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State, university and industry: the evaluation of their contributions to China's recent economic growth

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Abstract

In pursuit of becoming an innovative country by 2049, for the centennial of the People's Republic of China, the recent Chinese economic growth is impressive and gives this nation the prediction of occupying the position of first world economy by 2030. This performance has aroused an interest in understanding how the relationship between the State, university, and industry has contributed to such economic development. To this end, this exploratory research made use of bibliographic, documental, and field research (interviews and questionnaire application). The data were analyzed using theoretical content analysis, with theoretical categories derived from the Triple Helix Theory and Knowledge Transfer. The findings indicate that this is a virtuous relationship that occurs asymmetrically with a State with multiple responsibilities and committed to the driving forces of economic development, oscillating between a "strong state" and an "effective state".

Keywords: Triple Helix Theory. Chinese State. Chinese University. Chinese Industry. China.

1 Introduction

In any field of knowledge, China is a country that arouses curiosity. In large part, this is due to its accelerated economic growth – in just four decades, the country

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has become an industrial, commercial, and financial powerhouse, becoming one of the protagonists of the 21st century. Its growth has reached such an extent that it has greatly influenced the course of the development of global society (Barbosa, 2021). At the end of the 20th century, China was no more than a closed country, extensive in terms of territory, overpopulated, predominantly agrarian, and dependent on technological imports. However, at the beginning of the 21st century, it became a country increasingly recognized as a global center, strongly industrialized and working obstinately to, in less than three decades (2049) – on the occasion of the centennial of the Proclamation of the People's Republic of China (PRC) – be doubly recognized as a "modern socialist" country and as "a self-sufficient technological and industrial power" capable of maintaining the recently achieved rhythm of economic growth (The People's Government Of Fujian Province, 2021).

Since 1978, the central government has been acting pragmatically to consolidate a kind of State capitalism, marked by reforms aimed at laying the foundations of a modern and competitive industrial system, promoting the reopening of the Chinese market, and controlling China's integration into the world system (Amin, 2014).

As of 2010, the country is recognized as the second world economy, with a GDP of $14,723 trillion (Worldbank, 2020). Despite the crisis stemming from Covid-19, there are prospects that by 2030 it will occupy the first position (Breslin, 2016)[1]. "China has contributed more than 30% to world economic growth" (Li, 2021, p. 233).

The State does not doubt that investment in Education, associated with the increase in science and technology, is a factor that determines the sustainable development and continuous modernization of the nation in the path of what has been called the "New Age" (Jinping, 2020). The orchestration of policies, plans, programs and actions geared toward promoting Education, fostering science and technology, and developing high-tech industries is evidence of this (Zhou, 2008). For example, the launch of the fourth round of government financial contributions in February 2022 is aligned with the second phase of the Double First Class (*shuāng yī liú*) Project, inaugurated in 2017. This initiative aims to strengthen universities and disciplines in areas considered a priority for

[1] It is worth pointing the economic instability all over the world affected by Covid-19. Similarly, Chinese recent economic growth indicates uncertainty. In 2023, for instance, an adjustment in the Chinese real estate sector causing a drop of more than 60% in the volume of projects. China's growth was projected at 5.2 percent before slowing to 4.5 percent (Worldbank, 2023).

the country – Science, Technology, Engineering, and Mathematics – with the construction of world centers of excellence (China MoE, 2022).

There is an understanding that the investment-driven growth model is not sustainable, which justifies the emergence of a growth mindset driven by innovation (Li, 2021). The central government and the provinces converge on the understanding that Education, science and technology are determining factors for innovation and competitiveness in the productive sector. These, in turn, are responsible for promoting economic development and for expanding the radius of influence exercised by China's regional and global leadership. In this context, **the authors investigate how the relationship between the State, university and industry has contributed to the country's recent economic growth**.

In this study, the construction of the theoretical lenses that will favor the interpretative exercise of the data is based on the triple helix theory. Evidence points to the construction of an increasingly articulated relationship between government, university, and industry (Etzkowitz; Leydesdorff, 1995, 2000; Leydesdorff, 2012; Lu; Etzkowitz, 2008;) capable of strengthening companies and promoting the country's economic development. Added to it are the contributions from literature discussing innovation ecosystems (Carayannis; Bstyh; Campbell, 2012; Jackson, 2011; Ritala; Almpanopoulou, 2017), knowledge transfer (Bacon; Williams; Davies, 2019; Clinton; Merritt; Murray, 2009; Kogut; Zander, 1993; Nonaka, 1994).

In addition to this introduction (1), the paper consists of four more parts that evolve from the construction of the theoretical lenses (2) to the justified description of the methodological choices (3), followed by the analysis of the data (4) and the consolidation of the findings in the final remarks (5).

