

State-Owned Enterprises' reforms and their implications for the resilience and vulnerability of the Chinese economy: Evidence from the banking, energy and telecom sectors¹

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Abstract

This paper explores how policies of market liberalization and partial privatization of State-Owned Enterprises (SOEs) involved in the production and provision of key inputs – banking, energy and telecom – affect the vulnerability and resilience of an economy. SOEs' response to such policy changes and their ability to operate under the new market conditions are crucial for maintaining quality and continuity in the supply of intermediate goods and services that underlie the functioning of the economy and society. The paper analyses this issue in the context of Chinese SOEs' reforms. It finds that privatization and liberalization in China have been designed (i) to strengthen the economy's resilience, as access to private capital and to foreign markets have contributed to companies' growth and to increase the stock and quality of critical infrastructure for the country; but also (ii) to minimize the vulnerabilities that arise from such policies, by envisaging measures against volatility in capital markets and the destabilizing effect of market competition through ad hoc regulation. The paper may prove relevant for the next steps of Chinese SOEs' reforms and its findings might find applicability in other geographical contexts as well.

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Keywords

Resilience; Vulnerability; Connectivity; Chinese economy; State-Owned Enterprises' reforms; Partial privatization; Mixed ownership; Market liberalization; Infrastructure; Network industries

1. Introduction

The existing literature uses the concept of vulnerability to indicate a system's exposure to the risk of disruption due to weakness and defenselessness from potentially destabilizing factors such as disturbances or shocks of endogenous or exogenous nature (Berdica, 2002; Adger, 2006; O'Brien et al., 2007; Caschili, et al., 2015b). By contrast, the concept of resilience indicates the system's ability to react to such factors. Therefore, a system is defined as resilient if a disturbance or shock (i) does not alter its functioning and distinctive features, (ii) affects its functioning temporarily but the system is able to restore its operability in a relatively short period of time, (iii) alters the system's original functioning but the reaction leads to a change that allows to fulfill the original goals although in a different way (Reggiani et al., 2002; Briguglio et al., 2009; Gibson and Tarrant, 2010; Folke et al., 2010).

Although the two concepts are related to an extent, as they both refer to the risks and potentially existential challenges faced by a system, vulnerability indicates the *ex-ante* condition of exposure to risk, while resilience refers to the *ex-post* reaction to a destabilizing factor, namely when the risk has materialized itself into a factor of disturbance. The distinction is important and may prove relevant for policy purposes. In fact, it makes it possible to distinguish between (a) policy interventions that minimize vulnerability and prevent disruptions from occurring, for example by promoting regulatory measures to safeguard against potentially destabilizing (*exogenous*) effects for the economy; and (b) policy interventions that create the long-term (*endogenous*) conditions for resilience, for example by increasing the stock and quality of critical assets, which are necessary for the system to react positively to different types of shock.

In every system, connectivity plays an important role for the system's functioning and operability (Goyal, 2007; Reggiani et al., 2015). Connectivity may contribute to strengthening the system's resilience or expose it to increasing vulnerability, depending on the quality of infrastructure and networks connecting its main actors and structures, and on the system's ability to manage their interactions, which evolve over time and are subjected to constant changes (Kuroda, 2015; O'Kelly, 2015). Infrastructure and physical networks are the

backbones of economies, and are fundamental for the functioning of social and political systems as well. They ensure a smooth functioning of markets by connecting intermediate and final producers, and final producers to consumers across different locations within or outside the national borders (Cardinale, 2019b).

The connecting role of infrastructure and physical networks has social and political implications as well because they make it possible to supply the population with final goods and grant access to Services of General Interests (SGI) (Florio, 2013; Cardinale, 2017). Infrastructure and networks play an important role for national security and to preserve political stability against domestic and external threats (Millward, 2011). Their resilience or vulnerability to internal or external disturbances and shocks, in turn, are crucial to guarantee the functioning and security of the economy and society, and to prevent the economy from underperforming or experiencing disruptions.

Critical infrastructure and networks are usually owned and managed by large companies. Financial, technological and managerial features of these companies determine the extent to which critical infrastructure and networks are able to respond to disturbances or shocks in the ways described in points (i), (ii) and (iii) above. The contribution of such companies to the resilience of the economy becomes even greater when they are vertically integrated, namely when their business is not limited to the management of infrastructure and networks, but it involves other critical phases across production, transport and sales. Ultimately, their contribution to the economy's resilience is fundamentally linked to their ability to carry out and perform a connectivity role, which consists in the coordination and management of key phases of the value chain and in the supply of essential inputs to the economy in abundant and affordable ways.

The systemic effect of companies operating in network industries has historically justified various forms of State influence in their management, especially through the retention of substantial shares in the ownership, but also through regulation or concessions with obligations attached (Bauer, 2005; Florio, 2013; Cardinale, 2019). However, starting from the 1990s, privatization and liberalization policies around the world have also targeted network industries, although with substantial delay as compared to sectors with lower systemic relevance. The reshuffling of the governance of network industries has raised concerns in academic and policy debates regarding the potential impact for the economy².

² Recent academic contributions have reconsidered the role of SOEs by highlighting important points of strength as compared to Private Enterprises (PEs). This literature started in the 2000s but gained influence in the 2010s, after the world economic crisis highlighted the limitations of deregulation and the need to rethink corporate

This is the main question addressed in the paper. More specifically, the paper focusses on how policy changes affect the resilience and vulnerability of companies operating in key sectors of the economy, and whether their response to policy changes is adequate to maintaining quality and continuity in the supply of key goods or services to the economy and society. The focus is on banking, energy and telecom sectors in China. The choice is based on their systemic relevance for the economy, as each sector uses financial capital, energy, and telecom services as inputs in their production of final goods and services. The importance of these sectors to the economy's resilience is proven by the fact that when they underperform, because the quality of their output is low or the infrastructure securing supplies to interdependent sectors is not adequately developed, the economy is negatively affected and is also likely to underperform. Technical failures, mismanagement and serious disruptions in the production and supply of these inputs could even lead to large-scale disruptions in final productions and in fundamental services, causing serious damages to the economy and society.

The Chinese context is suitable for the purpose of this research because of the magnitude of policy changes occurred in recent decades (Hu and Wang, 2017), particularly liberalization and privatization policies. Policy changes are a major test for the economy's resilience because they cause substantial changes in previous patterns of production and distribution. The change has potentially destabilizing effects for the system when it occurs in sectors producing key inputs for the economy (Andreoni and Scazzieri, 2014; Kuroda, 2015; Scazzieri et al., 2015), as in the case of banking, energy, and telecom. In particular, liberalization policies are a form of sectoral regulation and have direct impact on the business of companies, especially when these retains monopolistic power (Bianchi, 1998), which is often the case with network industries. The entry of new competitors in the market results in changes in the strategies for procurement, production and sales (Bianchi and Labory, 2013), and in investment in current and future infrastructure and networks.

Privatization of State-Owned Enterprises (SOEs) is considered as a subset of liberalization policies, and results in a change in the ownership structure of the company. The transition from State to private ownership is likely to induce major changes in the management and in the

governance in ways that allow the pursuit of public interests in addition to profitability for shareholders. However, the main emphasis is still on the traditional theme of SOEs' vs PEs' performance, the countercyclical role of SOEs in times of recessions (Bance and Bernier, 2011), and on their role as providers Services of General Interest (SGI) (Bance and Obermann, 2015; Florio, 2013). The debate on SOEs among Chinese scholars emphasizes similar aspects, especially those related to performance, while Chinese policy-makers seem also to consider the strategic implications of SOEs' reforms. In Europe and BRIC countries (where SOEs are still relevant), little research has addressed the industrial policy role that contemporary SOEs can play (Bass and Chakrabarty, 2014; Clò et al., 2017), their systemic relevance as suppliers of essential inputs to final producers, and the implications for economic competitiveness deriving from it (Cardinale 2020).

decisions about production and infrastructure investment (Cardinale, 2019a; 2020; Barca et al., 2020). If private shareholders advocate for implementing investment strategies that prioritize the pursuit of short-term profitability, long-term investments on production and infrastructure may be reduced (Cardinale, 2017). This strategy may in turn negatively affect connectivity within the fundamental structure of the economy and, in the long term, the ability of these companies to supply key inputs to the economy, thus weakening and exposing the economy to a condition of increasing vulnerability.

