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Analysis on the Key Factors of the Network Separation in China in the Era of Telecommunications 4.0

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Abstract: The era of telecommunications 4.0 is a challenge to regulators and operators insofar as external environment, technology (such as SDN and NFV), and consumers' requirements have changed. This paper's main objective is to introduce and discuss several issues around the implementation of network separation as a regulatory remedy. The paper discusses network separation practice in several countries (including Sweden, the UK, Italy, Ireland, New Zealand, Australia and Singapore) and summarizes their advantages, disadvantages, process as well as effects. All findings are rendered in tabular form according to different separation modes which are accounting separation, functional separation, operational separation and ownership separation. Moreover, this paper discusses the main elements of a possible test for the adequacy of network separation. A sequential decision tree procedure with three questions is proposed: (1) Is there significant market power in China in the era of telecommunications 4.0? (2) Are there little vertical complementarities between services along the supply chain? (3) Is network separation a better regulatory tool than any other alternative remedy? By answering these three questions, the paper concludes that network separation is not suitable for China under the current situation.

Keywords: telecommunications regulation; network separation; telecommunications 4.0

1. Introduction

After the evolutions of analog telecommunication, digital telecommunication, and IP (Internet Protocol) telecommunication, the telecommunications industry will enter the era of telecommunications 4.0 which is not only merged IT (Information Technology) and CT (Communications Technology), but also taken DT (Data Technology) as the core of this era. This era is characterized by a strong demand for rich information access and consumption, likewise for diversification and flexibility of communication methods [1]. During the era of telecommunications 4.0, traditionally separated businesses such as cable TV, media and entertainment, telephone and broadband services will be offered through more flexible and unique infrastructures. The era of telecommunications 4.0 is a challenge to regulators and operators when external environment, technology (such as 5G, SDN and NFV) and consumers' requirements have all changed. Telecommunications industry has formed strong market barriers in China affected by various factors, such as natural monopoly and politics. Structural contradictions between institution and mechanism have existed for multiple years which need to be adjusted and reconstructed immediately. Long-term distortion of competition based on infrastructure has led to repeat construction, frequent price war, high entrance barriers and low openness. In order to reconcile these problems, the government has made various efforts. For example, changing tax type from business tax to value-added tax, granting virtual operator licenses and establishing a tower company (which offers construction, maintenance and operation of the tower). In addition, the discussion about network separation of domestic and foreign telecommunications regulators and operators has become a hotspots issue in the world.

As a regulatory remedy, vertical separation is an extreme measure designed to prevent market power, open the telecommunication market, and reduce price discrimination as well as non-price discrimination by separating infrastructure network from operators. Whereas, it may discourage the introduction of new entrants, which will cause the decline of economic welfare. Because vertical network separation, which has many degrees of modes, is considered to disrupts or reduces efficiencies of vertically integrated firms in theory. Many governments care about the potential for such damage to the economy and realize that some extreme forms of separation are irreversible, like ownership separation. So as a result, most regulators would not consider network separation and view it as the "last resort", which would be used only in cases of extreme and irremediable discrimination.

2. Separation modes in other countries

Network separation in foreign countries has already started for a long time. Since 2002, Australia (2005), Italy (2002 & 2008), New Zealand (2007), Sweden (2008), England (2005) and some other countries have taken certain separation modes. There are six degrees of separation lying between accounting separation and ownership separation according to a classification derived from Cave [3]. The definition of extremes-accounting separation and ownership separation are obvious. And there is a potentially infinite range of "operational" or "functional" separation alternatives between accounting separation and ownership separation. To simplify the classification, this paper introduces four network separation modes which are accounting separation, functional separation, operational separation and ownership separation. Crandall [4] points out that the greater the separation, the greater the independence between the network and retail operations. The network operator may lose the incentive to discriminate downstream competitors. Based on the vertically integrated economic theory, increased separation reduces the ability to capture vertical economies.

