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# TELECOMMUNICATIONS INFRASTRUCTURE: ANOTHER O-RING IN THE ECONOMIC DEVELOPMENT OF THE THIRD WORLD

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## INTRODUCTION

In his breakthrough 1993 article,<sup>1</sup> Michael Kremer developed, what he termed, the O-Ring Theory of Economic Development. His theory is based on the Shuttle *Challenger* explosion in 1986,<sup>2</sup> and postulates that a relatively small aspect of economic development (in Kremer's view, the production function and proper pairing of workers of similar skill), if not planned and executed correctly, can be disastrous to the sustainability of a developing economy.<sup>3</sup> In 1986, the Shuttle *Challenger* had over two million moving parts,<sup>4</sup> and countless non-moving parts; yet a single rubber seal changed the landscape of NASA and space flight forever.<sup>5</sup> This Comment asserts that another possible "O-Ring" in economic development is a stable telecommunications infrastructure. Investing in and budgeting for telecommunications should be a legislative and economic priority of third world governments to ensure that they stay competitive in the global market. Standard Ricardian theory<sup>6</sup> retards the

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<sup>‡</sup> Attorney, Williams Mullen. I would like to thank Professor Antonio Perez at the Catholic University of America, Columbus School of Law, for his guidance and assistance in writing this Comment.

<sup>1</sup> Michael Kremer, *The O-Ring Theory of Economic Development*, 108 Q. J. OF ECON. 551, 551 (1993).

<sup>2</sup> *Id.*

<sup>3</sup> *Id.*

<sup>4</sup> Jacqui Goddard, *Nice Runner, 278 Million Miles, One Owner, Just Eur27m; United States*, THE TIMES (Dec. 19, 2008), [http://www.timesonline.co.uk/tol/news/world/us\\_and\\_americas/article5366074.ece](http://www.timesonline.co.uk/tol/news/world/us_and_americas/article5366074.ece).

<sup>5</sup> Jeff Forrest, *The Space Shuttle Challenger Disaster: A Failure in Decision Support System and Human Factors Management*, DSSRESOURCES.COM (Oct. 7, 2005), <http://dssresources.com/cases/spaceshuttlechallenger/index.html>.

<sup>6</sup> *See infra* Part I.

growth of third world countries by incentivizing international organizations and developed countries to under-invest in their telecommunications infrastructure.<sup>7</sup> With the proliferation of mobile devices in both first and third world countries, a reliable telecommunications infrastructure is a necessary staple for equalizing economic growth.<sup>8</sup> There is a problem, however, in ordinary cost-based and pro-competitive governmental regimes: they will only exacerbate the advantage of first world countries and deepen the third world dependence on the developed world.<sup>9</sup> Spillover effects and technological pairing will tend to only worsen these problems.<sup>10</sup>

Part I of this Comment will fully explain the O-Ring Theory of Economic Development and how it can be applied in international telecommunications. Part I will also specifically focus on the Reference paper,<sup>11</sup> which is an outline of the goals for international telecommunications as proffered by the World Trade Organization (WTO), and how it might be used both to hinder and assist developing countries in their economic expansion. Part II of this Comment will discuss the possible counterarguments to the O-Ring theory, and, specifically, its application to international telecommunications development. Specifically, Part II will discuss leapfrogging and technology transfer programs that demonstrate specific anti-O-Ring effects. Lastly, Part III of this Comment will discuss the actual and potential O-Ring effects and adherence to conflicting international economic policies through a case study of the country of Cameroon.

#### PART I - THE O-RING AND ITS APPLICATION TO INTERNATIONAL TELECOMMUNICATIONS DEVELOPMENT

Kremer asserts that because firms are indifferent as to the skill level of their workers (as long as they are uniform), better workers will drift to better firms (which are usually located in developed<sup>12</sup> economies), allowing those firms and

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<sup>7</sup> See *infra* Part I.

<sup>8</sup> See *infra* Part III.

<sup>9</sup> See *infra* Parts II and III.

<sup>10</sup> See *infra* Part I.

<sup>11</sup> *Telecommunications Services: Reference Paper, Negotiating Group on Basic Telecommunications*, WTO (Apr. 24, 1996), [http://www.wto.org/english/tratop\\_e/serv\\_e/telecom\\_e/tel23\\_e.htm](http://www.wto.org/english/tratop_e/serv_e/telecom_e/tel23_e.htm) [hereinafter *Telecommunications*].

<sup>12</sup> The terms “developed” and “developing” countries are used throughout this paper as synonyms with first world and third world, respectively. In fact, Black’s Law Dictionary defines third world country by directing the reader to *Developing Country*. *Developing Country*, BLACK’S LAW DICTIONARY (10th ed. 2014).

those economies to increase their lead.<sup>13</sup> This effect is known as demonstrating positive spillover.<sup>14</sup> His economic principles are based on a production function solving for output, which includes worker quantity and skill level.<sup>15</sup> This production function is explained in more detail in appendix A.<sup>16</sup>

Once Kremer's hypothesis is proven, it is easy to see how, in the short term, workers and firms will happily accommodate the system. First world economies can afford to import better skilled workers and train their own workers to be more efficient.<sup>17</sup> This ability, in turn, creates high quality product.<sup>18</sup> Third world countries are unable to keep pace in this regard, so their product quality is lower and thus actually *more* expensive for their home country consumers.<sup>19</sup> In the short term, this outcome is acceptable (and efficient)<sup>20</sup> because developing countries will happily produce output and provide a service to their citizens, even if the price is somewhat high.<sup>21</sup> There is a market for lower-quality goods within any sub-economy, so third world countries are satisfied in the short term.<sup>22</sup> Over the long term, however, considering the disparities between the returns to scale on labor<sup>23</sup> (and telecommunications), third world countries will never be able to catch up; the first step they make toward becoming competitive eventually becomes the limiting factor in their ability to compete globally.<sup>24</sup> The factors that have the greatest impact on their ability to catch up in the long term are the combination of several spillover effects and strategic complementarities.<sup>25</sup> For example, spillover effects in telecommunications infrastructure could include, among virtually infinite others, transactional

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<sup>13</sup> Kremer, *supra* note 1, at 556.

<sup>14</sup> *Id.* at 570.

<sup>15</sup> *Id.* at 553-54.

<sup>16</sup> *Id.* at 554.

<sup>17</sup> See generally UNDP, HUMAN DEVELOPMENT REPORT, OVERCOMING BARRIERS: HUMAN MOBILITY AND DEVELOPMENT, v, 84 (2009), [http://hdr.undp.org/sites/default/files/reports/269/hdr\\_2009\\_en\\_complete.pdf](http://hdr.undp.org/sites/default/files/reports/269/hdr_2009_en_complete.pdf) [hereinafter HUMAN DEVELOPMENT REPORT] (mapping human migration in an effort to "broaden and rebalance perceptions of migration to reflect a more complex and highly variable reality."); Parija Kavilanz, *American manufacturers importing workers*, CNN MONEY (Mar. 5, 2012, 11:39 AM), <http://money.cnn.com/2012/03/05/smallbusiness/manufacturing-workers/>.

<sup>18</sup> See HUMAN DEVELOPMENT REPORT, *supra* note 17. See also Douglas A. Irwin, *A Brief History of International Trade Policy*, ECONLIB.ORG (Nov. 26, 2001), <http://www.econlib.org/library/Columns/Irwintrade.html> (arguing that economies throughout history have recognized the importance of exporting manufactured goods).

<sup>19</sup> Simon Romero & Sara Shahriari, *A Foods Global Success Creates Quandary at Home: Quinoa Is Now Too Expensive for Many Bolivians*, N.Y. TIMES, Mar. 20 2011, at A6.

<sup>20</sup> *Id.*

<sup>21</sup> *Id.*

<sup>22</sup> *Id.*

<sup>23</sup> Kremer, *supra* note 1, at 573.

<sup>24</sup> Nita Rudra, *Globalization and the Decline of the Welfare State in Less-Developed Countries*, 56 INT'L ORG. 411, 417-18 (2002).

<sup>25</sup> Kremer, *supra* note 1, at 570.

speed.<sup>26</sup>

Firms can conduct business more efficiently in developed countries because their information is faster and more reliable.<sup>27</sup> This will lead to further spillover incentives that include, among others, placing more employees in the developed country and raising the incomes of those employees who wish to relocate to faster networks. This simple maneuver will have numerous obvious and non-obvious spillover effects in both the short and long terms.

