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A Social Network Analysis of International Creative Goods Flow

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Abstract: This study used social network analysis to examine the structure of the international trade of creative goods. The results showed that the US, Canada, Europe, and certain Asian countries (e.g., China, the Republic of Korea, Japan, and Thailand) ranked high in terms of out-degree/in-degree, eigenvector, and betweenness centrality compared to other countries in the international creative goods trade network. A quadratic assignment procedure (QAP) revealed interrelations between each creative goods networks. In particular, the new media network strongly interacted with the design and art crafts network. Furthermore, multiple regression confirmed that each country's gross domestic product (GDP), gross national income (GNI) per capita, population, inbound tourism expenditure, and gross domestic expenditure on R&D (GERD) influenced their international trade of creative goods.

Keywords: creative economy; creative goods; intercultural communication; QAP; social network analysis

1. Introduction

The creative industries are representative of industry in general, in an era in which the significance of culture, leisure, and enjoyment has increased. The importance of creativity, technology, and talent has been increasingly recognized [1], and these attributes can be found at the core of the creative industries. Moreover, the creative industries function as important current indicators of national competitiveness. For example, the European Union (EU) launched a cultural policy program named Creative Europe, which was scheduled to operate from 2014 to 2027. The goal of this program was to strengthen the EU's competitiveness in the creativity and tourism industries as a way of coping with the rapidly changing global situation [2]. Recognizing the significance of creativity, EU members have encouraged creative industries to converge and have collaborated to improve cultural and linguistic diversity, as well as economic growth [3].

Creative goods, the products of the creative industries, include art crafts, audiovisuals, design, new media, performing arts, publishing, and visual arts [4]. Creative goods are associated with cultural backgrounds, values, customs, and religions [5,6]. In terms of trade, cultural interchanges are interactions between cultures realized through the import and export of creative goods. Therefore, an understanding of the ways in which cultural interchanges occur has also provided an understanding of international interactions. Intercultural communication has enabled contact and cooperation among various cultural and social groups comprising individuals with different religious, social, ethnic, and educational backgrounds in a context of globalization [7].

Studies related to creative goods in the creative industries have tended to focus on particular countries or specific creative goods, relationships between property rights and creativity, the effect of word-of-mouth publicity on creative goods, teamwork management in the creative industries, and creative organizations' social networks [8–14]. Although considerable research has been conducted on general trade networks [15–18], the authors of this paper are unaware of any studies that have attempted to identify the characteristics of creative goods networks as they relate to creative industries at the macro level.

Therefore, a social network analysis, which is considered to be a suitable method for identifying interactions between entities, was employed in this study. This method was applied to evaluate the structures and characteristics of all creative goods in different countries. Specifically, we examined the structural features of the international trade of creative goods and used a QAP to investigate the relationships between individual networks grouped by type of creative goods. In addition, the economic, environmental, geographical, and social elements of each country interacted with and affected trade [19,20]. Therefore, we were able to analyze the impact of economic, social, and cultural factors on out-degree/in-degree centrality indicators of the international creative goods trade network. Through this analysis, we can provide useful insights into the global structure of the creative industries.

2. Literature Review

The concept of the creative industry coincided with the concept of a national drive based on creative energy. It comprised industries such as advertisement, architecture, fine art, art and crafts, design, fashion, cinema, music, performance, publication, leisure, software, toys, television and radio broadcast, and video games. The use of the term varied among countries, including its use in relation to the entertainment industry, the content industry, and the copyright industry. The United Nations Conference on Trade and Development (UNCTAD) has defined creative products as the creation, production, and distribution of economic and cultural values, the types of products oriented to the market, and the chain of knowledge-based activities [2]. The United Nations Educational, Scientific and Cultural Organization Institute for Statistics (UNESCO-UIS), UNCTAD, and the World Intellectual Property Organization (WIPO) have shared several creative components, but certain differences remain. While WIPO has adopted a purely economic definition focused on copyright concepts, UNCTAD and UNESCO share more common cultural items [21].

The concept of the creative economy includes the system of the production, exchange, and use of creative products resulting from creativity, which require intellectual property rights in creative industries; this concept embraces the potential of creating economic values and employment [22,23]. Human creativity is an important economic resource, and a country's creative and cultural industries have played a crucial part in the economic development of many developed countries [11,24]. Furthermore, UNCTAD [2] considered technology, demand, and tourism the most important drivers for the growth of the creative economy, and among them, the tourism industry was considered to be associated with the creative industry. This demonstrates the organic composition of the tourism and creative industries in the innovative frame of creativity. The capability of cultural and creative entities to respond to changing exogenous or external market conditions and to predict future trends will determine their functionality and performance in the value chain in general, which will ultimately determine their overall competitiveness [25]. Horobets [26] analyzed the dynamics of the international trade of EU cultural goods in 2012–2017 and discovered that the average 6% annual growth of the EU index provided a basis for sustained growth of the creative economy and industries. Moreover, the trade of different creative goods can have a positive ripple effect, leading to the consumption of connected goods.

The creative goods trade can reduce the intercultural communication gap among different cultural and social groups. Therefore, each country's trade has been influenced by globalization. According to Meyer [27], globalization refers to the expanded interdependency among nations, which connotes not only economic exchange but also cultural awareness. The three key factors contributing to globalization are reduced trade and investment barriers, the development of countries' economies and their impact on global production capacity, and technological change in transport and communications technologies [28]. Globalization has five attributes: it is dialectically dynamic, universally pervasive, culturally hybridized, holistically interconnected, and individually powerful [29]. As such, researchers have emphasized that countries form a massive, globalized network and affect one another's cultures. Based on the intercultural communication theory, Kluver [30]

stated that globalization and informatization trends have significantly influenced the understanding of culture, society, and communication. Globalization is occurring in social life, communication, travel, finance, the military, ecology, health, law, and the production of goods and services [31]. As companies develop a global mindset in the manufacturing, importing, or exporting of their products and services, intercultural communication becomes more important in international business. Therefore, the world trade network structure is related to the globalization perspective [32]. Although skeptics have argued that globalization has helped some Asian economies, this is not true for all parts of the world [33]. In the same context, there is an opinion that even in the age of globalization, the world economy is structured as an area of integration and isolation [34].

Chung [35] explored structural changes and continuity in the international film trade over ten years and emphasized that, although international trade in media products had once been one-way, there was now an increase in regional and cultural exchange, according to more recent studies. Thus, the structure of international film trade has become denser over time, and both geographical proximity and linguistic commonality were important determinants. Aage and Belussi [8] used social network analysis to discover the external fashion sources used by a group of designers and firms. Cattani and Ferriani [36] examined the role of social networks in the Hollywood motion picture industry.

The literature on the interactions of international trade, economic growth, and economic income has increased in recent decades [20]. In addition, education has been intended to establish a high level of culture, and cultural creative products and services generally require of consumers a certain level of cultural knowledge, which improves with education [5,27]. The effect of the national economy, environment, geography, and society on the trade network index has also been studied [19]. A study by Niu [5] revealed that economic growth in Beijing could promote the export of Beijing's cultural creativity industry. That is, the concept of creativity constituted the core of creative industries in the creative economy, which induced a critical drive for the growth of national economies and of societies. Moreover, the global creativity index assesses a country's technology use as a proxy for the country's share of GDP on research and development (R&D) and its number of patents [37]. DiPietro and Anoruo [38] found a positive nexus between a country's export performance and its creative activity. Van Dong and Truong [14] stated that Vietnam's creative goods exports were positively affected by the economic scale, market development, and higher education of both Vietnam and its trading partners. In international trade, nations' economic, social, and cultural elements affected and interacted with trade.

Based on this theoretical background, this study examined the structure of the global creative goods trade network using social network analysis. In addition, the present study identified relationships between the international trade of different creative goods using economic, social, and cultural indicators. Economic indicators were classified into GDP and GNI per capita; social indicators, including population, higher education and training, and GERD; and cultural indicators, including inbound tourism expenditure using the specific nation's cultural resources. Therefore, the following research questions were developed:

RQ1. What are the structural features of the international creative goods trade network?

RQ2. Are there any relationships in the international trade networks between different types of creative goods?

RQ3. Are the social network analysis indicators of each country associated with economic, social, or cultural indicators (GDP, GNI per capita, population, higher education and training, GERD, or inbound tourism expenditure)?

3. Materials and Methods

3.1. Data

International creative goods trade data were collected from the UNCTAD [4] database. Creative goods comprised art crafts, audiovisuals, design, new media, performing arts,

publishing, and visual arts. The details of each of the categories of creative goods appear in Table 1 below.