The paper shows that the reforms of Chinese SOEs were implemented to increase the resilience of key sectors of the economy while minimizing the factors of vulnerability arising from the reforms. More specifically, resilience has benefited from the increasing capitalization of partially privatized SOEs and the possibility to invest in infrastructure and other industrial assets that are critical for the economy. At the same time, reforms made new aspects of vulnerability emerge, such as financial instability due to volatility of financial markets, conflicts between public and private shareholders, and rivalry between incumbent and emerging firms³.

To strengthen key sectors' resilience while containing newly emerging vulnerabilities, liberalization and privatization policies in China have been designed to address respectively (i) the short-term financial instabilities that may be caused by listing SOEs in stock exchanges, particularly when these go public in markets that are not subjected to domestic regulation; and (ii) the reduction of long-term investments and the potential deterioration and/or inadequate development of assets of systemic interest such as infrastructure and networks.

The paper is structured as follows. Section 2 analyses how a gradual process of reform of SOEs in the banking sector was a solution to reconcile growth and stability in the financial sector. Section 3 shows that SOEs' reforms in the energy sector has also contributed to their growth, although the ambition of the reforms has in some cases posed risks to energy security. Section 4 reconstructs the challenges faced during the years of reforms in telecom SOEs, and how a new industrial policy vision is trying to address and reconcile the development of technological leaderships with market competition. Section 5 summarizes the main findings, and Section 6 provides suggestions for further research.

³ See Kogut & Walker (2001) on the relation between changes in ownership structure as a result of globalization and resilience of the German financial sector. The paper argues that the globalization of the German financial sector was not detrimental for its resilience because the sector has successfully maintained some fundamental mechanisms of cooperation among local actors while also readapting them to the new globalized context. This finding is important for the purpose of this paper because globalization is closely related to the policies of liberalization and privatization, and has similar effects on governance and organizational changes of companies and industrial sectors.

2. SOEs' reform in the banking sector: preserving financial stability

The banking sector is critical for the resilience of an economy as capital allocation across sectors is key for industrialization and economic competitiveness. Stability and sound governance of the banking sector are crucial to reduce the economy's exposure to various factors of vulnerability such as economic and financial crises, or the financial collapse of key companies. For this reason, deep reforms in the banking sector are likely to generate deep changes in the economy, including the degree of exposure to systemic risks and the ability to adapt to the various challenges posed by domestic and international trends.

The reforms of the Chinese banking sector in the last four decades reflect the need to face fast transformations in the Chinese economy that were brought about by high economic growth and the transition to a more diversified and advanced economy. The partial liberalisation of the banking sector is only the culmination of a gradual process of reforms started in 1978 with the transition from a mono-bank system to a more diversified and decentralized one. In recent years, liberalization has resulted in the partial privatization of the largest commercial banks and the adoption of a joint-stock model that also envisages the entry of foreign investors as major shareholders (Wang and Giouvriss, 2019). However, regardless of the type of reform and stage of development, reforms have always been accompanied by regulatory measures aimed at preventing the banking system from being exposed to factors of instability, and to safeguard its resilience. This has been an aspect of continuity in the last four decades, starting from early reforms in the late 1970s to the latest deregulation and privatizations.

The first major reform occurred in 1978, and consisted in the separation between monetary policy and commercial lending within the People's Bank of China (PBC). The goal was to allow PBC to conduct monetary policy only, and to establish other banks to manage commercial lending. This reform led to the rise of the "big four" state-owned commercial banks, each in charge of a macro-sector of the economy (Garnaut et al., 2018). The Agricultural Bank of China (ABC) started managing funds addressed to rural activities. Bank of China (BOC) was created to finance foreign trade and investments. China Construction Bank (CCB) was established in view of the increasing urbanization and the need to support the construction sector. Industrial and Commercial Bank of China (ICBC) had the function to finance Chinese industrialization, which was promoted mainly by granting favorable terms to credit to Chinese State-Owned Enterprises (SOEs) operating in the manufacturing industry.

The abandonment of the mono-bank system was not initially intended as an early step to increase domestic market competition. It rather reflected the need to face the growth and

diversification of the Chinese economy, which was undergoing a transition from a rural to an industrial economy. The establishment of ad hoc financial institutions able to deliver specific financial services to each of the main sectors – primary, secondary and tertiary – was envisaged to face this growing complexity in the Chinese economy. Another important step towards the realization of a market economy occurred when PBC was granted with some degree of autonomy from the Ministry of Finance (MOF). This led to a substantial change in the forms of public financing, which consisted in a reduction of the equity interests held by MOF across different economic activities and companies' increasing reliance on loans provided by PBC (Byrd, 2018). Although the reduction of MOF's equity interests in economic activities has apparently downsized State intervention in the economy, the control of credit exercised through PBC was granting similar influence to the State. The divestment made it possible for the State to address increasing financial capital to more strategic purposes (both industrial and social), for example by increasing direct or indirect influence on emerging sectors.

In the period between the late 1980s and early 1990s, financial intermediaries outside the “big four” started growing at a fast pace. This period witnessed the reestablishment of the Bank of Communication (BOCOM), as well as the growth of Urban Credit Cooperatives (UCC) and Rural Credit Cooperatives (RCC), in addition to the emergence of other non-bank financial intermediaries such as Trust and Investment corporations, leasing, securities and insurance companies. The expansion of the Chinese financial sector culminated in the establishment of the Shanghai and Shengzhen Stock Exchanges in 1990 and 1991 respectively, which was a precondition for the partial privatization of SOEs and thus for a further acceleration of the transition to a market economy.

The 1990s was a decade of extensive reforms devoted to upgrading the regulation of an increasingly sophisticated banking sector, and to laying the groundwork for market competition. The separation between commercial and policy lending was an important step in this direction (Enjiang and Yuk-shing, 1998). It resulted in the establishment of ad-hoc banking institutions in charge of managing the policy lending, namely China Development Bank, Export and Import Bank of China and Agricultural Development Bank of China. Since then, the “Big Four” could only manage commercial lending. This separation was conceived to incentivise private investments thanks to the adoption of managerial practices oriented only towards the pursuit of profitability and exempted from the pursuit of policy objectives, which often pose constraints on financial returns. The growth of private investments in commercial banks was pivotal to increase the liquidity of banks and the volumes of lending, and thus to stimulate the growth of the whole economy. Despite the increasing influence of private

interests in the governance of commercial banks, the State retained majority shares over them, and thus it was able to influence their strategic decisions and preserve national interests.

In the late 1990s, the need to contain the potential spread of the East Asian financial crisis to China resulted in a slowdown of the reforms aimed at realising a socialist market economy. The measures to contain the crisis were both of emergency and structural nature, addressed to overcome evident vulnerabilities in the banking system such as excessive exposure to debt, and to strengthen the sector's resilience in the long-term. For example, one emergency measure consisted in the issuance of a special treasury bond worth RMB 270 billion to replenish the "Big Four". Another measure to improve the financial soundness of the "Big Four" envisaged the establishment of four Asset Management Companies to dispose of their non-performing loans (Garnaut et al., 2018).

In addition to emergency measures, the financial crisis provided the opportunity to implement structural reforms. For example, with the abolition of the Credit Plan system by the People Bank of China (PBC), commercial banks were prevented from granting unlimited credit to businesses and were forced to improve the assets and liabilities management practices. Tighter regulation on credit policies was promoted in addition to higher autonomy from the State in the management of funds. This made it possible for commercial banks to benefit from greater discretion over credit strategies and greater autonomy in selecting the amount of credit to allocate across firms and projects.