To explain, assume a relatively small, developed country and a relatively large company. If more executives relocate to a newly established global headquarters in this developed country and replace mid-level employees, then the area surrounding that firm (assumed to be a substantial portion of the country) will flourish. Employees will demand larger and more expensive homes, restaurants will open or expand, and perhaps an airport is required to shuttle the executives to different locations. These are all spillover effects from a fast and reliable telecommunications infrastructure. This is what happened when the United States, for example, invested in a faster and larger network and Cameroon could not.<sup>28</sup> The developing country will not be able to catch up. In an attempt to combat the natural market forces that have led to this unfortunate situation, the International Telecommunications Union (ITU) released the Reference Paper<sup>29</sup> to guide development in an egalitarian manner. The international economic forces at work that triggered that Reference Paper can be analogized to monopoly problems.<sup>30</sup>

#### *The ITU Reference Paper*

The WTO investigated the issue set forth herein in 1996 and created one of the foundational models for international telecommunications development: the Reference Paper.<sup>31</sup> The Reference Paper is a brief but influential work that was created to serve as a reference for international telecommunications law and development.<sup>32</sup> It was “the first international document that embodies concepts and elements of telecommunications policy and regulations.”<sup>33</sup> It pro-

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<sup>26</sup> See, e.g., ICT, THE WORLD IN 2010: THE RISE OF 3G 7 (2010) <http://www.itu.int/ITU-D/ict/material/FactsFigures2010.pdf>.

<sup>27</sup> Gordon Hanson, *The Globalization of Production*, NBER (2001) <http://www.nber.org/reporter/spring01/hanson.html>.

<sup>28</sup> See *infra* Part III.

<sup>29</sup> *Telecommunications*, *supra* note 11.

<sup>30</sup> See *infra* Part I.

<sup>31</sup> *Telecommunications*, *supra* note 11.

<sup>32</sup> Boutheina Guermazi, Exploring the Reference Paper on Regulatory Principles 1 (2002) (unpublished comment) (on file with WTO).

<sup>33</sup> *Id.*

vides “definitions and principles on the regulatory framework for the basic telecommunications services.”<sup>34</sup> In addition to advancing relevant definitions, the Reference Paper has six focal points: competitive safeguards, interconnection, universal service, public availability of licensing criteria, independent regulators, and allocation of scarce resources.<sup>35</sup> These six headings outline the goals of the WTO in assisting and regulating international telecommunications development. According to leading scholars:

The objective of the reference paper is twofold. First, it aims to provide foreign service providers with regulatory safeguards to guarantee that monopolies or former monopolies do not abuse their market power to undermine competition. Second, it aims to provide a harmonized set of regulations in order to minimize the phenomenon of asymmetric regulation.<sup>36</sup>

Similar to this Comment, the Reference Paper was created not to focus on combating the monopolization of the telecommunications industry per se, but rather “on the anti-competitive practices of major suppliers in a particular market.”<sup>37</sup> If a first world country has the ability to control the terms of use of their product, or their donation, the Reference Paper considers them a “major supplier.”<sup>38</sup> To compare to modern U.S. antitrust law, this approach is similar to the methods of dealing with monopolies and, specifically, group boycotts or exclusionary practices.<sup>39</sup> While it begins to address issues of anticompetitive practices and informational asymmetries, this Comment asserts that it falls short in fully providing developing countries with the protection they need.

Antitrust law is an appropriate lens for this evaluation because it is economic in nature, practical, and provides specific incentives that would be helpful in providing assistance to third world countries.<sup>40</sup> At a very basic level, antitrust law is concerned with fairness.<sup>41</sup> The benefits of allowing international telecommunications law to follow the basic rubric of antitrust law are multiple. However, for clarity this Comment will discuss three in detail: (1) incentive rationale coupled with risk aversion, (2) the existence of *per se* violations for group boycotts and horizontal restraints of trade, and (3) the fact-specific approach used to evaluate monopolistic behavior, specifically within the realm of natural monopolies.

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<sup>34</sup> *Telecommunications*, *supra* note 11.

<sup>35</sup> *Id.*

<sup>36</sup> Guermazi, *supra* note 32.

<sup>37</sup> *Id.* at 2.

<sup>38</sup> *See id.* at 3 (describing “major supplier”).

<sup>39</sup> CHARLES J. GOETZ & FRED S. MCCHESENEY, *ANTITRUST LAW: INTERPRETATION AND IMPLEMENTATION* 394 (Robert Clark et al. eds., 4th ed. 2009).

<sup>40</sup> RICHARD A. POSNER, *AN ECONOMIC ANALYSIS OF LAW* 379 (Vicki Been et al. eds., 8th ed. 2011).

<sup>41</sup> GOETZ, *supra* note 39, at 10-11.

The first reason why an antitrust law approach would be well suited to conquer the difficulties associated with an expanding global telecommunications industry is rooted in incentive theory. Incentive regulation is a recognized and relatively *laissez-faire* form of governmental control.<sup>42</sup> The threat of natural monopolies, as well as economic monopolies, is real in the telecommunications industry.<sup>43</sup> Natural monopolies demonstrate three main characteristics: (1) high fixed costs, (2) low marginal cost, and (3) a decreasing marginal cost curve through the point at which it crosses the average cost curve.<sup>44</sup> All three of these factors are present in the telecommunications industry, and, in fact, any industry that can be classified as a public carrier.<sup>45</sup> First, the fixed costs associated with telecommunications infrastructure are high.<sup>46</sup> These fixed costs are often high enough to be prohibitive.<sup>47</sup> Second, demonstrating the low marginal costs of the industry then becomes almost intuitive: the high fixed costs involve mainly start-up costs, and after the lines have been laid or satellites have been sent to orbit, the additional cost of adding the marginal user 'N' is negligible.<sup>48</sup> Third, the cost of adding marginal user 'N+1' is less than that of 'N' because with more "line"<sup>49</sup> that is added, it becomes easier to add further connections.<sup>50</sup> Thus, the telecommunication industry shows all of the classic symptoms of a market highly susceptible to natural monopolization. With this susceptibility comes the danger of artificially high prices.<sup>51</sup> One way to address this problem is through Incentive Regulation.<sup>52</sup>

We should, as a policy matter, encourage both efficient behavior and efficient outcomes. One of the benefits of Incentive Regulation is that it supports this notion.<sup>53</sup> Policies that tend to encourage inefficient entry miss the point of economic regulation.<sup>54</sup> Efficient economies are meritocracies and they should

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<sup>42</sup> POSNER, *supra* note 40, at 374.

<sup>43</sup> See GOETZ, *supra* note 39, at 378 (stating that a natural monopoly is "a situation wherein the economic of scale are so strong that a single provider will almost inevitably come to dominate the 'market.'").

<sup>44</sup> POSNER, *supra* note 40, at 367-68.

<sup>45</sup> *Id.* at 368-69.

<sup>46</sup> *Id.* at 367.

<sup>47</sup> *Id.*

<sup>48</sup> *Id.*

<sup>49</sup> Here, read "line, Internet connection, satellite connection, etc."

<sup>50</sup> For an example of low marginal costs, imagine adding one additional home to an existing power grid. The costs of laying an additional few feet of line to a massive structure are relatively negligible.

<sup>51</sup> POSNER, *supra* note 40, at 369.

<sup>52</sup> *Id.* at 374.

<sup>53</sup> *Id.*

<sup>54</sup> *Id.* at 369.

be treated as such.<sup>55</sup> A firm should not be punished for having a low cost structure subject to legal limitations imposed by, for example, the Sherman Act<sup>56</sup> and Clayton Act.<sup>57</sup> Incentive Regulation “permit[s] rate changes based on changes in an industrywide [sic] cost index.”<sup>58</sup> This rubric would allow firms to benefit from an external increase in cost by subjecting their permitted price-increases to reflect those external increases in cost.<sup>59</sup> To apply this method to telecommunications, we can assume that a natural resource is used in the construction and repair of all telecommunications lines; silicone in fiber-optic cables, for example. If the price of this raw material were to increase by \$1 per pound in a given time period, then naturally monopolistic firms could increase their prices to reflect this change without ramifications.<sup>60</sup>

*The Economics of the O-Ring’s Application in International Telecommunication*

Ricardian theory is based on comparative advantage.<sup>61</sup> Comparative advantage is a situation in which one supplier can produce something at a lower cost than another supplier.<sup>62</sup> Given a few simplifying assumptions,<sup>63</sup> Ricardian

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<sup>55</sup> GOETZ, *supra* note 39.

