UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

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CREATIVE INDUSTRY 4.0

TOWARDS A NEW GLOBALIZED CREATIVE ECONOMY

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United Nations publication issued by the United Nations Conference on Trade and Development.

UNCTAD/DITC/TNCD/2021/3

eISBN: 978-92-1-001252-2

ACKNOWLEDGEMENTS

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ABBREVIATIONS AND ACRONYMS

CCI	Cultural and creative industry
DITC	Division on International Trade and Commodities
IADB	InterAmerican Development Bank
ICTs	Information and Communications Technologies
GDP	Gross domestic product
GVCs	Global value chains
ITU	International Telecommunication Union
LDCs	Least developed countries
MTO	Make To Order
OECD	Organisation for the Economic Co-operation Development
RCA	Revealed comparative advantages
R&D	Research and Development
SDGs	Sustainable Development Goals
SMEs	Small and medium-sized enterprises
SOA	Service-oriented architecture
TiVA	Trade in Value-Added
TNCDB	Trade Negotiations and Commercial Diplomacy Branch
UN-ITC	United Nations International Trade Center (UN-ITC)
UN-ECLAC	United Nations Economic Commission for Latin America and the Caribbean
UNESCO	United Nations Education Science and Culture Organization
UNDP	United Nations Development Programme
UNWTO	United Nations World Tourism Organization
WEF	World Economic Forum
WIPO	World Intellectual Property Organization

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ABSTRACT

This report looks at the implications for the Creative Economy of the rapid changes in automated technology and advanced internet communication that came to be known as Industry 4.0. Conservative estimates put the Creative Economy's contribution to global gross domestic product at about 3 per cent, roughly in line with its contribution to world trade. This contribution is expected to be strengthened by a surge in digitalization and advanced technologies that characterise Creative Industry 4.0. Among the many observations that this report makes, ones that are important from the perspective of sustainable and inclusive development especially that of small developing countries are that: (1) Creative Industry 4.0 can speed-up the transfer of technology; (2) the size of the domestic market will no longer be a limit when it comes to developing a product; (3) new niche market opportunities are emerging. Another key observation is that the availability of adequate technology is not sufficient; it must be made available to stakeholders. The report highlights a series of policy options aimed at harnessing the potential of Creative Industry 4.0 for economic and social development.

1.

Introduction

The Creative Economy is an analytical category that encompasses a very diverse array of sectors. It includes heritage and cultural products, such as handicrafts, and it incorporates the software designers that fashion the digital economy and influence the future of the whole of society (Dubina and Campbell, 2019). In a world of global networking, via the evolution of digitalization and the changing behaviour of people, both as producers and as consumers, analysis needs to look beyond individual creativity. Today, business innovation is the process of both generating and applying creative ideas in a commercial context (Bakhshi and Mc Vitte 2009). At the same time, even the most traditional, cultural or heritage-dependent creative activities are being transformed by the evolution of technologies.

This study examines the economic aspects of the interaction between creativity and technological-business innovations. The objective of the study is to better understand how the 4th industrial revolution, or Industry 4.0, has changed the way creative actors are performing their activity. In this study, creativity is regarded as the fuel and the engine of the Creative Economy and refers to the act of generating new ideas and approaches to technological applications.

The study is organised in two parts. The first part looks at the definitional issues based on a review of the literature, followed by an assessment of the economic weight of the Creative Economy in terms of production, employment, and trade. The second part invites the reader to examine possible implications of Industry 4.0 on various branches of the creative industries. Particular attention is paid to the new trading opportunities that "Creative Industry 4.0" may provide to developing countries through redefining these countries' comparative advantages. The study concludes with policy options for developing countries to nurture the competitiveness of their creative industries in the new digital economy.

II.

What constitutes the Creative Economy?

The way in which "Creative Economy" is defined tends to vary in accordance with the perspective or chosen objective of the observer. Some authors highlight the sociological and anthropological dimensions (culture, heritage), others look more at creativity from an economic perspective. Historically, authors have associated creativity with the production of social meaning in the form of texts and symbols (music, image, stories). Most primitive forms of symbolic production can be traced back to prehistoric sculptures and cave paintings from the Stone Age. Even when creators were remunerated for their work, the value of their production was perhaps just symbolic. It is generally accepted that the commercial dimension of creativity was articulated as an economic concept in early 2000 when authors Richard E. Caves, David Throsby and John Howkins shed light on this issue in their seminal books.[1]

This section assesses the various definitions of Creative Economy that have been adopted in the literature, by countries, and by international agencies. We regroup them into several categories, according to their main focus: (i) economic value; (ii) sociological value; (iii) business value; and (iv) combination of these. Needless to say, the categories are non-exhaustive.[2]

A. Creativity as an autonomous economic concept

The concept of "Creative Economy" is relatively new. While creativity and innovations have been at the centre of reflections in economics and business for many years,[3] it was only in the 1990s that this notion became a focus of attention. In 1994, the term 'creative industries' first appeared in "Creative Nation", a report issued by the government of Australia (Afriantari and Harikesa, 2020).[4]

John Howkins (2001, 2007), the leading pioneer in the identification of the Creative Economy, offers several definitions. Creativity is the ability to generate something new, either in the sense of 'something from nothing' or giving a new character to something already existing. Creativity becomes an economic activity when it produces an idea with economic implications or becomes a tradeable product.

Creativity also flourishes in the sciences and even in management. In the introduction to his 2001 book "The Creative Economy: How People Make Money from Ideas", Howkins states that "Creativity is present at all levels of business, from the management of a company to the development, branding and shape of each product". Scientific and technological creativity is better defined under the denomination of patent industries: innovations in pharmaceuticals, chemicals, electronics, and transport equipment, etc. Although more difficult to define, the trademark and design industries are more widespread than the previous two categories.

These various activities constitute the core functions of the creative industries. The Creative Economy, sometimes called the "orange economy", is a broader concept, which includes interactions with consumers and associations, as well as the contribution of the creative activities, such as Research and Development (R&D), which take place outside the creative industry sub-sector. In a later book, Howkins (2009) emphasises the importance of the territory in creating a favourable eco-system for creativity.

In some countries, such as Australia and the United Kingdom, the term "creative industries" refers to a much smaller subset of Howkins' domain: arts and culture. Such is in the case of the Department of Culture, Media and Sports of the United Kingdom (DCMS). This definition is close to the approach of sociologists', and examined in the following section, but it also includes sports (sporting events being understood here as entertainment, based on individual performance). It opens a way to recognising indirect contributions of creativity to prosperity and jobs: The creative industries may be seen then as businesses that are based on individual creativity, talent and skill, and that have the potential to create jobs and wealth through the generation and exploitation of intellectual property. This approach underlines the importance large cities attach to their socioeconomic and spatial manifestations in terms of both the production and consumption of creative products and symbols.[5]

The definition adopted by the World Intellectual Property Organization (WIPO) reflects its institutional terms of reference, highlighting the importance of the copyright aspect. In some sense, it is a legal definition more than an economic one. As WIPO (2015) states, "The concept of copyright and related rights is defined in national legislation. In most countries, the basic concepts are consistent with the provisions of [international WIPO and WTO] treaties […] and other relevant international conventions". Copyright-based industries are those that are dedicated, interdependent, or that are directly or indirectly related with the creation, production, representation, exhibition, communication, distribution, or retail of Copyright protected material.

The United Nations Economic Commission for Latin America and the Caribbean (UN-ECLAC) extended the concept of cultural industries with the idea of "content industries" (Castro, 2008) to identify cultural and entertainment industries that use Information and Communication Technologies (ICT). The "content industries" are closely related to the copyright dimension: publishing, film, TV, radio, phonographic, mobile contents, independent audio-visual production, web contents, electronic games, and content produced for digital convergence (cross-media).

B. Creativity as cultural and sociological activities

Cultural industries, according to Markusen, Wassall, DeNatale and Cohen (2008), boil down to activities that are directly involved in the production of social meaning in the form of texts and symbols.[6] Under this definition, cultural industries "include television, radio, the cinema, newspapers, magazine and book publishing, music recording and publishing industries, advertising, and the performing arts. These are all activities the primary aim of which is to communicate to an audience, to create texts". A more restrictive definition, and what might be termed a "sociological" interpretation, is offered by Hesmondhalgh (2019). It is based on the notion of "the signifying system", where creative activities are related to cultural industries that are directly involved in the production of social meaning in the form of texts and symbols.

Mercer (2009) adopts a clear anthropological and sociological approach to cultural industries, bundling together art and culture as ethno-linguistic constructs: "Arts of living, doing, and being, not just arts:

that's what culture is about". In O'Connor (2010), this social construct is often related to radicalism, counterculture or, in more recent years, to the rise of the "bourgeois-bohemians" globalized upper-middle class in Western metropoles. Florida (2003) also highlights the role of a Creative Class living in Creative Cities.

The United Nations Education Science and Culture Organization (UNESCO), while following the same line of thought, also incorporates the notion of copyright (i.e., focusing on the formal segment of the industry): the cultural and creative industries are those that combine the creation, production and commercialization of creative contents that are intangible and of a cultural nature.

C. Towards a synthesis

Writing from a business school point of view, Roy, Sivakumar and Wilkinson (2004) provide a detailed discussion of the ways in which supply-chain relationships may contribute to innovation. In this business perspective, innovation occurs in the "development" phase of a new product, which includes idea generation, idea screening, concept testing and development.[7]

Bakhshi and McVittie (2009) conduct an econometric analysis on the relationships between creative linkages and innovation performance in firms in the United Kingdom. They conclude that if an average firm duplicates its spending on creative inputs, the likelihood that the firm will introduce a product innovation, either new to the firm or to its market, is around 25 per cent higher. Bakshi and McVittie (2009) focus particularly on knowledge transfers embodied in business-to-business (B2B) transactions.

At the InterAmerican Development Bank (IADB), Buitrago, Restrepo and Duque Márquez (2013) propose to adapt a practical definition of the "Orange Economy" that should start from a common area including: (i) Creativity, arts and culture as productive endeavours; (ii) Products strongly related to intellectual property rights, in particular copyright; and (iii) Activities with a direct role in the value chain transforming ideas into products.

UNCTAD goes further beyond a mere economic definition of Creative Economy and encompasses artistic, cultural and industrial aspects. UNCTAD and the United Nations Development Programme (UNDP) (2008) summarise the definition of the "Creative Economy" as follows:

a. The Creative Economy is an evolving concept based on creative assets potentially generating economic growth and development;

b. It can foster income generation, job creation and export earnings while promoting social inclusion, cultural diversity, and human development;

c. It embraces economic, cultural and social aspects interacting with technology, intellectual property and tourism objectives;

d. It is a set of knowledge-based economic activities with a development dimension and cross-cutting linkages at macro and micro levels to the overall economy; and

e. It is a feasible development option calling for innovative multidisciplinary policy responses and inter-ministerial action.

At the heart of the Creative Economy are the creative industries. "Creative industries" can be defined as the cycles of creation, production and distribution of goods and services that use creativity and intellectual capital as their primary inputs. They are classified by their role in heritage, art, media, and functional creations.

III.

Assessing the socio-economic impact of the Creative Economy

The socio-economic impacts of the Creative Economy are multifaceted. Analysing 47 different publications from the relevant literature, Daubaraite and Startiene (2015) find that the creative industries can influence the national economy through, *inter alia*: (i) Fighting unemployment (mentioned in 39 publications), in particular youth unemployment (mentioned in 3 publications);[8] (ii) Contributing to gross domestic product (GDP) and value added (in 32 publications); (iii) Contributing to exports (in 13 publications); (iv) Contributing to social inclusion (in 11 publications); (v) Contributing to social and cultural development (in 6 publications); and/or (vi) Increasing the quality of life (in 5 publications). According to the consulting firm Deloitte (2021), the importance of the Creative Economy for overall economic performance is likely to grow. This means its importance for policymaking is also likely to continue to increase.

The 2020 Otis Report on the Creative Economy by the Otis College of Art and Design sees the Creative Economy as a whole as comprising people with creative occupations, people in a non-creative job working in creative industries, and workers with creative occupations working in any other industry. The latter group is quite important, as shown in a survey of nine countries of the Organisation for the Economic Co-operation Development (OECD) over the 2011–2018 period undertaken by the consulting firm Deloitte. Deloitte (2021) estimates that the creative industries represent 7 per cent of total employment, a share that has been growing through time. This number includes an imputation for creative occupations outside of the creative industries, the second largest group with 23 per cent of total creative employment in 2018 after "IT, software and computers". The Deloitte report also finds that its estimate of creative employment outside the creative sectors is the largest source of variation between countries at a similar level of economic development.

The contribution of the Creative Economy to GDP remains a measurement issue, due both to the limited availability of specific official statistics (*e.g.*, based on satellite accounts) and to the difficulties of assessing non-market benefits. Worldwide comparable data are usually scarce and outdated. Using a conservative definition that excludes crafts and creative activities in non-creative industries, the 2015

report by Ernst and Young Global estimates the Creative Economy's contribution to global GDP to be about 3 per cent. Using revised figures for developed economies, UNCTAD (2008) puts the contribution somewhere between 2 and 6 per cent, albeit national data show large variations between countries. Looking at the intangible contribution of the creative functions in manufacturing, Chen, Los and Timmer (2018) find that investment in intellectual property products (computer software and databases, research and development, mineral exploration and artistic originals) generate an income share of 2.4 per cent of the value-added in manufacturing.