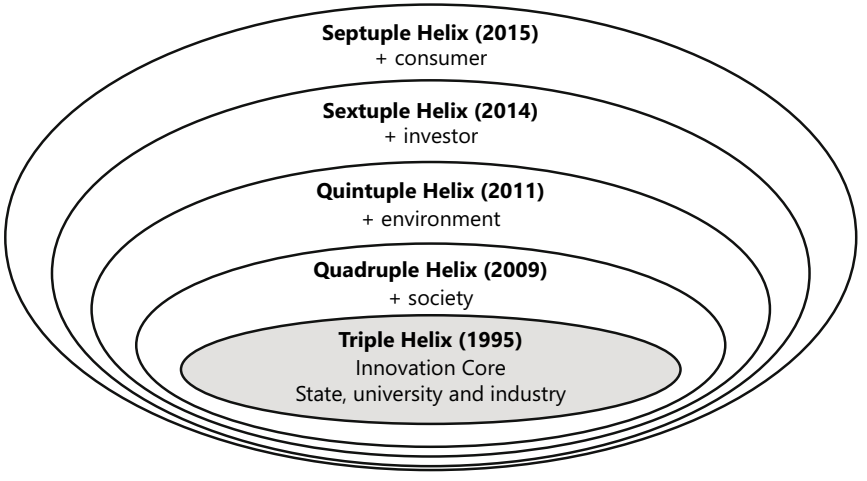
2 State, university and industry as drivers of economic growth

As of the 1990s, with the flourishing of neoliberalism, knowledge gains centrality as it becomes a determining factor for sustainable economic development, responsible for part of society's infrastructure (Guile, 2008). At the beginning of the 21st century, facing the challenge of promoting economic development, knowledge-based innovation attracts the attention of academia (Carayannis; Barth; Campbell, 2012; Carayannis; Campbell, 2011; Etzkowitz; Leydesdorff, 2000) and the transformations resulting from the relationship between the State,

university, and industry begins to justify research projects and inspire theoretical propositions (Greenacre; Gross; Speirs, 2012).

It is observed that the promotion of relationships between the State (governmental sector), university (educational sector), and industry has the potential to increase economic development (Etzkowitz; Leydesdorff, 2000). To this end, the interaction between these three actors occurs in an interactive and non-linear manner (Etzkowitz, 2003; Torlig; Resende Junior, 2018). This explains the advance in new management forms with more comprehensive connectivity perspectives, integrating new actors (society, environment, consumer, and investor) and configuring the composition of a true ecosystem (Figure 1).

Figure 1 - Innovation Ecosystems



Source: Authors (2022), based on Carayannis and Campell (2011); Carayannis, Barth and Campbell (2012); Etzkowitz and Leydesdorff (1995); Mineiro *et al.* (2019)

The interaction between these three actors is considered the core of the Triple Helix Theory (THT), which is used frequently not only as a normative framework for understanding their interactions and their relationship to the promotion of technological development and innovation but also as a common strategy adopted by governments when developing innovation policies (Cai, 2014; Campbell, 2006). China is a revealing example of what it is intended to draw attention to.

The rapid technological increase, associated with products with shorter life cycles, without disregarding the intensification of global competition between great powers, are factors that reinforce the pivotal role of the university (Campbell, 2016; Etzkowitz, 2003), since it is increasingly responsible for generating and disseminating knowledge (Ankrah; Omar, 2015). In this context, Torlig and Resende Junior (2018, p. 2) observe that the responsibilities attributed to the institution expand enormously since "the university assumes the role not only of knowledge and human capital provider but also becomes a productive sector institution that commercializes the intellectual property developed within its centers of study and research." This view has led several authors to recognize that some universities gain the third mission (Aryanitis; Kubli; Woerter, 2008; Campbell, 2006; Etzkowitz; Leydesdorff, 2000; Philpott *et al*., 2011; and has motivated authors to question how much this transformation can mischaracterize the mission of the public university guided by teaching, research, and extension (Santos, 2011; Santos; Almeida Filho, 2008). Considering the nature of the interactions advocated by the THT, it is possible to recognize three alternatives: a) interactions in which the State controls academia and industry ("strong state or statist"); b) interactions in which each of the three actors develops independently ("*laissez-faire*"), separated by clear limits (borderlines); and c) interactions in which the dynamics of the helices can be characterized by the increased overlap of hybrid organizations at the interfaces ("trilateral networks and hybrid organizations") (Etzkowitz, 2003). For Campell (2006, p. 72), this prior arrangement, when expanded, defines the preferred scenario for developing advanced and knowledge-based economies. To some extent, according to the author, it "even defines [or should define] the primary reference for the global evolution of societies."

2.1 The THT - the specificities of the Chinese case

In countries with economies in transition, such as China, one notices variations in State behavior, particularly regarding encouraging economic modernization (Balzer, Askonas, 2016; Etzkowitz, 2003)[2]. Rather than a "strong state," the interactions envisioned by the THT require an "effective state" (Etzkowitz, 2003, p. 32). What does this mean? The presence of a government is notoriously committed to the driving forces of economic development and, for this very reason, willing to support the agents responsible for it, in addition to inhibiting anything dysfunctional or predatory (Breznitz, 2007).

