

COMPARISON OF IMPACTS OF ECONOMIC AND SOCIAL FACTORS ON COUNTRIES' LOGISTICS PERFORMANCES: A STUDY WITH 26 OECD COUNTRIES

Samet Guner* and Erman Coskun**

* School of Business, Sakarya University, Turkey, Email: sguner@sakarya.edu.tr

** School of Business, Sakarya University, Turkey, Email: ecoskunr@sakarya.edu.tr

Abstract The aim of this study is to set forth the relationship of economic and social factors with logistics performance of countries', which is very important for their competitiveness. To achieve this, researchers had correlated the logistics performances of twenty six OECD countries with a variety of economic and social indicators and interpreted the results. Analysis of results shows that, contrary to expectations, social indicators are more related with logistics performance than economic ones. The article discussed findings and reasons for them.

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1. INTRODUCTION

Logistics is the activity that manages the flows of goods, cash and information between the point of supply and the point of demand and includes activities like transportation, warehousing, packaging, material handling, etc. Logistics is vital for companies, as well as countries. Logistics systems ensure the suitable problems solving of transportation, storage and increase the competitiveness of company's and country's economies at all (Navickas, et al, 2011). As Burmaoglu and Sesen (2011) suggested that firm level logistics activities has been affected by national and global environment and also it effects these environments.

Mustra (2011) suggested that logistics is one of the most important elements of national competitiveness. The quality of logistics services and infrastructure has a facilitating impact on the transportation of goods among countries. Efficient delivery of logistics services is the ability to move goods expeditiously, reliably and at low cost (Hollweg and Wong, 2009). Inefficient logistics structure cause extra costs in terms of time and cash (Korinek ve Sourdin, 2011) and this situation effects the competitiveness of both enterprises and countries negatively.

Many empirical studies have revealed that logistics performance has a positive impact on international trade flows. Shepherd and Wilson (2009) suggest that logistics environment is one of the trade facilitator that reduces costs of importing and exporting for countries. Behar and Manners (2008) mentioned that the lower transport costs would increase trade volumes. Hausman et al (2005) have demonstrated the significant relationship between transportation costs and international trade flow. Also Limao and Venables (2001) proved the significant relationship between transportation costs, the quality of transportation infra-structure and countries' trade volumes. Hausman et al (2005) showed that weak logistics performance causes a decrease in trade volumes. In their study, Nordas and Piermartini (2004) found that quality of infrastructure has a significant relationship with trade flows and among the all infrastructure indicators; port efficiency has the largest relationship with trade flow.

In this study, researchers focused on the relationship of countries' logistics performances with different economic and social indicators and discuss which indicator is more decisive. In order to achieve this aim, the logistics performance index (LPI, World Bank) will be introduced in the section two and other economic and social indicators will be introduced in section 3.

2. DEFINING THE LOGISTICS PERFORMANCE INDEX

Logistics performance index (LPI) is an index that developed by World Bank in 2007 first and updated and expanded in 2010 to measure the countries' logistics performances according to certain criteria and ranks them based on their scores.

LPI is the most comprehensive index to data to measure the countries' logistics performances (Mustra, 2011) and aims to provide an insight to countries to face with possible opportunities and strengths. LPI scores are calculated from a survey that 1000 professionals from 130 countries participated in it. Participants consist of multinational freight forwarders, global express carriers and small and medium size freight forwarders.

LPI helps to reveal the bottlenecks of a country in terms of logistics and identifies the needs and priorities of any improvements (Mustra, 2011). In other words, it provides a comparative overview to countries' logistics structures. Thus, it provides valuable information for companies which operates or plans to operate in these countries. The first LPI in 2007 encompassed 150 countries. As to second LPI in 2010, it encompassed 155 countries and added a different dimension about domestic logistics (Behar, 2010).

