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Education-driven university-industry cooperation: A comparative analysis of European Union and Chinese policies and practices with special focus on the creative industry sector

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Abstract:
The article explores the similarities and differences in education-driven university-industry cooperation policies and practices in China and the European Union (EU), focusing on the creative industry sectors. Through a comparative analysis of policy histories, top-down and bottom-up practices in both geographical/political entities, the paper reveals that China emphasizes "deep integration" by establishing Modern Industrial Colleges and Future Technology Colleges to create an organic connection between education, research, and industry. In contrast, the EU promotes synergy through the "Knowledge and Innovation Communities" framework and supports grassroots innovation projects and transnational collaborations. The comparison is enriched by the presentation of concrete cases illustrating differences and similarities. The article concludes that China and the EU are complementary in their approaches to university-industry cooperation: China's deep integration model offers insights for the EU, while the EU's grassroots innovation and knowledge-sharing mechanisms may provide inspiration for China. The paper recommends further comparative studies to enhance mutual learning and collaboration between the two geographical/political entities in education and industry cooperation.

1. Introduction

Supporting university-industry cooperation (UIC) is a high-level policy priority in China and the European Union (EU). In both geographical/political entities numerous local and institutional initiatives are actively pursuing this goal. UIC policies and practices in China and the EU show many similarities, but they also have significant differences, offering rich opportunities not only for comparison but also for mutual learning. This paper seeks to illuminate these similarities and differences to foster mutual knowledge sharing.

Enhancing UIC has become a policy priority due to the recognition of its positive impact on both the quality of teaching in universities and the innovation capacities and competitiveness of industry. This is reflected in the concepts of Triple Helix and Knowledge Triangle which have inspired policies of innovation and higher education development in many countries. The Triple Helix model was developed to explain why certain countries or regions produce ground-breaking technologies and experience outstanding industrial innovation dynamism, while others do not. This influential model, introduced in the mid-1990s by the Dutch and American researchers Leydesdorff and Etzkowitz, aimed to explain the emergence of "high-tech conurbations", such as Silicon Valley in California and Route 128 in Boston (Galvao et al., 2019; Amaral et al., 2024). Studying such cases they came to conclusion that innovation and economic development

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are generated by the dynamic interactions between three key actors: academia, industry and government. This can be illustrated by the example of a professor who benefiting from a favourable regulatory environment created by the government offers consulting services for a company, using his/her scientific knowledge to solve practical problems and to increase the knowledge capital of the company, and at the same time he brings his experiences from the business world back to the university to enrich both his research and teaching.

In the EU, committed to enhance innovation-driven economic growth, the original Triple Helix model was transformed into another model called Knowledge Triangle. The "academia" pole was divided into two separate parts: "research" and "education" and, as the whole dynamics was seen from the innovation policy perspective of governments, the "government" pole was dropped from the model. The pole "industry" naturally remained part of the model, but its name was changed to "innovation", meaning basically industrial innovation (see Fig 1) or often "business", suggesting a broader conception of industry. Separating research from education allowed for a stronger emphasis on the teaching function of universities, a focus that was largely overlooked in the original Triple Helix model. The Knowledge Triangle model has offered an effective conceptual tool to the EU to guide not only innovation or industrial policies but also policies aimed at modernising education (Maassen& Stensaker, 2011; Jávorka, 2016).

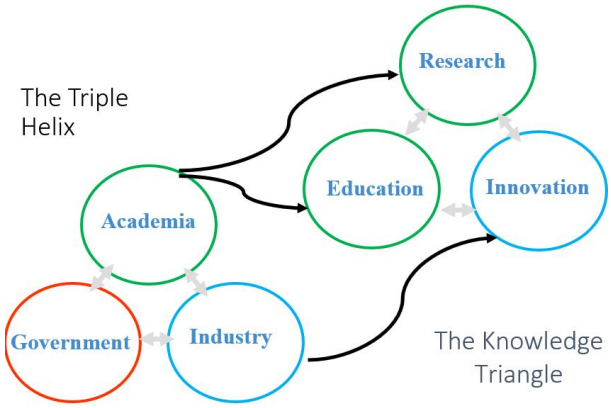

Fig. 1. From the Triple Helix to the Knowledge Triangle.

The Triple Helix model has significantly influenced innovation thinking and policies both in the EU and China (Zhou, 2008; González et al., 2019). The idea of the Knowledge Triangle (zhīshi sānjiǎo) has also influenced innovation thinking in China, which has been "closely following what Europe is doing to reform and develop its higher education and research system"(Song, 2010). The authors of this paper think that with its recent university-industry integration (UII) policy China has developed a probably more advanced, influential and sophisticated application of the Knowledge Triangle model than what we can see in the European Union, where it originated.

