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Effect of Green Social Capital, Green Organizational Capital, and Green Human Capital on Green Competitiveness: Empirical Research on Logistics Service Providers

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Abstract

As in other industries, the competitiveness in the logistics industry is evolving towards a green-oriented competitiveness approach. This transformation has enabled traditional competitiveness strategies to evolve into green competition strategies. The resource-based view theory bases on competitiveness for the resources that companies have. It also takes its place in the green competitiveness perspective. The intellectual capital of logistics companies is among intangible resources that provide advantages to companies. In this research, the effect of green intellectual capital (green social capital (GSC), green organizational capital (GOC), green human capital (GHC)) on green competitiveness (GC) performance is discussed. In the empirical research, GSC, GOC, GHC and GC scales were used. The studies on the scales were examined and it was explained that the reliability and validity levels of the scales were sufficient. The sample area of the research consists of logistics companies operating in Artvin. The universe of the research consists of all logistics stakeholders serving in Artvin. The sample area was determined by the simple random sampling method. The data of the research were collected in October-November 2022. Meaningful data was obtained from 593 participants. Analysis of the scales and hypothesis tests were carried out with the collected data set. Three research models and three hypotheses were developed in the study. According to the research findings, it has been determined that all intellectual capital dimensions have a positive and significant effect on green competitiveness. In addition, the model that explains the effect of all intellectual capital dimensions on green competitiveness was determined as the best model. As a result of the research, suggestions were developed for logistics companies and researchers.

Keywords: Green Human Capital, Green Social Capital, Green Organizational Capital, Green Competitiveness, Logistics Service Providers, Hierarchical Regression Analysis

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Yeşil Sosyal Sermaye, Yeşil Örgütsel Sermaye ve Yeşil İnsan Sermayesinin Yeşil Rekabetçilik Üzerindeki Etkisi: Lojistik Hizmet Sağlayıcı Şirketler Üzerine Ampirik Araştırma

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Özet

Diğer endüstrilerde olduğu gibi lojistik endüstrisinde de rekabetçilik anlayışı yeşil odaklı rekabetçilik anlayışına doğru evrilmektedir. Bu dönüşüm geleneksel rekabetçilik stratejilerinin de yeşil rekabet stratejilerine evrilmesini sağlamıştır. Kaynaklı tabanlı görüş teorisi kapsamında rekabetçilik anlayışı şirketlerin sahip olduğu kaynaklara dayandırılmaktadır. Bu durum yeşil rekabetçilik bakış açısında da yerini almaktadır. Şirketlerin rekabet avantajı kazanmada avantaj sağlayan entelektüel sermayeleri soyut kaynaklar arasındadır. Bu araştırmada lojistik hizmet sağlayıcı firmaların yeşil entelektüel sermayelerinin (yeşil sosyal sermaye (YSS), yeşil organizasyon sermayesi (YOS), yeşil insan sermayesi (YİS)) yeşil rekabetçilik (YR) performansları üzerindeki etkisi ele alınmıştır. Ampirik araştırmada YSS, YÖS, YİS ve YR ölçeklerinden faydalanılmıştır. Ölçeklere ait araştırmalar incelenerek ölçeklerin güvenililik ve geçerlilik düzeylerinin yeterli olduğu açıklanmıştır. Araştırmanın örneklem alanını Artvin ilinde faaliyet gösteren lojistik firmaları oluşturmaktadır. Araştırmanın evrenini Artvin ilinde hizmet veren tüm lojistik paydaşlar oluşturmaktadır. Örneklem alan basit rastgele örnekleme seçim yöntemiyle belirlenmiştir. Araştırmaya ait veriler Ekim-Kasım 2022 tarihlerinde toplanmıştır. 593 katılımcıdan anlamlı veri elde edilmiştir. Toplanan veri setiyle ölçeklere ilişkin analizler ve hipotez testleri yapılmıştır. Araştırmada üç araştırma modeli ve üç hipotez geliştirilmiştir. Araştırma bulgularına göre tüm entelektüel sermaye boyutlarının yeşil rekabetçilik üzerinde pozitif yönde anlamlı etkisi olduğu tespit edilmiştir. Ayrıca entelektüel sermaye boyutlarının aynı anda yeşil rekabetçilik üzerinde etkisini açıklayan model en iyi model olarak belirlenmiştir. Araştırma sonuçlarına göre lojistik firmalara ve araştırmacılara öneriler geliştirilmiştir.