LPI has six dimensions; (1) customs, (2) infrastructure, (3) international shipments, (4) logistics competence, (5) tracking and tracing, and (6) timeliness. The study defines the dimensions as follows (World Bank, 2010b);

- *Customs (CUS)*: Measures the efficiency and effectiveness of the customs clearance process (Sinitsina, 2011).
- *Infrastructure (INF)*: Measures the country's telecommunication, IT, and transportation infrastructure quality (Arvis et al., 2007).
- *International Shipments (INT)*: Measures the ease of arranging competitively priced shipments.
- *Logistics Competence (LOG)*: Measures the logistics competence and quality of logistics services.
- *Tracking & Tracing (TRA)*: Measures the ability to track and trace consignments.
- *Timeliness (TIM)*: Timeliness of shipment delivery (Mustra, 2011). It measures how often logistics service providers reach the consignee within the scheduled and expected delivery time.

Each country scored and ranked according to six dimensions above. After that, an overall score acquired for each country by evaluating all dimensions together. The scores vary between 1,34 (min.) and 4,11 (max.). According to results, top three countries are Germany (4,11), Singapore (4,09) and Sweden (4,08) while the nethermost countries are Sierra Leone (1,97), Eritrea (1,70), and Somalia (1,34). In this study researchers used the 2010 LPI scores.

3. ECONOMIC AND SOCIAL INDICATORS

As we mentioned before, researchers will correlate the countries' logistics performances with their economic and social indicators. In this section, these economic and social indicators are introduced.

In this study, gross domestic product and economic growth rates of countries' used as economic indicators. In addition to these data, transportation infrastructure gross investment spending of countries' also used as an economic indicator that is closely related with logistics performance. Explanations of these data are as follows;

- *Transportation infrastructure gross investment spending (INV)*: This data is the sum of the total investment spending of each country on road, railway, seaway and airway between 2000 and 2008. These data derived from the official website of OECD.
- *Gross Domestic Product (GDP)*: This data indicates the gross domestic products of participant countries in 2010. These data derived from the official website of World Bank. GDP used in this research to reflect the economic power of participant countries.
- *Growth Rate (GRW)*: This data indicates the growth rates of participant countries in 2010.

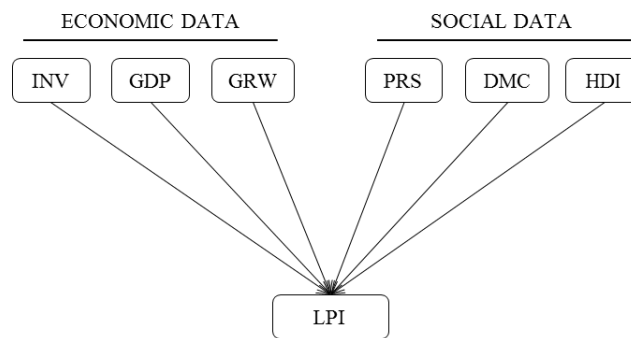


Fig. 1. Research Model

On the other hand, social indicators that were used in this research are political risk, democracy index, and human development index. Explanations of these data are as follows;

- *Political Risk (PRS)*: Prepared by Political Risk Services in 2010. Countries are scored between 0 and 1; 0 is worst and 1 is best. Dimensions of political risk are; voice and accountability (VA), political stability and absence of violence (PV), government effectiveness (GE), regulatory quality (RQ), rule of law (RL) and control of corruption (CC).
- *Democracy Index (DMC)*: Democracy index prepared by Economist Intelligence Unit to provide a snapshot of the state of democracy worldwide for 165 countries in 2010. This index has five dimensions; electoral process and pluralism, civil liberties, the functioning of government, political participation, and political culture (EIU, 2010).
- *Human Development Index (HDI)*: Developed by United Nations and provides valuable data about nations' social structure. As a composite measure

of health, education and income, the HDI assesses levels and progress using a concept of development much broader than that allowed by income alone (United Nations, 2010). Dimensions of human development index are; life expectancy at birth (LE), mean years of schooling (MS), expected years of schooling (ES) and gross national income per capita (GN).

The research model which relates the data with LPI can be seen in Figure 1. In the further sections, the correlations among these data will be researched.

