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Well-Being and Economic Freedoms in OECD

Irina GEORGESCU[1], Jani KINNUNEN[2]

Abstract

OECD countries represent advanced market economies. Well-being in OECD countries can be measured by Better Life Index (BLI). In this paper, firstly, two composite indices are built for BLI and Freedom Index (FI) based on principal component analyses of the 24 individual well-being variables and 10 economic freedom variables for 2013-2016. The purpose is to study the effect of the composite FI and the individual economic freedoms on the composite BLI. This is done by linear regressions between the indices and, separately, between individual freedoms and the BLI. Also, GDP per capita is included into regressions. Then, multiple correspondence analysis (MCA) is conducted on categorized 2016 data for further insights. The approach leads to several findings: countries in higher quartiles measured by BLI are related to higher freedom index; while GDP per capita explains about 51% (R^2) of BLI using a univariate regression, the freedom index explains as much as 69%. Multiple correspondence analysis shows that countries belonging to the two highest quartiles, measured by BLI, are very similar and they are related to very high and high levels of freedoms and GDP, while the countries belonging to lowest and second lowest BLI quartiles form both clearly separate groups and are related to low freedoms and GDP and medium-level freedoms and GDP, respectively. Freedoms related to monetary and fiscal policies were not found significant in line with earlier literature suggesting that the policies can create well-being.

Keywords: *Better-life index; composite index; economic freedom; multiple correspondence analysis; OECD; regression analysis; well-being.*

1. Introduction

What creates well-being is a widely studied complex issue. Long-term development is connected to a functioning market economy and democratic

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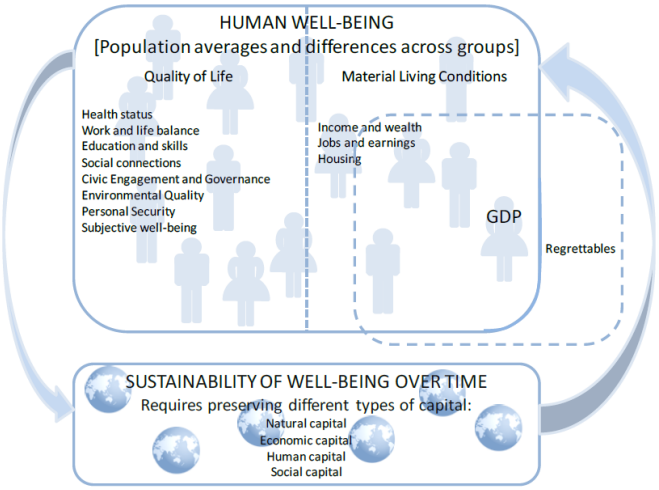
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institutions, which allow individuals pursue well-being, long, healthy and prosperous lives according to their subjective preferences within available options and established institutions [2, 4, 6, 11, 13, 19].

GDP as a measure of a country's economic productivity or output has some limitations, such as not including pollution, subjective happiness, the value of leisure and longer life spans. Measures regarding the national income, such as GDP or GNI may be good measures of economic well-being, but not well-being in a broader sense [18]. The United Nation's Human Development Index (HDI) takes a broader view as a composite index with the following components: health, education and level of income. The health dimension refers to life expectancy at birth, the education is measured by schooling years and the living standard is quantified by the logarithm of GNI per capita. A limitation of HDI in the analysis of the most advanced countries, such as OECD countries, is that these countries are all on the highest end of scale measured by its narrow components, while development is required on a broader scale.

OECD has developed a wide range of indicators of human well-being including measures for quality of life and separately for material living conditions, the latter including GDP, and "regrettables", such as pollution or inequality. The OECD framework presented in Figure 1 is based on sustainability depending on natural, economic, human and social capital.

Figure 1. OECD framework [15, 16, 17]

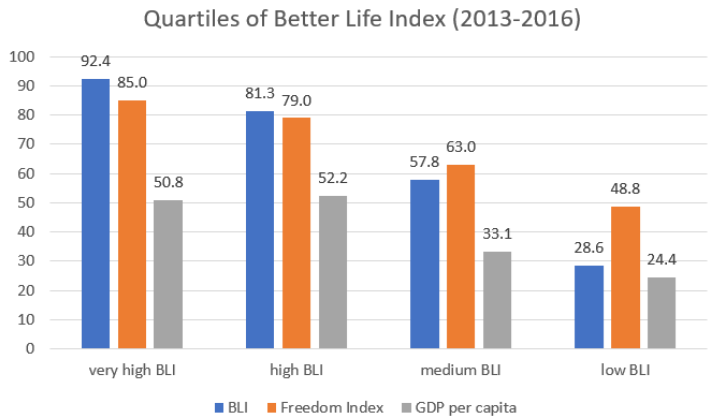


In this paper, we will build, step-by-step, a composite well-being index (BLI) and a composite freedom index based on OECD's composite building methodology [14]. We will put the relationships of the two indices