Compared with the Triple Helix model, the Knowledge Triangle offers a conceptual framework that, as mentioned, supports better the direction of the focus on education-driven university-industry cooperation (EUIC). This form of UIC has long been rather neglected in research on UIC (Zhuang & Shi, 2024; Borah & Malik, 2014; Orazbayeva, 2020; Plewa et al., 2015). The fact that education has become one of the poles of the triangle naturally leads not only to the question of how education can contribute to industrial growth and innovation but also to the question of how cooperation with industry can enhance quality and innovation in education. This can encourage policymakers and institutional leaders to consider how UIC might serve as an effective tool for enhancing teaching quality and modernizing the entire higher education system.

2. Methodological notes

Justifying a comparison between a country (China) and an international institution (the EU) might be important especially for comparatists who often focus on cross-country similarities and differences. Although the EU is not a country, as a supranational political entity it shows many similarities with countries (especially confederative states), having legislative power, strong executive capacities, geopolitical missions and specific cultural identity. This kind of comparison can help us better understand our own national systems, and foster mutual learning and understanding as much as classical cross-country comparisons.

In this paper, we use a comparative historical policy analysis approach supported by specific cases to illustrate and contextualise the presented policies and practices. We use the term policy in a broad sense, acknowledging that it "could be considered to be a text, a process, a discourse, a political decision, a programme, even an outcome" (Blackmore & Lauder, 2005). The comparative historical approach helps us understand policy evolution processes (how policies develop over time and what political, social and economic factors drive them) and draw policy lessons (what contemporary policymakers can learn from historical examples and how past policies can condition current practices).

We add specific illustrative cases to the analysis in order to avoid the risk of presenting only "the assumptive worlds of policy makers" (Halpin, 2005), that is, to contextualise policies and to help the reader to see better local/institution practices created or enhanced by these policies. While these cases do not represent the totality of existing local/institutional practices they can demonstrate well their richness and diversity. This contextualisation is supported by presenting cases from one specific sector or professional area: the creative industry and design education. This choice can be justified by the fact that this sector appears much less frequently in the UIC literature than classical industrial and professional areas, such as manufacturing or engineering (Taylor, 2007; Comunian & Smith, 2014).

2.1 UIC policies and practices in China and in the EU

Comparing the development and the current state of UIC/EUIC policies and practices in China and the EU may bring several benefits. Given their long and rich histories of

supporting UIC and EUIC, examining these developments – focusing particularly on common challenges, specific solutions, relevant experiences, and effective practices – may help both regions better understand this complex area, recognize opportunities, and learn from one another.

In this part of the paper, we offer a short analysis of the history and state of UIC in the two geographical/political entities focusing on similarities and differences. Before doing this, however, it is important to clarify what we mean using the letter "I" in the UIC abbreviation, that is, designating "industry". We use a broad definition in which industry encompasses virtually any organized effort to create value in society, transcending the traditional narrower meaning of the term focusing mostly on manufacturing. This broad definition places industry into the context of the knowledge and service economy.

2.2 China

One of the first things the western observer might notice when reading Chinese policy documents or related academic literature is that the most frequently used term to describe the relationship between education and industry is not "co-operation" but "integration". In Chinese thinking and practice the boundaries between the two sides are much less sharp than in Europe, as sometimes expressed by the formula "the factory in the school and the school in the factory" (Molnar & Koen, 2015). This idea was originally inspired in the fifties of the last century by the Soviet model promoting the integration of education and productive labour, with the aim of combining the impartment of academic knowledge with the development of practical skills. The radical realisation of this idea was a key element of the Maoist thought which during the Cultural Revolution led to a significant disruption of university education as a social institution separated from the world of work. The idea of integrating theory, learning and schools with practice, work or life has also been inspired by traditional Chinese thinking going back to ancient times (Di & McEwan, 2016; Ye, 2020).

The integration of education and industry in China typically took shape between the 1950s and mid-1990s, within the Chinese institution of Dānwèi, translated into English as "Work Unit". Many Dānwèis were large state-owned companies that functioned not only as production units but also provided all kinds of social care services to their employees, such as food, medical care and education, including schools which were organisationally integrated with the company (Lü & Perry, 1997). Universities also operated as Dānwèi, as they often established factories or other kinds of production units which were organisationally integrated with the university. While in the nineties factory schools were separated from their founding company and put mostly under the supervision of local and provincial governments, the status of companies created by universities could remain unchanged. The institution of Xiàobàn qǐyè, translated into English as "university-run enterprises", has been a special feature of Chinese higher education also after the restoration of the traditional university sector following the policy of opening up, and these enterprises have often been established by leading research universities (Han, 2013; Li & Tan, 2020).

A more recent development that could be interpreted as a kind of advanced form of the earlier university-run enterprises are the Modern Industrial Colleges (Xiàndài chǎnyè xuéyuàn) (Liu, 2022; Wang & Wang, 2024). Typically, these are common ventures of universities and companies resulting in the creation of specialised faculties or schools within universities or in industry parks, funded and controlled by both sides. Modern Industrial Colleges have created especially favourable conditions for deepening university and industry integration covering all aspects of teaching, research and the third mission.