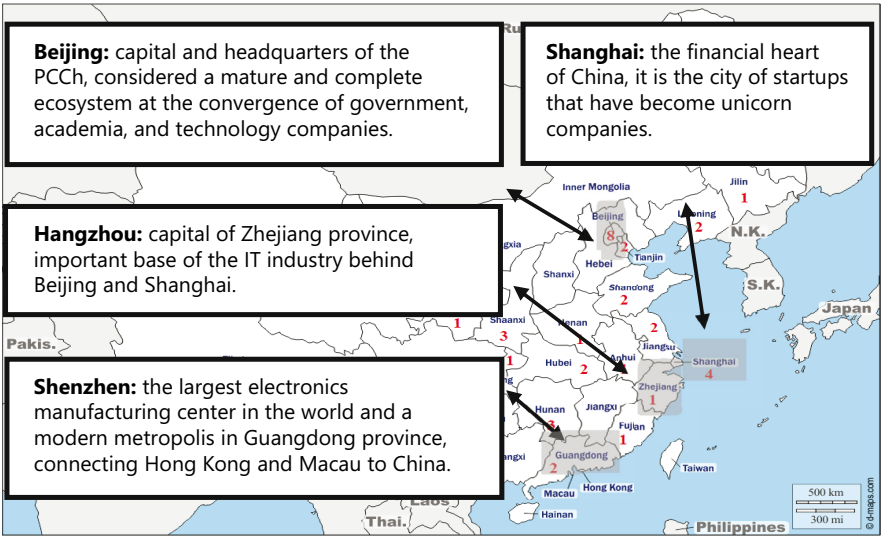
Currently, China is possibly transitioning between this strong state and an effective state, as it functions "not only as the main investor but also as the regional organizer

[2] Even though not being the scope of this study, it calls attention the crucial role of civil society when it mentions *economy in transition*. Once China is in a stage of middle to high incomes and of high human development, reflecting the modernization of people (Hu *et al.,* 2021, p. 22).

of innovation, attracting university and industry to promote innovation" (Zhou, 2008, p. 124). To this end, the state has adopted some degree of flexibilization by promoting measures that favor decentralization and international market expansion (Barbosa, 2021). An example of this is the educational sector, particularly Higher Education. As an increasing number of universities assume strategic responsibilities in this process, they have been favored with massive investments, especially directed to cutting-edge research in areas considered of strategic interest to the country (Science, Technology, Engineering, and Mathematics – STEM).

In the early 1980s, due to the volume of resources allocated – around RMB 18.6 billion (2.8 billion US Dollars) (Cai, 2013) – to the university system (Liu, Dai, 2012) and the pressure exerted by the strongly oriented planning for domestic economic development, Chinese private companies reinforced investments in areas involving STEM, particularly responsible for the innovation achieved in the country's coastal cities – Hangzhou, Shenzhen, and Shanghai, for example – (Figure 2), recognized for being important hubs of technological innovation (QI, Nov./2021). This reinforces the thesis that measures dependent on the effective State exert influence at the national and local levels, especially when they enable the involvement of other civil society organizations (Etzkowitz, 2003).

Figure 2 - Main technological innovation poles in the country

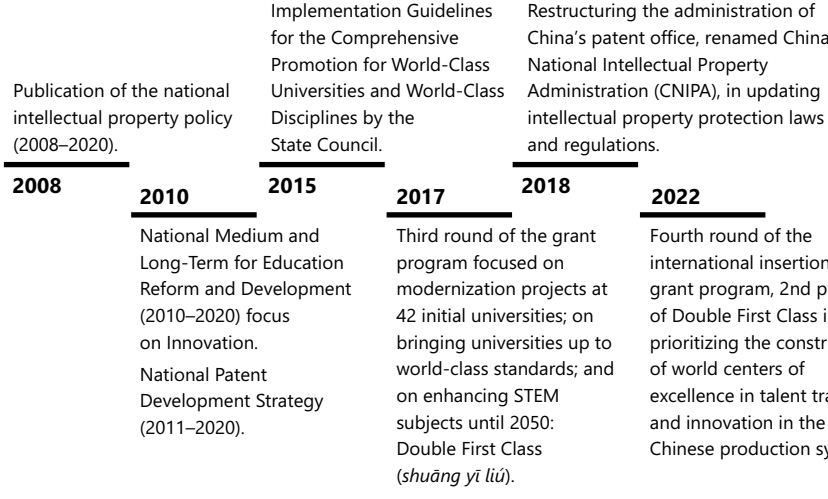


Source: Authors (2022), based on Qi (2021)

In this context, since the 1980s and especially in the 2000s, the research university has increasingly gained an international reputation. As a result, it has gradually expanded its participation in international research networks and formed strategic international alliances. Thus, the Chinese university, particularly the group favored by the Double First Class program (both the 2017 and 2022 editions), configures a powerful institution at the service of the interests of the Chinese State without autonomy to define its *raison d'être* (Liu *et al*., 2019).

Investment in a globally respected Higher Education system is a well-known practice among developed Western countries (Campbell, 2006; Philpott *et al*., 2011). When participating in a seminar that took place in 2021, Qu Yuhui, the then Minister Counselor of the Chinese Embassy in Brazil, assured us that, at present, "the conduct of the Chinese State does not differ from what the U.S. did in the 1950s, 1960s, and 1970s, [regarding] the creation of an environment conducive to interaction among governments, enterprises, and R&D agencies through incentive policies and massive investments." Evidence of this is gathered in Figure 3, describing government measures introduced in the Education sector between 2008 and 2022.