However, PBC reserved itself the right to intervene in the Big Four's lending management through the so-called "Window Guidance" (Fukumoto et al., 2010). This provision was addressed to grant adequate levels of investments to sectors of strategic relevance such as energy, infrastructure, high-tech, especially in cases where they were suffering from shortage of capitals. In summary, the abolition of the Credit Plan and the introduction of Window Guidance had the dual purpose of improving the management and financial soundness of banks, while safeguarding the main channels of financing for strategic sectors and avoid the potential drawbacks of financial discipline for economic growth.

By the early 2000s, the liberalization reforms reached a turning point with the partial privatization of state-owned commercial banks, which allowed domestic and foreign investors to buy major shares. In 2004, the ceiling of foreign ownership was lifted from 20% to 25%, while the ceiling for single foreign ownership was lifted from 15% to 20%. Foreign investments were not only allowed in existing Chinese banks. Foreign banks were also allowed to entry and operate in the Chinese market. In 2005, investments by foreign banks amounted to \$18 billion, with Bank of America, Goldman Sachs, HSBC, and Royal Bank of Scotland taking the lead.

Table 1 and Table 2 show the main foreign investors in three of the Big Four and in other major Chinese banks, following their Initial Public Offerings (IPOs) in the mid-2000s.

Table 1: Foreign investors and shares held in three of the Big Four Chinese banks

	Foreign investors	% of total shares held
Bank of China	Royal Bank of Scotland, Merrill Lynch, Li Ka shing, Temasek, UBS, ADB	16%
China Construction Bank	Bank of America, Temasek	14%
Industrial & Commercial Bank of China	Goldman Sachs, Allianz, American Express	10%

Source: Leigh and Podpiera (2006)

Table 2: Foreign investors in other major Chinese banks

	Foreign investors
Bank of Communications	HSBC
Bohai Bank	Standard Chartered Bank
China Everbright Bank	China Everbright Holding (HK), ADB
Citic Bank	BBVA
Huaxia Bank	Deutsche Bank, Pangaea Capital, Sal. Opp.
Industrial Bank	Hang Seng Bank, IFC
Minsheng Bank	IFC, Asia Finance Holding
Shanghai Pudong Development Bank	Citigroup
Shenzen Development Bank	Newbridge Capital

Source: Leigh and Podpiera (2006)

The policy of market opening was strengthened by a State Council Decree in 2006, which granted equal rights to foreign and local financial institutions. However, to prevent financial instabilities from occurring as a result of the increasing exposure to foreign capital, the Chinese government implemented some changes at the institutional and regulatory levels. For example, it established the Central Huijin Investment Co. Ltd (CHIC) to hold and manage the control stakes of the Big Four on behalf of the State Council. Furthermore, the China Banking Regulatory Commission (CBRC) was established in 2006 to maintain financial stability in accordance with PBC policy but also to face the increasing complexity of the banking system,

due to its expansion, and to prevent the systemic risks potentially brought about by liberalization.

The enhanced regulation encouraged further cycles of liberalization and privatization reforms. By the end of 2013, sixteen major commercial banks were listed at the Shanghai, Shenzhen or Hong Kong Stock Exchanges. The liberalization of the banking sector coincided with better performance among the main commercial banks.

In addition to stricter lending regulation, the introduction of private shareholders in the ownership structure of former State-Owned Enterprises (SOEs) was also a major determinant to the extensive reduction of Non-Performing Loans (NPL) (Garcia-Herrero et al., 2006). In fact, private shareholders would be unlikely to bear the risk of keeping a high NPL ratio, especially if the lending strategy was politically motivated and entailed uncertain returns. The reduction of NPLs, in turn, has contributed to the rise of pre-tax profits, as shown in graph 2.2. However, other factors such as economic growth and internationalization of the Chinese commercial banks were also decisive for performance improvements.

The recent liberalization of the interest rate on loans and deposits can be seen as the culmination of the banking sector's reforms. However, the timing of this reform shows once again the cautious approach to liberalization adopted by Chinese policy-makers. In fact, interest rate liberalization was only completed in 2015, when previously launched reforms of market opening and privatization had encouraged the entry of domestic and foreign operators (Li and Liu, 2019). Only in a more competitive financial market could deregulation of interest rates result in lower prices for consumers. Market competition and deregulation made it possible for the PBC also to rely on an effective mechanism of interest rate pass-through when pursuing objectives of monetary policy. In contrast, the previously high market concentration required regulated interest rates to prevent the Big Four from taking advantage of their market power and apply a high mark-up in price.

To summarize, the partial privatization of Chinese state-owned banks was functional to increase their dimension, which in turn was an essential precondition to strengthen the resilience of a fast-growing economy. By contrast, a less than proportionate growth of the banking sector vis-à-vis the economy as a whole decreases the ability of the national banks to help a fast-growing economy overcome the diverse types of instability, crises and failures, of cyclical and structural nature, associated with the process of growth and development. At the same time, to minimize the vulnerabilities arising from privatization, a set of institutional and regulatory reforms have been implemented. For example, the Chinese State has maintained majority stakes across the major commercial banks, which is an important guarantee for

investors and therefore a factor of stability for the bank. Furthermore, the State's influence in the board may still be an effective tool to imprint a strategic direction in line with the industrial policy objectives of long-term growth and resilience.

3. SOEs' reform in the energy (oil & gas) sector: meeting energy security challenges

Energy security is vital for the functioning of an economy. The provision of energy supplies in abundant and affordable ways is necessary for the continuity of industrial production and of fundamental services to citizens. Continuity and quality of energy supplies are essential for the growth and competitiveness of the national industry, which is in turn an important element of resilience for the economy. In fact, a strong industrial structure is essential for the economy's ability to react to various types of shock or disruption, because its financial, technological, organizational and human resources are crucial to quickly overcome crises of various nature, such as economic, social, health-related, and political.

In the last decades, the Chinese energy policy has been driven by the task to reconcile energy security with market-oriented reforms and environmental sustainability. For example, listing in stock exchange of Chinese energy SOEs was done to increase their capitalization and the investment in production and infrastructure. Liberalization was an opportunity to internationalize domestic companies. It resulted in a higher trade volume with producing countries, contributing to ensure stable commercial relations and secure constant energy supplies to China⁴. Overall, this strategy has proven successful, as energy security targets were met. The growth in production and import as well as in the stock of energy infrastructure was able to meet the six-fold increase in electricity and natural gas consumption of the last 20 years (IEA, 2020).

However, in certain cases, energy security has proven difficult to reconcile with liberalization on the one hand, and with innovation aimed at environmental sustainability on the other hand. In fact, although innovation is usually pursued to increase energy efficiency in the phases of production and transport, the application of new technologies to existing energy systems may also generate supply risks. These risks materialized in recent years across some regions in the north of China, where the phasing-out of coal and its replacement with renewables and natural gas infrastructure was not always successful in meeting energy demand,

⁴ See Caschili et al. (2015a) for an in-depth analysis of the role of international networks and supply chains for resilience and vulnerability.

which caused temporary disruptions to large industrial areas (Meng & Glenn, 2017; Wang et al., 2020).

In a similar way, liberalisation can increase uncertainty in infrastructure investments, as competition may jeopardize the long-term financial returns deriving from them. Furthermore, the transition from monopoly to market competition may be a major cause of destabilization in the supply chain, due to coordination problems⁵. Privatization of State-Owned Enterprises may be detrimental for energy security if listing in stock exchanges entails a direct exposure to financial volatility and growing difficulties to reconcile private shareholders' short-term profitability with long-term investments for energy security. The difficulties to reconcile energy security with the modernization of the energy sector shed light on the rationale of the Chinese gradual approach to reforming the energy system in the last decades.

Since its early development, the Chinese energy industry has had a monopolistic structure across the main energy markets, namely oil & gas, electricity and coal. In some cases, a monopoly was granted only for a specific phase of the energy supply chain. For example, in the petroleum industry, China National Petroleum Corporation (CNPC) was operating onshore Exploration & Production (E&P) of crude oil and natural gas; China National Offshore Oil Corporation (CNOOC) was established to operate the offshore E&P; Sinopec was in charge of operating the downstream business, particularly refinement and petrochemical. In the electricity sector, State Power Corporation of China was a monopolist across all market segments, from generation to transmission and distribution. The monopolistic market structure was justified by the existence of natural monopolies, as well as by the necessity to reinvest monopolistic rents for the growth and upgrade of the energy industry (Zhang, 2004).