and GDP per capita under regression analysis and show that the composite freedom index predicts well, better than GDP does, the well-being in OECD countries. In Figure 2, the built BLI is divided into four classes, *very high, high, medium* and *low*. The well-being (BLI) quartiles grow together with the economic freedoms (Freedom Index), while economic development measured by GDP per capita is not showing as clear relation to BLI: The higher the well-being, the higher the economic freedom; Per capita GDP, instead, is the highest in the second highest (*high)* well-being quartile.

We will further cluster OECD countries with their related individual freedoms and Freedom Index to find very clear clusters to appear.

Figure 2. Well-being, Freedom Index and GDP



2. Problem Statement

Evidence is strong for the economic freedoms' positive link to economic development, both on the level and growth of GDP with various sets of countries [5, 6, 7, 13, 20, 3]. Similar findings have been made with OECD countries [3, 12]. It is, however, not clear whether an increase in economic freedoms leads to increasing economic growth, e.g., there is evidence for a possible threshold after which this may not be a case, cf. [1]; also, causality is sometimes argued to be from economic development to economic freedoms instead of vice versa, and sometimes the causality is shown to go both ways, cf. [9].

This paper extends the studies of economic freedoms to the broader well-being measure than the economic one (GDP), to the Better Life Index (BLI). BLI is based on OECD's own indicators specifically reported on

OECD countries to capture the range of well-being in the most advanced countries and economies. We study the predictive ability of economic freedoms and the systematically built Freedom Index to a broadest well-being index. As BLI covers various qualitative and even subjective factors alongside material/economic components, the role of economic freedom is unclear. As GDP measures the realized economic strength on which other well-being components can be built on, the comparison of the predictive power of economic freedoms and GDP can offer policy implications. This can show that economic freedoms predict, and, thus, potentially have much broader well-being effects than economic growth.

It is of interest to find out, which sets/clusters of countries share same levels of the features/economic freedoms, which are capable to predict the well-being.

3. Aims of the Research

The purpose of this paper is to study how economic freedoms (on the level of both the composite index and individual freedoms) are related to well-being measured by BLI. We test, whether the built Freedom Index, as well as, the individual freedoms are significant explanatory variables of BLI and which of them are the most important. It is further tested, whether GDP per capita explains well-being better or worse than the freedom indicators.

It is expected that economic freedoms are positively related to BLI, but the systematically built composite Freedom Index's relationship is an open question. It is expected that GDP's predictive ability may not be beaten by the constructed Freedom Index. Further, it is expected that the economic freedoms in the most economically free OECD countries may have limited explanatory power.

Lastly, relatedness of countries (clusters of country) and the levels of freedom and well-being variables are studied. This will show clusters of similar countries and their features (variable classes), which make them similar to each other. It is unknown, whether clear clusters would appear from a relatively homogeneous group of OECD countries.

4. Data and Research Methods

The used data consists of 24 OECD's indicators of well-being (Table 1), GDP per capita (World Bank), and 10 economic freedom indicators (Table 2) published by the Heritage Foundation and the Wall Street Journal

for the period 2013-2016 (OECD has published the BLI indicators starting from 2013). The data includes 36 countries, i.e. 34 OECD countries (Latvia joined in 2016, but is excluded) and 2 partner-countries, Russia and Brasilia for which OECD publishes the data, as well.

Table 1. OECD's indicators for Better Life Index

Well-being indicators	
Dwellings_without_basic_facilities	Years_in_education
Housing_expenditure	Air_pollution
Rooms_per_person	Water_quality
Household_net_adj._disposable_income	Stakeholder_engagement_for_developing_regulations
Household_net_financial_wealth	Voter_turnout
Labour_market_insecurity	Life_expectancy
Employment_rate	Self-reported_health
Long-term_unemployment_rate	Life_satisfaction
Personal_earnings	Feeling_safe_walking_alone_at_night
Quality_of_support_network	Homicide_rate
Educational_attainment	Employees_working_very_long_hours
Student_skills	Time_devoted_to_leisure_and_personal_care

We, firstly, use principal component analysis [8, 14] in building two composite indices: 1) better life index, BLI, based on the 24 indicators and 2) economic Freedom Index based on the 10 individual freedoms.