Anahtar Kelimeler: Yeşil İnsan Sermayesi, Yeşil Sosyal Sermaye, Yeşil Organizasyon Sermayesi, Yeşil Rekabetçilik, Lojistik Hizmet Sağlayıcı Şirketler, Hiyerarşik Regresyon Analizi

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1. INTRODUCTION

Environmental pollution is one of the main problems faced by humanity today. To prevent environmental pollution, all units of society are struggling with different methods. There are efforts to reduce waste consumption and use energy consumption more efficiently with sustainable environmental policies in various industries. In fact these efforts are subject to competition among companies. This type of competition is conceptualized as "green competitiveness (GC)" in the literature. Porter and Linde (1995) refer to the concept of competitiveness as GC, which deals with the reuse and inclusion of wastes in the re-production processes in the development of new products. Starik et al. (1996) emphasize that traditional competitive strategies are insufficient for companies to develop environmental policies and explain that green-oriented competitiveness should be taken as a basis. Nassar and Tvaronavičienė (2021), who determined the theoretical basis of GC in the literature, found that GC is mostly handled based on the Resource-based view (RBV) theory. RBV theory is based on the use of internal resources for companies to gain sustainable competitive advantage (Madhani, 2010).

Intellectual capital is shown among companies' invisible assets (Itami and Roehl, 1991) and intangible resources (Hall, 1999). Radjenović and Krstić (2017) show intellectual capital among the sources of competitive advantage within the scope of RBV. Youndt et al. (2004) explained intellectual capital in three basic dimensions: human capital, social capital, and organizational capital. Kwantes (2007) has shown that intellectual capital is among the factors that determine competitiveness at the organizational level. In the meantime, it can be mentioned that the green-oriented intellectual capital of the companies can be used to gain green competitive advantage. In this research, green human capital (GHS), green social capital (GSC), the green organizational capital (GOC) was accepted as green-oriented intellectual capital components. Chen and Chang (2013) describe GHC as "the summation of employees' knowledge, skills, capabilities, experience, attitude, wisdom, creativity, and commitments, etc. about environmental management and environmental concern". Stating that GSC is based on social relations, Delgado-Verde et al. (2014) explained GSC as "It has to do with the knowledge derived from employees' informal and personal relationships". On the other hand, Delgado-Verde et al. (2014) explained the GOC as "the specification, empowerment, and support infrastructure associated with environmental protection or the development of sustainability strategies (Huang and Kung, 2011)".

The main purpose of this research is to determine the green intellectual capital levels of logistics service providers in the green competitive environment and to determine the effect of green intellectual capital on green competitiveness. In this context, it is aimed to determine the best model structure by hierarchical regression analysis by considering the green intellectual capital dimensions and green competitiveness. In line with these aims and objectives, two research questions are developed. The research questions are as follows:

- Research Question 1: Is there a significant relationship between green intellectual capital dimensions and green competitiveness?
- Research Question 2: What is the best model for the effect of green intellectual capital dimensions on GC?

To answer the above research questions, this research is discussed in seven parts. In the second part, the conceptual framework of GC and green intellectual dimensions is presented. In the third part, research hypotheses and research models are explained with the literature review. In the fourth part, the research methodology is given. In the fifth part, the findings are presented. In the sixth part, the results of the research are shared. In the seventh part, the implications and limitations of the research are explained.

2. CONCEPTUAL FRAMEWORK

2.1. Green Social Capital

Green social capital, also known as green relational capital, refers to "the sum of an organization's collaborative relations with customers, network members, suppliers, and other partners regarding green innovation and corporate environment-friendly management that makes it possible to create fortunes and obtain a competitive edge" (Pham et al., 2019; Mansoor et al., 2021; Alam et al., 2021). In other words, the idea of "green intellectual capital" encompasses "*green social capital*" which refers to informal connections, productive conversations, information exchange among colleagues, and reciprocal engagement on environmental projects (Delgado-Verde et al., 2014). These connections are founded on the mutual trust developed over time via interactions between the parties (Villena et al., 2011). GSC is crucial for the development of organizational and human capital. Social capital development may benefit the firm and its stakeholders (Carey et al., 2011). It improves communication, increases cooperation, and encourages participation in the collaborative development of added value (Zhang et al., 2018).

To thrive and stay ahead of the competition, it is crucial for aligning their interests with those of their stakeholders (Massaro et al., 2018). Nevertheless, customers, the government, and suppliers (the three main stakeholders) are all very interested in adopting "green practices" As a result, businesses are under more and more pressure to embrace green human resource management procedures. So, it's important to have strong social green capital for embracing green social procedures (Pham et al., 2020).