However, since the 1990s, the energy sector has undergone extensive reforms. For example, State Power Corporation of China was fragmented into five companies operating in the generation phase and two operating in the transmission phase (Pollitt et al., 2017). In the oil & gas sector, market reforms occurred in a slightly different way, in that they provided the possibility for existing monopolies to operate in each other's phase of the supply chain. Overall, the objective was to incentivize competition in domestic markets to prepare national companies to an imminent opening to the global market.

In the last three decades, liberalization reforms have been promoted and deepened despite the frequent changes in the energy governance and the reshuffling of public bodies responsible

⁵ However, the entry of new energy firms is likely to partially offset the above-mentioned negative effects on energy security if the growing number of operators leads to an increase in investment in the sector and generates additional supply without causing coordination problems.

for energy policy and planning. Among other things, fragmentation of energy governance was the result of Chinese SOEs' internationalization, the large-scale growth of their investment and business abroad, and the difficulty for central State institutions to control and manage this aspect of SOEs' business. Although the State Council remains the main body regulating the key issues related to Outward Foreign Direct Investment (ODI), other State bodies play an increasing role. For example, State Asset Supervision and Administration Company (SASAC), which owns and manages State shares in the main Chinese energy SOEs, has direct influence in the board and hence on investment strategies for both domestic and foreign markets (Cunningham, 2015).

Partial privatisation of SOEs was a pillar of the liberalization policy, and more broadly, of the Chinese vision to increase China's global influence in key sectors. In fact, on the one hand, the increasing managerial autonomy of partially privatised energy SOEs was essential to cope with their expanding business abroad, and with the need to increasingly decentralize and deregulate some important aspects of this business. On the other hand, partial privatization of SOEs secured access to (domestic and foreign) private capital, which was functional to their growth and the possibility to compete in global markets. The acquired leadership, in turn, had beneficial effects for the modernization of domestic production and infrastructure networks, expanding access to energy to poorly served areas and improving energy security.

The plan to partially privatise the main energy SOEs was ambitious because it envisaged their listing in stock exchanges, rather than the safer option of targeting selected private investors. The decision to rely on Initial Public Offerings (IPOs) was encouraged by the possibility to access to a greater pool of capital. Furthermore, listing SOEs in stock exchanges made it possible to reform extensively their corporate governance to comply with standards of listed companies, improving operational efficiency. Greater access to capital and improved operational efficiency were deemed important for strengthening the resilience of energy companies, although the volatility of the financial market could become an element of constant instability for them.

By the late 1990s, the three largest energy SOEs merged their most competitive assets and core business units, each into a subsidiary to be listed shortly after. China National Petroleum Corporation (CNCP) established PetroChina, Sinopec Group created Sinopec Ltd, while CNOOC spun-off CNOOC Ltd. However, privatisation of each company occurred in different ways, reflecting the need to overcome different types of vulnerabilities across these companies. Table 3 shows the main investors on the three largest Chinese energy SOEs following their Initial Public Offerings (IPOs) between 1999 and 2001.

Table 3. Partial privatization of the three largest Chinese energy firms

Parent company	Market segment	Listed subsidiary	Major new investors	% of total shares held by investors
CNCP	Onshore upstream, national grid	PetroChina	BP Amoco, Sing Hung Kai, HK Cheung Kong Enterprises, Hutchison Whampoa	10%
Sinopec	Downstream, petrochemicals	Sinopec Ltd	State Development Bank, Cinda, Orient, Huarong, Exxon Mobil, Shell, BP	43.94%
CNOOC	Offshore upstream	CNOOC Ltd	Asian Infrastructure Funds, American International Assurance	27.5%

Source: Author's elaboration on data by Zhang (2004)

PetroChina's IPO was mainly conceived to improve CNCP's operational efficiency and incentivise its internationalisation process. In fact, the IPO required undertaking reforms to separate the most efficient and profitable units, which were merged into PetroChina, from the loss-making ones, which remained under CNPC. Therefore, the IPO was a first step in a process of CNPC's restructuring that envisaged the dismantling of unprofitable assets through leasing or auction, and the introduction of managerial practices from the private sector such as the promotion of employee buy-outs. The floatation of 10% of PetroChina's total shares was enough to justify the reforms in the corporate governance, while at the same time to grant CNPC with revenues amounting to \$2.89 billion and 90% control (Feshraki, 2000). The fact that the floating stock was acquired mainly by strategic investors, including competitors such as BP, did not prevent CNPC from maintaining a high level of influence over management. In fact, the floatation of only 10% can be interpreted as part of the general perception in China of the strategic nature of PetroChina's assets for energy security.

Sinopec Ltd's IPO was also conceived to improve performance and competitiveness vis-à-vis its peers in the downstream global energy market. However, the volume of the IPO and the nature of targeted investors suggests the existence of some differences as compared to the case of PetroChina. First, the sale of almost 44% of the assets indicates that although a majority share was still retained by the State, a more diversified shareholder base was allowed. The pursuit of this strategy may have different reasons. For example, Sinopec Ltd's smaller dimensions as compared to PetroChina suggested a potentially smaller systemic effect in case of IPO's failure or financial instability. Another reason is connected to the nature of the

industry. In fact, although the refining and petrochemical industry is responsible for the production of essential goods such as fuel and plastics, it supplies a lower number of sectors as compared to the oil & gas industry, thus domestic production may be more easily replaced by imports. Therefore, conflicting interests in the management and subsequent stalemates that are more likely to occur in presence of a more diversified shareholder base would have led to a lower systemic impact.

Furthermore, the high volume of shares sold indicates another important fact, namely Sinopec Group's high debt. The sale of almost 44% of Sinopec Ltd's shares made it possible to raise \$3.73 billion (Zhang, 2004). As the main creditors were domestic banks, a great part of the shares was sold through a 'debt for equity swap'. This made it possible to keep at least half of the shares sold within State-controlled groups such as State Development Banks and asset management companies, while only the remaining 21.21% was held by foreign energy firms such as Shell, Exxon Mobil and BP.

Although partial privatisation of CNPC and Sinopec Group's subsidiaries was successful in reconciling market-oriented reforms with financial stability, the case of CNOOC brings evidence of various financial risks that IPOs could generate. The difficulties encountered in listing CNOOC Limited can be partly attributed to the lack of previous experience, as in 1999 CNOOC was chosen as pilot experiment by the Chinese government to conduct the first listing of a major energy subsidiary. In fact, the first attempt to issue \$2bn between Hong Kong and New York has failed. After a substantial cut of the share price, the issue was reduced to 1bn and subsequently the IPO was temporarily pulled back. Before a more successful IPO in 2001, in which \$1bn were raised, CNOOC has adopted a more cautious strategy of selling major shares to selected investors, increasing trust and the chances of success (Feshraki, 2000). Another successful strategy to increase trust among foreign investors was to realise joint investments into the Chinese market with foreign energy firms. This led CNOOC in 2002 to realise the largest Chinese joint venture with Royal Dutch Shell to build a petrochemical plant worth \$4.3bn.

CNOOC failures in the first two attempts to go public have significantly lowered the value of the company, negatively affecting the firm's budget as well as investments in current and new projects. Considering the dominating role of CNOOC in the Chinese offshore upstream and its contribution to energy supplies to the country, the devaluation of the firm and the difficulty to finance projects is likely to affect energy security in the long term, which represents a factor of vulnerability for a fast-growing economy. However, the third attempt to list CNOOC was successful, and the negative effects seem to have had only a limited impact.

The implications of partial privatisation for the vulnerability of the energy system, as well as for its resilience in the long term, do not merely concern the financial stability deriving from IPOs of major energy companies. Partial privatization may also influence resilience if it results in a more limited ability by the government to pursue long-term investments for energy security. In fact, the transition from full government ownership to mixed (public-private) ownership leads the board to prioritise the pursuit of profitability at the expense of public policy objectives, including energy security (Cardinale, 2017).