Secondly, we conduct regression analysis on selected cases, where the built composite BLI is the dependent variables. The cases include *case 1*: the simple univariate regression between BLI and the built composite Freedom Index; *case 2*: similarly, between BLI and GDP per capita; and *case 3*: between BLI and the 10 individual freedom indicators.

Thirdly, multiple correspondence analysis [10] is run with 2016 data of the 10 individual freedoms, BLI, Freedom index and GDP per capita. For this purpose, the original data is categorized and divided into four classes as shown in Table 2: an indicator is *very high* if it is equal or larger than the indicator's 3rd quartile (i.e., 75th percentile) limit, *high,* if the value is lower than that, but equal or higher than the median value (i.e., 50th percentile limit), medium (med), if the value is lower than median, but larger than the 1st quartile (i.e., 25th percentile) limit, and *low*, if the value is lower than that. Table 2 shows the calculated quartile limits for each indicator.

Table 2. Categories of variables and quartile limits

Variable X	X >=	75%	> X >=	median	> X >=	25%	< X
PropertyRights	*very high*	90.0	*high*	80.0	*medium*	64.1	*low*
FreedomOfCorruption	.	81.0	.	71.5	.	54.0	.
FiscalFreedom	.	75.3	.	66.0	.	58.3	.
GovtSpending	.	54.8	.	42.6	.	25.0	.
BusinessFreedom	.	89.5	.	80.1	.	72.1	.
LaborFreedom	.	72.8	.	59.7	.	52.3	.
MonetaryFreedom	.	84.9	.	81.3	.	77.8	.
TradeFreedom	.	88.0	.	87.8	.	86.3	.
InvestmentFreedom	.	90.0	.	80.0	.	70.0	.
FinancialFreedom	.	80.0	.	70.0	.	60.0	.
GDPperCap	.	47.7	.	38.9	.	28.7	.
FreedomIndex	.	81.1	.	72.2	.	60.8	.
BLI	*very high*	87.5	*high*	69.9	*medium*	48.1	*low*

The composite indicator that we built follows the OECD methodology from the Handbook of Constructing Composite Indicators [14]. After applying PCA and retaining a number of PCs capturing the most of the total variability, we build two composite indicators: the Freedom Index and the Better Life Index (BLI) in the following way: the weights describing the contribution of each PC are computed from the proportion of variance of each PC to the total variance. The PC extraction for the Freedom Index is based on the ten economic freedom indicators.

During the PCA application to obtain the Freedom Index we obtain two tests indicating the data suitability for structure detection. The KMO (Kaiser-Meyer-Olkin) test was used to indicate the proportion of the total variance, which may be caused by the underlying factors. The KMO-value of 0.784 (>0.5) secures that PCA is suitable for the data. Bartlett's test of sphericity of 0.00 (< 0.05) suggests that a factor analysis is useful. Together, the tests imply that the chose approach can be used with the presented variables.

Table 3. Principal components and coefficients

Total Variance Explained				Component Matrix		
PC	Eigenvalues				PC	
	Total	% of var	cum %		1	2
1	4.83	**48.26**	48.27	PropertyRights	**0.91**	**0.12**
2	1.58	**15.82**	**64.09**	FreedomOfCorruption	0.90	0.02
3	0.98	9.84	73.93	FinancialFreedom	0.77	0.34
4	0.71	7.07	81.00	InvestmentFreedom	0.83	0.12
5	0.59	5.85	86.84	TradeFreedom	0.71	-0.01
6	0.51	5.09	91.94	MonetaryFreedom	0.63	0.12
7	0.34	3.35	95.28	BusinessFreedom	0.69	-0.15
8	0.26	2.63	97.91	LaborFreedom	0.36	0.56
9	0.15	1.50	99.41	FiscalFreedom	-0.55	0.68
10	0.06	0.59	100.00	Gov'tSpending	-0.36	0.79

According to the principle of the cumulative proportion of the explained variance (cum % in Table 3) we will retain two PCs, retaining 64.088% of the total variance. Using the two selected PCs, we build a compound PC, whose coefficients are the weights equal to the corresponding proportion of the variance explained by each component to their total variance: PC = $\frac{48.26}{64.088} PC_1 + \frac{15.82}{64.088} PC_2$.