Table 1. Creative goods composition.

Creative Goods	Composition
Art crafts	carpets, celebrations, paperware, wicker-ware, yarn, and other art crafts
Audiovisuals	film, CDs, DVDs, and tapes
Design	architecture, fashion, glassware, interior, jewelry, and toys
New media	recorded media and video games
Performing arts	musical instruments and printed music
Publishing	books, newspapers, and other printed matter
Visual arts	antiques, painting, photography, and sculpture

International creative goods trade data were provided annually by UNCTAD Statistics. To date, they have reported their international creative industry trade data from 2002 to 2015. To include the main parts of the creative industries, data concerning the values and shares of creative goods imports were selected for this study. Trade amounts were reported in US dollars. Furthermore, it is important to note that some countries were missing data for one year during the studied period. The data covered all OECD and G20 countries. The most recent data available for this analysis were from 2014 and 2015; however, the data collected in 2014 (a total of 222 countries) included more countries than those collected in 2015.

For the multiple regression, data on the antecedent variables were collected from several sources. Data regarding each country's GDP (in United States dollars (USD)), GNI per capita (USD), and total population were obtained from the World Bank [39]. Data regarding higher education and training in each country were obtained from the Global Competitiveness Report [40]. This report measures higher education and training rates, secondary and tertiary enrollment rates, and the quality of education as evaluated by business leaders [40]. Data regarding each country's inbound tourism expenditure (USD million) were collected from the United Nations World Tourism Organization (UNWTO), while each country's GERD data were gathered from UNESCO. Expressed as a percentage of GDP, GERD was the total intramural expenditure on R&D performed in a given national territory during a specific reference period [41]. The sample of the present study comprised 61 countries covered by the aforementioned data from 2014.

3.2. Analysis

Social network analysis identified the interactions between actors in a network formed through some type of relationship [16]. Social systems, which were the subject of social network analysis, were formed through the aforementioned relationships; social network analysis approached these systems by focusing on each relationship within a mutual connection [42]. Formal network analysis was the best approach for exploring and comparing the relational patterns of movement within these relationships [43].

In the present study, the countries were represented by nodes. A link between two countries involved the exchange of creative goods from one country to another. Degrees of connection were established based on the correlation coefficients of centrality scores and centrality rankings [44]. The social network measures assigned to individual actors and the typical social network measures used to describe the networks were shown in Table 2.

Table 2. Social Network Measures.

Measure	Definition
In-degree centrality	Number of directional links to the country from other countries (creative goods imports)
Out-degree centrality	Number of directional links from the country to other countries (creative goods exports)
Betweenness centrality	The extent to which relationships are controlled or mediated between countries but are not directly connected
Eigenvector centrality	The extent to which the number and importance of directly connected countries are taken into account

The present analysis examined the following network indicators: in-degree/out-degree, betweenness, and eigenvector centrality. Degree centrality was computed using the row or column sums of the adjacency matrix [45]. The values of creative goods trade were coded into a one-mode matrix, with rows representing message senders and columns representing message receivers. These matrices were utilized as inputs for the social network analysis software package UCINET (Version 6.624, Analytic Technologies, Lexington, KY, USA). The international creative goods trade networks were analyzed and visualized by NetDraw (Version 2.160. Analytic Technologies, Lexington, KY, USA).

A QAP was used to investigate correlations between pairs of networks. This type of analysis calculated an ordinary measure of statistical association (e.g., Pearson's r) [45,46]. The advantage of a QAP is that it provided a direct test to determine whether two matrices are similar to one another [47]. Therefore, a QAP was used in the present study to determine the relationships between different creative goods. This QAP identified a significant network-level correlation in the structure of the links between the creative goods trade network matrices.

4. Results

Regarding RQ1, the itemized international creative goods trade network is shown in Tables 3–9. Table 3 presents the out-degree/in-degree, eigenvector, and betweenness centrality of the top 20 countries in the international art crafts trade network. The results showed that China had the highest out-degree centrality (16,061,570,048), followed by India, Turkey, Belgium, the Republic of Korea, Taiwan, the US, and Germany. The US, Cambodia, the UK, Germany, Hong Kong, Japan, and Canada had the highest in-degree centrality. China had the highest eigenvector centrality, implying that the number of countries with which it is connected is not only large but also includes major countries. China was followed by the US, Cambodia, Hong Kong, Japan, Canada, and the UK. In terms of betweenness centrality, the US was the most central country by far, occupying the role of a message deliverer or a control in the network. The US was highly influential due to its high betweenness and eigenvector centrality. The next most central countries were France and Canada. The international art crafts trade network is displayed in Figure 1.

Table 3. International trade of art crafts network.

Rank	Country	Out-Degree	Country	In-Degree	Country	Eigenvector	Country	Betweenness
1	China	16,061,570,048	US	7,493,210,112	China	0.697	US	2027.125
2	India	1,909,445,248	Cambodia	2,158,286,848	US	0.614	France	1740.271
3	Turkey	1,900,714,880	UK	2,002,855,552	Cambodia	0.178	Canada	1301.132
4	Belgium	1,407,558,528	Germany	1,777,264,640	China, Hong Kong	0.148	Spain	1232.149
5	Republic of Korea	1,282,637,952	China, Hong Kong	1,369,909,632	Japan	0.109	Thailand	1036.914
6	China, Taiwan	1,152,371,840	Japan	1,241,140,736	Canada	0.097	Switzerland	902.827
7	US	1,000,713,216	Canada	1,070,058,688	UK	0.096	Netherlands	801.604
8	Germany	983,454,144	France	1,048,219,328	India	0.091	Germany	774.068
9	Italy	918,516,096	Vietnam	1,032,430,528	Germany	0.073	China	715.197
10	Netherlands	752,305,600	Italy	1,020,625,216	Vietnam	0.073	Belgium	690.739
11	China, Hong Kong	729,027,648	China	755,893,376	Turkey	0.066	UK	675.701
12	Vietnam	599,212,096	Indonesia	673,364,416	China, Taiwan	0.057	Indonesia	650.113
13	Pakistan	526,449,920	Mexico	655,742,400	Italy	0.055	United Arab Emirates	634.752
14	France	495,232,704	Spain	644,993,984	Mexico	0.053	Italy	583.255
15	Thailand	405,045,856	Netherlands	617,443,200	France	0.051	Australia	535.805
16	Egypt	384,593,664	Russian Federation	570,973,888	Brazil	0.050	South Africa	505.319
17	Japan	332,182,144	Belgium	531,786,656	Netherlands	0.044	India	462.874
18	Spain	319,013,312	Australia	511,275,616	Belgium	0.043	Japan	430.095
19	UK	281,166,112	Brazil	501,899,200	Republic of Korea	0.040	Turkey	403.338
20	Austria	256,463,856	Turkey	470,854,368	Australia	0.036	Republic of Korea	388.940

Table 4. International trade of audiovisuals network.

Rank	Country	Out-Degree	Country	In-Degree	Country	Eigenvector	Country	Betweenness
1	US	3,365,296,128	China	3,188,622,336	China	0.532	Thailand	2494.414
2	Germany	2,970,414,080	Germany	2,173,686,016	US	0.418	France	2273.659
3	Singapore	1,923,347,840	UK	1,574,900,992	Singapore	0.394	Germany	1585.299
4	Ireland	1,885,148,928	France	1,293,718,656	Germany	0.267	Netherlands	1373.947
5	Japan	1,857,090,944	Russian Federation	1,219,902,336	Japan	0.239	Switzerland	1313.611
6	Netherlands	1,734,253,568	Thailand	1,180,880,512	Canada	0.192	South Africa	1266.096
7	Austria	1,398,298,624	US	1,121,685,248	UK	0.166	US	1194.692
8	UK	1,367,827,584	Canada	1,009,545,024	Ireland	0.165	Canada	1163.477
9	China	1,103,637,632	Republic of Korea	866,400,128	Netherlands	0.159	Austria	996.696
10	Malaysia	984,617,472	India	855,289,792	France	0.149	UK	979.333
11	France	844,499,840	Netherlands	819,636,224	Austria	0.140	Mexico	631.325
12	Sweden	841,530,944	Austria	744,487,040	Thailand	0.112	Spain	621.070
13	Poland	771,347,328	Italy	610,935,040	Republic of Korea	0.098	Singapore	617.244
14	Czech Republic	640,172,672	Japan	538,265,152	Mexico	0.090	Republic of Korea	547.183
15	Finland	609,197,888	Spain	526,228,576	Poland	0.089	Sweden	523.770
16	Estonia	568,691,776	China, Hong Kong	459,567,648	India	0.088	China	507.138
17	Mexico	433,760,064	Belgium	447,864,832	Malaysia	0.086	Ireland	419.263
18	China, Taiwan	393,031,200	Singapore	441,800,640	China, Hong Kong	0.083	Russian Federation	389.642
19	China, Hong Kong	283,680,192	China, Taiwan	440,890,784	China, Taiwan	0.070	Italy	387.374
20	Italy	214,082,016	United Arab Emirates	434,049,696	Italy	0.069	Belgium	380.523

Table 5. International trade of design network.