<sup>56</sup> See Sherman Antitrust Act, 15 U.S.C. §§ 1-7 (2012) (“Every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several States, or with foreign nations, is declared to be illegal.”).

<sup>57</sup> 15 U.S.C. § 13(a).

It shall be unlawful for any person engaged in commerce, in the course of such commerce, either directly or indirectly, to discriminate in price between different purchasers of commodities of like grade and quality, where either or any of the purchases involved in such discrimination are in commerce, where such commodities are sold for use, consumption, or resale within the United States. . . where the effect of such discrimination may be substantially to lessen competition or tend to create a monopoly in any line of commerce, or to injure, destroy, or prevent competition with any person who either grants or knowingly receives the benefit of such discrimination, or with customers of either of them. . .

*Id.*

<sup>58</sup> POSNER, *supra* note 40, at 375.

<sup>59</sup> *Id.*

<sup>60</sup> See *id.* This example is based on Judge Posner’s explanation of Incentive Regulation.

<sup>61</sup> STEVE SURANOVIC, INTERNATIONAL TRADE: THEORY AND POLICY, v. 1.0, THE RICARDIAN THEORY OF COMPARATIVE ADVANTAGE FLAT, Ch. 2 (2016) (ebook).

<sup>62</sup> Lauren F. Landsbur, *Comparative Advantage, An Economics by Topic detail*, THE LIBR. OF ECON. & LIBERTY, <http://www.econlib.org/library/Topics/Details/comparativeadvantage.html> (last visited Oct. 23, 2016).

<sup>63</sup> A.C. Mulligan et. al., *David Ricardo and Comparative Advantage*, IANG BLOG, [http://iang.org/free\\_banking/david.html](http://iang.org/free_banking/david.html) (last visited Oct. 23, 2016). These assumptions include the following the following:

There are no transport costs. Costs are constant and there are no economies of scale. There are only two economies producing two goods. The theory assumes that traded goods are homogeneous (i.e., identical). Factors of production are assumed to be perfectly mobile.



theory generally states that comparative advantage serves as the fundamental component and deciding factor behind international trade.<sup>64</sup> Ricardo's theory is important in international telecommunications because it provides the economic reasoning behind the first world's decision to under-invest in the third world.<sup>65</sup> The first world has a comparative advantage in both research and development ("R&D") of new telecommunications technologies, as well as their addition to existing infrastructure.<sup>66</sup> Thus, it is more efficient for them to simply provide the third world with already-developed technologies than to provide them with the funding to develop it on their own. The processes of learning by doing and any positive externalities that may occur during R&D phases are therefore unavailable to the third world.<sup>67</sup> The Reference Paper does not (and arguably cannot) deal with this issue. The positive returns associated with the research, development, and implementation of telecommunications infrastructure are not fully comprehended by the Reference Paper and lead to a major disadvantage to the third world.

Having set out the theory and the economics behind Michael Kremer's thesis, this Comment will now discuss how the theory can specifically be applied to telecommunications infrastructure.

With the proliferation of mobile devices on both a national and global scale and the constant development of newer and faster data networks,<sup>68</sup> it is easy to see how a reliable telecommunications infrastructure is crucial for a developing economy.<sup>69</sup> The O-Ring Theory of Economic Development applies to telecommunications infrastructures as well as skill-level of labor.<sup>70</sup> This portion of the analysis—proving that this theory applies to telecommunications—is relatively straightforward. The more difficult part is deciding how to utilize that

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There are no tariffs or other trade barriers. There is perfect knowledge, so that all buyers and sellers know where the cheapest goods can be found internationally.

*Id.*

<sup>64</sup> *Id.*

<sup>65</sup> *See infra* Part III.

<sup>66</sup> *See infra* Part I.

<sup>67</sup> *See infra* Part III.

<sup>68</sup> Sébastien Page, *AT&T to Launch 4G Network in 2011*, IPHONE DOWNLOAD BLOG (Sept. 16, 2010), <http://www.iphonedownloadblog.com/2010/09/16/att-to-launch-4g-network-in-2011/>.

<sup>69</sup> *See generally* Lars-Hendrik Röller & Leonard Waverman, *Telecommunications Infrastructure and Economic Development: A Simultaneous Approach*, 91 THE AM. ECON. REV. 909 (2001) (discussing the effects of telecommunications on the economy of countries).

<sup>70</sup> *See generally* Kremer, *supra* note 1 (establishing that something is an o-ring when, if it fails, it can be catastrophic to a developing economy). Technically, many things *can* be o-rings in any given economic situation. I am limiting my analysis to show that currently telecommunications are an economic staple but the general concept, when broadly defined, can apply to various inputs.

knowledge. Thus, Part II, Section I will focus on strictly applying Kremer's theory to telecommunication infrastructures in third world countries.<sup>71</sup> Section II will then begin to analyze what can be done with this information. Specifically, this Comment will examine what incentives are present to assist developing countries in realizing the criticality of a reliable and stable telecommunications infrastructure.

### *Telecommunication and Economic Growth*

We all have cell phones. As of 2010, there are five billion cellular connections (essentially, cell phones) worldwide,<sup>72</sup> and it is estimated that 70% of the global population owns a cell phone based on the number of cell phones sold.<sup>73</sup> We all use the Internet; from 2005 to 2008, Internet usage in the United States alone rose roughly ten percent,<sup>74</sup> and global Internet usage rose 444.8% from 2000 to 2010.<sup>75</sup> Rapid dissemination of information is becoming necessary for any developing economy. It is insufficient to show, simply, that telecommunications are becoming important. It must be both necessary and positively correlated to economic development before asserting that it is a catalyst for growth. Röller and Waverman studied the global penetration rate of telecommunication infrastructures and plotted that information in an econometric model against gross domestic product ("GDP") growth.<sup>76</sup> They found there is a positive correlation between telecommunication infrastructure and GDP growth.<sup>77</sup> However, a positive correlation is not enough—there must also be causation.<sup>78</sup> To assert causation, they examined the impact that investment in,

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<sup>71</sup> See *infra* Part II.

<sup>72</sup> *Over 5 billion mobile phone connections worldwide*, BBC.COM (July 9, 2010), <http://www.bbc.co.uk/news/10569081>. Astonishingly, twenty percent of all new cell phone connections occurred in the 18 months between January 2009 and July 2010, and it is predicted that another one billion connections will be made before 2012.

<sup>73</sup> *Cell Phone Statistics-The Growth of Mobile*, MOBILECAUSE.COM (Dec. 15, 2010), <https://www.mobilecause.com/cell-phone-statistics>.

<sup>74</sup> Andrew Perrin & Maeve Duggan, *Americans' Internet Access: 2000-2015*, PEW RES. CTR. (June 26, 2015), <http://www.pewinternet.org/2015/06/26/americans-internet-access-2000-2015>.

<sup>75</sup> *Internet Usage Statistics*, INTERNET WORLD STATS, <http://www.internetworldstats.com/stats.htm> (last updated June 30, 2016).

<sup>76</sup> Röller, *supra* note 69 (using a structural model that closely examines telecommunications investment).

<sup>77</sup> *Id.* (conducting several studies to determine the impact of telecommunications infrastructure on economic growth in various forms).

<sup>78</sup> The causation does not need to be positive, however; the *correlation* does. This is a subtle distinction that will become important later on in the comment. For example, finding a positive correlation between properly functioning o-rings and successful shuttle launches would not prove difficult; they are positively correlated. Conversely, when an o-ring fails, a shuttle launch has a lower chance of success. This relationship only becomes apparent,

and proliferation of, telecommunications infrastructure has on a growing economy.<sup>79</sup> Their results include investment leading to:

Growth because its products—cable, switches, and so forth—lead to increases in the demand for the goods and services used in their production. In addition, the economic returns on to telecommunications infrastructure investment are much greater than the returns on just the telecommunications investment itself. Where the state of the telephone system is rudimentary, communications between firms is limited...As the telephone system improves, the costs of doing business fall, and output will increase for individual firms in individual sectors of the economy. ‘If the telephone does have an impact on a nation’s economy, it will be through the improvements of the capabilities of managers to communicate with each other rapidly over increased distances.’ Thus, telecommunications infrastructure investment and derived services provide significant benefits; their presence allows productive units to produce better...it has been argued that telecommunications investments have important spillovers and create externalities.<sup>80</sup>

Both the direct and spillover effects<sup>81</sup> of investment in telecommunications infrastructure are substantial.

