Competition in Colombian Telecommunications

J. Gregory Sidak[*]

In November 2015, the Colombian think tank Fedesarrollo published its report *Update on the Study of Competition in the Mobile Telephony Market in Colombia*,[1] which purports to find a lack of competition in Colombian telecommunications. Fedesarrollo's report also offers policy recommendations to remedy the supposed problems with competition in Colombian telecommunications that it identifies. However, Fedesarrollo's simplistic empirical analysis is fundamentally flawed and uninformative. Moreover, the policy recommendations that the report's sponsors—telecommunications operators Telefónica and Tigo—offer in the report and elsewhere would harm Colombia consumers. In this article, I evaluate the market for mobile voice services in Colombia, analyze Telefónica's and Tigo's policy recommendations, and critique Fedesarrollo's empirical analysis.

I conclude that there is no evidence of consumer-welfare loss in Colombian mobile markets. On the contrary, empirical analysis of mobile voice services in Colombia reveals consumer-welfare gains. Moreover, the policies that Telefónica and Tigo recommend—increased asymmetric regulations and restrictions on the offerings of their primary competitor, Claro Colombia—would harm consumers and competition in the markets for mobile voice and data services in Colombia, with a disproportionate share of that harm falling on Colombia's poorest consumers. Those policies would

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   [1]   Felipe Castro & Juan Benavides, Fedesarrollo, Actualización del Estudio sobre la Competencia en el Mercado de Telefonía Móvil en Colombia (2015) [hereinafter 2015 Fedesarrollo Study].

shield Telefónica and Tigo from competition, which would increase prices in the short run and discourage investment and long-run growth. Telefónica's and Tigo's recommendation to delay new spectrum auctions could cost Colombian consumers billions of pesos in lost consumer surplus.

Finally, the Fedesarrollo report's methodology of computing consumer-welfare loss is seriously flawed and divorced from accepted telecommunications economics. Moreover, the report's flawed empirical analysis does not support—and in fact bears no relationship to—its policy prescriptions.

In Part I, I analyze the market for mobile voice services in Colombia using competitive benchmark prices. I identify comparable countries on the basis of factors affecting both supply and demand. I econometrically estimate Colombian prices on the basis of prices in those comparable countries and compare those predicted prices with the actual prices of mobile services in Colombia. I find that the actual prices in Colombia were 26 percent lower than predicted prices. Thus, relative to consumers in comparable countries, Colombian consumers benefited from an increase in consumer surplus due to lower mobile prices.

In Part II, I consider the welfare effects of Telefónica's and Tigo's policy proposals. The report's policy proposals find no support in its flawed empirical analysis: the policy and empirical portions of the Fedesarrollo report are completely unrelated to one another. I analyze and explain how the policies that Telefónica and Tigo recommend would harm Colombian consumers, would shield Telefónica and Tigo from competition, and would result in increased prices in the short run and discourage investment and long-run growth.

In Part III, I identify specific errors in the Fedesarrollo report. The report incorrectly uses demand elasticities to estimate changes in quantity demanded, in a way that violates economic theory. The Fedesarrollo report misidentifies the countries that are "comparable" to Colombia, and it then compares the average prices for mobile voice and data services in those countries without considering the differences that would affect prices. The Fedesarrollo report also relies on outdated economic analysis. For example, the report assumes a relationship between market concentration and prices, which is inconsistent with modern theoretical and empirical results. Finally, the report uses data inconsistently and in a manner that misrepresents the state of Colombia's mobile market.

In Part IV, I offer my own policy recommendations. Unlike Telefónica's and Tigo's recommendations, my recommendations are grounded in current economic theory. Ending ineffective asymmetric regulations will encourage investment and long-run growth and will force Telefónica and Tigo to compete more aggressively in the short run. Asymmetric termination rates

and restrictions on on-net and off-net pricing differentials shield Telefónica and Tigo from competition. Those regulations discourage competition in the short run and harm long-run growth by discouraging investment. Moreover, Telefónica's and Tigo's policy recommendations would disproportionately harm the poorest Colombians. It is time for Colombia to end its failed experiment with asymmetric regulation.

Encouraging infrastructure-based competition, implementing a symmetric regulatory regime, and holding open spectrum auctions without restriction or delay will encourage dynamic competition without any offsetting harm to static competition. Those policy initiatives will ensure that the markets for mobile services in Colombia remain competitive in both the short run and the long run.

I. Analyzing the Market for Mobile Voice Services in Colombia Using Competitive Benchmark Prices

In this part, I analyze the market for mobile voice services in Colombia using competitive benchmark prices to adjust for differences in demand and costs across countries and over time. I econometrically estimate Colombian prices on the basis of prices in those comparable countries and compare those predicted prices with the actual prices of mobile services in Colombia. I find that the actual prices of mobile voice services in Colombia were, on average, 26 percent lower than the predicted prices. Relative to consumers in peer countries, Colombian consumers benefited from an increase in consumer surplus due to lower mobile prices.

A. Identifying Peer Countries

To determine countries comparable with Colombia, I begin with the 47 countries included in the Bank of America-Merrill Lynch Global Wireless Matrix for the first quarter of 2015.[2] From that list of countries, I select the countries most comparable with Colombia on the basis of two factors: (1) Gross domestic product (GDP) per capita;[3] and (2) urban population as a percentage of total population.[4] Analyzing comparable countries on the basis of GDP per capita enables me to identify countries whose overall economic development is comparable with Colombia's. Analyzing comparable countries on the basis

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[2] Bank of America Merrill Lynch, Global Wireless Matrix 1Q15 (2015) [hereinafter 1Q2015 Global Wireless Matrix].

[3] *GDP per Capita (Current US$)*, World Bank (2015), http://data.worldbank.org/indicator/NY.GDP.PCAP.CD [hereinafter *GDP per Capita Data*].

[4] *Urban Population (% of Total)*, World Bank (2015), http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS [hereinafter *World Bank Urban Population Data*].

of the urban-population percentage enables me to identify those countries in which the costs of deploying and maintaining a mobile network are similar to such costs in Colombia (because it is less costly to provide service to consumers in densely populated urban areas). Other factors that affect the cost of service, such as network equipment, should be roughly equivalent across countries (because the same equipment manufacturers sell throughout the world). The resulting set of countries will be similar to Colombia with respect to both the demand for mobile services, as reflected in GDP per capita, and the supply of mobile services, as reflected in the percentage of population in urban areas.

Table 1 reports the countries that I have identified as comparable to Colombia, along with the GDP per capita and the urban-population percentage of those countries.

Table 1. Countries That Are Similar to Colombia in
GDP Per Capita and Urban Population

Country	2014 GDP Per Capita (in 2015 U.S. Dollars)	Urban Population (% of Total Population)
Colombia	$7,904	76.16
Algeria	$5,484	70.13
Argentina	$12,510	91.60
Brazil	$11,384	85.43
Chile	$14,528	89.36
Greece	$21,498	77.68
Iraq	$6,420	69.36
Republic of Korea	$27,970	82.36
Malaysia	$11,307	74.01
Mexico	$10,326	78.97
Morocco	$3,190	59.70
Peru	$6,541	78.29
Portugal	$22,132	62.91
Russia	$12,736	73.92
South Africa	$6,483	64.30
Spain	$29,767	79.36
Turkey	$10,515	72.89
Ukraine	$3,082	69.48

Sources: 1Q2015 Global Wireless Matrix, *supra* note 2; *World Bank GDP per Capita Data*, *supra* note 3; *World Bank Urban Population Data*, *supra* note 4.

To compile the countries listed in Table 1, I first determine a list of comparable countries on the basis of GDP per capita. I calculate the standard deviation of the GDP per capita of the 47 countries included in the Global Wireless Matrix. I then select all those countries whose 2014 GDP per capita is within one standard deviation of Colombia's 2014 GDP per capita. Next, I further cull that list of comparable countries on the basis of urban population as a percentage of total population, such that the resulting list of comparable countries includes only countries with urban-population percentages within one standard deviation of Colombia's urban-population percentage. That is, the resulting preliminary list of comparable countries comprises countries that are comparable with Colombia on the basis both of GDP per capita and the urban-population percentage.

I exclude from the final list of comparable countries Iraq, Russia, Ukraine, and Algeria because of exogenous factors or missing data. I exclude Iraq because of the disruption in economic activity that the U.S. invasion in 2003 might have caused during the time frame relevant for my analysis. I exclude Russia and Ukraine because those countries both have regulatory regimes that require the receiving party to pay, which makes those countries less comparable with Colombia for the purposes of analyzing mobile markets.[5] I exclude Algeria because the price data that I use in my empirical analysis are not available for Algeria. Table 2 shows the final sample of countries comparable to Colombia that I use in my analysis.

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[5] For further explanation of the relevance of the regulatory regime, see Ralf Dewenter & Jörn Kruse, *Calling Party Pays or Receiving Party Pays? The Diffusion of Mobile Telephony with Endogenous Regulation*, 23 Info. Econ. & Pol'y 107, 111 (2011).

Table 2. Final Sample of Comparable Countries

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Turkey	$10,515	72.89

Sources: 1Q2015 Global Wireless Matrix, *supra* note 2; *World Bank GDP per Capita Data*, *supra* note 3; *World Bank Urban Population Data*, *supra* note 4.

B. Evaluating Competition and Consumer Welfare in the Market for Mobile Voice Services Using Competitive Benchmark Prices

In this part, I perform an econometric analysis of the price for mobile voice services in Colombia that adjusts for differences in demand and costs across countries and over time. By controlling for those other factors that affect prices, I isolate the estimated effect of differences in market performance on prices. Contrary to the Fedesarrollo report, I find that the Colombian mobile voice market performed well relative to comparable countries.

I first use an econometric model to estimate the relationship between the price of mobile voice services and factors that affect either (1) the demand for those services or (2) the costs of providing those services. I use annual data from 2010 through 2014, a time period that overlaps with Fedesarrollo's sample but incorporates more recent data. I adjust for differences in demand across countries and over time by including per capita GDP as an explanatory variable in my regressions. As income levels increase within a country, the demand curve for mobile services shifts outward, which increases the price that consumers pay in that country. To adjust for cost differences

between countries and over time, I use a Hausman-Taylor instrument.[6] One calculates the Hausman-Taylor instrument by taking the average price in all other countries as a measure of cost within a given country. If costs are correlated across countries, prices in other countries are an effective measure of costs so long as there are no common demand shocks. Because all countries use similar mobile equipment and common mobile technologies, the cost of providing mobile services should be highly correlated internationally. As costs decrease, prices should also decrease over time. I also include the percentage of each country's population that lives in urban areas as a determinant of cost in my model. The higher the concentration of a country's population in dense urban areas—where infrastructure deployment is least costly on a per-subscriber basis—the lower the cost of providing mobile services. Together, the Hausman-Taylor instrument and the urban-population percentage should capture much of the variation in the cost of providing mobile services between countries and over time.

Using the estimated relationship between prices and the demand and cost factors in the sample of comparable countries, I find the benchmark price of mobile voice services in Colombia in each sample year. The benchmark price is the price that the model predicts for Colombia on the basis of Colombia's GDP per capita, the Hausman-Taylor instrument, and the urban-population percentage.[7] I compare those benchmark prices to the observed prices in Colombia. If Colombia's market for mobile voice services has performed similarly to markets in the comparable countries, then the benchmark prices should be approximately equal to the observed prices. However, I find that observed prices for mobile voice services in Colombia were substantially *lower* than the benchmark prices. Thus, contrary to the findings of Fedesarrollo's improper and misleading comparison, rigorous econometric analysis of the prices of mobile voice services indicates that the market for mobile voice services in Colombia performed well relative to comparable countries. Likewise, because Colombia's actual prices were lower than what my econometric model predicted, differences in market performance between Colombia and comparable countries have actually increased consumer surplus in Colombia.

I estimate benchmark prices for mobile voice services in Colombia using voice revenue per minute (VRPM) as my price measure. Compared with other measures, such as the ITU's mobile voice basket price that Fedesarrollo uses, VRPM is a better tool for measuring prices across countries, because it reflects the prices that consumers actually pay in each country. VRPM incorporates variation across countries in voice usage patterns (such as the mix of

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[6] *See* Jerry A. Hausman & William E. Taylor, *Panel Data and Unobservable Individual Effects*, 49 Econometrica 1377 (1981).

[7] The fixed effects in my model will also contribute to predicted prices in Colombia.

on-net and off-net calls and the types of subscription plans used), as well as the difference between prices for the largest operator and other operators. A rigid measure, such as the ITU's mobile voice basket price, cannot capture those differences between countries. I explain the problems with using the ITU's mobile voice basket price as a proxy for mobile voice prices in more detail in Part III.B.

I use GDP per capita, the urban-population percentage, and the Hausman-Taylor cost instrument as independent variables. I measure prices, income, and costs in logarithms, such that each estimated slope coefficient represents an elasticity (the ratio of the percentage change in the price to the percentage change in the explanatory variable). I convert all observations that are measured in local currency to U.S. dollars using the exchange rate for the year of the observation. Because telecommunications equipment is typically sold in worldwide markets, exchange rates are a better tool for adjusting prices than is the purchasing power parity (PPP) approach to adjusting prices that Fedesarrollo used. Notable authorities, including Jerry Hausman (for whom the Hausman test and the Hausman-Taylor instruments used in this paper are named), Nobel laureate Angus Deaton, and the OECD have cautioned against using PPP to make cross-country comparisons at a disaggregated level, as Fedesarrollo did.[8]

I estimate my model of mobile voice prices using a fixed-effects model, which uses an indicator variable for each country to capture variation across countries that is not included in the other independent variables.[9] I use a Hausman specification test to determine whether fixed effects or random effects are the best estimator for my model. The test rejects the use of a random-effects model in favor of a fixed-effects model.[10] Table 3 presents the results of the fixed-effects estimation.

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[8] *See, e.g.*, Jerry A. Hausman & Agustin J. Ros, *Correcting the OECD's Erroneous Assessment of Telecommunications Competition in Mexico*, CPI Antitrust Chron., June 2012, at 9–10 (2012); Angus Deaton & Alan Heston, *Understanding PPPs and PPP-Based National Accounts*, 2 Am. Econ. J.: Macroecon. 1, 32 (2010); OECD Statistics Department, Eurostat-OECD Methodological Manual on Purchasing Power Parities 35–37 (2006) (recommending against using PPP-adjusted prices for comparisons at low levels of aggregation).

[9] *See, e.g.*, William H. Greene, Econometric Analysis 287 (Prentice Hall 5th ed. 2003).

[10] The test statistic for the Hausman test is 35.90, which indicates rejecting the use of random effects with a probability of nearly 1. *See* Jerry A. Hausman, *Specification Tests in Econometrics*, 46 Econometrica 1251, 1267–69 (1978).

Table 3. Fixed-Effects Estimation of
Mobile Voice Prices

Variable	Coefficient	Standard Error
GDP per capita	0.6619*	0.3610
Hausman-Taylor Cost Instrument	0.6610***	0.1779
Percentage of Population in Urban Areas	-0.1111	0.0898
Constant	1.1889	7.5672
Number of Observations	70	
R-Squared	0.6629	

Notes: * indicates statistical significance at the 90-percent confidence level, ** indicates statistical significance at the 95-percent confidence level, and *** indicates statistical significance at the 99-percent confidence level.

Sources: I performed the regression analysis using data collected from 1Q2015 Global Wireless Matrix, *supra* note 2, *World Bank GDP per Capita Data*, *supra* note 3, and *World Bank Urban Population Data*, *supra* note 4.

The results in Table 3 are as expected. The coefficient for GDP per capita is statistically significant at the 10-percent level of significance and indicates that a 1-percent increase in GDP per capita predicts a 0.66-percent increase in the price of mobile voice services. The coefficient for the Hausman-Taylor cost instrument is significant at the 1percent level of significance and indicates that a 1-percent decrease in costs predicts a 0.66-percent decrease in the price of mobile voice services. The coefficient for the urban-population percentage is negative, suggesting that prices decrease as the percentage of a country's population that lives in urban areas increases (due to lower costs of providing mobile voice services). However, that coefficient estimate is not statistically significant.

I use my estimation results to calculate benchmark mobile voice prices in Colombia over the sample period. Table 4 reports the benchmark (predicted) prices and observed prices for Colombia.

Table 4. Predicted and Observed Mobile
Voice Prices in Colombia

Year	Predicted Price [A]	Observed Price [B]	Percentage Difference ([B] – [A]) / [A]
2010	$0.070	$0.041	–41%
2011	$0.064	$0.041	–36%
2012	$0.057	$0.042	–26%
2013	$0.050	$0.042	–16%
2014	$0.040	$0.036	–10%
Average			–26%

Sources: I derived the predicted prices from the regression described in Table 3. Observed prices are from 1Q2015 Global Wireless Matrix, *supra* note 2.

The actual price for mobile voice services in Colombia is lower than the predicted price for every year in the dataset, by an average of 26 percent. Relative to consumers in peer countries, Colombian consumers benefited from an increase in consumer surplus due to lower mobile prices. Figure 1 presents predicted prices and observed prices in Colombia over the sample period as a graph.

Figure 1. Predicted and Observed Mobile Voice
Prices in Colombia, 2010–2014
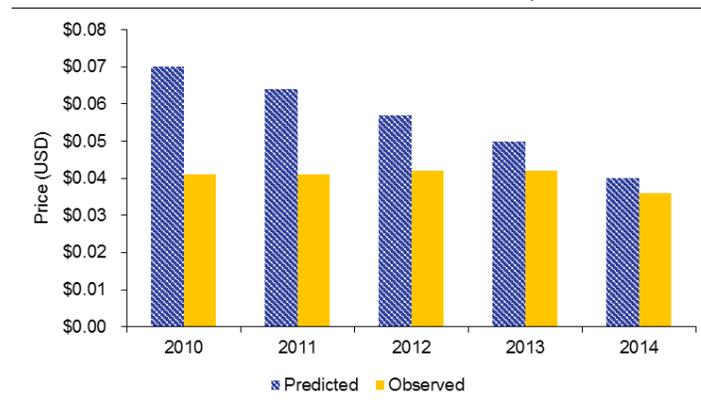
Sources: I derived the predicted prices from the regression described in Table 3. Observed prices are from 1Q2015 Global Wireless Matrix, *supra* note 2.