These forms of deep integration of universities and industry were present in China long before the new western ideas of Triple Helix, knowledge transfer and Knowledge Triangle penetrated into the country. Some researchers, analysing the Chinese history of UIC, describe this process in terms of three or four consecutive development stages. One author, for example (Nan, 2019), described three stages: (1) early integration, (2) separation and (3) new integration. In a similar logic, another author (Ouyang, 2020) mentioned four stages: (1) integration, (2) separation, (3) cooperation and (4) integration. During the separation period the traditional education/research function of universities was restored, meaning also detachment from industry. However, the emergence of modern innovation and research policies, inspired, among others, by the ideas of Triple Helix and knowledge transfer, resulted in efforts to strengthen cooperation with industry which in the last decade led to the rebirth of the move towards (deep) integration. This stage can be connected to the decision of the Chinese State Council in 2017 to "deepening the integration of industry and education" (State Council, 2017).

This decision gave a strong impetus to local initiatives, often supported by provincial and municipal governments, leading to the emergence of various forms of cooperative actions between universities and companies that can be described as deep integration. This often means co-action covering every operational fields of higher education as illustrated by the example of a university in Southern China defining "nine joint actions" areas, such as "joint governance and culture development, joint development of program syllabi and curricula, joint building of faculty teams, joint research on applied technologies, joint development of industrial standards, joint development of qualifications and certificates, joint provision of innovation and entrepreneurship education, joint engagement in modern apprenticeships and community services, and joint establishment of overseas TVET skill development centers" (Lin & Pang, 2024).

Regarding the differences and similarities between the early stage of integration and the current trend of "deep" integration two major elements need to be highlighted: one related to innovation and knowledge transfer, and the other with the contribution of industry to the modernisation of education. While the symbiosis of universities and industry in the early stage of development was determined by ideological goals and fundamental material needs, the current policy and practice of UII is led by intentions to use innovation as a main engine of improving economic competitiveness in the

global knowledge economy and to use knowledge transfer from universities to industry as a tool to promote industrial innovations. Similarly, while in the early period combining education and industrial work was guided by ideological considerations and was perceived as a way of reforming the "old" education system, in the current period integration it is used as a tool to channel advanced technological knowledge to schools often criticized for teaching obsolete knowledge.

2.3 The EU

For those readers who are not familiar with the European Union it might be useful to evoke some specificities of this unique geographical/political entity, especially in the context of the comparative approach of this paper. Although in some respects the EU might behave like a country, it is an economic, political, social and cultural alliance of sovereign member counties based on a treaty between them. However, unlike international inter-governmental organisations, the EU is only partially controlled by its member states as, during the past decades, they delegated their sovereign power to this supranational entity in many policy areas. There are competing theories trying to explain the unique political nature of the EU, some of them maintaining that the EU has remained under the control of its member states, while others underlying the capacity of the EU to act autonomously similarly to sovereign countries (Wiener & Diez, 2004).

Education is one of those policy areas where member countries have been reluctant to delegate their sovereign power to the EU (Pépin, 2007). However, especially in the last two and a half decades, the EU developed a large repertoire of policy instruments, such as the use of organisational capacity, financial incentives and ideational impact, and much less regulatory tools, that made it possible for it to go beyond what member countries do, exercising an increasing influence on their national policies (Halász, 2013; Krejsler & Moos, 2023). Higher education is not exception: the EU acts also in this policy area as a major initiator of new policies, strengthened by its earlier strong historical role in the area of research and innovation policies (Curaj& Pricopie, 2020). Furthermore, in higher education national academic communities also have preserved their power, although counterbalanced by powerful EU level supranational networks, such as, for example, the European University Association.

Earlier developments in the EU show a rather sharp contrast with what we saw in China. A key element of the European university ideal, inherited from the Middle Ages, has traditionally been autonomy and independence from the outside world, especially from business. When, in the middle of the 2000s the European Commission proposed a new modernisation strategy for higher education, "insularity" (universities being "insulated from industry") was identified as a major bottleneck of European higher education (Commission of the European Communities, 2005).

However, supporting UIC has long been a high-level priority in the European Union. The EU's first education-related program, initiated in the mid-1980s, aimed to connect universities with companies across member countries, facilitating opportunities such as cross-border internships for students and educators. When the European Commission first proposed a common policy strategy in the field of higher education in the early nineties, connecting HE with regional development was one of the proposed priorities, and UIC appeared as a key element of this (Commission of the European Communities, 1991). Later, in the middle of the nineties, the European Commission presented its first overall education development strategy, and one of the proposed five priorities was "bring school and the business sector closer together" (Commission of the European Communities, 1995).