4. RESEARCH ANALYSIS

4.1. Participants and Their Data

Analysis encompasses twenty six OECD countries. These countries can be listed with alphabetical order as follows; Austria, Belgium, Canada, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Italy, Lithuania, Luxembourg, Mexico, Moldova, Norway, Poland, Portugal, Russia, Serbia, Slovakia, Slovenia, Spain and Turkey. LPI scores of participating countries are given in Table 1.

Table 1 Total LPI Scores of Participating Countries; Source: World Bank, 2010.

Rank	Country	Score	Rank	Country	Score
1	Germany	4,11	14	Portugal	3,34
2	Luxembourg	3,98	15	Slovakia	3,24
3	Belgium	3,94	16	Turkey	3,22
4	Norway	3,93	17	Iceland	3,20
5	Finland	3,89	18	Estonia	3,16
6	Canada	3,87	19	Lithuania	3,13
7	Denmark	3,85	20	Mexico	3,05
8	France	3,84	21	Hungary	2,99
9	Austria	3,76	22	Slovenia	2,87
10	Italy	3,64	23	Croatia	2,77
11	Spain	3,63	24	Serbia	2,69
12	Czech R.	3,51	25	Russia	2,61
13	Poland	3,44	26	Moldova	2,57
26	Moldova	2,57			

Note: Dimensions of LPI are given in appendices.

Economic indicators of participant countries are given in Table 2.

Table 2 Economic Indicators of Participating Countries

Country	INV	GDP	GRW	Country	INV	GDP	GRW
Austria	22.318	379.069.258.278	2,3	Lithuania	2.970	36.306.384.146	1,3
Belgium	26.444	469.374.172.185	2,3	Luxem	2.963	53.333.642.384	2,7
Canada	75.679	1.577.040.082.218	3,2	Mexico	10.559	1.034.804.491.265	5,5
Croatia	17.803	60.851.860.677	-1,2	Moldova	18.973	5.808.796.184	6,9
Czech R.	9.122	192.032.097.602	2,3	Norway	18.450	412.989.604.299	0,7
Denmark	12.306	309.865.711.250	1,3	Poland	27.707	469.440.132.670	3,9
Estonia	1.568	19.216.566.444	3,1	Portugal	22.408	228.872.317.881	1,4
Finland	11.167	238.745.695.364	3,7	Russia	95.731	1.479.819.314.058	4
France	164.205	2.560.002.000.000	1,5	Serbia	2.203	38.423.239.717	1
Germany	113.718	3.280.529.801.325	3,7	Slovakia	5.542	87.268.098.543	4,2
Hungary	79.795	128.631.634.125	1,3	Slovenia	5.376	46.908.328.072	1,4
Iceland	1.908	12.574.305.880	-4	Spain	115.614	1.407.405.298.013	-0,1
Italy	181.022	2.051.412.153.370	1,5	Turkey	16.322	734.364.471.760	9

INV: OECD, Between 2000-2008, Million €

GDP: World Bank 2010, Million €

GRW: World Bank 2010d, %

Social indicators of participant countries are given in Table 3.

Table 3 Social Indicators of Participating Countries

Country	PRS	DEM	HDI	Country	PRS	DEM	HDI
Austria	0,93	8,49	0,851	Lithuania	0,67	7,24	0,783
Belgium	0,86	8,05	0,867	Luxembourg	0,94	8,88	0,852
Canada	0,90	9,08	0,888	Mexico	0,63	6,93	0,75
Croatia	0,74	6,73	0,767	Moldova	0,51	6,33	0,623
Czech Rep.	0,77	8,19	0,841	Norway	0,93	9,8	0,938
Denmark	0,92	9,52	0,866	Poland	0,78	7,12	0,795
Estonia	0,70	7,61	0,812	Portugal	0,79	7,81	0,795
Finland	0,98	9,06	0,871	Russia	0,54	3,92	0,719
France	0,81	7,77	0,872	Serbia	0,57	6,33	0,735
Germany	0,89	8,34	0,885	Slovakia	0,74	7,35	0,818

Hungary	0,72	7,04	0,805	Slovenia	0,75	7,76	0,828
Iceland	0,88	9,65	0,869	Spain	0,77	8,02	0,863
Italy	0,71	7,74	0,854	Turkey	0,53	5,73	0,679

PRS: Political Risk Services, 2010. Average of dimensions

DEM: Economist Intelligence Unit, 2010

HDI: United Nations, 2010

Note: Dimensions of PRS and HDI are given in appendices.