Colombian prices were less than the prices in peer countries predicted throughout the sample period. The model predicted that mobile voice prices in Colombia would be much higher than the actually observed prices

at the beginning of the sample period and would fall more rapidly throughout the period. The Fedesarrollo report erroneously compared only the change in prices over the time period and ignored the fact that Colombia *began* the sample period with lower prices than the prices in peer countries would predict. The obvious consequence of Colombia having lower prices at the beginning of the sample period is that prices in Colombia could not be expected to fall as quickly as in peer countries. That slower price decrease does not indicate a consumer-welfare loss. Rather, and contrary to Fedesarrollo's claims, lower prices for mobile voice services in Colombia relative to peer countries increased consumer surplus.

A rigorous econometric analysis of mobile data markets should take the same approach as my econometric analysis of mobile voice markets. However, there do not exist sufficient data to undertake that analysis of the mobile data market at this time. Observable and publicly available price data in comparable countries are based on advertised prices, which, as I explain in Part III.D, are not a reasonable approximation of the actual prices that consumers face within a country. Moreover, prices that the ITU has collected on mobile data service are based on only the largest operator, in only the largest city in the country, and for only stand-alone data plans.[11] Without price data that reflect the actual prices paid by consumers, one cannot conduct a rigorous empirical analysis of the mobile data market in Colombia. Any effort to do so on the basis of the limited data available likely would lead to erroneous conclusions.

II. Harm to Colombian Consumers from the Policy Recommendations That Telefónica and Tigo Propose

Telefónica and Tigo have proposed through the Fedesarrollo report and in separate publications that the Comisión de Regulación de Comunicaciones (CRC) (1) impose *ex ante* regulations in the market for mobile data services; (2) continue and increase asymmetric mobile termination rates; (3) regulate the market for the sale of low-end, inexpensive handsets; (4) delay spectrum auctions pending new regulations; (5) require Claro to submit its price changes for prior CRC approval; and (6) prohibit Claro from offering bundles of mobile voice and mobile data services. These policy recommendations are completely divorced from the Fedesarrollo report's empirical analysis and

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[11] *See* International Telecommunication Union, Covering Note, New Telecommunication/ICT Indicators from Administrative Data Sources 2011–2013, at 4 (Feb. 17, 2014), http://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ITC_IND_HBK-2011-C1-PDF-E.pdf. Fedesarrollo itself recognizes the absence of reliable price data for mobile data services by attempting to compile its own prices (by searching mobile operators' websites) rather than using prices from the ITU or other publicly available sources. *See* 2015 Fedesarrollo Study, *supra* note 1, at 47.

find no support in economic theory. Telefónica's and Tigo's policy recommendations would enrich Telefónica and Tigo at the expense of competition and consumer welfare in the markets for mobile services in Colombia.

A. The Fedesarrollo Report's Lack of Support for Its Own Policy Recommendations

The naïve assumption that regulatory intervention in telecommunications markets benefits consumers pervades the Fedesarrollo study. Yet, the study presents no evidence that regulation of mobile services has improved or will improve consumer welfare in Colombia. The Fedesarrollo study's policy recommendations do not follow logically from its empirical analysis, nor does the study provide theoretical justifications for those recommendations. Thus, the study's policy recommendations are baseless, regardless of the merits of the study's empirical analysis.

1. The Report's Erroneous Assumption That Existing Asymmetric Telecommunications Regulation Has Benefited Colombian Consumers

The Fedesarrollo study reports that in Colombia market concentration in the provision of mobile services has decreased from 2011 through 2014,[12] that prices have declined from 2010 through 2013,[13] and that mobile penetration has increased from 2003 through 2014.[14] The study implicitly—and, in some cases, explicitly—attributes those developments to regulatory intervention in mobile services in Colombia. For example, the study asserts that "the regulation and policy framework developed in Colombia, especially in recent years, has increased penetration of the mobile phone and internet market in the last decade" and that "market concentrations in terms of subscribers have improved in recent years, probably thanks to the regulations implemented."[15]

Yet, Fedesarrollo provides no evidence or rationale for those assertions. The study makes no attempt to determine how Colombia's market concentration, prices, and mobile penetration would have evolved in the but-for world in which the CRC had not imposed regulatory constraints. Without comparing the actual changes in Colombia's mobile services to the changes that would have occurred in the but-for world, Fedesarrollo cannot credibly claim that the regulation heretofore adopted has benefited Colombia. To the contrary, as I explain in Part IV, analysis of the CRC's asymmetric regulations reveals that they have likely slowed both the decrease in prices and the

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[12] 2015 Fedesarrollo Study, *supra* note 1, at 38.
[13] *Id.* at 45.
[14] *Id.* at 8.
[15] *Id.* at 38, 41.

increase in penetration in Colombian mobile services.[16] Although the regulations previously adopted might have benefited Claro's *competitors*, there exists no credible evidence to suggest that those regulations have benefited consumers.

2. *Telefónica's and Tigo's Policy Recommendations Bear No Relationship to the Report's Empirical Results*

The Fedesarrollo study's erroneous assumption that regulation of mobile services in Colombia—and, in particular, asymmetric regulation of Claro—benefits consumers evidently forms the sole basis of the study's policy recommendations. Those policy recommendations do not follow logically from the study's empirical results. The Fedesarrollo study purports to show that the markets for mobile services in Colombia suffer from higher prices,[17] lower penetration rates,[18] and higher market concentration[19] relative to corresponding markets in supposedly "comparable" countries, and that a lack of competition in Colombian telecommunications has caused a loss of over 1 percent of Colombia's GDP in forgone consumer surplus.[20] In Part III, I demonstrate that Fedesarrollo's empirical analysis is flawed and unreliable. However, even if Fedesarrollo's results were sound, those results would not justify its policy recommendations.

The Fedesarrollo study does not explain how its recommendations would alleviate the problems that the report purports to identify. For example, the Fedesarrollo report advocates that the CRC "continue using asymmetrical charges and regulating the rate differential for [Claro],"[21] and it even suggests that the CRC "consider prohibiting [Claro] from charging other operators for the mobile calls that end in its network."[22] However, Fedesarrollo does not explain how those measures would decrease prices, increase penetration, decrease market concentration, or benefit Colombian consumers in any way. Fedesarrollo similarly fails to show how any of its other policy recommendations would benefit Colombian consumers. Indeed, some of Fedesarrollo's policy recommendations—for example, restricting the importation of low-end handsets[23]—are harmful on their face to Colombian consumers. In Part II.B through Part II.E, I analyze those policy recommendations

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[16] *See* Agustín J. Ros & Douglas Umaña, *The Demand for Mobile Services in Colombia and the Impact of Asymmetric Mobile Regulation*, 15 INFO 54, 54–55 (2013) (finding that asymmetric regulation of on-net and off-net differential pricing reduced consumer welfare in Colombia by approximately $100 million USD from 2009 through 2011).

[17] 2015 FEDESARROLLO STUDY, *supra* note 1, at 12–15.

[18] *Id.* at 18.

[19] *Id.* at 38–39.

[20] *Id.* at 3.

[21] *Id.* at 50.

[22] *Id.*

[23] *Id.*

Fedesarrollo's report. I find that, contrary to Fedesarrollo's unsupported (and unsupportable) assertions, the policies that the study recommends would harm both competition and consumer welfare in Colombia.

B.   *Harm to Consumers from* Ex Ante *Regulation of Mobile Data Services*

A common shortcoming of regulation is that the regulator lacks the information necessary to achieve its desired goals, let alone the socially optimal outcome.[24] Proper determination of socially optimal prices requires knowledge of marginal costs for current *and future* technologies, which even the mobile network operators themselves might not be able to estimate reliably. By trying to regulate competitive outcomes, including prices, the CRC would be gambling on its ability to predict the unknown future. This gamble is the primary shortcoming of *ex ante* regulation: "What cannot be known, cannot be planned."[25] Whereas *ex post* enforcement of competition laws enables the competition authority or the court to assess what has already happened, *ex ante* regulation tries to control the unknown.

In urging the CRC to impose *ex ante* asymmetric regulation on mobile data services in Colombia,[26] Telefónica and Tigo are asking the CRC to attempt to predict and manipulate future competition in a market in which technology is still evolving rapidly. There is no guarantee that the CRC has the ability to regulate the market for mobile data services in Colombia in a manner that will promote competition in the short run, much less in the long run. In a dynamic industry, it is unlikely that anyone, including a regulator, can have enough foresight to anticipate accurately the development of new technologies and the "gale of creative destruction" that accompanies them.[27]

For example, at the time of the AT&T divestiture, experts on the future of capitalism at McKinsey & Co. projected that the United States would have only 900,000 mobile subscribers in the year 2000.[28] Of course, it turned out that there were almost 110 million mobile subscriptions in the United States in 2000.[29] The number of mobile subscriptions exceeded 7 billion worldwide at the end of 2015, or approximately 97 percent of the world's total population, including children too young to speak.[30] In 121 countries, the number of mobile subscriptions exceeds the population.[31] Since the introduction of

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[24]   Friedrich Hayek won the Nobel Prize for this insight. *See* Friedrich von Hayek, *The Use of Knowledge in Society*, 35 Am. Econ. Rev. 519 (1945).

[25]   Friedrich von Hayek, The Fatal Conceit: The Errors of Socialism 85 (Routledge 1998).

[26]   2015 Fedesarrollo Study, *supra* note 1, at 50.

[27]   *See* Joseph A. Schumpeter, Capitalism, Socialism and Democracy 84 (Harper & Bros. 1942).

[28]   *Cutting the Cord*, Economist (Oct. 7, 1999), http://www.economist.com/node/246152.

[29]   International Telecommunications Union, Mobile Cellular Subscriptions tab 1 (2014) [hereinafter ITU Mobile Cellular Subscriptions].

[30]   International Telecommunication Union, ICT Facts and Figures 2015, at 2 (2015), http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf.

[31]   ITU Mobile Cellular Subscriptions, *supra* note 29, at tab 1.

the mobile telephone, technological innovation has improved the product delivered over mobile networks to include voice, messaging, and data. By any reasonable standard, the mobile telephone industry has been one of the most successful, innovative industries of the past century.

The growth and evolution of mobile data services in Colombia pose an equally serious problem for regulators in 2016. In Colombia, the number of mobile data subscriptions has grown from approximately 5 million in 2010 to more than 21 million by the first quarter of 2016.[32] Because mobile data penetration is relatively low and growing rapidly in Colombia, it would be extraordinarily difficult for the CRC or anyone else to predict the evolution of market conditions, including the presence or absence of market power, with sufficient accuracy to promote competition through *ex ante* regulation.

In addition, the potential harm to consumers from subjecting the market for mobile data services in Colombia to unnecessary *ex ante* regulation exceeds the potential harm to consumers from failing to regulate that market. Regulation and enforcement of competition policy are inherently subject to errors. Without perfect information about a firm's motives, it can be difficult for an antitrust regulator to differentiate between a firm that is successful due to superior business acumen and a firm that abuses market power to reduce competition. Sometimes, a regulator incorrectly condones a practice that is anticompetitive, committing a "false negative" error; other times, a regulator condemns a legitimate business practice as anticompetitive, committing a "false positive" error. Each kind of error produces different social costs. Enforcement of competition law must therefore "be guided by basic economic analysis, [for] otherwise the law acts blindly upon forces it does not understand and produces results it does not intend."[33]

False negatives occur when the competition authority permits conduct that harms competition. When a false negative occurs, the cost to society is the harm to competition that results from the conduct in question. Such welfare costs will decrease with time because monopolies tend to be self-destructive: supracompetitive prices will attract potential entrants.[34] In the long run, false negatives in competition regulation or litigation will be self-correcting.

In contrast, false positives occur when the regulator enjoins conduct that promotes competition or does not harm competition. The potential for erroneous intervention adds to the risks that accompany any investment; that

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32 *See Internet: Nacional Total Internet Móvil*, Ministerio de Tecnologías de la Información y las Comunicaciones, http://estrategiaticolombia.co/estadisticas/stats.php?&pres=content&jer=1&cod=&id=14#TTC; Ministerio de Tecnologías de la Información y las Comunicaciones (MINTIC), Boletín Trimestral de las TIC—Cifras Primer Trimestre de 2016, at 25 (2016) [hereinafter MINTIC Bulletin 1Q16].

33 Robert H. Bork, The Antitrust Paradox: A Policy at War with Itself 91 (Basic Books 1978).

34 Frank H. Easterbrook, *Limits of Antitrust*, 63 Tex. L. Rev. 1, 2 (1984).

added risk would deter potential competitors from investing in the first place. Dynamic competition would diminish, and consumers would suffer. These social costs can be particularly high in dynamic, innovative industries.[35] False condemnation of new product or process innovations will dampen innovation across the economy. Yet, innovative industries are particularly susceptible to false positives, because innovation involves new products and practices. Because little is known about the practices that spawn new products, the initial likelihood that these practices will be falsely condemned is biased upward. Therefore, in innovative industries, false positives carry a particularly high cost and occur with a relatively high probability.

In addition, the potential gains from *ex ante* regulation are nonexistent in Colombia, where the three primary operators are already established players funded by multinational corporations. Colombia's fourth mobile network operator, Avantel, is a niche operator that deliberately targets the lucrative corporate segment of mobile services in Colombia.[36] Unlike in a market with recent entrants that might struggle to achieve minimum efficient scale, none of Colombia's potential or current mobile network operators could possibly need the support of *ex ante* regulations to enter or survive. Consequently, the potential benefit of *ex ante* regulation in Colombia is nil.

In sum, the *ex ante* asymmetric regulation that Telefónica and Tigo propose would unreasonably rely on the CRC's ability to predict the future of competition in a dynamic market. That the potential harm from a false positive (that is, condemning conduct that is not anticompetitive) exceeds the potential harm from a false negative (that is, permitting conduct that is anticompetitive) also implies that the CRC should reject the proposals of Telefónica and Tigo.

C.   Harm to Colombian Consumers and Reduced Investment in Telecommunications Networks from Asymmetric Mobile Termination Rates

The Fedesarrollo report recommends that the CRC (1) extend the period in which the CRC applies asymmetric mobile termination rates (MTRs) to Claro Colombia and (2) consider reducing the MTR that Claro may charge to zero while maintaining higher MTRs that Telefónica and Tigo may charge.[37] However, the report makes no attempt to justify its recommendation by analyzing the potential effects of continuing asymmetric MTRs. Neither

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[35] *See* Geoffrey A. Manne & Joshua D. Wright, *Innovation and the Limits of Antitrust*, 6 J. Competition L. & Econ. 153, 168–71 (2010); J. Gregory Sidak & David J. Teece, *Dynamic Competition in Antitrust Law*, 5 J. Competition L. & Econ. 581, 613 (2009).

[36] *"Con el 4G, Tarifas en Telefonía* Móvil *Podrían Bajar Más": Presidente de Avantel*, ElPais.com.co (Aug. 12, 2014), http://www.elpais.com.co/elpais/economia/noticias/con-4g-tarifas-telefonia-movil-podrian-bajar-presidente-avantel (quoting the president of Avantel as confirming that Avantel will "continue in the corporate niche" and that "[that focus] is the great difference that [Avantel has] in the market").

[37] 2015 Fedesarrollo Study, *supra* note 1, at 50.

economic theory nor empirical evidence justifies extending (or having imposed in the first place) asymmetric MTRs in Colombia. On the contrary, allowing Telefónica and Tigo to continue to charge Claro an asymmetric MTR would harm Colombian consumers by reducing mobile operators' incentives to invest and increasing their incentives to engage in rent-seeking behavior.

1. The Absence of Conventional Theoretical Justifications for Permitting Asymmetric Mobile Termination Rates in Colombia

The justifications that regulators and commentators typically offer for asymmetric MTR regulation fall into three categories. First, some regulators use asymmetric termination rates to increase the ability of new entrants to compete with incumbents.[38] Second, other regulators take the position that exogenous cost differences between entrants and the incumbent justify asymmetric MTRs.[39] Third, some economists argue that an incumbent operator's unregulated termination rates might be high enough to induce the exit of existing competitors from a market.[40] None of the three justifications applies to either Telefónica or Tigo.

a. Entry Justifications

One common justification for implementing asymmetric MTRs is to help entrants reach sufficient scale to compete with the incumbent.[41] According to that theory, entrants that have not yet reached a scale sufficient to compete with incumbents can earn greater revenue from charging a higher termination rate or can lower their costs by paying the incumbents a lower termination rate. The second step in the theory is that the entrant will use that additional net cash flow to invest more quickly in increasing its scale.

An important caveat to the entry rationale is that asymmetric MTR regulation implemented to help an entrant gain scale should be temporary, because, as Stephen Littlechild has said, "asymmetric regulation of larger networks . . . increasingly tends to distort the process of competition."[42]

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[38] *See, e.g.*, Common Position, European Regulators Group, ERG's Common Position on Symmetry of Fixed Call Termination Rates and Symmetry of Mobile Call Termination Rates 37 (Jan. 25, 2008), http://berec.europa.eu/doc/publications/erg_07_83_b_report_mtr_ftr_cp_12_03_08.pdf.

[39] *See, e.g., id.*; Spectrum Value Partners, *Asymmetrical Pricing for Mobile Termination Charges* 11–12, (white paper prepared at the request of Cellular Operators Association of India (COAI)) (Dec. 2, 2008), http://s3.amazonaws.com/zanran_storage/www.coai.com/ContentPages/2500913789.pdf.

[40] *See, e.g.*, Mark Armstrong & Julian Wright, *Mobile Call Termination*, 119 Econ. J. F270, F288 (2009). However, no regulatory body has explicitly adopted the prevention of firm exit as a justification for asymmetric termination rates, to my knowledge.

[41] Some economists have developed theoretical models predicting that asymmetric MTRs could increase consumer surplus under certain circumstances. *See, e.g.*, Martin Peitz, *Asymmetric Regulation of Access and Price Discrimination in Telecommunications*, 28 J. Reg. Econ. 327 (2005).

[42] Stephen Littlechild, *Price Controls for Mobile Termination Charges*, 1 Vodafone Pub. Pol'y Series 25, 31 (2002).