The major break-through, however, happened in 2000 when the heads of the Sate of the EU adopted the "Lisbon strategy" – an ambitious longer-term modernisation program – which, among others, stated that "learning partnerships should be established between schools, training centres, firms and research facilities for their mutual benefit" (European Council, 2000). This was reflected in the EU education sector strategy, which outlined three strategic objectives, one of which emphasized "opening up education and training systems to the wider world" with a strong focus on school-business partnerships (The Council of the European Union, 2022).

During the decade following the adoption of the Lisbon Strategy, several specific initiatives were made with the goal of promoting UIC within the European Union. Some of these initiatives were part of the new higher education modernisation agenda, others emerged as part of the common research and innovation policy. In 2007 the European Commission adopted a policy document which has served as "guidelines for universities and other research institutions to improve their links with industry across Europe" (European Commission, 2007).

Perhaps the most important following action was the establishment of the European Institute of Technology (EIT) in 2008 which has gained a key role in implementing the UIC related policies of the EU in accordance with the Knowledge Triangle concept. One of the key actions of EIT has been the creation of so-called Knowledge and Innovation Communities (KICs) which are consortia of universities, companies and other public or private agencies which develop common programs at bachelor, master and doctoral level, and conduct various research and development projects enhancing industrial innovation.

Another key initiative has been the creation of the University-Business Forum (UBC) which is a communication and knowledge sharing platform connecting academia and industry. The UBC, organising regular biannual general meetings, thematic conferences and publishing various reports, has become a major idea generator and promoter of UIC in the EU. In the context of the China-EU comparison it is worth being mentioned that UBC has had regular meetings with Asian countries in the framework of the Asia-Europe Meeting (ASEM) platform which has been an important UIC related policy knowledge sharing channel between Asia and Europe.

The work of the UBC has been guided by a policy document issued in 2009 stating that "universities should develop structured partnerships with the world of enterprise" and suggesting various institutional mechanisms supporting UIC. This document contained several recommendations addressed

to the EU member countries, such as, "collaborative work with industry should be acknowledged as equally important as academic tasks like publishing for career advancement and compensation" and promoted the idea of using "intermediary organisations" to create an "interface between universities and companies" (Commission of the European Communities, 2009)

UIC has been promoted by many EU level incentives built into various education, research and regional development programs which have been providing significant financial resources for those universities, companies or public and private agencies which initiated specific UIC related activities in the member countries. The European Union has also supported many research projects exploring the state of UIC in Europe or analysing the drivers and barriers of UIC. Perhaps the most significant was a large survey conducted during 2016 and 2017 in all member states collecting questionnaire responses from more than 17 000 persons (academics, university leaders, knowledge transfer professionals and businessmen), and interview responses from more than 20 recognised UIC experts, providing also more than 50 detailed good practise case studies (Davey et al., 2018). Through these research projects, some of them aimed at evaluating large scale interventions and programs, the EU created a rich knowledge basis for future UIC-related policy making and institutional level practices promoting UIC.

One of the outcomes of this intensive knowledge building, specially interesting in the context of this paper, has been the growing interest in the education pole of the Knowledge Triangle and the growing recognition of the importance of education-driven university industry cooperation (EUIC), which has inspired also some Asian authors (Orazbayeva, 2020; Orazbayeva, 2020; Zhuang & Shi, 2024). In fact, many of the EU supported UIC-related initiatives have aimed at using UIC for modernising universities and improving the quality of teaching and learning in higher education.

An interesting element of the European EUIC scene is the role of brokerage agencies in the mediation between education and industry. A good example is the Finnish company Demola which using EU funding, has been provided EUIC supporting mediation services in several EU countries. A key element of these services is the organisation of company internships for students, but this might also include UIC oriented faculty development (Qin, 2023). Another interesting example is the emergence of the new profession of "skills brokers" in the United Kingdom (Halász, 2011) who also can offer mediation services.

3. EUIC initiatives in China and the EU

Although there are significant differences between China and the EU, regarding the traditions of UIC and the role of government in promoting and guiding it, there are also interesting similarities. In both geographical/political entities, many related actions and programs have been initiated by local and institutional actors. Since the everyday reality of UIC can be grasped only through a closer analysis of these local/institutional initiatives, in this section we present four illustrative cases from one industrial sector – the creative industry – completed with references to a sector-specific comparative analysis focusing on one of its specific areas (fashion industry). It has to be stressed again that these specific cases are presented here to illustrate what has been described in the previous section, and they do not represent the totality of the rich and diverse landscape of existing initiatives.

3.1 Illustrative cases from China

Following the promulgation of the policy document on UII mentioned earlier (State Council, 2017) various new UII platforms were launched in China, including the Modern Industrial Colleges (MICs). MICs serve regional economies by aligning education with industry demands, focusing on applied skills and immediate workforce needs, and creating demonstrative platforms for innovation and entrepreneurship. Regulations require that in these institutions, student practice hours constitute no less than 30% of total teaching hours, alongside the development of internship training bases, and the number of part-time industry instructors equals or exceeds full-time faculty (MOE, 2020a).