For example, representatives of private shareholders in the board could lobby executive managers to pursue only those investments in Exploration & Production (E&P) or in transmission infrastructure that provide stable and safe financial returns. Private investments in this sector are usually driven by high oil prices, while in periods of low oil prices their volume is to an extent reduced. However, providing constant energy supplies to industry and households requires adopting a different approach, which promotes stable investments regardless of fluctuations in the energy cycles and private shareholders' short-term profitability objectives. In China, the adoption of a model that ensures high and stable investments in transport and production infrastructure is necessary to meet the world's fastest-growing energy consumption.

A common view in the literature attributes gas and infrastructure scarcity in certain Chinese regions to lack of market competition (Dong et al., 2017). According to this view, PetroChina, which owns and manages 80% of the national grid, is deliberately underinvesting due to lack of competitive pressure. This is shown by a reduction in capital investments of 30% each year since 2014, although the fall of the oil price seems to play a major role in this trend (Liu and Ma, 2016). According to this view, PetroChina's underinvestment would have caused major disruptions to energy supply in China's Northern regions and hit several key industrial areas, causing temporary suspensions of their production processes. From this perspective, lack of competition in the energy market could contribute to make the economy vulnerable to energy disruptions and to jeopardize its resilience in the long term.

However, other policy changes may have contributed to the aforementioned disruptions. One important factor is certainly the "coal-to-gas" policy, which envisages a large-scale substitution of coal with natural gas to generate electricity across the country. In this context, PetroChina may have experienced increasing pressure to meet policy targets and to cope with extensions of the gas network. The 2014 deal between CNCP and Gazprom to supply China with 38bcm yearly for 30 years was signed also to make it possible for PetroChina to meet the targets of the "coal-to-gas" policy. However, the transmission pipeline "Power of Siberia",

which will be owned and managed by Gazprom, is not yet completed (Kong et al., 2019). In fact, gas will only reach China by 2024, preventing PetroChina from accelerating the implementation of the “coal-to-gas” policy at the expense of the Northern Chinese regions.

Partial privatization of PetroChina is another important factor which can explain underinvestment in these regions, and which could contribute to exacerbate the vulnerability of the Chinese energy system. In fact, although supplying the Northern regions with Russian gas would certainly increase PetroChina’s sales and expand its energy market share at the expense of coal producers, it is also true that investment costs for the expansion of the gas grid in these regions may exceed the returns from gas sales. As Northern regions have lower than average income, shareholders would maximise short-term profitability if the Russian gas were sold to higher-income regions. In addition, higher-income regions are already well served by a network of gas infrastructure, which makes it possible to realise extensive savings on new infrastructure investments. However, in the long term, underinvesting in the Northern regions may be a missed opportunity not only for economic development, but also to increase the connectivity of the national energy system as a whole. A higher level of connectivity among different consumption, storage and transport points would increase the ability to quickly overcome gas scarcity or disruptions across regions, providing a positive contribution to the resilience of the energy sector and of the economy as a whole.

PetroChina’s reluctance to extend the Chinese gas grid in some regions may also be the result of the increasing uncertainty deriving from the way market-oriented reforms will evolve. For example, the plan to unbundle the infrastructure business from production and sales, and to open the energy market to domestic and international companies, represents an element of uncertainty for current infrastructure investments and for the grid’s extension. In fact, these measures would allow PetroChina’s competitors to access the grid and appropriate a substantial share of upstream and downstream markets, from which infrastructure investments are usually recovered. For this reason, PetroChina has recently announced its intention to sell two thirds of the domestic gas grid to financial or strategic investors. This measure would make it possible to cut debt, increase the availability of cash, and focus on markets that are less subjected to policy reforms. Although this strategy could be functional to enhance the operational efficiency of PetroChina, the implications for energy security of a grid managed by multiple companies with short-term profitability goals are uncertain.

Overall, market and SOEs reforms in the energy sector have positively contributed to the economy’s resilience, as they allowed energy firms to grow, invest in the expansion and upgrade of energy production and infrastructure, and meet energy security challenges posed by

a high consumption rate. However, reforms have also shown some potential downsides. For example, the exposure to financial volatility resulting from being listed in stock exchange is a factor of vulnerability, as the stability of companies that are crucial for energy security is also influenced by sudden and unpredictable dynamics such as change in investors' confidence and in the strategies of influential investments funds. Furthermore, the beneficial effects on resilience provided by the access to private capital may be offset in the long term by an increased emphasis on short-term profitability at the expense of long-term investments for energy security, which typically occurs as a result of privatization.

4. SOEs' reform in the telecom sector: partial privatization as a tool of industrial upgrade

As in the case of financial capital and energy, telecom services are crucial for industrial production and for society. In fact, the high technological content of the telecom industry enables innovation and industrial upgrade in other sectors. The incorporation and use of Information and Telecommunication Technologies (ICT) across sectors also increase industrial competitiveness, which is itself a factor of resilience⁶. The contribution to resilience is not only related to the economy, but it has a much broader dimension, considering the industry's importance for national defense. However, the increased connectivity that results from technological advancements may also expose the economy to sources of vulnerability. For example, the economy is increasingly exposed to cyber threats because (i) it relies almost exclusively on ICT and often lacks alternative systems; and (ii) the advancements and spread of ICT among non-states actors has also increased threats to cybersecurity.

SOEs' reforms have to an extent taken into account the specificities of the telecom sector, while also showing similarities with the reforms in other key sectors. Until the early 1990s, the telecom industry was wholly managed by the Ministry for Post and Telecommunication (MPT) through the Directorate General of Telecommunications (DGT). However, by 1994 DGT became a separate entity and the *de facto* monopolist. In the MPT's view, the monopoly was functional primarily to national security, both in peace and war time (Shen, 1999; DeWoskin, 2001). In fact, the telecom infrastructure was deemed essential for the State to access information and overcome potential threats to political stability originating both domestically and abroad. The monopoly of the telecom market was believed to be functional also to

⁶ See the Sections 3 and 5 for a more detailed explanation of the nexus between national industry and the economy's resilience.

important civil and industrial purposes. For example, a state-owned integrated telecom industry was managed more easily than one with many operators, and could be more effective in providing a stable and reliable service. Furthermore, it made it possible for the State to benefit from extensive monopolistic rents and pursue ambitious plans of extension and upgrade of the telecom network.

However, various stakeholders in society and institutions advocated improving the performance of the telecom network and to extend it to under-served regions. Citizens were not happy with the quality of services, which were underperforming in comparison with other countries. The Ministry of Energy, Ministry of Railway and Ministry of Defense had also interest in promoting the telecom network's upgrade to improve the performance of infrastructure and services in their respective sectors. The Ministry of Energy and Ministry of Railways had previously developed their own telecom networks alongside their own energy and railway networks. One of the reasons was to reduce average costs by taking advantage from the profitable telecom business (Ure, 1997). The Ministry of Defense was mainly interested in developing its own telecom network to establish a reliable communication channel countrywide and prevent potential threats to national security.

The need to modernize the telecom sector opened the door to foreign firms. However, market opening was only limited to equipment suppliers and was subject to conditions related to technological transfer. The strategy succeeded in upgrading the domestic industry, which became increasingly independent from the import of foreign technology. In 1999, 23.6 million new lines were developed, while almost 100 percent of the newly added exchanges were manufactured in China. Until the mid-2000s, Chinese telecom operators were still relying on foreign equipment company, but mainly for the deployment of the most advanced technologies (Ure, 1997). For example, in 2004 Unicom relied on the US firm Lucent to develop a Code Division Multiple Access (CDMA) infrastructure across four large Chinese regions. Shortly after, the rapid growth of Chinese companies such as Huawei and ZTE would make it unnecessary to rely on foreign companies even for the deployment of cutting-edge technologies.