As mentioned by Clark (2009), a plethora of different definitions means that it is almost impossible to conduct meaningful analysis across countries. According to this author, whilst output and export figures based on existing creative industry classification may be justified, it is much less so when using a whole-sector definition to estimate employment figures. In the words of the author, "many that work in the creative sectors are not undertaking work that can be considered 'Creative".[9]

A. Sectoral assessments

This section assesses the socio-economic impact in different creative sectors and activities: Crafts; Art, Culture and Creative Industries; Research and Development; and Copyright industries. From the empirical perspective, there are two main advantages in focusing on these three categories. First, when taken together, they cover a large spectrum of economically relevant creative activities. Second, since each category is measured according to different statistical sources and indicators, it is possible to capture different dimensions of the Creative Economy.

1. Handicrafts, art, and culture

Handicrafts, articrafts, and art are creative products that incorporate varying degrees of creativity and carry a strong cultural dimension. They are complementary and not mutually exclusive as the boundary between crafts and art is fuzzy.

Crafts

The size of the handicrafts global market is very difficult to estimate, due to the coexistence of various definitions for this sector. Another complicating factor is the informal nature of handicrafts production and consumption in many countries. Estimates of the commercial market size for crafts in 2020 vary between US$650–720 billion, depending on the analyst (IMARC, 2021). As mentioned, these are only rough estimates based on formal channels of distribution, such as department stores, the retail trade and e-commerce. Its value would probably be much higher if informal trade, *i.e.* purchases made directly from the artisan, rural and tourist markets, were taken into consideration.

According to IMARC (2021), woodware, including those products that are used in the manufacturing of kitchenware, decorative materials, toys, etc., represents the most popular type of handicraft products across the globe. North America is the leading market as consumers in the region are willing to spend on handmade jewellery, apparel, and handcrafted home accessories. New trends in "articrafts" promote the fusion of ethnic and contemporary design that are also appealing to interior designers and corporate clients.

The handicrafts industry is flourishing in developing regions, including least developed countries (LDCs), and in many Indigenous communities, partly because of the low capital investment required. The market for handicrafts has benefitted from the development of tourism and the opening of new e-commerce channels, which has improved access to overseas consumers. In 2020, the drop in tourism due to the COVID-related lockdown has taken away an important source of income from artisans in major tourist destinations such as the Caribbean islands. Looking forward, most analysts expect the worldwide formal handicrafts market to exhibit double-digit growth during the next five years.

It is difficult to find comprehensive data on employment in the craft sector as most handicrafts producers are informal-sector artisans in developing countries. More generally, handicrafts are a cottage industry, and, in rural areas, handicraft employment is usually seen as a complement to agricultural labour. To give an idea of the magnitude of this "known unknown", official estimates suggest that India, one of the world's largest handicraft producers and exporters, is home to 7 million artisans, most of whom are in rural and semi-urban areas. However, data from unofficial sources indicate that the real figure may be as high as 200 million.[10] The reason for this disparity is the informal and unorganised nature of this sector.

Art, culture and creative production

There is greater statistical coverage of production and employment in Art and Culture. One of the most comprehensive mappings of the Art and Culture segment of the Creative Economy was published by the consultancy group Ernst and Young Global in 2015, to commemorate the 10th anniversary of the UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expressions.

The report was based on a mix of official statistics, industrial reports and a specific survey and estimates and was commissioned by several institutions. Most of the data in the study refer to 2013 and relate to the definition of UNESCO, covering Advertising, Architecture, Visual Arts, Performing Arts, TV, Radio, Music, Books, Gaming, Movies, and Newspapers and Magazine. It excludes creative employment in non-cultural industries.

According to the study, cultural and creative industries account for about 3 per cent of global GDP, provide nearly 30 million jobs worldwide, and employ more people aged 15–29 than any other sector. Employment in this sector is pro-cyclical because demand in many creative fields depends largely on the overall state of the economy, due to the optional nature of arts and cultural purchases.

As per Table 1, Asia-Pacific is the world's biggest market for the cultural and creative industry (CCI), generating US$743 billion of revenue (33 per cent of global CCI sales) and 12.7 million jobs (43 per cent of CCI jobs worldwide).[11] Europe is the second largest CCI market, accounting for US$709 billion of revenues (32 per cent of the global total) and 7.7 million jobs (26 per cent of all CCI jobs). North America is the third largest CCI market with revenues of US$620b (28 per cent of global revenues) and 4.7 million jobs (16 per cent of total jobs). The North American market is powered by leading cultural and entertainment players: the region is the largest market for TV (US$182b), movies (US$28b) and radio (US$21b). The Latin American CCI generates US$124b in revenues (6 per cent of CCI global market) and 1.9 million jobs (7 per cent of total CCI jobs). Africa and the Middle East CCI market achieves US$58b in revenues (3 per cent of the total) and provides 2.4 million jobs (8 per cent of total CCI jobs).

The average turnover per employee differs widely between sectors and between regions, as reflected in Table 1. Revenue per employee depends, among other things, on labour productivity. In the cultural sector, productivity is usually subjected to the "Baumol Effect" and does not increase much with technology, at least in the performing arts: it takes the same amount of time to perform a baroque concerto today as it did in the 18th century. On the other hand, even in this sector, technology has dramatically changed the way that arts are distributed and consumed. Once recorded, the same baroque concerto can be sold to and listened by millions of people over many years. Therefore, the "Baumol Effect" does not tell the full story: technology may reduce the number of performing workers required to satisfy the market and even, on occasion, boost their income to super-star status.

Table 1. Cultural and Creative Industries: Revenues and employment, 2013

CCI sectors	Revenues [a]	Employment	Turnover/employee [c]
Television	477	3.5	135.2
Visual arts	391	6.7	58.1
Newspapers and magazines	354	2.9	123.6
Advertising	285	2.0	145.9
Architecture	222	1.7	133.1
Books	143	3.7	39.0
Performing arts	127	3.5	35.9
Gaming	99	0.6	163.6
Movies	77	2.5	31.0
Music	65	4.0	16.3
Radio	46	0.5	91.6
Total (less double counting)	**2 253**	**29.507**	**76.4**
Asia and Pacific	743	12.7	58.5
Europe [d]	709	7.7	92.1
North America [e]	620	4.7	131.9
Latin America and the Caribbean [e]	124	1.9	65.3
Africa and Middle East [f]	58	2.4	24.2

Notes: a/ US$ billion; b/ millions of jobs; c/ US$ thousand; d/: Ernst and Young Global included Turkey in Europe; e/: Mexico is included in Latin America; f/ Ernst and Young Global included Iran in the Middle East.
Source: Author, based on Ernst and Young Global (2015).

A 2014 study by Ernst & Young Global limited (Ernst and Young Global 2014) shows that the Creative Economy's contribution to the GDP of the European Union was 4.2 per cent in 2012. A total of 7 million Europeans, or 3.3 per cent of the European Union's active population (after removal of double counting), are directly or indirectly employed in creative and cultural activities. Performing arts (1.23 million), visual arts (1.23 million) and music (1.17 million) employ more than 1 million people each, followed by advertising (818000) books (646000) and films (641000). Altogether, in 2012 in the European Union, CCIs employed as many people as the food and beverage services industry. They provided work for nearly 2.5 times more people than automotive manufacturers and 5 times more than the chemical industry. According to this survey, the creative and cultural sectors employed on average, more 15 to 29-year–olds than any other sector in Europe (19.1 per cent of total employment in CCIs versus 18.6 per cent in the rest of the economy).

The CCI sector is also significant in developing and emerging countries. Zou, Siriboonchitta, Yamaka and Maneejuk (2020) report that in China, the value added of the national culture and related industries in 2018 accounted for 4.3 per cent of GDP, employing 2.35 million persons. As for Latin America and the Caribbean, Ernst and Young Global (2015) indicates that the CCI sector represented 2.2 per cent of GDP and 1.9 million job and reports similar numbers for Africa and the Middle East (1.1 per cent and 2.4 million jobs).

In most developing countries, official data may underestimate the weight of the CCIs due to the sector's informal nature. Ernst and Young Global (2015) estimates that informal CCI sales in emerging countries totalled an estimated US$33 billion in 2013 and provided 1.2 million jobs. According to UNESCO (2018), the Creative Economy generates annual global revenues of US$2.25 trillion and exports of over US$250

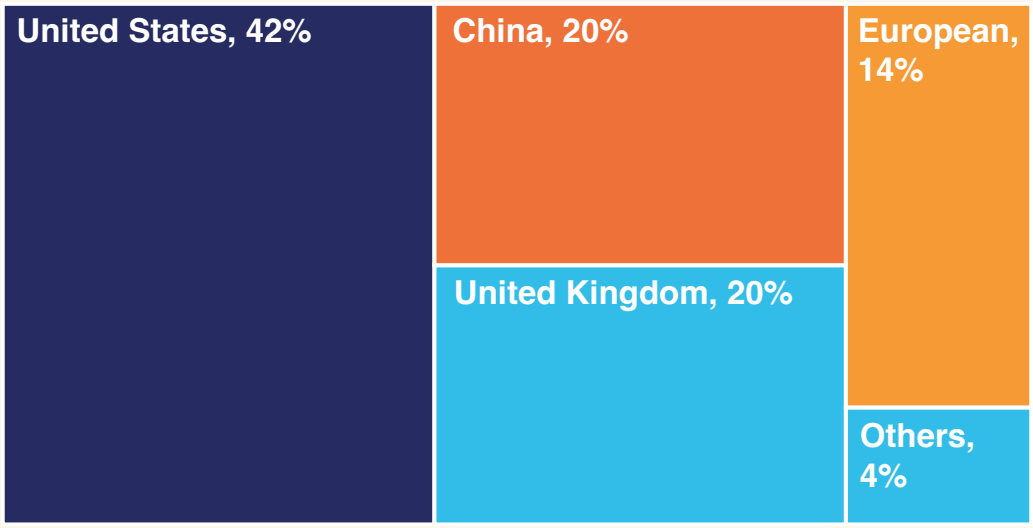
billion. When it comes to the booming sub-sector of e-commerce, the CCI sector is a key driver of the digital Creative Economy, contributing US$200 billion in global digital sales.

The sub-sector of collectible art and antiques (items considered worthy of collecting and traded in auctions and galleries) is smaller (US$67 billion in 2018, its best year so far). With ups and downs, this market was growing at an annual average of 5 per cent in the decade up to 2019. However, in 2020, traditional art suffered greatly from the lockdown, travel bans, and social distancing. Global art sales fell 22 per cent in 2020 to US$50.1 billion, as stated in McAndrew (2021). It was the steepest market drop since the 2008–2009 financial crisis. On the other hand, global e-commerce sales of art and antiques reached a record high of $12.4 billion, doubling its 2019 value to represent a record share of 25 per cent of the market's turnover.

With more than 80 per cent of UNESCO World Heritage properties having closed down due to the COVID-19 pandemics, the livelihoods of millions of cultural professionals have been seriously jeopardized according to the World Tourism Organization (UNWTO).[12] As reported by UNWTO, global tourism suffered its worst year on record in 2020, with international arrivals dropping by 74 per cent, with 1 billion fewer international arrivals in 2020 than in the previous year, This compares with the 4 per cent decline recorded during the 2009 global economic crisis.

The actors in this market, which mainly include public or private galleries and individual dealers, are geographically concentrated in three areas: the United States (42 per cent), Europe (34 per cent) and China (20 per cent), but their clients, *i.e.*, private collectors, designers, and museums come from all over the world (Figure 2). McAndrew (2021) estimates that the majority of the 305000 businesses operating in the global art and antiques market are small and micro-sized businesses, both in terms of turnover and employees. The sector was estimated to employ directly 2.9 million people in 2020.

Figure 1. The collectible art and antique market shares in 2020 (percentages)



Source: Author, based on McAndrew (2021).

2. Copyright industries

Another source of valuable information on a closely related aspect of the Creative Industry is the World Intellectual Property Organization (WIPO). Its coverage of "Copyright industries" differs from the standard definitions of creative industries, some sectors of the Creative Economy being excluded (arts of traditional crafts, for example, except when exhibited in museums) while ofther sectors are included (TV sets, computer equipment or blank recording supports). WIPO data also differ qualitatively, as statistics on copyright industries cover only a proportion of the innovations that are internationally patented.

Table 2. Design, patents, and trademarks. Applications by region, 2010–2019 (counts and percentages)

	Industrial design			Patent			Trademark		
Region \year	2010	2019	Annual growth*	2010	2019	Annual growth*	2010	2019	Annual growth*
Africa	17 100	17 500	0.26	12 700	16 100	2.67	193 300	260 900	3.39
Asia	588 900	928 900	5.19	1 028 800	2 094 800	8.22	2 400 000	10 696 700	18.06
Europe	304 900	331 300	0.93	343 200	363 900	0.65	1 981 900	2 336 800	1.85
LAC	14 500	15 600	0.82	55 400	55 700	0.06	600 700	799 000	3.22
North America	34 200	57 400	5.92	525 700	657 900	2.52	501 100	866 300	6.27
Oceania	8 900	10 200	1.53	31 600	35 800	1.40	139 900	194 000	3.70
Total	968 500	1 360 900	3.85	1 997 400	3224 200	5.46	5 816 900	15 153 700	11.23

Note: */ Average annual growth rate over 2010–2019.

