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EXTERNAL ECONOMIC EFFECT OF THE INNOVATION FACTOR OF CREATIVE INDUSTRIES

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Abstract
To assess the external economic effect of the innovation factor of creative industries, it is offered to differentiate incoming and outgoing flows for all 84 indicators of the Global Innovation Index by the degree of impact on soft innovations. The paper covers the basic theoretical aspects of the classification of creative industries, soft innovations and methods of their evaluation. The dual model 'The Analysis of the External Effect of Soft Innovation in Creative Industries – EESICI' is developed. Creative industries innovation process is proposed to be considered as a network structure – integration of 2 processes: 'Inbound process of soft innovation production' (IsPP index) and 'Outbound process of soft innovation commercialization' (OsPP index). The effectiveness of soft innovation is defined as the ratio of the two proposed indices. The proposed analysis sequence of the external effect of creative industries soft innovations consists of 7 stages. In the first stage, the representativeness of 20 soft innovation indices is determined by factor analysis. In stages 2–4, 2 models of inbound and outbound soft innovation flows are constructed using taxonomy method. In stage 5, a cluster analysis is used to classify 132 countries under study according to their level of soft innovations implementation. In stages 6–7, the level of soft innovations is calculated and a strategic matrix of countries positioning based on the use of soft innovations in creative industries is constructed. Scenarios of changes in the positioning of countries depending on the achieved level of economic effect of the creative industries innovation factor are considered.

Keywords: *creative industries, soft innovation, the Global Innovation Index, external economic effect.*
JEL Codes: *C31, G14, O31.*

Introduction

Today, the 21st century is called the era of national development and universal globalization: creativity and innovation are becoming the growth driver of a new creative economy. This concept is based on new ideas of synergetic integration of capital and art, business and technology. The UN resolution declared 2021 the International Year of Creative Economy for Sustainable Development (Eurostat 2022). UNESCO defines cultural and creative industries as 'industries that combine the creation, production and commercialization of contents, which are intangible and cultural in nature'. The term 'creative industries' first emerged in the 1990s in the United Kingdom. The Creative Industries Mapping Document set out the definition of creative industries that is used today as the canonical definition. Creative industries are defined as sectors of activity, which have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property. The management of intellectual rights, the use of soft innovation, has emerged as a determinant of creativity. Ashwin and Hirst (2015) identify two types of soft innovations. First, they are innovations in creative industries where the

value of the result is predominantly aesthetic rather than functional (Barge-Gil, Nieto, and Santamaria, 2011). Second, such innovation is the result of creative support activities (Benghozi and Salvador, 2016). In industries where the final product is mainly functional, aesthetic inputs can be key components of the production process, determining consumers' perception of functionality.

Literature review

Research on the creative industries has grown markedly in many developed countries in recent decades. Chen (2021) proposes a classification of creative industries as 'any activity producing value-added products in the form of intellectual property and aimed at the masses', which previously had more of an artistic component. Creative industries encompass traditional cultural industries such as publishing, broadcasting, television, film, arts and crafts, and creative service industries (advertising, architecture, design and photography). In the EU, the annual growth rate of employment in the creative sector was 1.3 % over the period of 2018-2020 (Eurostat 2021). (Eurostat, 2021). Gohoungodji and Amara (2022) found that European regions with an above-average concentration of creative industries tend to have higher economic growth. Gryshchenko et al. (2021) find that the creative sector is a driver of economic development and innovation in countries and an effective tool for overcoming the crisis.

Creative industries are growing rapidly in today's economy (Gustafsson and Lazzaro, 2021). Bakhshi, and McVittie (2009) note that the economic center of major cities is shifting from manufacturing to creative industries. Jaw, Chen and Chen (2012) show that creative industries depend on individual consumer choices, determined by the feedback of information through social media. Protogerou, Kontolaimou and Caloghirou (2017) argue that analysis of the creative and cultural industries should address philosophical, sociological and communicative aspects. Zukauskaite (2012) identifies four different types of innovation effects of creative industries: 1) economic effects of increased employment, value added or export of creative industries; 2) indirect effects of creative industries on the development of other industry sectors; 3) spillover effects of innovation (innovation processes, new ideas, creative inputs) from the creative sector to other economic sectors; 4) indirect effects of increased quality of life through soft innovation. Thus, recent studies have not focused on the growth of innovation performance of creative industries. As a result, assessing the innovation development of creative industries at the individual country level is still insufficiently studied. This requires a comparative analysis of the development of soft innovation of creative industries in countries with the level of innovation development in traditional industries worldwide. The aim of this study is to develop and test a model for determining external economic effects of the innovation factor of creative industries.

