presents the institutional equilibrium matrix for the EU economies in 2008. Countries were divided into four typological groups ac-cording to the level of institutional equilibrium. Institutional equilibrium was recorded in 11 economies, weak informal equilibrium in 5, institutional disequilibrium in 11. There was no countries with weak formal institutional equilibrium in 2008.

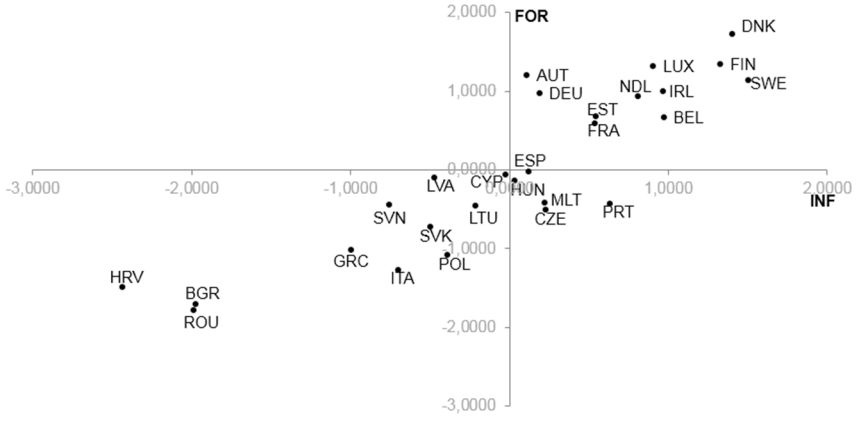


**Figure 3.** Institutional equilibrium matrix in 27 EU economies in 2008

Source: own work.

The results show that researched economies are diversified in terms of the quality of institutional equilibrium. In 2008, institutional equilibrium was mainly found in highly developed EU countries (e.g. Denmark, Sweden, Finland, Luxemburg, Germany), while institutional disequilibrium was recorded mainly in underdeveloped countries (Bulgaria, Romania, Greece).

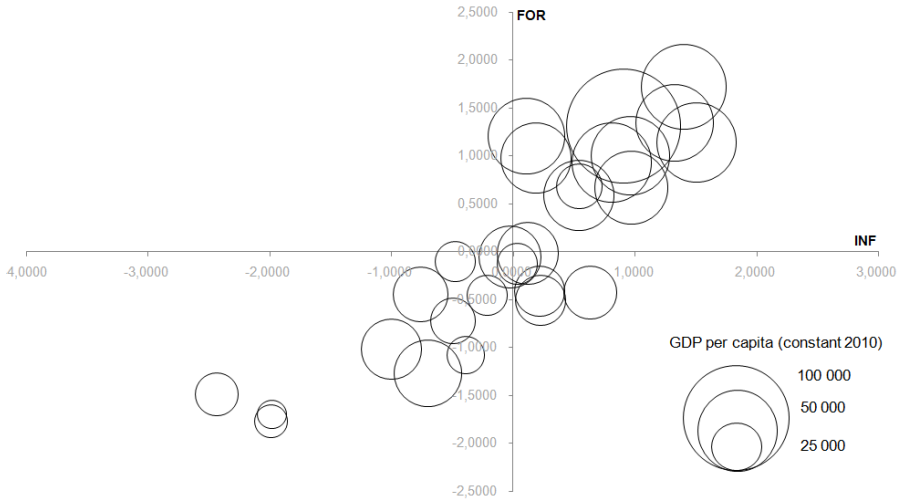


**Figure 4.** Institutional equilibrium and GDP per capita in 2008 (27 EU economies)
Source: own work.

Analysis of the statistical data may allow one to conclude that as institutional equilibrium improves, the level of GDP per capita in the economy rises. The average level of GDP per capita in economies with an observed institutional equilibrium is more than $51 thousand, while the average level of GDP per capita in countries with institutional imbalances is the lowest, at about $19 thousand. Figure 4 presents the institutional equilibrium matrix and GDP per capita in 2008 for 27 researched EU economies. As it turns out, institutional systems in developed economies are in institutional equilibrium.

