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Information-Communication Technologies and Opacity of Economics

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During the last decade the information-communication technologies (ICT) are a doubtless leader among the factors which determine the possibilities for a stable growth of economics. They govern it not only directly by their participation in the formation of the gross domestic product (GDP) but also indirectly by improving the efficiency of the branches where these technologies are widely used. The applications of ICT turn more and more to be a decisive indicator of the possibilities for development of a given country. This sets as an order of the day the problem to search dependencies between the usage of ICT and the different indicators for a socio-economic status of separately chosen countries.

The present work examines the influence and the mutual relation between the indicators for using of ICT and the factor "opacity of economics" which renders a growing influence upon many aspects of the economic development. This problem is especially actual for the countries in transition from central and southeast Europe and Russia.

The data for the realized comparisons are taken from the sources in [1] and [9]. The used indicators for ICT are from the authoritative international union for telecommunications (ITU) [4].

1. Indicators for opacity of economics

Nowadays there is no commonly accepted definition of the concept for opacity of economics. One of the most representative and significant investigations [7] gives an estimate of opacity based on multiple data by a respective index. There are specially elaborated methods for determining of its values for the different countries which include three subsequent stages:

a) a preliminary estimate of the index for opacity by accumulating a corporative information from the separate investigated aspects and its analysis by experts;

b) a standard statistical processing of the accumulated during the preceding stage data and an estimate of the index for opacity and its components;

c) an analysis of the obtained data and also of the index for opacity over different most important trends. If necessary, a new iteration is made by accumulating additional data, the new refined estimate of the opacity index and its components included.

The research develops the generally accepted thesis that the opacity which is significant for many countries seriously hinders the economic development because it leads to significant omitted possibilities and benefits. The most important from them is the loss by repulsion of direct foreign investments (DFI). The unused DFI in a single country lead to redirecting them to other countries.

The opacity index is determined by expert estimates in five domains: the national economic policy; the legal system; in the accounting standards and accessible to a corporative information and information from the banks and the governmental administration; in the normative regulation. In English this is designated as CLEAR which means transparent (Corruption; Legal; Economic; Accounting; Regulatory).

In the following below material the opacity index is used to determine the mutual dependence of this index with the globalization index, the ICT indicators, the competitive power and the GDP per capita of the population.

The opacity index and its five components, the correlation coefficients from tables 2, 4 and 7 included, are calculated for every country from the aggregate of 35 countries. Bulgaria is not at this aggregate.

Tables 1, 3, 5 and 6 include together 10 out of 35 countries from different regions of the planet.

The coefficients of mutual correlation between the opacity index and its components, the globalization indexes, for perspective and current competitive power, the indicators for ICT and GDP per capita of the population are calculated over the whole aggregate of 35 countries and they are described in [9].

Table 1 introduces the values for opacity and its five components for everyone from the ten examined countries.

Table 1

No	Country	Corruption Influence (C)	Legal Opacity (L)	Economic Opacity (E)	Accounting Opacity (A)	Regulation System Opacity (R)	Opacity Index
	1	2	3	4	5	6	7
1.	Hongkong	25	55	49	53	42	45
2.	Italy	28	57	73	26	56	48
3.	Hungary	37	48	53	65	47	50
4.	Greece	49	51	76	49	62	57
5.	Japan	22	72	72	81	53	60
6.	Brasil	53	59	68	63	62	61
7.	Romania	61	68	77	78	73	71
8.	Czech Republic	57	97	62	77	62	71
9.	Turkey	51	72	87	80	81	74
10.	Russia	78	84	90	81	84	84

Among the countries with the least opacity, or much the same, the biggest transparency is Hungary and the bottom of the table is occupied by four countries from Eastern Europe with the greatest opacity. It is possible to expect that the indicators of Bulgaria are near to the relevant data of these four countries.

Japan occupies the middle of the table with medial indicators for opacity. It is possible to treat its economics as comparatively close for external investments and an economic invasion.

The data from Table 1 show that there is no entirely linear dependence between the opacity index and its five components but that the main trend is well outlined: the greater the opacity index is, the more its components are increased. This dependence follows also from Table 2 which shows the coefficients of mutual correlation between the opacity index and its five components.