Even the European Commission, which is sometimes portrayed as favoring entrants over incumbents in its market regulation, recognizes the desirability of symmetric termination rates. Symmetric termination rates, the European Commission has said, "promote efficiency [and] sustainable competition and maximi[z]e consumer benefits in terms of price and service offerings."[43] In limited situations, the European Commission recommends that, when "it can be demonstrated that a new mobile entrant operating below the minimum efficient scale incurs higher per-unit incremental costs than the modeled operator, . . . the [regulator] may allow these higher costs to be recouped during a *transitional period* via regulated termination rates."[44] That is, the European Commission believes that asymmetric termination rates may allow an entrant to grow to the point at which it can achieve minimum efficient scale and compete with the incumbent, after which point asymmetric rates are unnecessary.

This entry rationale cannot apply to Telefónica and Tigo in Colombia, because both operators have *already* achieved sufficient scale to compete with Claro. The European Commission expressly recommends that the duration of asymmetric termination rates "should not exceed four years after market entry."[45] Telefónica and Tigo began offering mobile service in Colombia in 2004 and 2003, respectively.[46] With more than a decade of experience competing for Colombian mobile subscribers, Telefónica and Tigo cannot remotely be considered new entrants in Colombia in 2016. Under the European Commission's approach, any asymmetric termination rates that might have been deemed justifiable for Telefónica and Tigo would have ended by 2008. Similarly, the OECD said in its review of Colombian telecommunications that "[a]symmetrical termination rates are . . . hard to justify for operators that have already been in the market for many years, such as Telefónica and Tigo."[47] The OECD urged the CRC to "ensure that mobile termination rates reach symmetry between the three established operators *within the shortest possible time*."[48] The OECD said that "asymmetrical termination rates can be highly distortive, [with] the exception being very recent entry."[49]

The European Commission has also said that a market share between 15 and 20 percent is generally sufficient for a wireless operator to reach

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[43] Commission Recommendation of May 7, 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, 2009 O.J. (L 124) 67, ¶ 7, at 68 [hereinafter EC Recommendation on MTRs].

[44] *Id.* ¶ 10, at 71 (emphasis added).

[45] *Id.*

[46] Tigo, Informe 2011 Pacto Global 4 (2011); *Colombia*, Telefónica, https://www.telefonica.com/en/web/about_telefonica/geographic_spread/colombia.

[47] Organisation for Economic Cooperation & Development, OECD Review of Telecommunications Policy and Regulation in Colombia 70 (2014) [hereinafter 2014 OECD Report].

[48] *Id.* at 148–49 (emphasis added).

[49] *Id.* at 148.

minimum efficient scale.[50] In the first quarter of 2016, Telefónica's subsidiary Movistar Colombia had about 23 percent of mobile subscribers.[51] Tigo had about 19 percent of mobile subscribers, not including the subscribers reported under UNE-EPM, which merged with Tigo in 2014.[52] Millicom, the minority shareholder in Tigo, said in its 2014 annual report that Tigo had grown "at more than double the market rate" for the preceding two years.[53] Tigo has gained market share steadily since 2008,[54] including an increase of two percentage points between the first quarter of 2015 and the first quarter of 2016.[55] Both Movistar and Tigo have clearly reached minimum efficient scale. Moreover, the 20-percent threshold is intended for *new* entrants, not firms that have operated within a market for more than a decade.

In addition, Telefónica entered the markets for mobile services in Colombia by acquiring BellSouth Colombia, which was the largest mobile operator in Colombia by revenue.[56] Telefónica's current position in the market reflects its subsequent loss of market share due to competition from Claro and other operators—not the scale disadvantages of recent entry. It also bears emphasis that Claro overtook Telefónica as the largest mobile operator in Colombia without the benefit of the asymmetric MTRs that Telefónica and Tigo request.

The president of Avantel, the only operator small enough and new enough to conceivably meet the European Commission's criteria for asymmetric MTRs, has explicitly stated that Avantel will continue to target the corporate niche market in Colombia.[57] Attempting to induce Avantel to expand beyond that market through asymmetric MTRs would serve no purpose. Moreover, empirical evidence indicates that asymmetric MTRs fail to achieve even the limited goal of increasing the market share of entrants—no less increasing consumer welfare.[58]

In short, according to the entry justification for asymmetric MTRs, a higher MTR allows an entrant to grow to the point that it no longer has a significant cost disadvantage due to its lack of scale resulting from its recent entry. As a matter of logic, once the entrant overcomes that disadvantage,

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[50]   EC Recommendation on MTRs, *supra* note 43, ¶ 17, at 70.

[51]   MINTIC Bulletin 1Q16, *supra* note 32, at 32.

[52]   *Id.*; Press Release, Millicom, Tigo Colombia Merges with UNE (Aug. 14, 2014), http://www.millicom.com/media/millicom-news-features/tigo-colombia-merges-with-une/.

[53]   Millicom, 2014 Annual Report 28 (2014) [hereinafter 2014 Millicom Annual Report], http://www.millicom.com/media/2379621/Millicom-Annual-Report-2014.pdf.

[54]   Bank of America-Merrill Lynch, BoA-ML 2Q2014 Global Wireless Matrix Data (2014) tab Country (filtering by country (Colombia) and choosing Market Share Data).

[55]   MINTIC Bulletin 1Q16, *supra* note 32, at 32.

[56]   *El Desencanto del Año a Colombia Móvil-Ola no le Sonó el Negocio*, El Tiempo (Dec. 17, 2004), http://www.eltiempo.com/archivo/documento/MAM-1568881.

[57]   *See "Con el 4G, Tarifas en Telefonía Móvil Podrían Bajar Más": Presidente de Avantel*, *supra* note 36.

[58]   *See* J. Gregory Sidak, Andrew P. Vassallo & Leonard Sabetti, *Did Asymmetric Mobile Termination Rates Help Entrants Gain Market Share?* (Criterion Econ. Working Paper, 2015).

asymmetric termination rate regulation becomes unnecessary and then is nothing more than a tax on the entrant's competitors and on consumers. Even if one accepts the entry justification for asymmetric MTR regulation as a theoretical conjecture, that justification in no way applies to Telefónica and Tigo. The entry justification cannot apply to operators owned or financed by large multinational corporations, after they have achieved minimum efficient scale, more than a decade after they have entered the Colombian market, and more than seven years after even the European Commission's approach would have sunset such asymmetric regulation.

b.   *Exogenous Cost-Difference Justifications*

Regulators sometimes justify asymmetry in MTRs on the basis of exogenous cost differences between competing mobile operators, especially cost differences that arise from holding spectrum in different bandwidths.[59] In those cases, a regulator seeks to offset cost differences by allowing a mobile operator with a spectrum-based cost disadvantage to charge a higher MTR. In the case of Telefónica and Tigo, however, no such cost-difference justification exists. As I explain below, there are no systematic differences in the three primary Colombian operators' spectrum holdings that could justify allowing Telefónica and Tigo to charge a higher MTR.

Generally speaking, as the frequency of the spectrum used to provide mobile service increases, the area covered by a single cellular tower decreases.[60] For example, 800 MHz spectrum will require fewer towers to cover the same area compared with 1700 MHz spectrum. It is therefore cheaper to provide cellular coverage using lower-bandwidth spectrum.[61] Regulators have used that cost difference as a justification for allowing mobile operators with higher-frequency spectrum holdings to charge higher MTRs. For example, in France in 2001, regulators allowed Bouygues Telecom to charge an MTR that exceeded its competitors' MTR by 14 percent.[62] One reason given for that difference was that Bouygues Telecom held licenses in the 1800 MHz band, whereas its competitors held licenses in the 900 MHz band.[63] In comparison, the MTR that Telefónica and Tigo charged in Colombia in 2014

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[59]   *See, e.g.*, Spectrum Value Partners, *supra* note 39, at 6.

[60]   *See, e.g.*, JOSEPH SADOUN, YVES R. HAMEL ET ASSOCIÉS INC., ANALYSIS OF THE COVERAGE DIFFERENCES BETWEEN THE CELLULAR (850 MHz) AND PCS (1900 MHz) BANDS, INCLUDING A SAMPLE DEPLOYMENT STUDY OF HIGHWAY 401 AND KINGSTON, ONTARIO 5 (2003), http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/microcellsch_e.pdf/$FILE/microcellsch_e.pdf (finding that it would take 1.3 times as many cellular sites to cover a particular stretch of highway using 1900 MHz towers instead of 850 MHz towers and 1.5 times as many cellular sites to cover the city of Kingston, Ontario using 1900 MHz towers instead of 850 MHz towers).

[61]   *See, e.g.*, *id.*

[62]   Spectrum Value Partners, *supra* note 39, at 10.

[63]   *Id.* at 11.

exceeded the MTR that Claro charged by at least 23 percent.[64] Telefónica's and Tigo's recommendation that the CRC reduce Claro's MTR to zero would infinitely increase that asymmetry.

In Colombia, analysis of the three primary MNOs' spectrum holdings demonstrates that Telefónica and Tigo lack such a systematic cost disadvantage. Claro and Telefónica each hold 85 MHz of nationwide spectrum rights in Colombia. Although Tigo currently holds 135 MHz of nationwide spectrum after its 2014 merger with UNE, it is in the process of ceding 50 MHz of those holdings to the Colombian government to meet the government's spectrum cap, leaving Tigo with the same quantity of spectrum holdings as Claro and Telefónica: 85 MHz.[65] Figure 2 shows the distribution of each operator's spectrum holdings by frequency bands after Tigo cedes its spectrum in excess of the government's cap.

[64] According to the Bank of America-Merrill Lynch Global Wireless Matrix, Telefónica and Tigo both charged an average MTR of 56.87 cents (USD) in 2014, and Claro charged an average MTR of 46.00 cents (USD). The percentage difference between the two figures—that is, (56.87–46.00) ÷ 46.00—equals 23.6 percent. 1Q2015 Global Wireless Matrix, *supra* note 2, at 223.

[65] *See* Ministerio de Tecnologías de la Información y las Comunicaciones (MINTIC), Documento de Consulta Publica—Proceso de Selección Objetiva para Asignación de Espectro Radioeléctrico en las Bandas 700 MHz, 900 MHz, 1.900 MHz y 2.500 MHz para Servicios Móviles 22 (2015) [hereinafter MINTIC Spectrum Proposal] (summarizing Tigo-UNE's current spectrum holdings); *UNE devolverá tres bandas de espectro a la Nación tras fusión con Tigo*, Caracol Radio (Dec. 12, 2015), http://caracol.com.co/emisora/2015/12/10/medellin/1449773947_866826.html (identifying the spectrum bands that Tigo will cede to the Colombian government).

Figure 2: Distribution of Mobile Operators'
Spectrum Holdings in Colombia
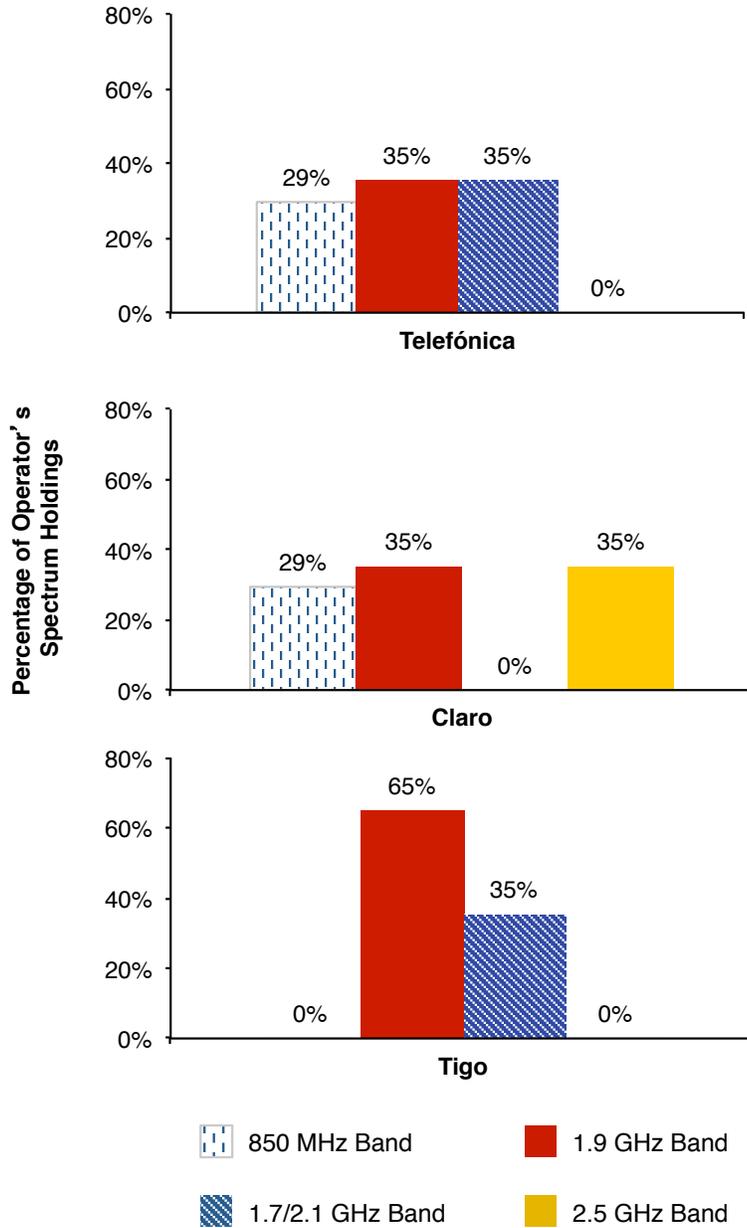
Sources: 2014 OECD Report, *supra* note 47, at 97 tbl.2.12; MINTIC Spectrum Proposal, *supra* note 65, at 22; *UNE devolverá tres bandas de espectro a la Nación tras fusión con Tigo*, *supra* note 65.

Of the three mobile operators, Telefónica's spectrum holdings are most concentrated in the lower-frequency bands. Tigo and Claro each have a spectrum disadvantage compared with Telefónica's holdings. Tigo lacks holdings in the lowest-frequency band (where Claro and Telefónica each have 29 percent of their holdings). Similarly, over 35 percent of Claro's holdings are in the highest-frequency band (where neither Tigo nor Telefónica has holdings). Therefore, possible cost differences arising from spectrum holdings do not justify charging Claro a higher MTR than its competitors pay. Because Telefónica has greater access to low-frequency bands, its costs of establishing and operating a network based on spectrum holdings are less than Tigo's and Claro's costs, all other factors held constant. Moreover, until Tigo cedes its 50 MHz of spectrum in excess of the spectrum cap, Tigo has an advantage over the other operators in terms of total spectrum holdings. Thus, exogenous cost differences would justify charging either Telefónica or Tigo—but not Claro—a higher MTR.

c. *Exit Justifications*

The counterpoint to the rationale that asymmetric termination rate regulation can promote entry is the rationale that it discourages exit by existing firms. Some regulatory economists have developed theoretical models that predict that a high MTR charged by a large incumbent can induce the exit of its smaller rivals.[66]

Regardless of whether this theory finds any empirical support, it is clearly not a theory that supports asymmetric MTRs in Colombia. Telefónica and Tigo do not need a higher termination rate to remain and continue investing in the market. Telefónica is a large, international telecommunications operator, with more than sufficient resources. Like América Móvil, Telefónica has all the advantages of scale economies in procurement of equipment, spectrum, base stations, advertising, customer acquisition, and government relations. Similarly, Tigo has access to the considerable combined resources of its majority shareholder Empresas Públicas de Medellín (EPM) and its minority shareholder Millicom, a multinational telecommunications operator.[67]

Even if Millicom or Telefónica were to stop operating in Colombia, each would have the option of selling its subsidiary instead of liquidating it. The sale of either Movistar or Tigo need not drastically alter the competitive landscape for mobile services in Colombia; it could simply result in a new owner of each operator's wireless network. Moreover, even if either operator were liquidated, the infrastructure that it uses would remain. Once costs

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[66] *See, e.g.*, Armstrong & Wright, *supra* note 40, at F288.

[67] Narayan Ammachchi, *Millicom and EPM Merger in Colombia Finally Receives Approval*, Nearshore Americas (Aug. 5, 2014), http://www.nearshoreamericas.com/millicom-epm-merger-final-approval/.

have been sunk to create multiple mobile networks, those same costs do not serve as a barrier to entry.[68] Spectrum does not depreciate. Unless the infrastructure that supports Movistar and Tigo's networks is physically destroyed, it will also remain available for use by a subsequent entrant into the market. If either Telefónica or Millicom and EPM decided to exit Colombia, another multinational mobile operator could purchase the exiting firm's network infrastructure in Colombia.

Finally, as a factual rather than theoretical matter, neither Telefónica nor Millicom has indicated that it intends to exit the Colombian market. Absent evidence to the contrary, there is no reason to believe that either operator will withdraw from Colombia. Thus, the proposition that Telefónica and Tigo need to charge a higher MTR to be induced to remain in the market lacks any factual support.

2. *Reduced Investment Incentives and Increased Rent-Seeking Incentives for Telecommunications Providers*

Permitting Telefónica and Tigo to receive a higher MTR than Claro receives would reduce the incentives of telecommunications providers to invest in their networks. As I explain below, the higher MTR may decrease Claro's expected return on investment and increase its expected cost of capital. In addition, asymmetric MTRs may create another dimension of rent-seeking competition between operators.

For Claro to invest in a project such as expanding or upgrading its network, it needs assurance that it will have a reasonable opportunity to recover, and earn a competitive return on, the investment's sunk cost. Necessarily, Claro must be able to earn a sufficient margin above marginal cost.[69] If the CRC permits Telefónica and Tigo to charge a higher MTR, Claro's marginal costs will rise, which will lower Claro's expected profit.

Next, Telefónica's and Tigo's success in securing even more asymmetric MTRs (as they argue that Claro's MTR should be reduced to zero) would reduce predictability in Colombia's regulatory process. It is implausible that Claro expected when it entered the Colombian telecommunications market that the CRC would permit other mobile operators to charge asymmetric MTRs, while forcing Claro to charge a rate of zero. An increase in regulatory risk would increase Claro's cost of capital. Holding the return to capital

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[68] *See* George J. Stigler, The Organization of Industry 70 (Univ. of Chicago Press 1968); J. Gregory Sidak & Daniel F. Spulber, Deregulatory Takings and the Regulatory Contract: The Competitive Transformation of Network Industries in the United States 82–83 (Cambridge Univ. Press 1997).