### 6.2. Institutional equilibrium in the EU countries in 2018 – SEM-PLS results

The parameter estimates of the outer sub-model of the SEM-PLS model of the dependence of the quality of formal institutions on the quality of informal ones was presented in Table 7. All parameters are statistically significant at the $p < 1\%$ level. Moreover, outer sub-model is coincident. Cronbach's α and composite reliability values indicate the internal consistency of the latent variables. There is also convergent validity noted.

The strongest changes in the value of the latent variable informal institutions (INF) are reflected by the synthetic indicator representing media freedom ($IF_1$, 0.9066). The Association, Assembly & Civil Society ($IF_3$, 0.7879) variable is the least correlated with the latent variable INF. The formal institutions (FOR) variable is reflected by the rule of law measure ($F_1$, 0.9480) in the strongest way, while the general regulation indictor ($F_4$, 0.5935) has the lowest factor loading value. The results are similar compared to the sub-model estimated for data from 2008.

**Table 7.** Parameters of the outer sub-model (SEM-PLS model for 2018)

| Symbol | Factor loading *(st. dev.)* | t stat | p-value | AVE | α-Cb | pc |
|---|---|---|---|---|---|---|
| the quality of formal institutions (FOR) | | | | | | |
| $F_1$ | 0.9480 *(0.0162)* | 58.4582 | 0.0000 | 0.7305 | 0.9031 | 0.9297 |
| $F_2$ | 0.8351 *(0.0640)* | 13.0567 | 0.0000 | | | |
| $F_3$ | 0.9258 *(0.0179)* | 51.8289 | 0.0000 | | | |
| $F_4$ | 0.5935 *(0.1299)* | 4.5685 | 0.0000 | | | |
| $F_5$ | 0.9203 *(0.0234)* | 39.2777 | 0.0000 | | | |
| the quality of informal institutions (INF) | | | | | | |
| $IF_1$ | 0.9066 *(0.0280)* | 32.3694 | 0.0000 | 0.7147 | 0.9198 | 0.9375 |
| $IF_2$ | 0.8278 *(0.0570)* | 14.5295 | 0.0000 | | | |
| $IF_3$ | 0.7879 *(0.0960)* | 8.2037 | 0.0000 | | | |
| $IF_4$ | 0.8805 *(0.0456)* | 19.3152 | 0.0000 | | | |
| $IF_5$ | 0.7911 *(0.0531)* | 14.9022 | 0.0000 | | | |
| $IF_6$ | 0.8713 *(0.0648)* | 13.4453 | 0.0000 | | | |

Source: own work.

Table 8 contains a cross loadings between latent variables in SEM-PLS model estimated for data from 2018. Cross loadings values indicate that the variables were correctly assigned to the latent structures. The discriminant ability of the external model can be positively validated.

**Table 8.** Cross loadings between latent variables in SEM-PLS model (2018)

| Symbol | FOR | INF |
|---|---|---|
| $F_1$ | **0.9480** | 0.7694 |
| $F_2$ | **0.8351** | 0.4930 |
| $F_3$ | **0.9259** | 0.8188 |
| $F_4$ | **0.5935** | 0.3909 |
| $F_5$ | **0.9203** | 0.7571 |

| Symbol | FOR | INF |
|---|---|---|
| $IF_1$ | 0.7232 | **0.9066** |
| $IF_2$ | 0.6404 | **0.8278** |
| $IF_3$ | 0.4787 | **0.7879** |
| $IF_4$ | 0.6494 | **0.8805** |
| $IF_5$ | 0.7563 | **0.7911** |
| $IF_6$ | 0.6885 | **0.8713** |

Source: own work.