Table 2

No	Indicators	Opacity Index	Corruption Influence	Legal Opacity	Economic Opacity	Accounting Opacity	Regulation System Opacity
1	2	3	4	5	6	7	8
1.	Opacity index	1	0.85	0.88	0.85	0.80	0.91
2.	Corruption influence	0.85	1	0.67	0.69	0.53	0.77
3.	Legal opacity	0.88	0.67	1	0.66	0.67	0.75
4.	Economic opacity	0.85	0.69	0.66	1	0.57	0.82
5.	Accounting opacity	0.80	0.53	0.67	0.57	1	0.60
6.	Regulation System opacity	0.91	0.77	0.75	0.82	0.60	1

The coefficients in the first row of Table 2 are in the interval from 0.85 to 0.91; from it follows that the dependence between the opacity index and its components is almost linear. The separate five factors of the opacity index are not so strongly mutually correlated: from 0.53 to 0.82. The most weakly correlated factors are the “corruption influence” and the “accounting opacity” (0.53), the most strongly – the “economic opacity” and the “regulation system opacity” (0.82).

2. Influence of ICT over the opacity index

The estimation of the ICT development is based on two most widely used indicators: the number of personal computers (PCs) for 100 men and the number of the Internet users for 10 000 men which are known for almost all countries.

Table 3 contains data for the two indicators for the currency of ICT and also for the opacity index of the ten compared countries.

The influence of the ICT currency over the opacity index and its components a relevant correlation analysis is realized the quantitative indicators of which are given in the following Table 4.

Table 3

No	Country	Opacity index	Number of PCs for 100 men	Number of internet users for 10000 men
1	2	3	4	5
1.	Hongkong	45	34.7	2942
2.	Italy	48	19.1	1047
3.	Hungary	50	7.5	699
4.	Greece	57	6	939
5.	Japan	60	28.7	3044
6.	Brasil	61	1.6	293
7.	Romania	71	2.6	267
8.	Czech Republic	71	10.7	976
9.	Turkey	74	3.4	304
10.	Russia	84	3.8	136

Table 4

No	Indicators	Opacity Index	Corruption Influence	Legal Opacity	Economic Opacity	Accounting Opacity	Regulation System Opacity
1	2	3	4	5	6	7	8
1.	Nunber of PCs for 100 men	–0.66	–0.76	–0.42	–0.65	–0.41	–0.59
2.	Number of Internet users for 10000 men	–0.46	–0.65	–0.24	–0.50	–0.17	–0.44

Based on the data from the preceding two tables it is possible to inference some conclusions:

2.1. All correlation coefficients from Table 4 are negative which means that there is an inverse dependence between the ICT indicators and these for opacity: the increase of the first ones leads to a decrease of the opacity index and also of its components, i.e. the building of a more transparent economics requires a proportional growth of the number of PCs and the INTERNET-users.

The comparison of the last two rows in Table 4 shows that the number of PCs exerts about an unit and a half times greater influence over the opacity index and its components than the number of the INTERNET users. It is possible to suppose that this is due to the still wider currency and the greater number of PC users compared with the INTERNET users on the one hand and on the other that in lots of application domains the usage of the INTERNET technologies has not reached the "critical mass" over which the application effect of these technologies will be felt strong enough.

2.2. The comparison between the separate opacity factors indicates that the most strong connection is the correlation link between the ICT indicators and the corruption level : respectively 0.76 up to 0.65. One of the possible explanations is the fact that the greater part of the received investments does not go directly to the economics but that it is controlled by clerks which are corrupted very often. This repulses the foreign investors. In the case of a wider currency of ICT a definite part of the decision making processes is programmed and realized by automated computer systems and this restricts the possibilities for a corruption.

On the other hand the wide currency of the E-commerce and the E-business decreases the possibilities the clerks to "infuse" corruption into the real economics.

2.3. Among the correlation coefficients the middle values are these which show the dependencies between the currency of ICT and the indicators for an economic transparency and an opacity of the regulations norms. The last two factors possess a high mutual correlation link: a coefficient of 0.82 in Table 2.

The opacity of the economic policy is reflected negatively over the volume and the nature of the DFI, over the exporting capabilities of the country and therefore also over the returns of a foreign currency. If the economic rules are not formulated well enough or if they are not at all observed then it is hard to expect an influx of new technologies and innovations and consequently also of a stable economic growth. It is not always possible to prove and argument the dependence of these two factors on the usage of ICT but it follows from the values of the correlation coefficients that there exists such dependence and that it is present statistically on the average.

