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# INTERIM PRICING OF LOCAL LOOP UNBUNDLING IN IRELAND: EPILOGUE

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## *Abstract*

*In an earlier article, we presented a case study of local loop unbundling (LLU) in the Republic of Ireland in 2001. We explained how the predecessor regulatory body to the Irish Commission for Communications Regulation (Comreg) could select the least arbitrary interim access rate. This article is an epilogue to the unfolding LLU experiment in Ireland. We provide assess the approach advocated by the Industry Advisory Group (IAG), which was appointed by Comreg to resolve the access-pricing dispute between the incumbent, eircom, and the regulator. The IAG does not provide factual support for its assertions that the low digital subscriber line (DSL) penetration and subscription rates in Ireland result from market failure – that is, that eircom is restricting supply of DSL service. Nor does the IAG provide factual support for its presumption that DSL service represents a distinct product market under standard tools for competitive analysis. Assuming, counterfactually, that the factual basis for such regulatory intervention exists, we articulate the problem confronting Comreg: to estimate the ratio of a variable for which Comreg believes it has very good information (eircom's historical costs) to a variable for which it has no information (eircom's long-run average incremental cost, or "LRAIC"). The IAG's solution cannot inform Comreg of this relationship. The IAG suggests that, after arbitrarily excluding the three countries with the highest LRAICs, eircom should make its unbundled loops available at a price within the range of the remaining LRAICs in the truncated sample. A more principled approach would be to estimate the ratio of historical costs to LRAIC from other countries and then to apply that ratio to eircom's historical costs. Alternatively, one would estimate in a regression model the relationship between LRAIC and the economic and demographic factors that influence LRAIC.*

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## 1. INTRODUCTION

In the summer of 2001, *eircom*, the incumbent telecommunications operation in the Republic of Ireland, appealed to that nation's High Court the decision in April 2001 by the Office of the Director of Telecommunications Regulation (ODTR) to set *eircom*'s local loop unbundling (LLU) prices by way of a simple benchmarking approach.<sup>1</sup> In the summer of 2002, we analyzed ODTR's proposed pricing methodology in an article published by the *Journal of Network Industries*.<sup>2</sup>

After months of deliberations with ODTR, *eircom* agreed to discontinue its proceedings in the High Court in 2002 following agreement on a historical cost-based LLU price with the successor organization to ODTR, the Commission for Communications Regulation (Comreg). Comreg then proceeded to establish an Industry Advisory Group (IAG) chaired by Professor William Melody, an economist at Delft University. The remit of the IAG was to oversee the introduction of a long-run average incremental cost (LRAIC) methodology for setting regulated prices for unbundled access by competitors to *eircom*'s network. The IAG worked on this task from May 2002 until January 2003, when it issued Professor Melody's report to all industry participants.<sup>3</sup> In this article, we assess the findings and methodology of the IAG's Final Report from the Chair.

At the very outset, it bears emphasis that the immediate question before Comreg is the setting of *interim* rates. Interim rates are by definition temporary. They are subject to greater imprecision and uncertainty than one would demand of permanent rates that resulted from a proper, detailed analysis of all relevant economic data. The methodology used to set interim rates may not even resemble the methodology that would be used in a permanent rate-setting proceeding—such as a price cap that contemplated increases in *eircom*'s productivity over time. Moreover, a permanent rate-setting proceeding should be expected to give thoughtful analysis to serious policy questions which may be too complex to answer satisfactorily in the expedited setting in which interim rates must be established. One such policy question would be whether a particular rate-setting methodology allows *eircom* a reasonable opportunity to earn a competitive return on its newly invested capital. Despite these inherent limitations in the setting of interim rates, it nonetheless remains true that there are degrees of arbitrariness in the formulation of interim rates.

<sup>1</sup> Eircom PLC v. Office of the Director of Telecommunications Regulation, The High Court Judicial Review, 2001 No. 539 JR (filed July 30, 2001).

<sup>2</sup> J. Gregory Sidak & Hal J. Singer, "How Can Regulators Set Nonarbitrary Interim Prices Rates? The Case of Local Loop Unbundling in Ireland", 3 *J. Network Indus.* 273 (2002).