To support the thesis of a correlated relationship without direct proof of a causal relationship, analogies can be used. Restricting the analysis to economic development leads to a few interesting examples. The first example is labor, which is positively correlated to economic growth, and without which an economy cannot survive.<sup>82</sup> Similarly, an economy cannot grow in the twenty-

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however, when the latter occurs. The o-ring must fail in order to observe their true connection. This is the natural relationship between any necessary but insufficient input, such as a telecommunications infrastructure. Thus, we will see the correlation but examine the underlying data to trust (for lack of a better word) that a causal relationship exists.

<sup>79</sup> Röller, *supra* note 76.

<sup>80</sup> *Id.* at 909-10 (stating that various studies support the notion that “[i]t is a common conception that a modern communications system is essential to development.”); Nathaniel H. Leff, *Externalities, Information Costs, and Social Benefit-Cost Analysis for Economic Development: An Example from Telecommunications*, 32(2) *Economic Development and Cultural Change* 255 (Jan. 1984).

<sup>81</sup> Spillover effects are, generally speaking, externalities. *See, e.g.*, Adam B. Jaffe, *Economic Analysis of Research Spillovers Implications for the Advanced Technology Program*, ADVANCED TECHNOLOGY PROGRAM (Dec. 1996), <http://www.atp.nist.gov/eao/gcr708.htm>; *see also* Externality defined as “A consequence or side effect of one’s economic activity, causing another to benefit without paying or to suffer without compensation”. —Also termed *spillover*... *Externality*, BLACK’S LAW DICTIONARY (10th ed. 2014).

<sup>82</sup> This idea presents the intriguing question of how an economy, within the strict definition of the word, can exist with a very limited (single digit) work force. The answer will rely on fact that, for this example, it is assumed that an economy can exist with zero workers. An economy cannot exist with zero workers. The impossibility proves the notion that a necessary condition (here, certain limited inputs in economic development) exists even if the

first century without a reliable telecommunications infrastructure. An economy, by definition,<sup>83</sup> has never existed without even a rudimentary telecommunications system and by showing through positive correlations that increased investments and efficiencies in infrastructure lead to economic development, it can be positively asserted that we have discovered another O-Ring.

#### *Application of the Telecommunication Theory*

Once it is evident that a telecommunications infrastructure is an O-Ring in economic development, the analysis must necessarily shift from one of discovery to one of application. Essentially, how can we apply this information? There are several important points to be made in this section. First, the question must be asked of how much government regulation and incentivizing is necessary for a developing economy to properly grow. Second, a discussion of private versus public sector involvement in this process is compulsory. The International Telecommunications Union (ITU) answered these questions by creating the Reference Paper, to which around 75 countries have already adhered.<sup>84</sup>

#### *Government Regulation and Incentives*

Applying an appropriate amount of government regulation in international telecommunications is a difficult balance to strike. Just as most parents strive to strike a balance between draconian methods of regulating a child's behavior and a more *laissez faire* method of allowing self-teaching with the inevitable mistake, governments of developing economies should strike a balance between over- and under-regulation of their expanding telecommunications infrastructure. On the one hand, with too much regulation comes the possibility of limited development of new technologies and methods that might be present in a state of competition.<sup>85</sup> On the other hand, a state of complete deregulation in

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causation relationship cannot be directly proven due to a lack of direct evidence. An economy has never existed which consisted of zero workers, yet it can be asserted that a workforce, irrelevant of skill level, is positively correlated with economic development.

<sup>83</sup> Economy is defined as: the management or administration of the wealth and resources of a community". *Economy*, BLACK'S LAW DICTIONARY (10th ed. 2014). This implies that a transfer of information, whether, as was the case in historic barter economies, through verbal exchange in person or, more modernly, through a telecommunications network, is necessary.

<sup>84</sup> Guerhazi, *supra* note 32, at 25 n.2.

<sup>85</sup> POSNER, *supra* note 40, at 288-89 (discussing monopoly as a form of regulation involving patents, and how a market with more than one firm in a perfect state of competition is more likely to try and innovate from a technological standpoint than a market in which one firm controls the sole means of production).

the area of building an infrastructure might lead to the problems associated with natural monopoly present in any infrastructure,<sup>86</sup> such as misguided incentives. The pros and cons of government regulation in this area will be discussed, but this Comment asserts that limited regulation, coupled with competition, is the optimal strategy to handle the rigors of maturation associated with establishing a technological infrastructure. With the continuing globalization of telecommunications, there is support finding that international regulation is necessary to combat natural forces that could undermine the third world's chances of competing with the developed countries. The United Nations (U.N.) has investigated this issue and responded by enabling the ITU to combat these problems.<sup>87</sup> The goal of the ITU is "to get everyone to work together – government and industry alike – to come up with solutions that work: for sharing knowledge, developing tools, and building and safeguarding networks."<sup>88</sup> The ITU is necessary to ensure an equal playing field for all countries,<sup>89</sup> and has burdened itself with the responsibility of ensuring that developing countries have sufficient telecommunications infrastructure to stay competitive globally.<sup>90</sup> With respect to international aid, communications and transportation infrastructure is the highest subset of aid from the World Bank, above energy, agriculture, and education.<sup>91</sup> Thus, it is clear the World Bank, as well as the

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<sup>86</sup> Wei Li & Lixin Colin Xu, Note, *The Impact of Privatization and Competition in the Telecommunications Sector around the World*, 47 J.L. & ECON. 395, 400 (Oct. 2004) (stating "Most economists . . . argue that that privatization works best when there is competition that limits the market power of the incumbent(s). Competition is thus seen as a complement of privatization.").

<sup>87</sup> See generally *About ITU*, ITU, [http://www.itu.int/newsroom/press\\_releases/aboutitu.html](http://www.itu.int/newsroom/press_releases/aboutitu.html) (last visited Oct. 26, 2016) (stating that the ITU has been in existence for over 145 years and has "coordinated the shared global use of the radio spectrum, promoted international cooperation in assigning satellite orbits, worked to improve telecommunications infrastructure in the developing world, established the worldwide standards that foster seamless interconnection of a vast range of communications systems and addressed the global challenges of our times, such as mitigating climate change and strengthening cybersecurity.") (emphasis added) [hereinafter *About ITU*].

<sup>88</sup> *ITU vision statement*, ITU, <https://www.itu.int/en/ITU-D/Climate-Change/Documents/S-GEN-CLIM-2008-11-PDF-E.pdf> (last visited Oct. 26, 2016).

<sup>89</sup> See generally *Building global communication frameworks for all*, ITU, [http://www.itu.int/net/newsroom/CIS/2009/backgrounders/global\\_communication.aspx](http://www.itu.int/net/newsroom/CIS/2009/backgrounders/global_communication.aspx) (last visited Oct. 26, 2016) (stating ITU "has also successfully regulated worldwide use of the radio-frequency spectrum, ensuring all international wireless communications remain interference-free to ensure the relay of vital information and economic data to all parts of the globe.").

<sup>90</sup> See *About ITU*, *supra* note 87.

<sup>91</sup> See generally *Financing for sustainable development*, OECD.ORG, [http://www.oecd.org/department/0,3355,en\\_2649\\_34447\\_1\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/department/0,3355,en_2649_34447_1_1_1_1_1,00.html) (last visited Oct. 26, 2016).

ITU, view communications as a necessary element in development. Alternatively, a course of action that could also be deemed favorable to the expansion of a reliable telecommunications infrastructure is full privatization in both the developmental and implementation stages.