PC is a vector, whose elements are the values of the attributes computed as the weighted sum of the first two PCs, with the weights (0.75 and 0.25), respectively. For example, the coefficient of PC representing the Property Rights is computed as follows: $\frac{48.26}{64.088} 0.907 + \frac{15.82}{64.088} 0.124 = 0.7137$, and the Freedom Index (FI) will have the form:

*FI = 0.7137 * PropertyRights + 0.6808 * FreedomOfCorruption + 0.6646 * FinancialFreedom + 0.651 * InvestmentFreedom + 0.53 * TradeFreedom + 0.5016 * MonetaryFreedom + 0.4836 * BusinessFreedom + 0.4076 * LaborFreedom - 0.2446 * FiscalFreedom - 0.0774 * Gov'tSpending.*

Similarly, the Better Life Index (BLI) is built on the 24 variables presented in Table 1 (the PCA table with coefficients is not presented here). In this case, we retain seven PCs explaining 81.194% of the total variability. The corresponding compound PC is:

$$PC' = \frac{32.22}{81.194} PC_1 + \frac{15.089}{81.194} PC_2 + \frac{10.160}{81.194} PC_3 + \frac{7.604}{81.194} PC_4 + \frac{6.834}{81.194} PC_5 + \frac{4.89}{81.194} PC_6 + \frac{4.388}{81.194} PC_7$$

Now, PC' is a vector, whose elements are the values of the attributes computed as the weighted sum of the first seven PCs, with the weights (0.396; 0.185; 0.125; 0.093; 0.084; 0.060; 0.057), respectively.

For example, the coefficient of PC' representing the dwellings without basic facilities is computed as follows: *0.396 * (-0.755) + 0.185 * (-0.071) + 0.125 * 0.093 + 0.093 * (-0.402) + 0.084 * (-0.037) + 0.06 * 0.121 + 0.057 * 0.03 = - 0.341.*

The BLI index takes the form:

*BLI = + 0.0815 * Time_devoted_to_leisure_and_personal_care + 0.3759 * Personal_earnings + 0.3748 * Water_quality + 0.3633 * Life_expectancy + 0.3559 * Rooms_per_person + 0.3287 * Household_net_adjusted_disposable_income + 0.3136 * Life_satisfaction + 0.3026 * Self-reported_health + 0.2434 * Household_net_financial_wealth + 0.2599 * Quality_of_support_network + 0.2265 * Stakeholder_engagement_for_developing_regulations + 0.2126 * Years_in_education + 0.2088 * Student_skills + 0.1759 * Labour_market_insecurity + 0.1877 * voter_turnout + 0.1758 * Housing_expenditure + 0.0611 * Educational_attainment - 0.053 * Employees_working_very_long_hours - 0.063 * Air_pollution - 0.099 * Long_time_unemployment_rate - 0.111 * Feeling_safe_walking_alone_at_night - 0.125 * Employment_rate - 0.237 * Homicide_rate - 0.341 * Dwellings_without_basic_facilities.*

The Freedom Index and the Better Life Index are built using standardized values (with mean 0 and standard deviation 1) and they are finally rescaled to a range 0-100 according to the min-max normalization formula:

$$z_i = \frac{x_i - \min(x)}{\max(x) - \min(x)},$$

where $x = (x_1, ..., x_n)$ represents the i:th normalized actual data, z_i is the corresponding i:th index value, min(x) and ma(x), the minimum and maximum of the actual data. By the min-max normalization, the two composite indices take values between 0 and 100.

5. Findings

5.1 Regression Analysis

For Case 1, a univariate regression is run between the two built composite indices (Table 4). The obtained regression line is:

*BLI = -14.28 + 1.15 * FreedomIndex.*

In other words, for each unit increase in the Freedom Index, BLI increases by 1.15 units. To check if the results are statistically significant, we notice that Significance F is less than 0.05. The Freedom Index is a good predictor since its p-value is less than 0.05. The adjusted R^2 statistic with a value closer to 1 indicates the best fit. Freedom Index has adjusted R^2 of 0.689, which is very high for a univariate regression.

Table 4. Case 1: BLI = c + a*FreedomIndex

Regression Stats						
Multiple R	0.831					
R^2	0.691					
Adj. R^2	**0.689**					
Std. error	14.411					
# of obs.	144					
ANOVA						
	df	*SS*	*MS*	*F*	*Sig F*	
Regr.	1	65951.45	65951.45	317.58	**0.00**	
Resid.	142	29489.22	207.67			
Total	143	95440.67				
	Coef	*Std. error*	*t-stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	**-14.28**	4.61	-3.10	**0.00**	-23.39	-5.16
FreedomIndex	**1.15**	0.06	17.82	**0.00**	1.02	1.28

For Case 2, the regression line is (Table 5):

*BLI = 18.80 + 1.15 * GDPperCap.*

In other words, for each unit increase in the GDP per capita, BLI increases by 1.15 units. Significance F is less than 0.05, therefore the results are statistically significant. GDP is a good predictor since its p-value is less than 0.05. The adjusted R square statistic is equal to 0.508 indicating the moderate fit. We also ran a regression for *BLI = c + a*GDP + b*FreedomIndex* (related table is not shown here) to find that R square increased to 0.767 and both GDP per capita and the Freedom Index were significant. All together shows that Freedom Index is a superior predictor of BLI than GDP per capita.

