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## Price-Cap Regulation: The Answer to China's Telecommunications Competition Dilemma

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# PRICE-CAP REGULATION: THE ANSWER TO CHINA'S TELECOMMUNICATIONS COMPETITION DILEMMA

## INTRODUCTION

China had the largest global cellular phone market as of January 2002, and the second largest global fixed-line market as of November 2001. China is currently the fastest-growing major telecommunications market.<sup>1</sup> Despite the sheer size and potential of the market, regulation of the telecommunications industry in China is underdeveloped by Western standards. This lack of development carries over to Chinese regulatory agencies, laws, and market experience. Since the early 1990s China has made a concerted effort to modernize its telecommunications market and regulatory infrastructure. This effort included breaking the telecommunications monopoly of China Telecom and creating a viable regulatory agency.<sup>2</sup> In 2000, with its WTO entry looming, China enacted its first telecommunications regulations, which mirrored the WTO requirements imposed by the international community.<sup>3</sup> The 2000 law,

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1. *China Plans Four Integrated Telecom Operators to Spur Competition*, AGENCE-FRANCE-PRESSE, Jan. 8, 2002, at 1, available at Global News-bank, Record No. 0F0EC211B525EF12.

China has emerged as the world's largest cell phone market, with 140 million mobile subscribers in late November 2001, an increase of 64% from early 2001. The country's 177 million fixed-line users as of November [2001] up 23% from the beginning of last year, also contributed to its position as the planet's fastest growing major market for telecommunications.

*Id.*

2. John Y. Lo & Charles C.K. Poon, *China*, in THE DEACONS' GUIDE TO TELECOMMUNICATIONS IN ASIA 85, 85 (Ralph Cunningham ed., 2001).

In 1995, the State Council, the top body in the executive branch of the Chinese Government, approved the basic concept of separating the telecom regulatory function from the service operation. The separation process was implemented by reform at the ministerial level in 1998 when a new regulatory body known as the Ministry of Information Industry (MII) was established. The MII is a government ministry directly responsible to the State Council. It is responsible for the management of three key industries: telecommunications (including broadcasting infrastructure), electronics and information products manufacturing, and software.

*Id.*

3. *See id.* at 97.

As a result of the significant restructuring of China's telecommunications market in recent years, China's aspiration to join the WTO and its commitment to comply with the latter's requirements, telecommunications regulation in China is entering an active phase. The promulgation of the [Telecommunications] Regulations in September 2000 marked China's first attempt at regulating telecom industry in a comprehensive, albeit somewhat crude,

however, is merely a simplified, short-term solution, and many scholars believe China will draft a comprehensive regulatory law.<sup>4</sup>

With the creation of a second market participant in the 1990s, China Unicom, the Chinese telecommunications sector began to shift from a monopolistic environment to a more competitive one. Although the government has tried to break up China Telecom, the major fixed-line provider, it has struggled to establish consistent and comprehensive national pricing standards.<sup>5</sup> The inconsistent pricing standards have hindered improvements in service quality, product offerings, and predatory pricing.<sup>6</sup>

The United Kingdom's telecommunications price regulations provide a model that China should implement. British telecommunications regulation did not exist until 1980,<sup>7</sup> and the government achieved significant institutional change from 1980 to 1984.<sup>8</sup> The government established a new regulatory regime by creating the Office of Telecommunications (OFTEL) and allowing a second telecommunications provider, Mercury, to compete with British Telecom (BT), the previous monopoly provider.<sup>9</sup> The government also devised a way to address BT's

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manner. Subsequent subsidiary regulations will likely fill many of the voids left by the Regulations.

*Id.*

4. *Id.* See generally Laura B. Sherman, *The Impact of China's WTO Entry on the Telecommunications and IT Sectors*, 817 PLI/Comm 207 (2001). Following its accession to the WTO, the telecommunications sector has undergone significant change and further regulations are necessary for full WTO compliance. *Id.*

5. Kenneth J. DeWoskin, *The WTO and the Telecommunications Sector in China*, 167 THE CHINA Q. 630, 645 (2001). "The state has struggled with pricing issues for years in the competition between China Mobile and Unicom, more recently in wireless competition between China Mobile and China Telecom, and most recently in collapsing prices for international service over the Internet..." *Id.* at 645. See also Fod Barnes, *Regulating Telecommunications*, in COMPETITION IN REGULATED INDUSTRIES 215 (Dieter Helm & Tim Jenkinson eds., 1998).

In a market where competition is developing, but not fully established, competition cannot be relied upon to stop excessive prices, but within that constraint there is no obvious reason why the pattern of prices should not be left up to the supplier, subject to the normal rules on anti-competitive behavior.

*Id.*

6. Barnes, *supra* note 5, at 215. China Telecom responded to the entry entrance of China Unicom, its main competitor with predatory price reductions. *Id.*

7. MICHAEL PALMER & JEREMY TUNSTALL, *LIBERATING COMMUNICATIONS* 263 (NCC Blackwell, 1990). During the 1970s, the United Kingdom endured a nationalized industrial period. *Id.* Deregulation in the 1980s somewhat broadened this policy. *Id.*

8. MARK THATCHER, *THE POLITICS OF TELECOMMUNICATIONS* 148 (Oxford University Press, 1999).

9. *Id.* at 148–49. The 1984 Telecommunications Act "abolished British Telecom's monopoly over telecommunications systems" and created the office of Director of General Telecommunications, which was responsible for the enforcement of licenses. *Id.* at 148–49. See also Telecommunications

monopoly power in pricing.<sup>10</sup> The United Kingdom decided to follow an incentive-based pricing scheme, known as the “price-cap,” which regulates local and long-distance service prices to promote greater market efficiency.<sup>11</sup>

Part I of this Note provides a brief historical overview of the telecommunications industry in China and the United Kingdom. Part II analyzes and compares issues of telecommunications regulation and competition in both China and the United Kingdom, and pricing and regulatory schemes for telephone services. Part III demonstrates how applying the British model for telecommunications pricing can positively affect the telecommunications industry in China. This Note proposes that China should concurrently implement the British policy for pricing telephone services and its pro-competition regulatory reforms in order to promote greater efficiency in the Chinese telecommunications sector.