*Privatization*<sup>92</sup>

Privatizing entire industries has been both beneficial and devastating to economies.<sup>93</sup> As with most evaluations, there are valid points to be made on both sides of the debate. With privatization and deregulation come increased incentives to research and develop more efficient methods of production and distribution.<sup>94</sup> In his book, Judge Posner explains the various attributes of deregulation (as most economists do), while recognizing the need for government regulation and ownership in certain areas.<sup>95</sup> Coincidentally, one of the examples that Judge Posner provides is on point:

What is the demand for deregulation? A clue is the competing away of regulation-induced profits in the airline industry. A more general cause is technological change, which in recent decades has favored competition; think of the effect of the cell phone, fiber optic cables, and the Internet on telephone service.<sup>96</sup>

The ITU acknowledges the trends of privatization and competition, as well as the need for minimal levels of government ownership and regulation.<sup>97</sup>

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<sup>92</sup> Privatization, used herein, means strict privatization, as the word is defined in Black's Law Dictionary ("The act or process of converting a business or industry from governmental ownership or control to private enterprise.") *Privatization*, BLACK'S LAW DICTIONARY 1390 (10th ed. 2014), and in close relation, also used is the term, deregulation.

<sup>93</sup> For example, the global market collapse in 2008 was due, in part, to the under-regulation of the financial services industry which led to the "simultaneous mortgage default of thousands of homeowners." Yusuf Yusuf, *Moment of Clarity: A Centrist Approach to Mortgage Lending*, 12 CARDOZO PUB. L. POL'Y & ETHICS J. 267, 269 (2013).

<sup>94</sup> POSNER, *supra* note 40, at 385 (examining both the fall in real prices for tickets and increased airline traffic that resulted from deregulation of the airline industry in the 1970s).

<sup>95</sup> See generally POSNER, *supra* note 40, at 385-86 (comparing industries such as "electric power generation" in which the government clearly does not possess a comparative advantage in terms of production to industries where the government may be able to provide better service such as "jails and prisons").

<sup>96</sup> *Id.* at 385.

<sup>97</sup> See Joel Stratte-McClure, *Privatization and Liberalization Set Off Big Bang*, ITU (Oct. 13, 1999), <https://www.itu.int/newsarchive/wtd/1999/iht10/tem-02.html> (discussing worldwide trends of privatization and competition among companies in the world telecommunications sector); Gustavo Peña Quiñones, *ITU/NBTC, Seminar on Telecommunications Regulatory Best Practices: Toward the Digital Economy Thailand*, 40 (2015), <https://www.itu.int/en/ITU-D/Regional->

The best approach in dealing with international telecommunications development is to have privatization of the industry with substantial (but not burdensome) governmental regulation.<sup>98</sup> The trend, however, is toward privatization.<sup>99</sup> For example, between 1980 and 1998 the percentage of countries with private telecommunications operators increased from 2% to 42%.<sup>100</sup> Industries that require substantial and often prohibitive fixed costs show this kind of privatization growth very rarely.<sup>101</sup> In a study involving 177 countries, Wei Li and Lixin Colin Wu econometrically examined the actual impact that privatization and competition has on the telecommunications sector around the world.<sup>102</sup> In general, they found a positive correlation between privatization and economic growth.<sup>103</sup> Their assertion, however, goes further to suggest that “full privatization, which gave private owners control rights, were much more effective in improving performance than partial privatization, which left control rights in the hands of bureaucrats.”<sup>104</sup> Their study only examines internal regulation; that is, regulation within each developing country.<sup>105</sup> They fail to account for the possible effects that a global regulatory body, such as the ITU, might have on telecommunication development. Most of the reasons they give for the competitive advantage of privatization over publicly owned enterprise,<sup>106</sup> however, would hold true even under a global framework. For example, they cite the lack of incentive to monitor individuals for performance, as well as a general lack of incentive to reduce costs, as reasons why privatization shows increased returns.<sup>107</sup> We have seen, however, that incentives can be provided to government enterprises as well as corporations to lower costs and increase efficiency.<sup>108</sup> These incentives usually come in the form of tax breaks for utilizing

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Presence/AsiaPacific/Documents/Events/2015/March-DigitalEconomy/Session1-2\_Gustova\_Pe%C3%B1a-Qui%C3%B1ones.pdf (stating “the concept of *minimal regulation* should be prioritized when it comes to government regulation of Information, Communication, and Technology, worldwide).

<sup>98</sup> This notion underlies the Reference Paper, but the paper has fallen short of providing the developing world adequate protection from predatory practices of first world countries.

<sup>99</sup> Li, *supra* note 86, at 396.

<sup>100</sup> *Id.*

<sup>101</sup> *Id.* at 396-400.

<sup>102</sup> *Id.* at 397.

<sup>103</sup> *Id.*

<sup>104</sup> *Id.*

<sup>105</sup> *Id.* at 401-02.

<sup>106</sup> For example, Ricardian principles. See generally Lauren F. Landsbur, *Comparative Advantage, an Economics by Topic detail*, LIBR. OF ECON. & LIB., <http://www.econlib.org/library/Topics/Details/comparativeadvantage.html> (last visited Nov. 1, 2015); SURANOVIC, *supra* note 61, at Ch. 2.2.

<sup>107</sup> Li, *supra* note 86, at 399-400.

<sup>108</sup> See James Salzer, *Lawmakers hand out tax breaks to some businesses*, ATLANTA J. CONST. (Apr. 14, 2010), <http://www.ajc.com/news/news/local-govt-politics/lawmakers->

green energy, subsidies, and so forth.<sup>109</sup> The incentives generally are from governments to private companies. Within the realm of the telecommunications industry, the incentive chain can run from international governing bodies through local governments to private firms.

Governmental incentives are what is lacking from the Reference Paper, and what is lacking in international telecommunications law, to ensure that the developing world can economically compete with the developed world.<sup>110</sup> Absent from *any* regulation, there would be sufficient incentives for the first world to invest in the developing world's telecommunications network, however the amount of investment ensures that the third world remain below the first world in the ability to compete on an international level.

## PART II: COUNTER ARGUMENTS – LEAP-FROGGING AND TECHNOLOGY TRANSFER PROGRAMS

Part II of this Comment will discuss the various counter arguments to the O-Ring's application to telecommunications development. Specifically, the ideas of leap-frogging and technological transfer programs are formidable opponents for an O-Ring analysis within the framework of international telecommunications development.

### *Leap-Frogging*

As an alternative to requiring developing economies to repeat every step of the growing process, the concept of leap-frogging would allow these economies to learn from their developed counterparts and avoid some growing pains.<sup>111</sup> Leap-frogging would allow third world countries to "take-off" from a state of early development to competing on a global level.<sup>112</sup> This concept is a counter argument to the O-Ring theory, because this Comment asserts that developing economies will never be able to catch up to advanced economies due to increasing returns on investment to telecommunications infrastructure, whereas the leap-frogging theory asserts that "developing countries can jump some steps and avoid having to go through stages experienced by the present

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hand-out-tax-breaks-to-some-businesses/nQsbW/ (explaining how some businesses were offered tax breaks for building tourist attractions, entertainment centers, golf courses, etc.).

<sup>109</sup> *Id.*; see also Jim Abrams & Associated Press, *Renewable energy firms clamor for tax breaks*, ABC NEWS, <http://abcnews.go.com/Business/story?id=5696908&page=1> (last visited Sept. 14, 2016) (stating how individuals were also targeted for special tax breaks).

<sup>110</sup> See *infra* Part III.

<sup>111</sup> A.S. Bhalla, Note, *Can 'High' Technology Help Third World 'Take-Off'?*, 22 ECON. & POL. WKLY. 1082, 1082 (1987).

<sup>112</sup> *Id.*



advanced countries.”<sup>113</sup> Proponents of theoretical leap-frogging agree that increasing returns exist absent their theory.<sup>114</sup> They assert that “[u]nless the third world countries introduce high technology in their export-oriented industries ... they are unlikely to retain or capture export markets.”<sup>115</sup> Third world countries can utilize the concept of leap frogging to counteract this partially outcome-determinative disadvantage.