2.2. Green Organizational Capital

Green organizational capital referred to as structural capital is a term used to describe intangible and legal assets, databases, and invisible assets, including things like green organizational culture, philosophy, systems of management of environmental knowledge, and procedures, methods, and structures related to environmental protection and supporting green initiatives (Yong et al., 2019; Arsawan et al., 2022). In other words, it refers to "the totality of organizational knowledge management systems, capabilities, commitments, information technology, rewards system, operation processes, databases, organizational culture, managerial mechanism and philosophies, company's reputation, trademarks, copyrights, and patents, among other things, green innovation within organizations or environmental safety" (Xu and Wang, 2018; Pham et al., 2019; Alam et al., 2021).

The knowledge that has been converted into a database, programs, organizational processes, or organizational capital, may promote organizational productivity and performance (Edvinsson and Malone, 1997). In other words, strong organizational structures will improve an organization's performance (Kamaluddin and Kasim, 2013). Intellectual capital is also merely human capital if organizational capital is absent (Mehralian et al., 2013). Human capital alone cannot address environmental issues since strategic decisions also depend on corporate culture and processes (Jardon and Dasilva, 2017). Organizational capital aids in process and system organization, which in turn enables the necessary technological know-how and develops into organizational competencies. Additionally, organizational strengths become a prerequisite for generating better performance (Jardon and Martos, 2012).

2.3. Green Human Capital

The term "*green human capital*" refers to the accumulation of employee knowledge, talents, experience, innovation, and devotion to the implementation of environmental protection policies and procedures. In other words, it is a workforce that is environmentally conscious and actively

participates in green efforts. The workforce is devoted to promoting environmentally friendly workplaces and upholding ecological ideals both at work and in personal life and it also exhibits a strong commitment to environmental projects (Ahmad, 2015).

Employees that can ensure environmental sustainability in the company's industrial activities therefore, tend to support the long-term viability of the enterprise. This is because the employees' improved knowledge and expertise boost their output and aid in the growth of the company (Yong et al., 2019). The availability of green human resources inside a firm promotes the adoption of environmental management techniques like green supply chain management as well as the traits and skills that make a person a valuable employee. Through teamwork, enthusiasm, and competency among the teams, it grows every day. A company's human capital is increased via employee education. By increasing its human capital in this way, the company will promote employee creativity, which will support its development in innovation (Yousaf, 2021).

Employee contributions might take the form of training employees to boost corporate productivity, passing employee expertise to the business, or altering the culture of the organization. Even if the individual stops working in the future, the business may still benefit from their all expertise. We may infer from this that the business values its people as valuable capital. An employee also feels valued since the firm is using his labor as a legacy that will be developed and applied so that the company may function even better (Dahiya and Raghuvanshi, 2021). Additionally, it is believed that human capital is a crucial component of the process of building intellectual capital, playing a part in the creation of *GOC* and *GSC* (Cavicchi and Vagnoni, 2017). Without its presence, they cannot function perfectly.

2.4. Green Competitiveness

Businesses might benefit from environmental policies to increase their competitiveness in the market. (Porter, 1990). The term GC is proposed by him for the first time in the 90's. It refers to the capacity to achieve a competitive edge in the market based on the green (Porter and Linde, 1995). Since then, several studies have been done to examine green competitiveness from different angles. In general, there are two ways to define green competitiveness. According to one perspective, GC is a conceptualized idea. The concept of GC comprised a variety of enterprise-specific elements, including the procurement of raw materials, production, product consumption, and waste management (Chiang et al., 2011). Another perspective holds that being environmentally friendly is a relative competitive advantage. According to some experts, green competition offered more alluring goods and services than rivals based on environmental protection (Bowen and Fankhauser, 2011).

When an organization focuses on an environmental innovation strategy, it enhances the resources allocated to green goods or procedures and coordinates these resources to meet its objectives, potentially boosting green competitiveness. Having such methods can help businesses find new market possibilities and lessen the impact of government regulations (Chen, 2008a). Consumers are increasingly prepared to pay extra for environmentally friendly items as a result of rising environmental views, which might encourage businesses to include green environmental protection principles with their product design and packaging to appeal to customer preferences (Song and Yu, 2018).

3. LITERATURE REVIEW, HYPOTHESES DEVELOPMENT, AND RESEARCH MODEL

In the literature, some studies deal with the relationship between intellectual capital and competitiveness at the macro and micro levels. At the macro level, the country's intellectual capital and competitiveness levels are evaluated together. Januškaitė and Užienė (2018)

considered intellectual capital at the macro level and showed it among the important social indicators for the development of regional competitiveness. In addition, the significant effect of all dimensions of intellectual capital on competitiveness was emphasized. Herciu and Ogrean (2015), on the other hand, showed intellectual capital and competitiveness among the basic elements that provide economic development. At the micro level, the competitiveness relations of firms with intellectual capital are discussed. Kianto et al. (2013) stated that firms can gain to competitive advantage with successful intellectual capital management. It was also supported that this competitiveness plays an active role in increasing financial performance. Suciu and Năsulea (2019) cited intellectual capital along with the creative economy as key drivers for competitiveness. In the literature, it is seen that the effect of intellectual capital on competitiveness is discussed in different industries. Such as railway industry (Shchepkina et al., 2022), SMEs manufacturing industry (Vazquez-Avila et al., 2012), automotive industry (Xu et al., 2022).