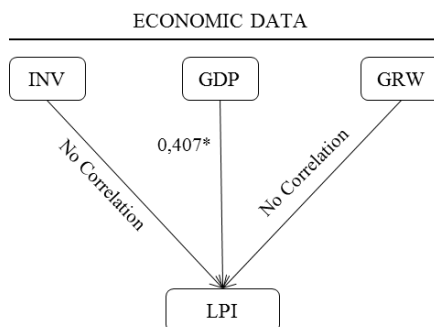
4.2. Analysis Technique

In this research, in order to measure the direction of relation between LPI and social and economic indexes (Bayram, 2009), correlation analysis is utilized. It means our goal is not to seek causality relationship within variables. For analysis, SPSS 17 was used.

4.3. Results

Results For Economic Indicators

Correlation results of economic and social data with logistic performance index can be seen in Figure 2. According to this, contrary to expectations, there is no relationship between INV – LPI and GRW – LPI. In other words, countries’ spending on transport infrastructure and their growth rates has no impact on their logistics performances. However there is a weak relationship between GDP and logistics performance. Hereby, it can be suggested that economic indicators aren’t be a determinant for logistics performances of countries’.



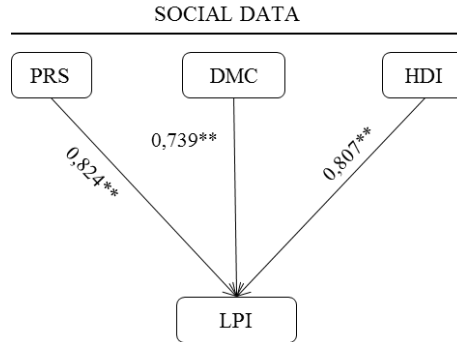
* Correlation is significant at the 0,05 level (2 tailed)

** Correlation is significant at the 0,01 level (2 tailed)

Fig. 2 Correlation of Economic Indicators with LPI

Results For Social Indicators

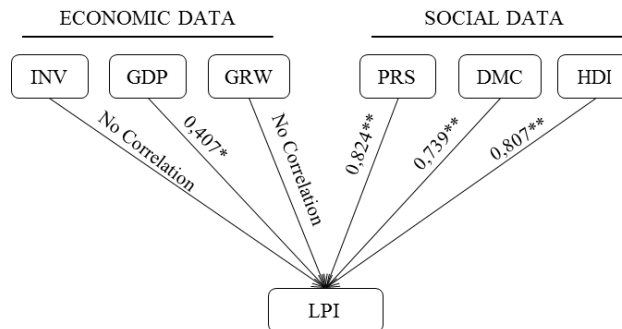
When we correlate social data with LPI, significant and positive relationships are found (Fig. 3). According to results, PRS has 0,824, DEM has 0,739, and HDI has 0,807 correlation scores with LPI and all of them are significant at the 0,01 level.



- * Correlation is significant at the 0,05 level (2 tailed)
- ** Correlation is significant at the 0,01 level (2 tailed)

Fig. 3 Correlation of Social Indicators with LPI

Thus, based on our findings, countries' logistics performances are more related with social indicators than economic indicators. To clarify the relationships between PRS – LPI and HDI – LPI, all dimensions of these data will be correlate each other in the next section.



- * Correlation is significant at the 0,05 level (2 tailed)
- ** Correlation is significant at the 0,01 level (2 tailed)

Fig. 4 Correlation Diagram

4.4. Further Analysis

To make analysis deeper; first of all, all dimensions of political risk (PRS) and dimensions of logistics performance index (LPI) correlated with each other and the results are shown in Table 3. According to results, most dimensions of political risk have significant positive relationship with LPI dimensions. The most interesting result of this analysis is that the relationship of customs performance with government efficiency (0,827) and control of corruption (0,831). As it can be seen in Table 3, GE and CC has significant positive relationships not only with customs performance but also with other performance dimensions. In addition, regulatory quality is the most important determinant of timeliness performance.