As the mildest form, "accounting separation" may simply require the firm to maintain separate records for its upstream and downstream divisions, then report critical data to regulators, thus facilitating regulators' efforts to monitor compliance. In 2006, the Swedish government assigned PTS to investigate the telecommunications market and found the presence of market power [5]. As a response to the assessment, TeliaSonera promised to open its broadband network, introducing fair competition mechanisms and audit facility. However, the accounting separation mode failed to solve the problem of non-price discrimination because PTS's market survey showed that the broadband market competition was still very inadequate after the accounting separation – TeliaSonera offered broadband services as the monopoly operator in many areas. In order to avoid tougher separation, TeliaSonera implemented voluntary separation by creating Skanova Access AB on January 1, 2008. Then Skanova was established as a wholly owned subsidiary of TeliaSonera. The main function of Skanova is to sell copper-related infrastructure on the same commercial terms to all operators on the Swedish market, including TeliaSonera itself. Although voluntary functional separation had been implemented, the legislative process still went on until the Law came into effect on July 1st, 2008. Although accounting separation in Sweden did not last long, it is undeniable that accounting separation limited the price discrimination, but non-price discrimination is a different urgent matter. Non-price discrimination may be seen in relation to products such as unbundled loops, wholesale line rental and bit stream. The proposed remedy is a redesign of business processes – operational separation or functional separation – to ensure precisely equal treatment.

Functional separation and operational separation require the establishment of independent departments or subsidiaries which are still affiliated with the dominant operators. The departments or subsidiaries have a certain degree of autonomy, provide equivalence entry to the competitive enterprises. The leading telecommunications operators in UK, Italy and Sweden have chosen voluntary separation to avoid tougher regulation. The first country in Europe implementing functional separation in the telecommunications market was the UK. BT offered a series of legal undertakings under national competition law in September 2005. The undertakings gave a commitment to create a new business unit of 30,000 people called Openreach, which offered equal access and infrastructure to other companies. According to the functional separation mode, Openreach has its own senior staff, capital expenditure budget, offices, employee incentive schemes and brand identity [6]. For the market, the broadband penetration doubled after the separation. But then many problems emerged in the operation process, such as the phenomenon of insufficient investment incentives, slow network upgrade, the lack of flexibility to provide network access products, the insatiable needs of various types of business, as well as the controversial wholesale price and other issues. The new entrants have been limited by their own network coverage and low communication quality with incumbents. So it is difficult for the new entrants to compete with the incumbents in the communication market. After functional separation was introduced to the United Kingdom, New Zealand practiced it as a follower. In 2006, New Zealand's parliament passed law the Telecommunications Amendment Act (No.2). As a result, Telecom New Zealand agreed to reorganize and split into three separate divisions such as retail, network, and wholesale. In contrast to the experience of functional separation in the New Zealand, in order to appease regulators, Tele Italia created Open Access, a separation wholesale service unit, to manage its fixed-line network and provide easier equal access for competitors and new entrants [7]. The access network service was provided by Open Access and the core network service was provided by Network Department. Open Access did not have independent legal entity so it was still controlled by the Italian telecommunications. As Open Access did not dock directly with other operators, operators needed to apply for services to the network wholesale department. From then on this has been causing two problems: the first one is that Open Access might treat Italian telecoms and other operators in an unequal way, as well as the second one is that the costs within the Italia telecoms might be compelled to share with the competitors. To sum up, this separation mode increases the transparency, limits non-price discrimination, reduces the incentive of discriminatory and encourages the market competition. However, the disadvantages are undeniable. Functional separation and operational separation modes are irreversible because of the establishment of an independent department. What's more, lacking the incentive to invest, low quality of service, costly and difficult regulatory are urgent issues to tackle.