<sup>3</sup> Industry Advisory Group 2, *Final Report from the Chair* (27 Jan. 2003) [hereinafter *IAG Final Report*].

Some methods for setting interim rates are demonstrably superior to others in terms of making productive use of all of the limited data that are at the regulator's disposal. The current difference of opinions concerns whether Comreg has at its disposal a less arbitrary method of setting interim rates than the one that the IAG has proposed.

In Part II, we describe the problem posed by the IAG: to estimate the ratio of *eircom's* LRAIC to its historical costs. The IAG asserts that the low market penetration of digital subscriber line (DSL) service in Ireland is evidence of market failure, and, therefore, of the need for mandatory unbundling of *eircom's* loops at regulated prices. The IAG, however, fails to demonstrate that this factual predicate is satisfied. We proceed with our analysis based on the unproven assumption – and, in my view, the counterfactual assumption – that Comreg has an economic justification to compel *eircom* to share its network with rivals at regulated prices. If there is to be price regulation when *eircom* is ordered to lease loops to rivals so that they can offer DSL service, then in my estimation, the IAG identified a meaningful problem. My agreement with the IAG stops there, however.

In Part III, we describe the IAG's approach to solving the problem posed by the IAG and explain why its approach rests on fallacious economic reasoning and is therefore necessarily uninformative. If the problem is to estimate the relationship between *eircom's* LRAIC and its historical costs, then Comreg needs a data set that contains *both* LRAIC and historical-cost calculations from other countries. Alternatively, one could estimate the relationship between LRAIC and demographic factors across countries in a regression analysis of the kind that we performed in our earlier article. It is not sufficient to examine observations of LRAIC alone, to eliminate arbitrarily the three countries with the highest LRAICs from the sample, and then to conclude that the LRAIC of *eircom's* network falls within that truncated range.

## **2. THE REGULATORY PROBLEM CORRECTLY STATED**

In this section, we review the factual predicate to mandate unbundling of *eircom's* loops. Although that factual predicate is not satisfied, we proceed to articulate the cost-estimation problem facing Comreg under the counterfactual assumption that Comreg is justified in compelling *eircom* to share its network with rivals at regulated prices.

## 2.1. *The Factual Predicate to Mandatory Unbundling of eircom's Loops at Regulated Rates*

If it is dedicated to maximizing consumer welfare in Ireland, Comreg should compel *eircom* to unbundle its loops only if *eircom*, by restricting access to that network element, could exercise market power in a properly defined market for a product consumed by end-users. For ease of exposition, we refer to this formulation as the Hausman-Sidak test for mandatory unbundling, which one of the authors developed with Professor Jerry Hausman of the Massachusetts Institute of Technology.<sup>4</sup> The IAG asserts that Comreg is justified in forcing *eircom* to share its network elements at LRAIC because of the following alleged market failure:

Local Loop Unbundling (LLU) is necessary for competitors to be able to supply to end users digital subscriber line (DSL) services, the higher capacity lines needed for faster, higher quality access to more Internet services. Arrangements for the introduction of DSL services have proven to be complex and contentious in many countries and particularly so in Ireland. By comparison to European Commission (EC) benchmarks for progress in telecom reform, Ireland has been slow to introduce LLU and DSL services, offers only limited bit-rate options and charges very high prices. The market is very slow in developing and viable competition has yet to emerge.<sup>5</sup>

The IAG asserts that this alleged market failure – the pace of DSL acceptance in Ireland – justifies government intervention of a radical form. But the IAG does not provide factual support for its assertions that Ireland's low DSL service penetration and subscription rates result from *eircom*'s alleged restriction of supply of DSL service.

To the contrary, although DSL service deployment has been slower in Ireland than in other EU nations, this fact by itself is not evidence of any market failure. The Organization for Economic Cooperation and Development (OECD) reports that, as of 2001, only slightly more than 30 percent of households in Ireland had a home computer.<sup>6</sup> This percentage is one of the lowest among the 21 OECD countries for which data is available, and it is roughly half that of the four countries that had the highest rates of broadband penetration in 2001 (Korea, Canada, Sweden, and the United States). From these data, it is reasonable to infer that residential demand for broadband

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<sup>4</sup> For a detailed description of the Hausman-Sidak test for mandatory unbundling of an incumbent's network, see Jerry A. Hausman & J. Gregory Sidak, "A Consumer-Welfare Approach to the Mandatory Unbundling of Telecommunications Networks", 109 *Yale L.J.* 417, 463 (1999).