Table 5. Case 2: BLI = c + a*GDPperCap

Regression Stats						
Multiple R	0.715					
R^2	0.512					
Adj. R^2	**0.508**					
Std. error	18.113					
# of obs.	144					
ANOVA						
	df	*SS*	*MS*	*F*	*Sig F*	
Regr.	1	48854.84	48854.84	148.92	**0.00**	
Resid.	142	46585.83	328.07			
Total	143	95440.67				
	Coef	*Std. error*	*t-stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	**18.80**	4.08	4.61	**0.00**	10.74	26.86
GDPperCap	**1.15**	0.09	12.20	**0.00**	0.97	1.34

In Case 3, the predictive ability of individual freedoms are tested (Table 6). The regression line becomes:

*BLI = - 84.08 + 0.23 * PropertyRights + 0.53 * FreedomOfCorruption - 0.48 * FiscalFreedom - 0.10 GovtSpending + 0.24 * BusinessFreedom + 0.22 * LabourFreedom - 0.27 * MonetaryFreedom + 1.42 * TradeFreedom - 0.32 * InvestmentFreedom + 0.35 FinancialFreedom.*

Good predictors are Freedom from Corruption, Fiscal Freedom, Labour Freedom, Trade Freedom, and Financial Freedom, since their p-values are less than 0.05. Significance F is less than 0.05, therefore the results are statistically significant. The adjusted R square statistic is equal to 0.796 indicating a good fit. Again, we also ran the same regression including GDP per capita. The adjusted R square increased to 0.856 (not shown here), suggesting that individual freedoms can explain BLI better than the composite Freedom Index, but both predict BLI far better than GDP per capita.

Table 6. Case 3: BLI = c + $\sum a_i$*IndividualFreedom$_i$

Regression Stats						
Multiple R	0.900					
R^2	0.810					
Adj. R^2	**0.796**					
Std. error	11.669					
# of obs.	144					
ANOVA						
	df	*SS*	*MS*	*F*	*Sig F*	
Regr.	10	77331.6	7733.2	56.80	**0.00**	
Resid.	133	18109.0	136.2			
Total	143	95440.7				
	Coef	*Std. error*	*t-stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	**-84.08**	26.98	-3.12	**0.00**	-137.45	-30.71
PropertyRights	0.23	0.16	1.47	0.14	-0.08	0.54
FreedomOfCorruption	**0.53**	0.14	3.64	**0.00**	0.24	0.81
FiscalFreedom	**-0.48**	0.13	-3.77	**0.00**	-0.74	-0.23
GovtSpending	-0.10	0.07	-1.49	0.14	-0.23	0.03
BusinessFreedom	0.24	0.16	1.47	0.14	-0.08	0.55
LabourFreedom	**0.22**	0.08	2.77	**0.01**	0.06	0.37
MonetaryFreedom	-0.27	0.24	-1.11	0.27	-0.74	0.21
TradeFreedom	**1.42**	0.36	3.95	**0.00**	0.71	2.13
InvestmentFreedom	-0.32	0.19	-1.71	0.09	-0.68	0.05
FinancialFreedom	**0.35**	0.14	2.44	**0.02**	0.07	0.63

5.2 Multiple Correspondence Analysis

The multiple correspondence analysis, MCA, is conducted using all 10 individual freedoms, GDP per capita, and the two built composite indices totalling 13 variables. Each variable is categorized and divided into 4 classes, *very high, high, medium* and *low* based on quartile limits as presented earlier in Table 1. All 36 countries are included. The MCA procedure is done using R software/language in line with [10].

MCA (as well as, principal component analysis) is based on dimensions, or components, which are ordered by how much each dimension explains of the total variance of all variables. MCA does this with qualitative variables, while PCA with quantitative data. With our data, the first dimension explains 18.7% of the total (cumulative) variance and the second dimension explains 10.5% together totalling 29.2%. The next dimensions from the third to tenth explain (in declining order) 8, 7, 6.4, 5, 5, 4.6, 4.3, and 3.7%. Next, we consider only the first two dimensions.