2.4. The most weak dependence is observed between the currency of ICT and the legal opacity (with coefficients 0.42 and 0.24 respectively) and the accounting opacity with coefficients 0.41 and 0.17. The first of these opacities strengthens the fears of the potential investors for the preservation of their rights of ownership and about the observation of the right of intellectual properties and also of a patent protection. This leads to a limitation of the activities of these investors and also to the realization of this activity through offshort zones. The negative effect is also due to the long bureaucratic procedures, of the registration administrations and also of the multiple license requirements.

Here it is also impossible to formulate the dependence of the cited factors on the ICT currency but just like in the case of the "corruption influence" factor it is connected with a decrease of the clerks' arbitrariness and with an increase of the accumulation and processing of information by ICT.

2.5. As a whole the data from Tables 3 and 4 show in a quite convincing manner that there exists a correlation link between the ICT currency and the different opacities and that this relation must not be neglected. Therefore the development and the currency of ICT may and must be used as a tool to decrease the opacity and also to increase in this way the efficiency of the economics on a given country.

3. Opacity and unreceived direct private investments

One of the not minor factors for the development of a market economics is the possibility for a stable influx in it of direct foreign investments (DFI). They depend to a great extent on the opacity of economics for a given country. The growth of opacity leads to additional taxes for the DFI, to changes in the values of the governmental securities and also of the current prices and as a whole it influences in a negative way the DFI influx. In this case it is possible to maintain that the corresponding country does not receive these DFI that can enter its economics if the transparency is greater. Therefore there is a sense to search for a dependence between the unreceived DFI and the opacity of economics in the separate countries.

There is a research in [7] where the lower and upper limits for the estimates of unreceived DFI are defined for every one of the investigated countries. Table 5 contains

the estimates for the unreceived DFI and the percentages of the same related to the really obtained DFI for ten explored countries.

Table 5

№	Country	Opacity Index	Lower limit of unreceived DFI		Upper limit for unreceived DFI	
			Percents	$\times\$10^6$	Percents	$\times\$10^6$
	1	2	3	4	5	6
1.	Hongkong	45	41	7824	54	10305
2.	Italy	48	53	2352	71	3151
3.	Hungary	50	63	1319	83	1738
4.	Greece	57	92	1011	122	1340
5.	Japan	60	104	6576	137	8662
6.	Brasil	61	106	30267	141	40261
7.	Romania	71	149	2174	197	2874
8.	Czech Republic	71	147	4519	194	5964
9.	Turkey	74	160	1375	212	1822
10.	Russia	84	199	7417	263	9802

Based on the data from table 5 it is possible to make the following conclusions:

3.1. The increase of the opacity of economics leads to an increase of the sums which are not received from DFI. For example the opacity index of Japan is comparatively high and the sums of unreceived DFI are significant, in the interval from 6.5 milliards of USD to 8.6 milliards of USD per year. The percentages of these are from 104% to 137% of the really influx in this country DFI. At present in Japan painful processes are realized for opening of its financial system and economics for foreign participations. Compared with it Russia has greater sums of unreceived DFI and twice greater percentages than it of unreceived to received DFI.

3.2. The countries from Central and South-Eastern Europe and Russia are at the bottom of Table 5, i.e. they have high opacity indexes and with high degrees of unreceived DFI in absolute sums and also as percentages of the unreceived to the received DFI.

3.3. As it follows from Tables 4 and 5 the opacity of economics is strongly correlated with the ICT indicators: the greater opacity is connected with a smaller applicability of ICT. It is possible to conclude from tables 3 to 5 that there exists a mutual dependence also between the unreceived DFI and the ICT indicators: the greater sums and percentages of unreceived DFI correspond to a worse usage of ICT.

4. Dependencies between the indexes of opacity, competitive power and globalization

It is interesting to compare the most common parameters of opacity and of competitive power, and of GDP per capita of the population. It is possible to obtain some important dependencies from it.

In [6] there is a quantitative estimate of the competitive power for the compared ten countries. This is done by two indexes: for the current competitive power and for the perspective competitive power. The typical of them is that the smaller indexes correspond to a greater competitive power.

The research of the most important globalization processes has allowed to obtain respective indexes of globalization for a aggregate of 50 countries [5].

These quantitative estimates together with the data for opacity are shown in Table 6.