Ownership separation, as the most intense separation mode, requires stripping the bottleneck facilities into a separate firm. Under the ownership separation mode, the upstream and downstream portions of the firm are literally divided into separate companies with different management. All vertical efficiencies, which depend upon joint ownership and control, are eliminated. Singapore and Australia choose this mode. The government of Singapore planned a multi-tier structure: a common duct and dark fiber operator (NetCo) who would lease dark fiber to multiple operators would light up these fibers with equipment (OpCo) who would in-turn wholesale bandwidth to retail service operator (RSP). But the over-compartmentalizing of multi-tier structure led to the failure of effective market competition pattern. Finally, the infrastructure layer was controlled by the operators together. In Australia, the National Broadband Network (NBN) Corporation was established for the purpose of investing up to AU\$43 billion in a new FTTH network [8]. And the Australian government ordered the infrastructure to be invested by the government itself, and requested the NBN to provide network wholesaling business at the same price set by the government. With the development of users and technology upgrades, the disadvantages of ownership separation appeared. Because the new network needed to cover the whole country, the construction progress was slow. Within the EU Member States, ownership separation has been only discussed seriously in Ireland. Babcock & Brown considered Irish regulator approval for a form of structural separation which would create a highly regulated NetCo [9]. After almost a year of negotiations with the Irish government and regulator, Babcock & Brown abandoned its separation proposal in favour of ownership separation due to a combination of the slowdown in credit markets, economic uncertainty and a lack of clarity on the regulatory regime [10]. As the most intense separation mode, ownership separation's advantages are to totally eradicate price fixing and effectively increase the market competition. Using the strength of the whole nation to build infrastructure will accelerate the universal services' process. But the drawback is almost fatal. Compared to the transformation and upgrading the original operator's network, building a national broadband network by a new company is a vast project. With the influence of economic weakness, broadband network construction progress is highly inefficient, almost impossible to carry out.

Besides, there are some countries against the separation; for instance, France, Spanish and the Netherlands. Table 1 provides an overview of four network separation modes adopted in some countries. I, II and III stand for the degree of separation, and I is the lightest, III is the heaviest.

Table 1 Properties of raw materials

Separation mode	Definition	Degree of separation	Countries	Pros	Cons	Conclusion
Accounting separation	Independent financial statements	I	Nation: Early Sweden Effect: The broadband market competition was still inadequate	Limit the price discrimination	Cannot to limit non-price discrimination	The mildest form but fail to limit non-price discrimination
Functional or operational separation	Independent departments or subsidiaries	II	Nation: the United Kingdom Effect: Broadband penetration doubled, insufficient investment incentives, slow network upgrade, the lack of flexibility to provide network access products Nation: Sweden Effect: Competition is still insufficient Nation: Italy Effect: Unequal access, more cost to share	Increase the transparency, limit non-price discrimination, reduce the incentive of discriminatory and encourage the market competition	Irreversible, lack incentive to invest, low quality of service, costly and difficult regulatory	Many Countries choose voluntary functional or operational separation to avoid tougher regulations
Ownership separation	Separate firm	III	Nation: Singapore Effect: Effective market competition pattern failed Nation: Australia Effect: Progress is slow	Increase the market competition, eradicate price fixing and accelerate the universal services	Too vast construction project, highly inefficient broadband network construction progress	Heavy investment burden, low efficiency in construction and upgrading

3. Discussion about network separation in China

The inspiration from the experience of foreign countries is that the network separation helps some countries to solve the problem of monopoly, openness and discrimination in a certain extent. However, the network separation is not a panacea, and sometimes it even damages social welfare. So, whether to take the network separation and what separation mode should be taken, we will get different answers in different backgrounds.

The era of telecommunications 4.0 has put forward a higher level of demand – multi-service platform, personalization and quick response-for Chinese telecommunications operators. In this background, whether China is suitable for conditions about network separation or not, according to the Ricardo Gonçalves’s point, we need to discuss the following three problems:

3.1 Is there significant market power in China in the era of telecommunications 4.0

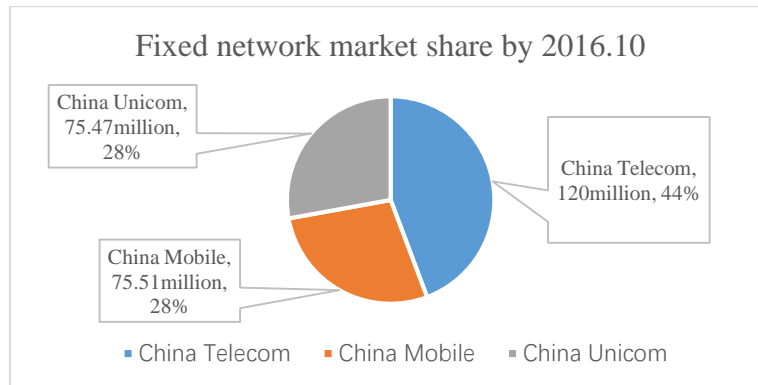


Figure. 1 Fixed network market share by 2016.10

The existence of market power is the premise of the market reform. If there is an obvious market power in the industry, which cannot be regulated by natural competition, this market needs to be adjusted. In fact, market power exists in Chinese telecommunications industry. By the effect of natural monopoly property and political factors, high cost and a long period of infrastructure construction cause the entry barrier is too high. So small and medium-sized enterprises cannot afford the cost, and only a few companies have the strength to complete the construction of infrastructure. China Telecom is in a monopoly dominant position in the broadband access market, so if it sets price in a different way to the subordinate enterprises and other competitors, this will lead to discrimination of the service quality in the downstream broadband market [11]. And China Telecom has the incentives to set higher price to increase the competitors’ cost to access the broadband network for reining the development. As shown in Figure 1, by the end of October 2016, the number of subscribers to China Mobile’s fixed network service is 75.51 million, the number of subscribers of China Unicom’s fixed network service is 75.47 million, and China Telecom’s subscribers are more than 120 million, which locates in the top of three operators [12]. China Telecom holds the absolute market power in the fixed line broadband market. However, this market power is transmitted vertically, from upstream to downstream, producing price discrimination and non-price discrimination, such as unequal access, deliberately prolonging the waiting time and installing the low version operating system, in order to crush competitors and monopoly the market.

3.2 Are there little vertical complementarities between services along the supply chain

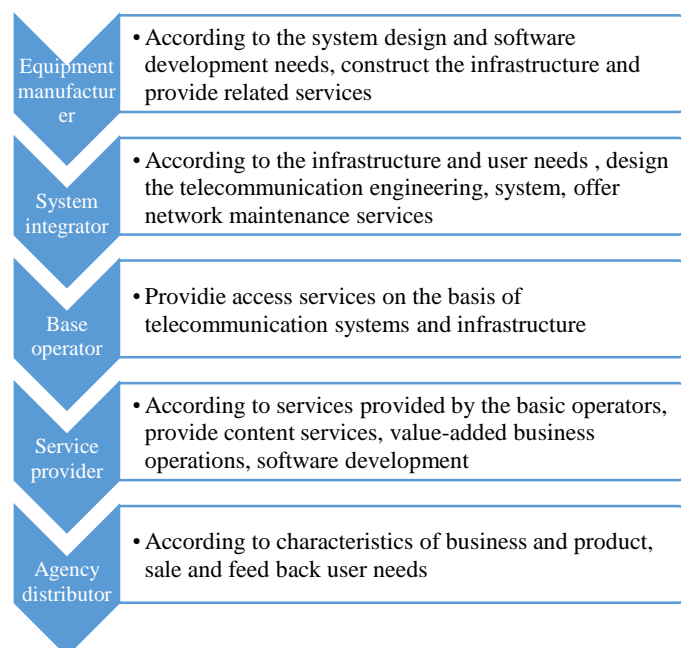


Figure. 2 Traditional supply chain for telecommunications

Vertical complementarities refer to the fact that the services along the supply chain are not independent, but there is a close interrelationship between them.

Traditional supply chain for telecommunications is shown in figure 2, it contains: equipment manufacturers, system integrators, base operators, value-added service providers, and agency distributors. It can be seen that in the era of telecommunications 4.0, each link of the traditional telecommunications industry chain is interdependent. Thus, transaction costs of the vertical integration enterprises are much lower than the separation ones. More importantly, Chinese rural land area is much larger than the urban area. In the past few decades, based on the principle of universal service of telecommunications, the primary task has been the construction of infrastructure all over the nation. Network separation will lead to increased transaction costs and low efficiency. The main operators will transfer the focal points of work from constructing the infrastructure to endless competition with each other. Taking the example of the ownership separation in Australia, the pace of telecom universal service to promote will be far lower than expected.

Under the era of telecommunications 4.0, based on SDN, NFV and other new technologies, traditional telecommunications industry is facing industrial restructuring of a multi-industry to form a new ecology. Kirsch and Hirschhausen [13] believe that a new generation of telecommunications networks will be a flexible multi-service platform. Learn from the cloud computing layers, as shown in figure 3, in the era of telecommunications 4.0 the telecommunications industry ecology is divided into three layers: the infrastructure layer, the platform layer and the application layer. The infrastructure is provided by the infrastructure layer, and the monopoly attribute of this layer is the most deeply. By the SDN technology, a controller is introduced between the application layer and the infrastructure layer to simplify operation and management and unified control and scheduling. Telecommunications with SDN makes the network programmable and more flexible. The platform layer provides a unified northbound interface to the application layer, thus the open application layer will be able to meet the demand of personalization and rapid response to business or users.