Rank	Country	Out-Degree	Country	In-Degree	Country	Eigenvector	Country	Betweenness
1	China	119,897,923,584	US	60,853,317,632	China	0.675	Canada	1404.048
2	Italy	25,793,767,424	China, Hong Kong	27,192,170,496	US	0.592	US	1152.574
3	France	16,771,828,736	Germany	17,007,591,424	China, Hong Kong	0.246	France	1118.858
4	India	13,329,161,216	UK	16,831,697,920	Japan	0.148	Netherlands	717.989
5	Germany	11,397,925,888	France	14,541,173,760	France	0.134	UK	665.190
6	US	9,513,821,184	Japan	14,304,950,272	Italy	0.126	Thailand	584.471
7	Vietnam	8,152,137,216	Switzerland	13,819,928,576	UK	0.121	Switzerland	553.965
8	China, Hong Kong	6,906,440,192	United Arab Emirates	13,409,119,232	Germany	0.118	Spain	541.513
9	Switzerland	6,341,344,256	Italy	8,377,286,656	Canada	0.082	Mexico	531.398
10	Thailand	6,012,520,960	Canada	7,653,496,832	India	0.074	Austria	519.321
11	Malaysia	5,105,714,176	Singapore	6,264,443,904	Mexico	0.070	Germany	515.249
12	UK	5,023,371,776	Russian Federation	5,719,577,600	Vietnam	0.066	Singapore	493.706
13	Poland	4,225,331,200	Australia	5,474,208,256	Switzerland	0.061	South Africa	489.462
14	Spain	4,129,943,808	Netherlands	5,247,385,088	Australia	0.054	United Arab Emirates	488.387
15	Mexico	3,737,477,888	Spain	5,222,945,792	United Arab Emirates	0.050	Republic of Korea	416.092
16	United Arab Emirates	3,526,600,960	China	4,952,588,288	Russian Federation	0.048	China	411.657
17	Indonesia	3,508,356,608	Belgium	4,887,282,688	Spain	0.046	Belgium	391.184
18	Netherlands	2,987,886,592	Republic of Korea	4,499,047,424	Thailand	0.040	Australia	390.853
19	Czech Republic	2,964,043,776	Austria	3,826,048,000	Republic of Korea	0.039	Ireland	353.533
20	Turkey	2,850,425,856	Mexico	3,358,569,728	Netherlands	0.036	Italy	350.939

Table 6. International trade of new media network.

Rank	Country	Out-Degree	Country	In-Degree	Country	Eigenvector	Country	Betweenness
1	China	23,594,729,472	US	10,120,960,000	China	0.692	France	2713.160
2	China, Taiwan	5,408,891,904	China, Hong Kong	4,904,310,784	US	0.573	Netherlands	2182.606
3	US	2,108,117,632	Germany	3,401,995,264	China, Hong Kong	0.222	Switzerland	1384.515
4	Republic of Korea	2,010,177,408	UK	2,709,358,848	Japan	0.189	US	1238.217
5	Japan	1,812,998,656	Japan	2,582,089,472	China, Taiwan	0.167	Germany	1099.391
6	Germany	1,670,242,432	China	2,157,086,464	Germany	0.131	Canada	1040.752
7	Netherlands	1,622,292,096	France	1,868,595,840	UK	0.119	Spain	1000.904
8	UK	1,091,910,272	Netherlands	1,763,417,216	Netherlands	0.096	China	866.616
9	Malaysia	955,441,024	Canada	1,437,337,344	Republic of Korea	0.089	South Africa	837.466
10	Singapore	837,566,912	Poland	1,257,928,320	Canada	0.086	UK	717.886
11	Ireland	784,263,360	Mexico	1,231,842,560	France	0.080	Australia	695.545
12	France	768,034,176	Australia	986,418,752	Mexico	0.066	Mexico	669.967
13	Austria	618,859,200	Singapore	856,847,040	Australia	0.055	Thailand	623.616
14	Poland	556,843,648	Spain	836,148,224	United Arab Emirates	0.044	Austria	619.301
15	Czech Republic	531,335,360	United Arab Emirates	769,198,080	Poland	0.038	Republic of Korea	577.525
16	China, Hong Kong	355,453,344	Italy	764,402,304	Singapore	0.032	India	500.116
17	Mexico	348,790,880	China, Taiwan	742,029,312	Malaysia	0.030	Denmark	403.793
18	Philippines	347,563,360	Austria	633,031,552	Russian Federation	0.030	China, Hong Kong	398.575
19	Canada	256,494,640	Czech Republic	607,395,776	India	0.026	Ireland	393.463
20	Switzerland	246,003,712	India	563,243,840	Spain	0.026	Belgium	386.954

Table 7. International trade of performing arts network.

Rank	Country	Out-Degree	Country	In-Degree	Country	Eigenvector	Country	Betweenness
1	China	1,906,418,688	US	1,178,285,440	China	0.609	France	2427.622
2	Indonesia	777,602,048	Germany	599,147,328	US	0.578	Canada	1942.294
3	Japan	540,309,376	Japan	431,087,648	Germany	0.266	Germany	1880.413
4	US	482,800,128	UK	292,924,704	Japan	0.258	US	1834.410
5	Germany	442,753,184	France	264,421,680	Indonesia	0.250	China	1497.683
6	Netherlands	242,337,888	China	203,331,440	Netherlands	0.125	Spain	1426.869
7	France	126,451,752	Canada	201,702,160	UK	0.122	Republic of Korea	1292.332
8	China, Taiwan	109,820,944	Netherlands	177,240,096	France	0.114	Netherlands	1267.471
9	Mexico	90,549,360	Republic of Korea	158,171,216	Canada	0.111	UK	1238.223
10	Republic of Korea	82,165,208	Australia	126,576,816	Republic of Korea	0.083	Thailand	951.708
11	UK	74,785,824	Italy	117,319,984	Mexico	0.076	Switzerland	828.376
12	Italy	73,087,904	Brazil	103,672,144	Brazil	0.065	Australia	796.002
13	Canada	49,353,192	Switzerland	95,800,592	Australia	0.062	South Africa	745.816
14	Sweden	33,165,444	Russian Federation	95,494,880	China, Taiwan	0.054	Italy	737.032
15	Spain	32,304,812	China, Hong Kong	88,410,768	Russian Federation	0.050	Austria	683.609
16	Czech Republic	29,805,560	Spain	88,106,224	China, Hong Kong	0.049	Japan	510.092
17	Switzerland	23,671,408	Austria	67,219,480	Italy	0.044	Ireland	494.500
18	Belgium	23,643,388	United Arab Emirates	66,828,428	Switzerland	0.036	China, Taiwan	472.695
19	Thailand	23,089,208	Belgium	61,531,308	Spain	0.035	Sweden	463.127
20	Austria	22,770,532	Mexico	54,741,564	United Arab Emirates	0.031	United Arab Emirates	443.254

Table 8. International trade of publishing network.