Source: Author, based on WIPO data.

When looking at the evolution of applications for patents and other types of intellectual property on innovations (Table 2), two observations can be made. First, there is a wide heterogeneity across regions, with Asia representing between 60 per cent and 70 per cent of all published applications in 2019. China in 2019 surpassed the United States to become the top filer of international patent applications. This is not entirely justified by the sheer size of the countries in the Asian region. Controlling for economic size, Republic of Korea, China and Japan occupy the top spot per unit of GDP on a world basis for patent fillings.

The gap between industrialised and advanced developing countries in terms of innovations is decreasing. Indeed, the annual rate of growth observed in Table 3 for lower and upper middle income countries is higher than for high-income ones. The second observation is more worrysome, as the innovative gap between high and low performers has been increasing over the past 10 years. For example, the annual average number of patent applications from low-income countries has dropped by 16 per cent since 2010. We will return to this issue when considering the role of the Creative Economy in contributing to the Sustainable Development Goals (SDGs).

Table 3. Design, patents, and trademarks. Applications by income groups, 2010–-2019 (counts and percentages)

	Industrial design			Patent			Trademark		
Region \year	2010	2019	Annual growth*	2010	2019	Annual growth*	2010	2019	Annual growth*
High-income	432 500	490 000	1.40	1 395 800	1 593 400	1.48	2864 100	4 104 400	4.08
Low-income	2500	2500	0.00	9700	2000	-16.09	64 500	95 000	4.40
Lower middle-income	34 100	46 900	3.60	61 100	80 600	3.13	560 900	971 200	6.29
Upper middle-income	499 400	821 500	5.69	530 800	1 548 200	12.63	2 327 400	9 983 100	17.56
Total	968 500	1 360 900	3.85	1 997 400	3 224 200	5.46	5 816 900	15 153 700	11.23

Note: */ Average annual growth rate over 2010–2019.

Source: Author, based on WIPO data.

The contribution of copyright industries to national employment is slightly higher than their share of GDP and stands at an average of 5.3 per cent. Mexico and the Philippines (about 11 per cent) have by far the highest share of their labour force employed in the copyright Industries, albeit with low labour productivity. The highest labour productivity is found in St. Kitts and Nevis, Panama and St. Lucia.

WIPO (2014) distinguishes between 4 different groups of copyright industries according to the level of dependence on copyright material – core, interdependent, partial and non-dedicated support industries. The core group covers Press and Literature, Software and Databases, Radio & TV, Music & Theatre, Advertising, Motion pictures and video, with the addition of Copyright collecting societies. The report suggests that developed economies produce more value and jobs in their core group of copyright industries. For the developing world, non-core goups of sectors are of higher significance in terms of job generation and value creation. This points to the importance of including non-core sectors in any analysis of the copyright contribution, including the economic linkages and spillover effects of copyright in developing economies.

3. Research and Development

Research and Development (R&D) bears perhaps the closest resemblance to the business definition of creative activity. It also directly relates to the capacity to produce the copyrighted products analysed in the preceding section. However, the importance of R&D goes much further. From a development perspective, any review of creative activities would be incomplete without an assessment of the weight of a sector that is key for creating and transferring technologies.

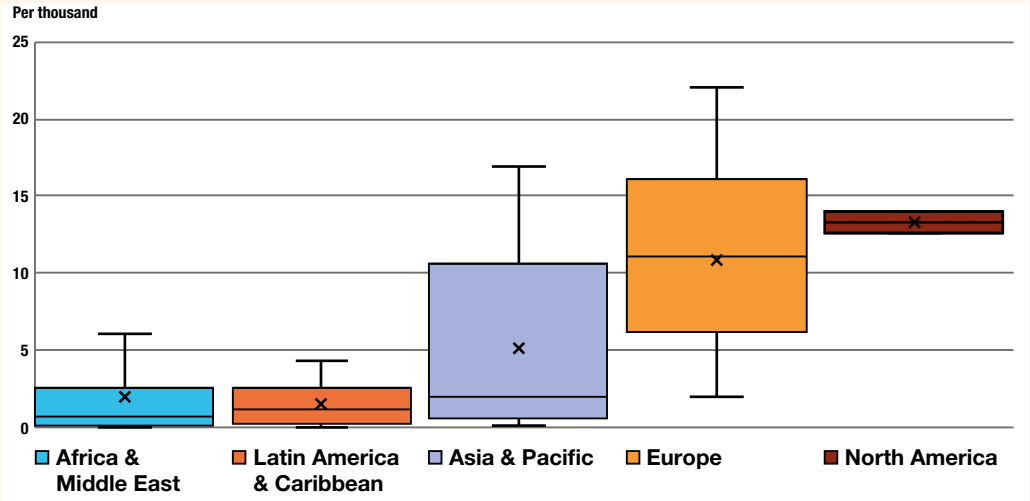
Mapping the depth of R&D activities at country level remains a challenge as data are scarce and reflect heterogeneous definitions. Thus, the following sections are mainly illustrative. In order to have comparable figures for R&D,[13] this study uses the same regional disaggregation used in Ernst and Young Global (2015) while compiling available data from UNESCO and OECD focusing on the year 2015.[14] The box and whisker diagrams in Figure 2 display the 1st and 3rd quartiles, with an inner line indicating the median and X the mean. The ends of the "whiskers" display the lower and upper limits beyond which values are considered outliers. The closer the mean is to the median, the more homogeneous the regional grouping is.

In general, there is an important heterogeneity between the regional groupings (Figure 2) and also within each grouping, except for North America. This mainly reflects the close correlation between R&D spending and levels of income. It is particularly the case for Africa and Middle East region, because Israel has been included in the Africa and Middle East group by the Ernst and Young Global (2015) study (Turkey being classified as Europe). Israel is an outlier for this group, which includes many Least Developed Countries (LDCs). The Asia and Pacific group is also very heterogenous, as it includes both developed and developing countries, some of which are classified as LDCs.

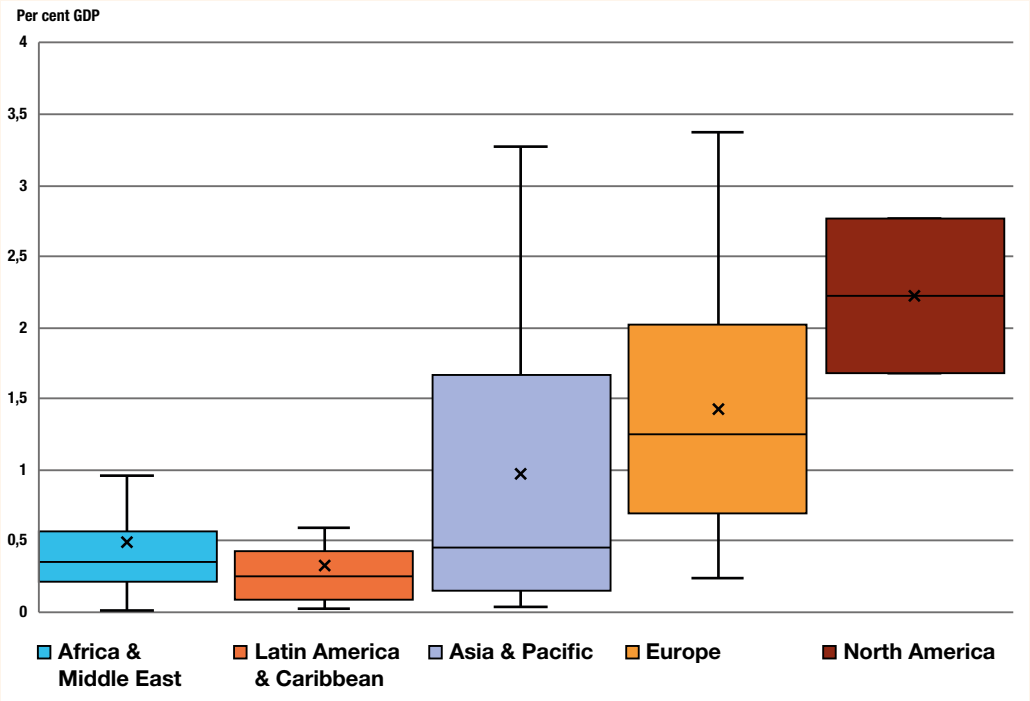
The correlation between R&D employment and GDP per capita is very high (0.81 over the whole sample of countries). It is lower between R&D expenditure (relative to GDP) and per capita income (0.67). The correlations are particualrly strong for Europe (0.88 and 0.82 for employment and spending, respectively), and remain high in Asia-Pacific (0.83 and 0.55). Obviously, correlation is not causation, but there is probably a circular causation between development level, as measured by income, and R&D. First, it is because commercial R&D is concentrated in the large multinational firms of developed and advanced developing countries. Second, it is because R&D depends largely on public spending and rich countries in general have larger levels of public spending. But fostering R&D, and in particular employment in R&D activities as a vector of technological transfer is also important, at least qualitatively, for low and middle income developing countries.

Figure 2. Research and Development, employment and contribution to gross domestic products, 2013–2018 (average)

a. Personnel employed in Research and Development (per thousand employees)



b. Gross domestic expenditure on Research and Development (percentage of GDP)



Note: All persons engaged directly in R&D per thousand employed persons, in Full Time Equivalent.
Gross domestic expenditure on R&D as a percentage of GDP.
Source: Author, based on UNESCO and OECD data.

B. Global trade in creative goods and services

One approach to measuring the commercial value of the Creative Economy and its evolution through time is to look at its contribution to international trade. However, mapping trade in creative "goods" and "services" depends crucially on how such goods and services are defined, which in turn depends on how the Creative Economy itself is defined. Instead of counting up the value of trade in goods and services that are deemed to be "creative", an ideal measure of the contribution of the Creative Economy to trade would be to measure the creative content of all traded goods and services, in the same way that statisticians measure their carbon footprint.[15] As no such statistics yet exist, we use here the usual approach despite its limitations.

The present UNCTAD classification of creative goods that we are using in this section is composed of seven sectors (see Table 4). In total, there are [195] individual products, classified at the 6-digit-level of the 2012 Harmonized Commodity Description and Coding System (HS2012). The actual "creative contents" may vary widely from one product to another, which is an important limitation when aggregating results. Thus, trends rather than absolute values may be more informative, in particular when the data refer to well identified sub-categories.

Indeed, as it stands, this classification could result in an overestimation of the total figure of trade in creative goods, because it does not distinguish between products with "high" creativity components and those with less. For example, the design (CER004) sector covers trade in all fashion items, such as clothing and shoes. Counting the value of trade in all fashion items regardless of their creative contents may be the reason why the design sector accounts for 68 per cent of the total trade in creative goods (2019 data).

Table 4. Classification of creative goods

CER001	All creative goods	
CER002	Art crafts	Carpets, Celebration, Other art crafts, Paperware, Wickerware, Yarn
CER003	Audio-visual	Film, CD/DVD/Tapes
CER004	Design	Architecture, Fashion, Glassware, Interior, Jewellery, Toys
CER005	New media	Recorded media, Video games
CER006	Performing arts	Musical instruments, Printed music
CER007	Publishing	Books, Newspaper, Other printed materials
CER008	Visual arts	Antiques, Paintings, Photography, Sculpture

Source: UNCTAD Stat website.

Using the UNCTAD classification, the value of the world exports of creative goods amounted to US$548 billion in 2019, before the COVID-19 pandemic. This corresponds to slightly less than 3 per cent of the value of world merchandise exports for the year. Although exports of creative goods increased between 2010 and 2019 by an annual average of 2.4 per cent, in-line with the growth of total merchandise trade, this figure hides much of the heterogeneity in the evolution of individual sectors.

In 2019, CER004 Design (architecture; fashion; glassware; interior decoration; jewellery; toys) dominated world trade in creative goods (68 per cent) and benefited from sustained demand (exports increased by an annual average of 4.4 per cent between 2010 and 2019). At the other extreme, CER006 (musical instruments and printed music) and CER003 (audio visual records) accounted for only one and three per cent, respectively, of world trade. The weight of CER003, the Audio-visual chapter, decreased in both relative and absolute terms, registering an annual average decline of 7 per cent over the 2010-2019 period (see Table 4). A similar trend, albeit less accentuated (-3 per cent per year), is observed for CER007 Publishing (books, etc.). This downward trend is attributable in large part to the process of digitalization, which resulted in sales of publishing goods being recorded as trade in publishing services instead.

From a regional perspective, over the same period, Africa and the Pacific region (Oceania) registered a decrease in the value of their exports, while those of North America remained stagnant. In contrast, Latin America (growing 3.8 per cent per year in average), Asia (2.9 per cent) and Europe (2.2 per cent), registered positive growth, albeit from very different bases. Once again, it should be stressed that these aggregate data cover very heterogenous products, and should, therefore, be taken with a pinch of salt.

As mentioned, because of the definitional issues, regional divergences within a given chapter are probably more informative than the evolution of broadly defined aggregates. For example, one may note for CER005 (recorded media and video games) the divergence between Africa (a drop of 7 per cent in the annual average) and Latin America and the Caribbean (an increase of almost 15 per cent). Whereas explaining this divergence would require a dedicated analysis which falls outside the scope of this study, the available trade data can be used to indicate evolving strengths and weaknesses.