<sup>5</sup> *IAG Final Report*, *supra* note 3, at 2.

<sup>6</sup> Organization for Economic Cooperation and Development, *Measuring the Information Economy* 2002, at 45 (2002).

service in Ireland is weaker than in other developed countries. Indeed, according to a study that Comreg itself cites, when asked why they did not spend more time online, 33 percent of Irish Internet users replied that they had “no need” to use the Internet more, and another 15 percent stated that they had “no interest” in using the Internet more.<sup>7</sup> Such responses strongly suggest that slack demand has played a much larger role in the slow deployment of DSL service than the IAG or Comreg acknowledge.

DSL service in Ireland is currently available on a limited scale and at a price that is relatively high by international standards. This market condition, however, is not evidence of either market failure or the exercise of market power by *eircom*. Rather, it is consistent with a long-term, sustainable deployment strategy of a new product with inherently uncertain demand among residential consumers. According to the Deputy Secretary-General of the International Telecommunications Union, Roberto Blois, the provision of broadband service is typically economically efficient only at two disparate levels:

[T]here are two equilibrium points at which the cost of supplying broadband is more or less equal to the price, at a given level of demand. At equilibrium point A, a small easily-served market can be provided with broadband at relatively high prices. This market segment comprises mainly business or wealthy residential users living in apartment blocks. Beyond equilibrium point B, a mass market is reached at which point profits can be made through economies of scale, from a residential mass market. The problem lies between points A and B. In this zone, it is uneconomic to provide service and suppliers without deep pockets will tend to fail.<sup>8</sup>

With this framework in mind, *eircom* is likely providing service at the level that Mr. Blois calls “equilibrium point A.” Artificially compelling *eircom* to move away from point A, or mandating that *eircom* subsidize other carriers in taking the same action by providing them leased lines below *eircom*’s historical cost, ignores this demand characteristic of Ireland’s broadband Internet access market and will likely cause substantially more harm than good.

The slow deployment of residential broadband in Ireland relative to other European nations more likely results from prudent investment decisions than market failure. The available evidence demonstrates that Ireland has weaker demand for broadband service than do other developed countries, and that

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<sup>7</sup> Commission for Communications Regulation, *Future Delivery of Broadband in Ireland—Responses to Consultation*, Document No. 03/08, Jan. 21, 2003, at 16 n.11 (citing research by the Market Research Bureau of Ireland).

<sup>8</sup> Roberto Blois, ITU Deputy Secretary-General, *Broadband in a Time of Financial Crisis*, presentation before the IDATE Conference, Montpellier, France, Nov. 23, 2001, available at <http://www.itu.int/osg/dsg/speeches/2001/26idate.html>.

the costs of providing broadband service are legitimately higher. Ireland is largely rural and there are not many metropolitan areas, making the country difficult to serve.<sup>9</sup> The discovery that the preferences of consumers in a particular area are not what one thinks they ought to be, or that the costs of providing service to those consumers are higher than one would like them to be, is a market *feature* and not a market *failure*. It would be a reckless use of the funds entrusted to it by its shareholders for *eircom* to deploy DSL service on a large scale if the extent of consumer demand in the market made it unlikely that *eircom* could reach the equilibrium point B that Mr. Blois discussed.

If a regulatory agency believes that more rapid consumer adoption of a particular service would generate positive externalities (as the IAG appears to believe with respect to DSL service), then, in the absence of market failure, the most appropriate course of action is to stimulate demand through a system of carrier-neutral and platform-neutral incentives. But devoting public resources to stimulate demand may be politically more daunting than stimulating supply by compelling *eircom* to subsidize its competitors in their offerings of resold DSL service.