Methodology

The developed dual model 'The Analysis of the External Effect of Soft Innovation in Creative Industries – EESICI' is presented in Figure 1. According to Figure 1, the innovation process of creative industries is presented as a network structure which combines two processes: the 'Inbound process of soft innovation production' (IsPP index) and the 'Outbound process of soft innovation commercialization" (OsPP index). The soft innovation performance coefficient is defined as the ratio of the two proposed indices.

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Pre-ranking of indicators

Step 1. Identifying the representativeness of soft innovation indicators (factor analysis)

$$EESICI_{F_i} = \sum_{i=1}^{m} F_i$$

m – number of key components of soft innovation equal to the number of factors

$$F_i = \frac{1}{Expl.F_i} \times \sum \left(a_{ij} \times X_{ij}\right)$$

$Expl.F_i$ – factor load of the i-th component; a_{ii} – indicator value X_{ii}; X_{ii} – ij-th indicator.

Step 2. Making indicators comparable

$Is = \left[Is_i^j\right]$ – ghosting the *IsPP* matrix to a dimensionless standardised form;
$Os = \left[Os_i^j\right]$ – ghosting the *OsPP* matrix to a dimensionless standardised form,
where i – index number, j - sub-index number

Model (M.1): Inbound process of soft innovation production of (IsPP)

Step 3. Calculation of the taxonomy coefficient *IsPP*

$L_i^{Is} = \left[Is_i^j - Is_0\right]^2$ – multidimensional Euclidean distance;

$\overline{L^{Is}} = \frac{1}{N}\sum_{i=1}^{N} L_i^{Is}$

$\sigma^{Is} = \frac{1}{N}\left[\sum_{i=1}^{N}\left(L_i^{Is} - \overline{L^{Is}}\right)^2\right]^{1/2}$ – standard deviation of multidimensional distances;

$\eta_j^{Is} = 1 - \frac{L_i^{Is}}{\overline{L^{Is}} + 2\sigma^{Is}}$ – the taxonomy coefficient of the incoming soft innovation production process

Model (M.2): Outbound process of of soft innovation commercialization (OsPP)

Step 4. Calculation of the taxonomy coefficient *OsPP*

$L_i^{Os} = \left[Os_i^j - Os_0\right]^2$ – multidimensional Euclidean distance;

$\overline{L^{Os}} = \frac{1}{M}\sum_{i=1}^{M} L_i^{Os}$

$\sigma^{Os} = \frac{1}{M}\left[\sum_{i=1}^{M}\left(L_i^{Os} - \overline{L^{Os}}\right)^2\right]^{1/2}$ – standard deviation of multidimensional distances;

$\eta_j^{Os} = 1 - \frac{L_i^{Os}}{\overline{L^{Os}} + 2\sigma^{Os}}$ – the taxonomy coefficient of the outgoing soft innovation production process

Ranking of countries in terms of soft innovation performance of creative industries

Step 5. Cluster analysis of the level of development of soft innovation

Making indicators dimensionless: $z_{ij} = \left(x_{ij} - \bar{x}_j\right) / S_j$

Minimising the standard deviation from the cluster centre:

$min\ \left[\sum_{i=1}^{k}\sum x(j) \in S_i \left\|x^{(j)} - \mu\right\|^2\right]$ where $x^{(j)} \in R^n$; $\mu_i \in R^n$; μ_i – cluster centroid R_i.

Step 6. Calculation of the soft innovation performance indicator of the creative industries

$EESICI = \frac{\eta_j^{Os}}{\eta_j^{Is}}$ – the level of effectiveness of soft innovation of the creative industries

Step 7. Building a strategic positioning matrix for the use of soft innovation in creative industries

Figure 1. Sequence of analysis of external effects of creative industries soft innovation

Results and discussions

In step 1 (factor analysis), indicators that influence the inbound and outbound processes of soft innovation production in creative industries were identified. Table 1 shows a fragment of the STATISTICA 10 program listing.