According to the theory, it is somewhat intuitive that leap-frogging is made easier when third world countries invest less in infrastructure because they can then jump from one stage to a more advanced one more easily.<sup>116</sup> In practice, however, it actually is beneficial in the long term for third world countries to invest more in domestic infrastructure because they will have better systems in place and can leap-frog further than they would otherwise.<sup>117</sup>

Leap-frogging presents an interesting conundrum. This counterargument assumes away a foundational element of this Comment. According to A.S. Bhalla, “it assumes that the indigenous technology capability is at a stage where high technology can be assimilated and efficiently utilised [sic], and some components of it can be domestically produced.”<sup>118</sup> This seemingly minor assumption brushes away this Comment’s major premise. The argument that high technology can be easily assimilated into third world countries assumes that there is already sufficient technology in place upon which high technology can be built. Therefore, it naturally follows that those countries that already have a semi- to fully-reliable telecommunications infrastructure can more easily leap-frog whereas those countries in the early stages of development will suffer from smaller jumps. In certain conditions, this situation demonstrates increasing returns to investment on infrastructure, which will further the O-Ring problem. Thus, although leap-frogging serves as an interesting counter argument to this Comment’s thesis, this fatal assumption ultimately serves as an Achilles’ heel.

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<sup>113</sup> *Id.*

<sup>114</sup> *Id.* at 1083.

<sup>115</sup> *Id.*

<sup>116</sup> *See, e.g., id.* (“A dilemma faced by the third world policy-makers is to strike a good balance between domestic technological development and imports of technology from abroad.”). Thus, it is reasonable to assume that it might be efficient for policy makers to invest less in domestic infrastructure and instead focus on importing technology in an attempt to use that technology to leap-frog.

<sup>117</sup> *See* Bettina Gransow, *Chinese Infrastructure Investment in Latin America-an Assessment of Strategies, Actors and Risks*, 20 J. OF CHINESE POL. SCI. 267, 268 (2015) (for example, China investing in its infrastructure resulted in high economic growth).

<sup>118</sup> Bhalla, *supra* note 111, at 1083.

*Technology Transfer Programs*

The idea behind technology transfer programs is the natural incentive that first world countries have to invest in third world countries.<sup>119</sup> The developed country has an incentive to donate technology to under-developed countries so that its own network functions more efficiently and on a broader level. Countries do this for many reasons, but mainly because it is advantageous to them in the long term to have compatible and reliable grids globally, across many technological disciplines.<sup>120</sup> It becomes easier to market a cell phone, for example, if the purchaser/user is assured that their phone will work on cellular grids all over the world.<sup>121</sup> The Federal Aviation Administration's (FAA) investment in flight systems of various countries is another example of tech transfer.<sup>122</sup> Although most of this Comment is dedicated to cellular and Internet infrastructures, satellite grids and updates are just as much a part of the global telecommunications network. The FAA is "moderniz[ing] the national airspace from a ground radar system to satellite-based GPS technology."<sup>123</sup> This new technology and method will be known as the Next Generation Air Transportation System (NextGen).<sup>124</sup> NextGen will allow pilots to communicate via a superior satellite-based grid system, as opposed to the current cellular system.<sup>125</sup> To realize all the benefits that the system is designed to provide, the system must have global support.<sup>126</sup> The benefits of sharing this new technology include easier flight paths when flying internationally, the need for only one flight system on each plane, and simpler training for pilots on the new software.<sup>127</sup> This donation is considered a technology transfer because the NextGen software was developed and largely utilized in the United States, yet it will be implemented in many countries all over the world.<sup>128</sup> This sort of technology transfer

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<sup>119</sup> *See id.* at 1085 (explaining how often, First World occupants often want to share new technologies with poorer countries that otherwise would not be able to afford them).

<sup>120</sup> *Century of Aviation Reauthorization Act, Hearing on Reauthorization and Reform of the Federal Aviation Administration and the Airport Improvement Program Before the Subcomm. on Aviation of the Comm. on Transp. & Infrastructure H.R.*, 112th Cong. 30 (2011) [hereinafter *Century of Aviation*] (statement of Hon. Randolph Babbitt, Administrator of the FAA).

<sup>121</sup> One sees the emergence of certain apps aimed at tracking the experience with particular wireless carriers to give the consumer more power when choosing cell phone plans. *See, e.g., About Us*, SENSORLY, <http://www.sensorly.com/about-us> (last visited Oct. 26, 2016) (an example of an app that enables its users to track their wireless connectivity).

<sup>122</sup> *Century of Aviation*, *supra* note 120.

<sup>123</sup> *NextGen Works*, FAA.GOV, <https://www.faa.gov/nextgen/works/#content> (last visited Sept. 12, 2016).

<sup>124</sup> *Id.*

<sup>125</sup> *Id.*

<sup>126</sup> *Century of Aviation*, *supra* note 120.

<sup>127</sup> *Id.* at 34.

<sup>128</sup> *Id.* at 74.

arguably can assist third world countries in their attempts to catch up to the developed world within the realm of telecommunications.<sup>129</sup>

This assertion presents a counter argument to this Comment because it postulates that first world countries have an incentive to assist third world countries in gaining ground in the developmental race.<sup>130</sup> An interesting economic note to this theory is the fact that natural market forces are at work; no international enforcement is necessary to ensure that technology is transferred and thus standard Ricardian theory can explain these transfers.<sup>131</sup> The comparative advantage, encouraging countries to produce goods at a lower cost, comparative to the same good made in another country,<sup>132</sup> weighs in favor of the developed country. The reason developed countries have the comparative advantage is because technology already exists upon which to build further improvements.

That argument, however, has flaws. Technology transfer programs are beneficial to third world countries; this is undeniable.<sup>133</sup> Undoubtedly, third world countries are placed in a better position due to the charity of the first world countries. People will be more likely to travel to countries if they know their cell phone will operate properly;<sup>134</sup> airlines are incentivized to reduce prices on flights to destinations where NextGen will be installed;<sup>135</sup> tourism will increase in countries that have Internet access.<sup>136</sup> The flaw comes from a process called learning-by-doing,<sup>137</sup> which enables those conducting purposeful research not only to gain from their directed goal, but also to discover new ideas or process-

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<sup>129</sup> Bhalla, *supra* note 111, at 1082-83.

<sup>130</sup> *See generally id.* at 1084 (describing the persuasiveness of policy considerations when making decisions that influence the pace and direction of technological change in small and large countries).

<sup>131</sup> *See generally* Murray N. Rothbard, *The Ricardian Law of Comparative Advantage*, MISES DAILY ARTICLES (Apr. 26, 2012), <https://mises.org/library/ricardian-law-comparative-advantage> (defining the Ricardian Model as a model of international trade introduced by David Ricardo and explaining comparative advantage). In this case, the comparative advantage of the developed national would be the ability to perform superior research and development. However, herein lies the flaw to this possible rebuttal argument of tech transfer; the developed country is 'learning-by-doing,' whereas the developing country just utilizes the new technology and gains from no positive externalities.

<sup>132</sup> *Id.*

<sup>133</sup> *See generally* Bhalla, *supra* note 111.

<sup>134</sup> Röller, *supra* note 69, at 910 n.3.

<sup>135</sup> *Century of Aviation*, *supra* note 120, at 71 (statement of Olas E. Calio, President & CEO of Air Transp. Ass'n of Am.).

<sup>136</sup> Craig Standing, et al., *The Impact of the Internet in Travel and Tourism: A Research Review 2001-2010*, 31 J. of TRAVEL & TOURIST MKT., 82, 82-83 (Jan. 23, 2014).

<sup>137</sup> Dr. Henning Troll & Dr. Thomas Stahlecker, Fraunhofer ISI, *Europe's Regional Research Systems: Current Trends and Structures*, EUR. RES. AREA 7, 8 (2009), [http://ec.europa.eu/invest-in-research/pdf/download\\_en/kf2008.pdf](http://ec.europa.eu/invest-in-research/pdf/download_en/kf2008.pdf).

es along the way. Troll and Stahlecker state, “examples from basic research demonstrate that not all knowledge derived from research is an immediately relevant input to innovation processes. It does, however, add to the knowledge base and may become relevant in the long term.”<sup>138</sup> A great example of the learning-by-doing process is the Internet itself.<sup>139</sup>

The Internet was an ‘invention’ of the military, but began to be applied in ways not originally intended.<sup>140</sup> Researchers in the United States learned that by working with military communication, something much greater could develop.<sup>141</sup> Thus, if the United States were to share the military communications with another country so that it connected the armed forces around the globe, then that would be considered technology transfer. The domestic developments in Internet connectivity, as a result of targeted research, occurred by ‘doing.’ Herein lies the shortcoming of the technology transfer argument. Although the developing country benefits by being provided with superior technology, the developed country: (1) already has the technology that was given, and (2) can learn from their original developments, a possibility absent from third world nations. Thus, although technology transfer programs can be helpful to developing countries in the short term, it will not assist them in the long term and may ultimately exacerbate their inability to catch up in global telecommunications development.