Unlike the equipment market, the service market remained monopolistic at least until the mid-1990s and heavily protected from foreign investments until the early 2000s, when China joined WTO. The debate around the reform of the telecom sector was polarized. More conservative positions were held by MPT and the incumbent China Telecom, as the entry of new operators would put an end to their control over the telecom industry. In contrast, other views supported an intermediate solution, which consisted in granting access to new entrants

but limiting it to State-owned domestic companies. This solution probably envisaged State ownership as an element of interest alignment and coordination among network operators, in addition to the support of specific regulatory measures. Ultimately, the rivalry between incumbent and new entrants, and the destabilizing effects for the market, could have been mitigated by the mutual effect of State ownership and ad-hoc regulation.

In line with the approach to reform adopted in other key sectors of the economy, the latter view prevailed. A gradual market opening to domestic companies was believed to be the only effective approach to reconcile potentially conflicting objectives, such as stability and reliability of the network, with market competition (Mueller and Tan, 1997). The establishment of Unicom in 1994 was the first step in this direction, as it started operating alongside the former monopolist China Telecom. Unicom's ownership structure was peculiar as 75% of the ownership was shared among the Ministries of Railways Electric Power Industry and Electronics Industry, while the remaining shares were owned by other state-owned investors. In other words, Unicom was the result of the merger of pre-existing minor networks owned separately by the above-mentioned ministries. The foundation of Unicom was probably an attempt by such ministries to break the monopoly of MPT over the telecom sector, which was exercised through the control of China Telecom (Zheng and Ward, 2011). One of the main objectives for Unicom's shareholders was to appropriate a share of the large monopolistic rents of China Telecom and benefit from the strategic advantages of owning and managing a telecom network.

As a result, the transition to a more competitive market structure was opposed by MTP and China Telecom. In fact, although the State Council recognized China Unicom with the same legal rights as China Telecom, the latter took advantage of its privileged market position to obstacle China Unicom's growth. For example, it started a price war on wireless and international internet services, while urging the State Council to adopt a regulation that safeguards telecom companies from the detrimental effects of market competition. Not surprisingly, China Telecom prevented China Unicom from accessing its network, forcing China Unicom to be competitive only in the areas reached by its limited network (DeWoskin, 2001). In addition, Unicom's network could be difficultly extended due to a limited endowment fund.

The lack of adequate financial resources and technologies led Unicom to set up joint ventures with foreign investors, despite the regulation was still banning foreign equity in telecom networks. As a result, in 1998, the regulatory authority declared some of these joint ventures illegal, issuing orders to even halt projects that were near completion. This measure

not only created major disruptions in the areas licensed to Unicom, but generated commercial uncertainty across the supply chain, slowing down the delivery of other projects.

It soon became clear that conflicting interests between the incumbent China Telecom and the new entrant Unicom were causing increasing uncertainty in the sector. For this reason, China Telecom was further unbundled to decrease its market power and generate a transition from a duopoly to an oligopoly of four operators. However, the transition to an oligopoly did not secure greater coordination between incumbent and new entrants. For example, a new rivalry emerged between China Telecom and its former subsidiary China Mobile, which was spun off to become an independent operator. One of their disputes concerned the access to a conduit for new fibre lines in Lanzhou. In this occasion, China Telecom prevented China Mobile from accessing the network thanks to its control of the trunked system, leading China Mobile to retaliate, causing project delays and disruptions in the area (DeWoskin, 2001).

To solve the shortage of capital and increase their market power, China Unicom and China Mobile launched their IPOs. Unicom's IPO in the 2000 proved very successful both in the New York and Hong Kong stock exchanges as it raised \$4.9 billion. The success of China Unicom's IPO was the result of the expected growth of the Chinese telecom market by financial investors, as shown by the similar success of China Mobile's IPO shortly after. The IPOs have contributed to the consolidation of China Unicom and China Mobile in the Chinese telecom market, thanks to increased availability of capital as well as improved corporate governance and operational efficiency (OECD, 2016). However, in some occasions, being a public company has also shown some drawbacks. For example, the volatility of stock markets has shown destabilizing effects after leaks over the Ministry of Information Industry's intention to cut to zero airtime charges on incoming calls, causing the fall of China Unicom's and China Mobile's stock price and great financial losses (DeWoskin, 2001). Only a subsequent denial by the Ministry has slowly brought the stocks to the previous values.

To contain the destabilizing effects of privatizations, regulatory provisions envisage limitations on foreign investments, particularly in the most commercially sensitive segments of the telecom market. More specifically, companies providing Basic Telecom Services (BTSS) are required to remain majority-owned by the State, while no specifications are made for operators of Value-Added Telecom Services (VATS). The distinction underlines the strategic relevance of BTSS, particularly because they own and operate a public network infrastructure, which serves the purpose of their core business of voice telephone and data transmission services. This makes them very different from operators of Value-Added Telecom Services (VATS), which are only resellers of telecom services and do not own a network infrastructure.

Although foreign investors are allowed to retain equity stakes in BTSs' operators, they are prevented from having a substantial influence in the management.

This provision, which remains part of the current legislation, aims to provide special protection to network infrastructure. In this way, the State reserves the right to influence the decisions related to fundamental aspects of management, as networks are critical for national security and industrial upgrade. For example, the lack of long-term investments in the extension and upgrade of telecom networks could jeopardize the State's ability to access important information for security purposes during peace times and to rely on safe and widespread communication channels during war times. Furthermore, telecom networks have proven to be a key driver for industrial upgrade, thanks to the high technological content of their assets. Therefore, managing the telecom networks according to a commercial logic alone could prevent the State from pursuing important innovation objectives.

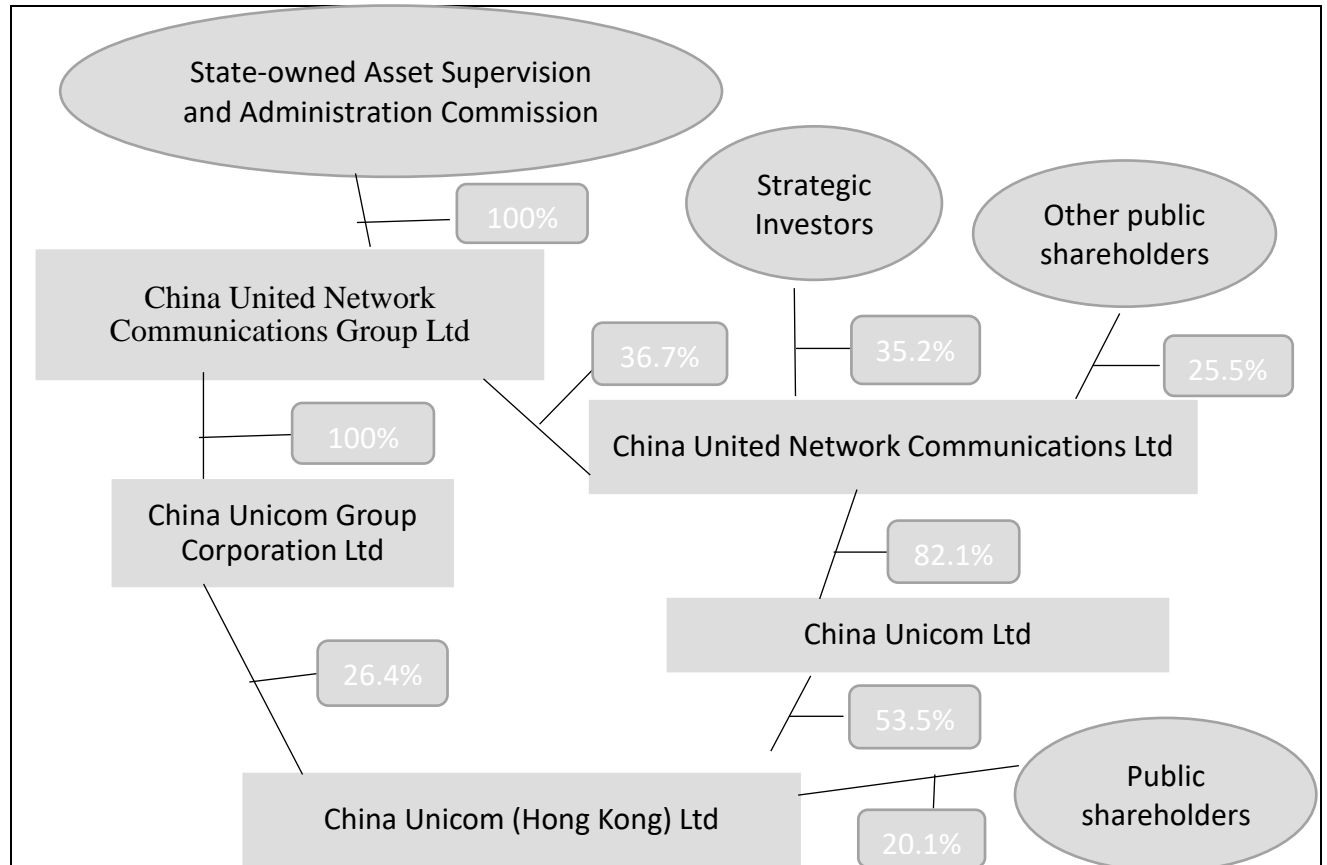
Nevertheless, it is worthy to note that majority stakes retained by the State did not discourage the existence of private investors' minority shares alongside them. In contrast, private investments in Chinese telecom firms have played an important role for their growth in domestic and global markets, especially in the case of new entrants such as Unicom. In addition, private investments made it possible for State-Owned telecom firms to acquire managerial practices from the private sector and to compete in global markets with leading firms in the telecom sector.