When the studies dealing with the relationship between green-focused intellectual capital and competitiveness are examined, very limited research has been found. There are some studies about the relationship green human capital, green organizational capital, green social capital, and green intellectual capital on corporate competitiveness. Chen (2008b) showed GHC, GSC, and green relational capital among the green intellectual capital dimensions. It has also been found that green intellectual capital dimensions have a significant effect on corporate competitiveness in information and electronics companies. Considering the manufacturing companies operating in Taiwan, Huang and Kung (2011) revealed the importance of green intellectual capital in gaining the competitive advantage. Likewise, Chaudhry et al. (2016) concluded that green intellectual capital has a significant positive effect on competitiveness. Yusliza et al. (2020) determined the positive effect of green intellectual capital on environmental performance. Likewise, Asiaei et al. (2022) obtained empirical findings that green intellectual sub-dimensions have a significant effect on environmental performance. In the sample of manufacturing companies, Astuti and Datrini (2021) found that the relationship between green competitiveness and green intellectual capital is positive. Lee et al. (2014) also found that green leadership has a significant effect on green competitiveness. It can be mentioned that green human capital has a positive effect on green competitiveness because managers and leaders are the human capital of companies.

In this research, it is aimed to test the effect levels of green intellectual capital sub-dimensions on green competitiveness in logistics service providers operating in the logistics industry and to determine the best model structure. In this context, three hypotheses have been developed. These hypotheses are:

H1: Green social capital significantly affects green competitiveness.

H2: Green social capital and green organizational capital significantly affect green competitiveness.

H3: Green social capital, green organizational, and green human capital significantly affect green competitiveness.

Three research proposal models are developed to test each hypothesis (Figure 1). With hierarchical regression analysis, the R^2 values of the proposed models are observed and the model with the highest explanation percentage is determined.

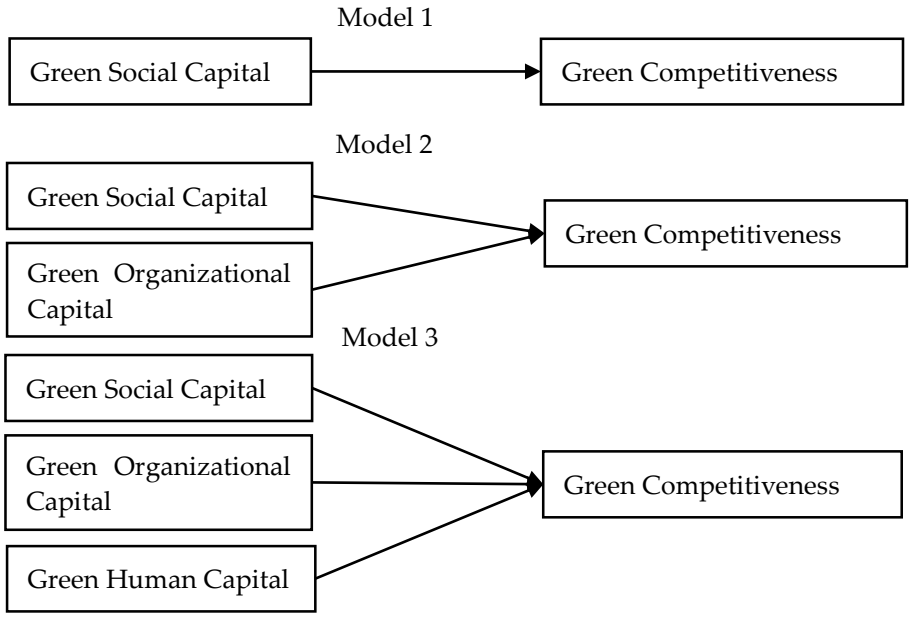

Figure 1. Research Models

4. METHODOLOGY

4.1. Measurement

Three independent variables and one dependent variable are used in this empirical study. Scales for testing hypotheses are obtained from the literature. The GC scale is taken from Agyabeng-Mensah and Tang (2021). This scale consists of seven items and one dimension. In this study, the AVE and CR values of the GC scale were determined as 0.636 and 0.858, respectively. All factor loads were also higher than 0.70. The GHC scale is obtained from Chang and Chen (2012). This scale consists of five items and one dimension. In this study, the AVE, CR, and Cronbach's alpha values of the GHC scale were 0.751, 0.867, and 0.939, respectively. All factor loads were also higher than 0.80. GSC and GOC scales are obtained from Delgado-Verde et al (2014). The GSC scale consists of four items. Likewise, the GOC scale consists of four items. Cronbach's alpha values were 0.857 and 0.886, respectively. The factor loads of both scales are higher than 0.60. A 5-point Likert scale is also used ("1" strongly disagree, "5" strongly agree).