## I. BACKGROUND

### A. China

Six corporations now share the Chinese telecommunications market: China Telecom (the largest participant), China Unicom, China Netcom, China Mobile, China Satcom, and China Railcom.<sup>12</sup> Despite the existence of the other telecommunications corporations, China Telecom is the traditional dominant actor and has the largest customer base.<sup>13</sup> A recent telecommunications structural reform plan divided the former China

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Act of 1984, ch. 12 (Eng.). “An act to provide the appointment and functions of the Director General of Telecommunications; to abolish British Telecommunications’ exclusive privilege with respect to the provision of telecommunications services and certain related services.” *Id.*

10. INGO VOGELSANG & BRIDGET M. MITCHELL, TELECOMMUNICATIONS COMPETITION 266 (1997). Though some parts of the telecommunications market could reasonably foster competition, there were other sectors where BT’s monopoly was unassailable (such as basic local and long-distance telephone service). *Id.*

11. *Id.* at 267. The incentive-based pricing scheme was based on Sir Alan Walters’ “output related profits levy” (ORPL) scheme. *Id.* “The scheme defined a basket of regulated services whose prices on average would be allowed to grow at the rate of inflation minus an unspecified adjustment factor (X). Inflation would be measured by the retail price index (RPI).” *Id.* See also J.R. NORSWORTHY & S.L. JANG, EMPIRICAL MEASUREMENT AND ANALYSIS OF PRODUCTIVITY AND TECHNOLOGICAL CHANGE 8 (D.W. Jorgenson & J. Laffont eds., Elsevier Science Publishers B.V. 1992). “Productivity is an economic concept: it is the ratio of output to input. Efficiency, a concept based on physical science, is also a ratio of output to input measured in physical units.” *Id.*

12. *China’s Telecommunications Reform Nears Completion*, XINHUA NEWS AGENCY (May 16, 2002), at 1, available at Global News Bank, Record No. 0F39A07FB276D137.

13. Lo & Poon, *supra* note 2, at 88. China Telecom went through a series of “restructurings.” *Id.* Its predecessor was the Ministry of Posts and Telecommunications (MPT), which had acted as both the regulator and operator of telecommunications services in China.” *Id.*

Telecom trunk line transmission network into southern and northern parts.<sup>14</sup> Under the revised structure, China Netcom will hold thirty percent of the national trunk line, and China Telecom will hold the remaining seventy percent.<sup>15</sup>

In preparation for its WTO accession in November of 2001, China progressed in adjusting its internal telecommunications regulation to include ownership restructuring and operational restructuring.<sup>16</sup> This restructuring established an independent regulator to supervise a changing market that included new entrants and the duopoly of China Telecom and China Netcom.<sup>17</sup> That independent regulator is the Ministry of Information Industry (MII), established in 1998,<sup>18</sup> which manages and plans telecommunications networks and regulates the telecommunications industry.<sup>19</sup>

Before 2000, China followed a piecemeal approach to telecommunications regulation, which did not adequately manage the increasingly complex landscape of the developing telecommunications

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14. See *China's Telecommunications Reform Nears Completion*, *supra* note 12, at 1. See also Eric Sautede, *Telecoms in China: Towards a Post-WTO Shock Therapy?*, CHINA PERSPECTIVES, May/June 2002, at 41.

Since May 16th, 2002, China Telecom has thus split into two: its activities in 21 southern and western provinces remain under the banner of China Telecom Group (33.8% of the overall revenue of telecoms) and its activities in ten northern provinces passes to China Netcom Group (17.2% of overall revenue in 2001) by incorporating the activities of Netcom Corp. as a subsidiary (Internet access and high-speed data transfer) and those of Jitong (2nd satellite network, 2nd Internet network and telephone business via the Internet).

*Id.*

15. See *China's Telecommunications Reform Nears Completion*, *supra* note 12, at 1.

The new China Telecom Corporation [will] maintain business in 21 provinces and cities in southern and northwestern China and hold 70 percent of the national trunk line transmission network assets owned by the former China Telecom. The 10 northern provincial corporations of the former China Telecom including those in the provinces of Henan, Shandong, and Northeastern provinces, together with the former China Netcom and Jitong Communications Corporation, merged in the new China Netcom Communication Group Consolidation Group Corporation [China Netcom], holding 30 percent of the national trunk line transmission network assets. Both new corporations have now become two fixed line telephone network enterprises with equal capacity in China's telecommunications market. The two companies both have complete domestic long-distance trunk transmission networks and local telephone networks in their own areas and they are also allowed to build and operate local telephone networks in each other's areas.

*Id.*

16. See DeWoskin, *supra* note 5, at 637. This type of reform has been a global trend since the breakup of the AT&T monopoly in the United States in the mid-1980s. *Id.*

17. *Id.* The existence of an independent "regulator make[s] it possible for new entrants to establish commercially viable market positions and shares." *Id.*

18. See Lo & Poon, *supra* note 2, at 85-86.

19. *Id.* Operators are required to seek approval and obtain an operational license from the MII. *Id.* at 92.

sector.<sup>20</sup> The issuance of the Telecommunications Regulations (“The Regulations”) in 2000 was a significant starting point for developing comprehensive legislation.<sup>21</sup> The Regulations outline distinct licensing regimes for the operators of basic telecommunications services and those of value-added services.<sup>22</sup> The Regulations also outline competitive safeguards, which state that MII will impartially foster competition and prohibit anti-competitive acts or methods in the telecommunications industry.<sup>23</sup>

Interconnection is an intricate part of increased competition in the telecommunications industry because new operators must use the trunk line of the existing main provider.<sup>24</sup> To effectively implement interconnection, operators must negotiate an agreement with the main provider, if not, a mediating authority will impose a mandatory connection agreement.<sup>25</sup> The Regulations mandate that “cost” to the telecommunications service provider is the basis of telecommunications service pricing, taking into account other factors such as the development of the economy, the telecommunications industry, and the ability of customers to afford subscriptions.<sup>26</sup> The “cost” figure is formulated by cost data reported by telecommunications operators, and hearings by the government, telecommunications operators, and subscribers.<sup>27</sup>

### *B. The United Kingdom*

The 1984 Telecommunications Act (“the Act”) instituted significant changes in the telecommunications landscape of the United Kingdom, including the privatization of BT, the end of BT’s statutory monopoly, a new licensing regime, and the creation of a “separate regulator.”<sup>28</sup> “The Act transformed BT into a private limited company and allowed for the

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20. *Id.* at 89. The few regulations assembled on telecommunications were an incomplete patchwork of fragmented pieces. *Id.*

21. *Id.* at 90. The Regulations are broad-based and cover the important areas of telecommunications regulations. *Id.*

22. *Id.* at 91.