Latent variable FOR is strongly, positively (0.7891) determined by INF latent variable (Formula 6). The relationship is statistically significant at the level of 1%. Again, the thesis that informal institutions are the core of the institutional system is confirmed. The coefficient of determination is at the level of 0.62, which indicated quite good, but satisfactory, model fit. S-G test value (10 folds) is equal to 0.43 – SEM-PLS model has fairly good abilities to predict blindfolded observations.

$$\widehat{\mathrm{FOR}}_{2018} = \underset{(0.0543)}{0.7891^{***}}\mathrm{INF}_{2018} - 1.8568 \tag{6}$$

The analysed SEM-PLS model for 2018 is considered to be positively verified both in terms of substantial and statistical criterions. The consequence is that the latent variable values can be used for the institutional equilibrium designation.

Figure 5 shows the institutional equilibrium matrix for the 27 EU economies in 2018. Institutional equilibrium was recorded in 11 economies, weak informal equilibrium in 2, weak formal equilibrium in 2. The remaining EU countries (12) were classified into the group of countries with institutional disequilibrium.

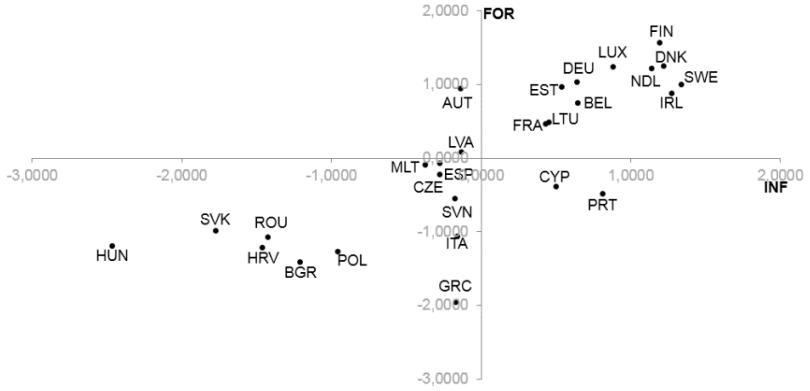


**Figure 5.** Institutional equilibrium matrix in 27 EU economies in 2018

Source: own work.

Institutional equilibrium is characteristic of highly developed countries (e.g. Finland, Denmark, Sweden, Ireland, Netherlands or Germany) in the European Union, while institutional disequilibrium occurs in economies of a low level of economic development (e.g. Bulgaria, Romania, Slovakia).

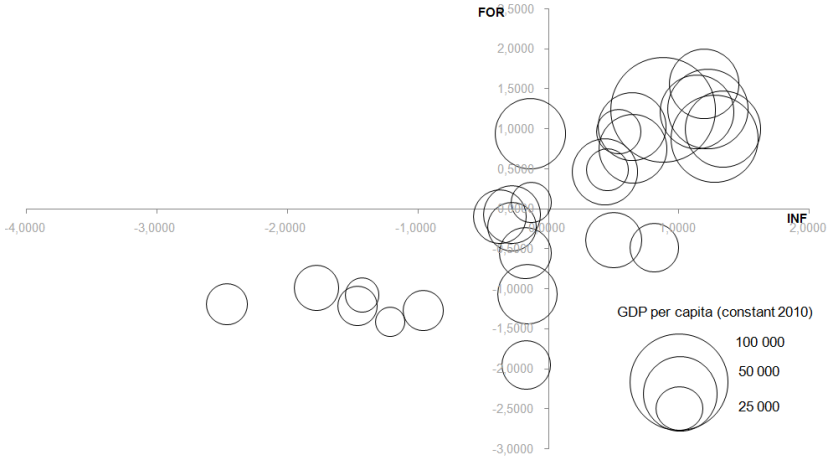


**Figure 6.** Institutional equilibrium and GDP per capita in 2018 (27 EU economies)

Source: own work.