Table 1. Results of factor analysis (fragment). Identification of indicators for inbound and outbound soft innovation production processes in creative industries
(STATISTICA 10 listing)

Variable	Factor Loadings (Unrotated) (data) Extraction: Principal components (Marked loadings are > 0.700000)	
	Factor 1	Factor 2
$X_{1.1.1}$	-0.190815	-0.495010
$X_{1.1.2}$	0.145745	-0.272548
$X_{1.2.1}$	-0.053503	-0.338784
$X_{1.2.2}$	0.086729	-0.368339
$X_{1.2.3}$	-0.075268	-0.028653
$X_{1.3.1}$	-0.018377	0.016648
$X_{1.3.2}$	-0.201241	0.013647
$X_{2.1.1}$	0.972538	0.609842
$X_{2.1.2}$	-0.272548	-0.063570
$X_{2.1.3}$	-0.230653	0.058107
$X_{2.1.4}$	-0.028653	0.063570
$X_{2.1.5}$	0.016648	0.116809
…	…	…
$X_{7.2.1}$	-0.595590	0.753435
$X_{7.2.2}$	-0.193242	0.254125
$X_{7.23}$	0.083290	0.053738
$X_{7.2.4}$	-0.173581	0.157425
$X_{7.2.5}$	0.494490	0.856839
$X_{7.3.1}$	-0.075583	0.777582
$X_{7.3.2}$	-0.263590	0.356131
$X_{7.3.3}$	0.355276	0.053232
$X_{7.3.4}$	-0.145422	0.858438
Expl.Var	4.062440	3.858818
Prp.Totl	0.512495	0.419909

The data in Table 1 shows that those indicators which affect soft innovation processes are highlighted in red by the software. The numbering and labelling of the indicators correspond to the Global Innovation Index (2021). The first factor (inbound process) includes the indicators: $X_{2.1.1}$ – Expenditure on education, % GDP; $X_{2.3.3}$ – Global corporate R&D investors, top 3, mn US$; $X_{3.1.4}$ – E-participation; $X_{4.1.3}$ – Microfinance gross loans, % GDP; $X_{4.2.4}$ – Venture capital recipients, deals/bn PPP$ GDP; $X_{6.2.3}$ – Software spending, % GDP. The variance (degree of influence) of this factor is 51.25%. The second factor (outbound process) includes the following indicators: $X_{4.3.3}$ – Domestic market scale, bn PPP$; $X_{5.2.2}$ – State of cluster development and depth; $X_{5.3.1}$ – Intellectual property payments, % total trade; $X_{5.3.5}$ – Research talent, % in businesses; $X_{6.1.3}$ – Utility models by origin/bn PPP$ GDP; $X_{6.2.4}$ – ISO 9001 quality certificates/bn PPP$ GDP; $X_{6.3.1}$ – Intellectual property receipts, % total trade; $X_{6.3.4}$ – ICT services exports, % total trade; $X_{7.1.2}$ – Global brand value, top 5,000, % GDP; $X_{7.1.4}$ – ICTs and organizational model creation; $X_{7.2.1}$ – Cultural and creative services exports, % total trade; $X_{7.2.5}$ – Creative goods exports, % total trade; $X_{7.3.1}$ – Generic top-level domains (TLDs)/th pop. 15-69; $X_{7.3.4}$ – Mobile app

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creation/bn PPP$ GDP. The variance (degree of influence) of this factor is 41.99%. Thus, the factor analysis conducted in the first stage shows that out of 84 indicators of the Global Innovation Index (2021) – 20 indicators influence the production of soft innovations in creative industries: 6 inbound and 14 outbound. In steps 2 to 4, 2 models were built (the coefficients of each indicator are the results of the factor analysis performed (step 1):

$$F_{IsPP} = 1/4.062440 \cdot (0.972538\ X_{2.1.1} + 0.745745\ X_{2.3.3} + 0.753503\ X_{3.1.4} + 0.986729\ X_{4.2.4}) \quad (1)$$

$$F_{OsPP} = 1/3.858818 \cdot (0.863570\ X_{4.3.3} + 0.758107\ X_{5.2.2} + 0.863570\ X_{5.3.1} + 0.916809\ X_{5.3.5} + 0.753435\ X_{6.1.3} + 0.775268\ X_{6.2.4} + 0.718377\ X_{6.3.1} + 0.801241\ X_{6.3.4} + 0.072538\ X_{7.1.2} + 0.697435\ X_{7.1.4} + 0.753435\ X_{7.2.1} + 0.856839\ X_{7.2.5} + 0.777582\ X_{7.3.1} + 0.858438\ X_{7.3.4}) \quad (2)$$

In step 5, 132 countries worldwide were clustered on the level of development of inbound and outbound soft innovation of creative industries according to the defined 20 indicators (Figure 2).