In the era of telecommunications 4.0, the separation of the infrastructure layer and the platform layer will lead the following three issues. Firstly, SDN cannot play its role of the controller in a splitting structure. Secondly, after the three operators were stripped off the infrastructure, the original differentiation competition will turn into a homogeneous competition. The operators will carry out a vicious price war causing the loss of profits, as a result, they will lose the strength to support the follow-up technology evolution, innovation and upgrading. Thirdly, the divestiture of infrastructure causes the loss of competitive environment and incentive for innovation. Heeb [14] considers that there are incentives for internal innovation in vertically integrated enterprises. And the key differentiation competition of operators is based on the innovation of the telecommunications network and making the network as the core assets. Whether it is the traditional era or the era of telecommunications 4.0, the existence of the vertical complementarity along the supply chain services determines that the network separation is not the best choice for the Chinese government.

3.3 Is network separation a better regulatory tool than any other alternative remedy

In recent years, Chinese telecommunication regulator has rolled out policies in order to solve the problem of insufficient market openness. For example, in 2015 "Notice on the pilot work on universal service of telecommunications" [15] was released under the joint efforts by the ministry of finance and industry coupled with the ministry of information and technology. The notice is about to promote the construction of a new generation of information infrastructure, in order to solve the problems of telecommunications universal service mechanism and grant funds. It also has prevented the operator from the competition based on infrastructure which is constructed repeatedly in developed areas and rarely in remote areas. The implementation of "The General Office of the State Council's guiding opinions on speeding up the construction of high-speed broadband network and reducing the charges" [16] has caused that ministry of industry and information technology pay more attention to the speed and charges of the network. A multi-pronged approach has reduced the level of telecommunications charges and increased the cost-effectiveness of telecommunications services. This move has resulted in operators being evacuated from a price war, and removed more focus on improving the quality of service, so the move has contributed to healthy competition. In 2013 regulators actively promoted the opening of the telecommunications market and the diversification of market competition, carried out the pilot work of mobile communications resale business [17] and established dynamic coordination mechanism of wholesale price. By the end of 2016, a total of 42 resale companies has developed more than 40 million users [18]. These regulatory moves in a certain extent have promoted the competition, at the same time gained satisfactory change. As an irreversible regulation measure, network separation has the risk of harming the scope economy, the integration efficiency and the investments. So it is better to view the network separation as the "last resort" to solve the monopoly problem which is difficult to be solved by other regulatory measures.

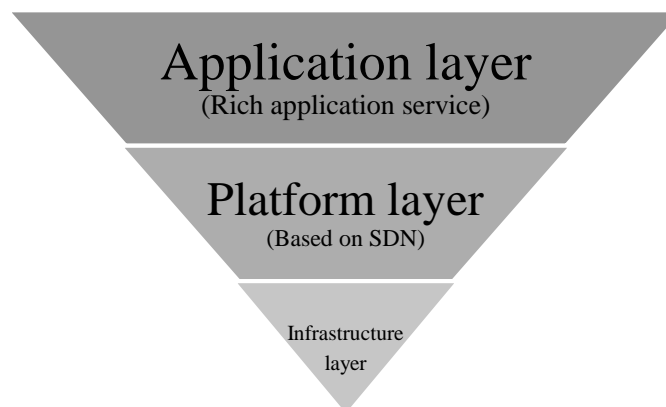


Figure. 3 A multi-tier model of telecommunications ecology

4. Conclusion

Thereby, in the era of telecommunications 4.0, the external environment of the telecommunication industry and market customers' demand have changed. This era is a transition period from the information era, sense era to the intelligence era finally. In the transition process, the change of industrial ecosystem determines that Chinese government cannot easily choose network separation as the market regulation way to avoid harming the economies of scope, causing irreversible damage to the integrated business. Conversely, operators should keep the efficiency advantage of integration and set up rapid response and personalization service system. And the government should continue to play the key role in regulation, such as the charge policy, universal service, competition and scale economy, service quality standard and interconnection between different businesses.

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