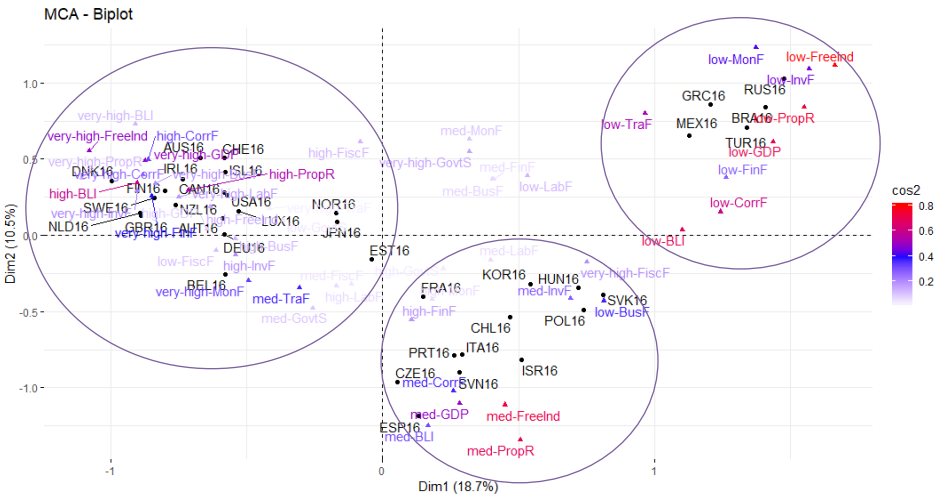


Figure 3. Well-being, Freedom Index and GDP

The 36 countries and the four classes of all variables (cf. Table 1) under analysis are plotted on the MCA factor map with the first two dimensions in Figure 3. Three clusters of countries are found. The closer the countries and the classes are to each other, the closer they are related although some close countries may deviate even significantly by some of their features, i.e., variable categories.

Cluster 1: Countries with *very high*/*high* BLI, Freedoms and GDP. The summary Table 7 shows the 19 countries belonging to this cluster. The cluster has average BLI of 77.7 (*high* category). Only Australia, Switzerland and New Zealand fall into *very high* BLI category, other countries belong to *high* BLI category, except Japan falls to *medium* level and Estonia to *low* level on the farthest corner on the factor map. Average Freedom index is 81.7 (*very high*) and average GDP per capita is 52.2k USD. Only New Zealand and Estonia fall to lower GDP categories than *very high* or *high*. Of the individual freedoms *high* property rights is the most significant feature of this cluster (the red colour in Figure 3 means the strongest correlation with other factors).

Table 7. Well-being and freedom in "top" cluster

ID	BLI		Freedom index		GDP per capita	
AUS16	90.4	*very high*	86.3	*very high*	47.8	*very high*
CHE16	88.2	*very high*	85.4	*very high*	62.9	*very high*
NZL16	87.7	*very high*	92.2	*very high*	38.8	*med*
USA16	85.7	*high*	78.1	*high*	57.3	*very high*
DNK16	85.3	*high*	94.0	*very high*	49.8	*very high*
CAN16	85.2	*high*	78.5	*high*	44.0	*high*
ISL16	84.3	*high*	73.1	*high*	51.1	*very high*
SWE16	81.6	*high*	87.3	*very high*	49.1	*very high*
NOR16	81.5	*high*	72.1	*med*	59.3	*very high*
LUX16	81.3	*high*	79.0	*high*	105.8	*very high*
NLD16	78.4	*high*	86.9	*very high*	51.3	*very high*
BEL16	78.2	*high*	79.5	*high*	46.7	*high*
FIN16	77.7	*high*	86.1	*very high*	43.4	*high*
DEU16	76.5	*high*	75.9	*high*	48.8	*very high*
IRL16	72.7	*high*	81.3	*very high*	72.8	*very high*
AUT16	72.6	*high*	80.1	*high*	50.1	*very high*
GBR16	71.0	*high*	87.7	*very high*	42.7	*high*
JPN16	57.4	*med*	72.3	*high*	41.5	*high*
EST16	40.0	*low*	77.1	*high*	29.4	*med*
average	77.7	*high*	81.7	*very high*	52.2	*very high*

Cluster 2: Countries with *medium* BLI, Freedoms and GDP**.** Table 8 summarizes the 12 countries belonging to this "middle" cluster: the cluster average for BLI is 46.9 (*low*), Freedom index 64.7 (*medium*) and GDP per capita 33.1k USD (*medium*), all clearly lower than in the "top" cluster. Very small variance of Freedom index in this cluster can be noticed. Variances of BLI and GDP per capita are much higher. Again, *medium* property rights is the most significant individual freedom describing this cluster.