Rank	Country	Out-Degree	Country	In-Degree	Country	Eigenvector	Country	Betweenness
1	China	5,166,584,832	US	4,699,135,488	US	0.599	Thailand	2263.753
2	US	4,832,649,728	UK	2,668,508,416	China	0.486	Canada	1859.137
3	Germany	4,657,953,280	Germany	2,583,319,040	Canada	0.424	France	1534.624
4	UK	3,539,824,384	Canada	2,354,478,592	UK	0.291	Netherlands	1087.069
5	Canada	2,768,850,688	France	2,138,980,736	China, Hong Kong	0.200	Switzerland	934.395
6	France	1,860,965,504	Switzerland	1,666,676,480	Germany	0.155	US	925.288
7	Italy	1,208,927,616	China, Hong Kong	1,320,455,936	France	0.117	Spain	922.763
8	Spain	913,967,872	Belgium	1,084,313,088	Mexico	0.096	South Africa	752.521
9	Sweden	902,431,808	India	1,033,367,552	Australia	0.088	UK	674.521
10	Netherlands	859,438,912	Austria	1,009,201,728	Switzerland	0.075	Ireland	655.635
11	Poland	826,314,496	Netherlands	997,757,248	India	0.073	Singapore	609.797
12	Russian Federation	789,119,168	Italy	992,064,128	Italy	0.071	Republic of Korea	582.348
13	Belgium	770,256,320	China	881,436,288	Japan	0.061	Belgium	570.788
14	China, Hong Kong	706,969,280	Australia	832,652,544	Netherlands	0.060	Mexico	469.962
15	Republic of Korea	653,731,968	Spain	738,062,144	Spain	0.056	India	445.472
16	Switzerland	562,337,984	Mexico	717,507,520	Austria	0.045	United Arab Emirates	440.982
17	Finland	519,838,464	Russian Federation	684,595,904	Belgium	0.045	Austria	427.733
18	Austria	517,752,768	Norway	557,915,392	Brazil	0.042	Germany	417.108
19	Czech Republic	448,910,432	Czech Republic	516,834,016	Republic of Korea	0.040	China	383.810
20	Japan	406,379,840	Japan	505,409,568	Singapore	0.038	Sweden	274.481

Table 9. International trade of visual arts network.

| Rank	Country	Out-Degree	Country	In-Degree	Country	Eigenvector	Country	Betweenness
1	US	5,279,748,096	US	11,468,224,512	US	0.614	US	3718.871
2	China	5,063,912,448	UK	5,895,920,640	France	0.440	France	2168.771
3	France	4,384,244,736	Switzerland	2,144,769,792	UK	0.411	Germany	1813.381
4	UK	2,981,753,856	China, Hong Kong	1,947,771,776	China	0.308	Netherlands	1409.296
5	Germany	2,259,345,152	Germany	1,454,895,232	Germany	0.210	Canada	1222.539
6	Switzerland	2,219,373,056	France	1,075,458,688	Switzerland	0.210	UK	1170.171
7	Italy	1,793,794,944	Japan	701,399,552	Italy	0.162	China	863.502
8	Netherlands	980,775,552	Netherlands	666,194,624	China, Hong Kong	0.155	Switzerland	836.371
9	Japan	826,418,304	Canada	505,309,216	Netherlands	0.084	Belgium	726.357
10	Spain	709,514,432	China	485,177,984	Spain	0.070	Spain	711.663
11	China, Hong Kong	470,897,984	Singapore	456,432,800	Japan	0.068	Japan	667.039
12	Belgium	350,865,632	Austria	401,857,888	Canada	0.042	Italy	633.417
13	Russian Federation	337,319,136	China, Taiwan	359,359,072	Russian Federation	0.039	Australia	569.597
14	Austria	327,192,960	Belgium	352,956,256	Belgium	0.037	Austria	511.445
15	India	323,425,792	Republic of Korea	328,655,424	Austria	0.035	United Arab Emirates	510.921
16	Republic of Korea	322,784,640	Italy	316,987,328	Republic of Korea	0.027	Republic of Korea	482.262
17	Thailand	293,484,864	Australia	292,616,288	Mexico	0.025	South Africa	472.069
18	Mexico	211,213,520	United Arab Emirates	220,747,600	India	0.024	Thailand	454.933
19	Canada	200,620,656	Spain	200,423,040	Singapore	0.022	Sweden	353.188
20	China, Taiwan	182,628,048	Qatar	188,673,680	Australia	0.017	New Zealand	349.607
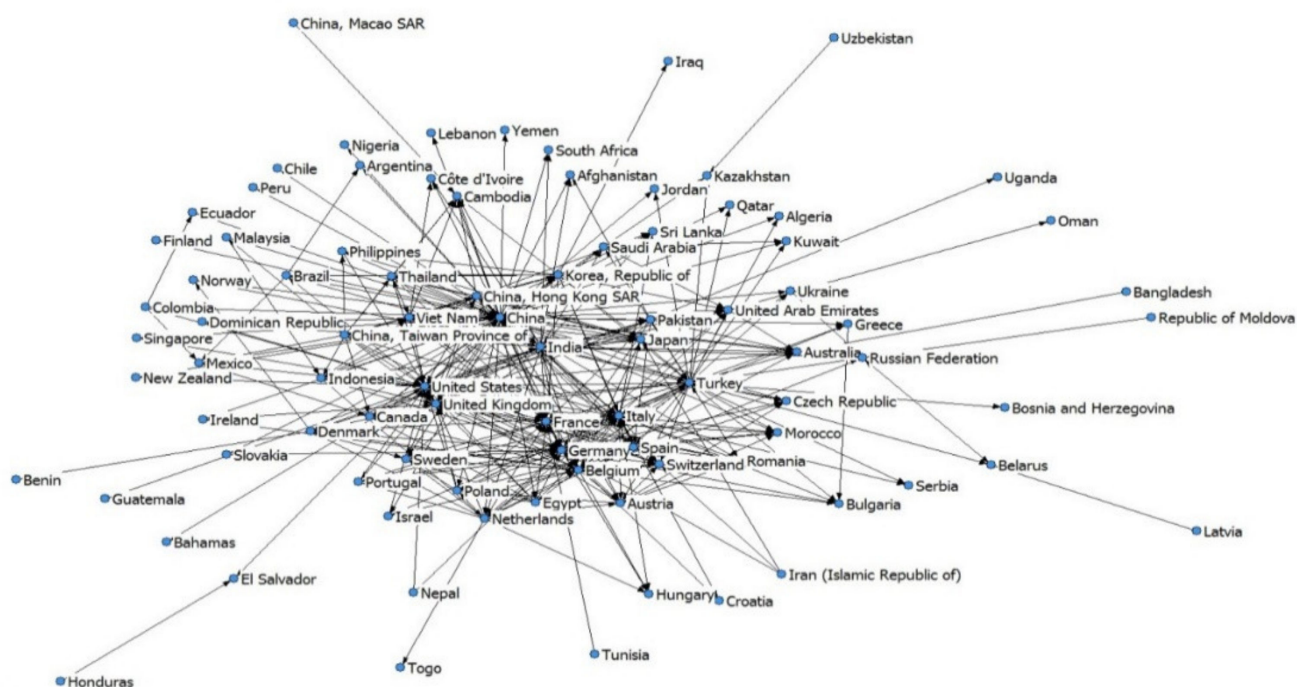
Figure 1. International trade of art crafts network.

Table 4 presents the analytic indicators of the international audiovisuals trade network. The US, Germany, Singapore, Ireland, and Japan have the highest out-degree centrality. China, Germany, and the UK were the most central countries in terms of in-degree centrality. China had the highest eigenvector centrality, followed by the US, Singapore, Germany, Japan, Canada, and the UK. Furthermore, Thailand, France, Germany, the Netherlands, Switzerland, South Africa, the US, and Canada remained as the top countries in terms

of betweenness centrality. Figure 2 graphically represents the global structure of the international audiovisuals trade network.
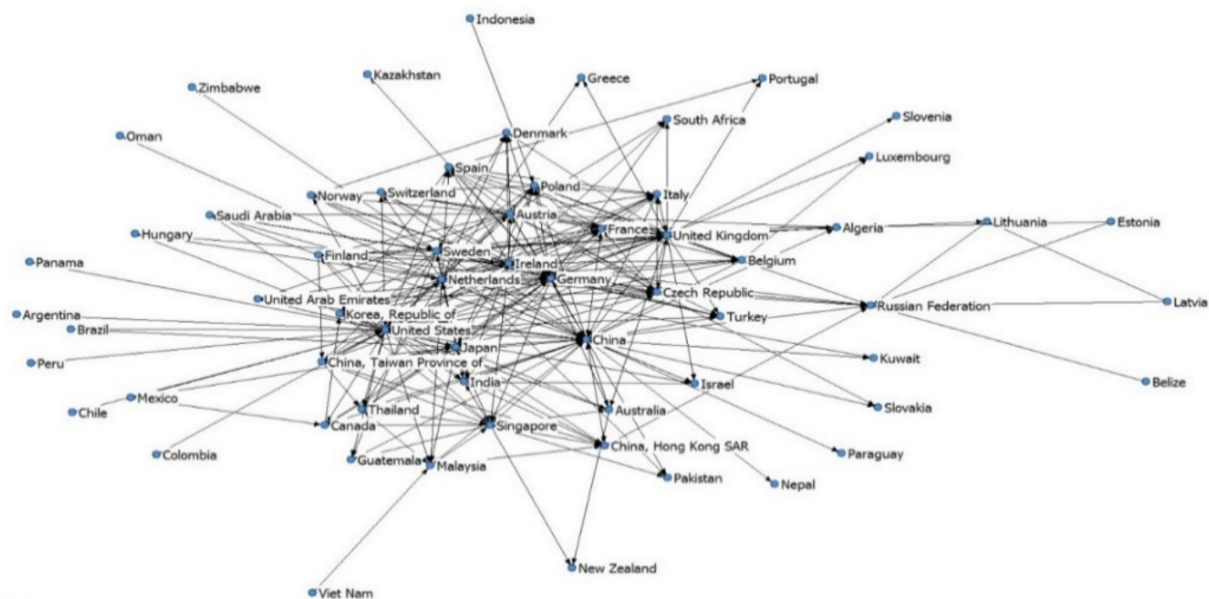

Figure 2. International trade of audiovisuals network.