23. Zhonghua renmin gongheguo dianxin tiaoli [Telecommunications Regulations], art. 25, in Zhonghua renmin gongheguo guowuyuan gongbao [State Council Gazette] No. 3, 11 (2000) [hereinafter “PBC Telecommunications Regulations”].

24. See Lo & Poon, *supra* note 2, at 93.

25. PRC Telecommunications Regulations, at art. 19. See also *id.* art. 20. For a definition of interconnection, see Barnes, *supra* note 5, at 214.

26. PRC Telecommunications Regulations, art. 23.

27. *Id.* art. 26.

28. See THATCHER, *supra* note 8, at 148.

sale of shares by the government.”<sup>29</sup> OFTEL assumed the central role of telecommunications regulator and began to break away from BT by developing a specialized expertise in telecommunications regulation.<sup>30</sup> OFTEL’s two main goals were to promote competition and develop incentive-based regulation.<sup>31</sup>

To further OFTEL’s first goal, promoting competition, the Act mandated full interconnection between BT’s network and Mercury.<sup>32</sup> OFTEL further stimulated competition by mandating that BT base its tariffs for use of BT’s network upon an OFTEL formula rather than BT’s public tariffs.<sup>33</sup> By the 1990s, OFTEL changed from a promoter of competition to a competition authority.<sup>34</sup> “OFTEL’s regulatory powers are officially vested in a single regulator, the Director General,” who facilitates policy without the interference of Parliament.<sup>35</sup>

The 1984 Act provided the framework for the government’s so-called “duopoly policy.” The policy mandated that competition for fixed network services would be limited to a duopoly for a period of at least seven years. The duopoly policy also imposed a range of restrictions on the nature of activities that could be conducted by persons other than the two duopolists.<sup>36</sup>

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29. *Id.*

30. *Id.* at 174, 175.

31. *See id.* at 174.

[OFTEL] had two main “legs”. The first was promoting “effective competition” as the highest priority for oftel, from the list of duties specified in § 3 of the Telecommunications Act 1984. OfTel claimed that competition would benefit consumers and was compatible with its other duties. The second “leg” was developing “incentive regulation.” It applied where competition was not possible and involved establishing a regulatory framework that “mimicked” a competitive market, seeking to produce similar incentives and pressures to those offered by competition.

*Id.*

32. *Id.* at 178–79. After BT and Mercury failed to negotiate the terms of interconnection between their networks, OFTEL made a determination in favor of competition. *Id.* at 178. “There should be full interconnection between the two networks, so that any person could call any other person, and any customer should be able to choose which network carried his call, even if this meant that BT’s local network was used at both ends and Mercury’s network only for the trunk section.” *Id.* at 178–79.

33. *See id.* “The tariffs charged by BT for use of its network should be based on its costs plus a percentage determined by OFTEL, not BT’s public tariffs, greatly assisting the economic viability of competition.” *Id.* at 179.

34. *Id.* at 209. “With the extension of competition in the 1990s, OFTEL modified its stated purpose, seeking to become a ‘competition authority.’” *Id.*

35. Sean P. Farrell, *Telecommunications in the United Kingdom*, 18 HASTINGS COMM. & ENT. L.J. 321, 334 (1996); *see also* Telecommunications Act, 1984, Ch. 12, § 1 (Eng.).

36. Farrell, *supra* note 35, at 328.

Mercury Communications was named the company to share the network with BT.<sup>37</sup>

“BT’s share of the residential market has steadily decreased since 1991.”<sup>38</sup> Despite its loss in market share, BT continues to innovate and to keep up with current technology, while cutting rates and improving service.<sup>39</sup>

## II. ANALYSIS

### A. Competition Policy

Policies such as the division of China Telecom and the introduction of China Unicom are indicators that China is committed to generating greater competition in the telecommunications sector, but realizing that competition will be an entirely different matter. The split of China Telecom will significantly affect the telecommunications sector, but its impact on stimulating significant competition is still in doubt, because the resulting companies will likely hold regional monopolies.<sup>40</sup> The regulatory solutions outlined in the 2000 Telecommunications Regulations seem promising in the abstract, but past experiences have exposed major difficulties in policy implementation.<sup>41</sup> For example, China Unicom, has experienced difficulties since its creation in 1994. These difficulties

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37. *Id.*

38. *Id.* at 364.

39. *See id.*

Nor has BT remained idle in light of these market changes. In a direct response to such changes, BT cut domestic rates by \$540 million during the first nine months of 1994. BT has continued to string more fiber-optic lines. BT’s service also markedly improved. The installation time for new phone lines has dropped from weeks to days. The majority of BT’s pay phones are now functional whereas roughly 60% were out of order at any given time prior to the introduction of competition.

*Id.*

40. See Rachel Abramson, *Catching Flies With Chopsticks*, 11 MINN. J. GLOBAL TRADE 1, 22 (2002).

In a massive restructuring that began and continues as we go to press, the hundred percent state owned monopoly China Telecom will split into northern and southern regional providers and merge with smaller data provider of data services in the north. Signs of this evolution began in March 1999, when China Telecom split into four competing service units: fixed-line telephone (China Telecom), mobile (China Mobile), paging (given to China Unicom), and satellite (ChinaSat). Rather than stirring competition, critics suggested this split would create new monopolies in each service area, or “supercarriers” surrounded by a competitive fringe.

*Id.* at 22. See also China’s Telecommunications Reform Nears Completion, *supra* note 12, at 1.

41. Rachele B. Chong and Wendy Chow, *Financing Telecommunications Projects in Asia: A Promising Regulatory Perspective*, 52 FED. COMM. L.J. 1, 14 (1999). “Even in its partially competitive markets, China’s regulatory requirements hinder competition.” *Id.*



occurred in its attempt to expand through foreign investment, its interconnection with the State-owned local network,<sup>42</sup> and its attempts to license its cellular service.<sup>43</sup> The problems in the China Telecom breakup and China Unicom case display the complexities and weaknesses of the current Chinese regulatory environment.<sup>44</sup> Since the issuance of the 2000 Regulations, Chinese telecommunications regulation has taken a more proactive stance. The duopoly system between China Telecom and China Unicom, created to cut into China Telecom's monopoly, has done more to frustrate than develop a more competitive environment.<sup>45</sup> Although MII has licensed China Unicom to provide all of its telecommunications services, Unicom has made only a slight impact in mobile communications, holding an eight percent market share.<sup>46</sup> China

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42. See generally Leontine D. Chuang, *Investing in China's Telecommunications Markets Reflections on the Rule of Law and Foreign Investment in China*, 20 NW. J. INT'L L. & BUS. 509 (2000).