Moreover, the IAG presumes incorrectly that DSL service represents a distinct product market for purposes of competitive analysis. A broad consensus exists that all mass-market broadband Internet access services are in the same product market. For example, the U.S. Federal Communications Commission (FCC), the U.S. Department of Justice (DOJ),<sup>10</sup> the U.S. Federal Trade

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<sup>9</sup> Mark Holmes, "Eircom: Better Late Than Never To Market With DSL", *Broadband Networking News*, May 7, 2002, at 1. Furthermore, according to Susan Richardson of the Gartner Group, Eircom has experienced delays in deploying DSL in part because of "ins and outs with the regulator." *Id.*

<sup>10</sup> Competitive Impact Statement at 9, *United States v. AT&T Corp.*, Civil No. 00-CV-1176 (D.D.C. filed 25 May 2000) ("A relevant product market affected by [the AT&T/MediaOne] transaction is the market for aggregation, promotion, and distribution of broadband content and services.").

Commission,<sup>11</sup> and academicians<sup>12</sup> have all previously so concluded.<sup>13</sup> In its 2001 *Fixed Wireless Competition Order*, the FCC found that “DSL technologies remain the most significant competitors to Internet over cable.”<sup>14</sup> In its *AOL/Time Warner Merger Order*, also issued in 2001, the FCC concluded that high-speed Internet access services constitute the relevant product market in determining the effects of the proposed merger on the public interest.<sup>15</sup> The

<sup>11</sup> Complaint, AOL, Inc. v. Time Warner, Inc., Dkt. No. C-3989 (FTC filed 14 Dec. 2000) at ¶ 21 (“The relevant product market in which to assess the effects of the proposed merger is the provision of residential broadband Internet access service.”); Hearing Designation Order, Application of EchoStar Communications Corp. and EchoStar Communications Corp. to Transfer, CS Dkt. 01-348 (FCC adopted Oct. 9, 2002) at ¶ 285 (referring to “competing platforms” in the “broadband market”).

<sup>12</sup> See Jerry A. Hausman, J. Gregory Sidak & Hal J. Singer, “Cable Modems and DSL: Broadband Internet Access for Residential Customers”, 91 *Am. Econ. Ass’n Papers & Proc.* 302 (2001) [hereinafter Hausman, Sidak & Singer, “Cable Modems and DSL”]; Jerry A. Hausman, J. Gregory Sidak & Hal J. Singer, “Residential Demand for Broadband Telecommunications and Consumer Access to Unaffiliated Internet Content Providers”, 18 *Yale J. on Reg.* 129 (2001) [hereinafter Hausman, Sidak & Singer, “Residential Demand for Broadband”].

<sup>13</sup> As explained by Hausman, Sidak, and Singer, broadband access to the Internet represents a discrete product market, separate from the market for narrowband, dial-up Internet access because, among other things, many of the services supported by broadband connections are not available through narrowband connections, and the demand for applications that can be supported only by high-bandwidth connections strongly suggests that the product markets for narrowband and broadband access are distinct. Moreover, empirical research shows that narrowband Internet access prices (including the access charge plus the price of a second telephone line) do not constrain broadband Internet access prices. See Applications for Consent to the Transfer of Control of Licenses and Section 214 Authorizations by Time Warner Inc. and American Online, Inc., Transferors, to AOL Time Warner Inc., Transferee, CS Dkt. No. 00-30, 16 F.C.C. Rcd. 6547, ¶ 71 (2001) (citing Declaration of Jerry A. Hausman, Attached to the Comments of America Online, Application for Consent to Transfer TCI to AT&T, CS Dkt. No. 98-178, at ¶¶ 4-10; Declaration of Daniel Rubinfeld and J. Gregory Sidak, Attached to the Comments of GTE, Application for Consent to Transfer Control of MediaOne to AT&T, at 8) [hereinafter *AOL/Time Warner Order*]; Hausman, Sidak & Singer, “Cable Modems and DSL”, *supra* note 12; Hausman, Sidak & Singer, “Residential Demand for Broadband”, *supra* note 12.

<sup>14</sup> Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, CS Dkt. No. 00-132, 16 F.C.C. Rcd. 6005, ¶ 51 (2001). See also Broadband Today, FCC Staff Report (Oct. 1999) at 42 (“[A]s deployment of DSL, satellite, and wireless advances, in large part spurred by rapid cable modem deployment, consumers will have alternative platforms to use for high-speed data access[.]”).