Table 8. Well-being and freedom in "middle" cluster

ID	BLI		Freedom index		GDP per capita	
FRA16	68.6	*med*	67.7	*med*	41.5	*high*
ESP16	64.3	*med*	67.8	*med*	36.3	*med*
ITA16	56.8	*med*	62.7	*med*	38.1	*med*
CZE16	53.0	*med*	69.9	*med*	35.1	*med*
SVN16	52.8	*med*	62.9	*med*	32.9	*med*
ISR16	47.3	*low*	65.8	*med*	37.9	*med*
SVK16	42.4	*low*	56.8	*low*	30.6	*med*
PRT16	42.4	*low*	65.6	*med*	30.6	*med*
KOR16	41.2	*low*	64.9	*med*	35.9	*med*
POL16	40.8	*low*	61.8	*med*	27.5	*low*
HUN16	28.7	*low*	62.3	*med*	26.7	*low*
CHL16	24.4	*low*	67.7	*med*	23.5	*low*
average	46.9	*low*	64.7	*med*	33.1	*med*

Cluster 3: Countries with *low* BLI, Freedoms and GDP. The "bottom" cluster consisting of 5 countries (of which Brasilia and Russia are OECD partner countries) is summarized in Table 9.

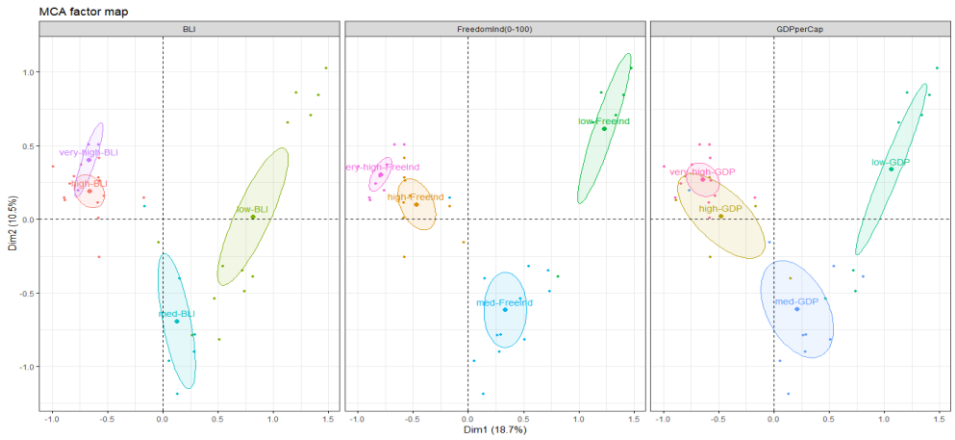
Table 9. Well-being and freedom in "bottom" cluster

ID	BLI		Freedom index		GDP per capita	
GRC16	44.3	*low*	41.5	*low*	26.7	*low*
TUR16	21.4	*low*	42.9	*low*	24.6	*low*
BRA16	14.7	*low*	23.2	*low*	15.2	*low*
MEX16	7.5	*low*	45.1	*low*	18.6	*low*
RUS16	2.3	*low*	11.8	*low*	23.2	*low*
average	18.0	*low*	32.9	*low*	21.7	*low*

All countries in cluster 3 belong to the *low* category by BLI, Freedom Index, as well as, GDP per capita. The average BLI is 18.0, Freedom index 32.9, and GDP per capita 21.7k USD. Now, significant individual freedom are *low* property rights, *low* trade freedom and *low* freedom from corruption.

Figure 4 maps separately the four categories of BLI, Freedom Index and GDP per capita on the same two-dimensional map as seen in Figure 3. It is seen that the *low* classes of the 3 indicators all map on the top-right quadrant. They are clearly contributing similarly to the first most important (horizontal) dimension. Similarly, the *medium* classes of the 3 indicators are all mapped on the bottom-right quadrant. They are all contributing about as much to the second (vertical) dimension. The two top-classes (*very high* and *high*) of BLI, Freedom Index and GDP per capita are all mapped on the top-left quadrant. They contribute similarly both to the first and the second dimensions.

Figure 4. Mapped well-being, Freedom Index and GDP



6. Discussion

This paper studied the OECD countries together with its partner countries. The results are applicable mainly only to these countries: firstly, the same broad set of indicators are not available as such for other countries and, secondly, OECD countries represent the most advanced market economies with the highest level of living standards. It may be that the results are not generalizable to countries at other levels of development. Also, there are several methods to build composite indicators. Thus, with other methods, different results may be obtained. However, the applied

PCA approach is a main-stream approach and well-validated with extensive applications.

Regression analysis was conducted on selected important cases from the view of this study. The regressions provided strong and statistically highly significant evidence for the relationship of economic freedom(s) and well-being. However, more advanced models are suggested to be applied in future studies, but their results can be expected to lead to even stronger explanatory power of freedoms, e.g. with ARMA-regression methods; on the other hand, the time-period was only four years due to the availability of data. After gathering data for future years and/or if different periods are put under analysis, results may vary. Also, OECD's well-being indicators are under constant revisions, which may lead to incomparable future data.

