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POSTAL FLOWS AS AN INDICATOR OF SOCIODEMOGRAPHIC AND ECONOMIC CHARACTERISTICS OF CERTAIN AREA

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Abstract

Traffic flows that achieve transfer of information, transport of goods and passengers at the national level, represent a picture of social and economic population activities in a certain way. Besides that, today there are various standardized parameters that can determine the particularity of the observed region by measuring. In this work assignment, authors have tried to determine if different traffic flow are mutually connected and to what extent, as well as to confirm relationship between different indicators and to point at possible connections between traffic flows and measured indicators. Knowing individual country characteristics and its place in multilateral relations in the world, gives a new frame for defining complex position of the observed region at a wider level.

Keywords: traffic flows; postal flows; socioeconomic indicators.

1. Introduction

The development of the productive forces of a society and enlarging needs for new goods and services, has been the initiator of innovation throughout the whole human history. New manufactured goods look for wider and further market. Tracking flows of movements of the goods, passengers and information gives significant facts about the economic and social development of a certain region, while goods exchange volume between countries tells us about connectivity worldwide. Socio-economic profile of a certain country can be described by standardized indicators. Various external factors - sociological, technological, economical, same as internal, affect the volume of postal services. There are several studies which engaged in interconnection of different networks and indicators worldwide and Asian countries. In this document, the authors have presented selected European countries for which convenient data was available with intention to establish legitimacy in connecting passenger's, goods' and postal flows,

as well as possibility of approximation of certain indicators whose measuring and defining demands significant means, resources and presents a process that repeats constantly in time intervals.

Postal administration of 192 countries have been joined as members of Universal Postal Union, specialized UN agency and first universal world organization which presents the oldest type of multilateral cooperation worldwide. UPU coordinates postal politics and rules, enables cooperation and exchange of the best practice among members and makes a unique territory for a mutual exchange of postal items. For that reason it does not seem unusual that UPU took the main role in realizing United Nation's Sustainable Development Goals (SDGs) [1]. Those goals are accomplished through integration of physical, electronic and financial networks, developing new services and business models by implementation of new technologies. Posts are the second biggest contributor to social, economic and financial inclusion worldwide after the banking sector, especially for the women and the poor in rural areas, but also business - MSME's. Large amount of data, which is daily collected in over 660 000 posts worldwide, based on automated system, decreases input errors and represents a unique base that is continuously updated, genuinely reflecting activities of physical and legal persons which can be united and analyzed at a local, regional, national and international level.

The paper has been divided into several parts. After initial deliberations, a short description of used data and methods is given. Subsequently, an overview of literature is accomplished, and after that indicators used in this work have been presented. In continuation of work, data have been presented and analyzed with a discussion on gained values. Finally, conclusive considerations have been given with future research directions.

2. Literature Review

In the paper [2] the authors take into account multiple international networks of physical and digital flows, including, by the first time, international postal network. By measuring the position of each country in the Trade, Postal, Migration, International Flights, IP and Digital Communications networks, they build proxies for a number of crucial socioeconomic indicators. They also evaluated a global connectivity degree measure applying multiplex theory across the six networks that accounts for the strength of relationships between countries and conclude that countries with shared community membership over multiple networks have similar socioeconomic profiles.

Statistical analysis of Postal Network Data and Trade Data within ASEAN countries is examined in the paper [3]. The authors also assess how the PND can affect the other recent socioeconomic indicators among ASEAN countries. They are using statistical analysis just like the correlation to measure the variables post from and post to data with 8 socioeconomic indicators.

In the paper [4] authors investigate to what extent favorable nominal exchange rate profiles may indeed stimulate, in the short-run, exports to a given destination under floating exchange rate regimes. As a proxy for international trade flows, they use the

EU countries	0	0	0	1	1	1	1	1	1	1	1	1	1
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Table 1 (continuation) Overview of countries and basic partition

Administrations	MLT	MNE	NOR	POL	ROU	RUS	SRB	SVK	SVN	CHE	MKD	UKR	GBR
Developed countries	1	0	1	1	0	0	0	1	1	1	0	0	1
Developing countries	0	1	0	0	1	1	1	0	0	0	1	1	0
EU countries	1	0	0	1	1	0	0	1	1	0	0	0	1

It was significant to determine two equally important aspects for observed countries. On one hand, their individual characteristics stated by socioeconomic indicator values, and on the other hand, their participation in international flows of goods, passengers and information. Parameters that were used: number of shipments in domestic and international traffic, value of imported and exported goods, and number of plane passengers in domestic and international traffic. Basic idea was to determine connection of different flows, and after that to determine mutual connection of indicators, same as indicators and traffic flows connection.