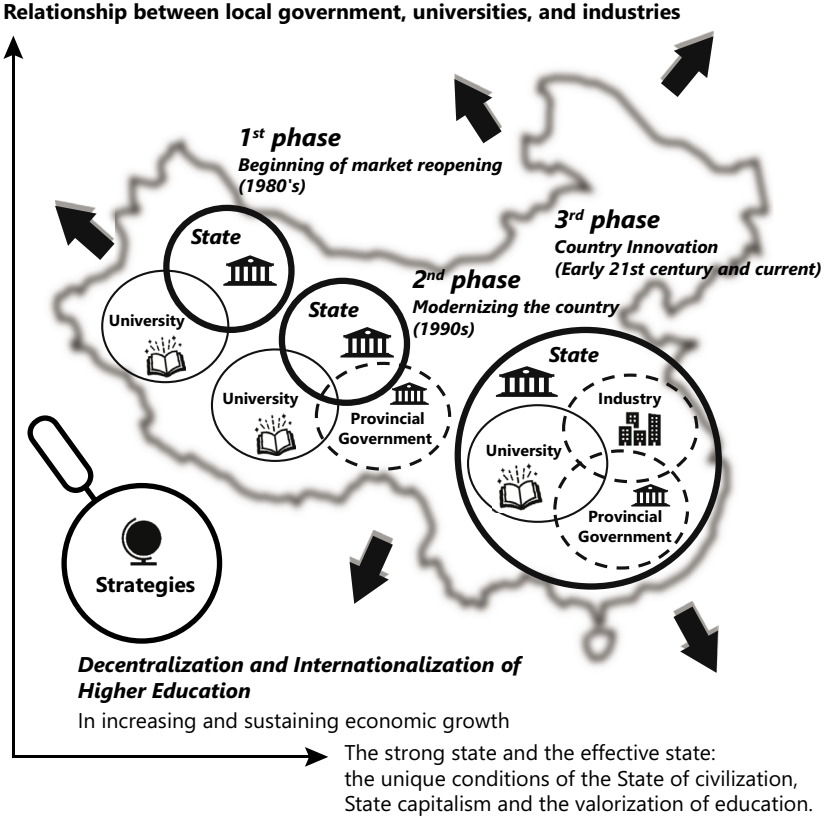
Figure 3 - Government Measures for Education (2008–2022)



Source: Authors (2022), by accessing official websites of the Chinese Ministry of Education and CNIPA

In sum, considering the Chinese case, the composition of the nature of the interactions presents in the statist THT (Figure 4) began in the phase of market reopening (the 1980s) with the prevalence of a bilateral relationship between the State and universities (1st stage). In the country's modernization phase (the 1990s), it involved the decentralization policies that led to a certain trilaterality between the State, provincial government and universities (2nd stage) – the antechamber of other stages (early 21st century onwards) in which a relationship between the provincial government, university, and industry has prevailed (3rd stage). The stage at which the State (central government) assumes responsibilities as a policymaker and regulatory agent, overseeing national interests and security, as well as regional coordination (Cai, 2014; Tian *et al*., 2019) in order to promote innovation and global competitiveness culture.

Figure 4 - Triple Helix Theory in the Chinese context



Source: Authors (2022), except for the 3rd stage (Cai, 2014)

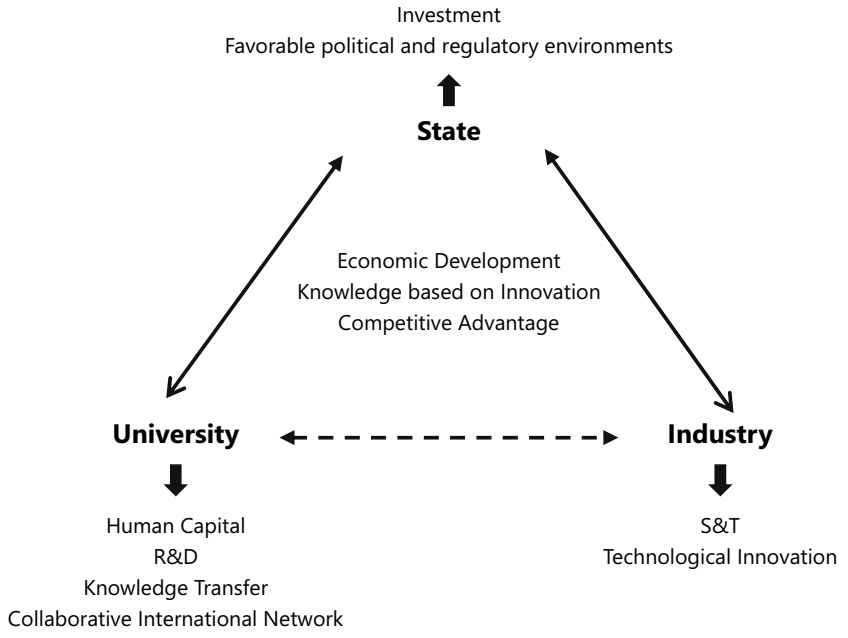
In light of the above, the research adopted an analytical scheme that considers the collaboration resulting from the relationship between the State, university and industry as the theoretical category capable of guiding the interpretative exercise of the data (Chart 1).