The mean level of GDP per capita in the EU countries with institutional equilibrium is more than $53 thousand in 2018. As institutional equilibrium gets worse, the level of GDP per capita in the economy falls down. Countries with institutional disequilibrium achieve relatively low levels of GDP per capita on average (approximately $21 thousands in 2018). Figure 6 presents the equilibrium matrix and GDP per capita in 2018 for EU economies. Sustainable institutional systems imply higher levels of economic development. It turns out that institutional equilibrium is an important factor of economic development of modern world economies.

## 7. Conclusions

The main aim of the article was to identify the relationship between formal and informal institutions, as well as to measure and assess the institutional equilibrium of EU economies. The aim of the paper was achieved using SEM-PLS modelling.

Three research hypotheses are considered to be positively verified. As it turned out, the efficiency of informal institutions strongly, positively determines the quality of formal institutions. This is evidenced by the parameter of the internal relationship, which is equal to 0.8771 in 2008 and 0.7891 in 2018. The obtained results are consistent with economic and institutional theory. Informal institutions, which are the "core" of the institutional system, interact with formal ones. They strengthen their operation, but also set certain limits of their change. The strength of the relation between informal and formal rules is getting weaker over time. It seems that there is a trend in the EU economies towards disintegration rather than integration of the institutional structure. Moreover, institutional equilibrium positively influences the dynamics of economic development processes. The higher the level of institutional equilibrium, the higher, on average, the level of earned income.

The constructed models allowed for the assessment of the quality of formal and informal institutions, which enabled the construction of the institutional equilibrium matrix. In 2008, the highest efficiency of formal institutions was in Denmark and the lowest in Romania. In 2008, informal institutions were the strongest in Sweden and the weakest in Croatia. In 2018, Finland led the classification in terms of the FOR latent variable, while Greece closed the ranking. Sweden was characterised by the strongest informal institutions in 2018. The lowest quality of informal institutions in 2018 was observed in Hungary (this was also the largest fall in the ranking - from 16th place in 2008 to 27th place in 2018). Changes in the level of institutional equilibrium were not major. Noteworthy is the improvement in Lithuania, where institutional disequilibrium was in 2008 and institutional equilibrium in 2018 (the largest improvement among the EU countries in 2018, compared to 2008).

The proposed research method can be a beneficial tool for monitoring the relationship between formal and informal institutions. Moreover, the concept of measuring institutional equilibrium, admittedly very simple, can be a useful mechanism for institutional analysis.

The analyses carried out in this paper indicate that EU economies are diversified in terms of the quality of informal and formal institutions and, consequently, in institutional equilibrium. Large institutional disparities also translate into a large diversification in economic development. This problem would still appear to be still relevant and topical.

## References

Amable, B., (2016). Institutional complementarities in the dynamic comparative analysis of capitalism. *Journal of Institutional Economics*, Vol. 12, No. 1, pp. 79–103, doi: 10.1017/S1744137415000211.

Balcerzak, A., (2020). Quality of Institutions in the European Union countries. Application of TOPSIS Based on Entropy Measure for Objective Weighting. *Acta Polytechnica Hungarica*, Vol. 17, No. 1, pp. 101–122, doi: 10.12700/APH. 17.1.2020.1.6.

Ciborowski, R. W., Skrodzka, I., (2020). International technology transfer and innovative changes adjustment in EU. *Empirical Economics*, Vol. 59, No. 3, pp.1351–1371. doi: 10.1007/s00181-019-01683-8.

Fiedor, B., (2015). Instytucje formalne i nieformalne w kształtowaniu trwałego rozwoju [Formal and Informal Institutions in Shaping Sustainable Development]. *Zeszyty Naukowe Uniwersytetu Szczecińskiego. Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania*, Vol. 2, No. 40, pp. 83–107, doi: 10.18276/sip.2015.40/2-07.