4.2. Sampling

In this study, which deals with the intellectual capital and competitiveness levels of logistics companies from an environmental perspective, the relationship between green intellectual sub-dimensions and green competitiveness is examined. Today, it is necessary to reduce energy consumption and waste production to establish a more livable environment. Green-oriented approaches in logistics activities based on energy consumption have changed the understanding of competitiveness and included the green understanding of competition. In this research, a sample was created from the employees of logistics companies operating in Artvin province. Hopa Sarp customs gate, Hopa port and international transportation companies are located in Artvin. According to the records of Hopa Chamber of Commerce, there are 62 international transportation companies (Hopa, 2022). The universe of the research consists of all logistics stakeholders serving in Artvin. The data set was collected by questionnaires. The sample area was determined by the simple random sampling method. The questionnaire form is composed of two parts. In the first part, there are demographic variables. In the second part, there are scale items of the scales. Questionnaire forms were delivered to the participants via electronic form. In addition, questionnaires were applied

through face-to-face interviews. The data collection process took a total of two months. Data collection process was completed in October-November 2022. 593 questionnaires were filled correctly. Analyzes were carried out on 593 data. This number is sufficient in the 95% confidence interval (Bartlett et al., 2001). Frequency analyzes of demographic variables are presented in Table 1. According to these data, it has been observed that the logistics companies providing transportation services in the Artvin region are very dense. Approximately 80% of the participants are in the 26-55 age group. In addition, man participants are approximately four times more numerous than woman participants.

Table 1. Sampling

Gender	**Number**	**%**	**Marital Status**	**Number**	**%**
Man	465	78.4	Married	334	56.3
Woman	128	21.6	Single	259	43.7
Total	593	100	Total	433	100
Logistics Area	**Number**	**%**	**Age**	**Number**	**%**
Transportation	411	69.3	18-25	59	9.9
Warehouse	75	12.6	26-35	182	30.7
Packaging	56	9.4	36-45	187	31.5
Customs	33	5.6	46-55	110	18.5
Others	18	3.0	56+	55	9.3
Total	593	100	Total	593	100

5. FINDINGS

5.1. Reliability and validity of the scales

In this section, the analyzes of the scales are presented. In this context, the kurtosis and skewness scores of the variables were examined to test whether the data set has a normal distribution. At the same time, The Kolmogorov and Smirnov normality (KS) test was performed. Afterwards, sample adequacy and scale reliability tests were conducted. Then, factor loadings of the scale expressions were determined by exploratory and confirmatory factor analysis. In addition, average variance extracted (AVE) and composite reliability (CR) scale validity tests are presented. KS normality test findings, kurtosis and skewness scores of the scales were calculated with SPSS. It is presented in Table 2. It has been observed that the kurtosis and skewness values are between "-2.5" and "2.5". Kurtosis and skewness scores indicate a normal distribution (Kline, 2011). In addition, there are studies suggesting the use of kurtosis and skewness values in the determination of the normal distribution (Can, 2018; Gürbüz, 2019).

It is necessary to have sufficient sample for the validity and reliability analyzes of the scales. In this context, Kaiser Meyer Olkin (KMO) and Bartlett's Test of Sphericity (BTS) tests were applied to the scales. Test findings are presented in Table 3. KMO scores are greater than 0.70 and the BTS significance level is less than 0.01 (Tabachnick et al., 2007). In this case, the sample area is sufficient. In addition, the reliability analysis findings of the scales are presented in Table 3. All of the Cronbach's Alpha (α) scores of the scales are greater than 0.70. Thus, all scales are reliable.

Table 2. Normality Test Findings

Scales	N	Mean	SD	Kolmogorov-Smirnov Z	Asymp. Sig.	Skewness	Kurtosis
Green Social Capital (GSC)	593	3.41	0.75	2.494306	0.000	0.014	0.188
Green Organizational Capital (GOC)	593	2.84	0.85	2.530065	0.000	0.456	0.390
Green Human Capital (GHC)	593	3.31	0.93	2.378963	0.000	-0.334	-0.319
Green Competitiveness (GC)	593	3.82	0.77	3.065874	0.000	-0.885	1.226