Chart 1 - Construction of the analysis categories

Theoretical	Key Concepts	Authors	Subcategories
State	Actor commited to the driving forces of economic development as well as being the main investor and regulator – Variety of Behavior (strong / effective)	Etzkowitz (2003); Zhou (2008); Cai (2014); Tian et al (2019).	Investment
			Regulation
University	Actor responsible for talent development, promotion and dissemination of science and technology, and commercialization of the intellectual property developed within its research centers – a pivotal role	Campbell (2006); Carayannis (2006); Etzkowitz (2003); Philpott et al. (2011); Ankrah & Omar (2015); Torling et al. (2018).	Human Capital
			R&D
			Knowledge Transfer
			Collaborative International Network
Industry	Actor increasingly dependent on university graduates and S&T absorption, responsible for promoting innovation and global competitiveness - Relevance of the municipality	Zhou & Leydesdroff (2006); Etzkowitz (2003); Qi (2021); Huang et al. (2004); Cai (2014); Balzer & Askonas (2016).	S&T
			Technological Innovation

Source: Authors (2022)

Figure 5 - Representation of the analysis categories



Source: Authors (2022)

In conducting the research, the terms State, indicating central government; university, encompassing research centers; and industry, referring to the productive sector, will be adopted.

3 Methodology

The investigation resulted from the combination of bibliographical and documental material and a field research methodology that combines a questionnaire and the conduct of interviews (a survey of intensive nature) (Creswell, 2014). Despite involving the survey of data of an extensive nature (questionnaire application), a qualitative approach was adopted in which exercises that transition between description and interpretation prevail (Creswell; Clark, 2015). This presupposes the triangulation of collection techniques and instruments, along with data organization and interpretation techniques (Creswell, 2014).

The association between bibliographical and documental research allowed us to recognize the relevance of the project that the State has assigned to the universities initially affected by Double First Class.

The desk research explored the Double First Class project (2017; 2022) and the five-year economic plans, both the previous one (the 13th) (2016–2020) and the current one (THE 14th) (2021–2025), whose contents revealed the Chinese State's protagonism in policymaking and regulating the process and outcomes. In addition, it examined the reports entitled "Global Innovation Index 2021" and "World Intellectual Property Indicators 2019" signed by the World Intellectual Property Organization (WIPO). It is also considered in the global academic rankings – The Best Global University, The Best Global for Engineering, and The Best Global for Electrical and Electronic Engineering University in China-Fiscal Year 2020/2021, signed by US News College and the British company Clarivate Analytics.

Initially, a questionnaire was prepared and made available in Portuguese and English for the field research since respondents were of different nationalities (Chart 2). Its structure involved three sections: the first gathered 11 questions whose answers helped draw the respondent's profile (Chart 2). The second section involved three questions exploring the relationship between the State, university, and industry in China.

In summary, the profile of respondents was made up of professionals representing governmental bodies (ministers and foreign affairs advisors), representatives of the academic environment (professors, researchers, and program coordinators), and representatives of the corporate environment (people in business, CEOs, directors, managers and lawyers).

The collection instrument was applied between September and November 2021 using the resources allowed by the JotForm online platform (overview in Chart 2).

Chart 2 - Respondents - profile overview

Nationality	Brazilian (66), British (4), Singaporean (1), Chinese (5), Colombian (1), Spanish (1), American (3), Indian (1), Italian (1), Dutch (1), and Uruguayan (1). 80% Latin American and 20% other continents out of 85=100%.
Academic background	Business Administration, Computer Science, Political Science, Law, Economics, Education, Agricultural, Civil, Electrical, Mechanical and Mechatronic Engineering, History and International Relations. Engineering (20), International Relations (15), and Technology (10) predominate.

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Proficiency in Mandarin	More than half (52%) of the NON-Chinese respondents reported some level of proficiency in Mandarin: basic 24; intermediate 12; and advanced 5.
Professional relationship	Government agencies (ministers and foreign affairs advisors); Representatives of the academic environment (professors, researchers and program coordinators); Representatives from the corporate environment (businessmen, CEOs, directors, managers and lawyers).
Predominant hierarchical level	Government agencies (head); Representatives of the academic environment (leadership); Representatives of the corporate environment (owners and managers).
Sector	Services (72), with a predominance of the Education sector (40), the Engineering field (20) and the Industrial sector (13).
Size of company	Large (41), Micro (21), Medium (15) and Small (8).
Experience with international trade involving China	35 act as commercial representatives, consultants, or conduct research involving Chinese industries.
Participation in international cooperation networks	41 claim to participate in international cooperation networks.
Predominant interests of the operating organization with China	34 claim to be part of a Research & Development (R&D) network; 28 recommend teaching in the Chinese language and culture; 26 affirm their interest in expanding the market.
Performing organization integrates collaboration network with universities	53 say no; 32 say yes; 1 did not know the answer.