Multiple correspondence analysis is a high-level qualitative method and with a relatively small sample of countries, somewhat spurious results may appear. However, the clusters mapped very clearly onto the two dimensions.

7. Conclusions

This paper presented strong evidence for the predictive power of individual economic freedom indicators and the economic Freedom Index on well-being, BLI. The results are in line with earlier evidence. The built economic Freedom Index showed surprisingly strong predictive ability, which was much higher than the corresponding ability of GDP per capita. This has potentially certain important policy implications: in line with the just critique of GDP not representing other dimensions of well-being than the economic dimension, it seems, however, that economic freedoms do cover and may lead to much broader well-being effects than focusing on policies to increase countries' GDP even in the case of the most economically free countries.

References

[1] Altman M. How much economic freedom is necessary for economic growth? Theory and evidence. Economics Bulletin. 2008;15(2):1-20.

[2] Andrei AM, Galupa A, Georgescu I. Measuring the Influence of Economic and Social Inequality on Growth. Empirical Evidences for Central and Eastern Europe. The 16th International Conference on Informatics in Economy IE 2017, Bucharest, Romania, pp. 463-469.

[3] Cebula RJ, Clark JR, Mixon Jr FG. The Impact of Economic Freedom on Per Capita Real GDP: A Study of OECD Nations. The Journal of Regional Analysis & Policy. 43(1):34-41, 2013.

[4] CORE Team. The economy: Economics for the changing world. Oxford University Press, September 2017. Internet: http://www.core-econ.org/the-economy/book/text/0-3-contents.html

[5] Georgescu I, Androniceanu A, Kinnunen J. A Computational Analysis of Economic Freedom Indicators and GDP in EU States. The 17th International Conference on Informatics in Economy IE 2018, Iasi, Romania, pp. 461-468.

[6] Gwartney J, Lawson R, Hall J, Murphy R. Economic Freedom of the World. Fraser Institute 2018 Annual Report, 2018.

[7] Hussain ME, Haque M. Impact of Economic Freedom on the Growth Rate: A Panel Data Analysis. Economies. 2016;4(5):1-15.

[8] Joliffe I. Principal Component Analysis. Wiley Online Library. 2005.

[9] Justesen MK. The effect of economic freedom on growth revisited: New evidence on causality from a panel of countries 1970–1999. European Journal of Political Economy. 2008;24:642-660.

[10] Kassambara A. Practical Guide to Principal Component Methods in R. factoextra. 2017.

[11] Kinnunen J, Androniceanu A, Georgescu, I. Impact of Economic and Political Systems on Human Development Index: A Computational Evaluation. The 18th International Conference on Informatics in Economy IE 2019, Bucharest, Romania, pp. 459-466.

[12] Kinnunen J, Georgescu I, Tamminen L. Do Economic Freedoms Create National Wealth? Clustering and Principal Component Analyses of Freedom Variables and GDP. The Real Options Workshop, 3-4 October 2017, Lappeenranta, Finland, pp. 13-16.

[13] Miller T, Kim AB. Index of Economic Freedom: Promoting Economic Opportunity and Prosperity. The Heritage Foundation and Dow Jones & Company, Inc, Jan 2017.

[14] OECD 2008. Handbook of Constructing Composite Indicators: Methodology and User Quide. Internet: https://www.oecd.org/sdd/42495745.pdf

[15] OECD 2011. Compendium of OECD well-being indicators. OECD Better Life Initiative. Internet: http://www.oecd.org/std/47917288.pdf

[16] OECD 2017: How's Life? 2017: Measuring Well-being. [Internet]: https://read.oecd-ilibrary.org/economics/how-s-life-2017_how_life-2017-en#page1

[17] OECD 2019: How's Life in the Digital Age? Opportunities and Risks of the Digital Transformation for People's Well-being. [Internet]: https://read.oecd-ilibrary.org/science-and-technology/how-s-life-in-the-digital-age_9789264311800-en#page6

[18] Osberg L, Sharpe A. An Index of Economic Well-Being for Selected OECD Countries. Review of Income and Wealth. Series 48, Number 3, 2002: 291-316.

[19] Procházka P, Čermáková K. Influence of Selected Institutional Factors on the Economic Growth: Case Open Markets. Procedia Economics and Finance. 2005;30:702-709.

[20] Vega-Gordillo M, Alvarez-Arce JL. Economic Growth and Freedom: A Causality Study. Cato Journal. 2003;23(2):199-215.