Table 5. Exports of creative goods by chapter and region, 2019 (million dollars and percentage)

Region	CER002	CER003	CER004	CER005	CER006	CER007	CER008	Total
Africa	685.6	46.4	1372.7	71.2	8.5	157.8	360.2	2702.5
- Growth rate	-2.3	-2.0	-0.2	-7.0	-2.3	-7.6	8.0	-0.9
Asia	29363.9	7486.3	227882.4	30356.0	3895.0	8060.8	11188.4	318232.7
- Growth rate	3.8	-5.5	4.1	-1.6	1.3	-1.2	4.9	2.9
Europe	7216.8	8912.7	121545.9	6797.2	1537.8	18465.1	17302.8	181778.2
- Growth rate	0.1	-7.6	5.1	-4.3	2.7	-2.2	4.2	2.2
Latin America and the Caribbean	565.0	387.5	5947.7	1694.4	151.8	582.2	865.0	10193.6
- Growth rate	0.4	-6.2	4.1	14.6	5.3	-5.1	9.0	3.8
Northern America	1269.1	1868.4	14046.0	2853.5	544.6	5292.3	7809.0	33682.9
- Growth rate	0.0	-10.6	3.5	-0.7	0.7	-5.3	4.5	-0.1
Pacific	36.7	83.8	624.2	179.7	9.6	271.7	156.4	1362.2
- Growth rate	-5.2	-9.7	-0.1	0.9	2.5	-3.8	5.4	-1.5
World	39137.1	18785.1	371418.8	41952.0	6147.3	32830.0	37681.8	547952.0
- Growth rate	2.7	-7.2	4.4	-1.8	1.7	-2.7	4.6	2.4

Note: Values: year 2019; Growth rates: compound average annual growth rate over the 2010–2019 period.
Source: Author based on CEPII-BACI data; see Gaulier and Zignago (2010) for more details.

When looking at the demand-side (imports), one notes a similar heterogeneity across regions and between products. CER004 (Design) is an exception, with demand growth staying within a narrow 4 per cent-to-5 per cent interval in all regions. While Europe remains the biggest market in terms of volume, Asian and North American consumers have been the main drivers in terms of growth. These three regions account

for as much as 92 per cent of total imports of creative goods. This market concentration has been increasing over the years, as imports from other regions have registered low rates of growth.

Due to the limited availability of detailed trade data, the challenge of estimating the value of trade in creative services is an even greater one than that of measuring trade in creative goods. The UNCTAD classification of creative services includes: Advertising, market research and public opinion polling services; Architectural, engineering and other technical services; Audio-visual and related services; Personal, cultural, and recreational services; Other personal, cultural, and recreational services; and Research and development services. Regrettably, only a minority of countries report their trade in services data at this level of detail.

Based on very preliminary estimates, the value of world trade in creative services stood around US$1 trillion in 2019 (18 per cent of total trade in commercial services). Unfortunately, half of this figure corresponds to imputations and not to actual information.[16] The export growth between 2010 and 2019 is estimated to have been approximately 9 per cent per year, which is much higher than the estimated annual growth of creative goods exports during the same period.

Based on the limited available data, most of which relate to developed economies, exports of services for software development and information systems grew very rapidly, at an annual rate of over 15 per cent, representing one-third of total creative exports in 2019. Within this group, software development is by far the dominant activity. Charges for the use of intellectual property (licenses and other royalties), which was the dominant item in 2010, with 37 per cent of total exports, grew relatively slowly over the decade and stood as only the third item in importance (28 per cent). Creative business services (architectural, advertising, etc.) maintained their relative importance (33 per cent of total reported exports). The relative weight of cultural, heritage and recreational services, shrank over the period and in 2019 stood at only 5 per cent of total creative services exports.

Services can be exported through any of the four modes of supply, two of which are of specific relevance to developing countries. The four modes of supply are: [1] Cross border supply; [2] Consumption abroad (services consumed in the territory of the supplier country such as tourism); [3] Commercial presence (foreign services supplied through commercial presence in the consuming countries); and [4] Temporary presence of natural persons.

Mode 4 is particularly relevant for a large segment of creative services, such as performing arts (an artist travelling to a foreign country for a recital) and professional services (a self-employed architect going abroad to deliver advice to foreign clients). The most common exponent of Mode 2 is tourism, which is a major source of export earnings for many countries, in particular small developing islands. Honeck (2008) shows that a flourishing tourism sector in least developed countries (LDCs) can incentivise local manufacturing, transforming raw materials into high value-added goods.[17] Equally, the presence of creative industries, such as local art and craft, increases the attractiveness of tourist destinations. Phillips *et al.* (2017) claim that this is due to the fact that local art and craft "maintain the quality of uniqueness, and represent an innate connection to the heritage and culture of the destination, as well as the indigenous knowledge and craftsmanship of local artisans".

Creative goods and services are also "indirectly" exported when they are used by other domestic industries that then export their products (Fazio, 2021). This indirect mode of export is better analysed when looking at trade in value-added along Global Value Chains in order to measure the creative footprint of traded products (see footnote 16).

C. The production of creative "intangibles"

Most analyses related to the importance of the Creative Economy for development refer to the commercial value of its production and its contribution to remunerated employment. Yet its contribution to social and cultural development, which may be substantial, cannot be measured only in terms of the commercial

value of its products and services. This non-economic dimension is noted, for example, in the UNESCO 2005 Convention on the Protection and Promotion of the Diversity of Cultural Expressions.

1. Non-market value of the Creative Economy

Frey (2009) points out that cultural goods and services have symbolic as well as commercial value, which can be subdivided into: Existence value (people gain benefit from knowing that it exists); Option value (people value the possibility of enjoying art sometime in the future); Bequest value (people gain satisfaction from knowing that their descendants will be able to enjoy cultural goods and services); Prestige value (people gain satisfaction from knowing that the cultural supply in their city or region is highly valued by persons living outside it); and Education value (people are aware that their cultural supply contributes to their and/their fellow citizens' sense of culture).

Since symbols and culture have some of the features of public goods, it is difficult to value them based on market transactions. Non-market valuation techniques have been developed since the 1960s to address the issue of estimating the benefits gained by consumers of public and mixed goods. Wiśniewska, Budziński and Czajkowski (2020) conducted a pioneer non-market evaluation of cinemas by estimating the change in consumer surplus related to the loss of access to cinemas, museums, and theatres in Warsaw, Poland, based on the observed individual attendances and their costs. The authors find that whereas the benefits provided by cinemas to individuals were substantive, cinemas are practically excluded from public subsidies.

Similarly, free innovations, discussed later in Box 2 (section III.D), do not generate monetary rewards and are not measured by national accounts. Von Hippel (2017) analyses the motivations of the "free innovators" in the household sector of the economy who create an innovation using unpaid leisure time and share their work without protecting their design from adoption by free riders.[18]

2. Territorial assessment of the Creative Economy

Many researchers have used the "territory" as their domain of analysis and have established a link between creative industries and economic development of the area where these industries are established (Correa-Quezada, Álvarez-García, Del Río-Rama and Maldonado-Erazo 2018). Many of these studies have adopted the "Creative City" paradigm (see Box 1), as in Florida (2002). Using regional European data for 1999–2008, Marco-Serrano, Rausell-Koster and Abeledo-Sanchis (2014) show that there is significant feedback (bidirectional causality) between per capita GDP and employment intensity in the cultural and creative industries.

Box 1. The Creative City

The concept of "Creative City" can be traced back to the late 1970s in Europe then in Australia. It was initially a crossbreed of urban planning and sociology that promoted an encompassing view of urban life in cities. When conducting urban development, urban planners were encouraged to facilitate cultural activities and to encourage creativity. This aim was facilitated by the fact that, in general, urban centres attract higher skilled people, who tend to be more open-minded. Florida (2002) synthetises their lifestyle as a combination of three "Ts": "talent, technology, tolerance". In 2004, UNESCO launched the worldwide "Creative Cities Network", a cooperative framework of about 250 cities that has identified creativity and cultural industries as a key element of their development plans.

There is also an economic dimension to the concept of "Creative City", which takes the form of dynamic gains of agglomeration. Economic growth is created by bringing together creative individuals and entrepreneurs engaged in creative industries. As successful creative cities become centres of attraction for more talent and more entrepreneurs, the process is self-reinforcing. They also become academic centres of excellence and foster scientific and technological innovations.

Box 1. The Creative City (Cont'd)

Creating a "Creative City" requires time, resources and a favourable initial cultural and economic environment. In order to start the "cultural reaction" process that generates creative activity, the "Creative City" must be designed in such a way that creative individuals (often informal or underground creators) can meet up with creative entrepreneurs. This process is not usually spontaneous and requires public policy support and urban planning to create "spaces" (physical areas, institutions or associations) where these two types of actors can meet.

A successful programme may, however, also generate negative outcomes, often associated with the process of gentrification of urban centres. Rises in the prices of housing tend to displace previous urban dwellers that cannot afford the higher costs of living.

The lockdowns caused by the COVID-19 pandemic have accelerated the pivot towards digitalization. On the demand-side, households have attended fewer cultural or sport events and consumed more on-line. On the supply-side, remote working during the COVID19 lockdown in 2020 showed that, for many jobs, employees do not need to be physically present. The "open space" model may, in the near future, be replaced by the "dissolving office" with a "liquid work-force" being contracted world-wide (Accenture, cited in Baldwin, 2019). The post-COVID era may, therefore, lessen the role of the territory as "the" Creative Economy eco-system.

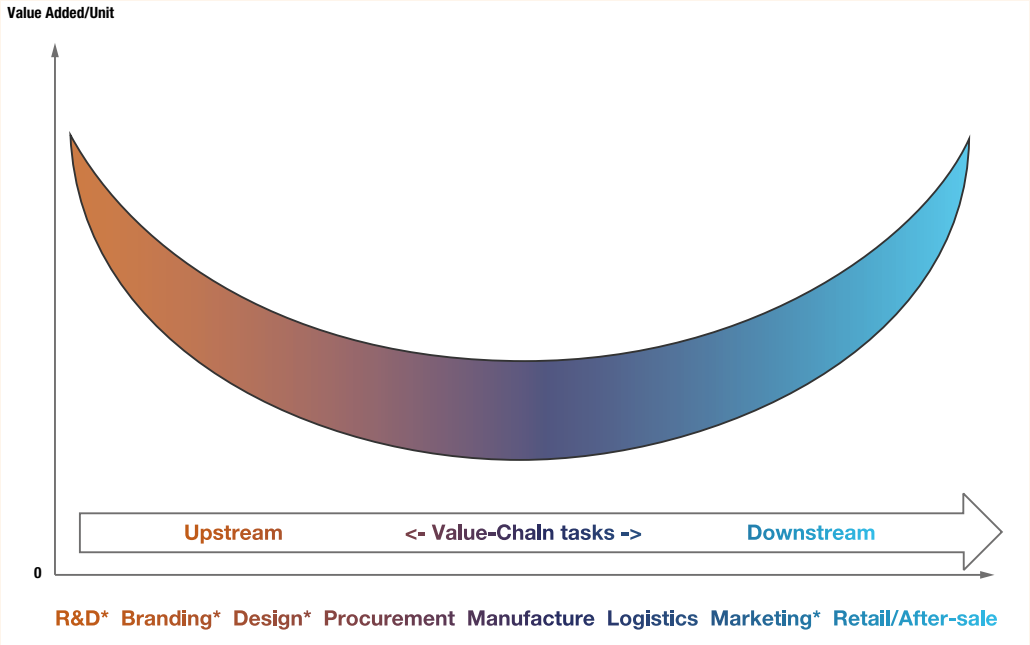
3. Inter-industry spill-over impacts of the Creative Economy

Another approach looks at how creativity in one industry can dynamically influence the productivity and growth of other industries. Downstream creative industries producing and selling final goods and services require creative inputs from upstream suppliers. The relationship runs both ways, as innovative upstream suppliers allow the innovative downstream industry to continue exploring new products and new markets.[19] Bakhshi (2009) shows that interactions between buyers and suppliers within a supply chain can support radical innovations when demand for the final product is unstable, which is the case for many creative businesses.

Spill-overs from the "creative" sector to other industries are closely associated with the notion of "intangible capital", a broad category of knowledge-based assets.[20] Intangibles, by definition, lack physical embodiment. In the 21st century economy, their contribution to economic growth is increasing through the creation of income in global value chains (GVCs), both at the production and at the commercialization stages. To shed some light on the importance of creative functions, it is illustrative to look at the Smile Curve, a major concept used for analysing value in the product cycle.

The "knowledge-intensive" functions requiring high creativity are found mostly in R&D, branding and design (preproduction stages) as well as in marketing, which are classified as "innovation activities" by Crepon, Duguet and Mairesse (1998) and others. GVC tasks range from preproduction (research and development, product design, and branding) to production to postproduction (marketing, distribution, and retailing). It is the firms specializing in pre- and postproduction tasks that organize, manage, and operate GVCs. In general, the more innovative pre- and postproduction tasks add much more value than production tasks to a product manufactured and traded along a value chain.[23] (Inter-agency Global Value Chain Report, 2021).

Figure 3. The Smile Curve



Note: */ indicates activities with a high creative content.
Source: Author, adapted from Stan Shih.