<sup>15</sup> See Applications for Consent to the Transfer of Control of Licenses and Section 214 Authorizations by Time Warner Inc. and American Online, Inc., Transferors, to AOL Time Warner Inc., Transferee, CS Dkt. No. 00-30, 16 F.C.C. Rcd. 6547, at ¶¶ 56, 69 (2001). Although the FCC suggested that its finding that residential high-speed Internet access services constitute a discrete product market might be limited to the specific context in which the issue had been raised, *id.* at n.202, we are not aware of any basis upon which application of the 1992 *Merger Guidelines* could yield different product market definitions in different proceedings. In any event, the FCC has never formally or informally deviated from the view that broadband Internet access services constitute a discrete product market. To the contrary, the FCC has in numerous other contexts treated the broadband Internet access market as a discrete product market. See, e.g., *High-Speed Services for Internet Access: Subscriberhip as of December 31, 2000*, Industry Analysis Division, Common



FCC also concluded that “[t]he main competitor to cable in the market for residential high-speed Internet services is currently DSL[.]”<sup>16</sup>

Absent a quantitative determination of whether two services are part of the same product market, courts have generally included products in the same market if they are “reasonably interchangeable” in their use.<sup>17</sup> Without first establishing a well-defined product market, the IAG lacks any economic foundation to presume that *eircom* could exercise market power over residential consumers of high-speed Internet access service by restricting the ability of competitors to have unbundled access to the *eircom* network.

In short, the IAG Final Report fails the Hausman-Sidak test, as there is no product market consisting solely of DSL services and there is, moreover, no evidence that *eircom* is restricting the supply of DSL service. Consequently, there is no reason based on consumer welfare maximization to compel *eircom* to share its network elements with rivals at regulated prices.

Despite this observation, we proceed under the unproven and seemingly counterfactual assumption that mandatory unbundling and government price regulation are necessary to protect consumers of broadband Internet access in Ireland. But it is important to emphasize that the IAG is mistaken to assert that “[c]onsumers would not be offered services at prices reflecting the costs of an efficient network”<sup>18</sup> but for mandatory unbundling at regulated prices based on LRAIC. In a related vein, it is hyperbole rather than economic logic for the IAG to say that “the development of the infrastructure for Internet and e-economy services in Ireland cannot be held hostage by this problem.”<sup>19</sup> The IAG ignores that competition *between* cable modem providers and DSL service providers is already promoting the welfare of consumers.

## 2.2. The IAG’s Statement of the Problem

Comreg has articulated the following problem: it needs an estimate of a variable that does not exist (*eircom*’s LRAIC) but has an estimate only of a variable that it believes to be biased upward (*eircom*’s historical cost). Indeed, the IAG succinctly describes the problem as follows:

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Carrier Bureau, FCC, August 2001, at Table 5 (presenting market shares for “high-speed services for Internet access.”).

<sup>16</sup> *Id.* at ¶ 65.

<sup>17</sup> *Brown Shoe Co. v. United States*, 370 US 294, 325 (1962). *See also*, ABA Antitrust Section, *Antitrust Law Developments* 200 (3d ed. 1992).

<sup>18</sup> *IAG Final Report*, *supra* note 3, at 3.

<sup>19</sup> *Id.* at 11.

As a benchmark source, eircom's actual historical costs require *adjustment*, and a determination of the appropriate *adjustment* requires an examination of other benchmark sources. eircom is reluctant to move away from its actual costs. Comreg finds the use of benchmark data from telecom operators in other countries more appropriate, and rely heavily on data from US operators where there is a history of data over time and across many operators.<sup>20</sup>

Each party would surely agree that the two variables in question are positively correlated, and thus the relationship between eircom's LRAIC and historical cost can be estimated. Algebraically, the relationship may be written as  $L_i = \alpha H_i$ , where  $L_i$  is the LRAIC of a carrier in country  $i$ ,  $H_i$  is the historical cost of a carrier in country  $i$ , and  $\alpha$  is the ratio of the LRAIC to the historical cost, the adjustment factor that the IAG seeks. If the regulator does not allow the network owner to earn a competitive risk-adjusted return on its historical cost, then  $\alpha$  will be less than or equal to one. If the regulator allows the network owner to earn a competitive risk-adjusted return on its historical cost, and if that return is large, then  $\alpha$  will exceed one. In the following section, we describe the economic mistake in the IAG's approach to estimating eircom's LRAIC, and we then propose two alternative estimation methods that are more intellectually defensible as a matter of economic analysis.