MICs are co-built by at least two stakeholders from universities, governments, enterprises, research institutes, and industry associations. These hybrid organizations bridge academia and practice, linking these institutions together in various configurations. MICs typically use outcome-based curriculum design, project teaching, involve enterprise experts as mentors and integrate cutting-edge technologies into teaching (Hu et al., 2023).

One specific form of MICs deserving special attention is the Future Technology Colleges (FTCs), targeting strategic areas of frontier technologies, like AI, quantum computing or new materials. They prioritize original innovation, interdisciplinary research, collaboration with top-tier research institutions and industry enterprises and progressive pedagogy fostering creativity and entrepreneurship (MOE, 2020b). A good example is Shenzhen Polytechnic University's Tech X Academy, co-founded by Shenzhen Polytechnic University (SZPU), the local government as well as an educational and incubation platform institution created by an entrepreneurial technology professor (Li Ze Xiang) in 2021. This is a "teaching laboratory" focusing on advanced robotics and automation, with instructors bringing experience from leading high-tech companies, such as Huawei or DJI, and the China Academy of Space Technology (SZPU, 2004).

Tech X Academy is educating students to work as entrepreneurs/innovators, makers and discoverers, and future leaders through learning and practicing cross-disciplinary thinking. It adopts a cutting-edge, interdisciplinary approach to education, emphasizing project-based learning and the customization of individual learning paths, encouraging learning through playing. Student project teams identify real-world problems through market research, they define issues, propose design solutions, prototype and iterate products. They also validate the commercialization potential of their designs through human-centered and business-oriented approaches.

A specially interesting FTC case is the School of Future Design (SFD) of Beijing Normal University. As an innovative cross-disciplinary platform, this college promotes the concept of ”design for a better future life” by integrating multiple fields such as art, technology, and education, especially in the research directions of design and future lifestyle, art and technology, as well as design and education. Every year, the school releases project-based learning activities, guided by academic and industry teachers, allowing students and faculty from different disciplines to work in teams. The design outcomes are presented in May of the following year to the collaborating enterprises and organizations.

In the 2023-2024 academic year, SFD collaborated with primary schools to create an arts education curriculum based on the structure, colors, and patterns of the Forbidden City's caisson ceilings. The curriculum has been designed for students in grades 4-6 and includes teaching tools such as the Forbidden City color cards and study manuals. This program was successfully implemented in primary schools in Guangdong and Henan provinces (SFD, 2024a).

SFD combines interdisciplinary collaboration and real-world problem-solving, providing students with a deep integration of theory and practice. One of the many collaborative activities of SFD was a project realised in cooperation with a Shenzhen cultural institution in 2024. This project adopted a “human-centered” service design approach leading to the creation of an interactive and personalized data visualization display system based on the identification of the needs of different museum user groups, ensuring that each user group receives tailored services. The project team, including 8 students, conducted extensive user research, stakeholder analysis, and data support to design this smart service system based on Internet of Things, big data, and artificial intelligence, enhancing the venue's management efficiency and visitor experience. Participating students not only focused on learning design skills but also collaborated with professionals from local companies, understanding real-world business needs and transforming ideas into feasible design solutions. This educational model cultivates industry-ready, innovative talents with practical skills, allowing students to grow through hands-on practice and master cutting-edge service design thinking and technological applications (SFD, 2024b).

SFD has made it possible for BNU, a teacher education university, to extend its collaboration and external networking activities from its traditional field (the “learning industry”) to the broader area of creative industries. Both the Forbidden City and the Shenzhen smart service design projects were focusing on areas of advanced technologies, creating UII in sectors that do not belong to the traditional manufacturing industry. They demonstrate that the FTC model of UII is not limited to the classical industrial fields and engineering, but can be applied practically in every sector.

The case of MICs above illustrates how local/institutional initiatives can be realized in the framework of national government supported UII programs, exploiting opportunities created by top-down measures. Grassroots initiatives, however, can also emerge outside of the top-down framework, as illustrated by another case in which a higher education teacher was driving UII at local and community level. Wu Haiyan, an entrepreneurial fashion designer, born in 1958 in Hangzhou (Zhejiang Province) and graduating at the China Academy of Art (CAA) in 1984, after a long industrial experience became a fashion teacher and later the Dean of the School of Design Art of CAA. From 1992 to 2000, she worked as a chief designer in a large enterprise. Later she established the WHY Designer Studio, which primarily provides services in fashion, textiles, interior design, theatrical costumes, and celebrity customizations. She has also been serving in several national and provincial professional organisations, and was the recipient of important professional awards (Len, 2013).