Fiedor, B., (2019). Proces transformacji a nowa ekonomia instytucjonalna (NEI): Koszty transakcyjne i równowaga instytucjonalna [Process of transformation vs. New Institutional Economy (NIE): Transaction Costs and Institutional Equilibrium]. *In Ekonomia i polityka. Wokół teorii Grzegorza W. Kołodko* [*Economics and Politics. Around the Theory of Grzegorz W. Kołodko*], E. Mączyńska (eds.), Warszawa: PWN, pp. 164–182.

Fuentelsaz, L., González, C., Maicas, J. P., (2019). Formal institutions and opportunity entrepreneurship. The contingent role of informal institutions. *BRQ Business Research Quarterly*, Vol. 22, No. 1. pp. 5–24. doi: 10.1016/j.brq. 2018.06.002.

Gancarczyk, M., (2002). Instytucja a organizacja w nowej ekonomii instytucjonalnej [Institution and Organisation in New Institutional Economics], *Gospodarka Narodowa. The Polish Journal of Economics*, Vol. 176, No. 5-6, pp. 78–94, doi: 10.33119/gn/113844.

Godłów-Legiędź, J., (2010). Współczesna ekonomia: Ku nowemu paradygmatowi? [*Contemporary economics: Towards a new paradigm?*], Warszawa: C. H. Beck.

Gruszewska, E., (2011). Dezintegracja w zinstytucjonalizowanym świecie [Disintegration in an Institutionalized World]. *Ekonomia i Prawo*, Vol. 7, No. 1, pp. 49–65, doi: 10.12775/eip.2011.003.

Gruszewska, E., (2013). Instytucje a proces tworzenia kapitału w Polsce [*Institutions vs. the process of capital formation in Poland*]. Białystok: Wydawnictwo Uniwersytetu w Białymstoku.

Gruszewska, E., (2017). Instytucje formalne i nieformalne. Skutki antynomii [Formal and Informal Institutions. Results of Antinomy]. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, No. 493, pp. 36–50, doi: 10.15611/ pn.2017.493.03.

Hair, J. F., Hult, G. T. M., Ringle, C., Sarstedt, M., (2014). *A Primer on Partial Least Squares Structural Equation Modeling*, Los Angeles, London, New Delhi, Singapore, Washington DC, Melbourne: SAGE Publications.

Hair, J. F., Ringle, C. M., & Sarstedt, M., (2011). PLS-SEM: Indeed a Silver Bullet. *Journal of Marketing Theory and Practice*, Vol. 19, No. 2, pp. 139–152, doi: 10.2753/mtp1069-6679190202.

Helmke, G., Levitsky, S., (2004). Informal Institutions and Comparative Politics: A Research Agenda. *Perspectives on Politics*, Vol. 2, No. 4, pp. 725–740, doi: 10.1017/S1537592704040472.

Hindriks, F., Guala, F., (2015). Institutions, rules, and equilibria: A unified theory*. *Journal of Institutional Economics*, Vol. 11, No. 3, pp. 459–480, doi: 10.1017/S1744137414000496.

Hodgson, G. M., (2006). What Are Institutions? *Journal of Economic Issues*, Vol. 40, No. 1, pp. 1–25, doi: 10.1080/00213624.2006.11506879.

Höpner, M., (2005). What connects industrial relations and corporate governance? Explaining institutional complementarity. *Socio-Economic Review*, Vol. 3, No. 2, pp. 331–358, doi: 10.1093/SER/mwi014.

Lohmöller, J.-B., (1989). *Latent Variable Path Modeling with Partial Least Squares*, Verlag, Berlin, Heidelberg: Springer.

Mahoney, J., Thelen, K., (2010). *Explaining Institutional Change: Ambiguity, Agency, and Power*, Cambridge: Cambridge University Press.

Miłaszewicz, D., Nermend, K., (2020). Application of Vector Measure Construction Methods to Estimate Quality of Institutions: Nations in Transition. *European Research Studies Journal*, Vol. XXIII, No. special 2, pp. 16–29. doi: /10.35808/ersj/1805.

Mohmand, S. K., (2015). *Customary institutions and public authority: A literature review*, Bern: Swiss Agency for Development and Cooperation.