Indicators are data or combination of data collected and processed for a clearly defined analytical or policy purpose. During defining and analyzing particular problem, one of the most vulnerable segment is a proper selection of indicator, by which certain area can be described adequately. The OECD provides a unique set of comparable statistics and indicators on about 2000 regions in 35 countries. It currently encompasses yearly time series for around 40 indicators of demography, economic accounts, labour market, social and innovation themes in the OECD member countries and other economies. In this study, 14 different indicators were used, with a goal to determine a profile of a certain country more in detail. These indicators are: GDP (Gross Domestic Product), CPI (Corruption Perception Index), Gini.Idx (Gini Index), PovRate (Poverty Rate), HDI (Human development Index), LifeExp (Life Expectancy), Happiness (Happiness Score), LitRate (Adult Literacy Rate), Inet (Internet penetration) - 2 indicators: number of users in millions and user percentage, B2C (B2C E-commerce Index) - reflects the processes involved in an online shopping, B2C transaction (components – Internet users, The availability of secure Internet servers, delivery, payment), Mobile (Mobile cellular subscription), CO2 (Emissions of carbon dioxide), APL (Annual Performance Level) – parameter of quality of service for postal operators showing the percentage of items actually delivered within the quality standard.

4. Results and discussion

In this paper appropriate data, available to authors were analyzed. Postal flows were presented by overall number of postal item, parcel and express mails in domestic traffic (post_dom), then in international traffic by number of all listed items - receipt (int_rec) and dispatch (int_dis) and overall number of item in international traffic (SUM_int). After that, all item were gathered and represented by overall domestic and

international volume of item (SUM_dom_int). Data were used from UPU base from 2016. The trade network is constructed from records maintained by the UN Statistics Division in the Comtrade Database. It contains the number and value of products traded between countries classified by commodity class. Data relate to goods flows have two segments - import (Trade_imp) and export (Trade_exp). Parameter that reflects flows of passengers is Air passengers carried, which includes both domestic and international aircraft passengers of air carriers registered in the country (AIR). Source is International Civil Aviation Organization, Civil Aviation Statistics of the World and ICAO staff estimates.

In first part of analysis, a comparison of different traffic flows was carried out. In Table 2, a correlation analysis between postal flows was carried out - by segments in domestic and international traffic, flows of goods - import, export and passengers' flows. Pearson's correlation coefficient was used for determining of connection. By reviewing results, a high correlation degree can be seen among different traffic flows, which leads to the conclusion that traffic flows are synchronized - regions with a great flow of passengers and goods, also have a significant flow of postal items, or need for a transfer of great amount of information. All postal flows are very connected, too - a large number of postal items in international traffic means a large number of mails in domestic traffic. Therefore, a large overall number of mails can be noticed.

Table 2 Correlation among traffic flows

Indicator	post_dom	int_dis	int_rec	SUM_int	SUM_dom_int	Trade_imp	Trade_exp	AIR
post_dom	1,000	0,984	0,795	0,939	1,000	0,879	0,708	0,898
int_dis	0,984	1,000	0,780	0,939	0,985	0,846	0,660	0,869
int_rec	0,795	0,780	1,000	0,948	0,803	0,901	0,917	0,903
SUM_int	0,939	0,939	0,948	1,000	0,943	0,927	0,841	0,940
SUM_dom_int	1,000	0,985	0,803	0,943	1,000	0,883	0,715	0,902
Trade_imp	0,879	0,846	0,901	0,927	0,883	1,000	0,944	0,852
Trade_exp	0,708	0,660	0,917	0,841	0,715	0,944	1,000	0,797
AIR	0,898	0,869	0,903	0,940	0,902	0,852	0,797	1,000

In the second part of the analysis (Table 3), a mutual connection of different socioeconomic indicators was spotted, as well as a connection of traffic flows with these indicators. Defining correlation coefficient values for all listed data, following conclusions were noticed:

- Postal flows accomplish a significant correlation with indicators - GDP, number of internet users in millions (Inet_mil) and number of mobile subscribers (Mobile). Therefore, one type of communication does not exclude the use of other types of communication, but stimulates them. Developed manufacturing society with a high level of GDP also initiates a need for communication that is accomplished

by postal connections. The fact that, correlation of goods' and passengers' flows with these two parameters is realized similarly, is also significant.