43. See Xiongjian Liang & Yan Xu, *Chapter Five: Policy and Regulations, in TELECOMMUNICATIONS IN CHINA* 129-30 (Jintong Lin, Xiongjian Liang, & Yan Wan eds., 2001). "After China Unicom moved into the market, the MPT created many barriers to block the development of China Unicom." *Id.* China Unicom experienced discriminatory treatment in access to mobile switching centers as Unicom was restricted to only one local network while such restriction was not applied to China Telecom. *Id.* at 130.

44. See Chuang, *supra* note 42, at 516. "The failure of [China Unicom's] CCF foreign investment ventures with foreign investors is a perfect illustration of the risks created by China's shifting regulatory environment and its weak legal framework." *Id.* See also Jiang, *supra* note 42, at 220.

Ineffectual government support of competition stems from a lack of understanding of the significance of competition to the Chinese telecommunications industry and the failure to introduce feasible policies and rules of conduct to facilitate such competition. The confusion of the function of the Ministry of Post and Telecommunications as a government organ with the management of China Telecom as an enterprise also has much to do with this situation.

*Id.*

45. See Liang & Xu, *supra* note 43, at 144.

The key problem lies less in the strategic competitive frailty of China Unicom but rather more in the somewhat immature and irregular regulatory framework which has effectively inhibited an aggressive and proactive stance on the part of the maturing company. Additionally, the existence of a duopoly system has frustrated the development of a more comprehensive telecommunications competition policy. Compared with the situation in such advanced countries such as the US and the UK, China still has to undertake an arduous deregulatory "long march." The recent restructuring of the regulatory framework is just a small first step on the path.

*Id.*

46. *Id.* at 143-44.

China's bold policy experiment with telecommunications deregulation should not be lightly discarded. The establishment of China Unicom was courageous and represented a discontinuous break with the past. Realistically, it must be admitted that, while China Unicom was licensed for all telecommunications services, competition has only taken place to date in mobile communications. The 8% market share of China Unicom in mobile communications is

Telecom's monopoly has not fundamentally changed, even after its separation into four competing service units (China Telecom, China Mobile, Guoxing, and China Satellite).<sup>47</sup> The restructuring of the industry indicates that China is willing to undertake significant reforms towards stimulating competition and growth in the telecommunications market.<sup>48</sup> More importantly, the shortcomings of past policies and the current pro-competition policy indicate further reform is necessary outside of the duopoly framework to foster sufficient competition.<sup>49</sup>

The virtual monopoly of the telecommunications industry and the failure of the duopoly approach in spurring competition mirror the early telecommunications landscape in the United Kingdom. Before 1984, the telecommunications situation in the United Kingdom was characterized by high prices, poor service, and a government monopoly.<sup>50</sup> In 1984, the British government undertook substantial liberalizing reforms to remedy

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admittedly small, although its activity in this field has contributed to the formation of a contestable market.

*Id.*

47. *Id.* at 172, 177. "On February 14, 1999, . . . China Telecom was divided into four companies, each separately responsible for the operations of: fixed line telephony, mobile communications, wireless paging and satellite communications." *Id.* at 172. Though competition has intensified in the mobile sector, China Telecom remains the dominant player in the fixed line telephone service. *Id.* at 177.

48. See Chong & Chow, *supra* note 41, at 14-15. "Despite the many high regulatory hurdles in the China telecommunications market, there is a 'new sophistication in the marketplace.' *Id.* (citing Ken Zita, *Will China Embrace Competition? Foreign Equity in Telecoms Hangs in the Balance*, at <http://www.ptc.org/plantptc/Zita-Ken/papershtm> (last visited Jan. 17, 2004)). The Chinese government is beginning to realize that development of the telecommunications industry is vital to the growth of the economy and business sectors." *Id.*

See also Sautede, *supra* note 14, at 34, 35. "From the 1980s on, the Chinese telecommunications sector became one of the priority sectors of economic development and it enjoyed considerable advantages, in line with the demands placed on it by the constitution of a strong national industry." *Id.*

49. See Liang & Xu, *supra* note 43, at 144.

Positive support to China Unicom by the MII since its establishment, the recently implemented reform of splitting China Telecom into four independent companies, and China's expected entrance into the WTO, all give promise of a more liberalized telecommunication market. The recent establishment of a third operator, China Netcom Corporation, is clear evidence that China is fully determined on a more liberalized telecommunication market. With the opening of the world's largest telecommunication market, it is not extravagant to claim that a new era of telecommunications deregulation for both China and the world, is approaching.

*Id.*

50. Sir Bryan Carsberg, *Telecommunications Competition in the United Kingdom: A Regulatory Perspective*, 37 N.Y.L. SCH. L. REV. 285, 285-86 (1992). Sir Bryan Carsberg was the first Director General of OFTEL. *Id.* In 1981, a quarter of a million people in London were waiting for telephone service, the Post Office was not doing its job [and] had a complete monopoly over all aspects of telephone equipment and services." *Id.*

the situation.<sup>51</sup> These reforms included the privatization of BT, the creation of OFTEL, and the introduction of a second market competitor (Mercury).<sup>52</sup> The duopoly approach, which began in 1984, was premised on the notion that the inclusion of a single competitor would alleviate the monopoly problem.<sup>53</sup> This notion was proven faulty at the end of the seven-year period set for duopoly (1990) because Mercury did not compete significantly with BT.<sup>54</sup>

Industry regulation substantially affects both competition and price control.<sup>55</sup> In a perfect competition market with numerous competitors, competitors' retail prices will not be much more than their marginal cost.<sup>56</sup> Conversely, in a monopoly, the monopolist usually charges exploitative prices, well above cost.<sup>57</sup> Hence, in a monopoly market, government

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51. *Id.* at 286. The British government needed to liberalize the industry in order to make it function better.

52. *See* THATCHER, *supra* note 8, at 148.

53. *See* Carsberg, *supra* note 50, at 289.

OFTEL began, in 1984, with the duopoly policy. The government's idea was that if there were lots of competitors in the marketplace, they might all be weak and competition might fail. The approach, therefore, was that if we focused competition on one company—i.e., Mercury—we would have stronger competition and insure some level of success. Perhaps that was effective; it is impossible to tell whether it would have worked better if we had had more competitors from the beginning. We did start that way, however, and we have grown a strong competitor.