D. The demand-side drivers

Most of the definitions we have reviewed so far focus on the supply side. Yet, demand for creative products may probably play a greater role from a dynamic perspective. Indeed, the notion emerged in the 1990s that people were "global consumers" as well as workers and producers.[21] These "global consumers", often —but not only located in Creative Cities, are what drive the fast-moving segments of the Creative Economy.

UNCTAD and UNDP (2010) highlight the increase in the demand for creative products, which has been a significant driver of the Creative Economy's growth. Cultural/creative products are typically "experience goods and services" for which tastes are acquired through consumption.[22] They are also symbolic goods, whose value derives from cultural values, constructed by imitating others or distinguishing oneself from others (Chang, 2012).

The consumption of symbols is also related to the satisfaction of basic needs in advanced economies: the growth of creative industries in developed nations may simply reflect consumer spending moving on from saturation in other product categories. In other words, creative goods and services are "superior goods" that are increasingly in demand when household income increases. 'Beauty is in the eye of the beholder': if creative industries are producers of symbols and social meanings (Markusen *et al.* 2008), then the symbolism exists only if it exists also in the eyes of (some of) the consumers. For example, the objective of creative workers involved in branding, marketing and advertising is to create in the mind of the consumers an image of social meanings associated with a specific brand. The interaction between producer and consumer is key according to Bakhshi, Hargreaves and Mateos-Garcia (2013), who understand that the core function of the creative talent is to appreciate the 'kind' of effect that is desired and to devise an

original way of achieving that effect without expressing it in precise terms (or in any terms at all in the case of open–ended creativity).

The inclusion of sports in several definitions of creative activities (for example in the United Kingdom and the United States) is probably linked to consumer demand for entertainment, with sports being seen as competing with other segments of the cultural and entertainment industries, such as movies, opera, videogames. At the same time, increasing consumer demand for cultural experiences and products such as crafts and music while on vacation has brought tourism closer to or even within the category of Creative Economy (UNCTAD and UNDP. 2010, p.21).

In some cases, the "creative" character associated with a product resides almost entirely with the consumer. This is the case with musical instruments whose design and production are standardised (even if it requires craftmanship and expertise to make them). It could be argued that creativity mostly takes place when the instrument is played. As an extension of this, in some cases, and thanks to the democratization of advanced technologies, consumers are also becoming the producers of innovative products (see Box 2).

Box 2. The creative consumers

Several recent developments in technology have helped create a class of "creative consumers", as defined by Eric von Hippel (2017). Free innovation, according to this author, is an inherently simple grassroots innovation process, where innovations are developed by consumers. These innovators are self-rewarded for their efforts (through personal utility, learning, and fun) and they give their designs away "for free".

Referring to[23] the results of nationally representative surveys in a selection of six OECD countries, the author finds that from 1.5 to 6.1 per cent of members of the household sector engage in product innovation. That makes for tens of millions of "free innovators", who, as defined by von Hippel, are consumers who develop innovation at a private cost during their unpaid discretionary time and do not seek intellectual property right for their inventions.

General demand is usually irrelevant for these innovators, who care mainly about their own needs. Innovations mainly result either in improving the functionalities of existing products or in solving specific needs of a given community. Von Hippel (2017) cites the examples of a home-display system for remotely monitoring glucose levels that was developed by the parents of a diabetic child, and of an open-source system for printing artificial hands for children and adults in 3-D, among others.

Technological progress and the availability of cheap advanced digital tools have blurred the boundaries between amateur and professional art and craftspeople. Dedicated Internet forums and open-source platforms allow individual creators to develop their innovations collaboratively and share their ideas. As in the case of design tools, von Hippel (2017) forecasts that "virtual reality tools and other new communication-related tools not yet envisioned, will extend the scale and scope of free innovation and diffusion".

IV.

Creative Industry 4.0

The historical concept or definition of the Creative Economy is inadequate to explain the contribution of creativity to today's production and consumption. "Change is in the air" claims Sturgeon (2017) when referring to the imminent arrival of the 4th Industrial Revolution. This "revolution" is driven by progress in information technology and software, advanced production equipment, robotics and factory automation, which are expected to generate a quantum leap in how industries produce, and people consume. In this context, the 4th Industrial Revolution will also change how the creative industries finance, produce and distribute their products and services. The COVID-19 pandemic has played the role of accelerator in the digital revolution. For example, Vlassis (2021) looks at the rise of platforms in the audio-visual sector during the pandemic. A closely related aspect of the de-localization forces induced by Creative Industry 4.0 is analysed below in section III.A.

A. The 4th Industrial Revolution

At the 46th annual meeting of the World Economic Forum (WEF) in 2016, Charles Schwab characterised the Fourth Industrial Revolution as "a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres".[24]

Two key ingredients of the 4th Industrial Revolution will have important implications in defining Creative Industry 4.0. One is that automation systems are becoming cheaper, smarter, and more adaptable by "employing" robots as a technically and economically viable alternative to human labour. The other is lowered costs and greater programming flexibility, which in turn have lowered the volume threshold for cost-effective production. This has also made using robots for niche tasks in companies working with small batch sizes an economically viable choice (Tilley, 2017).

The 4th Industrial Revolution is also about communication and cooperation. One of the components of Industry 4.0 is its service-oriented architecture (SOA), aimed at integrating heterogeneous systems. SOA

has received a great deal of attention as it creates a cyber-physical manufacturing environment that enables communication and interaction amongst all the players in the value-creation chain (Xu, Xu and Ling Li, 2018). SOA enables the timely sharing of information and integration of entities that would not have been able to inter-connect using previous informatic technology. Not only does SOA open the door to more cooperative production in geographically diversified locations, but it also opens the way for new marketing and distribution channels of creative goods and services. As the marketing and distribution of creative products is often identified as one of the main bottlenecks in developing new activities, the following section will look at these aspects in more detail.

Industry 4.0 goes beyond production: it is also changing the way in which products are distributed and commercialised. By flattening the world, technology has changed our understanding of international trade. Globalization today is about more than international supply chains and trade; it also includes trade in ideas embodied in intellectual property. The revenue from intellectual property rights in the United States almost doubled between 2005 and 2018 (from US$64 billion to US$119 billion) and represented about 5 per cent of total United States goods and services exports, according to van der Marel (2021).

Similarly, there is a convergence of taste and consumption patterns among consumers, especially young adults. This, however, has not resulted in a convergence around a unique globalized standard. On the contrary, it has facilitated many business models to co-exist, providing smaller firms with niche-opportunities to compete in a world dominated by large corporations (see Li, 2020, for a definition of business model). This element of Industry 4.0 is particularly relevant when it comes to the Creative Economy, which is characterised by heterogeneity.

It is often said that the special circumstances created by the COVID-19 pandemic have served as an accelerator for many of the Creative Industry 4.0 trends. According to the International Telecommunication Union (ITU), global Internet traffic was 66 times higher in 2019 than in 2005, and the number of Internet users more than doubled from 2010 to 2019 (ITU, 2020). Because of the “stay at home” regime and lockdowns in 2020 and 2021, people were forced to switch to online solutions. The main winners have been the global platforms, such as Alibaba, Amazon, Netflix or Tencent, which are integrating e-commerce and e-entertainment. Vlassis (2021) reviews the rise of global platforms in China and the West, and highlights the issues caused by these oligopolistic structures in Western economies.

The growth in global e-commerce since mid-March 2020 has accelerated (UNCTAD, 2020b). Indeed, international trade in bits is expected to register strong growth in the future. The cross-border business to consumer (B2C) e-commerce market may reach almost US$5 trillion by 2026, against a value of just US$440 billion in 2019.[25] Purchases from mobile devices (m-commerce) are estimated to reach 3.5 trillion in 2021.[26]

With COVID-19 bringing global tourism to a standstill, millions of people in quarantine have been seeking out cultural and travel experiences from their homes. In this process, the crafts industries that rely on visitors to sell their products have seen their businesses collapse. The crisis has put between 100 and 120 million tourism jobs at risk, according to UNWTO, many of which are in small and medium-sized enterprises.

B. When Industry 4.0 meets the Creative Economy

The Creative Economy is not unaffected by the 4th Industrial Revolution. New technologies provide new tools for the creative industry to leverage individual talents or to share and develop new ideas. New technologies also open new channels to reach consumers. However, new technologies present significant challenges for some segments of the creative industry. The related literature on both aspects of this subject is now abundant. Peukert (2018), for example, presents a review of the economic implications of the digital revolution for the cultural industries. His proposals for a new research agenda ranging from digital participation to artificial intelligence can be extended to the wider creative industries. In the same vein, Li (2020) examines how digital technologies may facilitate business model innovations in the creative industries.

1. Creative Industries as incubators of new technologies

Many of technologies that paved the way to Industry 4.0 were born in the workshops of creative workers working on 3D augmented reality videogames. The movie industry has been using computer-generated scenography and animations for decades, with digital fakes playing alongside human actors. Sturgeon (2017) asserts that the new creative capabilities offered by Industry 4.0 should free designers of technical hurdles, allowing them to rely more on their subjective and artistic judgment. Creative activities such as architecture have used computer assisted design (CAD) and 3D rendition software for decades; now, fashion is also using new technologies, as are other branches of art (see Box 3).

New tools promote new ideas. The industry for example has undertaken experimentations with digital technologies at the downstream end of the value chain, by creating new forms of delivering the product to the consumers, from augmented reality to motion capture and motion sensors. Today, advanced artificial intelligence and face recognition techniques allow the creation of synthetic media called "deep fakes", a contraction of deep learning and fake, impersonating actual actors with an almost perfect rendition. With this technology, the industry has the opportunity to revive dead actors and characters with a simple face swap and coordinated synthetic language.[27]

Industry 4.0, with associated technologies such as 5G Internet, is a promising framework for the Creative Economy, as it will be used for integrating and extending design, manufacturing, and distribution processes at both intra- and inter-organisational levels. As UNESCO (2018) recognises, the cultural industry is increasingly hyperlinked, multimedia-based, and interactive. New technologies open up access to digital content, reduce production costs, and increase exposure. For example, prototyping required to test new designs or products can be made easier and faster with 3D printers. The digital economy also creates innovative ways to finance small and micro projects, such as crowd funding.

Heritage activities that preserve old traditional techniques can also benefit from advances in technologies for various aspects of their production cycle, from training and knowledge sharing to procurement and commercialization. The experience of art dealers in developing online viewing rooms (OVRs) and their success in attracting younger buyers are an indication of the sector's strong potential to increase turnovers and diversify sales. This is particularly relevant for developing countries or for minority communities wanting to preserve and develop their indigenous cultural heritage.

2. Industry 4.0 as a threat to some creative activities

Several aspects of Industry 4.0 may pose an existential challenge to some segments of creative activities such as handicrafts. Technology and innovations can allow almost all handmade utility crafts to be "manufactured". Design and modelling software can integrate traditional patterns or shapes in new designs. Industry 4.0, with its capacity to mimic the work and feelings of human beings, can even produce crafts that may be undiscernible from the original products, even mimicking the small variations and imperfections that human artisans make. This is particularly important when considering policy options to achieve the Sustainability Goals (SDGs), since the kind of "natural monopoly" that "the long years required to master the skills required to be a first-class practitioner" craftspeople enjoyed could be rapidly eroded by the new generation of advanced robots guided by artificial intelligence capable of reproducing traditional crafts in mass.

At the same time, Zulaikha and Brereton (2011) argued that traditional crafts can benefit from the "democratisation" of advanced digital technology in Industry 4.0, both for the production and for the sale of their trade. As being hand-made is the distinguishing characteristic of traditional craft production, an innovation strategy should reflect this special craftsmanship. Accordingly, the "traditional touch" of handicraft products can be protected from undue competition by using appropriate Intellectual Property instruments.

The attitude of business owners to the new technologies may be an obstacle to adopting Creative Industry 4.0. Are all the craftspeople up to date with and willing to master the challenges of the digital age? Perhaps

there is a difference in attitude between the artist-craftspeople and the ordinary craftsperson, as posited by Zulaikha and Brereton (2011). The COVID-19 pandemic may have been a turning point in this respect. During lockdowns, artisans had to turn towards non-traditional channels, such as e-commerce platforms to buy their inputs and sell their products.

Box 3. Digital technologies, creation and distribution

At the heart of the fashion industry is the notion of design. Every season, designers must come up with new ideas for the fashion market. To give shape to their ideas, designers have moved from paintbrushes to pixels. In a few years, in addition to their customary creation of patterns and garments, designers will be able to dress virtual mannequins to present their products to the public. Designers will also become a more integral part of the process, moving beyond pure creation to the actual manufacturing of garments, their vision being embedded more deeply into the DNA of their products (McKeegan, 2019).

As in many other creative industries, this sector was affected by supply-chain disruptions, lockdowns, and collapsed international travel during the Covid-19 pandemic. In the global luxury market, sales in 2020 shrank by some 22 per cent, according to consultancy Bain and Altagamma.[28] In response to the Covid-19 challenge, most high-end brands expanded their e-commerce channels. On-line digital sales are expected to account for some 30 per cent of global luxury item sales by 2025.

Digitalization has also helped reduce the effects of the Covid-19 pandemic on fashion. To remain in activity during the lockdowns, Hanifa, a Congolese fashion brand created by designer Anifa Mvuemba, turned to innovative 3D technology. When the brand's runway show in New York was cancelled, Mvuemba transformed each garment into a 3D image and fitted them onto the bodies of moving avatars. In May 2020, she held a virtual fashion show in which each garment appeared to be worn by invisible models strutting across a catwalk. One of the top marketing trends in 2021 is expected to be 3D modelling augmented reality that imitates actual life and improves the shopping experience (Kratovich, 2021).