Table 5 shows the overall degree centrality of the top 20 countries in the international design trade network. Overall, the US and China were the most central countries in this network, followed by Italy, Hong Kong, France, and Germany. The international design trade network is displayed in Figure 3.
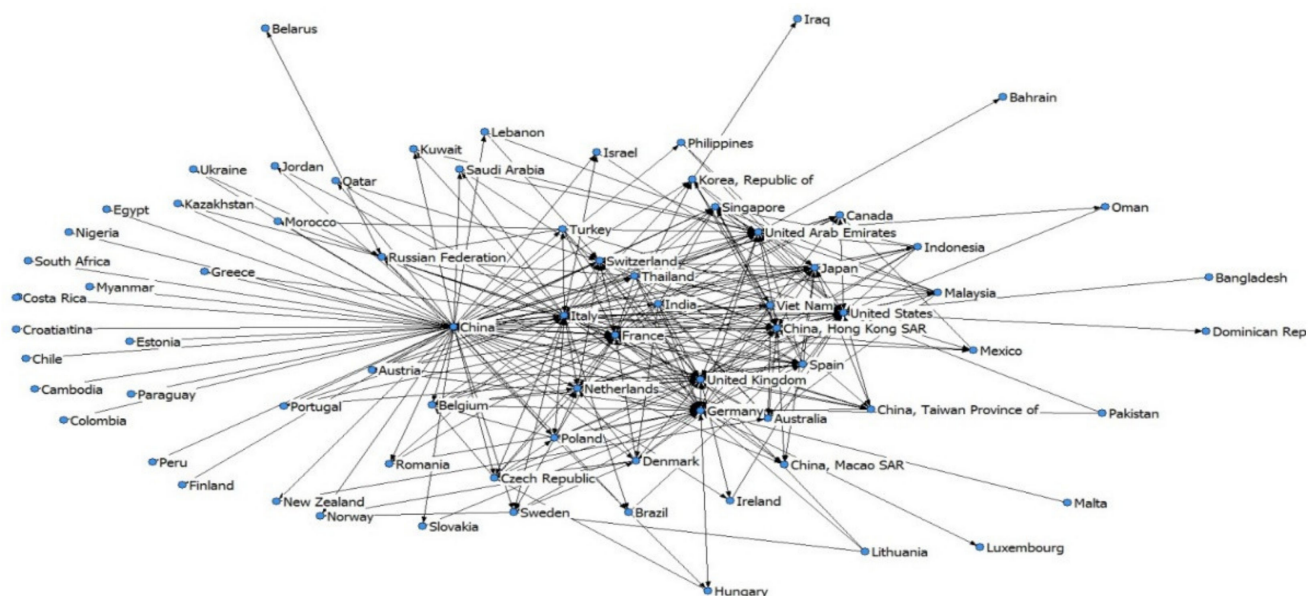

Figure 3. International trade of design network.

Table 6 presents each country's out-degree, in-degree, eigenvector, and betweenness centrality scores in the international new media trade network. The results show that China has the highest out-degree centrality, followed by Taiwan, the US, the Republic of Korea, Japan, Germany, and the Netherlands. The US had the highest in-degree centrality, followed by Hong Kong, Germany, the UK, Japan, China, France, and the Netherlands. Furthermore, China has the highest eigenvector centrality. Finally, France, the Netherlands,

and Switzerland have the highest betweenness centrality. Figure 4 graphically represents the global structure of the international new media trade network.
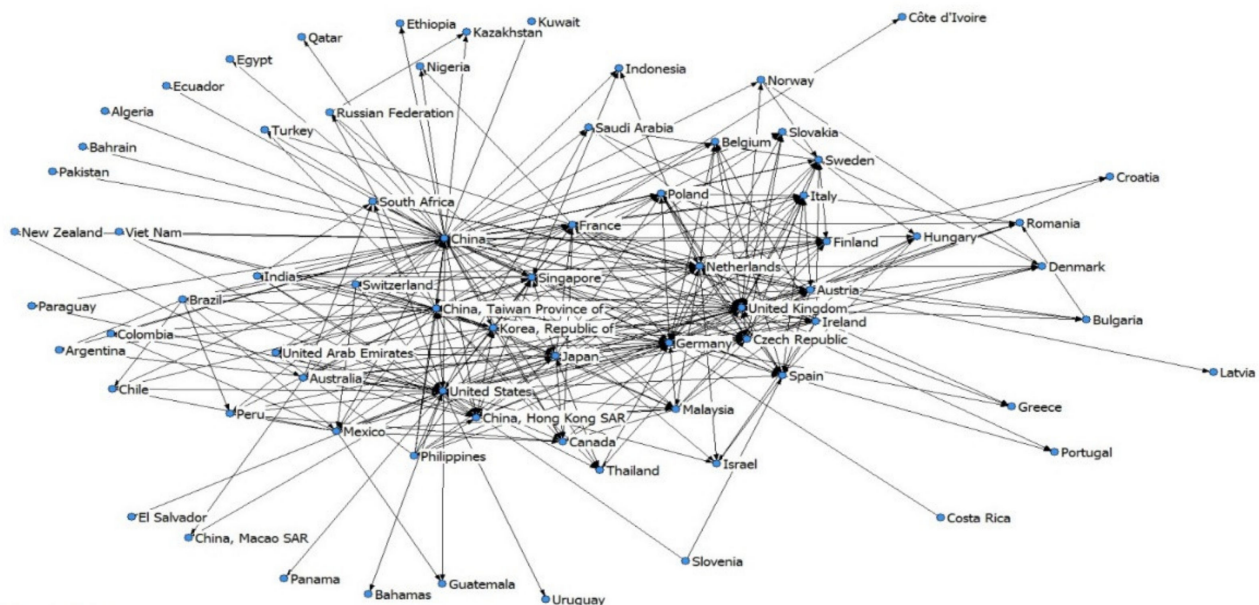

Figure 4. International trade of new media network.

In terms of the international performing arts trade network (Table 7), China has the highest out-degree centrality. China's eigenvector centrality is similar to that of the next most central country: the US. In terms of eigenvector centrality, these countries are followed by Germany, Japan, and Indonesia. Furthermore, the US, Germany, Japan, the UK, France, and China have the highest in-degree centrality. In terms of betweenness centrality, France is the most central country, followed by Canada, Germany, the US, and China. The international performing arts trade network is displayed in Figure 5.
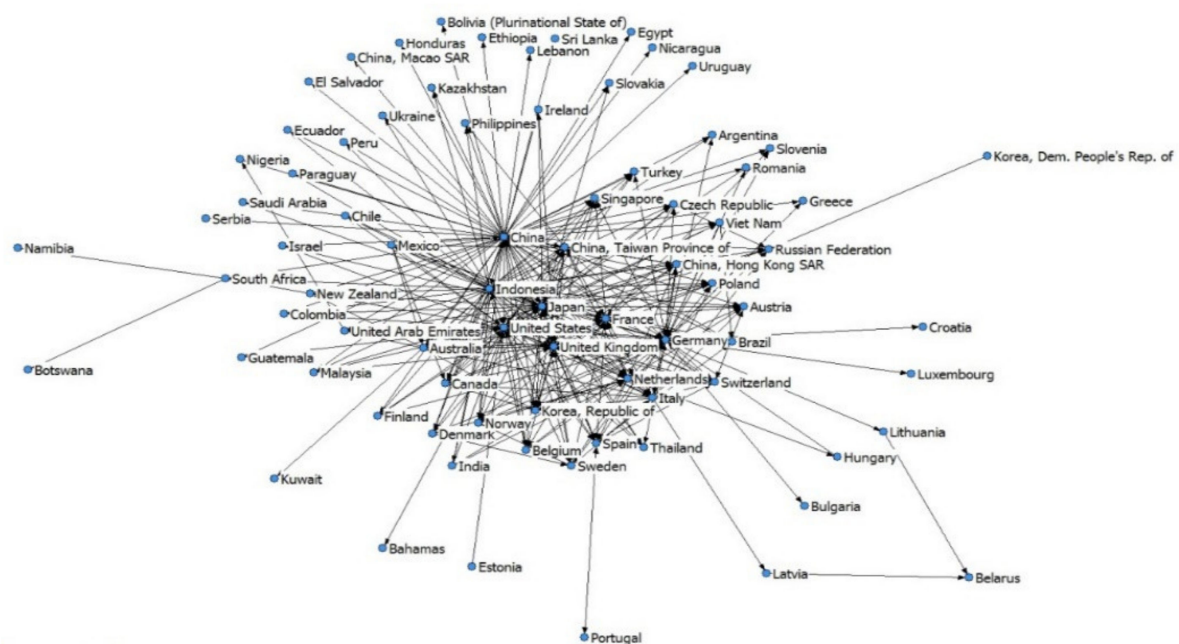