### 3. A SUPERIOR ALTERNATIVE TO BENCHMARKING

Although the IAG articulates a sensible problem, the answer that it proposes will not inform Comreg of the proper adjustment factor. Nor will the IAG's recommendation inform Comreg of eircom's LRAIC.

#### 3.1. A Sample of LRAIC Calculations Alone Cannot Inform the Adjustment Factor or eircom's LRAIC

In the same paragraph in which the IAG articulates the alleged problem facing Comreg, the IAG proceeds to offer a solution that is incorrect as a matter of economic analysis:

The Chair has suggested that data from incumbent operators in European countries more comparable in size to Ireland might be more appropriate. Denmark in particular is recognized as having a reasonably efficient incumbent operator. It has recently completed a LRIC study, and it offers LLU services that are being taken up by competitors.

All benchmark data has certain strengths and weaknesses. The IAG2 parties are unlikely to reach agreement on the appropriate benchmark data sources for several

<sup>20</sup> *Id.* at 8 (emphasis added).

key elements in the LRIC model. As it is not appropriate to include eircom's inefficient legacy costs in the LRIC model, in these instances, Comreg will need to make its own independent judgment on the most appropriate data to be used.<sup>21</sup>

The IAG offers Comreg an arbitrary and intellectually indefensible solution. The IAG is telling Comreg that it can estimate *eircom's* LRAIC, which it earlier admits is "country-specific"<sup>22</sup> and therefore unique to Ireland, by examining a truncated<sup>23</sup> range of LRAICs from other EU countries – with a special emphasis on Denmark. The IAG offers no demographic or geographic justification for why Denmark should be given particular weight, just as it offers no justification for why the three EU countries with the highest LRAICs should be excluded from the set. Presumably, the IAG arbitrarily chose Denmark because it has the smallest LRAIC in the truncated sample. Indeed, not only is Denmark's LRAIC of € 8.24 the smallest in the truncated sample, but the next highest observation is Italy's LRAIC of € 11.63, or 41 percent higher.

Furthermore, the IAG's proposal is only tangentially related to the question that it, itself, had posed. It is impossible to estimate the adjustment factor without having observations of both LRAIC and historical cost from each of the other countries. It is also impossible to estimate a given country's LRAIC by examining the LRAICs of a truncated sample of other countries.

### **3.2. A More Robust Sample Would Enable Comreg to Use Regression Analysis to Estimate Either the Adjustment Factor or *eircom's* LRAIC Directly**

Two alternative methodologies would provide Comreg a more reliable and intellectually defensible estimate of *eircom's* LRAIC. Both are simple applications of multiple regression analysis. Neither alternative method could be implemented, however, without a more robust data sample than what the IAG has used. Fortunately, such data are readily available.

#### **3.2.1. Estimation of the Adjustment Factor**

Under the first alternative methodology, the IAG could have compiled a database of both LRAIC and historical cost for each incumbent carrier in the

<sup>21</sup> *Id.* at 8.

<sup>22</sup> *Id.* at 2 ("However, the challenges of adjustment facing incumbent operators and national telecom regulators are country specific and require innovative approaches to their resolution.")

<sup>23</sup> *Id.* at 13 ("Comreg should consider a weak LLU price benchmark – for example, that *eircom* prices be required to be within the lowest 12 of the 15 EU countries."). The truncation of the sample at the twelfth observation would be the quintessential example of arbitrary administrative action. It is improbable that such a rule would withstand judicial review even when an appellate court must give substantial deference to the regulator.