Another example of how technology transfers are ineffective for purposeful GDP growth is seen in recent ITU statistics regarding their relationship.<sup>142</sup> According to the ITU, the least technologically developed country in the world is Myanmar.<sup>143</sup> Focusing specifically on cellular penetration in Myanmar, the country is only twenty-four years behind the most developed country in terms of telecommunication development, Sweden.<sup>144</sup> This could, in part, be due to

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<sup>138</sup> *Id.*

<sup>139</sup> See generally Vinton Cerf, *How the Internet Came to Be*, NETVALLEY (1993), <http://www.netvalley.com/archives/mirrors/cerf-how-inet.html> (describing how experimenting with voice compression led to the separation of Transmission Control Protocol from Internet Protocol and later, User Datagram Protocol).

<sup>140</sup> See Barry M. Leiner et al., *Brief History of the Internet* 2-3 INTERNET SOC’Y, [http://www.internetsociety.org/sites/default/files/Brief\\_History\\_of\\_the\\_Internet.pdf](http://www.internetsociety.org/sites/default/files/Brief_History_of_the_Internet.pdf) (last visited Oct. 22, 2016) (describing how independent researchers developed the concept of the internet and then reached out to the military for funding to implement their ideas).

<sup>141</sup> *Id.* at 7 (describing how government suggestions of incorporating Internet protocols into supported operating systems led to widespread use of the Internet as we know it today).

<sup>142</sup> ITU, *The World in 2009: ICT Facts and Figures: A Decade of ICT Growth Driven by Mobile Technologies* 4 [http://www.itu.int/ITU-D/ict/material/Telecom09\\_flyer.pdf](http://www.itu.int/ITU-D/ict/material/Telecom09_flyer.pdf) [hereinafter *The World in 2009*] (last visited Sept. 12, 2016) (using this chart to explain how despite the prevalence of technology transitions such as mobile device users in developing countries, this transition has little effect the overall GDP of the country).

<sup>143</sup> *Id.*

<sup>144</sup> *Id.*

the fact that Sweden and other developed countries invested in a global telecommunications network, which would help Myanmar.<sup>145</sup> In terms of economic development, however, Myanmar remains over 160 years behind in terms of GDP per capita.<sup>146</sup> This demonstrates the importance of assisting countries in their telecommunication programs. It also shows, however, the importance of a sophisticated network and the levels of return that can be gained by relatively slight advantages in telecommunications infrastructure (and, thus, an inability to catch up).

Both counter arguments presented in this Comment are commendable as individual theories, but are both lacking in their ability to properly deal with developmental issues presented with international telecommunications infrastructure.<sup>147</sup> Taken to their logical extremes, they can even be seen to worsen the problem.<sup>148</sup> That problem, this Comment asserts, is that normal market forces and standard Ricardian incentives create a situation in which third world countries will be unable to catch up to first world countries in their economic development. Leap-frogging and technology transfer programs both arguably place the developing country in a better position than they would be otherwise; however, this Comment deals in relative terms, not absolute terms.<sup>149</sup> The issue of “catching up,” as defined in this Comment, is necessarily relative in nature; every country in the world might be “improving” or “developing,” but it is their position relative to the whole that matters. In this sense, both the leap-frogging and technology transfer theories fail to properly deal with the issue of relative growth of the already-developed countries when compared to their lesser-developed counterparts. Thus, the need for a regulatory body such as the ITU to combat the natural market forces is clear, and becomes further clarified by a case study of Cameroon.

### PART III – CASE EXAMPLE: CAMEROON

Cameroon serves as a good case study for this Comment for several reasons. First, it demonstrates the characteristics of a third world country.<sup>150</sup> The GDP

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<sup>145</sup> Lars Hulkrantz, *Telecommunications Liberalization in Sweden: Is “Intermediate” Regulation Viable?*, 9 SWED. ECON. POL’Y REV. 133, 157-58 (2002).

<sup>146</sup> *The World in 2009*, *supra* note 142, at 4.

<sup>147</sup> *See infra* Part II.

<sup>148</sup> *See infra* Part II.

<sup>149</sup> *Absolute and Relative*, ENCYC. OF MARXISM, <https://www.marxists.org/glossary/terms/a/b.htm> (last visited Oct. 22, 2016).

<sup>150</sup> The Third World is defined as a developing country, or [t]he group of nations (esp. in Africa and Asia) not aligned with major powers, whether Western democracies (i.e., the *First* — or *Free* — *World*) or countries that were formerly part of the Soviet bloc (i.e., the *Second World*). Although Third World nations are often

of Cameroon ranked 97<sup>th</sup> in the world, at \$72.74 billion in 2015.<sup>151</sup> By comparison, the United States ranked third in the world (behind China and the European Union<sup>152</sup>) at \$18.040 trillion.<sup>153</sup> Second, telecommunications investment in Cameroon is lacking.<sup>154</sup> Only about seventeen percent of the international aid directed toward Cameroon is focused on the category of “economic infrastructure and services.”<sup>155</sup> Thus, there is enough of an incentive from the U.N. and from other nations to invest in Cameroon’s telecommunications infrastructure, but insufficient incentive to allow full development. Third, Cameroon fits the Comment well because it has demonstrated positive GDP growth over the last decade, but not enough to be able to compete internationally.<sup>156</sup> Said another way, it is moving forward, but still falling behind. The average annual GDP growth for all African countries for the past decade is 5.2%.<sup>157</sup> This annual percentage has steadily increased, at worst, remaining constant, over that time period.<sup>158</sup> Cameroon, on the other hand, has had a maximum annual GDP

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underdeveloped, the term *Third World* may denote only their political rather than their economic status.

*Third World*, BLACK’S LAW DICTIONARY (10th ed. 2014). Developing Country is then defined as

[a] country that is not as economically or politically advanced as the main industrial powers. Developing countries are located mostly in Africa, Asia, Eastern Europe, the Middle East, and Latin and South America. — Also termed *developing state*; *underdeveloped country*; *less-developed country*; *Third World country*. “Pertinent terminology has undergone extensive changes in the past 40 years. At the very start, before the category found its way into official texts, economic and political writings referred mainly to ‘poor’ or ‘backward’ countries. In the late 1940s, the term ‘underdeveloped countries’ came into common usage in economic literature and in the jargon of international organizations. It was replaced in the 1950s by the term ‘less developed countries,’ for which the current ‘developing countries’ was eventually substituted. These terms are essentially interchangeable as they refer to the same group and kind of countries. However, variations in the use of the term reflect significant changes in the perception of the central issue, namely, economic development, as well as responses to justified sensitivities on the part of the countries principally concerned.

*Developing Country*, BLACK’S LAW DICTIONARY (10th ed. 2014) (emphasis added).

<sup>151</sup> *The World Factbook: Country Comparison: GDP (Purchasing Power Parity)*, CIA.GOV, <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2001rank.html#cm> (last visited Oct. 22, 2016).

<sup>152</sup> *Id.*

<sup>153</sup> *Id.*

<sup>154</sup> OLIVIER NANA NZÈPA & ROBERTINE TANKEU KEUTCHANKEU, 2007 CAMEROON TELECOMMUNICATIONS SECTOR PERFORMANCE REVIEW, A SUPPLY SIDE ANALYSIS OF POLICY OUTCOMES 29 (2008) (ebook).

<sup>155</sup> *Aid at a Glance Charts*, ORG. FOR ECON. CO-OPERATION & DEV., <https://public.tableau.com/profile/thielemans.v#!/vizhome/shared/HCGM5YYF5> (last updated Jan. 27, 2016).

<sup>156</sup> UNECA, AFRICAN STATISTICAL YEARBOOK: 2010 118-20 (2010) (ebook).

<sup>157</sup> Press Release, World Bank, Africa’s Growth Set to Reach 5.2 percent in 2014 With Strong Investment Growth and Household Spending (Apr. 7, 2014) (on file with author).