Source: Authors (2022)

Six non-structured interviews were conducted in November 2021 to have data that would help provide a certain density to the interpretative exercise. In order to make the dialog coherent, Brazilian and Chinese interlocutors were prioritized when conducting the interviews because there are mutual interests involved; after all, China is Brazil's main trading partner – in 2021, 21.5% of exports were destined for China, representing the equivalent of 87.9 billion US Dollars (Ipea, 2021). The selection criteria for the interviewees were the same as for the respondents. While 66 (78%) of the 85 (100%) respondents to the questionnaire were of Brazilian nationality, in the interviews, it was possible to hear two representatives of the Chinese State, university and industry, respectively, four of Chinese nationality and only two of Brazilian nationality (Chart 3).

The only underlying question was, "**how would you describe the contributions that the relationship between the State, university, and industry can make to China's recent economic growth?**" Because two interviewees live in China and the period required physical distance due to Covid-19, all interviews were conducted online using the Zoom platform.

To preserve the interviewees' identities, they were named by the combination of letters I (for interviewee) and numbers (I1, I2, I3, I4, I5 and I6), respecting the sequence in which the interviews were conducted (see summary in Chart 3).

Chart 3 - Interviewees – profile overview

	Instance Represented	Nationality	Hierarchical Level	Place of action	Date in 2021	Duration in minutes	Language
I1	State	Chinese	Board of Directors	Chinese Government	05/11	21:26:31 **12-hour time zone*	Portuguese
I5		Chinese	Minister	Chinese Embassy in Brazil	29/11	27:34:55	Portuguese
I3	University	Chinese	Board of Directors	Asia-Latin America Study Center	13/11	20:54:66 **12-hour time zone*	English
I4		Brazilian	Leadership	Asia Study Center	16/11	19:01:00	Portuguese
I2	Industry	Brazilian	Board of Directors	China-Brazil Business Council	10/11	25:52:83	Portuguese
I6		Chinese	Board of Directors	Chinese company	30/11	19:42:96	English

Source: Authors (2022)

Finally, while the data from the questionnaire were tabulated and explored in the section dedicated to interpretation and discussion, the data generated by the interviews were treated with the aid of the categorical content analysis technique. To this end, the categories of analysis guiding the discussion were extracted from the theory (Table 1), serving as a reference for the classification of the record units (Bardin, 2016, p. 50).

4 Results and Discussion

From the answers to the questionnaire (85 = 100%) and the interviews, it appears that the interlocutors recognize not only the existence of pragmatically built relationships between the State, the university, and the industry but also associate this relationship with the determination to promote China's economic growth, highlighting the importance of the complementarity of the responsibilities they assume in contemporary times.

> **I1:** "[The] State is carrying out the planning, guiding, and investing in Education. The university [in turn] is following all this planning and helping the companies with training the workforce (sic) and research. And industries are investing in Education. [...]."

> **I2:** "These three pillars are essential for Chinese development. The dominant State looks at the university and industry as potential sources of innovation [...] and has been investing massively in bringing these sectors together".

> **I3:** "First, the State will make a coordinated policy and give direct account to. [...] University will adjust itself according to the demand of the market. […] And industry, they need a high scale and professionals [...] to adapt to the rules of the market".

> **I4:** "[There is] an investment for these three actors to act in an often integrated and synergistic way."

> **I5:** "There is an increasingly active and more sophisticated interaction between university and industry [...] with support from [central and local] governments".

> **I6:** "Chinese government has built it […] university focuses on comprehensive training to make our students have more capability and research and […] industry needs the specialists, to do the special job, and also focuses on a technology demand in research […] to attend the market".

As for the respondents, the main contributions resulting from the relationship between State, university, and industry involve three aspects related to the Chinese economy's growth: two of them highlight internal aspects – "*promoting innovation*

in strategic sectors for the Chinese economy" (53 = 63%) and "*enhancing the country's economic development*" (49 = 58%) – and one external aspect in that they assured "*influencing the increase in competitiveness of Chinese companies abroad*" (32 = 38%).

Despite the diversity of origins and the variety of professional ties (Chart 2), it is observed that the respondents emphasize aspects associated with the development of China's domestic market, to the extent that only twelve (15%) signaled that the State is contributing to "*attracting international investments*" and eight (10%) perceived that there is "*promotion or encouragement of the opening of the Chinese market*."

Somehow, some respondents disregard that among the reforms committed to promoting the country's economic growth, market reopening gains importance as one wishes to promote China's integration into the world system (AMIN, 2014, p. 287). Thus, China's prioritization in international research network formation with major countries was noted. On the other hand, it is because the interests that bring the companies of 34 respondents (40% of 85 = 100%) closer to China lie in the possibility of "*integrating some R&D network*".

Although the interviewees recognize the importance of the relationship between the State, university and industry, the narratives express a certain personalization by highlighting the relevance of the management of Xi Jinping. There is an explicit recognition of the representative of the State (central government) as the principal responsible for the decisions of a nation committed to modernization in the path of what he calls the "New Era" (Jinping, 2018; 2020). An extract from one of the interviews is highlighted, illustrating the points to which attention is drawn,

> **I2:** "With the arrival of Xi Jinping [in 2013], the weight of the State increases. The strategic vision that the State is essential in driving Chinese economic development has been growing significantly. This year [2021], we already feel and will see an increasingly overactive State."