Figure 5. International trade of performing arts network.

In terms of out-degree centrality, China is the most central country in the international publishing trade network (Table 8). In terms of in-degree centrality, the US is the most central country in this network. The US, China, Canada, the UK, and Hong Kong have the highest eigenvector centrality. Thailand, Canada, France, the Netherlands, and Switzerland were the most central countries in terms of betweenness centrality. Figure 6 graphically represents the global structure of the international publishing trade network.
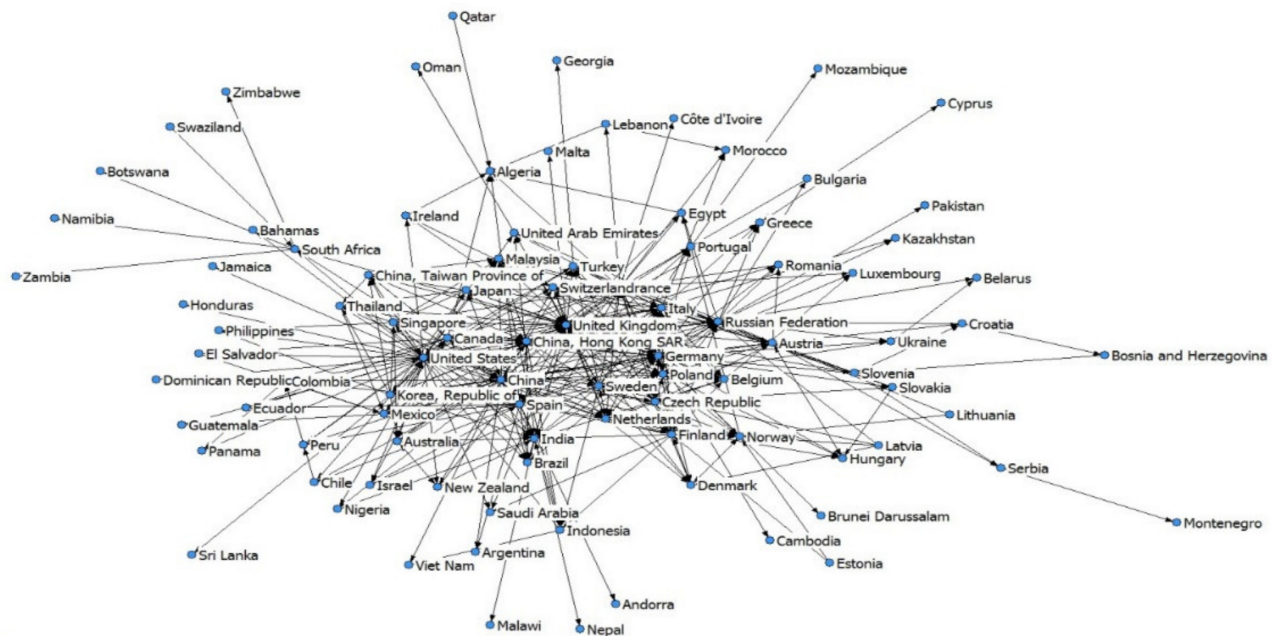

Figure 6. International trade of publishing network.

In the international visual arts trade network (Table 9), the US, China, the UK, France, and Switzerland have the highest out-degree and in-degree centrality. The US is highly influential due to its high betweenness and eigenvector centrality. Figure 7 graphically represents the global structure of the international visual arts trade network.
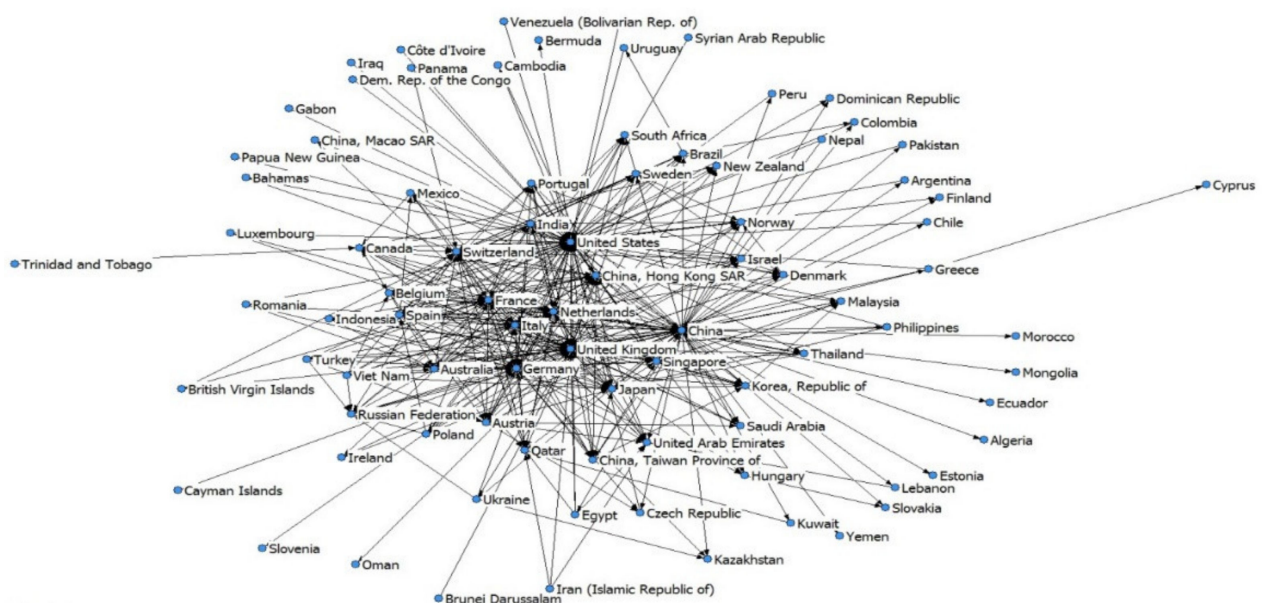

Figure 7. International trade of visual arts network.

To address RQ2, the network structures for each of the seven goods in the international creative goods trade network were compared using a QAP. The correlations between these networks are presented in Table 10. The results of the QAP are representative of the equivalence between the creative goods. The network structures of the different creative goods in the international creative goods trade network are interrelated. In particular, the new media network strongly correlates with the design network ($r = 0.92$, $p < 0.001$). Furthermore, the design network strongly correlates with the art crafts network ($r = 0.91$, $p < 0.001$). Finally, the art crafts network correlates with the new media network ($r = 0.89$, $p < 0.001$).

Table 10. QAP correlations between the networks of each creative goods.