When we correlate the dimensions of logistics performance with human development index, similar results has found. According to Table 4, there is a significant relationship between expected years of schooling with customs, infrastructure and logistics competence. Also gross national income is related with all of LPI dimensions significantly.

Table 4 Correlations of PRS and LPI Dimensions

PRS	LPI	Customs	Infrastructure	International Shipment	Logistics Competence	Tracking & Tracing	Timeliness
Voice and Accountability (VA)		0,706**	0,635**	0,474*	0,626**	0,647**	0,537**
Political Stability and Absence of Violence (PV)		0,492*	0,392*	-	-	-	-
Government Effectiveness (GE)		0,827**	0,802**	0,603**	0,773**	0,728**	0,598**
Regulatory Quality (RQ)		0,690**	0,647**	0,518**	0,689**	0,688**	0,717**
Rule of Law (RL)		0,705**	0,628**	0,574**	0,551**	0,591**	0,451*
Control of Corruption (CC)		0,831**	0,828**	0,568**	0,772**	0,719**	0,521**

* Correlation is significant at the 0,05 level (2 tailed)

** Correlation is significant at the 0,01 level (2 tailed)

Table 5 Correlations of HDI and LPI Dimensions

HDI	LPI	Customs	Infrastructure	International Shipment	Logistics Competence	Tracking & Tracing	Timeliness
Life Expectancy of Birth		0,791**	0,783**	0,520**	0,782**	0,754**	0,516**
Mean Years of Schooling		0,438*	0,392*	-	-	0,400	-
Expected Years of Schooling		0,535**	0,517**	-	0,521**	0,465*	-
Gross National Income per Capita		0,857**	0,871**	0,630**	0,807**	0,807**	0,691**

* Correlation is significant at the 0,05 level (2 tailed)

** Correlation is significant at the 0,01 level (2 tailed)

4.5. Discussion

Analysis results revealed that countries' logistics performances are more related with social indicators than economic indicators. This result is contrary with researchers' expectations. Since a high correlation was expected between gross transportation investment and logistics performance. There can be two possible reasons for this unexpected result;

1. Governments would not be able to lead their infrastructure investments and resources to improve their logistics performances. This result indicates the inefficient use of resources. All infrastructure investments are not directly go into logistics performance. Because there are some countries with high investment level but low LPI scores.
2. This result causes from the nature of the LPI survey. LPI is a questionnaire that applied to the logistics firms' managers. Questionnaire consists of qualitative statements which depend on personal experiences and interpretation rather than quantitative data. Participants contributed this study by their own experiences in each country. So it can be accepted that LPI is mostly subjective and measures the perceptions of participants. Accordingly, countries with high social indicators can be perceived better by participants. Because successful social indicators allow logistics service providers to operate smoothly and formally within a country. As a result, perspectives of logisticians can determine the country scores.

To test the first option, transportation infrastructure gross investment spending of countries' correlated with one of the LPI dimension, infrastructure. As we men-

tioned before, infrastructure dimension represents the country's telecommunication, IT, and transportation infrastructure quality. The results show that there is no any correlation between them and it confirms the first option.

On the other hand, correlations in Table 3 and Table 4 confirm the second option. For example, the most closely related data with customs performance are gross national income (0,857), control of corruption (0,831), and government effectiveness (0,827). These results are not surprised. In a country, corruption can be visible in customs. Since participants are having most of their observations on customs, they may evaluate for custom performance is the most important factor for them. Countries with better rules and systems are expected to provide better services in customs. High correlations of regulatory quality (0,690) and rule of law (0,705) with custom performance supports this explanation.

For instance, although Russia's total investment on transportation infrastructure is 5 times more than Norway's, Norway's logistics performance is higher than Russia (N: 3,93; R: 2,61). Also Norway's customs performance is higher than Russia (N: 3,86; R: 2,15). When the strong correlation between CC and CUS, and the CC scores of Norway (0,83) and Russia (0,33) taken into consideration, this result makes sense. It is possible to see the same results in other country comparisons as well.