Even academic fine arts are influenced by Industry 4.0. In 2019, Ai-Da, the world's first robot artist according to its creators, exhibited its creations at a University of Oxford exhibit, and Christie's New York became the first major auction house to auction an AI-generated work. Since 2006, British computer scientist Simon Colton has been developing creative graphics software to turn digital photographs into works of art (Haynes, 2019). In March 2021, a major auction house sold a collage of 5,000 individual electronic images that does not exist in actual physical form. The collage takes the form of a new kind of digital asset, a Non-Fungible Token, which is authenticated by blockchain and certified for its originality and ownership.

While "e-creation" is still in its infancy for academic art, using digital technologies for sales is an established practice. Online viewing rooms and online auction sales are among the digital strategies art dealers most commonly use. Sotheby's was one of the first online auction platforms on the market, going into partnership with Amazon in 1999 and then with eBay in 2003. According to McAndrew (2021), online sales brought an influx of young buyers new to the art market, with 40 per cent of online sales in 2020 coming from young "millennial" collectors. New technologies are particularly relevant for small art firms. Online art sales made up a substantially higher proportion of those businesses' sales, accounting for a reported 46 per cent of the sales of businesses with a turnover of less than $5 million in 2020.

3. Creative Industry 4.0 and development

Creative Industry 4.0 is not a matter for developed economies only. Middle-income developing countries, such as Indonesia, identify the Creative Economy as a potential "gold mine" in terms of finding new emerging markets, particularly for small and medium-sized firms that have access to the appropriate technology (Afriantari and Harikesa, 2020). The authors give examples of local textiles that can be branded as high-end fashion items, in addition to crafts, music, and architectural products. UN-ITC's Ethical Fashion Initiative also looks to connect marginalised artisans from the developing world — the majority of whom are women— with international fashion houses. Among the tools used to this end, the project relies on continuous data gathering, mapping and tracking tools.[29]

Moreover, Industry 4.0 is expected to lower the barriers to market entry for businesses. The availability of smaller and cheaper digitalised tools can help developing countries to move out of low volume hand-made crafts while preserving the originality of their cultural designs. As mentioned by Sturgeon (2017), new digital tools "present opportunities in developing countries where technical skills might be low, but

knowledge of local market preferences is high". These new technologies also create new channels for the marketing and distribution of products, improved productivity and higher volumes of sales, leading to higher income for artisans.

While Rodrick (2018) reminds us that these advanced technologies can be labour-saving, Creative Industry 4.0 can also preserve employment and create new job opportunities by opening new markets and increasing production. Many developing countries, particularly small developing countries, need to explore the new export channels created by e-commerce in order to expand the markets for their creative products. As we shall see below, creatives operating in the digital economy can reduce their size disadvantage by reaching out to customers worldwide.

V.

Creative Industry 4.0 and the future of comparative advantages

Sturgeon (2017) envisages three broad scenarios for the future of value creation in GVCs, each of which having very different outcomes for developing countries. One is the reshoring option, which entails driving a retreat from export-oriented development strategies in developing countries. The second scenario sees the tools of the 4th Industrial revolution empowering firms in developing countries both to move up in the value chain more easily and to become less dependent on the coordination of lead firms. The third scenario is close to maintaining the status quo, utilising comparative advantages in specialised tasks hence maintaining the existing geographical division of labour. These alternative scenarios illustrate the possible changes in comparative advantages in the world of "trade in tasks". These scenarios are also appropriate from a Creative Industry 4.0 perspective.

A. Comparative advantages in trade in creative goods and services

Comparative advantages cannot be measured directly and must be inferred from observing the volume, origin, and composition of trade flows. In other words, comparative advantages are "revealed" by trade data, hence the name Revealed Comparative Advantages (RCA). Balassa (1965) defined one of the first RCA indices. The Balassa formula remains one of the most widely used today, even if many other alternatives have been proposed since then (see Escaith 2020 for a review).

RCA is usually defined as the ratio of two shares. The numerator is the share of a country's total exports of the product of interest in its total exports, while the denominator is the share of world exports of the same product in total world exports. A value of an RCA above one for a given product means that the country has a revealed comparative advantage in that sector. This formula can be applied to both goods and services and serves to identify the potential benefits to exporters of product specialization.

In a world of global value chains, however, such an indicator may be misleading. This is especially the case for products with high creative content when the country where creation takes place (an intangible) differs

from the country where final assembly (building the tangible product) is carried out. Merchandise trade statistics will assign the export value to the country that exports the assembled product, while the actual revenue flows to other country, using different accounting channels for intellectual property, royalties and license fees payments in the respective countries' Balance of Payments.

This is particularly relevant for the Creative Economy: payments for the use of creativity may take the form of patent royalties, trademark royalties, franchises, copyrighted materials, book publishing royalties, music royalties, and art royalties. Well-known brands and fashion designers can charge royalties for the use of their names and designs. Publishers and media pay authors, musical artists, and production professionals for the use of their produced, copyrighted material. These payments are reflected in trade in creative services or as repatriation of profits if the exporting plant is a filial of a multinational enterprise.

Measuring these intangibles is difficult, and the statistical coverage of trade in creative services remains deficient. Yet, the contribution of these intangibles to trade and development is becoming more and more important in contemporary economics. For these reasons, the Inter-agency Global Value Chain Report (2021) dedicates a complete chapter to trade in intangible assets. The Report estimates that intangible assets add on average twice as much value to manufactured products as tangible capital.

B. Creating value: The role of intangibles

In most papers, measuring the contribution of the Creative Economy to economic growth relies on arriving at an estimate of the value of "intangible capital" and income flows resulting from intangible assets: intellectual property, such as patents and copyrights, or other intangibles that are currently not treated as investment in national accounts (such as market research, advertising, training, and organisational capital).

Intangible assets are usually classified in one of three ways: (i) computerised information, (ii) innovative property, and (iii) economic competencies. The first class includes computer software and databases. The second class encompasses all the activities linked to innovation such as R&D, copyrights and licenses. Lastly, the third class includes brand equity (with related expenditure on advertising and market research), firm-specific human capital, and organisational structure. The third category of assets is not directly observable using national accounts.

Positive spill-overs from the creative sector to other industries can take several forms (UNCTAD-UNDP, 2008):

- **Knowledge and artistic spill-overs**, which allow firms to benefit from new ideas, product or process innovations developed by creative firms.
- **Product spill-overs**, whereby the demand for a firm's product increases as a result of creative product development (*e.g.*, increased demand for improved hardware to run 3D video games).
- **Network spill-overs**, also called agglomeration economy, which are closely linked to the notion of the "Creative City": firms benefit from locating themselves close to large clusters of creative industries, typical of film or software production.
- **Training spill-overs**, which are closely related to the network effect, and happen when creative workers trained in one company move to another one.

There are basically two ways of measuring these external effects. One is to conduct specific surveys and develop ad-hoc measurement tools. This approach is intensive in micro-data and best used at a territorial level or for a specific branch of industry. The other is to build an indirect estimate based on input-output modelling, using growth accounting techniques.

An example of the indirect approach can be found in Chen, Los and Timmer (2018), who used the World Input-Output (WIOD) database. They find that investment in intellectual property products (IPP) as defined by National Accounts (computer software and databases, research and development, mineral exploration, and artistic originals) generates an income share of 2.4 per cent of the value-added in manufacturing

GVCs. According to the authors, the observable part of the Creative Economy output can explain only a minor part of intangible income, which stood at 27.8 per cent in 2000.

Alsamawi, Cadestin, Jaax, Guilhoto, Miroudot and Zurcher (2020) follow a similar line of research, using a larger set of developing countries. They find that total intangible capital accounts for about 27 per cent of income in manufacturing GVCs and that this share increased between 2005 and 2015 in OECD countries. The situation in non-OECD developing countries is different, as the return to intangible capital decreased during this period. The authors attribute this to the higher growth of labour compensation in emerging countries and to more competitive domestic markets, which made it more difficult to maintain high rents derived from market power. It would, nevertheless, be a concern if the drop in return to intangible capital reflected lower investment in intangible assets and weaker brands for firms in non-OECD economies (in other words, if it reflected lower investment in creative content).

C. From "trade in value-added" to "trade in income"

As we have seen, knowledge-related intangibles generate income revenues that are not properly measured by trade statistics. To assess the true international competitiveness of Country A, we need to answer how much value-added of other countries' exports translates into the income gains by the residents of Country A. This is particularly relevant to trade in creative products that have a large intellectual property content. But it is also significant for cross-border creative workers (mode 4 of trade in services) when the income earned by these workers does not stay in the country to which they are contributing value added.

Unfortunately, the ways of calculating bilateral "trade in income" are imprecise, and even more so for the income generated by the Creative Economy. The first approach would be to balance the value of exports with the payments for the creative services required to produce these exports. This information, constrained by the above-mentioned limitations on trade in services statistics, is available at sectoral level through the Trade in Value-Added (TiVA) databases. The large incidence of foreign-owned capital in many GVCs implies that profit repatriation is another channel for income being sent back, but this information is not available in TiVA data. The Smile Curve in Figure 3 tells us that a large share of these profits is related to the creative functions.

In a seminal paper, Bohn (2019) compares countries' exports of income with conventional gross export and value-added export indicators. Excluding small countries tax-havens, the United States and Japan are the two countries where trade in income is the highest — 50 per cent and 40 per cent higher in 2014 compared to the domestic value-added embodied in exports. The value of income transfer was so big in Japan that it converted the deficit in the value-added exports of US$72 billion into an income surplus of US$ 95 billion. In general, the author finds that more advanced economies had a higher net income surplus relative to their value-added surplus. The opposite was true for many emerging and developing countries.

From these results, we can extrapolate that the new perspective on competitiveness in "trade in income" depends significantly on the strength of the domestic creative industries and their capacity to create intellectual property. Multinational firms in high income countries improve their international competitiveness by keeping the core innovative functions such as R&D, design, and branding at home and offshore the manufacturing segment to countries with relatively low labour costs. The nexus between a country's creative capacity and its international competitiveness is, therefore, more significant than what traditional trade statistics suggest.

D. E-Commerce, E-Mode 4, and market access

Revealed comparative advantages reflect not only the competitiveness of an economy, but also the relative cost of trade. Even if a country's firms are internationally competitive at factory-gate prices, the additional trade costs erode its production-cost advantages. These trade costs tend to be high in developing countries that are far away from major global markets (*e.g.*, Europe, North America, and East Asia). The

rapid changes in business models associated with Industry 4.0 and the rise of the digital economy is changing this peripheral-country curse.

The growth of the global digital economy has accelerated in the last few years, and its coverage, speed and accessibility have increased dramatically. A few decades ago, UNIDO (2020) recalls, few would have imagined that the largest hotelier in the world would function without owning a hotel or guesthouse, or that a technology start-up could use a single smartphone application to build a US$40 billion taxi business without owning so much as a car.

In the new ecosystem of trade in digital services, or "trade in bits", the ways that firms produce and that households consume have been transformed. Consumers in many countries, developed or developing, have become accustomed to listening to music, following a TV series or radio program, and playing games on mobile devices. Digital tools have also offered opportunities for consumers to behave not simply as consumers but also as the generators of their own content. As a new generation of consumers becomes fluent in digital technology, they become able to co-create their own solutions. On the supply side, creative industries such as media companies increasingly resemble tech companies that use and transform data and online content into high-value services to consumers (Ernst and Young Global, 2014).

A worrying sign is the growing digital divide between countries and regions, and among people. UNESCO (2018) recognises an "imbalance in the trade of cultural goods and services worldwide, with less than 30 per cent of total global exports of cultural goods originating from developing countries" and "an imbalance in the level of access artists and cultural professionals have to create or perform in countries of their choice due to travel restrictions". In the Post-COVID-19 era, where Mode 4 delivery of services will remain restricted, poor quality of digital communication will further handicap low-income developing countries.

1. Trade growth at the intensive and extensive margins

When assessing trade growth, analysts differentiate between the extensive margin and the intensive margin. The extensive margin is related to diversification and can be defined as growth of trade through expanding the varieties of exported products or export markets. The intensive margin is related to the value of existing exports and can be further subdivided into changes in volumes and changes in unit prices for the same varieties of products.

In creative industries, the majority of stakeholders are SMEs, for whom export growth through the extensive margin can be very costly.[30] Growth at the intensive margin, however, also has its limits when the products are "niche products", which is often the case for creative industries. Creative Industry 4.0 offers opportunities to overcome these obstacles at both the extensive and the intensive margins.

A common observation has been that, in digital markets, new technologies and delivery platforms reduce the need for intermediaries. That is, on an online platform, a supplier's ability to offer products or services is not constrained by its storage or logistics capacity as was the case with bricks and mortar stores. Lin (2015) highlights the rapid rate of changes in business models, including online business models of creative industries. These platforms have applications for all types of businesses, opening doors to new digitally connected players (Inter-agency Global Value Chain Report, 2021).