	Art Crafts	Audiovisuals	Design	New Media	Performing Arts	Publishing	Visual Arts
Art crafts	1	–	–	–	–	–	–
Audiovisuals	0.09 **	1	–	–	–	–	–
Design	0.91 ***	0.12 ***	1	–	–	–	–
New media	0.89 ***	0.15 ***	0.92 ***	1	–	–	–
Performing arts	0.81 ***	0.21 ***	0.83 ***	0.84 ***	1	–	–
Publishing	0.51 ***	0.41 ***	0.57 ***	0.53 ***	0.51 ***	1	–
Visual arts	0.41 ***	0.14 ***	0.48 ***	0.41 ***	0.45 ***	0.39 ***	1

*** $p < 0.001$, ** $p < 0.01$.

Regarding RQ3, Table 11 shows the correlations between the out-degree/in-degree centrality of each creative good in the international trade network, GDP, GNI per capita, population, higher education and training, inbound tourism expenditure, and GERD for each country in 2014. The results indicate the out-degree/in-degree centrality of each international creative goods trade network correlated with GDP, higher education and training, inbound tourism expenditure, and GERD. However, the out-degree centrality of art crafts and that of design were not related to GNI per capita. Population was related to the out-degree centrality of art crafts, the in-degree centrality of audiovisuals, the out-degree centrality of design, and the in-degree centrality of publishing. The maximum variance inflation factor (VIF) did not exceed 10.

The multiple regression results predicting the international trade of creative goods are shown in Table 12. These results show that population ($\beta = 0.577$, $p < 0.001$), inbound tourism expenditure ($\beta = 1.068$, $p < 0.001$), and GERD ($\beta = 0.339$, $p < 0.01$) have positive effects on the out-degree centrality of art crafts; however, GDP ($\beta = -0.927$, $p < 0.001$) negatively impacted the out-degree centrality of art crafts. In contrast, GDP ($\beta = 0.643$, $p < 0.001$) and inbound tourism expenditure ($\beta = 0.399$, $p < 0.001$) have positive effects on the in-degree centrality of art crafts, while population ($\beta = -0.080$, $p < 0.01$) and GERD ($\beta = -0.085$, $p < 0.01$) have a negative impact on the in-degree centrality of art crafts. Population, inbound tourism expenditure, and GERD have a positive impact on the in-degree centrality of audiovisuals ($\beta = 0.265$, $p < 0.05$ for population; $\beta = 0.888$, $p < 0.01$ for inbound tourism expenditure; and $\beta = 0.304$, $p < 0.05$ for GERD). Except for GDP, none of the variables significantly affected the out-degree centrality of audiovisuals. In addition, GDP and inbound tourism expenditure had statistically significant effects on the in-degree centrality of design. Furthermore, GDP, population, and inbound tourism expenditure had significant effects on the out-degree centrality of design. The variable with the greatest impact on the out-degree centrality of new media was GERD ($\beta = 0.495$, $p < 0.001$). Furthermore, GDP and inbound tourism expenditure impacted the in-degree centrality of new media. Additionally, GDP and GERD impacted the out-degree centrality of performing arts, while GDP, population, and GERD impacted the in-degree centrality of performing arts. Except for inbound tourism expenditure, none of the variables significantly affected the out-degree centrality of publishing. Inbound tourism expenditure was the best predictor of the in-degree centrality of publishing ($\beta = 0.820$, $p < 0.001$), followed by GNI per capita ($\beta = 0.139$, $p < 0.05$) and population ($\beta = 0.117$, $p < 0.05$). Except for GNI per

capita and higher education and training, all variables significantly affected the in-degree centrality of visual arts. Except for inbound tourism expenditure, none of the variables significantly affected the out-degree centrality of the visual arts.

Table 11. Descriptive statistics and a correlation analysis (N = 61).

	1	2	3	4	5	6	7	8	9	10
1. Art crafts out-degree	1	–	–	–	–	–	–	–	–	–
2. Art crafts in-degree	0.376 **	1	–	–	–	–	–	–	–	–
3. Audiovisuals out-degree	0.330 **	0.736 **	1	–	–	–	–	–	–	–
4. Audiovisuals in-degree	0.567 **	0.512 **	0.642 **	1	–	–	–	–	–	–
5. Design out-degree	0.617 **	0.507 **	0.542 **	0.789 **	1	–	–	–	–	–
6. Design in-degree	0.400 **	0.955 **	0.707 **	0.558 **	0.579 **	1	–	–	–	–
7. New media out-degree	0.461 **	0.627 **	0.846 **	0.674 **	0.525 **	0.638 **	1	–	–	–
8. New media in-degree	0.401 **	0.952 **	0.759 **	0.562 **	0.583 **	0.979 **	0.675 **	1	–	–
9. Performing arts out-degree	0.376 **	0.719 **	0.857 **	0.648 **	0.508 **	0.708 **	0.839 **	0.749 **	1	–
10. Performing arts in-degree	0.398 **	0.943 **	0.845 **	0.655 **	0.565 **	0.906 **	0.776 **	0.910 **	0.879 **	1
11. Publishing out-degree	0.437 **	0.828 **	0.837 **	0.782 **	0.665 **	0.807 **	0.708 **	0.827 **	0.767 **	0.907 **
12. Publishing in-degree	0.531 **	0.909 **	0.784 **	0.734 **	0.748 **	0.903 **	0.670 **	0.909 **	0.728 **	0.912 **
13. Visual arts out-degree	0.378 **	0.836 **	0.714 **	0.673 **	0.741 **	0.827 **	0.638 **	0.810 **	0.702 **	0.869 **
14. Visual arts in-degree	0.320 *	0.983 **	0.671 **	0.409 **	0.433 **	0.933 **	0.565 **	0.926 **	0.630 **	0.896 **
15. GDP	0.382 **	0.969 **	0.733 **	0.524 **	0.503 **	0.896 **	0.658 **	0.888 **	0.760 **	0.955 **
16. GNI per capita	0.185	0.334 **	0.448 **	0.347 **	0.241	0.407 **	0.411 **	0.378 **	0.384 **	0.393 **
17. Population	0.573 **	0.229	0.123	0.335 **	0.545 **	0.196	0.132	0.216	0.172	0.219
18. Higher education and training	0.256 *	0.322 *	0.459 **	0.392 **	0.278 *	0.386 **	0.454 **	0.357 **	0.350 **	0.370 **
19. Inbound tourism expenditure	0.472 **	0.962 **	0.713 **	0.601 **	0.633 **	0.931 **	0.633 **	0.916 **	0.663 **	0.909 **
20. GERD	0.381 **	0.352 **	0.543 **	0.484 **	0.333 **	0.375 **	0.667 **	0.366 **	0.531 **	0.488 **

	11	12	13	14	15	16	17	18	19	20
11. Publishing out-degree	1	–	–	–	–	–	–	–	–	–
12. Publishing in-degree	0.931 **	1	–	–	–	–	–	–	–	–
13. Visual arts out-degree	0.854 **	0.918 **	1	–	–	–	–	–	–	–
14. Visual arts in-degree	0.771 **	0.864 **	0.803 **	1	–	–	–	–	–	–
15. GDP	0.800 **	0.876 **	0.834 **	0.945 **	1	–	–	–	–	–
16. GNI per capita	0.401 **	0.432 **	0.367 **	0.311 *	0.310 *	1	–	–	–	–
17. Population	0.185	0.329 **	0.208	0.204	0.331**	−0.079	1	–	–	–
18. Higher education and training	0.389 **	0.396 **	0.318 *	0.272 *	0.292 *	0.678 **	−0.063	1	–	–
19. Inbound tourism expenditure	0.833 **	0.927**	0.882 **	0.946 **	0.930 **	0.338 **	0.263 *	0.346 **	1	–
20. GERD	0.481 **	0.438 **	0.412 **	0.300 *	0.402 **	0.580 **	0.058	0.649 **	0.377 **	1

** $p < 0.01$, * $p < 0.05$.

Table 12. Multiple regression predicting international trade of creative goods (*N* = 61).

Independent Variable	Dependent Variable						
	Art Crafts Out-Degree	Art Crafts In-Degree	Audiovisuals Out-Degree	Audiovisuals In-Degree	Design Out-Degree	Design In-Degree	New Media Out-Degree
GDP	−0.927 ***	0.643 ***	0.513 *	−0.532	−1.038 ***	0.303 *	0.367
GNI per capita	−0.041	0.021	0.064	0.031	0.035	0.102	−0.043
Population	0.577 ***	−0.080 **	−0.082	0.265 *	0.517 ***	−0.056	−0.056
Higher education and training	0.002	0.031	0.086	0.040	−0.007	0.055	0.006
Inbound tourism expenditure	1.068 ***	0.399 ***	0.131	0.888 **	1.385 ***	0.641 ***	0.132
GERD	0.339 **	−0.085 **	0.200	0.304 *	0.182	−0.081	0.495 ***
R^2	0.604	0.976	0.636	0.516	0.703	0.890	0.633
	New media in-degree	Performing arts out-degree	Performing arts in-degree	Publishing out-degree	Publishing in-degree	Visual arts out-degree	Visual arts in-degree
GDP	0.329 *	1.020 ***	0.830 ***	0.147	0.018	0.058	0.584 ***
GNI per capita	0.080	0.062	0.038	0.058	0.139 *	0.085	0.047
Population	−0.040	−0.080	−0.089 *	−0.035	0.117 *	−0.028	−0.103 **
Higher education and training	0.035	−0.028	-0.009	−0.022	−0.003	−0.105	-0.021
Inbound tourism expenditure	0.604 ***	−0.370	0.112	0.631 **	0.820 ***	0.803 ***	0.466 ***
GERD	−0.060	0.247 *	0.102 *	0.166	0.036	0.106	−0.118 *
R^2	0.857	0.662	0.936	0.731	0.889	0.792	0.945

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

5. Discussion and Conclusions

This study has explored the structural features of the international creative goods trade network, as well as the relationships between different creative goods and the economic, social, and cultural indicators of nations.