However, in her study Sinitsina (2009) compared the Russia with Bulgaria, Romania, and Kazakhstan in terms of their logistics performances and stated that LPI score of Russia is lower than the others. According to her, the possible reason of this result is the absence of the private sector pressure to implement institutional reforms in the area of trade and transport in Russia. Addition to this possibility, our study suggests that countries' social indicators might be also effective on their logistics performances. Further analysis must be conducted.

Table 6 Comparison of Social Indicators of Russia with Other Countries

	PRS	DEM	HDI	LPI
Russia	0,54	3,92	0,719	2,61
Romania	0,60	6,6	0,767	2,84
Bulgaria	0,60	6,84	0,743	2,83
Kazakhstan	0,58	3,3	0,714	2,83

As can be seen in Table 6, although democracy and human development scores of Russia are higher than Kazakhstan, all other scores are lower than other countries' scores. As a result, LPI score of Russia is lower than Romania, Bulgaria, and Kazakhstan.

4.6. Limitations of the Research

The most important limitation of this research is that study is limited with just 26 OECD countries. Although other data are available for most of other countries, transportation infrastructure gross investment spending data is available only for these 26 countries and for this reason the study was conducted with 26 countries.

5. CONCLUSION

Research results show that countries' logistics performances are independent from transportation infrastructure gross investment spending and other economic indicators. However, there is a strong correlation between social indicators and logistics performance.

High levels of political indicators (like political stability, government efficiency, regulatory quality and democracy level) and social indicators (like expected years of schooling and gross national income) allows logistics service providers to operate smoothly and formally in these countries. Even if transportation investments are too high, this may not always mean a high level logistics performance.

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APPENDICES

Table 7 Dimensions of Logistics Performance Index

Country	CUS	INF	INT	LOG	TRA	TIM	Country	CUS	INF	INT	LOG	TRA	TIM
Austria	3,49	3,68	3,78	3,70	3,83	4,08	Lithuania	2,79	2,72	3,19	2,85	3,27	3,92
Belgium	3,83	4,01	3,31	4,13	4,22	4,29	Luxemb.	4,04	4,06	3,67	3,67	3,92	4,58
Canada	3,71	4,03	3,24	3,99	4,01	4,41	Mexico	2,55	2,95	2,83	3,04	3,28	3,66
Croatia	2,62	2,36	2,97	2,53	2,82	3,22	Moldova	2,11	2,05	2,83	2,17	3,00	3,17
Czech R.	3,31	3,25	3,42	3,27	3,60	4,16	Norway	3,86	4,22	3,35	3,85	4,10	4,35
Denmark	3,58	3,99	3,46	3,83	3,94	4,38	Poland	3,12	2,98	3,22	3,26	3,45	4,52
Estonia	3,14	2,75	3,17	3,17	2,95	3,68	Portugal	3,31	3,17	3,02	3,31	3,38	3,84
Finland	3,86	4,08	3,41	3,92	4,09	4,08	Russia	2,15	2,38	2,72	2,51	2,60	3,23
France	3,63	4,00	3,30	3,87	4,01	4,37	Serbia	2,19	2,30	3,41	2,55	2,67	2,80
Germany	4,00	4,34	3,66	4,14	4,18	4,48	Slovakia	2,79	3,00	3,05	3,15	3,54	3,92
Hungary	2,83	3,08	2,78	2,87	2,87	3,52	Slovenia	2,59	2,65	2,84	2,90	3,16	3,10
Iceland	3,22	3,33	3,10	3,14	3,14	3,27	Spain	3,47	3,58	3,11	3,62	3,96	4,12
Italy	3,38	3,72	3,21	3,74	3,83	4,08	Turkey	2,82	3,08	3,15	3,23	3,09	3,94