- GDP correlates highly with two parameters - number of internet users in millions (Inet_mil) and number of mobile subscribers (Mobile). Many today's theorists consider that this concept, produced at the industrial manufacturing development time cannot reflect intangible production well, or to be considered as a mere wellbeing of a certain country, which can be confirmed in our case, due to low correlation with quality of life and happiness parameters.
- IPC creates rankings of countries by rating corruption outspread in them. Index of a specified country indicates on a corruption perception value in a public sector on a scale from 0 to 100, where 0 represents a country that is considered to be highly corrupted, while a country rated by 100 is represented as a corruption-cleaned country. This parameter accomplishes a significant value of correlation with indicators - HDI, LifeExp, Happiness, B2C and Inet (%).
- Gini index represents the most recently used measure of inequality. In case of absolute equality, coefficient has value 0, and in case of absolute inequality value 1. The Poverty rate is the ratio of the number of people (in a given age group) whose income falls below the poverty line. These two indicators between each other positive correlate, but also give relatively low negative values of the correlation coefficient with other indicators.
- Indices HDI, LifeExp, Happiness remarkably correlate mutually. A significant connectivity is achieved with number of mobile subscribers and electronic commerce users
- Indicator Literacy Rate is very similar in all countries surveyed (93,1-99,9) and it does not indicate on connectivity with other indicators
- Indicators that represent number of mobile users and number of internet users correlate mutually, and also with GDP and with values that reflect traffic flows
- Development of electronic commerce, represented by B2C indicator, achieves a high coefficient of correlation with HDI, LifeExp, Happiness, CPI and a parameter that reflects internet availability in percentages.
- Indicator Emissions CO2 gives relatively low positive values, while highest positive value is accomplished by internet presence and electronic commerce development. It can be noticed that developed and wealthier countries are bigger polluters
- Indicator ALP, speaking about the quality of delivery of postal mails at defined standards, gives relatively low positive values, while highest positive value is accomplished with internet presence and electronic commerce presence.

Table 3 Correlation between traffic flows and socioeconomic indicators

Indicator	post_dom	int_dis	int_rec	SUM_int	SUM_dom_int	GDP	CPI	Gini	PovRate	HDI	LifeExp
post_dom	1.000	0.984	0.795	0.939	1.000	0.848	0.384	-0.020	-0.059	0.369	0.280
int_dis	0.984	1.000	0.780	0.939	0.985	0.793	0.467	-0.024	-0.099	0.399	0.307
int_rec	0.795	0.780	1.000	0.948	0.803	0.921	0.392	0.006	-0.149	0.507	0.309
SUM_int	0.939	0.939	0.948	1.000	0.943	0.911	0.454	-0.009	-0.133	0.482	0.327
SUM_dom_int	1.000	0.985	0.803	0.943	1.000	0.852	0.388	-0.020	-0.062	0.375	0.283
GDP	0.848	0.793	0.921	0.911	0.852	1.000	0.242	0.125	0.090	0.386	0.284
CPI	0.384	0.467	0.392	0.454	0.388	0.242	1.000	-0.243	-0.196	0.888	0.720
Gini	-0.020	-0.024	0.006	-0.009	-0.020	0.125	-0.243	1.000	0.366	-0.334	-0.339
PovRate	-0.059	-0.099	-0.149	-0.133	-0.062	0.090	-0.196	0.366	1.000	-0.211	-0.163
HDI	0.369	0.399	0.507	0.482	0.375	0.386	0.888	-0.334	-0.211	1.000	0.771
LifeExp	0.280	0.307	0.309	0.327	0.283	0.284	0.720	-0.339	-0.163	0.771	1.000
Happiness	0.328	0.372	0.533	0.483	0.335	0.356	0.813	-0.217	-0.359	0.864	0.669
LitRate	0.106	0.099	0.215	0.168	0.108	0.157	0.186	-0.040	-0.024	0.254	-0.239
Inet (mil)	0.502	0.426	0.744	0.627	0.508	0.750	-0.149	0.247	0.024	0.041	-0.193
Inet(%)	0.342	0.408	0.380	0.417	0.346	0.196	0.813	-0.289	-0.343	0.759	0.532
B2C	0.335	0.391	0.385	0.411	0.339	0.237	0.885	-0.273	-0.180	0.883	0.651
Mobile	0.331	0.245	0.646	0.481	0.338	0.662	-0.256	0.265	0.088	-0.027	-0.245
CO2	0.028	0.027	0.159	0.102	0.031	0.091	0.383	-0.017	-0.066	0.369	0.172
ALP	0.143	0.162	0.160	0.171	0.145	0.067	0.328	-0.490	-0.395	0.419	0.366
Trade_imp	0.879	0.846	0.901	0.927	0.883	0.963	0.347	0.007	0.040	0.467	0.342
Trade_exp	0.708	0.660	0.917	0.841	0.715	0.941	0.246	0.047	0.020	0.455	0.285
AIR	0.898	0.869	0.903	0.940	0.902	0.901	0.259	0.145	-0.076	0.313	0.142