Table 3. KMO and BTS Findings

		GSC	GOC	GHC	GC
KMO		0.713	0.737	0.828	0.892
BTS	**Approx. Chi-Square**	742.389	768.147	2380.862	4124.275
	df	6	6	10	21
	Sig.	0.000	0.000	0.000	0.000
Cronbach's Alpha(α)		0.770	0.792	0.905	0.918

In this research, the effect of green intellectual capital dimensions on green competitiveness in logistics companies in Turkey is examined. For this reason, scale items were directed to the sample area in Turkish. The originals of the scale items are in English. The approach suggested by Brislin et al. (1973) was adopted in translating the scale items into a different language. In this approach, firstly, the English expressions were translated into Turkish by the authors. Later, the Turkish expressions were translated back into English. All the translations made were shown to three English grammar experts working at the university, and the accuracy of the translations was confirmed. Thus, the questionnaire form was prepared and applied in Turkish. Exploratory factor analysis (EFA) was performed with SPSS because the scales were applied in a different language and sample area. The factor loading of each scale item must be at least 0.40. In addition, the Total Variance Percentage should be higher than 0.50 (Büyüköztürk, 2017). EFA findings are presented in Table 4. All scales are one-dimensional. With these findings, it is clearly stated that the scale items reflect the scale. In addition, the convergent and divergent validity of the scales were tested with AVE and CR tests. AVE should be greater than 0.50 and CR should be greater than AVE (Fornell and Larcker, 1981). AVEs of the scales are greater than 0.50 and CRs are greater than AVEs (Table 4). Thus, the scales are interpreted as valid.

Table 4. EFA Findings

Items	Factor Loads	Eigenvalues	AVE CR
GSC4- "In our company the employees assist each other in order to generate new ideas and improve environmental performance."	0.883		
GSC2- "We have appreciated the existence of constructive discussions among employees to solve the environmental problems of the firm."	0.835		
GSC3- "In our company the employees are willing to share their environmental knowledge and experiences."	0.722	2.392 / % 59.811	0.598 / 0.854
GSC1- "In our company we have appreciated the existence of informal contacts among employees aimed to exchange information about the environmental aspects of the activity."	0.629		
GOC4- "We have implemented in our company the appropriate procedures for the periodical assessment of compliance with the environmental regulation requirements."	0.838		
GOC3- "We are improving our environmental communication structures."	0.832	2.481 / % 62.031	0.619/ 0.866
GOC2- "Environmental responsibilities are clearly defined and delimited in our organizational chart."	0.753		
GOC1- "We already have a written environmental policy in our company."	0.720		
GHC4- "The cooperative degree of team work pertaining to environmental protection in the company is more than that of its major competitors."	0.914		
GHC3- "The products and services of environmental protection provided by the employees of the company are better than those of its major competitors."	0.910		
GHC5- "Managers in the company can fully support their employees to achieve the goals of environmental protection."	0.897	3.655 / % 73.093	0.730 / 0.930
GHC2- "The employees' competence of environmental protection in the company is better than that of its major competitors."	0.814		
GHC1- "The productivity and contribution of employees concerning environmental protection in the company is better than those of its major competitors."	0.724		
GC2- "Our firm is more capable of environmental R&D and green innovation than its major competitors."	0.930		
GC3- "Our firm offers green products and services that are better than that of its major competitor's."	0.926		
GC4- "Our firm has a better green corporate reputation than its competitors."	0.921		
GC1- "Our firm is more capable of environmental management than its major competitors."	0.892	4.976 / % 71.081	0.710 / 0.943
GC5- "Our firm has a competitive advantage of low cost about environmental management."	0.888		
GC6- "The major competitors of our firm cannot imitate its products or services easily."	0.670		
GC7- "The distinct position of our firm cannot be easily replaced by its major competitors."	0.610		

Notes: "GSC: Green Social Capital, GOC: Green Organizational Capital, GHC: Green Human Capital, GC: Green Competitiveness"

Confirmatory factor analysis (CFA) was done with the AMOS. CFA findings are presented in Table 5. In social sciences, scale factor loads should be greater than 0.40. In addition, Fit test values

are expected to be at an acceptable level (Tabachnick et al., 2007). According to Table 5, measurement model estimates are higher than 0.40. In addition, all Fit values are at an acceptable level. Thus, scale items are appropriate according to both EFA and CFA findings.