[69] *See, e.g.*, William J. Baumol & J. Gregory Sidak, Toward Competition in Local Telephony 34 (MIT Press & AEI Press 1994); William J. Baumol & David F. Bradford, *Optimal Departures from Marginal Cost Pricing*, 60 Am. Econ. Rev. 265 (1970).

constant, as the cost of capital increases, the level of investment for a prof-it-maximizing firm falls.[70]

Finally, the continuation of asymmetric MTRs will encourage rent seeking by Tigo, Telefónica, and any other mobile network operators that enter Colombia.[71] As I explained earlier, no entry, exit, or cost justification exists for regulation that mandates a disparity in MTRs. Thus, Telefónica and Tigo currently receive a windfall relative to Claro. Telefónica's and Tigo's success in earning economic rents through asymmetric regulation encourages Telefónica and Tigo to continue their rent-seeking behavior and invites any new entrants to compete in this new dimension of regulatory rent seeking. The availability of asymmetric MTRs increases mobile network operators' incentives to expend resources to influence policy through lobby-ing or similar activities. For example, the OECD observes that "the existence of asymmetric termination charges may distort competition if mobile operators focus their efforts on wholesale income from interconnection rates, rather than competing in the retail segment through lower prices that attract larger consumer bases."[72] Because policymakers—rather than compe-tition—determine the mobile operators' wholesale prices, asymmetric MTRs increase mobile operators' incentive to divert resources from investment in infrastructure or service quality to attempts to influence regulatory policy. In addition, if asymmetric MTRs are implicitly or explicitly available only to mobile network operators whose market share is below a certain percentage of subscribers, mobile network operators will have the incentive to maintain lower market shares. That rent-seeking behavior dampens competition for subscribers, particularly subscribers that produce less revenue (typically, low-income subscribers). By reducing incentives to invest in infrastructure and increasing incentives to engage in wasteful, rent-seeking behavior, asym-metric MTRs unequivocally harm consumer welfare.

D. *Harm to the Poorest Colombian Consumers from Regulation of the Market for the Sale of Inexpensive Handsets*

Telefónica and Tigo ask the CRC to regulate the market for low-end, inexpensive handsets, arguing that Claro dominates the import of those

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[70] *See* David Besanko & Daniel F. Spulber, *Sequential-Equilibrium Investment by Regulated Firms*, 23 RAND J. Econ. 153, 153–54 (1992) ("In anticipation of the future regulatory climate, the firm may reduce its investment below the socially efficient level."); *see also* Daniel F. Spulber, Regulation and Markets 610 (MIT Press 1989) ("In practice, honoring commitments to investors in regulated [firms] . . . keeps down future borrowing costs by reducing investor risk.").

[71] For explanation and analysis of rent-seeking behavior, see Gordon Tullock, *The Welfare Costs of Tariffs, Monopolies, and Theft*, 5 W. Econ. J. 224, 228–30 (1967); *see also* Richard A. Posner, *The Social Cost of Monopoly and Regulation*, 83 J. Pol. Econ. 807, 807 (1975); Anne O. Krueger, *The Political Economy of Rent-Seeking Society*, 64 Am. Econ. Rev. 291 (1974).

[72] 2014 OECD Report, *supra* note 47, at 71.

handsets.[73] That argument implicitly assumes that Claro's position in the market for low-end, inexpensive handsets gives Claro a cost advantage over its competitors. It is implausible that Claro actually has a scale advantage over its competitors in the purchase of low-end handsets. Telefónica had over 272 million mobile subscribers worldwide in June 2016.[74] There is no reason to believe that Movistar is not similarly situated to Claro in its ability to provide low-end handsets. In other words, if América Móvil's size enables Claro to offer reduced prices to Colombian consumers, then Telefónica's size also should enable Movistar to reduce the prices that it charges Colombian consumers. Likewise, Millicom is a large global provider of wireless services with over 57 million subscribers worldwide through the second quarter of 2016.[75] Economies of scale in handset procurement similarly should enable Millicom to reduce the prices that it charges Colombian consumers.

Even if América Móvil could use its size to acquire low-end handsets at a lower price than other firms, it would not be in the interest of consumers for regulators to attempt to vitiate that advantage. If América Móvil's economies of scale enable it to offer handsets at lower prices, that discount is a spillover benefit flowing from América Móvil's foreign subscribers to Claro's Colombian subscribers. As América Móvil's subscribers outside Colombia purchase more handsets, its cost of providing handsets to consumers in Colombia will fall, all other factors held constant. Why do Telefónica and Tigo think that the CRC would wish to prevent América Móvil from passing on those cost savings to Colombian consumers?

Telefónica's and Tigo's argument for regulation of the market for low-end handsets is a naked request for regulation that would increase their profits with no offsetting benefits for consumers. Regulation that increases the price that Claro's subscribers must pay for handsets would increase the profit-maximizing prices for Telefónica and Tigo as well. Such regulation would increase profits for Telefónica and Tigo, but it would harm consumers. If the prices of all low-end handsets were to increase, their quantity demanded would decrease and consumer surplus would fall. Some consumers would simply have a reduced surplus from purchasing handsets at higher prices, and other consumers would drop out of the market altogether. Consequently, any regulation that would increase handset prices (or impede decreases in handset prices) would clearly harm consumers. Such a measure would cause the greatest harm to the marginal consumers who exit the market as a result of the increased prices. Those marginal consumers are likely to be the lowest-income consumers in Colombia.

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[73]   *See* 2015 Fedesarrollo Study, *supra* note 1, at 50.
[74]   Telefónica, Results January–June 2016, at 12 (2016).
[75]   Millicom, Millicom Q2 2016 Business Update 1 (2016).

An increase in the price of low-end handsets would also increase the profit-maximizing prices for higher-quality handsets. Because there exists some demand substitution between low-end handsets and higherquality handsets, an increase in the price of low-end handsets would shift the demand curve for highend handsets outward, which in turn would increase the profit-maximizing price for highend handsets. However, that price increase would likely be less than the price increase for low-end handsets. Consequently, the harm to wealthier Colombians who would be more likely to purchase higher-quality handsets would be small relative to the harm to poorer Colombians.

Telefónica and Tigo present their proposed regulation as a means of decreasing concentration in Colombia's mobile markets—although Telefónica and Tigo do not explain how the proposed regulation would decrease concentration or increase competition.[76] However, the proposed regulation might actually discourage switching and solidify current market shares. For a wireless subscriber, the total cost of purchasing access to the network and using the network is the sum of the price of a handset and the price of mobile services using that handset. A consumer who wishes to switch plans might need to purchase a new handset. Because lower-income subscribers are less likely to be able to afford the purchase of a new handset under Telefónica's and Tigo's proposed regulation, those subscribers would be less likely to switch operators. Increasing the price of low-end handsets would only discourage switching and would likely stabilize the operators' current market shares. Put simply, such a regulation would discourage competition. Consequently, Telefónica's and Tigo's proposed regulation not only would harm consumers, but also could exacerbate the alleged problem that it purports to solve.

E. *Harm from Delayed Spectrum Auctions*

Telefónica and Tigo recommend that the CRC delay any spectrum auctions until it has implemented (or at least considered implementing) their latest regulatory proposals.[77] However, such a delay in spectrum auctions would significantly harm both Colombian consumers and the Colombian government. Spectrum is a necessary input to the provision of mobile services, and reducing the supply of that input would restrict the quantity and quality of mobile services available to consumers. The direct harm from delayed spectrum auctions includes delayed consumer benefits from greater spectrum availability and lost revenue for the Colombian government. The delay in spectrum auctions would also indirectly harm Colombia by reducing its

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[76] *See* 2015 Fedesarrollo Study, *supra* note 1, at 50; María Alejandra Medina, *Industria TIC Prende las Alarmas*, El Espectador (Sept. 29, 2016, 10:00 PM), http://www.elespectador.com/noticias/economia/industria-tic-prende-alarmas-articulo-657618.

[77] 2015 Fedesarrollo Study, *supra* note 1, at 49.

ability to compete with other countries for investment, which would result in lost surplus from delayed innovations.

Economists Thomas Hazlett and Roberto Muñoz have identified that increased spectrum availability for mobile operators can lead to reductions in mobile voice prices, reductions in concentration, and increased consumer welfare.[78] Ironically, Telefónica and Tigo ask the CRC to delay spectrum auctions with the purported goal of attaining the very outcomes that greater spectrum availability can achieve. Hazlett and Muñoz specifically analyzed the effect on consumer welfare of increased spectrum availability in Latin America.[79] They found that, on average, increasing the allocation of spectrum available to mobile telephony by 20 MHz increased consumer surplus by $50 per capita (in 2003 U.S. dollars).[80] They also found that increased spectrum availability led to decreases in both concentration *and* in prices.[81]

In Colombia, Hazlett and Muñoz predicted that making an additional 60 MHz of spectrum available to mobile operators increases consumer welfare by about $1.9 billion (in 2003 U.S. dollars).[82] The calculation by Hazlett and Muñoz of the increased consumer welfare likely understates the current benefit of increased spectrum availability because their study used data from 2002, when Colombia's mobile penetration was only about 14 percent (compared with penetration exceeding 118 percent in 2016).[83] With lower mobile penetration and before the development of significant demand for spectrum to support mobile data traffic, demand for spectrum was less likely to reach or exceed the spectrum allocated. From 2003 to 2014, mobile penetration in Colombia increased by a factor of 8, but the total spectrum holdings of facilities-based mobile network operators increased by a factor of only about 5, from 80 MHz to 405 MHz.[84] Consequently, Hazlett's and Muñoz's estimate of the benefit from increased spectrum availability is likely to be extremely conservative. Even so, adjusted for inflation, Hazlett's and Muñoz's findings imply that, in 2016, an additional 60 MHz of spectrum made available will increase consumer welfare by approximately $2.48 billion (or 7.38 trillion Colombian pesos).[85]

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[78] *See* Thomas W. Hazlett & Roberto E. Muñoz, *A Welfare Analysis of Spectrum Allocation Policies*, 40 RAND J. Econ. 424 (2009); Thomas W. Hazlett & Roberto E. Muñoz, *Spectrum Allocation in Latin America: An Economic Analysis*, 21 Info. Econ. & Pol'y 261 (2009).

[79] Hazlett & Muñoz, *Spectrum Allocation in Latin America: An Economic Analysis*, *supra* note 78.

[80] *Id.* at 262.

[81] *Id.* at 272.

[82] *Id.* at 274.

[83] *Id.* at 263; MINTIC Bulletin 1Q16, *supra* note 32, at 31.

[84] 2014 OECD Report, *supra* note 47, at 94.

[85] I adjust for inflation by first calculating that $1.00 in 2003 dollars is equivalent to $1.31 in August 2016 dollars, by dividing the U.S. consumer price index as of August 2016 (that is, 240.853) by the annual average U.S. consumer price index in 2003 (that is, 184.300). *See* United States Bureau of Labor Statistics, CPI Detailed Report: Data for August 2016, at 72 tbl.24 (Malik Crawford, Jonathan Church & Bradley Akin eds., Aug. 2016), http://www.bls.gov/cpi/cpid1608.pdf. Put differently, the inflation-adjustment factor for converting 2003 dollars to August 2016 dollars is 1.31. I multiply Hazlett's and Muñoz's estimated consumer

Suppose that Colombia is considering auctioning the rights to use 60 MHz of spectrum to mobile operators. Using Hazlett's and Muñoz's figure as a conservative estimate, a single month of delay of a payment of $2.48 billion would decrease the present value of the consumer surplus by over $10 million, and a single year of delay would decrease the present value of the consumer surplus by over $124 million.[86]

Colombian consumers can never recover the cost of that delay. Spectrum is an asset that does not depreciate. It is not depleted over time. With a typical good, a sale lost today might be replaced by an additional sale tomorrow. However, spectrum usage that is not authorized in, for example, the fourth quarter of 2016 is irretrievably lost. Colombian consumers can never capture the forgone benefits of that spectrum availability. Likewise, the Colombian government can never recover the loss from the delay of auction revenue and any potential usage license revenue from that period of delay.

Moreover, spectrum auction delays harm economic welfare even if one assumes that further spectrum allocation would add only excess capacity to operators' current spectrum holdings. The value of reserve spectrum rights exceeds the value of reserves of other productive inputs, because it allows the operator sufficient spectrum to expand until the next spectrum auction—the timing of which is subject to regulatory delay and uncertainty.[87] Even firms with spectrum holdings sufficient to serve their existing customers will therefore seek to accumulate additional spectrum. For each year of delay, the value of excess spectrum holdings to the operator is irretrievably lost.

In addition to directly harming economic welfare, delays in spectrum auctions can impose indirect harm. The government's decision about when to release more spectrum limits each operator's ability to expand in its current service regions or enter underserved regions. Even if demand for mobile services increases, an operator cannot meet that demand until the government releases more spectrum. Consequently, a mobile network operator that gains a large number of subscribers might not have the spectrum to support those new subscribers. When the total spectrum capacity in a

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welfare increase of $1.9 billion (in 2003 dollars) by the inflation-adjustment factor of 1.31 to find that the estimated consumer welfare increase has reached approximately $2.48 billion in August 2016. I convert that sum in 2016 dollars to 2016 Colombian pesos, using the exchange rate of 2,972 Colombian pesos per U.S. dollar (as of August 31, 2016). *USDCOP Spot Exchange Rate*, Bloomberg, http://www.bloomberg.com/quote/USDCOP:CUR. I multiply $2.48 billion by that rate to find that the consumer-welfare increase would be 7.38 trillion Colombian pesos.

[86] I assume a 5-percent annual discount rate, which Hazlett and Muñoz used to calculate the total benefit from spectrum allocation. Hazlett & Muñoz, *Spectrum Allocation in Latin America: An Economic Analysis*, *supra* note 78, at 433 n.26.

[87] The principle that productive capacity is lumpy—in other words, that a service provider must make an upfront investment in a block of capacity that exceeds current demand—is well established in the context of network industries. Benefits accrue to consumers immediately when a service provider has sufficient excess capacity to meet future demand. *See, e.g.*, William J. Baumol & J. Gregory Sidak, *The Pig in the Python: Is Lumpy Capacity Investment Used and Useful?*, 22 Energy L.J. 383, 388–89 (2002).

region is exhausted, operators will either increase prices or decrease quality. In either case, consumers are worse off.

Furthermore, Colombia must compete with other countries, in Latin America and throughout the world, for investment in its telecommunications operators. America Móvil and Telefónica operate in North America, Central America, South America, and Europe.[88] Millicom is a large provider of mobile services in Central America, South America, and Africa.[89] All other factors held constant, such multinational operators will allocate investments to the markets or countries with the greatest expected returns. Spectrum constraints limit the amount of growth that an operator can expect to achieve within a market. Limits on an operator's expected growth decrease its potential return to investment, all other factors held constant. Consequently, operators will more likely invest in countries that offer sufficient spectrum resources to support the operators' expected needs. Any delay in spectrum allocation might cause operators to allocate more investment to other countries, instead of Colombia.

If multinational operators of mobile networks increasingly choose to invest in countries other than Colombia, the introduction of newer goods and services in Colombia might be delayed. Investment within a country can encourage additional complementary investments. For example, an investment in spectrum will require or encourage additional investment in towers or base stations. If regulation in Colombia delays access to the necessary input of spectrum, then complementary investments will increasingly flow into other countries. The investment in other countries will make them only better suited to deploy advanced mobile technologies in the future and will slow the rate of innovation in Colombia.

The lost consumer surplus from the delayed or forgone entry of new products due to regulatory barriers is significant.[90] For example, Jerry Hausman estimated that the regulatory delay in the United States in the offering of voice messaging by local exchange carriers (a service for which there already existed a low-cost substitute, the answering machine) cost U.S. consumers over a billion dollars annually in lost surplus.[91] In addition to the direct effects of any spectrum auction delay, Colombia risks losing billions of dollars in lost potential surplus as a result of the delayed deployment of new products that use mobile networks.

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[88] *See Subsidiaries & Affiliates*, América Móvil, http://www.americamovil.com/amx/about/footprint (last updated June 30, 2015); *Atlas de Telefónica*, Telefonica, http://atlas.telefonica.com/atlas?region=WR&lang=eng.

[89] *See Our Locations*, Millicom, http://www.millicom.com/where-we-operate/#all+(corporate+offices+and+tigo+markets).

[90] *See* Jerry A. Hausman, *Valuing the Effect of Regulation on New Services in Telecommunications*, 1997 Brookings Papers on Econ. Activity: Microecon. 1, 13–24.

[91] *Id.* at 14–15.

Ironically, Telefónica and Tigo offer several policy prescriptions to the CRC that purportedly seek to reduce concentration in the markets for mobile services and lower prices for consumers. Yet they also ask the CRC to delay a measure—allocating more spectrum to mobile providers—that has been demonstrated empirically to decrease market concentration substantially.[92] Even if proponents of delaying the spectrum auction were to argue that the delay might enable the Colombian government to auction the spectrum at a higher price, the resulting marginal increase in revenue likely would be only a fraction of the harm that the delay would cause consumers, especially if one considers the lower present value of delayed auction revenue.[93]

F.   *Harm to Consumers from* Ex Ante *Price Regulation*

In its comments on the CRC's 2016–2017 regulatory agenda, Tigo recommended that the CRC subject Claro to *ex ante* price regulation.[94] Tigo recommended that the CRC require Claro to obtain CRC approval before changing its prices for mobile services. *Ex ante* price regulation of Claro would create immense social costs in Colombian mobile services. As I demonstrate in Part I, the market for mobile voice services in Colombia performs well compared with an appropriate sample of peer countries. Claro has been a leader in lowering price and increasing penetration.[95] The great danger in Tigo's proposal for asymmetric price regulation is that the Colombian government itself might constrain Claro's ability to reduce retail prices. By restricting Claro's ability to lower its prices, *ex ante* price regulation of Claro would reduce its competitors' incentives to reduce their prices and could facilitate collusion. The beneficiaries of that regulation would be Telefónica and Tigo—not Colombian consumers.

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[92]   *See, e.g.*, Hazlett & Muñoz, *A Welfare Analysis of Spectrum Allocation Policies*, *supra* note 78, at 431–32; *see also* Comments of 37 Concerned Economists at 4, In the Matter of Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, 15 FCC Rcd. 24203 (2001) (No. 00-230).