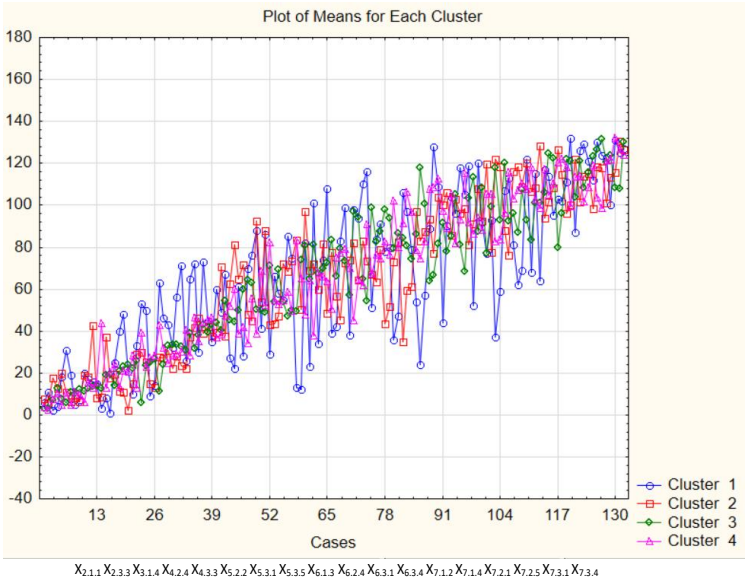

Figure 2. Graph of the average values for 20 soft innovation indicators of 132 countries (STATISTICA 10 listing)

The structure of clusters 1–4 is shown in Table 2–5. The country symbol/numbering corresponds to the numbering of the Global Innovation Index (2021).

Table 2. Cluster structure 1
(STATISTICA 10 listing)

Members of cluster number 1 (Data1) and distances from respective cluster center. Cluster contains 33 cases											
Case No.	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_10	C_11
Distance	15,200	14,959	13,366	11,399	10,979	9,927	11,688	12,435	11,286	8,468	5,943
Case No.	C_12	C_13	C_14	C_15	C_16	C_17	C_18	C_19	C_20	C_21	C_22
Distance	17,816	8,119	19,821	14,513	11,565	5,117	9,005	11,561	10,004	10,031	10,968
Case No.	C_23	C_24	C_25	C_26	C_27	C_28	C_29	C_30	C_31	C_32	C_33
Distance	17,513	12,875	11,614	11,216	20,397	13,466	13,746	11,206	16,957	20,421	17,377

Table 3. Cluster structure 2
(STATISTICA 10 listing)

Members of cluster number 2 (Data1) and distances from respective cluster center. Cluster contains 29 cases										
Case No.	C_34	C_35	C_36	C_37	C_38	C_39	C_40	C_41	C_42	C_43
Distance	19,719	20,197	16,003	15,845	13,656	14,789	14,177	19,347	14,125	11,658
Case No.	C_44	C_45	C_46	C_47	C_48	C_49	C_50	C_51	C_53	C_54
Distance	19,740	11,174	15,183	18,601	17,204	24,120	16,500	25,454	10,661	12,333
Case No.	C_55	C_56	C_57	C_58	C_59	C_61	C_63	C_67	C_70	
Distance	8,691	14,719	14,341	29,446	21,234	17,988	19,684	16,52136	19,893	

Table 4. Cluster structure 3
(STATISTICA 10 listing)

Members of cluster number 3 (Data1) and distances from respective cluster center. Cluster contains 29 cases										
Case No.	C_52	C_60	C_62	C_64	C_65	C_66	C_68	C_69	C_71	C_72
Distance	33,557	28,923	26,088	15,236	20,328	24,408	16,063	18,273	22,66	16,105
Case No.	C_73	C_74	C_75	C_76	C_77	C_78	C_79	C_80	C_81	C_82
Distance	22,652	28,980	16,224	15,401	12,008	19,169	18,299	23,207	18,786	31,152
Case No.	C_83	C_84	C_85	C_86	C_87	C_88	C_89	C_91	C_98	
Distance	20,449	14,766	23,241	28,146	18,456	24,184	27,892	25,689	23,516	