Table 8 Dimensions of Political Risk Scores

Country	VA	PV	GE	RQ	RL	CC	Country	VA	PV	GE	RQ	RL	CC
Austria	1,00	0,80	1,00	0,95	1,00	0,83	Lithuania	0,88	0,72	0,63	0,77	0,67	0,33
Belgium	1,00	0,74	1,00	0,77	0,83	0,83	Luxemb.	1,00	0,88	1,00	0,91	1,00	0,83
Canada	0,96	0,77	1,00	0,91	0,92	0,83	Mexico	0,88	0,64	0,75	0,77	0,33	0,42
Croatia	0,88	0,81	0,75	0,77	0,75	0,50	Moldova	0,67	0,56	0,25	0,50	0,75	0,33
Czech R.	0,96	0,71	0,75	0,95	0,83	0,42	Norway	1,00	0,79	1,00	0,95	1,00	0,83
Denmark	1,00	0,69	1,00	0,91	1,00	0,92	Poland	1,00	0,82	0,75	0,95	0,75	0,42
Estonia	0,88	0,68	0,63	0,86	0,67	0,50	Portugal	1,00	0,73	0,75	0,77	0,83	0,67
Finland	1,00	0,89	1,00	1,00	1,00	1,00	Russia	0,58	0,65	0,25	0,77	0,67	0,33
France	0,96	0,67	0,75	0,91	0,83	0,75	Serbia	0,79	0,65	0,50	0,55	0,58	0,33
Germany	1,00	0,70	1,00	0,95	0,83	0,83	Slovakia	1,00	0,77	0,75	0,82	0,67	0,42
Hungary	0,96	0,78	0,75	0,68	0,67	0,50	Slovenia	0,88	0,74	0,75	0,86	0,75	0,50
Iceland	1,00	0,77	1,00	0,59	1,00	0,92	Spain	0,92	0,63	0,75	0,82	0,83	0,67
Italy	0,96	0,71	0,63	0,91	0,67	0,42	Turkey	0,54	0,55	0,50	0,59	0,58	0,42

Table 9 Dimensions of Human Development Index

Country	LE	MS	ES	GN	Country	LE	MS	ES	GN
Austria	80,4	9,8	15	37.056	Lithuania	72,1	10,9	16	14.824
Belgium	80,3	10,6	15,9	34.873	Luxemb.	79,9	10,1	13,3	53.109
Canada	81	11,5	16	38.668	Mexico	76,7	8,7	13,4	13.971
Croatia	76,7	9	13,8	16.389	Moldova	68,9	9,7	12	3.149
Czech R.	76,9	12,3	15,2	22.678	Norway	81	12,6	17,3	58.810
Denmark	78,7	10,3	16,9	36.404	Poland	76	10	15,2	17.803
Estonia	73,7	12	15,8	17.168	Portugal	79,1	8	15,5	22.105
Finland	80,1	10,3	17,1	33.872	Russia	67,2	8,8	14,1	15.258
France	81,6	10,4	16,1	34.341	Serbia	74,4	9,5	13,5	10.449
Germany	80,2	12,2	15,6	35.308	Slovakia	75,1	11,6	14,9	21.658
Hungary	73,9	11,7	15,3	17.472	Slovenia	78,8	9	16,7	25.857
Iceland	82,1	10,4	18,2	22.917	Spain	81,3	10,4	16,4	29.661
Italy	81,4	9,7	16,3	29.619	Turkey	72,2	6,5	11,8	13.359

BIOGRAPHICAL NOTES

Samet Guner is a research assistant at Sakarya University, School of Business. His research interests are logistics, supply chain management, operational efficiency and environmental management.

Erman Coskun is a full professor of Management Information Systems and Quantitative Methods at Sakarya University's School of Business Administration. He also chairs MIS department. He holds a PhD from Rensselaer Polytechnic Institute. His research and teaching interests are Information Systems, Logistics and Supply Chain Management, Disaster and Emergency Management, and Management Science. He published several articles in journals such as *Government Information Quarterly*, *Journal of Homeland Security and Emergency Management*, *Journal of Systems and Software*, *Information and Software Technology*, *Journal of Organizational Change Management*, *International Journal of Business Strategy*.