Table 5. CFA Findings

Parameter Estimates	Estimate	S.E.	Fit Values
Measuring Model			
GSC4 <--- GSC	0.926*	0.041	"X^2 [2.2, N=593] = 1, CMIN/df (2.211) **, CFI (0.998)***, RFI (0.982)***, IFI (0.998)***, TLI (0.990)*** NFI (0. 997)***, RMSA (0.045)****"
GSC2 <--- GSC	0.781*	0.042	
GSC3 <--- GSC	0.543*	0.036	
GSC1 <--- GSC	0.449*	0.041	
GOC4 <--- GOC	0.841*	0.042	"X^2 [0.9, N=593] = 1, CMIN/df (0.926)**, CFI (1.000)***, RFI (0.993)***, IFI (1.000)***, TLI (1.001)***, NFI (0.999)***, RMSA (0.000)****"
GOC3 <--- GOC	0.828*	0.044	
GOC2 <--- GOC	0.555*	0.048	
GOC1 <--- GOC	0.509*	0.045	
GHC4 <--- GHC	0.959*	0.043	"X^2 [14, N=593] = 3, CMIN/df (4.658)**, CFI (0.995)***, RFI (0.981)***, IFI (0.995)***, TLI (0.985)*** NFI (0.994)***, RMSA (0.079)*****"
GHC5 <--- GHC	0.908*	0.043	
GHC3 <--- GHC	0.898*	0.047	
GHC2 <--- GHC	0.683*	0.047	
GHC1 <--- GHC	0.542*	0.045	
GC3 <--- GC	0.942*	0.035	"X^2 [37.2, N=593] = 11, CMIN/df (3.385)**, CFI (0.994)***, RFI (0.983)***, IFI (0.994)***, TLI (0.988)*** NFI (0.991)***, RMSA (0.063)*****"
GC4 <--- GC	0.941*	0.034	
GC2 <--- GC	0.914*	0.035	
GC5 <--- GC	0.865*	0.036	
GC1 <--- GC	0.860*	0.039	
GC6 <--- GC	0.539*	0.046	
GC7 <--- GC	0.472*	0.046	

Notes: "* p<0.01, ** CMIN/df < 3 (Good fit), **** CFI, NFI, RFI, IFI, TLI > 0.90 (Good fit), **** RMSA< 0.05 (Good fit). ***** 0.05 <RMSA< 0.08 (Acceptable fit)"

5.2. Test of The Research Hypothesis

The green-oriented intellectual capital of logistics service providers plays an active role in acquiring environmentally conscious customers. Green competitiveness, on the other hand, proposes to compete among firms by considering environmental concerns. The realization of logistics services with activities that cause environmental pollution takes away from green competitiveness. Three model proposals and three hypotheses were developed in this study. To test these hypotheses and to determine the best research model, the relationships between the variables are examined. Spearman Correlation analysis results are presented in Table 6. GC and GSC correlation relationship is moderate ($r(593)=0.401$, $p<0.01$). Correlation relationship between GC and GOC is high ($r(593)=0.585$, $p<0.01$). The correlation relationship between GC and GHC is higher ($r(593)=0.681$, $p<0.01$). In addition, correlations between all variables are significant.

GC was determined as the dependent variable in the study. Other variables are independent variables. In the first research model, the effect of GSC on GC is examined. In the second research model, the effect of GSC and GOC on GC is examined. In the third research model, the effect of GSC, GOC, and GHC on GC is examined. The model with the best explanation level is

determined by hierarchical regression analysis. Hierarchical regression analysis is performed with SPSS. Hierarchical regression analysis findings are shown in Table 7.

Table 6. Correlations Findings

Variables	Mean	S.D	GSC	GOC	GHC	GC
GSC	3.41	0.75	1			
GOC	2.84	0.85	0.357*	1		
GHC	3.31	0.93	0.389*	0.700*	1	
GC	3.82	0.77	0.401*	0.585*	0.681*	1

Notes: * $p < 0.01$ (2 tailed)

Table 7. Hierarchical Regression Analysis Findings

Variables	Proposed Model-1		Proposed Model-2		Proposed Model-3	
	Beta	**SE**	**Beta**	**SE**	**Beta**	**SE**
Green Social Capital	0.401*	0.039	0.220*	0.036	0.142*	0.033
Green Organizational Capital			0.506*	0.031	0.187*	0.037
Green Human Capital					0.495*	0.035
Constant	2.401		1.730		1.470	
F	113.274		184.061966		199.202116	
R	0.401		0.620		0.710	
R^2	0.061		0.384		0.504	
Adjusted R^2	0.161		0.382		0.501	
R^2 Change	0.161		0.223		0.119	