Wu Haiyan has deeply integrated education, research, and industry, driving multidimensional knowledge transfer. Under her initiative, education has not only become a key platform for cultivating innovative talents, but also became a terrain of continuous innovation in teaching content and methods through close collaboration with industry. Her research provided theoretical support for industry, driving technological advancement and model innovation; while partner enterprises could offer her opportunities for implementation, creating a mutually supportive, synergistic development cycle among the three poles.

One of the platforms Wu Haiyan created to connect the industry with teaching is the brand “Oriental Boutique”. Through joint university-industry fashion shows and offering real design projects she not only promoted brand development but also provided new opportunities for students from CAA to showcase their talents, fostering the knowledge transfer between industry and education through integrating industrial, academic, and research activities.

When Wu was a program leader in the Dyeing and Weaving Department of CAA, she was reforming the curriculum of her program, adding more practical courses to enhance students' hands-on abilities. She also introduced courses on Chinese arts and crafts, with the goal of ensuring that the designers she trains can develop their own design language in the global design circle. She was emphasizing cross-disciplinary knowledge and incorporated real business projects into program course design, stressing the practical experience and exploration of actual enterprise projects. With her rich industry experience and resources from the fashion business, she could also provide students with excellent internship opportunities and projects. Under Wu's reforms, the employment rate and the number of students involved in her program after the college entrance examination were among the highest in the university (Len, 2013). She also led several major research projects and created several new institutions bringing together academic experts, collaborating enterprises, design organizations, and cultural institutions (China Academy of Art , 2023).

The above cases demonstrate China's diversified practices in promoting cooperation between universities and industry. From national policy support to grassroots innovations, they show the deep integration of education, industry and research. Through the establishment of MICs and FTCs, education is closely connected with industry needs, promoting learning and innovative practices based on the introduction of corporate real projects and interdisciplinary studies, and cultivating

high-quality future talents that meet industry needs. At the same time, individual local actors (teachers, entrepreneurs and academic leaders), like Wu Haiyan, also build bridges between industry and academia, promoting the deep integration of education and industry at the grassroots level.

3.2 European illustrative cases

As mentioned earlier, the European Institute of Technology (EIT) has created several institutional entities called Knowledge and Innovation Communities (KICs). These are, as stated in a report about these institutions, "the main vehicles through which the EIT undertakes its activities" (Allinson, 2012). According to this report, the concept of the KIC itself represents an innovation as "there is no other similar initiative combining such large trans-European and thematic partnerships organised in committed legal entities". The KICs, as presented in the report, "are structured around a partnership of 20-30 core partners from all sides of the Knowledge Triangle." At the moment of writing this paper, there were nine KICs, all of them focusing on a theme related to major global challenges.

The legal status of KICs might be different, some of them are for-profit companies, and others are non-profit organisations (e.g. associations). The members of the KIC commit themselves to work together at least for seven years with the aim of becoming a self-sustainable organisation that can survive without EU funding. Their revenue might be generated by the companies and the institutions they create which produce marketable industrial, research and education products and services. The first KIC (Climate-KIC) was launched in 2010, and the last one (Culture & Creativity) in 2022. As an illustrative case this last KIC will be presented in the following in more details.

The idea of creating a Culture & Creativity KIC (CCKIC) was forwarded by EIT in 2021 through publishing a call for proposals, and the decision about the winning proposal was taken one year later. After the winning team submitted to the EIT a detailed strategic proposal the contract with them was signed in June 2024. CCKIC operates as the combination of a non-profit association and a for-profit limited company (with a headquarters in Cologne, Germany). At the writing of this paper, it had 61 members including higher education institutions, research centres, cultural organizations (such as museums, galleries, and cultural institutions), creative industry enterprises (from areas like design, media or entertainment) and also relevant governmental bodies. Like every KIC, the CCKIC is also open for further organisations to join it.

The mission statement of CCKIC shows commitment to the values of competitiveness, entrepreneurship, sustainable growth, interdisciplinary, cross-sector collaboration and positive social and environmental impact. Similarly to other KICs, CCKIC plans, among others, to develop new tertiary level programs at master and PhD level and also provides executive training programs in several areas (see Table 1) under a common branding and label (EIT CC Academy). It is expected that these programs will significantly improve the quality of skills development for the creative industry sector in the European Union.

While the case of CCKIC above illustrates the larger scale cross-country and cross-sector UIC related initiatives supported by the European Union, the second EU case below (also from the creative industry) illustrates those smaller scale actions which have been and are initiated by thousands of individuals or single institutions in the member countries. This is the case of a British fashion teacher, named Elisa Palomino, who gained funding from the EU education programs for a sustainable fashion initiative based on university-industry cooperation. According to her personal website between 2012 and 2023, she worked as a teacher at one of the most famous British fashion schools (Central Saint Martins, University of the Arts London) after accumulating rich work experiences during her 25 years of practice in the fashion luxury industry sector.