<sup>158</sup> *Id.*

growth rate of 4.5%, and has demonstrated negative trends since that year.<sup>159</sup> Lastly, Cameroon has been a member of the ITU for 50 years.<sup>160</sup> These four factors, (1) the proper labeling as a third world country, (2) insufficient amount of telecommunications infrastructure investment, (3) a relatively low GDP growth rate, and (4) membership in the ITU, enable an assertion concerning the proper application of this Comment's thesis to Cameroon.

This Comment asserts that insufficient investment in telecommunications infrastructure in third world countries, by first world countries and international organizations alike, is contributing to an increasing and likely-insurmountable gap in economic growth. Cameroon, and countries like it, demonstrates the four factors necessary to fit squarely into this hypothesis.

To place this Comment's argument on more solid footing, Cameroon is fighting an uphill battle to stay competitive in the global economic battle due to its lack of internal and external investment in telecommunications.<sup>161</sup> The ITU, by its own admission, does not provide sufficient support for telecommunications development in countries like Cameroon.<sup>162</sup> The main issue with countries such as Cameroon—and all third world countries for that matter—is that agencies such as the ITU evaluate their situation with an eye toward internal control and regulatory schemes, while acknowledging (yet brushing aside) the importance of international cooperation.<sup>163</sup> This contradiction is where all of the problems, and this Comment itself, lie. Multinational organizations cannot simultaneously recognize the proliferation of the global telecommunica-

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<sup>159</sup> In other words, the GDP growth rate of Cameroon demonstrates a negative second derivative. See UNECA, *supra* note 156 (depicting the downward trend of GDP growth in Cameroon in a chart with other African countries also represented).

<sup>160</sup> See generally *List of Member States*, ITU, [http://www.itu.int/cgi-bin/htsh/mm/scripts/mm.list?\\_search=ITUstates&\\_languageid=1](http://www.itu.int/cgi-bin/htsh/mm/scripts/mm.list?_search=ITUstates&_languageid=1) (last visited Oct. 22, 2016) (depicting member states of ITU and their dates of entry).

<sup>161</sup> To be fair, Cameroon has shown a higher annual GDP growth rate in telecommunications than any other sector in its economy. See UNECA, *supra* note 156, at 119. Their internal GDP of 500 million CFA Franc (about \$1.1 million USD) per year from transportation and communications is significant in their own economy, however their entire internal investment on both the transportation and communication sectors is less than some private individual salaries in the United States. See, e.g., *Morgan Stanley CEO gets pay worth \$15.2 million*, CHARLESTON GAZETTE-MAIL (Apr. 17, 2011), <http://www.wvgazette.com/ap/ApBusiness/201104170886>.

<sup>162</sup> ITU, AFRICA REGIONAL PREPARATORY MEETING FOR THE WORD TELECOMMUNICATION DEVELOPMENT CONFERENCE (WTDC-02) YAOUNDÉ (CAMEROON) 6 (2001), <http://www.itu.int/ITU-D/afr/WTDC02/PDFs/04e.pdf> (stating that “[a]t the international level, ITU has not been closely involved in telecommunication sector reform. In the past eight years, it has provided some technical assistance but otherwise almost no support for telecommunication development projects in Cameroon, possibly because the Area Office in Yaoundé is not functioning.”).

<sup>163</sup> *Id.* (arguing that, although the world is “shrinking,” Cameroon is simply “slow” to adapt to the changing environment).

tions environment, while simultaneously shirking responsibility for keeping the third world 'up-to-date.' The need for developing countries to engage in self-help cannot be overstated; however, their internal assistance can only go so far. When the global telecommunications industry is structured in such an antitrust-inducing manor, the need for a policy that encourages competitive behavior is crucial. Cameroon and all developing countries are feeling the reverberations of the ineffectiveness of the ITU.

International organizations such as the ITU must treat this problem as if it were more heavily an antitrust issue and properly incentivize other international organizations and developed countries to invest in developing economies. Group boycotts, exclusionary practices, monopolization, and tying arrangements are illegal under antitrust law, and should be more clearly condemned in the international telecommunications arena as well. Even though there has been relatively large internal investment by Cameroon in its domestic telecommunications infrastructure, international incentive for aid is lacking. The U.N., in combination with the ITU, must act to combat this problem.

## CONCLUSION

This Comment asserts that increasing returns to scale for telecommunications investment will lead to global economic dominance of first world countries. Standard Ricardian thinking will lead to under-investment on the part of global organizations and first world countries. Therefore, although the Reference Paper serves as a useful starting point for a theory of international equality, the problem needs to be dealt with as if it were an antitrust issue to incentivize the proper amount of investment. Organizations such as the ITU place too much emphasis on self-help and not enough on properly incentivizing the developed world to assist in allowing the third world to catch up. If incentives for the first world to invest in developing telecommunications infrastructures remain at their current levels, then developing economies will remain helpless, regardless of their own desire to compete.



## APPENDIX A

Michael Kremer's production function to solve for expected production as a product of labor and labor skill is as follows:<sup>164</sup>

$$E(y) = k^{\alpha} (\prod_{i=1}^n q_i) nB.$$

- "E(y)" because it is *expected* production, not *actual* production
- "B" is output per worker
- "n" is the number of workers
- "K" is capital
- "q" is the skill of each worker

TAKING REVENUE MINUS COSTS GIVES:

$$\max_{k, \{q_i\}} k^{\alpha} (\prod_{i=1}^n q_i) nB - \sum_{i=1}^n w(q_i) - rk.$$

- "w(q)" is the wage rate
- "r" is the rental rate of capital

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<sup>164</sup> Kremer, *supra* note 1, at 553-56.

THE FIRST ORDER CONDITION YIELDS:

$$\frac{dw(q_i)}{dq_i} = \frac{dy}{dq_i} = (\prod_{j \neq i} q_j) nBk^\alpha.$$

- The derivative of the marginal product of skill for the i-th worker with respect to the skill of the other workers is positive:

$$\frac{d^2y}{dq_i d(\prod_{j \neq i} q_j)} = nBk^\alpha > 0.$$

- Firms will bid the most for higher skilled workers. "Thus, in equilibrium, workers of the same skill are matched together in firms..."<sup>165</sup>
- And, given that all workers pair up with those of similar ability,  $q_i = q_j$  for all j, we can re-write the F.O.C. as:

$$\frac{dw}{dq} = q^{n-1} nBk^\alpha.$$

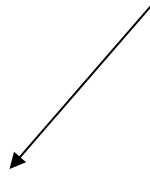
- F.O.C. on capital implies that:

$$k = \left( \frac{\alpha q^n nB}{r} \right)^{1/(1-\alpha)}.$$

- We find supply of  $k=k^*$  by adding up the k demanded by firms for all the workers with skills from 0-1:

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<sup>165</sup> *Id.* at 554.



$$\int_0^1 \left( \frac{\alpha q^n n B}{r} \right)^{1/(1-\alpha)} \frac{1}{n} \partial \phi(q) = k^*.$$

- Rearranging, we find that the rental rate of capital in equilibrium is:

$$r = \alpha B n^\alpha \left[ \int_0^1 q^{n/(1-\alpha)} \partial \phi(q) / R^* \right]^{1-\alpha}$$

- Rearranging, we find that the rental rate of capital in equilibrium is:
- With  $k = \left( \frac{\alpha q^n n B}{r} \right)^{1/(1-\alpha)}$ .

$$\frac{dw}{dq} = n q^{n-1} B \left( \frac{\alpha q^n n B}{r} \right)^{\alpha/(1-\alpha)}.$$

- Integrating like before, we find the wage schedule:

$$w(q) = (1 - \alpha) q^n B k^\alpha + c.$$

- Here, "C" represents the wage of a worker who has skill=0.
- Multiplying by n gives:

$$(1 - \alpha) Y + n c.$$

$\alpha Y$  is payment to capital,  $(1 - \alpha) Y$  is wage expense, thus  
profit = revenue - costs =

$$\underline{Y - \alpha Y - (1 - \alpha)Y = 0}$$

Thus, “. . . firms are indifferent as to the skill level of their workers as long as their labor force is of homogenous skill.”<sup>166</sup>

Since equilibrium profit is zero, more capital is demanded for better-skilled workers. Countries with better-skilled workers can be more efficient *and* use more capital, creating more output and increasing productivity even more. These kinds of increasing returns are what create incentives to third-world countries to engage in telecommunication infrastructure early-on in their development; they may never be able to catch up.

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<sup>166</sup> *Id.* at 556.