However, after reviewing a series of case studies on computer games, music and television in the United Kingdom, Searle (2011) concludes that while there is evidence that new technologies and delivery platforms reduce the number of intermediaries, they may also increase their strength. His research suggests that the digital era is creating fewer and more powerful intermediaries represented by a few internet-based platforms and social networks. The network effect —the more users a platform has, the more valuable those users find it— favours concentration. As mentioned, this tendency has accelerated during the COVID-19 pandemic (Vlassis, 2021). Digital platforms may also use algorithms that unfairly promote their own products or demand higher fees for greater visibility.[31]

That being said, new business models should be able to combine the vitality of creative activities and entrepreneurship with innovations in information technology. According to Ernst and Young Global (2014), the changes introduced by the new technologies can be summarized as follows:

- **Abundance:** The abundance and immense diversity of content is now taken for granted by today's consumers.
- **Personalization:** The creative industries embody our appetite for more and more personalized content and consumption.
- **Aggregation:** The emergence of "time and content consumption crossroads," such as Google and Facebook, has fuelled market segmentation enabled by big data and the renewed search for relevance.
- **Community:** Social networks and the digitization of community-based economy.
- **Involvement:** The role of consumers has changed. They contribute to the production, diffusion, and marketing of cultural and creative works.
- **Illegal content:** Unlawful copies and dissemination deprive creators of revenues, in some cases making it hard to create.[32] OECD (2021) indicates that new technological advances, such as blockchain, offer various means of genuineness identification to creative producers.

E-commerce offers new opportunities, but it is also a demanding business model. A study by the United Nations International Trade Center (UN-ITC) (2019) on the potential of digital trade for creative industries in Rwanda concluded that where you export to matters as remuneration from exports varies among destination markets. The report recommends, therefore, to tailor production of content to suit specific markets, rather than producing general content for a non-specific audience. Adjusting products according to market demand, therefore, becomes the key to the survival of smaller players.

Creative enterprises in developing countries often lack the resources needed for an ambitious diversification strategy, especially when it comes to exploring culturally distant foreign markets. Diversifying products or contents away from one's natural ecosystem carries a risk, too. Servicing consumers whose values and beliefs are different from one's own may cause misunderstandings and lead to commercial failures (Shahdad and Nakhaie, 2011). Referring to the fashion industry, Richter and Rinnebach (2014) observe that the main brands and retailers are now diversifying into emerging markets, which are experiencing significantly faster growth rates compared to mature and saturated markets. In order to do so successfully, these firms must understand the specific culture and behaviour of local consumers.

The aforementioned UN-ITC study (2019) also highlights the importance of exploring new business models. Most creative businesses surveyed by the ITC study were developed with limited financial and human resources. Their small size forced them to look for synergies with other actors in their local ecosystem (*e.g.*, home-grown solutions such as local e-payment, music and film festivals, and co-production schemes) but also to leverage global digital platforms such as ad-supported free services and revenue sharing with content contributors. OECD (2021) identifies a series of measures to help small entrepreneurs to harness the potential of new technologies such as the use of artificial intelligence or e-commerce platforms. This report also calls our attention to the risks of increased digital gaps between people, places and firms.

New business models may be a (local) solution to market failures. De Beukelaer and Fredriksson (2019) even suggest that IP piracy might actually contribute to the development of local cultural industries. They give the example of musicians in Africa who have accrued fame through media exposure resulting from pirated sales of their music. In some instances, creatives have focussed more on increasing their public visibility as "social media influencers" than on increasing sales of their music, thereby trading e-visibility for brand and product marketing.

2. The death of distance

One of the workhorses of international trade analysis is the gravity model. This model suggests that bilateral trade between two countries is the product of two opposing forces. On one side, there is the attracting force, which depends on the economic size of the trading partners and, on the other, is the repelling force, which depends on the physical distance between trading partners. To extend the analogy, the repelling force can be understood to reflect the costs of trade, which include transportation and tariff and non-tariff surcharges. Other repelling factors are language and cultural barriers that increase the cost of information and hamper the prospect of developing new markets or of negotiating new contracts. These soft barriers are often correlated with geographical distance.

Shifting to internet-enabled trade online can reduce the importance of geographical distance-related trade costs even when goods still need to be physically transported. Analysing intra-European Union trade with a gravity model, Gomez-Herrera, Martens and Turlea (2013) find that distance matters far less for e-commerce than for traditional trade. The rise of digital information technology has even caused some to proclaim the "death of distance" as a contributor to the repelling force. On the other hand, the report also points out that when distance matters less, other factors such as a common language tend to become relatively more important.

Xing (2018) extends the gravity analysis to a panel of developed, developing, and least-developed countries. As there is no specific bilateral e-commerce trade data for these countries, the research focuses on the impact of several ICT indicators on business-to-business (B2B) and business-to-consumers (B2C) types of trade. The study shows that since developed countries are already well covered by ICT networks, trade growth will be greater for those at the lower end of the ICT development spectrum. Fixed line and mobile phone penetration are particularly important for less developed countries, with an increase of 10 per cent in telephony coverage improving export performance by 10 per cent. A 10-percentage point rise in internet adoption leads to an average increase in trade of 1.23 percentage points in general. The positive impact upon trade goes as high as 3.25 percentage points for South-North exports.

Geography also matters for the domestic aspects of the Creative Economy. The importance of the "Creative City" is the clearest example of the benefits of clustering all actors and stakeholders in the same place. The cost of remoteness is particularly high for individual creators but can —and probably will— be alleviated by digital communication and production platforms.

Not only do new technologies offer new opportunities and reduce the barrier of physical distances, but they also compress time. First, the rhythm of innovation is currently accelerating at such a speed that even researchers and policy makers find it difficult to keep pace with the rapid changes in business models. Second, consumer preferences and behaviour are in such a state of flux that they outpace the production responses of content creators.[33] In the novel Through the Looking Glass, the Red Queen tells Alice, "It takes all the running you can do, to keep in the same place." Similarly, Creative Industry 4.0 runs the risk of requiring firms to adapt faster and faster just to stay in the market.

3. The death of market size - Head vs. Long Tails

Another obstacle thought to apply to firms in small developing countries looking for new market opportunities is that of the size of the domestic market. However, here again, the digital economy is allowing firms to bypass "traditional small-market-size limits" by allowing them to reach out to many more customers worldwide. Something similar is observed with crowdfunding investment in music production, where the capacity to reach many potential contributors compensates for the low level of their individual contributions.

As discussed above, as customers have become more reachable across the world, an online supplier's ability to offer a repertoire of content or services is not constrained by its storage or logistics capacities. Even traditional arts and cultural institutions use digital technologies to grow their 'virtual capacity.' For example, over ten million tickets for high–definition live broadcasts from the New York Metropolitan Opera

House have been sold since the series started in 2006 (Bakhshi et al, 2013). These new opportunities are relevant for creative industries as a whole —as illustrated by the Long Tail model— which involves selling a variety of speciality products to different individuals. Selling in the Long Tail, a slow-moving market, is also a way of avoiding the above-mentioned dilemma that the fictional Alice faced.

The Long Tail model was introduced by Chris Anderson the Editor in Chief of Wired magazine in 2004. Most business models target the fat "Head" part of a market (such as the core 80 per cent) in order to recoup the sunk costs of investment through high volumes of sales. If a product is not popular among this 80 per cent of consumers, as measured by their purchasing power, it will not offer a profitable return above the costs of production. Industry 4.0 allows producers to sell in the Long Tail without high sunk costs. In Make to Order (MTO) business models, products can be customized to different consumers' specifications and production begins only after a customer's order is confirmed. With no shelf space to pay for and, in the case of purely digital services, no manufacturing costs and hardly any distribution fees, Industry 4.0 makes selling to the Tail economically viable.

Move To Order and Long Tail marketing also allow suppliers to produce and sell non-mainstream products by betting on the 'wisdom of the crowd'. This is an important feature for the Creative Industry, which in general looks to produce highly symbolic products in small series. An example of the Long Tail in the publishing industry would be selling second-hand books, back number catalogues to connoisseurs, or vintage music albums fondly remembered by long-time fans or discovered anew by others. The market for books that are not sold in the average bookstore may be even larger than the market for those that are (Anderson, 2004). As a result, according to the Long Tail paradigm, almost anything is worth offering on the off chance that it will find a buyer. Benefits from the Long Tail strategy are shared by both producers and consumers. For the creative industry, it is an efficient business model, allowing small firms outside the mainstream market to find customers. For consumers, it provides opportunities to tap a much larger and more diversified market.

Fishing for consumers in the Long Tail marketplace through e-commerce and adopting an MTO business model allows businesses to grow at the extensive margin with a single lump-sum investment (website, etc.) and very low inventories. Moreover, the lump sum investment required to adapt to new technologies is falling.[34] From the perspective of the SDGs, the Long Tail marketplace offers the dual advantage of helping small producers in remote areas and of offering consumers at the lower end of the income range new options. Taking the Long Tail approach may, therefore, help many handcrafters to satisfy both existing and new demand.

By contrast, Bakhshi *et al.* (2013) point out that, for the majority of companies, 'living in the Long Tail' fails to generate significant sales. They attribute the sluggish sales in the Long Tail to an overall decline in demand for artistic products that lack large production and marketing budgets.

VI.

Harnessing comparative advantages in Creative Industry 4.0

Dudukalov and Ushakov (2020) argue that, for all economies, forward-looking modernization policies require "fuller support for life-long education", further development of technological and informational infrastructure, support to innovation and entrepreneurship, and deregulation. They also argue that dialogue with businesses and other stakeholders at local and national levels should be a standard feature of policymaking. Writing from their own experience of living in a transition economy, the authors also caution against the lobbying influence of sectorial interests in shaping policies. Taking an inclusive approach is what differentiates "smart" industrial policies from traditional "vertical" industrial policies.

A. Smart industrial policies

When industrial policies target global value chains, they are often called "smart industrial policies", perhaps to differentiate them from old-style import-substitution policies. This could also be because GVCs include so many actors at local, regional, national, and international levels that applying a traditional vertical or "silo" style public policy would not work.

For small developing economies that do not have competitive advantage in a large array of products, of which there are many, joining a complex international supply chain may be a means of finding a suitable niche in the value chain (Escaith, 2013). Taking the value-chain approach to figuring out a smart industrialization policy requires, first, that the policy be cross-sectoral and pay attention to firms in diverse productive sectors. Second, the policy needs to be granular.[35]

In particular, public policies must not succumb to the temptation of trying to 'pick-the-winner', especially when new technologies compress both distance and time. A smart Creative Value Chain policy is, therefore, one that is based on a dialogue between public and private actors, identifies main bottlenecks and defines stakeholders' priorities. Michael Porter's approach to industrialization (1985) suggests that public and private actors can and should pursue cooperative strategies to create high-value products that can be sold on the international market.

There should also be a dialogue between the central administration and local governments. Involving the territorial dimension in any GVC strategy, including one focused on creative industries, is critical to avoid the persistence of 'enclaves', such as export processing zones, and to facilitate the incorporation of more domestic firms in the value chain. One of the key characteristics of a GVC is that domestic content of exports is determined not only by the first-tier exporters, but also by their network of domestic suppliers, which are often small and medium-sized firms.

A Smart Industrial Policy aimed at fostering Creative Industry 4.0 is likely to be one that focuses on the development of a creative innovation system. According to Bakhshi *et al.* (2013), fostering the Creative Economy requires:

- a well-articulated education system, including schools as well as universities, colleges, and training providers, which supplies talent with the right mix of skills;
- fiscal incentives and funding programs to nurture R&D in the creative industries;
- a financial arm to provide content sectors that are often perceived as a high-risk segment with better access to venture capital (Bazalgette, 2017);
- a competition regime that protects intellectual property, provides a balanced copyright regime, avoids abuses of dominant positions, and acts swiftly to remedy them; and
- the issue of a "balanced copyright regime" (protection of copyrights vs. right of access to culture). In the context of low-income developing countries, this is a complex matter according to De Beukelaer and Fredriksson (2019). For, while the use of the "cultural exception" may be an effective means of shielding local creative producers from foreign competition, the ultimate effect on the community may be to hamper citizens' right of access to culture. On a related topic, Neuwirth (2005) reviews the treatment of cultural industries in international trade laws.

The above-mentioned policy elements are of the horizontal type, in the sense that they impact all activities and all consumers in society. Bakhshi *et al.* (2013) add another policy layer that aims specifically at the creative industry: to offer non-market support to the publicly subsidised arts and cultural sector. Creative activities that are not commercially viable may still possess some of the characteristics of a "public good" as discussed on market and non-market contributions in section III.C.1. Public support enables these activities to exist when doing so in a purely commercial environment would be difficult or even impossible.[36]

Additional challenges in designing a policy to foster the Creative Industry 4.0 stem from the heterogeneity of creative industries, and the attitude of the business owners to new technologies. When it comes to creative industry development, the different regions of the world face different challenges and have already applied heterogenous measures to achieve that end. In other words, recommendations on policy measures need to be context specific. Despite this, Bakalli (2015) calls for UNIDO to develop a holistic approach and validate a methodology for the sustainable and inclusive development of micro and small enterprises in the creative sector.

Craftspeople may nurture negative attitudes towards business and marketing concepts, which would stand as a barrier to change.[37] Their fears and misgivings may be assuaged through policy instruments that allow craftspeople to test out new technologies for digital fabrication. Such an approach was widely used in the past in agricultural extension programs. Fabrication laboratories (fab labs), a digital fabrication network, have stepped into this policy space by showing creatives throughout the world that they have the potential to create smart devices by themselves. Fab labs, usually linked to universities, try to help designers to rapidly realise their first prototypes and improve their connections with other stakeholders.