Table 3 (continuation) Correlation between traffic flows and socioeconomic indicators

Indicator	Happiness	LitRate	Inet (mil)	Inet(%)	B2C	Mobile	CO2	ALP	Trade_imp	Trade_exp	AIR
post_dom	0.328	0.106	0.502	0.342	0.335	0.331	0.028	0.143	0.879	0.708	0.898
int_dis	0.372	0.099	0.426	0.408	0.391	0.245	0.027	0.162	0.846	0.660	0.869
int_rec	0.533	0.215	0.744	0.380	0.385	0.646	0.159	0.160	0.901	0.917	0.903
SUM_int	0.483	0.168	0.627	0.417	0.411	0.481	0.102	0.171	0.927	0.841	0.940
SUM_dom_int	0.335	0.108	0.508	0.346	0.339	0.338	0.031	0.145	0.883	0.715	0.902
GDP	0.356	0.157	0.750	0.196	0.237	0.662	0.091	0.067	0.963	0.941	0.901
CPI	0.813	0.186	-0.149	0.813	0.885	-0.256	0.383	0.328	0.347	0.246	0.259
Gini	-0.217	-0.040	0.247	-0.289	-0.273	0.265	-0.017	-0.490	0.007	0.047	0.145
PovRate	-0.359	-0.024	0.024	-0.343	-0.180	0.088	-0.066	-0.395	0.040	0.020	-0.076
HDI	0.864	0.254	0.041	0.759	0.883	-0.027	0.369	0.419	0.467	0.455	0.313
LifeExp	0.669	-0.239	-0.193	0.532	0.651	-0.245	0.172	0.366	0.342	0.285	0.142
Happiness	1.000	0.039	0.119	0.732	0.809	0.045	0.384	0.289	0.418	0.440	0.308
LitRate	0.039	1.000	0.233	0.152	0.242	0.234	0.258	0.170	0.188	0.228	0.171
Inet (mil)	0.119	0.233	1.000	0.000	-0.032	0.977	0.237	-0.054	0.626	0.752	0.779
Inet(%)	0.732	0.152	0.000	1.000	0.830	-0.112	0.462	0.522	0.250	0.195	0.353
B2C	0.809	0.242	-0.032	0.830	1.000	-0.121	0.454	0.448	0.310	0.258	0.300
Mobile	0.045	0.234	0.977	-0.112	-0.121	1.000	0.238	-0.079	0.521	0.699	0.643
CO2	0.384	0.258	0.237	0.462	0.454	0.238	1.000	0.200	0.038	0.107	0.184
ALP	0.289	0.170	-0.054	0.522	0.448	-0.079	0.200	1.000	0.081	0.074	0.137
Trade_imp	0.418	0.188	0.626	0.250	0.310	0.521	0.038	0.081	1.000	0.944	0.852
Trade_exp	0.440	0.228	0.752	0.195	0.258	0.699	0.107	0.074	0.944	1.000	0.797
AIR	0.308	0.171	0.779	0.353	0.300	0.643	0.184	0.137	0.852	0.797	1.000

5. Conclusion

The results obtained represent a good start basis for further researching. It is highly significant that results for chosen European countries can be compared with existing research at a global level and in Asian countries. Besides comparing with other areas, authors consider usefulness to determine postal activity at region, counties and settlements levels and to compare them with flows of goods and passengers. It is also important to define specific characteristics of rural and urban areas, same as different parameters that describe them. Any additional research, data processing and analysing in small, undeveloped or developing countries demands significant means and resource usage, so possibility of using data that is daily passively collected presents a new business possibility, and saving significant means for the country, same as a cooperation with traditional trusting partner. Targeting areas with a low activity, socially and economically excluded, presents a powerful tool in planning and growth of undeveloped area developing strategies and connecting them at regional, national and international level.

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