Table 6

No	Country	Index of		Competitive power		GDP per capita of the population
		Opacity	Globalization	Current	Perspective	
	1	2	3	4	5	6
1.	Hongkong	45	–	18	13	24570
2.	Italy	48	40	24	26	20170
3.	Hungary	50	36.25	26	28	4640
4.	Greece	57	21.25	43	36	12110
5.	Japan	60	15	15	21	32030
6.	Brasil	61	7.5	30	44	4350
7.	Romania	71	–	61	56	1470
8.	Czech Republic	71	31.25	35	37	5020
9.	Turkey	74	10	33	54	2900
10.	Russia	84	7.5	58	63	2250

The coefficients for a mutual correlation between the indexes of the preceding table are given in the following Table 7.

Table 7

No	Indicators	Opacity index	Corruption influence	Opacity			
				Legal	Economic	Accounting	Regulation system
1	2	3	4	5	6	7	8
1.	Current competitive power index	0.57	0.73	0.37	0.61	0.24	0.60
2.	Perspective competitive power index	0.67	0.75	0.44	0.67	0.39	0.63
3.	Globalization index	–0.71	–0.68	–0.56	–0.65	–0.45	–0.70
4.	GDP per capita of the population	–0.63	–0.77	–0.39	–0.54	–0.42	–0.54

Both Tables 6 and 7 offer the possibility to study some regularities:

4.1. The influence of corruption is closely correlated with GDP per capita of the population by a coefficient. From this it follows that the greater corruption corresponds statistically on the average to a lower income per capita of the population. The same range has the correlation between the influence of corruption and the indexes for current and perspective competitive powers, respectively 0.73 and 0.75. The lower

competitive power is linked with a greater corruption. This is a conclusion that is observed in the real life.

4.2. Too high are also the coefficients for correlation between opacity and the globalization index and the GDP per capita of the population, respectively. Therefore the statistical rule on the average holds that "the greater transparency, the bigger globalization and a greater GDP per capita of the population".

4.3. The indexes for competitive power, for globalization and for a GDP per capita of the population are most poorly correlated with the accounting opacity and most strongly with the corruption influence.

4.4. The countries from Central and South-Eastern Europe are at the bottom of table 6 with worse indicators than almost all compared countries. Taking under consideration the data from Tables 5 and 6 they are worse even for the usage of ICT and for the GDP per capita of the population.

The conclusions from the analysis of the used statistical data are given at the end of every section. As a whole it is possible to make the following most common inferences:

1. The influence of ICT on the opacity of economics follows directly from the used statistical data. It is evident that in the future there will be a growth also of the mutual dependence between the usage of the ICT and other indicators of economics.

The usage of information digital models will grow for different aspects of the socio-economic processes and also for the impact over them.

2. The considerable dependence between the indicators of ICT and the indexes for opacity, globalization and competitive power shows that no country can realize an ascending development for one or several commonly accepted indicators with worsened values of other essential indicators. This means that it is necessary the progress to be realized in a complex manner and in a stagewise way with a gradual improvement of different indicators.

3. From the duscussed data it follows that the Central and Eastern-European countries lag considerably behind from the developed countries also in the usage of ICT and for the indicators which characterize the opacity and the competitive power of economics and the globalization processes. The problem for finding sufficiently effective methods and means for a transition to an innovative type of economics characteristic for the developed countries is extremely sharp. This problem may be solved successively only through a wide usage of ICT and on the basis of a well-developed and effective educational system. It is impossible at present to prognosticate which of these countries and for how long time periods will get over the barrier separating them from the developed countries. If it is possible they to overcome it in the readable future.

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Информационно-коммуникационные технологии и непрозрачность экономики

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(Р е з ю м е)

Рассматриваются влияние и связь между информационно-коммуникационными технологиями и параметром непрозрачности экономики. Для характеристики непрозрачности экономики используются показателями коррупции, состояния законодательства, состояния экономики, бухгалтерской системы и процессов регулирования. Информационно-коммуникационные технологии характеризуются относительными показателями персональных компьютеров, телефонных аппаратов, Интернет-хостов и Интернет-пользователей.

На основе данных корреляционного анализа получено ряд выводов о связях и взаимной зависимости между информационно-коммуникационными технологиями и непрозрачности экономики. Показано, что между показателями информационно-коммуникационных технологии и непрозрачности экономики существует обратная зависимость – увеличение первых из них ведет к уменьшением вторых и наоборот.