Various programs, implemented by official and non-governmental organizations, whose aim is to foster artisans' e-market readiness already exist. Among them, UNCTAD's eTrade Readiness Assessments program provides a snapshot of the e-commerce ecosystem in developing countries.[38] Similarly, OECD governments have introduced policies aimed at increasing small entrepreneurs' use of online platforms, through awareness campaigns, consultancy vouchers, self-assessment tools or training (OECD, 2021).

In this respect, it is important to note that the creative industries eco-system is a very competitive environment, even for non-commercial ventures that need to attract public or private sponsors. There is still much that needs to be learned about the design and implementation of digital-friendly business models in many parts of the creative and cultural sectors. The next section will show how this knowledge gap hinders the design of adequate public policies at both national and territorial levels. The network dimension is particularly important in Creative Industry 4.0 since it gives countries with a large diaspora a comparative advantage that may prove decisive when it comes to overcoming barriers to internationalization.

B. Overcoming barriers to internationalization

Digital technologies, in particular Internet-based platforms, are instrumental in overcoming barriers to foreign market access (OECD, 2021). Looking at the specific case of small and medium sized-entreprises (SMEs) engaged in crafts, Fillis (2004) comments that the Internet also exposes entrepreneurs to a wider world, leading to an increased awareness of global issues. The overall findings in Xing (2018) confirm that the level of ICT infrastructure and readiness to adopt e-commerce play an important role in boosting export growth, especially for those creatives who are in developing countries. The following section looks at the various dimensions of e-commerce readiness.

Even in large emerging countries, some segments of the Creative Industries are unprepared for the new economy. This is particularly so for the crafts sector in rural areas, despite the fact that this sector may potentially benefit more than most from new communication technologies. For example, when reporting on Indonesia, Zulaikha and Brereton (2015) mention that the development of information technology has smoothed both transaction and negotiation processes between craftspeople and their business contacts, which include buyers, capital or material providers, and government and other institutions. They, nevertheless, warn of the "negative consequences of relationships caused by misunderstanding" unless the application of ICT is "appropriate to the knowledge, social and economic systems of rural people".

In brief, the availability of technologies is not in itself sufficient. The need to have a credit or a debit card in order to complete transactions represents a barrier for some creatives. Even opening a bank account may prove a constraint in many LDCs. It is, therefore, essential to facilitate access to ICT technologies and to provide adequate hard infrastructure including postal services, financial services and transport networks. It is also important to empower creative workers to make the best of new opportunities created by new technologies. This is an issue of developing soft infrastructure, which ranges from human capital to favourable institutional environments.

An essential part of the domestic agenda of governments in developing their digital economy should consist of the establishment of legal frameworks to reduce uncertainties associated with e-commerce in areas such as consumer protection, data privacy protection, e-payments, facilitation of e-commerce, and cybersecurity. UNCTAD (2021) observes that many developing countries currently do not possess national laws regulating domestic e-transactions and online consumer protection, for instance.

As mentioned earlier, new artificial intelligence assisted robotics can replicate almost perfectly hand-made artisanal crafts and artefacts, allowing cheap but high-quality reproductions to be made anywhere in the world. There is no way to stop technological progress of this sort being made. However, modern trade governance offers new ways of protecting the know-how and the originality of traditional creative artisans.

WIPO (2016) reminds us that handicrafts have three components that can be protected by distinct forms of Intellectual Property: reputation (due to style, origin or quality); external appearance (shape and design); and know-how (the skills and knowledge used to create and produce). Know-how can be protected by patents or as a trade secret, external appearance can be protected by copyright or industrial designs, while reputation can be protected by trademarks, collective or certification marks, geographical indications or unfair competition laws. Blockchain technology offers new ways of tracing product genuineness (OECD, 2021). These international property (IP) tools should be part of any trade and industrial development policy aimed at promoting the exports of creative products, avoiding the erosion of comparative advantages and protecting creative workers.

VII.

Conclusion

Creative Industry 4.0 is expected to benefit from the opportunities brought by new technologies. On the design and production side, the study has identified four types of opportunity: enhanced efficiency, unrestricted creativity, greater interactivity; and flexibility that facilitates cost-effective customisation. The potential of knowledge-based creative products is not limited to the digital creative industry; It is also relevant for more traditional art and craft activities.

This report has also highlighted gaps in measuring the weight of the creative industries in the economy. With the apparition of new creative products and new creative functions made possible by advances in technology, the gap is only growing. The influence of Industry 4.0 on the Creative Economy calls, therefore, for a renewed discussion on how we measure creative goods and services.

The availability of smaller and cheaper digitalised tools helps developing countries to move out of low volume hand-made crafts while at the same time preserving the originality of their cultural designs. Commercialization of creative products and services has become easier and cheaper, allowing businesses to enter new niche markets. Without access to the Internet, many creators would have found it almost impossible to start a business selling their own products or services.

Yet, as mentioned above, not all segments of the Creative Economy are ready and able to benefit from this potential. This is particularly so for handicraft producers in rural areas. The availability of technologies to many producers of creative products and services remains insufficient. We need to ensure an adequate provision of necessary infrastructure, programs to empower workers to make the best of new opportunities, national, regional, and international legal frameworks to support SMEs and consumers in e-commerce, and modern trade governance to protect the know-how and creativity of individual artisans and small businesses.

ENDNOTES

1 Throsby, David, 2000. Economics and Culture, Cambridge Books, Cambridge University Press. Caves, Richard E, 2000, "Creative Industries: Contracts between Art and Commerce", Cambridge, Mass., Harvard University Press.Howkins, John, 2002, Creative Economy: How People Make Money from Ideas". London, Allen Lane.

2 Also interesting the recent article for some further discussion: Angelini, F., Castellani, M. Cultural and economic value: a critical review. J Cult Econ 43, 173–188 (2019).

3 Joseph Schumpeter (1883-1950) identified innovation as the critical dimension of economic changes and universalised the term "creative destruction". Theodore Levitt (1925–2006) is associated with innovation and the product cycle approach in the 1960s; he also popularized the term globalization.

4 See https://catalogue.nla.gov.au/Record/1948332

5 It may be interested to check Canada`s Cultural Satellite Account and how it approaches the definition at https://www.canada.ca/en/canadian-heritage/corporate/publications/general-publications/culture-satellite-account.html

6 UNESCO defines cultural goods and con sumer products that convey ideas, symbols and ways of life, i.e. books, magazines, multimedia products, software, recordings, films, videos, audio-visual programmes, crafts and fashion.

7 It may be worth noting that here that the Oslo definition of innovation has been important in expanding the scope of innovation studies to include not only product, but process and business innovations.

8 The issue of unemployment, which is ranked first in this list, is not restricted to developing countries. Discussing the rural silk weaving industry in Japan, Tanimoto (2006) concludes that traditional crafts sector provides opportunities to workers that were not absorbed by the modern industrial sector.

9 The distinction within a creative organization between those performing a creative function and the support staff is a politically sensitive issue. For example, Markunsen *et al.* (2008) consider that Florida (2002, 2003) definition of the "creative class", which makes this distinction, is "both crude and politically repugnant" (p. 27).

10 'Handicraft sector's biggest enemy is its name! Call it 'creative manufacturing', S. Khetarpal- Business Today, October 30, 2020.

11 In Indonesia, which brought the 2021 International Year resolution to the United Nations General Assembly, the Creative Economy contributes 7.4 per cent to the nation's GDP. It also employs 14.3 per cent of its workforce: from craft to gaming, fashion to furniture. It compares with only 0.54 R&D worker per thousand employees contributing 0.2 per cent of GDP (source UNESCO).

12 Sourced from https://www.unwto.org/cultural-tourism-covid-19.

13 Based on surveys, the data cover researchers, technicians and other support personnel involved in R&D activities in private and public sectors. Sectors of employment are business enterprise, government, higher education, private and non-profit. Fields of research includes natural sciences, engineering and technology, medical and health sciences, agricultural and veterinary sciences, social sciences, and humanities and the arts.

14 This regional grouping is far from being optimum, but I used it to provide comparable data.

15 Without entering into details, such an approach would mix at least three types of data: trade statistics, input-output tables and employment surveys. The first step is to measure the contribution of creative functions by industry, then to measure the direct and indirect creative contribution of each industry in exports.

16 Imputations are made applying to the aggregated services exports reported in balance of payments the more detailed structure observed in similar countries.

17 Honeck (2008) mentions in particular traditional clothing made of local cotton and sold directly to visiting tourists.

18 A major reason for this, according to the author, is that investing time and money to realize the profits attached to innovation has opportunity costs. Innovators may choose the path of free innovation because they prefer to use their time and money to follow other opportunities. Another motive for free innovation is that of self-reward or expectations of generalized recognition and reciprocity from their community.

19 In the type of specialised supply chain characteristic to innovative products, both buyer and seller of intermediate inputs have high domain specific knowledge, innovation attempts are marked by a high degree of knowledge overlap and cross-fertilization (Roy, Suvakumar and Wilkinson, 2004).

20 Economic growth is understood here in its national accounts definition, and measured by an increase in the real value-added generated by domestic industries.

21 As The Economist (March 13th 2021) remarks, the latest incarnation of global consumers looks likely to change how economics works. The new shoppers (N.B.: those who drive demand for the Creative Economy products) are "value-conscious and project their ethical values in their decision about what to buy".

[22] As mentioned by the author, cultural/creative products are often symbolic goods, whose value derives from cultural values, constructed by imitating others or distinguishing oneself from others.

[23] According to the author, this "no-cost" type of innovation has a price: free innovators generally have very little incentive to invest in diffusing what they create, which reduces the social value of their efforts.

[24] See https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/

[25] Sourced from https://www.fnfresearch.com/cross-border-b2c-e-commerce-market-by-category-852 and https://unctad.org/news/global-e-commerce-jumps-267-trillion-covid-19-boosts-online-sales

[26] Ch. Petrov '65 Wowing M-Commerce Statistics for 2021', available at: https://techjury.net/blog/mcommerce-statistics/

[27] As revealed by the website Tech Times: "Disney Is Using Deepfakes and Facial Recognition to Bring Back Dead Actors" 2 July 2020.

[28] 'The Future of Luxury: Bouncing Back from Covid-19'. Available at: https://www.bain.com/insights/the-future-of-luxury-bouncing-back-from-covid-19/

[29] See the dedicated UN-ITC website at: https://www.intracen.org/itc/projects/ethical-fashion/

[30] In the United Kingdom, for example, 90 per cent of creative businesses have no more than five employees, 80 per cent no more than two, and 60 per cent just one self-employed entrepreneur (Bazalgette, 2017).

[31] Creative products may be best placed to avoid being buried in search engines, as they are often described by very specific keywords that are more likely to be used by connoisseurs in search of a specific artifact or service.

[32] Nevertheless, Searle (2011) reports that a common attitude in the United Kingdom creative industry was that piracy would always occur and should be minimised, but that it was more important to focus on creating new content.

[33] Changes in consumer behaviour is characterised, according to Searle (2011) by two main themes: opportunities and increased competition. Opportunities creates a potential for success for the business models that are tailored to this behaviour. At the same time, increased competition in the form of both imitation (with or without piracy) and newer business models challenging existing ones.

[34] As reported by Dümcke (2015), the "business model" concept has been historically defined by "emphasizing value creation as a part of managing the development of new emerging technology" (p.4). Many different definitions of business models coexist. A business model is expected to (i) describe the rationale of how an organization creates, delivers and captures value;(ii) outline how a firm can successfully deliver value to its customers; (iii) underline core logic and strategic choices for creating and capturing value within a value network; (iv) shed light on the assumptions about how an entrepreneur or an organization create value and turn it into economic, social and or cultural output.

[35] For Dutta (2021), a systemic assessment of the value chain requires identifying all stages that contribute by adding value to the end-product and help moving it towards the end markets: End markets (creating value for the final user should remain the centre of attention); Business enabling environment (global, national and local norms and laws, public infrastructure); Vertical linkages between firms at different levels of the value chain; Horizontal linkages, both formal and informal, between firms and stakeholders that reduce transaction costs and contribute to efficiency and competitiveness; and Supporting markets, including financial services, legal and business consulting, and sector-specific actors (*e.g.*, procurement and marketing cooperatives).

[36] Yet the authors are not naïve about the risks of free riding and mention that this sector "may need incentives from its funders to undertake digital innovation to maximise audience reach and value. It may further need incentives to promote spill overs between the subsidised arts and the commercial Creative Economy".

[37] Fillis (2004) mentions in his research on United Kingdom and Irish crafts industries that craftspeople do not feel comfortable with the word 'market' and tend to follow their own creative instincts. It often implies not responding to market demand in order not to 'lose touch with the product'. The author concludes that "there is a dichotomy of 'art for art's sake' versus 'art for business's sake beliefs. Those following the former approach have no particular wish to embrace marketing […]. Conversely, a number of entrepreneurial marketers […] have used their creative strength to achieve both domestic and export market sales."

[38] See https://unctad.org/topic/ecommerce-and-digital-economy/etrade-readiness-assessments-of-LDCs

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Layout and Printing at United Nations, Geneva – 2200316 **(E)** – March 2022 – 432 – **UNCTAD/DITC/TNCD/2021/3**