[93]   *See* Thomas Hazlett, Roberto Muñoz & Diego Avanzini, *What Really Matters in Spectrum Allocation Design*, 10 Nw. J. Tech. & Intell. Prop. 93, 122–23 (2012).

[94]   Letter from Jaime Andrés Plaza, Vice President of Regulation, Colombia Móvil, to Juan Manuel Wilches, Executive Director, Comisión de Regulación de Comunicaciones 2 (Nov. 17, 2015) (on file with author).

[95]   Telefónica's voice revenue per minute, a proxy for price, exceeded Claro's throughout the period from 2008 to 2014. 1Q2015 Global Wireless Matrix, *supra* note 2, at 223. As I explain in Part IV.C.3, Claro's mobile coverage in underserved rural areas exceeds that of each of its competitors. *See Cobertura Soluciones Móviles*, Claro, http://www.claro.com.co/portal/co/pc/personas/ayuda/mapa-cobertura-movil/; Áreas de Cobertura de los Servicios en Mapa Interactivo en WEB, Tigo, http://www.tigo.com.co/mundo-tigo/mapa-cobertura; *Cobertura de Tecnología*, Movistar, http://www.movistar.co/atencion-cliente/cobertura-tecnologia.

1.	*Harm to Consumers from Regulatory Delays and Asymmetric Treatment of Price Increases and Decreases*

Requiring prior approval of Claro's tariffs would hinder Claro's ability to lower its prices, which would decrease competitive pressure on the other mobile operators in Colombia. To compete with Claro, the other mobile operators would need to lower prices only when Claro lowers its prices. By subjecting Claro's price reductions to regulatory delays, Tigo's recommendation that the CRC require Claro to obtain prior approval for its prices would diminish price competition in Colombian mobile services. *Ex ante* price regulation of Claro is contrary to the purported objectives of Tigo's own regulatory proposals: to eliminate rules, regulations, and laws that constrain business activities.[96] *Ex ante* price regulation would deprive Colombian consumers of the benefits of robust price competition in Colombian mobile services.

In a dynamic industry such as mobile telephony, even a delay of a few months is significant relative to the product life cycle of a new technology or service. How long would the CRC review that Tigo proposes take to make a decision on Claro's proposed tariffs? Likewise, to implement *ex ante* price regulation the CRC would need to decide whether it will review all price changes or only prices to which a competitor objects. Reviewing all price changes would further increase regulatory delays. However, allowing Telefónica, Tigo, and other competitors to dictate the CRC's regulatory agenda could harm consumers. Telefónica and Tigo would have the incentive to challenge only decreases in Claro's prices, because a price reduction would (all other factors held constant) induce consumers to substitute away from Telefónica's and Tigo's products. In contrast, an increase in the price of Claro's services would *increase* demand for its competitors' products. Thus, if the CRC were to review only challenged price changes, *ex ante* price regulation would slow the implementation of price decreases and would likely leave price increases unchallenged.

The potential for regulatory delay to harm competition and consumers is not the least bit hypothetical. Consider the cost to consumers in the United States resulting from delays in the introduction of new products due to the legal process following the AT&T divestiture. The antitrust consent decree that broke up the Bell System, known as the Modification of Final Judgment (MFJ), required AT&T to divest the Bell Operating Companies (BOCs), which provided local exchange service, and forbade the BOCs from, among other things, providing long-distance service.[97] The MFJ contained a

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[96] Letter from Jaime Andrés Plaza, Vice President of Regulation, Colombia Móvil, to Juan Manuel Wilches, Executive Director, Comisión de Regulación de Comunicaciones, *supra* note 94, at 2.

[97] Modification of Final Judgment, *reprinted in* United States v. Am. Tel. & Tel. Co., 552 F. Supp. 131, 226–34 (D.D.C. 1982), *aff'd sub nom.* Maryland v. United States, 460 U.S. 1001 (1983).

waiver procedure whereby the BOCs would request relief from the MFJ for specific services so long as "there [was] no substantial possibility that [the petitioning BOC] could use its monopoly power to impede competition in the market it seeks to enter."[98] However, the MFJ's waiver process became a source of regulatory delay. The MFJ's line-of-business restrictions caused consumers to forgo billions of dollars of consumer surplus annually because of the delay in introducing new telecommunications services.[99] One would expect similarly large losses in consumer surplus from Tigo's proposals to delay, through asymmetric regulation, the natural outcomes of price competition and innovation. The requirement that Claro obtain pricing approval for each new mobile service or even each new bundle would delay the introduction of those services and harm dynamic competition.

2. *Creating a Government-Managed Cartel Through* Ex Ante *Price Regulation*

In addition to hindering price competition and delaying the introduction of new products, Tigo's proposal to require CRC approval of Claro's price changes could facilitate price fixing in Colombian mobile services. By publishing Claro's rate changes before their implementation, *ex ante* price regulation would convert a workably competitive oligopoly into a government-managed cartel. Tigo's proposal would harm competition and consumers by facilitating price coordination between Colombia's mobile operators.

Evidence from telecommunications regulation in the United States demonstrates how publishing rates before their implementation facilitates price fixing. In the United States, the Communications Act of 1934 formerly required all common carriers to file their tariffs with the Federal Communications Commission (FCC), such that the FCC could ensure that the rates were reasonable and nondiscriminatory. By the 1970s, the long-distance market had been opened to competition. Consequently, the FCC implemented a policy of "permissive detariffing," which ended the requirement to file long-distance tariffs with the FCC—except for the dominant carrier, AT&T.[100] Later, the FCC even implemented a policy of *mandatory* detariffing, which forbade any carrier except AT&T from filing its long-distance tariffs.[101]

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[98] Modification of Final Judgment § VIII.C, 552 F. Supp. at 231.

[99] *See, e.g.*, Hausman, *supra* note 91, at 13–24.

[100] Second Report and Order, Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Therefor, 91 F.C.C.2d 59, 73–74 (1982).

[101] Sixth Report and Order, Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Therefor, 99 F.C.C.2d 1020, 1027–28 (1985), *vacated and remanded*, MCI Telecomm. Corp. v. Fed. Commc'ns Comm'n, 765 F.2d 1186 (D.C. Cir. 1985).

One rationale for mandatory detariffing was that the filing of tariffs facilitated collusion among competitors.[102] That the non-dominant long-distance carriers (MCI and Sprint) continued filing their own tariffs even after the FCC implemented permissive detariffing indicates that the FCC's concerns about collusion were well founded.[103] Additionally, every price change filed by AT&T was closely followed by MCI and Sprint.[104] If MCI and Sprint thought that AT&T's revised tariffs were too low, they could object to the FCC.[105] That MCI challenged the FCC's mandatory detariffing policy in litigation that went all the way to the Supreme Court of the United States[106] is yet another indication that MCI gained a strategic benefit from ensuring that all three major competitors in long-distance services would see one another's future price reductions before they took effect.

Although the courts held that the FCC lacked the statutory authority to remove the tariffing requirement of the Communications Act, the courts nonetheless fully recognized the FCC's economic rationale for detariffing long-distance rates.[107] The Supreme Court "itself ha[d] policed trade associations and rate bureaus under the antitrust laws precisely because the sharing of pricing information can facilitate price fixing."[108] Mandatory detariffing made price coordination more difficult.

Price coordination is most likely when firms can monitor and punish deviations from the coordinated pricing scheme.[109] For example, a large retailer might enforce price coordination by announcing that it will match the price of any smaller competitor. That unconditional price matching punishes any small competitor that deviates from the coordinated price. The submission of prices for prior regulatory approval fulfills a similar role in price coordination by enabling firms to monitor and punish deviations.

Tigo's proposed tariffing regulation would promote the kind of price coordination that the detariffing of long-distance rates in the United States sought to prevent. Requiring Claro to file tariffs would enable Claro's competitors to oppose every reduction in Claro's retail prices before that price cut could take effect. *Ex ante* price regulation of Claro would increase prices,

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[102] *See, e.g.*, *id.* at 1030 ("The continuation of tariffs for forborne carriers also presents an opportunity for collusive pricing by competing carriers. Since carriers can ascertain their competitors' existing rates and keep track of any changes in those rates by reviewing the filed tariffs, carriers may be encouraged to maintain rates at an artificially high level. Without forborne carrier tariffs on file, carriers may initiate price cutting or generally institute rates at a lower level to meet directly customer demand.").

[103] *See* Paul W. MacAvoy, The Failure of Antitrust and Regulation to Establish Competition in Long-Distance Telephone Services 71 (MIT Press & AEI Press 1996).

[104] *Id.* at 72.

[105] *Id.* at 73.

[106] *See* MCI Telecomm. Corp. v. Am. Tel. & Tel. Co., 512 U.S. 218, 221–24 (1994).

[107] *MCI v. AT&T*, 512 U.S. at 233.

[108] *Id.*

[109] *See* Richard A. Posner, Antitrust Law 67–68 (Univ. Chicago Press 2d ed. 2001).

decrease quantities, and harm dynamic competition in Colombian mobile services by facilitating price fixing among Colombian mobile operators.

In addition to facilitating collusion, Tigo's proposed regulation would dampen Claro's unilateral incentives to reduce its price in two ways. First, *ex ante* price regulation of Claro's tariffs would impose an additional administrative cost on Claro for each price reduction, which could be significant if filing procedures are complex. That administrative cost would discourage Claro from reducing its price by small increments, because the cost of submitting a price reduction for approval might exceed the expected profit from the price reduction. Second, *ex ante* price regulation would create a delay between the announcement of a price decrease and its implementation, allowing Tigo and Telefónica to anticipate and preempt the price reduction. Claro would thereby lose some of the strategic value of its price reduction. By decreasing the net value to Claro of a price reduction, *ex ante* regulation of Claro's prices will decrease Claro's incentive to unilaterally reduce prices. Even absent collusion, *ex ante* price regulation will increase prices for mobile services in Colombia.

3.   *Setting a Floor for Nonpredatory Prices Would Harm Consumers*

In the absence of predatory pricing, reducing the ability and the incentives of firms to reduce price harms consumers. However, predation is implausible in mobile telecommunications. The objective of predatory pricing is to increase the predatory firm's market power by forcing a competitor out of the market (and subsequently increasing prices).[110] However, it is highly unlikely that a mobile network operator could increase prices sufficiently after the exit of a rival to recoup its investment in below-cost pricing. The most important inputs for a mobile network operator are durable resources such as spectrum, towers, and transmitters. Even if one carrier were driven into bankruptcy, its assets would not evaporate. The company would be reorganized under bankruptcy law (with a lower cost structure), or its assets would be sold in liquidation to a new entrant in the mobile marketplace. Under those circumstances, it does not make economic sense to contend that predatory pricing could force the elimination—in any meaningful sense—of one of Claro's competitors. Therefore, because predation by Claro could never succeed, Claro has no incentive to attempt predatory pricing.

Moreover, Colombian competition law already prohibits predatory pricing.[111] Colombian competition law defines "reducing prices below cost for the purpose of eliminating various competitors or preventing their entry or

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[110]   *See* Dennis W. Carlton & Jeffery M. Perloff, Modern Industrial Organization 352 (Addison Wesley 4th ed. 2005).

[111]   Organization for the Economic Cooperation and Development, Colombia—Peer Review of Competition Law and Policy 2009, at 24 (2009).

expansion" to be an abuse of a dominant position.[112] The OECD observed in its 2009 review of Colombia's competition policy that under Colombian competition law "there is no obligation to develop in-depth economic analysis to determine whether [predatory pricing] has a negative effect on economic efficiency or on consumer welfare" and that predatory pricing leads to a "virtually automatic sanction."[113] Thus, Claro could not plausibly implement predatory prices under current Colombian competition law. The only possible effect of subjecting Claro's prices to regulatory approval in addition to the existing prohibition on predatory pricing would be to delay or prevent *nonpredatory* decreases in price.

A nonpredatory decrease in price unequivocally increases consumer welfare. Absent predation, the only possible motivation for preventing a firm from decreasing its prices is the protection of the firm's competitors—at the expense of consumers. The CRC should applaud pricing at a level that drives out a less efficient competitor; as Massimo Motta, the chief economist of the Directorate General for Competition (DG Comp), has explained, the prospect of failure is an inherent part of the competitive process.[114] It should never be Claro's legal responsibility to ensure that its rivals remain in the market. The competitive strategy of a dominant firm should not be contingent upon assuring the success of its rivals. Limiting price reductions in a way that reduces Claro's ability to price below its competitors effectively removes a competitor—the most potent competitor—from the mobile market. By limiting Claro's ability to compete on prices, subjecting Claro's prices to *ex ante* regulatory approval would reduce the incentives of Claro's competitors to lower their prices. Consumer welfare increases when prices fall, not when prices remain high because regulations encourage the entry or survival of inefficient firms in the market.

G. *Harm to Consumers from Restrictions on Bundling*

Tigo has also argued in its comments on the CRC's 2016–2017 regulatory agenda that the CRC should prohibit Claro from offering bundles of mobile voice and mobile data services.[115] That asymmetric bundling prohibition would reduce competition in mobile services and harm Colombian consumers.

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[112] *Id.*

[113] *Id.*

[114] *See, e.g.*, Massimo Motta, Competition Policy: Theory and Practice 412 (Cambridge Univ. Press 2009).

[115] Letter from Jaime Andrés Plaza, Vice President of Regulation, Colombia Móvil, to Juan Manuel Wilches, Executive Director, Comisión de Regulación de Comunicaciones, *supra* note 94, at 2.

When buyers have diverse preferences, bundling multiple goods in one package can increase overall output and social welfare.[116] Suppose that buyer *A* values product *X* at $50 and product *Y* at $20, and buyer *B* values product *X* at $20 and product *Y* at $50. Assume for simplicity that the seller is a monopolist with costs of producing each good that are constant and less than $20. If the seller does not bundle the products, it will sell both products at $50 each. The seller will receive $100, and both buyers will obtain only one product each. To sell both products to both of the buyers, the seller would need to set the price of $20, which would yield revenue of only $80. On the other hand, the seller can sell a bundle containing both goods at $70. In that case, the seller will receive $140, and both buyers will obtain two products. In the bundled case, the total surplus unambiguously increases, because the total quantity sold of each product increases.

Bundling often increases demand for the bundled products. In other words, demand for the bundle of products *X* and *Y* often exceeds the sum of the demand for *X* as a standalone product and the demand for *Y* as a standalone product. Demand might increase because the product integration changes the product definition in a manner that produces more satisfaction (utility) for consumers. Alternatively, demand might increase because the integration of *X* and *Y* reduces the cost to the consumer of engaging in product assembly or integration on her own. For example, the consumer might prefer to purchase mobile data and mobile voice services in one transaction with a single price. Or, the increased demand might result from some factor that is impossible to predict *a priori*, but which is reflected, ultimately and objectively, in consumers' higher willingness to pay.

Bundling also reduces production costs. In other words, it is often less costly for the single firm to produce *A* and *B* as an integrated product than it is for the firm (or multiple firms) to produce *A* separately from *B*.[117] Such efficiencies are also known as economies of scope.[118] Bundles of mobile voice and mobile data services plainly exhibit economies of scope, because a mobile network operator uses the same mobile network to provide both services. At the level of individual purchasing—that is, the consumer's purchase of a bundle instead of à la *carte* services from the same provider—combining mobile voice

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[116] *See* J. Gregory Sidak, *Do Free Mobile Apps Harm Consumers?*, 52 San Diego L. Rev. 619, 627–28 (2015); J. Gregory Sidak, *An Antitrust Rule for Software Integration*, 18 Yale J. on Reg. 1, 15–17 (2001); *see also* Direct Testimony of Professor Richard L. Schmalensee on behalf of Microsoft Corp. ¶ 241, United States v. Microsoft Corp., No. 98-1233 (D.D.C. 1999) (applying this rationale to bundling of web browsers and operating systems).

[117] *See* Sidak & Spulber, *supra* note 68, at 20; John C. Panzar & Robert D. Willig, *Economies of Scope*, 71 Am. Econ. Rev. 268, 268 (1981).

[118] Sidak & Spulber, *supra* note 68, at 22 ("[A]lthough natural monopoly implies economies of scope, the converse is not the case. Most multiproduct firms derive economies of scope from joint production; it is a primary motivation for companies to diversify their product offerings. That achievement of economies of scope does not imply that those companies could serve their entire markets at lower cost than two or more firms.").

services and mobile data services likely decreases the cost of billing, customer service, and monitoring. This efficiency unambiguously benefits consumers, because a profit-maximizing firm in virtually any real-world market decreases prices when its costs decrease.

The analysis of the firm's cost of producing a bundle also implicitly answers the question of *who*—the producer or the consumer—is the more efficient integrator of individual functionalities. Although it might be *feasible* for the consumer to integrate separate functionalities, the consumer might not be the lowest-cost integrator. In other words, the cost to the consumer of combining the two products after purchasing the products à la carte might exceed the cost to the producer of combining the same two products in a bundle. The superior efficiency of the producer is a factual question whose answer depends on economies of scale and scope, as well as learning-by-doing effects that allow the producer's unit cost of product integration to fall over time, with its level of cumulative output. Lifting limitations on bundling thereby increases economic efficiency by allowing the producer to integrate separate functionalities when it is the least-cost integrator. Moreover, the cost of integration might be higher for some consumers—for example, older consumers who are less familiar with mobile technology—than for others. Restricting the availability of bundles to those consumers harms those consumers and decreases economic efficiency.

Moreover, it is almost tautological that restrictions on Claro's bundling options would restrict consumers' options for purchasing mobile services in Colombia. Prohibiting Claro from selling any bundles whatsoever would restrict consumer choice by limiting consumers' options for bundled services to those provided by Telefónica and Tigo. Regulatory limits on Claro's ability to provide bundled services—whether indirectly, through the prohibition on differential on-net and off-net pricing, or through direct restrictions—dampen competition in Colombian mobile services.