Elisa initiated the creation of a smaller network of ten organisations (universities, research organisations, and companies) from various countries (including one from Asia), and submitted a project plan to the EU Horizon research program in 2019. The project, under the label FISHSkin, won and gained more than half million Euros to realise its objective which was to explore the possibility of using fish skin to produce fashion products. An article published in 2021 presenting the project explained its rationale underlining that "more than 50% of the total fish capture remaining material is not used as food, resulting in almost 32 million tonnes of waste", a large part of this being the skin of the fish, The project combined "the expertise of fashion designers, industrial designers, material scientists and aquaculture scientists, as well as companies directly connected to the market" (Jensen, 2021).

According to a study published by Elisa, the project also included an action research component which consisted of data-collection from "archival research in museums to study traditional knowledge in fish skin processing" and "mapping traditional fish skin crafts to validate their technical feasibility". Besides this, an educational component was also built into the project. Elisa organised a field trip to Iceland for fashion design students from universities in Iceland, Denmark, Sweden, Finland and the UK to make it possible for them to "produce fish leather designs using traditional skills built over generations by Arctic indigenous peoples" and to study the technological processes in an Icelandic tannery company, Atlantic Leather, which "has been turning local fish skin into highly sustainable leather since 1994" (Palomino, 2020). Elisa's project combining research, education, industrial innovation and societal goals was closed after five years of operation in 2024.

Both EU cases illustrate well the way the European Union supports UIC in accordance with the logic of the Knowledge Triangle concept. The two illustrative cases have been funded by the EU research program (Horizon), but similar projects get funding also from the education program of the EU (Erasmus+) and from the funds supporting social-economic development and regional development (structural funds). Projects like those presented here can get funding, for example, from the Erasmus Knowledge Alliances program in case they are based (1) on the partnership of at least six independent organisations (2) from at least three member

Table 1. CCKIC education priority areas.

General	Entrepreneurship, emerging technologies, and disruptive trends
Fashion	Circular fashion value chain Architecture Circular and sustainable buildings, climate adaptation and social dimension
Cultural Heritage	Specific crafts, emerging technologies usage towards social cohesion
Audio-visual Media	Responsible and trustworthy technology use, data privacy and ownership, supercomputing, cloud computing, AI in AVM, IP in AVM
Gaming	Disruptive technology adoption by SMEs, Digital ethics in gaming, cross-disciplinary with related sectors

countries and (3) at least two of them are higher education institutions, and (4) two of them business organisations.

There are thousands of initiatives similar to the smaller scale project of Elisa and also several larger scale programs, such as the CCKIC. A common feature of all of them is that those running the projects have to do it in a transparent way, creating websites where they share the knowledge and experience that they accumulate, publishing the outcomes and conducting an assessment of the social-economic impact of their activities.

3.3 The impact of UIC in specific sectors

As stressed earlier, UIC is used both in China and Europe as a tool to support the modernisation of universities and to improve the quality of teaching and learning in higher education. This requires a better understanding of impact mechanisms, which might have special characteristics in different industrial sectors and professional fields. For example, as revealed by a comprehensive Chinese study (Zhuang, 2023), professional communities in engineering education might be particularly open to recognise and appreciate the high level capacities of industrial actors to create knowledge and advanced skills through their own in-house research and human resource development. This is strengthened particularly if they interact with companies creating knowledge intensive products based on the use of cutting-edge technologies or providing services that require advanced human skills.

The China-EU comparison is particularly interesting when we observe industrial fields where the two geographical/political entities occupy different positions in global value chains or we look at professional areas that are strongly influenced by cultural differences, such as the creative industry or its subsector, the fashion industry. This can be illustrated by a recent comparative study focusing on fashion industry and fashion education (Huang & Halász, 2021). The authors of this study conducted interviews with Chinese and Hungarian fashion teachers in one Chinese and three Hungarian universities, asking them about their industrial experiences, and exploring how this has been influencing their way of teaching and their sense of professional self-efficacy. The analysis of the interview data has shown that fashion teachers in both countries not only have rich industrial experiences, but also think this is significantly increasing both the quality of their teaching and their sense of self-efficacy. This small sample study showed Chinese fashion teachers having stronger industrial connections and generally more positive attitudes towards UIC and its usefulness than their Hungarian colleagues, although in both cases they strongly and equally support the idea that UIC could and should be used for university and faculty development.

This study also revealed some significant differences between the forms of industrial experiences: while Chinese teachers were often connected to bigger and technologically more advanced companies, their Hungarian colleagues interacted mostly with smaller companies using less advanced technologies, and almost all of them were running their own small private enterprise. The study also demonstrated that being an EU member country does not necessarily mean that promoting EUIC becomes a domestic policy priority. The strong commitment to enhance the interaction of universities with business with a focus on using UIC for modernising higher education, in accordance with the logic of the Knowledge Triangle, is reflected in a rather modest way in the higher education and research policy of Hungary, still dominated by the classical from-university-to-industry knowledge transfer paradigm.