Notes: * $p < 0.01$ and dependent variable is Green Competitiveness

According to the first research model, GSC has a significant positive effect on GC ($F_{(1,591)}$= 113.273860, p=0.000<0.01). The R^2 value of this model is 0.061. Although the model is significant, it is insufficient. The first model can be expressed as: "GC=2.401+0.401 GSC". According to this finding, *the first hypothesis is supported*. For the second research model, GSC and GOC have a positive and significant effect on GC ($F_{(2,590)}$= 184.061966, p=0.000<0.01). The R^2 value of this model is 0.384. Although the second model is better than the first model, it is not at a sufficient level (R^2 change=0.223). The second model can be expressed as: "GC=1.730+0.220 GSC+0.506 GOC". So, *the second hypothesis is supported*. For the third research model, GSC, GOC, and GHC have a positive and significant effect on GC ($F_{(3,589)}$= 199.202116, p=0.000<0.01). The R^2 value of this model is 0.504. The third model is higher than the previous models (R^2 change =0. 119). The third model can be expressed as: "GC=1.470+0.162 GSC+0.187 GOC+ 0.495 GHC". *The third hypothesis is supported*. The general interpretation is as follows: The first research model has an explanation rate of 6.1%. The second model has a 38.4% disclosure rate. The third model has a 50.4% disclosure rate. Thus, the Model-3 is determined as the best model for explaining the GC.

6. RESULTS AND CONCLUSION

The logistics industry has an undeniable effect in facilitating and accelerating commercial activities. However, efforts to minimize costs cause logistics companies to take steps that leave environmentalism behind. At this point, structural changes are needed to create an environment-oriented competition from cost leadership-oriented competition. GC is inevitable to support environmentally friendly steps. In this research, GC green is discussed from the perspective of intellectual capital. In addition, in this empirical study, the effect of green intellectual capital on green competitiveness levels of companies operating in the logistics industry has been examined.

Three research models have been developed to reveal the effect of GSC, GOC, and GHC on GC. In the first proposed model, the effect of GSC on GC was tested. In the second model, the effect of GSC and GOC on GC was tested. In the third model, the effect of GSC, GOC, and GHC on GC was tested. According to the findings, the model with the highest level of explanation is the model that deals with the effect of all intellectual capital on the GC simultaneously. That is model 3. This finding explains that logistics companies should consider all aspects of green intellectual capital to gain green competitive advantage. It shows parallelism with research in different industries in the literature (Chen, 2008; Huang and Kung, 2011; Chaudhry et al., 2016; Yusliza et al., 2020; Astuti and Datrini, 2021; Asiaei et al., 2022).

In the hierarchical regression analysis findings, although the effect levels of the independent variables on the dependent variable are positive in the third model, the effect sizes differ. The most effective independent variable is GHC ($\beta_{GHC} = 0.495$). This explains that GHC creates a higher level of impact than other variables to gain green competitive advantage. If logistics companies develop their green-focused human capital and increase the human resources that are sensitive to the environment and adopt the importance of the environment, they can become more competitive in market conditions compared to rival companies. In terms of effect size, the GOC variable takes second place ($\beta_{GOC} = 0.187$). If logistics companies take green-oriented steps in the protection and development of their organizational structures, they can improve their GC levels. Thus, they are in a preferable position in market competitive conditions. Among the intellectual capitals, the variable with the lowest level of influence is GSC ($\beta_{GSC} = 0.162$). Although it has less impact than the other two types of capital, logistics companies can gain a green competitive advantage if they place environmentalism at the center of their social capital. Finally, with this empirical research, the importance of green intellectual capital components for green competitiveness has been revealed.

7. SUGGESTIONS AND LIMITATIONS

As a result of this empirical research, suggestions have been developed for logistics companies and researchers. Suggestions for logistics companies are as follows: (i) The increasing environmental concerns by society and industrial organizations have led competitiveness to green competitiveness. For this reason, it is recommended that logistics companies be ready for the new green competition order. (ii) For green competitiveness, it is recommended that logistics companies consider their intellectual capital with a green focus and increase their green intellectual capital. (iii) Green human capital is the most important intellectual capital that affects green competitiveness. It is recommended that logistics companies turn to environmentally in the selection of human resources. (iv) Logistics companies should create their organizational structures by considering the environment. (v) Logistics companies are recommended to direct their social capital towards a green perspective to gain a long-term competitive advantage. Suggestions for researchers are as follows: (i) The findings obtained by conducting empirical studies dealing with the relationships between green competitiveness and green intellectual capital in different industries can be compared with these research findings. (ii) Mediator and moderator impact analyzes can be performed between green intellectual capital dimensions and green competitiveness by using different variables. (iii) Studies dealing with the relationship between different green intellectual capital dimensions and green competitiveness can be conducted.

There are four limitations to this research. These limitations are as follows: (i) This research was conducted in the logistics industry. Different results can be achieved when applied in different industries. (ii) This research was conducted in Turkey. Different findings can be observed with the data collected from different language and culture. (iii) This research was carried out with a

survey based on the perceptions of logistics company employees. Different findings can be obtained by changing the sample area. (iv) The population of the research consists of logistics companies operating in Artvin province. It is assumed that the sample area represents the population.

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