*Id.*

54. *See id.*

At the end of 1990, as we came to the end of the seven-year period set for duopoly, it was clear that we could not be content with that form of competition. The duopoly had been successful, but competition between two is not real competition—certainly not the kind that really makes the marketplace dynamic. OFTEL felt a strong need to push competition to the limit—not to decide as a regulator how much competition the market could sustain, but to let the market open up and use the opportunities.

*Id.* *See also* Catherine Arnst & Gail Edmondson, *The Global Free-For-All: As Huge Telecom Markets Open, Carriers Aim to Carve up the World*, BUSINESS WEEK, Sept. 26, 1994, at 118. "Even if they suddenly sprout the gene for competition, most small carriers lack the resources to succeed on their own in a global market." *Id.*

55. *See* JILL HILLS, DEREGULATING TELECOMS 28 (1986).

Regulation can either involve setting the framework in which private enterprises operate, or it can mean detailed intervention in their affairs through the setting of their rates of return, or their tariffs or by decisions on which particular enterprises can enter a particular market, or what services may be offered.

*Id.*

56. *Id.* at 30. "Traditional economic theory suggests that perfect competition in a market in which prices to the consumer will be lowered to the point at which they meet marginal costs of production will only occur if there are numerous companies in competition." *Id.*

57. *Id.* "If one enterprise has a monopoly of the market its behavior is likely to be exploitative to consumers and prices will be fixed considerably above costs." *Id.*

regulation of prices and market behavior is necessary to curb monopoly pricing, thereby benefiting the consumer by lowering prices.<sup>58</sup>

However, competition in a market is not always the most efficient market structure. A natural monopoly can be the most favorable condition when a dominant firm alone supplies the market more efficiently and at a lower cost than in a market with competition.<sup>59</sup> Although an industry may have all the signs of maximum efficiency in a natural monopoly structure, it is not necessarily the case that the most efficient structure is in fact a natural monopoly structure.<sup>60</sup>

In a telecommunications market with a single dominant service provider, the telecommunications network has features of a natural monopoly because the duplication of complete networks is inefficient.<sup>61</sup> A local fixed network tends toward a natural monopoly due to the economies of density.<sup>62</sup> That is, it is cheaper to build a local network that supplies as

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58. See HILLS, *supra* note 55, at 30.

"[N]atural" monopolies have been considered to be in need of government regulation. Regulation by the government is intended to stop monopoly pricing and to benefit the consumer by lowering prices. What is in effect taking place is a transfer of wealth inasmuch as regulation is intended to benefit the consumer at the expense of the producer.

*Id.*

59. See VOGELSANG & MITCHELL, *supra* note 10, at 52.

The natural monopoly property makes monopoly the most efficient market structure. Natural monopoly is customarily said to prevail when a single firm can supply the market output at lower cost than any combination of firms. That customary definition corresponds to the normative concept that, when a natural monopoly exists, the socially optimal market structure is monopoly.

*Id.*

60. See *id.* "The mere demonstration that a market possesses the property of normative natural monopoly does not imply that the market is a positive natural monopoly, and vice versa, the existence of a positive natural monopoly does not imply that the market possesses the property of normative natural monopoly." *Id.*

61. John Vickers and George Yarrow, *Telecommunications: Liberalisation and the Privatisation of British Telecom*, in PRIVATISATION AND REGULATION: THE UK EXPERIENCE 223-24 (John Kayet al. eds., 1986).

The nature of demand for communications is a major reason why natural monopoly is likely to be present in the running of networks. A person's demand for the services of a telecommunications network depends upon who else subscribes to that network. If A wishes to call B (and/or hopes that B will call him), he must subscribe to the same network as B. This interdependence of demand means that supply of telecommunications services by two or more firms may be inefficient, and also that a supplier with many subscribers will tend to drive out suppliers with fewer subscribers if he can deny them interconnection on fair terms. The duplication of complete networks would obviously be inefficient, and so natural monopoly is likely.

*Id.*

62. Mark Armstrong, *Telecommunications*, in COMPETITION IN REGULATED INDUSTRIES 134 (Dieter Helm & Tim Jenkinson eds., 1998).

many users as possible, spreading the cost to more consumers and thus providing a greater return on investment.<sup>63</sup>

It is important to continue regulating the price structure for the dominant player in the telecommunications market to prevent exploitation of this natural monopoly power, and it is essential to provide a regulatory scheme that does not completely destroy incentives for the dominant player to become more efficient. It is also important that the scheme does not dissuade other potential competitors from joining the market to test whether the most efficient structure is a monopoly.<sup>64</sup>

### *B. Applying Competition Policy to China*

Under the 2000 Telecommunications Regulations, telecommunications services in China are governed by a cost-based structure, known as rate-of-return regulation (RORR).<sup>65</sup> In traditional RORR pricing, the firm's prices are set so that their total revenue covers their total cost, and the firm breaks even financially, earning a normal return on investment.<sup>66</sup> In

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63. *Id.*

[I]t is cheaper per person to build a local network connection, say, 5000 people in a given area than it is to connect 500. (The reason is partly because the cost of a local exchange can be spread over more local users, and partly because the greater the use of remote concentrators and the like means that a lower proportion of the local network is made up of costly cabling and ducting.)

*Id.*

64. See Carsberg, *supra* note 50, at 295.

As long as there is a dominant operator in the marketplace, it is essential to continue regulation. The question then becomes: what is the right sort of regulation? One needs to choose regulatory devices for their incentive effects. If the first message is "promote competition as your first regulatory weapon," the second is "let's have incentive forms of regulation where we must have regulation."

*Id.*

65. See PRC, Telecommunications Regulations, art. 23.

66. Ronald R. Braeutigam, *Price Caps in the U.S. Telephone Industry: How Real is Reform?*, in TELECOMMUNICATIONS POLICY 145, 147 (Donald L. Alexander ed., 1997).

The determination of individual rate level can often be viewed as a two-step process, commonly known as fully distributed cost pricing. First, whatever costs can be directly attributed to a particular service are assigned to that service. Then, the remaining "common" costs, which cannot be allocated unambiguously to individual services, are nevertheless assigned to individual services using some (inherently arbitrary) cost allocation formula.

*Id.* See also *id.* at 148.

Regulators sometimes designated noncompetitive markets as "core" markets. They could then apply a rate-of-return constraint to the set of core markets, requiring that the revenues generated in these markets cover no more than the share of costs allocated to these markets under fully distributed costing rules. Markets with relatively elastic demands (presumably because there are a good deal of competition in these markets) would then be designated as "noncore" markets, often free from constraints on pricing.