Restrictions on Claro's ability to bundle reduce competitive pressure on Telefónica's and Tigo's bundled offerings. All other factors held constant, prohibiting Claro from offering bundled services would increase the prices that Telefónica and Tigo charge for their bundles and reduce innovation in bundles of mobile services.[119] The CRC should instead promote competition

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[119] If bundled mobile services constitute a separate product market from the markets for mobile voice and mobile data services, Tigo's request might constitute an attempt to monopolize that market. For an analysis of bundled telecommunications services as a separate product market in the wireline context, see Pedro Pereira, Tiago Ribeiro & João Vareda, *Delineating Markets for Bundles with Consumer Level Data: The Case of Triple-Play*, 31 Int'l J. Indus. Org. 760 (2013).

and consumer welfare by permitting Claro to compete fully with Telefónica and Tigo in the provision of bundles of mobile services.

III. The Fedesarrollo Report's Flawed Analysis of Colombian Telecommunications

The Fedesarrollo report purports to reveal a lack of competition in Colombian mobile voice and mobile data services that supposedly has deprived Colombian consumers of substantial consumer welfare. Fedesarrollo's simplistic analysis is fundamentally flawed. The report's flawed sample selection, its misuse of data inputs, and its error-ridden methodology render Fedesarrollo's empirical results meaningless.[120]

A. *Problems with the Selection of Supposedly "Comparable" Countries*

The Fedesarrollo report identifies as supposedly "comparable" to Colombia all countries with gross national income (GNI) per capita (PPP) within 20 percent of Colombia's.[121] Although the Fedesarrollo report also compares Colombia to OECD countries and to Latin American countries, its analysis of welfare effects relies exclusively on the sample of countries with supposedly similar per capita income.[122] However, choosing countries solely on the basis of per capita GNI does not ensure that those countries are truly comparable with respect to their telecommunications markets. Among other factors, a country's geography and demography can affect the development of telecommunications markets. For example, it might be more profitable for a mobile operator to build its network in a densely populated country than in a sparsely populated country. Those factors will affect entry decisions, investment decisions, and pricing decisions by operators in each country. As I explain in Part III.C, the Fedesarrollo report makes no attempt to control for demand and cost factors *within* its sample. Therefore, the only opportunity for the report's price-comparison methodology to even approach an inference about consumer welfare is through a strictly comparable sample. However, analysis of the countries in Fedesarrollo's GNI-based sample reveals that they are not comparable to Colombia in terms of demand and cost factors that substantially affect prices in mobile services.

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[120] By letter dated November 25, 2015, I requested that Fedesarrollo make available the data and computer programs upon which it relied in its study to enable me to replicate and analyze the study's reported results. I received no response from Fedesarrollo, despite the fact that it is common and accepted practice in academic and policy debates for an economist to share such data. I therefore analyze the Fedesarrollo report on the basis of publicly available data and the Fedesarrollo report's limited explanations of its methodology.

[121] 2015 Fedesarrollo Study, *supra* note 1, at 5.

[122] *Id.* at 44–48.

First, Fedesarrollo's GNI-based sample includes countries whose populations differ substantially from Colombia's. Colombia had a population of 47.2 million as of July 2016.[123] Almost half of the 15 countries in the GNI-based sample (Albania, Bosnia and Herzegovina, Costa Rica, Jordan, Serbia, Macedonia, and Mongolia) have a population of less than 10 million.[124] In contrast, the population of every country in the sample that I use for my benchmark prices analysis exceeds 10 million.[125] The Fedesarrollo sample also includes China, which has a population of approximately 1.374 billion—over 25 times the population of Colombia.[126] Many of these countries share no other relevant characteristics with Colombia, such that a price comparison is essentially meaningless. For example, outside of per capita GNI, Colombia has little in common with Mongolia. When fixed costs of entry exist, such as licensing costs or spectrum acquisition, a country with a low population is less likely to offer sufficient expected operating profits to encourage entry. In addition, a country's total population affects investment in network equipment that is subject to large economies of scale. In particular, if the minimum efficient scale for providing network-based mobile services exceeds the population of a country, a potential mobile network operator has less incentive to invest in that country. Extreme population differences between countries therefore render simple comparisons of those countries' mobile prices uninformative.

Fedesarrollo also fails to consider other population characteristics that likely affect prices for mobile services, such as population density and its variance, population growth, and the geographic distribution of a country's population. Measures of population density and its variance affect costs through economies of density: it is more difficult to build a mobile network in a sparsely populated county than in a densely populated country, all other factors held constant. The rate of population growth (or decline) might affect scale-sensitive investments, which, in turn, affect the mobile network operator's costs. The distribution of population within a country affects the cost of reaching a given percentage of the population or reaching targeted groups, such as high-income consumers. By failing to incorporate the density, growth, and distribution of population in each country in its sample selection, Fedesarrollo further limited the sample's comparability.

The Fedesarrollo sample also includes countries whose individual characteristics limit their comparability to Colombia. For example, Egypt experienced a revolution (2012) and a military coup (2013) during the time

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123   *The World Factbook*, CENTRAL INTELLIGENCE AGENCY, https://www.cia.gov/library/publications/the-world-factbook/rankorder/2119rank.html.

124   *Id.*

125   *Id.* The two smallest countries in my sample, Greece and Portugal, each had a population of approximately 10.8 million in July 2015.

126   *Id.*

period in which Fedesarrollo calculated mobile price changes.[127] Because of Egypt's political instability, it is not comparable for purposes of evaluating Colombia's mobile markets.

In addition, the Fedesarrollo report excludes some of the countries most comparable to Colombia: Latin American countries that share its income and population distribution characteristics. My sample includes four Latin American countries (Argentina, Chile, Brazil, and Mexico) that the Fedesarrollo sample excludes. Each of those countries has a per capita GDP and a percentage of its population within an urban area that fall within one standard deviation of Colombia's. By excluding those comparable countries, which are also likely to share demographic, cultural, and geographic factors that might affect the markets for mobile services, Fedesarrollo further limits the value of its price comparison.

By choosing countries based entirely on a measure of per capita income, Fedesarrollo completely ignores the supply side of the market. Income affects the *demand* for mobile services but has little effect on the costs of providing service. By failing to identify countries with similar cost factors and ignoring demand factors other than per capita GNI, Fedesarrollo selected an inappropriate sample of supposedly "comparable" countries. Fedesarrollo's failure to disaggregate price differences due to competition from price differences due to those demand and cost factors renders baseless its conclusions about consumer welfare loss.

B. The Incorrect Use of Demand Elasticity Estimates That Generate Unreliable Welfare Effects

The Fedesarrollo report uses estimated demand elasticities and estimated price changes to calculate the purported effect of a given change in the price of Colombian mobile services on consumer welfare.[128] However, both the inputs and the methodology that the report uses to calculate that welfare effect are incorrect and render the estimated effects meaningless.

One fundamental source of inaccuracy in the Fedesarrollo report's welfare loss estimates is the mobile service basket that it uses as a measure of mobile voice prices. The Fedesarrollo report calculates welfare loss on the basis of the difference between the change in the price of mobile voice services in Colombia from 2010 to 2013 and the average change in the price of mobile voice services in supposedly "comparable" countries over the same time period.[129] The calculation uses estimated prices for a standard basket of mobile services published by the International Telecommunication Union

[127] *The World Factbook: Egypt—Background*, Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/eg.html (last updated Sept. 28, 2016).

[128] 2015 Fedesarrollo Study, *supra* note 1, at 44–48.

[129] *Id.* at 44–46.

(ITU).[130] The report does not explain why this representative basket is appropriate for Colombia, where the average consumer of mobile voice services uses more than 12 times as many minutes as does the average user in the sample of supposedly comparable countries that Fedesarrollo uses in its welfare calculation.[131] Because usage in Colombia so significantly exceeds usage in the set of supposedly "comparable" countries, the ITU's standard basket of mobile services is unlikely to represent accurately the distribution of mobile calls and the prices that consumers pay in Colombia. Analysis of voice revenue per minute, which captures differences in usage across countries, reveals flaws in the Fedesarrollo report's use of the ITU mobile basket—a simplistic measure that incorporates only the advertised price for a set of 30 prepaid calls and 100 text messages.[132] For example, data regarding voice revenue per minute are available in only 6 of the 15 countries listed as supposedly "comparable" on the basis of per-capita GNI.[133] From 2010 through 2013, prices in China fell by 0.93 percent on the basis of voice revenue per minute.[134] In contrast, the price of the ITU mobile basket in China, measured as a percentage of per capita GNI, fell by 63.0 percent from 2010 through 2013.[135] Similarly, whereas voice revenue per minute fell by 21.4 percent in Peru, the price of the ITU mobile basket, measured as a percentage of per capita GNI, fell by 80.4 percent.[136] In six of the seven countries (including Colombia) for which voice revenue per minute is observed, the change in price of the ITU

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[130] *Id.* at 11.

[131] Fedesarrollo reports that, on average, a Colombian user of mobile voice services uses 1,183 percent more minutes than does the average user in Fedesarrollo's comparable-sample. *Id.* at 10–11. Thus, the average user in Colombia uses 12.83 times more minutes than does the average user in the comparable-GNI countries.

[132] International Telecommunication Union, Measuring the Information Society Report 2014, at 232 (2014), https://www.itu.int/en/ITU-D/Statistics/Documents /publications/mis2014/MIS2014_without_Annex_4.pdf.

[133] Of Fedesarrollo's 15 "comparable" countries, China, Egypt, Indonesia, Peru, South Africa, and Thailand are included in the dataset. Albania, Bosnia and Herzegovina, Costa Rica, Dominican Republic, Ecuador, Jordan, Serbia, Macedonia, and Mongolia are not included in the dataset. 1Q2015 Global Wireless Matrix, *supra* note 2, at 201.

[134] Average VRPM in China was $0.0148 in 2010 and $0.0146 in 2013. *Id.* at 220–21. Thus, the percentage decrease in VRPM was 0.93 percent (that is, ($0.0146 – $0.0148) ÷ $0.0148 = –0.93 percent).

[135] The price of the ITU mobile cellular basket in China as a percentage of per capita GNI was 2.00 percent in 2010 and 0.74 percent in 2013. International Telecommunication Union, Measuring the Information Society 2011, at 68–69 (2011), http://www.itu.int/net/pressoffice/backgrounders/ general/pdf/5.pdf; International Telecommunication Union, Measuring the Information Society Report 2014, *supra* note 132, at 113. The price of the basket in China as a percentage of per capita GNI therefore decreased by 63 percent between 2010 and 2013 (that is, (0.74 percent – 2.00 percent) ÷ 2.00 = –63.0 percent).

[136] Average VRPM in Peru was $0.071 in 2010 and $0.056 in 2013. 1Q2015 Global Wireless Matrix, *supra* note 2, at 266–67. Thus, the percentage decrease in VRPM was 21.4 percent (that is, ($0.056 – $0.071) ÷ $0.071 = –21.4 percent). The price of the ITU mobile cellular basket in Peru as a percentage of per capita GNI was 12.40 percent in 2010 and 2.43 percent in 2013. International Telecommunication Union, Measuring the Information Society 2011, *supra* note 135, at 68–69; International Telecommunication Union, Measuring the Information Society Report 2014, *supra* note 132, at 113. The price of the basket in Peru as a percentage of per capita GNI therefore decreased by 80.40 percent between 2010 and 2013 (that is, (2.43 – 12.40) ÷ 12.40 = –80.4 percent).

mobile basket exceeds (in absolute terms) the change in price based on voice revenue per minute from 2010 through 2013.[137] Such discrepancies between (1) the change in voice revenue per minute—which incorporates the full range of usage—and (2) the change in the price of the ITU mobile baskets—which the Fedesarrollo report uses—render the Fedesarrollo report's welfare conclusions unreliable.

In addition, the ITU mobile basket's construction causes it to be a poor measure of prices that Colombian consumers pay and therefore a poor basis for estimating the welfare effects of changes in the price of mobile voice services. First, the ITU mobile basket uses only the price that the largest operator (that is, the operator with the most subscribers) in each country charges,[138] which might distort comparisons of prices charged in different countries. For example, in Indonesia, the largest mobile operator, Telkomsel, had voice revenue per minute of 390 Indonesian rupiahs (IDR) in 2013.[139] Telkomsel's competitors Indosat and Axiata had voice revenue per minute of only 133 IDR and 72 IDR, respectively.[140] The national average voice revenue per minute, weighted by market share, was 253 IDR.[141] It is therefore unlikely that the prices that Telkomsel charges are representative of average mobile voice prices in Indonesia. Likewise, when prices within a country vary by region, the ITU uses prices in the capital city or the largest city to represent national prices.[142] That simplification presents a similar problem: there is no reason to believe that mobile prices in a country's capital city or largest city, where cost of service is likely lower and more mobile operators might provide competing services, is representative of countrywide mobile prices.[143] The ITU's determination of the price for the basket of mobile services in each country assumes that the price that the largest national operator charges in the largest city represents the national price (even if the largest national

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[137] *See* 1Q2015 Global Wireless Matrix, *supra* note 2, at 220–21 (China), 222–23 (Colombia), 226–27 (Egypt), 240–41 (Indonesia), 266–67 (Peru), 276–77 (South Africa), 286–87 (Thailand); International Telecommunication Union, Measuring the Information Society 2011, *supra* note 135, at 68–69; International Telecommunication Union, Measuring the Information Society Report 2014, *supra* note 132, at 113.

[138] International Telecommunication Union, Measuring the Information Society Report 2015, at 211 (2015), http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2015/MISR2015-w5.pdf.

[139] 1Q2015 Global Wireless Matrix, *supra* note 2, at 241.

[140] *Id.*

[141] *Id.*

[142] International Telecommunication Union, Measuring the Information Society Report 2015, at 211 (2015), http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2015/MISR2015-w5.pdf.

[143] The ITU does not ensure that the prices it collects from countries by questionnaire are prices that are uniform across regions of the country. *See* International Telecommunication Union, ITU ICT Price Basket Questionnaire 2015—Sample Questionnaire (2015), https://www.itu.int/en/ITU-D/Statistics/Documents/datacollection/ITU_IPBQ_2015.pdf ("Please provide the prepaid tariffs in national currency of the operator with the largest market share (as measured by the total number of subscriptions). If prices vary between regions of the country, provide the tariffs that apply to the largest city.").

operator is not the largest operator in that city). The Fedesarrollo report fails to explain why such prices are accurate inputs for an analysis of prices in an entire country, no less for comparing prices across countries.

In addition, the ITU mobile basket excludes promotional prices. The ITU mobile basket is helpful as a snapshot of the prices of telecommunications products in a given country at a given point in time, but it is not an accurate input for a rigorous examination of consumer welfare. Estimates of consumer welfare implicitly assume that the prices measured are the prices that consumers pay. Any serious economic inquiry into consumer welfare must accurately measure those prices. A consumer-welfare analysis that relies on slapdash heuristics produces meaningless results.

Fedesarrollo uses a different, but also flawed, methodology for estimating consumer welfare loss in the market for mobile data services. Instead of comparing the *change* in prices in Colombia and supposedly comparable countries, Fedesarrollo's mobile data analysis simply compares price levels in 2014.[144] The Fedesarrollo report does not explain why it used one method for mobile voice services and a different method for mobile data services.

The Fedesarrollo report uses outdated estimates of the price elasticity of demand for mobile voice services and mobile data services to estimate the effect of its (inconsistently measured) price differentials for each type of service on consumer welfare in Colombia. The consumer-welfare analysis uses estimates of price elasticity of demand for mobile voice minutes and mobile data subscriptions from previous CRC studies.[145] The use of those estimates creates additional inaccuracies in the Fedesarrollo report. For example, the CRC generated the estimate of price elasticity of demand for mobile data that the Fedesarrollo report uses on the basis of data from 2008 to 2011.[146] Using the same ITU data that Fedesarrollo used to estimate mobile data market penetration, in 2008, 0.35 percent of Colombian consumers had a mobile data subscription.[147] By 2011, that percentage had increased to 6.5 percent.[148] Mobile broadband penetration exceeded 44 percent in the first quarter of 2016.[149] As markets evolve, consumer preferences also evolve. The market for

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[144] 2015 Fedesarrollo Study, *supra* note 1, at 47. Unlike my 2007 analysis of benchmark prices for mobile services in Ireland with Jerry Hausman, which used prices for a single year, the Fedesarrollo report's analysis of welfare loss in the market for mobile data services makes no attempt to control for any factors that affect prices (other than, indirectly, GNI). *See id.*; Jerry A. Hausman & J. Gregory Sidak, *Evaluating Market Power Using Competitive Benchmark Prices Instead of the Herfindahl-Hirschman Index*, 74 Antitrust L.J. 387, 404 (2007).

[145] 2015 Fedesarrollo Study, *supra* note 1, at 46–47.

[146] *Id.* at 47.

[147] International Telecommunication Union, ICT World Indicators Database 2015 (19th ed.) [hereinafter ITU Indicators 2015].

[148] *Id.*

[149] In the first quarter of 2016, there were 21,074,469 mobile broadband subscriptions in Colombia. MINTIC Bulletin 1Q16, *supra* note 32, at 25. The population of Colombia was approximately 47,220,856 in July 2016. *The World Factbook*, *supra* note 123. Mobile broadband penetration in Colombia was therefore approximately 44.6 percent (that is, 21,074,469 ÷ 47,220,856 = 44.6%) in 2016.

mobile data services today is very different from the market for mobile data services in 2008. It is therefore incorrect, as a matter of economic analysis, to assume that the same price elasticity of demand that was appropriate for estimating how demand for mobile data services would respond to a price change when mobile penetration increased from 0.35 percent to 6.5 percent is still appropriate when mobile penetration exceeds 44 percent—which is over six times greater than the highest penetration rate observed in the CRC study.[150] Mobile penetration in Colombia has increased by two orders of magnitude, with 135 subscribers in 2016 for every subscriber in 2008.[151] Elasticity estimates based on data from 2008 through 2011 are unreliable for purposes of analyzing the current market.

In sum, the Fedesarrollo report's estimates of welfare losses in Colombia are so fundamentally flawed that they are meaningless. The Fedesarrollo report uses inappropriate inputs in an unexplained calculation. There is no simple fix for the flaws in the Fedesarrollo report's methodology. Moreover, even if one could correct Fedesarrollo's methodology, the Fedesarrollo report selects its set of supposedly "comparable" countries using an unreliable and incorrect methodology.