4. Summary and conclusions

This paper has revealed significant similarities but also major differences between the policy and practice of UIC/EUIC in China and the EU. In Europe, the historical development of universities led to a relatively isolated higher education sector, separated from business and industry until recent decades. Before the 2000s, EU initiatives to bridge this gap faced significant resistance from academia in the member countries. In contrast, China adopted the practice of connecting education and industry as early as the 1950s. One implication of this is that when the new research and innovation policy following the logic of the Triple Helix, emerging in the West, was "imported" to China, this was quite easily absorbed by the country's institutions. The memories of the early integration illustrated by the saying "the factory in the school and the school in the factory" were still living and the separation period, started in the eighties, soon turned back to cooperation and then to integration. Although the term Knowledge Triangle is not frequently used in China, its logic is present in the dominant discourse often making reference to the need to connect production, knowledge and education.

While the EU policy discourse uses the term "cooperation", the dominant expression in China is "integration", very often

also accompanied by the adjective "deep". Deep integration is illustrated, among others, by the creation of Modern Industrial Colleges within the universities which leads to the creation of entities strongly connected with companies inside the university organisation, based on the direct use of industrial resources and directly supported by government agencies. This happens in every industrial sector, including the creative industry characterised by the blurring of borderlines between culture and business. This sector, often dominated by the practice and thinking of design and by its organic connection with the emerging knowledge, service and information economy, not only receives growing attention both in China and the EU, but it also has become an important field of innovative UIC building initiatives.

A major difference between China and the EU is connected to the fact that the latter is not a country but a special (still evolving) political entity that has limited jurisdiction in its member countries. While both China and the EU are using soft tools (especially ideational influence, coordination support and financial incentives) to promote UIC, China can also use more direct tools, such as legislation or direct political instruction by central and provincial/municipal government agencies, including the centralised institutional channels of the Chinese Communist Party. While in China the brokering function (mediation between universities and business) is the almost solely the responsibility of government agencies, in Europe this function is often assumed by non-public (private) actors as illustrated by the Finnish company Demola.

Although government agencies might play an important role also in Europe, especially creating appropriate legal frameworks and providing incentives, the real engine of UIC in the EU are bottom-up initiatives. These initiatives generated by various grassroots actors can get funding through parallel EU channels operated by several directorates of the European Commission responsible for education and training, research and innovation, industrial policy or employment and regional development. These channels, operated and guided by a coordinated common Knowledge Triangle led policy, complement each other and offer many funding opportunities for local actors engaged in UIC activities. This leads not only to a proliferation of UIC activities in every sector, including the creative industry, but also to a high-level variety of (often very innovative) solutions. A common requirement these grassroots initiatives have to meet, which also creates further incentives, is the obligation of sharing all UIC related knowledge and experiences with others. There are thousands of websites, academic publications, evaluation reports and other platforms offering rich information about current and past initiatives, some of them also providing structured search opportunities.

One logical conclusion that can be formulated on the basis of the analysis presented in this paper is that there is a great potential for mutual learning and sharing experiences related to UIC for both China and the European Union. The EU has, for example, much to learn from the Chinese policy and practice of "deep integration", especially from the related institutional mechanisms. Similarly, China can learn, among others, from the European practice of supporting innovative grassroots initiatives, as well as from the way related experiences are accumulated, made transparent and shared, supporting inter-agency horizontal learning. A further conclusion is that although significant comparative knowledge has already been created, there is a need for further China-EU comparative research enhancing mutual learning and knowledge sharing.

In China, where education-industry cooperation has long historical roots, we can see a specially favourable cultural and policy environment to implement "deep integration" at a massive scale. The EU policy of UIC can rely mostly on the bottom-up initiatives of engaged local or institutional players. While in China university-industry integration is directly promoted by government regulation, this cannot happen in the EU. In the latter both universities and companies enjoy high level autonomy, and a large part of the academic community is reluctant accept industrial players as equal partners from which they can learn. One of the things that China can learn from the EU is how to use indirect tools to avoid formal and superficial compliance in an environment where actions are always based on the voluntary efforts of committed actors. On the other side, what the EU can learn from China is, among others, how "deep interaction" works in practice: what kind of positive impact might be generated if universities and companies go beyond simple partnership and cooperation, becoming the co-creators of professional education.

When stressing the need for mutual learning and knowledge sharing we have to highlight the specific importance of knowledge flows from the East to the West. As demonstrated by a recent inter-regional comparative research initiative (Halász, 2024), while there is a long history of Asia learning from the West, using Asian knowledge to inspire and improve Western policies and practices is often neglected. Comparing the rich experiences of China in integrating education and industry with the efforts of the EU to promote university-industry cooperation might contribute to a new balance in the historically conditioned dominant forms and directions of cross-cultural knowledge flows.

Conflict of interest

The authors declare no competing interest.

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