The gradual nature of reforms has proven successful as China Telecom, China Unicom and China Mobile became among the largest telecom operators in the world. The progresses in the domestic regulation and the companies' expansion in global markets helped reduce the rivalry in the domestic market. For example, in 2008 China Unicom's acquisition of China Netcom, the second largest high-speed internet network operators in China, was allowed by China Telecom after China Unicom agreed to sell the CDMA business unit to China Telecom (Thomson Financial News, 2008). The operation made it possible to maintain a balance in the retention of strategic assets by the main companies, while increasing their dimension to improve the competitiveness in international markets.

In 2017, China Unicom was selected by the government as a pilot company to test the opportunity to bring SOEs' reform to a more ambitious level. The goal was to decrease State ownership further and allow strategic investors to retain important stakes in the company (see Figure 2). The strategic investors were Chinese private tech companies, recently emerged as major global players. These included Tencent, Baidu, JD.com, and other e-commerce, commercial banks and investment funds, both private and state-owned (China Unicom, 2017).

The deal had the ambition not only to increase the capital base, as in the case of previous IPOs in the 2000s. The reform intended to create an alliance between the main private and public players with a future vision to pool together their cutting-edge technologies and integrate the telecom with the internet and media industries.

Figure 2: Ownership structure of China Unicom and the introduction of strategic investors



Source: Author's diagram based on data by China Unicom (2019b)

So far, the strategy has not created major vulnerabilities for the company, at least in the short term, as Unicom's successful performance shows (China Unicom, 2019a). In the long-term, it would be interesting to see whether the partnership between state-owned and private companies will result in an effective coordination of public and private interests in China. Past attempts to reform the telecom sector have shown that destructive competition between incumbent and emerging companies may arise, resulting in uncertainty over investment and lack of coordination. Despite short-term disruptions for users and missed opportunities to strengthen the resilience of the telecom sector through extension and upgrade of telecom infrastructure, the internationalization of Chinese telecom companies has offered them an opportunity to coexist and cooperate in the domestic market, reaching a new equilibrium in the

new framework of market competition. The transition to the model based on mixed (public-private) ownership is an attempt to upgrade the model of corporate governance by considering the latest evolution of the telecom sector, namely the emergence of private tech companies. The attempt is to turn a potential challenge for the sector's resilience into an opportunity, by exploiting synergies among traditional and emerging players in high-tech sectors and pursue objectives of systemic relevance.

Looking at the overall process of telecom market reforms, it is possible to state that liberalization has represented a source of vulnerability for the economy mainly in the early phases. The element of vulnerability consisted in the destabilizing effect of the transition from a monopolistic to a more competitive market structure, which has caused major rivalries among incumbent and new entrants, sometimes leading to disruptions in the development of infrastructure and services. In contrast, partial privatization of telecom companies has not created major financial instabilities, due to the high profitability of the telecom sector and a stable demand for their shares by investors.

The reforms in the governance and ownership structure of SOEs have proven compatible with the objectives of growth of the Chinese telecom companies. Their listing in stock exchanges increased their capital base, making it possible to invest in the domestic development or import from abroad of new technologies (Shen, 1999). Although their growth initially provoked frictions among them in the domestic market, it subsequently provided an incentive to internationalize the business. The increasing profitability from domestic and international activities made it possible to finance large-scale investments in China and to provide high-quality telecom services across the whole national territory. The increasing connectivity and integration among different regions in China, as well as with international markets and supply chains, has certainly contributed to expanding and strengthening China's industrial structure, which is an indicator of the economy's resilience.

5. Concluding remarks

The partial privatization of State-Owned Enterprises (SOEs) operating in sectors that produce key inputs for industrial production or operate critical infrastructure systems – banking, infrastructure, network industries – can affect the economy's vulnerability and resilience in many ways.

SOEs' exposure to fluctuations in global capital markets may be a primary cause of increased vulnerability for the economy. For example, a failed Initial Public Offering (IPO) or

a sudden loss of trust from investors are likely to tighten budget constraints and jeopardize the firm's capability to finance operations and maintenance of current projects as well as invest in new projects. When financial instability occurs in companies producing essential inputs the effect on the economy is amplified, as the shortage and/or lower quality of such inputs negatively affect the production of several interdependent sectors using them. Such mechanisms are likely to disrupt production and fundamental services at the expense of the economy and society.

However, partial privatization may have mixed effects on resilience, namely the economy's ability to overcome disruptions or shocks. A positive contribution to resilience may result from the access to private capital, which is a precondition to increase the stock of critical infrastructure as well as the quality of their management and technology. A negative contribution to resilience may arise from the newly introduced managerial practices, especially if private shareholders' priority to maximise short-term profitability jeopardises long-term investments for growth and technological upgrade.

In the last three decades, the Chinese approach to reforming key sectors of the economy has been constantly addressed to minimize factors of vulnerability that potentially arise from each reform. In particular, the sale of substantial stakes in SOEs to private investors has been gradual, with majority stakes still remaining under State control. Listing only a minority stake limited the exposure to fluctuations in global financial markets and the potentially destabilizing effects deriving from it. Therefore, partial privatization was an opportunity to even strengthen the resilience of key industries and hence the resilience of the Chinese economy as a whole. For example, a gradual opening to foreign capital made it possible to increase the industrial and infrastructure stock, pursue a systematic process of reverse engineering to develop domestic technologies, and assimilate efficient managerial practices from foreign companies. This strategy in turn promoted industrialization and infrastructure-led upgrade, which are key elements for the economy's ability to react to shocks or disruptions. In fact, an advanced industrial structure is a crucial asset to successfully overcome different types of crises - economic, social, health, political - as it is a reserve of financial resources, technologies, and scientific and organizational knowledge for the country. However, strategies of privatization varied and resulted in different outcomes depending on the sector's specificities and strategic relevance for the economy.

In the banking sector, partial privatization of the main commercial banks was preceded by their strengthening through the issuance of treasury bonds and the establishment of asset management companies to dispose of non-performing loans. The strategy has succeeded to

prevent the listed companies from undergoing periods of financial instability, as shown also by successful IPOs. The introduction of strict lending regulations and promotion of higher autonomy in the management of funds improved the assets and liabilities management practices and the financial soundness of the banks.

In addition, the Chinese State introduced regulatory provisions to contain the risks connected to market-oriented reforms. For example, with the introduction of the ‘Window Guidance’, the State reserved itself the right to set higher lending volumes for strategic sectors, safeguarding against potential shortages of capital in sectors that produce key inputs for the economy. A similar logic was applied to the privatization process of state-owned banks. In fact, not only were equity stakes of foreign investors allowed within certain thresholds, with the State retaining control shares. The privatization process was also supported by the establishment of new regulatory institutions, asset management companies and special commissions for the supervision and administration of State assets, both to prevent financial instabilities and coordinate the industrial strategies of partially privatized banks with the State industrial strategy.