*Id.*

assessing the costs, the regulatory authority uses the cost data submitted by the regulated company.

There are several significant inefficient trends in the RORR pricing scheme. Because the regulated price provides a guaranteed normal return on investment, the regulated firm has little or no incentive to develop technology outside of the regulated market that might result in improved efficiency for its activities outside of the regulated market.<sup>67</sup> Another major deficiency lies in the reporting of costs to the regulator for the purposes of pricing. Because price is based on the costs of the regulated firm, the firm may have an incentive to misreport and attribute much of its total cost to the regulated market.<sup>68</sup>

### *1. The United Kingdom Model*

In determining the pricing structure of telecommunications services that would be implemented under the 1984 Telecommunications Act in the United Kingdom, the British researched the adoption of RORR, comparing the American model with an incentive-based scheme now commonly known as a price-cap regulation (PCR).<sup>69</sup> Under the guidance of Sir Bryan Carsberg,<sup>70</sup> a proponent of market dynamism and market-based approach, the United Kingdom chose to pursue PCR as the mechanism for pricing telecommunications services.<sup>71</sup>

Under PCR, prices are regulated by linking a price ceiling to an independent economic variable.<sup>72</sup> Prices increase at the rate of inflation,

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67. *Id.* "The regulated firm may have an incentive to choose a technology that fails to minimize the total cost," if the total costs of the new technology fall outside of the regulated market sphere. *Id.* Firms have little incentives to undertake economically efficient diversification into noncore markets. *Id.*

68. *Id.* at 149.

If the firm has any ability to influence the categorization of costs as attributable or common, then the firm will have an incentive to misreport the categories. Specifically, the firm would like to report as attributable to the core [regulated market] services as large a portion of total costs as possible, since that would raise the amount of revenues allowable in the core markets.

*Id.*

69. See VOGELSANG & MITCHELL, *supra* note 10, at 267. "In October 1982, the Department of Industry commissioned Stephen Littlechild to report on two proposals for regulating BT's prices: rate-of-return regulation on the U.S. model versus an incentive scheme designed by Sir Alan Walters, then the economic adviser to Prime Minister Margaret Thatcher." *Id.*

70. See Farrell, *supra* note 35, at 331.

71. See VOGELSANG & MITCHELL, *supra* note 10, at 267-68. In 1983, Stephen Littlechild, commissioned by the Department of Industry to report on pricing regulations, recommended a "local tariff reduction scheme" which essentially mirrors PCR. *Id.* In 1984 OFTEL adopted Littlefield's scheme with some modifications. *Id.* at 268.

72. See Braeutigam, *supra* note 66, at 151.

Under the heading of "price-cap" or "price-adjustment" plans are a variety of schemes in

measured by the retail price index (RPI), less an unspecified adjustment factor (X).<sup>73</sup> The British originally referred to this scheme as “RPI – X” and later renamed it “price-cap regulation” (PCR). PCR allows the prices of a regulated firm to be adjusted over a specified period of time in response to changes in factors, which the firm cannot control. These factors (externalities), include changes in technology, consumer demand, and consumer price preferences.<sup>74</sup>

A price ceiling is established to allow regulated firms to earn a reasonable rate of return and is set for a multi-year period of time, such as five, seven, or ten years.<sup>75</sup> If within that period of time the regulated firm develops more efficient methods of reducing costs, while remaining below the price ceiling, the firm makes increased profits.<sup>76</sup>

PCR provides incentives for cost reduction that are absent in RORR.<sup>77</sup> PCR permits the regulated firm to increase its rates to customers provided

which “prices are regulated directly through the establishment of price caps, ceilings, bands, floors, inflation-based formulas or other rules as opposed to setting prices indirectly based on earnings.” As long as the ceiling on the individual rates (or an index of rates) to be charged in regulated markets is satisfied, the firm could be allowed to enter into and produce whatever output levels it desires in other (unregulated) markets.

*Id.*

73. See VOGELSANG & MITCHELL, *supra* note 10 at 267. BT’s local telecommunications services were subject to price regulation where “prices on average would be allowed to grow at the rate of inflation minus an unspecified adjustment factor (X); . . . Hence the scheme bore the name ‘RPI – X’ and was later called price-cap regulation in the United States.” *Id.* See also Howard E. Thompson, *Price-Cap Regulation, Incentives for Cost Reduction, and Stockholder-Ratepayer Conflicts*, in *ECONOMIC INNOVATIONS IN PUBLIC UTILITY REGULATION* 97 (Michael A. Crew ed., 1992).

The productivity factor [or adjustment factor (X)] is the key element in the incentive mechanism. If cost reductions instituted by the utility exceed the productivity factor, then profits increase without an increase in real prices to the customers. The productivity factor determines the rule for sharing cost reductions between the customer and stockholder. A larger value for the productivity factor will transfer more of the cost reduction to the ratepayer than a smaller productivity factor.

*Id.* at 98.

74. See Braeutigam, *supra* note 66, at 151-52.

In its purest form, price-cap regulation would allow for a firm’s prices to be adjusted over time in response to changes in *exogenous* factors . . . [such as] . . . changes in prices paid for factors of production . . . changes in the state of technology utilized (but not developed) by the firm . . . demand for services . . . and income in the region and population.

*Id.* at 151.

See Diagram *infra*, for the algebraic representation of PCR. See NORSWORTHY & JANG, *supra* note 11, at 219. “[I]ndustry costs will increase by the amount of an increase in input prices less any productivity growth, and plus any external factors that affect costs. Output prices PO are assumed to reflect cost changes.” *Id.*

75. See Carsberg, *supra* note 50, at 295. “The limit [price ceiling] is set with regard to allowing the regulated company to earn a reasonable rate of return, but it is not adjusted from year to year.” *Id.*

76. See *id.* “If the [regulated] company becomes more efficient than expected, it makes more profit.” *Id.*

77. See Thompson, *supra* note 73, at 98, 99.

the rate of increase is less than the standard rate of increase in prices.<sup>78</sup> Through the decoupling of prices charged by the regulated firm from profits earned, PCR creates an incentive for cost reduction.<sup>79</sup> The price-cap's end result is to encourage greater efficiency and leaner competition, which tends to generate higher profits for the regulated firms.<sup>80</sup>

Upon review of PCR's effects on the British telecommunications market, it appears that BT has become a more efficient service provider and leaner competitor by investing heavily in modernization and an expanded network, while maintaining a consistently high rate of return.<sup>81</sup> Although BT's share of the residential market has steadily decreased BT continues to expand into other areas while also improving its domestic service.<sup>82</sup>

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To see how the incentives might work, assume that utility management is compensated on the basis of the market value of the enterprise. Then the goal of management will be to maximize value . . . Management will proceed with cost reduction efforts so long as the net effect is to increase profit and hence value. If, however, it is not possible to keep the cost increase less than the revenue increase allowed by the general price level less the productivity factor, other incentives will prevail.