Table 5. Cluster structure 4
(STATISTICA 10 listing)

Members of cluster number 4 (Data1) and distances from respective cluster center. Cluster contains 41 cases											
Case No.	C_90	C_92	C_93	C_94	C_95	C_96	C_97	C_99	C_100	C_101	C_102
Distance	25,385	19,266	17,203	16,561	26,174	22,147	18,080	17,455	24,365	20,033	21,982
Case No.	C_103	C_104	C_105	C_106	C_107	C_108	C_109	C_110	C_111	C_112	C_113
Distance	31,035	30,058	19,115	23,309	14,760	21,479	14,883	22,485	22,662	10,518	20,456
Case No.	C_114	C_115	C_116	C_117	C_118	C_119	C_120	C_121	C_122	C_123	C_124
Distance	14,434	12,990	15,998	19,214	13,953	14,689	21,654	15,532	20,666	13,168	12,798
Case No.	C_125	C_126	C_127	C_128	C_129	C_130	C_131	C_132			
Distance	16,054	20,193	19,101	17,753	16,280	20,767	18,624	22,036			

In stages 6 to 7, soft innovation coefficients of creative industries were calculated and a strategic country positioning matrix was constructed based on these coefficients (Figure 3).

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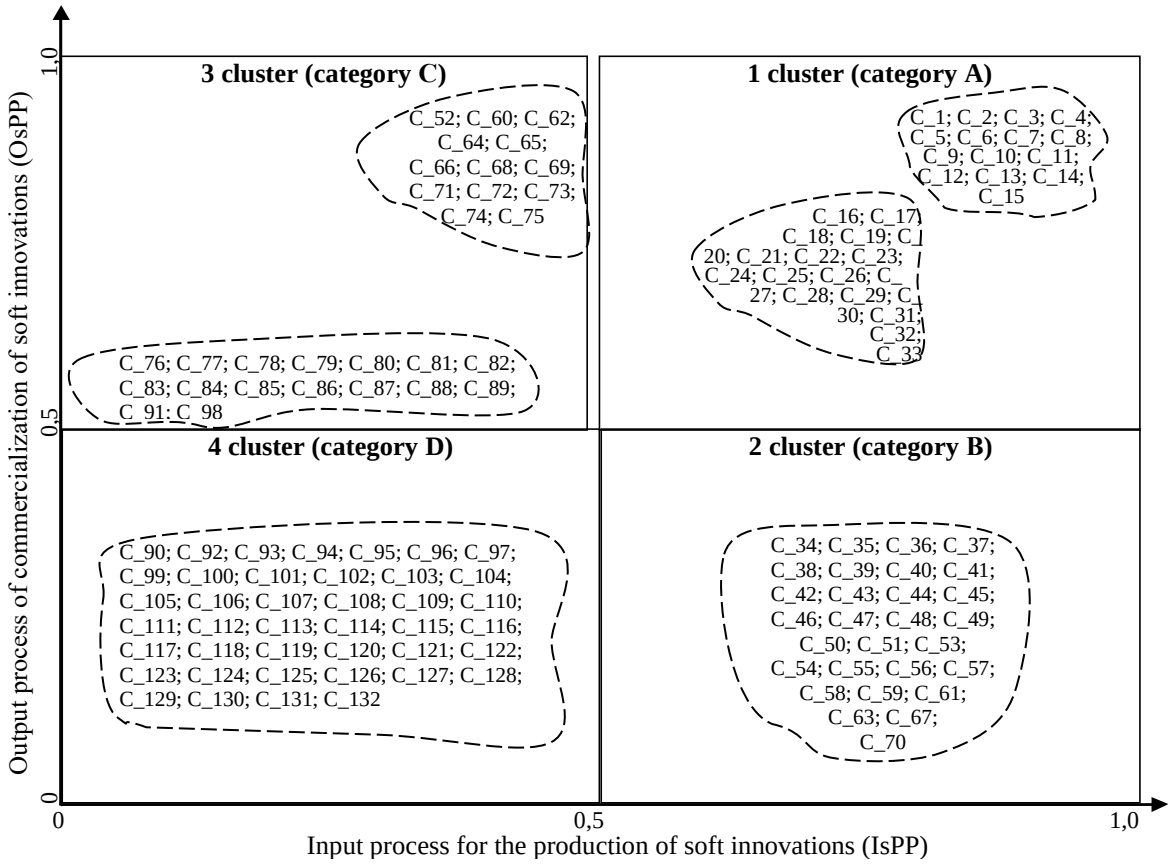