In the energy sector, partial privatization of the main companies was an occasion to restructure the entire sector through mergers and disposal of non-performing assets, as well as to introduce more efficient managerial practices. This policy made it possible for Chinese energy companies to grow, thanks also to increasing access to foreign capital, and to finance infrastructure investments needed to increase energy access across China and meet the fast-growing consumption rates. However, in some occasions, partial privatization has generated financial instability across the largest companies and has contributed to disruptions of energy supplies in some regions. For example, in the case CNOOC, the third largest Chinese energy company, the IPO has failed in the initial two attempts. To increase trust among investors, CNOOC’s management has first conducted private offerings, by targeting strategic investors. Subsequently, it has launched joint ventures with foreign multinational companies in the Chinese energy market, contributing to a successful IPO afterwards.

Partial privatization may have also contributed to sporadic energy security problems that recently occurred in China’s northern regions. Although the major cause for energy disruptions can be imputed to the ‘coal-to-gas’ policy, which aims to phase out coal in a very short period of time and replace it with natural gas, PetroChina’s partial privatization may be also a major determinant of this trend. In fact, in joint-stock (public-private) companies the pursuit of profitability is prioritised over public policy objectives such as energy security. In China’s northern regions, financial returns of infrastructure investments are highly uncertain, as income

levels are among the lowest in China, which could explain PetroChina's reluctance to extend the gas grid. Nevertheless, the majority stake retained by the State, in theory, makes it possible to re-orient the board's investment strategies in ways in which profitability and energy security can be reconciled.

Analogously, the partial privatization of the major Chinese telecom companies has been conceived to incentivize their growth and internationalization. However, this was done with a special attention to preserving China's industrial and security interests. In fact, the telecom sector has the highest technological content among those considered here, and thus a high potential of technological transfer to the rest of the economy. Moreover, the management and technology of telecom networks are key for the security of other critical infrastructure and networks as well as to provide a strategic advantage in military affairs. In the telecom sector, the risk of financial instabilities brought about by IPOs was limited thanks to the profitability of the telecom sector and the high margins of growth expected for telecom companies. In contrast, the main aspect of vulnerability was the instability led by the transition to a more competitive market structure, which caused rivalries between the former monopolist and new entrants competing for oligopolistic rents and technological leadership.

In recent years, privatization of Chinese telecom companies has not been conceived only as a strategy to improve operational efficiency and increase access to private capital, but also to take advantage from the synergies between State-owned and private firms and to boost China's technological leaderships. To do so, public offerings are being replaced by private offerings, as these make it possible to rely on strategic investors rather than financial investors only. As strategic investors are industrial corporations operating in the same or related sectors (internet, media, e-commerce), this strategy makes it possible to realise industrial synergies that result in long-term infrastructure investments, cooperation for the development of new technologies, and other industrial initiatives. This strategy aims to further strengthen the resilience of the Chinese telecom sector, which is a precondition for China to meet national objectives and global ambitions, of economic and political nature.

6. Research directions

The paper suggests that the Chinese experience in reforming SOEs, and more generally its transition to a market economy, may inform studies and policy-making in other countries where SOEs play a relevant role. This is true because China's attention to preserving SOEs is not driven only by a temporary necessity to fill the development gaps that typically occur in developing economies. In fact, China is already a great economic power and a world leader in

advanced technologies, parts of its industrial structure being technologically advanced or even at the frontier. Accordingly, China's innovative approach to the reconciliation of public and private interests is driven by a pragmatic attempt to organize available resources (public and private) in ways that suit domestic priorities and international challenges. For example, the corporatization (and partial privatization) of SOEs can be seen as a form of governance that makes it possible to reconcile the need to align political and economic interests domestically with the necessity to access foreign capital and penetrate foreign markets to face international competition from foreign companies operating in the same sectors. The extent to which China's SOE reforms will be successful may prove crucial for its rise as a world superpower⁷.

SOEs are complex nexuses of economic and political interests; as such, they require forms of governance that are able to balance the interests involved. This balance may be difficult to reach, but if achieved it may act as a very powerful driver to the pursuit of multiple and ambitious national goals. The reason why most Western economies, particularly in the European Union, have partially dismantled the system based on SOEs can be traced back to the end of the Cold War. The transition from a multipolar to a unipolar system in international relations has played a role in reshuffling the way political and economic interests were structured under SOEs in some EU countries. Ultimately, liberalization and privatization represented the policy tools to embrace new forms of governance more compatible with the unipolar system and with the agenda of globalization that was being pushed forward.

China was less exposed to this process of global change because of its non-involvement in the US sphere of influence. However, China's decision to maintain its SOE system can also be explained by the need to rely on SOEs for developmental purposes. State-led industrial development was not a priority in EU countries at the turn of the century, because of the considerable level of development achieved (Cardinale, 2019b). Another difference between China and the EU has to do with the views on State intervention that are held in the current historical phase. The increasing unpopularity of State intervention in Europe has justified the scale and approach to SOEs' dismantlement, while its absence in China has left room for a more pragmatic approach that uses SOEs as tools to capitalize on the opportunities offered by globalization.

Despite the different reasons and approaches to implementation, both EU countries and China have reformed their SOE system. But reforms of Chinese SOEs were gradual and

⁷ In the International Relations literature, a State is considered a superpower if its cooperation is needed by the international community to tackle every major world issue, considering the extent of its economic and political interests worldwide as well as its power of deterrence (Mearsheimer, 2001).

showed a clear intention to build a hybrid model that takes advantage of synergies between public and private interests of partially-privatized SOEs. In EU countries, the dismantlement of the SOE system was not backed by a clearly articulated industrial vision for the transition to the next stage.

The analysis of this paper bridges different strands of the literature whose interconnections are currently underexplored. The three main strands address (i) the resilience and vulnerability of socio-economic systems; (ii) the economics of network industries; and (iii) SOEs and liberalization reforms. This paper provides initial insights on how these three fields of study can be empirically linked with each other, by showing the extent to which privatization and liberalization policies that target SOEs operating in network industries expose the economy to new risks (vulnerability) and/or affect its ability to respond to factors of disturbance or shocks (resilience). Future research could provide more detailed and systematic empirical evidence on these issues, for example by showing the effects of policy changes on the resilience of specific sectors, infrastructure systems and single projects of systemic relevance (e.g. for energy security, transport connectivity, and cyber security).

The analysis of vulnerability and resilience has highlighted the importance of connectivity. It has emerged that the expansion of infrastructure networks and subsequent increase in connectivity within the economy often enhances resilience, as this makes it possible to take advantage of a wider range of assets and solutions that can be mobilized to overcome disruptions. It also shows that increased connectivity may expose the economy to factors of vulnerability, as the increasing interdependence between sectors, regions and countries is likely to intensify supply or provision risks in case of disruptions in the network. Future empirical research could build on this paper to systematically explore how connectivity in network industries is related to resilience and vulnerability. The insights of this paper could also provide the starting point for further theoretical research, for example for what concerns how the resilience and vulnerability of infrastructure networks depend on features of connectivity. An interesting direction could be to study the extent to which the infrastructure networks investigated in the article can be considered “nearly decomposable” (Simon and Ando, 1961; Simon, 1962), in the sense that “the short-run behavior of each of the component subsystems is approximately independent of the short-run behavior of the other components” while “in the long run, the behavior of any one of the components depends in only an aggregate way on the behavior of the other components.” (Simon, 1962, p. 474), or whether the subsystems of infrastructure networks are strongly interdependent even in the short-run. This could have important consequences for the resilience and vulnerability of infrastructure networks.

Additional features may become apparent by explicitly investigating infrastructure networks from the viewpoint of horizontal vs vertical connectivity (Scazzieri, 2021), i.e. whether infrastructure networks are links through which different industries deliver intermediate goods to one another, or as part of production sequences leading from inputs to final consumption for final investment goods.

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