Generally, the out-degree/in-degree, eigenvector, and betweenness centrality of the trade network were high in the US, Canada, Europe, and certain Asian countries. On a worldwide scale, the largest media, music, entertainment, and publishing companies were based in France, Germany, Japan, and the US [2]. Furthermore, several major Asia-Pacific economies (e.g., those of China, the Republic of Korea, Thailand, India, Indonesia, Malaysia, the Philippines, Singapore, and Vietnam) exhibited high creative economy activity as well as strategic interest in the development of the creative industry [2]. In Europe, the EU launched the Creative Europe cultural policy program, scheduled to operate from 2014 to 2020. OECD and G20 countries ranked high in terms of degree, eigenvector, and betweenness centrality compared to other countries. Therefore, these countries held important positions in the creative goods network and had great cultural influence over other countries.

Specifically, India, Turkey, and Cambodia ranked high in terms of out/in-degree, eigenvector, and betweenness centrality in the art crafts network relative to other creative goods networks. India and Turkey had high proportions of carpet exports (India: 935 million USD; Turkey: 2264 million USD), while Cambodia had a high proportion of yarn imports (2154 million USD). Regarding the audiovisuals network, Singapore and Ireland had relatively high out-degree and eigenvector centrality scores. Singapore and Ireland were substantial exporters of CDs, DVDs, and tapes (Singapore: 3091 million USD; Ireland: 716 million USD). In particular, the Singapore Asia-Pacific headquarters of Lucasfilm helped create the next chapter of the Star Wars franchise [48]. Italy and France ranked high in terms of out-degree in the design network relative to other creative goods networks. The US, China, and the Republic of Korea are at the forefront of in-degree and out-degree centrality in new media networks. China has a competitive advantage in the new media

network, which may have been affected by China's network infrastructure improvements in 2014, the dissemination of mobile devices, and an increase in income level. Indonesia ranked highly in terms of out-degree and eigenvector centrality in the performing arts network relative to other creative goods networks, having exported a high proportion of musical instruments (521 million USD). The major import and export destinations were the US, China, and the UK. The UK ranked high in terms of centrality in the publishing and visual arts networks relative to other creative goods networks, and Europe ranked high in terms of centrality in the visual arts network relative to other creative goods networks.

Using the QAP correlation, we found the network-level correlations between different creative goods networks. Particularly, the new media network strongly correlated with the design network, the design network strongly correlated with the art crafts network, and the art crafts network correlated with the new media network. Moreover, the multiple regression analysis confirmed that each country's GDP, GNI per capita, population, inbound tourism expenditure, and GERD influenced their international trade of creative goods. Meanwhile, higher education and training did not affect the international trade of creative products. This was in line with the study by Niu [5], showing that Beijing's economic growth promoted an increase in its exports of cultural creation industries, while an increase in residents' consumption and education did not significantly promote such exports by Beijing.

Countries with handicraft or design-based products, such as art crafts and design exports, tended to have high populations and inbound tourism expenditures but low GDPs. In contrast, countries with art crafts, design, and visual arts imports tended to be characterized by low populations but high GDPs. Inbound tourism expenditure positively influenced the import and export of art crafts, design, visual arts, and publishing. These products are assumed to be valuable tourism products because a viable tourism economy is connected to the development of new and existing tourism products. Countries with many audiovisual exports had high GDPs, and countries with many imports had large populations, inbound tourism expenditures, and GERD. Countries with many imports and exports in the performing arts had high GDP and GERD.

Moreover, GERD had a strong positive impact on the export of new media. The US and the Republic of Korea were ranked highly in new media out-degree centrality networks. Companies in the US were innovative, sophisticated, and supported by an excellent university system that collaborated with the business sector in R&D; similarly, the Republic of Korea possessed a high degree of technological adoption and relatively strong business sophistication, explaining its remarkable capacity for innovation [40]. This finding is in accordance with the findings of DiPietro and Anoruo [38], who found a positive nexus between a country's international trade and its creative activity. The capability of cultural and creative entities to respond to changing exogenous or external market conditions and predict future trends will determine their functionality and performance in the value chain in general, which will ultimately determine their overall competitiveness [25]. Based on the outcomes of this study, the following implications can be drawn.

First, the US, Canada, Europe, and certain Asian countries (e.g., China, Japan, Singapore, the Republic of Korea, and Thailand) ranked high in terms of out/in-degree, eigenvector, and betweenness centrality compared to other countries in the international creative goods trade network. Further, the top 20 countries in the international creative goods trade network included various regions. In recent times, the global community has been more strongly correlational and interdependent than in the past [49]. Cultural exchanges should reflect a mutual understanding; therefore, it is ideal to approach cultural exchanges from both directions, rather than unilaterally. In the same context, film production based on another culture is dependent on the bidirectional transfer between cultures, cultural borrowings, and reproduction [50]. From the perspective of a nation, forming cultural connections with other countries can serve as a strategy to create a new paradigm and reinforce intercultural communication in the cultural industry. Overall, the international trade of creative goods supports globalization, but there is also a case

in which gaps between major countries occur and this affects some countries' different creative goods disproportionately.

Second, the new media, design, art crafts, and performing arts networks are strongly associated with one another, indicating that art is connected to new media in circumstances where digitally based development has started to accelerate. The new media subgroup is the physical expression of connectivity; as such, it is highly dependent on access to equipment such as computers, mobile telephones, digital televisions, and MP3s [2]. New media art (e.g., art and technology) and computer and system art [51] appeared due to this phenomenon. In addition, the visual elements of various media triggered consumer interest and contributed to consumers' immersion in content consumption. As indicated by the results of the present study, creative industries are fields of international exchange that are closely linked and generate synergy, thus promoting growth. In other words, creative industries have been proven to influence one another and to have integrated value chains.

Third, the international imports and exports of creative goods correlated with economic, cultural, and social factors. This was supported by the results of the multiple regression analysis, which showed the effect relationship between the in-degree/out-degree centrality of the creative goods network and GDP, GNI per capita, population, inbound tourism expenditure, and GERD. The performance of these creative industries was affected by global politics and the economy. This was in line with the study by Van Dong and Truong [14], which stated that Vietnam's creative goods exports were positively affected by the economic scale and market development of both Vietnam and its trading partners. For instance, cultural exchange through the imports and exports of creative industries is related to inbound tourism expenditure. This indicates that each nation can use tourism as a method of cultural exchange to develop a creative industry. The vitalization of this phenomenon acts as a virtuous circle, playing a positive role in the development of a country's economy. Because art crafts reflect cultural attributes, they can easily be developed into tourism products with various types of differentiated goods. Tourists are major consumers of leisure and cultural services as well as various creative products, such as craftwork, music, and performance arts. Active intercultural contact through overseas travel will decrease the cultural discount issue and lead to increased demand for overseas media. Overall, this requires the creation of diverse content related to creative industries by establishing social and cultural environments based on creativity. Policies and strategies to promote the sustainable development of creative industries must be implemented in alignment with various fields, such as the economy, society, culture, technology, and environment.

6. Limitations and Future Studies

The present study had some limitations. For one, this study utilized international creative goods trade data from 2014. The scope of this analysis could be expanded by conducting a longitudinal study focused on periodic changes. In addition, a comparative analysis of general and creative industrial trade networks should be carried out to explore their common features and differences. This study analyzed the in-degree/out-degree centrality of each country's international creative goods trade network in connection with its economy, culture, and society. However, this paper did not discuss each country's unique cultural, social, and economic factors; these factors require further exploration in future studies.

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