Monecke, A., Leisch, F., (2012). semPLS: Structural Equation Modeling Using Partial Least Squares. *Journal of Statistical Software*, Vol. 48, No. 1, pp. 1–32. doi: 10.18637/jss.v048.i03

Nifo, A., Vecchione, G. (2015). Measuring Institutional Quality in Italy. *Rivista Economica Del Mezzogiorno*, No. 1-2, pp. 157–182.

North, D. C., (1992). Institutions, Ideology, and Economic Performance. *Cato Journal*, Vol. 11, No. 3, pp. 477–496.

North, D. C., (1994). Economic Performance Through Time. *The American Economic Review*, Vol. 84, No. 3, pp. 359–368.

Ostrom, E., (2008). *Doing Institutional Analysis: Digging Deeper than Markets and Hierarchies*, In Handbook of New Institutional Economics, C. Ménard, M. M. Shirley (eds.), Berlin, Heidelberg: Springer, pp. 819–848, doi: 10.1007/0-387-25092-1_31.

Platje, J., (2008). "Institutional capital" as a factor of sustainable development - the importance of an institutional equilibrium. *Technological and Economic Development of Economy*, Vol. 14, No. 2, pp. 144–150. doi: 10.3846/1392-8619.2008.14.144-150

Rademaker, M., Schuberth, F., (2021). *Composite-Based Structural Equation Modeling*, Retrieved April 13, 2021 from: https://m-e-rademaker.github.io/cSEM/

Rordik, D., (2007). *One Economics, Many Recipes: Globalization*, Institutions, and Economic Growth, Princeton: Princeton University Press.

Rogowski, J., (1990). Modele miękkie. Teoria i zastosowanie w badaniach ekonomicznych [*Soft models. Theory and application in economic research*], Białystok: Wydawnictwo Filii Uniwersytetu Warszawskiego w Białymstoku.

Seidler, V., (2011). The Role of Informal Institutions in Building the Institutional Framework of an African State: The Case of the Kanuri in Nigeria. *SSRN Scholarly Paper* ID 3050608, doi:10.2139/ssrn.3050608.

Skarbek, D., (2020). Qualitative research methods for institutional analysis. *Journal of Institutional Economics*, Vol. 16, No. 4, pp. 409–422, doi: 10.1017/S174413741900078X.

Skrodzka, I., (2016). Knowledge-Based Economy in the European Union: Cross-Country Analysis. *Statistics in Transition new series*, Vol. 17, No. 2, pp. 281-294. doi: 10.21307/stattrans-2016-019.

Veblen, T. B., (2016). *The Theory of the Leisure Class*, Scotts Valley: CreateSpace Independent Publishing Platform.

Vitola, A., Šenfelde, M., (2015). The role of institutions in economic performance. *Verslas: Teorija ir Praktika*, Vol. 16, No. 3, pp. 271–279, doi: 10.3846/ btp.2015.498.

Wilkin, J., (2011). Institutional Equilibrium: What Is it about and what Is its Role in the Economy? *Prace Naukowe Uniwersytetu Ekonomicznego We Wrocławiu. Ekonomia*, Vol. 15, No. 208, pp. 26–37.

Wilkin, J., Kargol-Wasiluk, A., Zalesko, M., (2019). Równowaga instytucjonalna - fundament równowagi gospodarczej [Institutional Equilibrium: the Foundation of Eco-nomic Equilibrium]. *Ekonomista*, No. 6, pp. 659–679.

Williamson, C. R., (2009). Informal institutions rule: Institutional arrangements and economic performance. *Public Choice*, Vol. 139, No. 3, pp. 371–387, doi: 10.1007/s11127-009-9399-x.

Wold, H., (1980). Soft modelling: Intermediate between traditional model building and data analysis. *Banach Center Publications*, Vol. 6, No. 1, pp. 333–346, doi: 10.4064/-6-1-333-346.