*Id.* at 98, 99.

78. *See id.* at 98. "The basic idea [of PCR] is that, as long as the utility can keep the rate of increase of rates to customers less than the general rate of increase of prices, its earned rate of return should be of no interest to regulators or customers." *Id.*

79. *Id.*

80. *Id.* *See also* Warren G. Lavey, *Making and Keeping Regulatory Promises*, 55 FED. COMM. L.J. 5 (2002). "Economists have focused on many principles and tools to improve the contributions of telecommunications regulations to enhancing consumer welfare and 'efficiency.'" *Id.*

*See also* Lavey, *supra* note 80, at 6. "Moreover, maximum rates should be determined through incentive-based price caps rather than through rate-of-return, cost-based regulation. Economists argue that the application of these and other economic principles have added to the competitiveness, price decreases, and service improvements of telecommunications markets." *Id.*

*See also* NORSWORTHY & JANG, *supra* note 10, at 218. "A utility that improves efficiency and responds to consumer demand effectively would see its profits rise." *Id.*

81. *See* VOGELSANG & MITCHELL, *supra* note 10, at 272. "Over the seven-year duopoly period (1984 to 1991) BT had become a formidable competitor in two major respects. It had invested heavily in a modernized and expanded network, and it had restructured its prices." *Id.* *See also id.* at 276.

In the first ten years of BT's price-cap regulation a monotonic trend has developed . . . the escalation of the *X* factor from *RPI* -3 to *RPI* -7.5 over a number of iterations is quite remarkable. From an optimistic perspective that shows the success of price-cap regulation in helping improve BT's productivity while maintaining a consistently high rate of return, even in the midst of recession in the United Kingdom. That clearly leaves some room for stringency.

*Id.*

82. *See* Farrell, *supra* note 35, at 365. BT expanded its international operations in response to domestic competition by buying a twenty percent stake in MCI. *Id.* BT's service also improved, as installation time has dropped from weeks to days. *Id.*



## 2. *The Competition Model in China*

The telecommunications landscape in China today nearly mirrors that of the United Kingdom two decades ago. The virtual monopoly of China Telecom in fixed-line domestic and long-distance service carries the same natural monopoly tendencies and effects that BT encountered in the late 1970s and early 1980s.<sup>83</sup> Like BT in 1984, China Telecom has moved toward privatization by publicly selling its shares.<sup>84</sup> Privatization of China Telecom will be a key factor in the future success of PCR because a non-government owned firm will be forced to find cost efficient processes to satisfy stockholders.<sup>85</sup> The duopoly approach implemented in the United Kingdom exposed the difficulty of using competition as the sole tool for promoting efficiency in the telecommunications market.<sup>86</sup> A comprehensive telecommunications regulatory law is on the horizon in China, following already significant reforms such as the recent creation of the MII in 1998 and the release of the Regulations in 2000.<sup>87</sup>

### III. PROPOSAL

China should adopt the PCR pricing mechanism in telecommunications services to promote within China Telecom greater efficiency and leaner competition among its competitors. The Regulations mandate that pricing will be regulated by the government until the market becomes fully

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83. China Telecom, though splitting into two regional entities, will still continue to hold regional monopolies that carry the same problems of a national monopoly with regards to interconnection and the tendency toward natural monopoly. See Abramson, *supra* note 40.

84. Edward R. Leahy & Michael O'Brien, *Telecommunications Law and Technology in the Developing World*, 22 B.C. INT'L & COMP. L. REV. 1, 22 (1999). "The Chinese government sold shares in China Telecom and raised \$4 billion in the initial public offering in October, 1997." *Id.*

85. *See id.*

86. This relates to the failure of both China Unicom (PRC) and Mercury Communications (UK) in becoming viable competitors to the dominant players, China Telecom (PRC) and British Telecom (BT).

87. *See* Abramson, *supra* note 40, at 17-18. The creation of the Ministry of Information Industry and restructuring of telecommunications governance is significant as "it illustrates a significant shift in China's telecom policy." *Id.* *See also id.* at 18. The 2000 Telecommunications Regulations is "a preview of the anticipated comprehensive Telecommunications Law." *Id.*

competitive.<sup>88</sup> The British experience has shown that incentive-based pricing alongside a duopoly is an extremely effective method of promoting leaner competition and greater efficiency.<sup>89</sup>

Because the telecommunications landscape in China today is similar to that of the United Kingdom in the early 1980s, China is in a good position to move towards PCR and follow the British model.<sup>90</sup> The split of China Telecom into two companies should promote greater efficiency and leaner competition alongside the price-cap incentive mechanism.<sup>91</sup>

One factor that might become a potential roadblock to price regulation in China is an underdeveloped independent regulator. In the case of the United Kingdom, OFTEL was pivotal in ensuring that price regulation was impartial and beyond political interference, ensuring a successful regulatory regime.<sup>92</sup> As China's telecommunications sector moves towards privatization, private shareholders will surely demand more legitimate, impartial and stringent oversight by a regulatory body.<sup>93</sup> The MII has proved it is ready for the task of stringent oversight, especially in its recent handling of interconnection issues and WTO concerns.<sup>94</sup> Furthermore, the MII has established several independent regulatory bodies at the provincial level under its direct national management, signaling a move toward

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88. See PRC Telecommunications Regulations, art. 24. "Charges for basic telecommunications shall be fixed by the government, guided by the government, or regulated by the market . . . . Charges for telecommunications services for which there is sufficient competition in the market shall be regulated by the market." *Id.*

89. See *supra* text accompanying note 81.

90. Both telecommunications markets (China and the UK in the 1980s) have a dominant player providing basic fixed-line and long-distance telephony service (China–China Telecom, UK–British Telecom), encouragement of a duopoly approach (China–China Telecom split today and the China Unicom in the past, UK–British Telecom and Mercury Communications). Both are moving toward establishing comprehensive regulatory reform.

91. The ability for each company to build in each other's networks creates an incentive mechanism that will push the companies to expand beyond their own networks.