C.   *The Use of Price Comparisons Without Necessary Adjustments for Cost of Service or Demand in Colombia*

The Fedesarrollo report purports to calculate welfare loss in Colombia on the basis of differences in prices between Colombia and supposedly "comparable" countries.[152] As I explained in Part III.A, those countries are poorly selected. Fedesarrollo makes no attempt to identify countries in which the costs of providing mobile services are similar to Colombia's or countries that share demand characteristics with Colombia (other than per capita income). More important, Fedesarrollo makes no attempt to control for variation in those demand and cost factors within its sample. Without such adjustments, Fedesarrollo's price comparison is meaningless.

A simple price comparison can provide no evidence of market failure or market power unless costs are similar in the compared markets. As a

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[150]   Robert S. Pindyck & Daniel L. Rubinfeld, Microeconomics 33 (Pearson Prentice Hall 6th ed. 2005) ("[T]he price elasticity of demand must be measured *at a particular point on the demand curve*.") (emphasis in original). Given the substantial changes in mobile data consumption in Colombia from 2008 through 2015, it is likely that the demand curve for data has shifted out, due to increased availability (and affordability) of complementary products, such as smartphones or mobile applications. Therefore, not only are the estimates based on usage from 2008 through 2011 at an incorrect point on the demand curve, but those estimates are also likely based on an entirely different demand curve.

[151]   There were 156,610 mobile data subscriptions in Colombia in 2008. *See* ITU Indicators 2015, *supra* note 147. There were approximately 21 million mobile data subscriptions in Colombia in the first quarter of 2016. MINTIC Bulletin 1Q16, *supra* note 32, at 25. Subscriptions therefore increased by a factor of 134.6 (that is, 21,074,469 ÷ 156,610 = 134.6).

[152]   2015 Fedesarrollo Study, *supra* note 1, at 44–48.

matter of elementary economics, prices are determined by the interaction between consumers' demand functions and producers' cost functions. As costs increase, profit-maximizing prices increase in virtually any real-world market.[153] Even if two markets share exactly the same demand function and contain identical firms offering identical products, a higher price will prevail in the market with higher costs.[154]

Traditional measures of market power recognize the role of costs in determining market prices.[155] For example, the Lerner Index is a commonly used measure of market power.[156] The Lerner Index for a particular firm is equal to the difference between the firm's price and its marginal cost, as a percentage of the firm's price.[157] As a firm's market power increases, its Lerner Index also increases. The Lerner Index is a useful measure of market power because it can be estimated from the price elasticity of demand for the firm's product.[158] A profit-maximizing firm will set its price such that the Lerner Index is equal to the negative reciprocal of that demand elasticity.[159] The economic theory underlying the Lerner Index demonstrates that, to infer market power using prices, one must also analyze costs.[160] Comparing prices in isolation, as the Fedesarrollo report does, reveals no information about market power or market performance.[161]

In addition, even if Fedesarrollo were to control for cost factors, its price comparison would not be evidence of a market failure in Colombian mobile services. Fedesarrollo's sample selection fails to ensure that its supposedly "comparable" countries have demands-ide characteristics similar to Colombia's. The only such characteristic that Fedesarrollo incorporates into its analysis is per capita income. There exist sufficient data to estimate prices in mobile markets such that a cross-country comparison accounts for demand and cost differences between countries.[162] Ultimately, a simplistic price comparison of countries that share only similar per-capita GNI is not sufficient to support an inference of market failure in mobile services in Colombia.

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[153] *See, e.g.*, Pindyck & Rubinfeld, *supra* note 150, at 291–92, 346.

[154] *See, e.g.*, *id.*

[155] *See, e.g.*, Carlton & Perloff, *supra* note 110, at 642–43.

[156] *Id.* at 278.

[157] *Id.* at 284.

[158] *Id.* at 278, 643.

[159] *See id.*

[160] *See, e.g.*, Hausman & Sidak, *supra* note 144, at 388 n.6, 401.

[161] The Fedesarrollo report does not use (or purport to use) the Hausman-Sidak method of analyzing competitive benchmark prices. 2015 Fedesarrollo Study, *supra* note 1, at 44–48.

[162] *See, e.g.*, Jerry A. Hausman & Agustin J. Ros, *An Econometric Assessment of Telecommunications Prices and Consumer Surplus in Mexico Using Panel Data*, 43 J. Reg. Econ. 284 (2013).

D. Flawed Data and Inconsistent Use of Data

In addition to containing methodological flaws, the Fedesarrollo report misuses and misrepresents data on Colombian mobile services. As I explained in Part III.B, the Fedesarrollo report uses the price of the ITU mobile services basket as its measure of price for computing consumer-welfare effects in mobile voice services. For the reasons I have explained, the ITU's mobile basket price is a poor tool for measuring or estimating consumer welfare. Likewise, for its estimates of the consumer-welfare effects from competition in mobile data services, Fedesarrollo uses a price basket for mobile internet based on its own search of mobile operators' websites.[163] Fedesarrollo never presents a table or appendix that lists those prices, nor does Fedesarrollo offer sufficient detail on how it calculated the price of the "mobile internet baskets" that it purports to compare across countries.[164] Consequently, it is impossible to assess the accuracy and reliability of Fedesarrollo's data inputs.

Moreover, advertised prices are an appropriate proxy for prices only if they reflect the actual prices that consumers pay. Fedesarrollo implicitly assumes that advertised prices are actual price, yet it makes no attempt to substantiate that critical assumption. If a significant percentage of mobile consumers purchase data as part of a bundle of services, then the advertised prices for stand-alone data service might not accurately reflect the prices that consumers actually pay. Thus, even if it is not possible to get a complete understanding of Fedesarrollo's mobile data basket—due to Fedesarrollo's omission of the details of how it calculated the price of the basket—the basket is likely an unreliable measure of price. Even if Fedesarrollo employed a more rigorous methodology for computing consumer welfare loss, its flawed measures of the prices of mobile voice and mobile data services would render its conclusions unreliable.

In addition to using inaccurate measures to estimate consumer-welfare effects, Fedesarrollo presents misleading data in its descriptions of Colombia's mobile markets. For example, Graph 1 on page 8 of the Fedesarrollo report shows that Colombia's mobile penetration rate was 116.1 percent (meaning 116 mobile subscribers for every 100 inhabitants) in 2014.[165] However, on the very next page, Fedesarrollo compares Colombia's mobile penetration rate to the average rate in its set of supposedly "comparable" countries and includes data only through 2013, when the penetration rate in Colombia was 104.1 percent.[166] By stopping one year earlier, Fedesarrollo obscures the 12-percentage-point increase in mobile penetration in Colombia from 2013

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[163] 2015 FEDESARROLLO STUDY, *supra* note 1, at 47.
[164] *Id.*
[165] *Id.* at 8.
[166] *Id.* at 9.

to 2014. Why? That inconsistency overstates the difference between mobile penetration in Colombia and supposedly "comparable" countries, which Fedesarrollo presents as having an average penetration rate of 117.6 percent in 2013.[167]

In addition to presenting misleading and inconsistent data, the Fedesarrollo report presents its data without any context. Fedesarrollo's examination of call quality shows that approximately one percent of calls were dropped for each Colombian operator between the fourth quarter of 2012 and the third quarter of 2014.[168] However, Fedesarrollo never provides any context to show whether this percentage is higher or lower than dropped call rates in other countries, and it never reaches any conclusions about how the dropped call rates reflect the quality of service in Colombian mobile markets. Yet, without conducting any analysis of Colombia's dropped-call rates relative to the rates in other countries, Fedesarrollo says in the introduction to its report that the market exhibits "low quality."[169] Yet regulators commonly cap the permissible rate of dropped calls at 2 percent of all calls—twice the rate that Fedesarrollo cites for Colombian operators.[170] Fedesarrollo never compares Colombian call quality to that in its set of supposedly "comparable" countries, which makes a comparison of quality-adjusted prices impossible.

Similarly, Fedesarrollo identifies, but does not consider in its analysis, that mobile voice usage in Colombia exceeded usage in OECD countries by 54 percent, usage in Latin American countries by 175 percent, and usage in supposedly "comparable" countries by 1183 percent.[171] Fedesarrollo fails even to consider the economic effects of a level of demand for mobile voice usage in Colombia that exceeds usage in Fedesarrollo's supposedly "comparable" countries by an order of magnitude. A substantially greater quantity demanded for mobile voice services in Colombia indicates that either (1) the demand for mobile voice services is substantially greater in Colombia than in supposedly "comparable" countries or (2) the quality-adjusted price is much lower in Colombia than in supposedly "comparable" countries. Fedesarrollo attempts to portray the Colombian mobile market as broken and in need of immediate policy intervention; but to do so, Fedesarrollo completely ignores

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[167] *Id.*

[168] *Id.* at 16.

[169] *Id.* at 5.

[170] *See, e.g.*, *Telecoms Operators Not Meeting Standards on Call Drop Issue: Trai*, Gadgets 360 (July 22, 2015), http://gadgets.ndtv.com/telecom/news/telecom-operators-not-meeting-standards-on-call-drop-issue-trai-718373 (reporting that Indian mobile operators had dropped call rates that exceeded the Indian Telecom Regulatory Authority's 2-percent benchmark for Delhi and Mumbai); *NTC Quality of Service Benchmark Rates Smart vs. Globe*, GMA News Online (Nov. 14, 2012), http://www.gmanetwork.com/news/story/282209/scitech/technology/ntc-quality-of-service-benchmark-rates-smart-vs-globe (reporting that the two primary mobile operators in the Philippines had dropped call rates that exceeded the regulator's 2-percent cap).

[171] 2015 Fedesarrollo Study, *supra* note 1, at 10–11.

data that do not support its conclusions. Fedesarrollo's misuse and misrepresentation of data yields a biased and unreliable analysis of competition in Colombian mobile services.

IV. Policy Changes That Will Promote Competition in the Markets for Colombian Mobile Services

In this part, I develop policy recommendations on the basis of sound economic analysis. Instead of increasing regulatory distortions that harm consumers and granting greater regulatory rents to Telefónica and Tigo, the CRC should implement symmetric termination rates, end restrictions on differential on-network and off-network pricing, and hold unrestricted wireless spectrum auctions. Those policy changes will promote infrastructure-based competition and increase short-run and long-run consumer welfare in Colombian mobile services.

A. *Promoting Infrastructure-Based Competition*

In telecommunications regulation, the regulator often must choose between rules that maximize consumer welfare in the short run and rules that maximize consumer welfare in the long run. Some policies increase short-run consumer welfare by reducing prices, but decrease investment and long-run consumer welfare. For example, in the 1990s and 2000s, regulators in many countries tried to promote competition in wireline voice and data through mandatory unbundling of network elements. As I have explained in the past, those policies were generally unsuccessful.[172] Competition in wireline services increased consumer welfare only after facilities-based competition allowed wireline telephone providers and wireline television providers to compete for each other's consumers.[173]

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[172] *See* Hausman & Sidak, *supra* note 144 (arguing that the FCC's interpretation of the Telecommunications Act of 1996 with respect to the mandatory unbundling of network elements at regulated prices subordinated consumer welfare to the welfare of individual competitors); Thomas M. Jorde, J. Gregory Sidak & David J. Teece, *Innovation, Investment, and Unbundling*, 17 Yale J. on Reg. 1 (2000) (demonstrating that mandatory unbundling at prices computed on the basis of long-run incremental cost distorts investment incentives).

[173] *See, e.g.*, Jan Bouckaert, Theon van Dijk & Frank Verboven, *Access Regulation, Competition, and Broadband Penetration: An International Study*, 34 Telecomm. Pol'y 661 (2010); Walter Distaso, Paolo Lupi & Fabio M. Manenti, *Platform Competition and Broadband Uptake: Theory and Empirical Evidence from the European Union*, 18 Info. Econ. & Pol'y 87 (2006); Scott Wallsten, *Broadband and Unbundling Regulations in OECD Countries* (AEI-Brookings Joint Ctr., Working Paper No. 06-16, 2006); Harold Ware & Christian Dippon, *Wholesale Unbundling and Intermodal Competition*, 34 Telecomm. Pol'y 54 (2010); Scott Wallsten & Stephanie Hausladen, *Net Neutrality, Unbundling, and Their Effects on International Investment in Next-Generation Networks*, 8 Rev. Network Econ. 90 (2009).

Regulators face the same challenge today in mobile markets. Investment in infrastructure and new technologies is a necessary prerequisite for expanding access to mobile services, increasing service quality, and developing new services that will increase consumer welfare. Policies intended to increase retail competition in the short run, such as mandatory access to essential facilities at regulated prices, ultimately harm dynamic competition and decrease investment in the long run—whether or not they are successful in temporarily decreasing retail prices. For example, economists have observed this short-run gain and long-run loss as a result of many regulatory measures that make network infrastructure available to retail competitors.[174]

The policy recommendations that I propose in the following parts will increase Telefónica's, Tigo's, and Claro's incentives to invest in expanding and improving their network infrastructure and encourage facilities-based entry and expansion. By increasing spectrum access, removing artificial limits on mobile network operators' return on investment, and ending regulations that distort mobile network operators' pricing incentives, the CRC can decrease prices for existing mobile services, increase usage, accelerate the expansion of mobile access, and encourage the development of new mobile services in Colombia.

B.   Symmetric Termination Rates

To promote competition and increase consumer welfare in Colombia, the CRC should immediately implement symmetric MTRs. By ending Claro's artificial cost disadvantage (and its resulting loss of profit) from paying higher MTRs, symmetric MTRs will create efficient incentives for Claro to invest in network upgrades and expansions. Such investment will accelerate the development of telecommunications technologies and the expansion of mobile services to unserved areas of Colombia, which will increase the quality of telecommunications services and expand those services to more consumers. Further, by permanently implementing symmetric MTRs, the CRC will prevent mobile operators in Colombia from earning economic rents as a result of MTR regulation. Mobile operators will have an increased incentive to compete in the provision of telecommunications services to consumers, instead of investing resources to influence and exploit regulatory policies. Minimizing rent-seeking behavior will encourage competition and increase consumer welfare. The OECD has similarly observed that implementing

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[174] *See, e.g.*, J. Gregory Sidak & Andrew P. Vassallo, *Did Separating Openreach from British Telecom Benefit Consumers?*, 38 World Competition 31 (2015) (finding that the functional separation of Openreach from British Telecom generated short-run consumer benefits in the form of lower prices but also led to negative long-run effects on service quality that outweighed those short-term gains).

symmetric MTRs in Colombia could encourage competition in the retail segment and thus lower prices for consumers.[175]

Furthermore, as I explained in Part II.C, none of the conventional justifications for applying asymmetric MTRs—protecting entrants, balancing exogenous cost differences, and preventing firm exit—applies to Colombia. Consequently, immediately implementing symmetric MTRs in Colombia will unambiguously increase competition and consumer welfare.

C. Ending On-Network and Off-Network Pricing Restrictions

A common rationale for prohibiting differential pricing between on-network and off-network calls is that mobile entrants face a purported barrier to entry in the form of network effects (sometimes called club effects). In markets that are characterized by network effects, a consumer's utility from consuming a particular good increases with the number of other consumers also consuming the good. The asserted barrier to entry arises when an incumbent mobile operator charges a higher price for calls to other networks than it charges for calls to its own network. In this case, a consumer might be inclined to join the operator with the largest market share to maximize the number of calls that the consumer makes "on-net." Some commentators also argue that a larger operator can foreclose competitors by charging an excessively high off-net price relative to its on-net prices.[176] That pricing differential supposedly discourages calls made to the smaller networks and thereby decreases the surplus that consumers receive from subscribing to the smaller operator.

However, the idea that network industries are inherently prone to market failure and thus require external intervention proceeds from incorrect economic analysis.[177] A mobile operator can exploit network effects in a small network as easily as in large network. An empirical study by Daniel Birke and Peter Swann found that the number of subscribers to a network within one's own household or social circle was a much stronger determinant of one's choice of network than the total number of current subscribers to the network.[178] Birke and Swann found that, if one additional member of a consumer's household were to join the same network, the resulting marginal benefit to the consumer would equal the marginal benefit of adding roughly 9.2 million subscribers to the network (none of whom being a member of

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[175] 2014 OECD Report, *supra* note 47, at 70–71.

[176] Ángel L. López & Patrick Rey, *Foreclosing Competition Through Access Charges and Price Discrimination*, 64 J. Indus. Econ. (forthcoming 2016), http://www.tse-fr.eu/sites/default/files/TSE/documents/doc/by/rey/jie_style_foreclosing_2015_04_01.pdf.

[177] *See, e.g.*, Daniel F. Spulber & Christopher S. Yoo, Networks in Telecommunications: Economics and Law 119 (Cambridge Univ. Press 2009).

[178] Daniel Birke & G.M. Peter Swann, *Network Effects and the Choice of Mobile Phone Operator*, 16 J. Evolutionary Econ. 65, 82–84 (2006).

that consumer's household).[179] The study's results indicate that the potential benefit of a ban on on-net and off-net differential pricing is minimal. However, such a ban does cause substantial harm to consumer welfare through higher prices and reduced investment, as well as a transfer of wealth from poor consumers to wealthier consumers.[180] In Colombia, current regulations prohibit Claro from charging differential on-net and off-net prices.[181] Lifting that prohibition will reduce prices and encourage investment in the provision of Colombian mobile services.

1. *Decreasing Retail Prices*

Ending the ban on on-net and off-net differential pricing will decrease prices and increase competition in Colombian mobile services by ending the ban's distortions of Claro's pricing incentives. By currently forcing Claro to charge uniform prices, the differential pricing prohibition causes Claro to diverge from optimal pricing and, in turn, dulls the strategic response of Claro's competitors. It is textbook economics that a profit-maximizing firm that offers two products that have similar price elasticities of demand and different marginal costs will charge a higher price for the product with the higher marginal cost.[182] On-net and off-net price differentiation exemplifies such an outcome. Off-net calls have higher marginal costs than on-net calls, because they include mobile termination charges. The expected marginal cost of any call is a weighted average of the cost of the two types of calls—in other words, the expected marginal cost of any call falls between the cost of an on-net call and the cost of an off-net call. Under its current uniform-pricing requirement, Claro must base its pricing decisions on that weighted-average marginal cost. Consequently, the corresponding profit-maximizing uniform price is between the on-net price and the off-net price.