In contemporary China, a combination between "a strong state" and an "effective state" in the terms used by Etzkowitz (2003) is observed. The central government recognizes the forces responsible for promoting economic development and spares no effort to support them, hoping to obtain the desired results. Besides being responsible for setting priorities and policies, it is primarily in charge of investment and regulation.

By understanding that China's expansion of its radius of influence necessarily involves investment in brains, S&T, and knowledge transfer between universities and industries, the elaboration of the five-year economic plans – 13th (2016-2020) and 14th (2021–2025), for example – foresee substantial investments directed to a growing group formed by universities favored by the Double First Class project (2017 and 2022). The results are admirable: 26 of the 42 universities initially favored with the high investments arising from this program are among the 100 best in the world, six of them in the selected group of the "Top 10," with ratings above 87%.

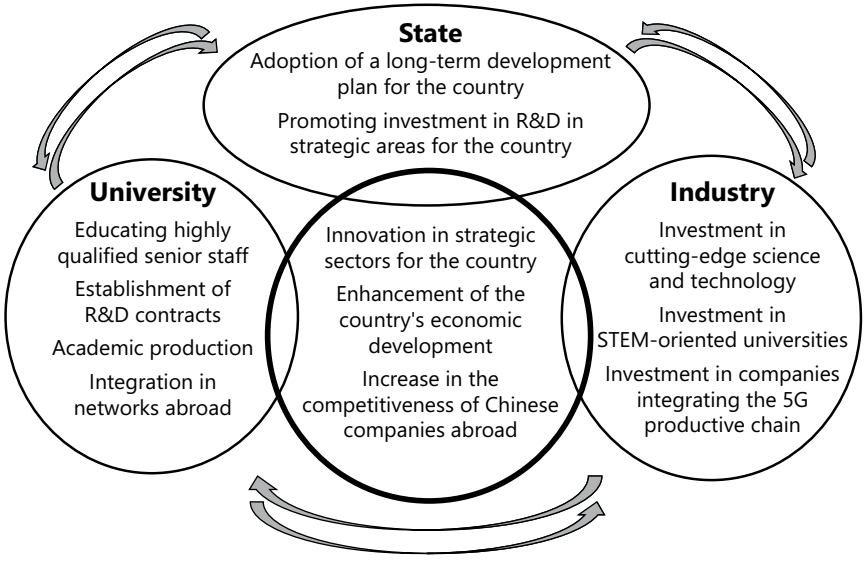
These results gain prominence when observing the increase (albeit slight) in the number of co-application patents involving universities and companies, without disregarding how they have influenced the installation of a culture based on innovation among industries in the country. According to the Global Index Innovation (GII, 2021), considering the measurement of the performance achieved by the innovation ecosystems of 132 economies, China occupies the 12th position, with several S&T clusters located in coastal cities (Figure 2), a region where there is a concentration of economic activity because it brings together the headquarters of large companies oriented to the digital technology segment, besides the capital (Beijing).

Three clusters are among the Top 10: Shenzhen (2nd position), Beijing (3rd position) and Shanghai (8th position) (GII, 2021). The existing 52 high-tech development zones evidence the consistency of technological advancement created more than two decades ago (1998). Several provinces gain relevance as they reinforce the central government's investment in the country's formation, development and consolidation of innovation technopolis. This perception was highlighted by one of the interviewees:

> **I5:** "[...] There is an increasingly active and sophisticated interaction between universities and industries, with the support of governments, especially the subnational ones [provinces or municipalities], not necessarily the central government [State]".

In the center of Figure 6, the three major contributions evidenced from the virtuous relationship between the State, university and industry in this section are respectively synthesized. Moreover, at the extremities, the resulting collaboration of each actor by categorical content analysis is shown in Table 1.

Figure 6 - Major contributions of the State-university-industry relationship to recent economic growth in China



Source: Authors (2022)

Table 1 - Categories and subcategories of analysis: by actor

Theoretical Categories	Subcategories	Major Contributions
State	Favorable Environments Political and regulatory	Adoption of long-term development plan for the country * *Revisited every five years and updated.*
	Investment	Promoting investment in R&D in strategic areas for the country
University	Human Capital	Educating highly qualified senior staff * *Trains 9 million new university students per year*
	R&D	Establishments of R&D contracts **Second largest player and R&D worldwide*
	Knowledge Transfer	Academic production **Electrical and Electronic Engineering, subarea Telecommunications - with H-Index over 40. Twenty-six of the 42 Chinese universities analyzed are among the 100 best universities worldwide, and six are among the Top 10.*
	Formation of Inter. Collaborative Networks	Integration in networks abroad. **The number of proceeding papers presented in congresses exceeds the number of published papers.*

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Company	S&T	Investment in cutting-edge science and technology
	Technological Innovation	Investment in STEM-oriented universities Investment in companies that integrate the 5G productive chain

Source: Authors (2022)

5 Final Remarks

The goals that combine developmental reforms and the country's reopening have economic growth as their horizon. In the context of the knowledge economy, China's competitiveness and international insertion depend on substantial investment in the modernization of the country's industry, necessarily involving the production and dissemination of S&T, particularly through knowledge transfer to industries, especially those located in the sectors prioritized by the five-year plans. The success of this presupposes creating and strengthening relationships between the State, university and industry – in China's case, by valuing the productive public sector and encouraging the productive private sector.