Figure 3. Map of the positioning of countries in terms of investment and return on investment in soft innovation of creative industries

As shown in Figure 3, the same countries that lead the Global Innovation Index (2021) are in category A (cluster 1). This confirms the view of Ashwin and Hirst (2015); Chen (2021). This group of countries is characterized by leadership in both soft innovation costs and high returns to innovation. However, category A is divided into 2 subgroups in terms of cost and commercialization. The first subgroup (Switzerland, Sweden, USA, UK, Republic of Korea, Netherlands, Finland, Singapore, Denmark, Germany, France, China, Japan, Hong Kong, China, Israel) is characterized by a premium level, which contradicts the view of Benghozi and Salvador (2016). This requires not only the development of traditional hard innovations, but also a focus on soft innovations, which, in the crisis caused by the Covid-19 pandemic, would not hold, but would strengthen the position gained. The second category A subgroup includes: Canada, Iceland, Austria, Ireland, Norway, Estonia, Belgium, Luxembourg, Czech Republic, Australia, New Zealand, Malta, Cyprus, Italy, Spain, Portugal, Slovenia, United Arab Emirates. In cross-country comparisons for these countries, the leadership in soft innovation can be held mainly by the constant returns to scale coefficient. This subgroup is characterized by relatively high IsPP and OsPP rates. It may be difficult for them to improve innovation outbound and soft innovation outcomes if inbound levels do not increase.

Cluster 2 (category B) includes 29 countries. This list is almost identical to that of the Global Innovation Index (2021) from

position 34 to 70. Category B countries are characterized by retention of the positions achieved, where the efficiency of investments in soft innovation is kept above 50%. The exceptions are Mauritius, Iran, Belarus, Republic of Moldova, Uruguay, Saudi Arabia, Qatar, and Armenia. The decline in the achieved positions for these 8 countries is primarily due to the deterioration of the political situation in the country, which reduces the willingness of soft innovators to work there. This is confirmed by Gustafsson and Lazzaro (2021). This category, as suggested by Gryshchenko et al. (2021) also put Ukraine in this category – it is ranked 49th.

Cluster 3 (Category C) also includes 29 countries: from 71st to 91st positions. These countries are characterized by low levels of investment in soft innovations and a so-called 'hysteresis effect': Successful investments in times of crisis subsequently generate exponential growth. Even if innovation cannot help overcome immediate financial difficulties, it is nevertheless a key element of viable future growth. In this group, it can also be noted as an improvement over the previous period: the shift from innovation outsiders to innovation followers. However, one country (the United Republic of Tanzania) has worsened its position.

In Cluster 4 (Category D), 41 countries fall from the 92nd to 132nd position. Both low levels of investment in soft innovation and low levels of commercialization characterize this category of countries.

Conclusions

For most countries, the use of soft innovation looks different from the use of hard innovation. Countries with relatively higher IsPP but lower OsPP performance (e.g. Canada, Finland, Japan, Korea and New Zealand) should encourage market-driven soft innovation, develop venture capital financing systems, information exchange platforms to facilitate access to patents and stimulate demand for innovation. Countries with lower IsPP but higher OsPP performance (e.g. Italy, Mexico, Norway and Portugal) should strengthen intellectual property rights protection to stimulate soft innovation, improve information dissemination, financing and resource support mechanisms for soft innovation. In contrast, follower countries with relatively lower levels of IsPP and OsPP, such as Bulgaria, Slovakia, Latvia, Lithuania, Poland, should focus on improving two components of the soft innovation production process. If these countries only increase the inputs to the innovation process, neglecting the efficiency of the process, this will have a limited impact on the results. If, on the other hand, these countries increase efficiency, their production and innovation process outputs can be improved without the need for additional investment in innovation inputs.

Thus, a common recommendation is the need to coordinate the development of strategic tools for the development of soft innovation of creative industries, taking into account the different roles of technology intermediate products in IsPP and OsPP processes. The more accessible knowledge and intellectual products that help to increase upstream soft innovations are, the greater the opposite effect i.e. an increase in downstream commercialization, will be.

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