Prohibiting Claro from charging differential prices compels Claro to increase its price for on-net calls to that profit-maximizing uniform price. On-net calls typically form a disproportionate share of calls by any operator's subscribers.[183] That is, if an operator has a market share of 10 percent, for example, it is likely that greater than 10 percent of its calls are on-net. If each subscriber were to make his calls by randomly drawing recipients from the population of subscribers to all operators, then the share of an operator's calls made on-net would be equal to its market share. However, subscribers

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[179] *Id.* at 81–82.

[180] *See* Ros & Umaña, *supra* note 16, at 55 (finding that the regulation of Claro's off-net prices led to a loss of $100 million in consumer surplus in Colombian telecommunications from 2009 to 2011).

[181] *See* 2014 OECD Report, *supra* note 47, at 148.

[182] *See, e.g.*, Jean Tirole, The Theory of Industrial Organization 299 (MIT Press 1992).

[183] *See* Birke & Swann, *supra* note 178, at 73–76. Even in the absence of price differentials, Birke and Swann observe that a disproportionate share of calls is made to another subscriber on the same mobile network.

do not select recipients randomly. The consumer's choice of an operator is likely to be heavily correlated with the choices of other consumers within the same household, and, when coverage differences exist between operators, with the choices of other consumers within the same geographic region. The economic intuition underlying this finding is straightforward: a subscriber is more likely to call someone within his household or his town than a random subscriber. Consequently, an operator's expected percentage of on-net calls will exceed its market share. Therefore, banning on-net and off-net differential pricing increases the price that Claro charges for the majority of mobile calls on its network.

Claro's higher retail prices have the indirect effect of encouraging other operators to increase their own retail prices. When firms compete against one another by choosing prices, competitors will react to one firm's price increase by increasing their own prices.[184] Therefore, eliminating—through regulation—Claro's ability to price on-net calls below off-net calls has the perverse result of increasing retail prices for all operators in Colombia.

In addition, the differential-pricing prohibition prevents Claro from matching its competitors' offers of bundles of mobile services that include unlimited on-net calls. Analysis of Claro's, Telefónica's, and Tigo's mobile service offerings between 2013 and 2015 reveals that the three mobile network operators competed by developing new bundled offers and, in turn, matching their competitors' new bundled offers.[185] Both Telefónica and Tigo offer bundles that include unlimited on-net calls.[186] The asymmetric regulation of Claro's on-net and off-net pricing prohibits Claro from matching those offers: Claro may only offer unlimited calls to *all* networks, at a uniform price. By preventing Claro from matching Telefónica's and Tigo's bundled offers, the differential-pricing prohibition dampens competition between bundles of mobile services in Colombia. All other factors held constant, the differential-pricing prohibition increases the prices that Telefónica and Tigo will charge for bundles that include unlimited on-net calls.

Removing the current restriction on differential on-net and off-net pricing will decrease the prices that Claro and other operators charge for mobile services by ending the distortion to Claro's pricing incentives. That decrease in prices will accelerate the growth of mobile penetration, increase existing subscribers' use of mobile services, and increase consumer surplus.

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[184] *See* TIROLE, *supra* note 182, at 214–18.

[185] *See* Letter from Santiago Pardo Fajardo, Vice President of Regulatory Affairs and Institutional Relations, Comcel, to Juan Manuel Wilches Durán, Director, Commission for the Regulation of Communications 2–7 (Oct. 23, 2015) (on file with author).

[186] *Id.* at 2–4; *Tienda*, MOVISTAR, http://www.movistar.co/tienda/Open-Catalog/Planes/Para-movil/c/paraMovil?q=%3Aranking; *Paquetes*, TIGO, http://www.tigo.com.co/contenido/arma-tu-plan/paquetes.

2. *Encouraging the Expansion of Mobile Coverage*

Ending the current requirement that Claro charge the same price for on-net and off-net calls would increase Claro's incentives to invest in network expansion and operation in Colombia. As a matter of economic theory, forcing Claro to charge a uniform price for services having different marginal costs reduces its profits. That Claro has charged differential prices in the past indicates that differential pricing is more profitable than uniform pricing.[187] The decrease in Claro's expected profit from operating its mobile network under compulsory uniform pricing reduces Claro's incentives to invest in its operations in Colombia. Banning differential pricing for on-net and off-net calls therefore harms Colombian consumers in the long run through reduced investment.

Proponents of the current ban on differential pricing might argue that increased investment by Claro's competitors would offset the harm to consumer welfare. However, it bears emphasis that any increase in expected profit for Claro's competitors would be concentrated in major urban areas in which the three mobile network operators currently compete—that is, in areas where Telefónica and Tigo have an existing network. In contrast, in regions where Telefónica and Tigo do not currently offer coverage (or do not currently offer coverage of comparable quality to Claro's coverage), mobile subscribers are more likely to make on-net calls than would subscribers in regions where Telefónica and Tigo already have built out their networks.[188] Consequently, it is unlikely that a decrease in the price of off-net calls would affect those subscribers' choice of mobile operator in those regions where Telefónica and Tigo offer little or no coverage. Because the network effects are so weak in those regions, uniform pricing will not encourage consumers to switch operators. If, consistent with the findings of Birke and Swann, millions of subscribers would need to switch operators to generate the same effect as one household member's switching, it would be difficult for Telefónica or Tigo to generate enough additional subscribers to justify the requisite network expansion. Therefore, the current prohibition on differential pricing for on-net and off-net calls does not substantially increase Telefónica's and Tigo's expected profit in those regions. Without an increase in expected profit, the current differential pricing ban does not encourage Telefónica's or Tigo's network expansion.

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[187] *See, e.g.*, *FNE Pide Multa de US$ 4,5 Millones para Claro por Discriminar Tarifas On/Off Net*, TeleSemana, http://www.telesemana.com/blog/2014/01/30/fne-pide-multa-de-us-45-millones-para-claro-por-discriminar-tarifas-onoff-net/#sthash.U81gZxHw.dpuf.

[188] *See* Birke & Swann, *supra* note 178. The most important network effect is the effect within a household. In areas in which Claro is the only provider, any current subscribers within a household will necessarily be Claro subscribers.

Ending the ban on differential pricing would have a net positive effect on mobile operators' incentives to expand their mobile networks. With a higher expected profit from the expansion, Claro will be more likely to build its network in areas with no mobile coverage and to improve its existing network.

3.   *Decreasing Prices for Colombia's Poorer Consumers*

In addition to increasing incentives for investment, ending the ban on on-net and off-net differential pricing would decrease prices for users who make mostly on-net calls. As I explained in Part IV.C.2, subscribers in regions served only by Claro are likely to make a higher percentage of on-net calls than subscribers in regions served by multiple operators. The regions most likely to be served by Claro alone are the poorer, less populated regions of Colombia.[189]

The regions in which all three operators compete are largely urban.[190] For a subscriber in those regions, the ban on differential pricing might decrease the average price of a call, because the subscriber is more likely to make calls to other existing networks (compared with a subscriber in a rural region with only one operator). Uniform pricing therefore transfers wealth from subscribers in regions served only by Claro to Claro subscribers in regions served by multiple operators. Because Colombia's wealth is highly concentrated in urban areas, uniform pricing is a regressive policy that harms Claro's subscribers in the poorer regions of Colombia.[191] Ending the current ban on differential pricing would decrease prices and increase net consumer surplus for all consumers and, in particular, those consumers living in low-income, rural regions of Colombia.

D.   *Ending Restrictions on Spectrum Availability*

The Ministerio de Tecnologías de la Información y las Comunicaciones (MINTIC), the Agencia Nacional de Espectro (ANE), and the CRC should

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[189]   For example, in Colombia's poorest state, Vaupés, Claro's network coverage extends to the state capital, Mitú, three smaller municipalities, and some rural areas, whereas Telefónica's and Tigo's networks cover only Mitú. *See Cobertura Soluciones Móviles*, *supra* note 95; Áreas de Cobertura de los Servicios en Mapa Interactivo en WEB, *supra* note 95; *Cobertura de Tecnología*, *supra* note 95; Departamento Administrativo Nacional de Estadística, Cuentas Nacionales Departamentales de Colombia tab 4 (2015).

[190]   For example, all three operators have service in the ten most populous cities in Colombia. *See Cobertura Soluciones Móviles*, *supra* note 95; Áreas de Cobertura de los Servicios en Mapa Interactivo en WEB, *supra* note 95; *Cobertura de Tecnología*, *supra* note 95. The ten most populous cities in Colombia are Bogotá, Cali, Medellín, Barranquilla, Cartagena, Cucuta, Bucaramanga, Pereira, Santa Marta, and Ibagué. *Most Populated Cities in Colombia*, WorldAtlas.com (2015), http://www.worldatlas.com/sa/co/cities-in-colombia.html.

[191]   In 2015, one in four Colombians in urban areas lived in poverty, as compared with half of Colombians in rural areas, according to the United Nations. *See* Emmar Rosser, *Colombia Halved Poverty Levels over Past Decade: UN*, Colombia Reports, http://colombiareports.com/colombia-halved-poverty-levels-over-past-decade-un/.

remove or increase the caps on spectrum holdings for mobile network operators and immediately hold an open spectrum auction. The agencies should refrain from tying social programs to spectrum rights, imposing asymmetric restrictions on spectrum availability, and establishing asymmetric obligations for auction winners. Unrestricted spectrum auctions will increase competition and consumer welfare in Colombian mobile services.

The two main inputs in Colombian mobile services are network infrastructure and spectrum. The availability of those inputs affects mobile network operators' ability to enter and expand in Colombia. However, of those two inputs, only spectrum creates a constraint on competition in mobile services. All operators can readily increase their network infrastructure through investment, and the three primary mobile network operators in Colombia have ample access to capital and funding from their large parent companies.

In contrast, the Colombian government controls the availability and allocation of spectrum. Columbia first auctioned spectrum in 1993.[192] However, until recently, Colombia's spectrum auctions have been "beauty contests" that select winners based on government-determined criteria, rather than true auctions in which the highest bidder receives the spectrum award.[193] In addition, in three allocations between 2004 and 2009, the Colombian government directly assigned spectrum to existing mobile network operators.[194] In Colombia's most recent spectrum auction, in May 2013, the government imposed asymmetric obligations on recent entrants and incumbents, established a spectrum cap for all operators, and excluded Claro from bidding for the lower-frequency spectrum blocks.[195] Obligations for spectrum winners in the 2013 auction included (1) bearing the cost of migrating government users to other spectrum blocks; (2) covering all municipalities within five years (for incumbents) or the 50 largest municipalities and government capitals (for entrants); (3) sharing passive infrastructure; (4) providing national roaming at regulated rates; and (5) providing free tablets with educational apps and training to low-income students.[196] The proposal that the MINTIC published for the 2016 spectrum auction also considers imposing conditions on auction winners.[197]

In addition to imposing these conditions that auction winners must satisfy, spectrum rights in Colombia are subject to caps. Each of the three primary mobile network operators in Colombia has reached or approaches its spectrum cap—which also applies to the forthcoming 2016 auction—in at

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[192] 2014 OECD Report, *supra* note 47, at 94.
[193] *Id.*
[194] *Id.*
[195] *Id.* at 95.
[196] *Id.*
[197] MINTIC Spectrum Proposal, *supra* note 65, at 79.

least one spectrum band.[198] Each operator may hold a maximum of 30 MHz of spectrum in low-frequency bands and 85 MHz of spectrum in high-frequency bands.[199] Claro and Telefónica each hold 25 MHz of low-frequency spectrum—only 5 MHz below the spectrum cap.[200] As I explained in Part II.C.1, Tigo's spectrum holdings in the high-frequency bands now exceed the 85-MHz cap as a consequence of its merger with UNE, and Tigo must return its 50 MHz of spectrum in excess of the cap to the government.[201]

Ending restrictions on spectrum availability will encourage investment in, expansion of, and entry into Colombian mobile services. As I explained in Part II.E, releasing more spectrum to mobile network operators will increase consumer welfare and investment in Colombian mobile services and produce revenue for the Colombian government. However, it also bears emphasis that an unrestricted auction will produce greater increases in competition and consumer welfare than will an auction that limits spectrum acquisition using spectrum caps and asymmetric obligations for auction winners.

To the extent that spectrum caps and obligations affect all mobile network operators similarly, those features of a spectrum auction decrease consumer welfare and government revenues in a straightforward way: by artificially decreasing the total amount of spectrum acquired and exploited or the price that spectrum operators pay for that spectrum. For example, tying spectrum rights to unrelated obligations such as social programs decreases mobile network operators' incentives to acquire spectrum by artificially increasing its cost. Imposing obligations on spectrum acquisition constitutes a tax on the socially productive activity of expanding mobile networks.[202] Colombia should eliminate that tax.

Spectrum caps can also discourage entry into and expansion of Colombian mobile services, and they can limit government revenues from spectrum auctions. For example, in Mexico's Tender 21 spectrum auction, spectrum caps that prevented the three largest mobile network operators from bidding on nationwide spectrum led to high prices for regional spectrum and unclaimed nationwide spectrum. In Tender 21, the Mexican government auctioned two nationwide blocks of 30 MHz, along with an additional 30 MHz by region, broken into three blocks of 10 MHz in each region.[203] The Mexican telecommunications regulator, Cofeco, had set spectrum caps that prevented the three largest Mexican operators (Telcel, Movistar, and Iusacell) from

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[198] *Id.* at 22, 76.

[199] *Id.* at 22.

[200] *Id.*

[201] *Id.*; *UNE devolverá tres bandas de espectro a la Nación tras fusión con Tigo*, *supra* note 65.

[202] *See, e.g.*, Hazlett, Muñoz & Avanzini, *supra* note 93, at 120.

[203] Ramiro Tovar Landa, Spectrum Auction Tragedies: The Case of the Mexico Spectrum Auction for AWS Services 1 (Aug. 30, 2010) (unpublished manuscript), http://ssrn.com/abstract=1667950.

bidding on the nationwide blocks of spectrum.[204] The spectrum caps were intended to promote entry into the mobile market.[205] Instead, the caps only limited the spectrum available to Mexican phone subscribers and might have had the unintended effect of stifling competition. Only Nextel qualified as a bidder for the nationwide blocks; it received one block for the minimum price of 180.3 million MXN.[206] The other nationwide block went unassigned, as there were no bidders for it. Meanwhile, the 30 MHz that the Mexican government auctioned by region in 10 MHz blocks sold for more than 5.1 billion MXN.[207] As a result of the flawed auction design of Tender 21, not only did no new entry occur, but 30 MHz of spectrum also went unassigned and is not available for use by any mobile telephone operator in Mexico.

Tender 21 in Mexico shows how spectrum auction design and limits on spectrum availability by themselves can discourage entry and expansion. Moreover, *asymmetric* obligations or restrictions on auction participation cause additional losses to consumer welfare by decreasing productive efficiency and distorting competition in Colombian mobile services. Absent asymmetric obligations or restrictions, a spectrum auction will allocate each block of spectrum to the operator that can produce the most economic surplus with the spectrum—that is, the operator with the highest willingness to pay for that spectrum. Both spectrum caps and asymmetric obligations that distort incentives for spectrum acquisition can cause a deviation from that optimal allocation. A mobile network operator that has (1) reached its spectrum cap; (2) faces more stringent obligations; or (3) is simply prohibited from bidding on valuable spectrum bands—as Claro was in the 2013 spectrum auction—will acquire less spectrum, all other factors held constant, than will an operator that faces lesser constraints. That artificial difference in spectrum acquisition harms productive efficiency—and, ultimately, consumer welfare—by diverting spectrum to an operator that will produce less economic surplus. In addition, the prospect of influencing asymmetric restrictions and obligations increases mobile network operators' incentives to engage in rent-seeking behavior that diverts resources from investments in service expansion and quality.

In contrast, the optimal allocation of spectrum that a well-designed, unrestricted auction produces increases competition and consumer

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[204] *Id.* at 9–10. Operators were not allowed to accumulate more than 80 MHz in spectrum rights, which precluded Telcel, Movistar, and Iusacell from bidding on the 30 MHz national blocks.

[205] *Id.* at 13.

[206] Rafael del Villar Alrich, A Step Closer to Next Generation Mobile Services: Regulatory Perspectives for Mexico 14, LatAm-EU Symposium on ICT Regulation (Nov. 15, 2010), http://www.cullen-international.com/asset/?location=/content/assets/training--conferences/conferences/2010/latam-ict-del-villar.pdf/latam-ict-del-villar.pdf.

[207] *Id.* at 15. The exact amount was 5,067,749,000 MXN. *Id.*

welfare.[208] By ensuring that spectrum is allocated to the highest bidder, an unrestricted auction allows mobile network operators to use spectrum to provide services that consumers value most highly.[209] Unrestricted auctions permit all mobile network operators to compete aggressively in expanding coverage and increasing service quality; thus they encourage efficient entry and investment. Limiting spectrum availability to even a single operator will reduce consumer welfare by reducing that operator's ability to offer high-quality service to consumers and thereby increasing its quality-adjusted prices. That operator's competitors will then have less incentive to reduce their quality-adjusted prices. Consequently, even limiting the spectrum available to a single operator can harm all consumers—even those that purchase services from other operators. In this way, open spectrum auctions benefit all consumers by increasing static and dynamic competition.

V. Conclusion

The Fedesarrollo report purports to demonstrate a lack of competition in Colombian mobile services and proposes policy recommendations to correct those supposed competition problems. Yet, the Fedesarrollo report's flawed and simplistic analysis yields an incorrect result. The market for Colombian mobile voice services performs well when, unlike the Fedesarrollo report, one uses a rigorous econometric analysis to compared markets in peer countries. Moreover, Telefónica's and Tigo's policy recommendations—as presented in the Fedesarrollo report and elsewhere—find no support in either Fedesarrollo's empirical analysis or economic theory. Telefónica's and Tigo's policy recommendations would increase the profits of those companies at the expense of competition and consumer welfare in Colombian mobile services. Instead of granting Telefónica's and Tigo's bid to increase their regulatory rents, the CRC should promote infrastructure-based competition and increase consumer welfare through a regime of symmetric regulation and open spectrum auctions.

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[208] *See, e.g.*, Evan Kwerel & Walt Strack, Federal Communications Commission, Auctioning Spectrum Rights 3 (2001), http://wireless.fcc.gov/auctions/data/papersAndStudies/aucspec.pdf.
[209] *See, e.g.*, *id.*