The success of the National Medium and Long-Term for Education Reform and Development (2010–2020), the National Patent Development Strategy (2011–2020) and the Double First Class (*shuāng yī liú*) project (2017), for example, depends on strengthening universities, which demand investment. However, universities are responsible for educating highly qualified senior staff, S&T development, knowledge transfer, R&D contracting (the world's second largest player) and forming an international cooperation network serving the productive sector. The more the strategic importance of a university system capable of contributing to the rebirth, rejuvenation and revitalization of the country in general and especially its economy is recognized, the more the university is favored with investments, the more it assumes responsibilities, and the less it enjoys academic autonomy. After all, "*[...] the university serves business and local economic development.*" (**I1**).

Regarding the literature, it is noted that the Chinese university is little known and, although it is mentioned, it is marginally studied. In this sense, the association between the State, university and industry arouses curiosity and justifies the investigation. In the context of an emerging Eastern country, with an economy in transition and the perspective of being recognized as the first world economy in less than ten years, the country has reinforced the Western capitalist system.

Nevertheless, in the realm of functions established by a strong-state interaction, the State, university and industry act in an integrated way, guided by distinct and complementary goals. Although this is a fair relationship, it occurs asymmetrically since the State has multiple responsibilities. Besides being responsible for defining goals (five-year plans) and formulating policies, it is the main agent for financing the programs and the only one responsible for regulation, consistent with the principles that characterize the triple helix (strong-state). Perception made explicit by the interviewees - front "*The strategic vision that the State is fundamental in driving China's economic development, we will see an even more superlative State*" (**I2**).

Though, given the existence of a government committed to the driving forces of economic development, the last four decades have seen a combination, not always balanced, between a "***strong state***" and an "***effective state***". In this context, Chinese universities and industries are subordinated to the State's interests and the State's political and economic agenda regarding the economy's success and the development involved.

Finally, given the launch of the second phase of the examined project Double First Class (*shuāng yī liú*) in 2022, the State's focus on the internationalization, mainly, of Higher Education is reinforced. To further delve into the virtuous relationship between the State, university and industry in the recent economic growth in terms of a sustainable development in China, it requires a longitudinal study of this research, including the contributions of the relationships between other Chinese actors (society, environment, for example) of the composition of the innovation ecosystem (Figure 1).

Estado, universidade e empresa: avaliação de suas contribuições para o recente crescimento econômico na China

Resumo

Em busca de se tornar um país inovador até 2049, para o centenário da República Popular da China, o recente crescimento econômico chinês impressiona e dá a essa nação a previsão de ocupar o posto de primeira economia mundial até 2030. Desempenho este que despertou o interesse de compreender de que modo a relação entre Estado, universidade e empresa tem contribuído para tal desenvolvimento econômico. Para tanto, esta investigação, de caráter exploratório, fez uso de pesquisas bibliográfica, documental e de campo (entrevistas e aplicação de questionário). Os dados foram tratados por meio de análise de conteúdo teórica, com as categorias teóricas elaboradas a partir da teoria Tríplice Hélice e Transferência do Conhecimento. Os achados indicam se tratar de uma relação virtuosa, que ocorre de forma assimétrica com um Estado de múltiplas responsabilidades e comprometido com as forças propulsoras do desenvolvimento econômico, oscilando entre um "Estado forte" e um "Estado efetivo".

Palavras-chave: *Teoria da Tríplice Hélice. Estado Chinês. Universidade Chinesa. Empresa Chinesa. China.*

Estado, universidad y empresa: evaluación de sus contribuciones al reciente crecimiento económico en China

Resumen

En busca de convertirse en un país innovador en 2049, para el centenario de la República Popular China, el reciente crecimiento económico chino es impresionante y da a esta nación la previsión de ocupar la posición de primera economía mundial en 2030. Esta actuación ha despertado el interés de comprender cómo la relación entre el Estado, la universidad y la empresa ha contribuido a dicho desarrollo económico. Para ello, esta investigación, de carácter exploratorio, se valió de la investigación bibliográfica, documental y de campo (entrevistas y aplicación de un cuestionario). Los datos fueron tratados mediante análisis de contenido teórico, con categorías teóricas elaboradas a partir de la teoría de la Triple Hélice y la Transferencia de Conocimiento. Los resultados indican que se trata de una relación virtuosa que se produce de forma asimétrica con un Estado con múltiples responsabilidades y comprometido con las fuerzas motrices del desarrollo económico, oscilando entre un "Estado fuerte" y un "Estado eficaz".

Palabras clave: *Teoría de la Triple Hélice. Estado Chino. Universidad China. Empresa China. China.*

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