92. See Farrell, *supra* note 35, at 325.

BT's privatization created a number of new regulatory concerns. One of the most pressing concerns was preventing BT from abusing its de facto monopoly power. However, the government also wanted to ensure that BT's new, private shareholders could look forward to a regulatory regime with little or no political interference. The solution to both concerns took the form of a new regulator: the Office of Telecommunications (OFTEL).

*Id.*

93. See Abramson, *supra* note 40, at 23-24. "China Unicom and China Mobile have held initial public offerings (IPO) on the Hong Kong stock market. China Unicom sold over 20% of its market share . . . . China Telecom is expected to announce the next telecom IPO despite repeated delays." *Id.*

94. See Sautede, *supra* note 14, at 39. "Following the injunctions of the State Council, [the Ministry of Information Industry] has been especially vigilant about inter-connection problems, particularly because [of] the arrival of new operators." *Id.*

greater regulatory managerial efficiency.<sup>95</sup> WTO accession commitments mandate that the MII cannot control telecommunications operators and must be impartial with respect to all market participants.<sup>96</sup> Compliance with its WTO commitments and continued MII development should pave the way for the MII to function much like OFTEL functions today. The effective management of PCR in China will depend upon the establishment of a truly independent regulatory agency.<sup>97</sup>

The division of China Telecom did not significantly increase competition.<sup>98</sup> The northern and southern parts from the split of China Telecom are the component parts.<sup>99</sup> In telecommunications, competition between parts is limited, because the local networks have regional monopolies.<sup>100</sup> Therefore, because each corporation would continue to hold a local monopoly, real competition is impossible.

A final potential roadblock lies in the PCR mechanism itself. The “X,” or productivity factor, is a determined figure that considers cost and various external factors.<sup>101</sup> Cost will continue to play a significant role in

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95. *Id.*

[T]he granting of licenses for both basic and value-added services between provinces is to be carried out nationally, but licenses for value-added services within any given province are granted by telecoms regulators provincially. (in August 2000, the Ministry of Information Industry established at the provincial level several “independent regulatory bodies” under its direct national management).

*Id.*

96. See Sherman, *supra* note 4, at 225.

In order to avoid the conflict of interest which arises when the body regulating the telecommunications industry is also the major telecommunications operator, the Reference Paper requires that the regulator be separate from, and not accountable to, any operator . . . Thus MII can continue to act as the regulator so long as it does not ‘control’ China Telecom, China Mobile, or the other government-owned telecommunications companies. But the regulator must be impartial with respect to all market participants. This specifically imposes a requirement not to favor government-owned or controlled companies.

*Id.*

97. See Sautede, *supra* note 14, at 44.

The provisions for the setting up of an “independent regulatory agency” (the allocation of licences, the powers to settle disputes and to sanction) will be particularly important as, while the opening up to foreign capital will be phased in gradually, liberalization of the sector requires that the various players be able very quickly to have recourse to other than a body that is both judge and party, to wit the MII.

*Id.*

98. See Vickers & Yarrow, *supra* note 61, at 237.

99. See *supra* note 14 and accompanying text (stating that China Telecom has split into a northern and southern part).

100. See Vickers & Yarrow, *supra* note 61, at 237. “In telecommunications the scope for competition between the parts is limited. Local network A does not compete with local network B.” *Id.*

101. See Braeutigam, *supra* note 66, at 151-52. Factors outside of the firm’s control (externalities) include changes in technology, subscriber demand, and subscriber willingness to pay. *Id.*

the determination of "X," bringing the same problems underlying RORR pricing, thereby making PCR potentially the equivalent of the scheme at fault.<sup>102</sup> However, the results from PCR in the United Kingdom have proven otherwise.<sup>103</sup> Apparently, the external factors keep "X" from approaching the old RORR cost figure. So long as China develops an independent and transparent regulator such as OFTEL, there should be similar positive results.<sup>104</sup>

#### IV. CONCLUSION

Though China is still in the early stages of comprehensive regulatory reform, the adoption of the PCR pricing mechanism is feasible and realistic.<sup>105</sup> The United Kingdom was in a similar situation nearly two decades ago, and found success with PCR in promoting greater market efficiency and leaner competition.<sup>106</sup> The telecommunications industry in China is currently at a crossroads. The long anticipated national comprehensive telecommunications law in China should replace the cost-based (RORR) pricing scheme with PCR if China is to solve the competition dilemma posed by a monopolistic telecommunications landscape.

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102. See Vickers & Yarrow, *supra* note 61, at 232. In determining BT's "X" factor, cost would form the main basis for the determination of "X". *Id.* "If 'X' is determined by reference to BT's actual costs, we are back to rate-of-return regulation, with all its attendant problems . . . The point is not that Professor Littlefield's scheme is at fault. It is that his scheme may end up being roughly equivalent to the schemes criticized. Thus the problems of rate-of-return regulation would appear to be hard to avoid in regulated private monopoly." *Id.*

103. See *supra* note 81 and accompanying text. British Telecom has become a more efficient, proactive service provider and leaner competitor by investing heavily in modernization and an expanded network, while maintaining a consistently high rate of return. VOGELSANG & MITCHELL, *supra* note 10, at 272.

104. See Sherman, *supra* note 96, at 225. WTO accession commitments mandate that the MII cannot control telecom operators and must be impartial with respect to all market participants. *Id.* Compliance with its WTO commitments, and continued MII development should pave the way for the MII to function much like OFTEL functions today. *Id.*

105. See Carsberg, *supra* note 50, at 285. "The modern phase of UK telecommunication liberalization dates from 1981." *Id.* The national comprehensive telecommunications law in the United Kingdom was passed in 1984. *Id.* at 286. See also Sautede, *supra* note 14, at 34-35. China has had even a longer period of time to ponder regulatory reform, since it began efforts to reform the industry in the 1980s. *Id.* "From the 1980's on, the Chinese telecommunication sector became one of the priority sectors of economic development and it enjoyed considerable comparative advantages." *Id.* at 34.

106. See Carsberg, *supra* note 50, at 285-86.

Diagram: Price Cap Equation<sup>107</sup>

$$POTEL - PITEL - TFPTEL + ZTEL$$

POTEL = Percent change in the firm's output prices.

PITEL = Percent change in the firm's input prices.

TFPTEL = Percent change in the firm's total factor productivity.

ZTEL = Changes in the firm's external costs.

*Theodore Oliver Yee* \*

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107. See NORSWORTHY & JANG, *supra* note 11, at 219.

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