European Union. With both values, the IAG could have estimated the appropriate adjustment factor for *eircom's* historical costs. Suppose that on average, the ratio of the LRAIC to the historical cost is  $\hat{\alpha}$  for fifteen EU countries. With this ratio, the IAG could have calculated *eircom's* LRAIC as the product of  $\hat{\alpha}$  and *eircom's* historical-cost estimate of providing an unbundled loop. This methodology is superior to the IAG's approach because it makes use of valuable information that the IAG ignores and because it is not subject to the inherent subjectivity of benchmarking. Moreover, estimation of the ratio of LRAIC to historical cost directly addresses the problem raised by the IAG estimating the adjustment factor.

The ratio of LRAIC to historical cost is fairly straightforward to estimate in the United States. Table 1 shows that ratio for a sample of U.S. states for which data were available.

**Table 1: Ratio of Regulated Access Rate to Historical Costs for a Sample of U.S. States**

State	1999 Average Embedded Cost (1)	1999 Average Access Rate (2)	Average Access Rate / Average Embedded Cost
IN	14.81	8.20	0.55
IA	13.45	8.20	0.61
WA	17.58	11.33	0.64
VT	21.72	14.41	0.66
KS	20.72	14.04	0.68
MI	14.44	10.15	0.70
TX	19.65	14.15	0.72
OR	20.66	15.00	0.73
NE	19.12	14.32	0.75
GA	21.95	16.51	0.75
NC	21.66	16.71	0.77
DE	15.43	12.05	0.78
CT	15.83	12.49	0.79
VA	17.03	13.60	0.80
IL	12.12	9.81	0.81
OK	18.24	14.84	0.81
WI	12.66	10.90	0.86
TN	20.84	18.00	0.86
KY	22.55	20.00	0.89
NY	15.99	14.81	0.93
ME	18.90	17.53	0.93
PA	15.03	14.06	0.94
NH	18.40	17.99	0.98
AL	19.14	19.04	0.99
AZ	21.79	21.98	1.01
MD	14.12	14.50	1.03
WV	23.66	24.58	1.04
NJ	15.19	16.17	1.06
UT	18.43	20.00	1.09
MA	13.49	14.98	1.11

State	1999 Average Embedded Cost (1)	1999 Average Access Rate (2)	Average Access Rate / Average Embedded Cost
NV	17.71	19.83	1.12
MT	22.69	27.41	1.21
MN	14.76	17.87	1.21
ID	18.82	25.52	1.36
DC	5.64	10.81	1.92
NM	23.31		
ND	16.00		
US			
FL	19.87		
CO	23.01		
PR			
SC	24.88		
MO	17.82		
HI			
VI			
CA	11.96		
AR	25.03		
OH	12.70		
MS	26.35		
LA	20.96		
SD	17.65		
WY			
AK			
RI	15.21		
Average			0.92

Sources: (1) DALE E. LEHMAN & DENNIS L. WEISMAN, THE TELECOMMUNICATIONS ACT OF 1996: THE "COSTS" OF MANAGED COMPETITION 100 (Kluwer 2000); (2) BILLY JACK GREGG, A SURVEY OF UNBUNDLED NETWORK ELEMENT PRICES IN THE UNITED STATES (Spring 2001), available at [www.nrri.ohio-state.edu/programs/telcom/pdf/UNEMatrix50701.pdf](http://www.nrri.ohio-state.edu/programs/telcom/pdf/UNEMatrix50701.pdf).

As Table 1 shows, the average ratio of the regulated access rate to the historical costs in the United States was 0.92. In fact, for several western states that are sparsely populated, such as Idaho, Montana, Nevada, and Utah, the ratio actually exceeded one.

It is possible to apply a more precise adjustment factor than the *average* adjustment factor by examining what influences the variation in adjustment factors across the U.S. states and the District of Columbia. For example, demographic and economic characteristics of a particular jurisdiction might have a significant influence on the extent to which regulators are willing to allow the incumbent to recover fully its historical costs. Table 2 presents those data for individual U.S. states and the District of Columbia, along with each jurisdiction's adjustment factor.

**Table 2: Demographic and Economic Characteristics of U.S. States**

State	Population (1,000s)	Population Density (peo- ple/sq. mile)	Degree of Urbanization	Wage Rate Index (U.S., 1999=100)	Avg. Access Rate / Avg. Em- bedded Costs
IN	5,943	165.7	71.7	104.59	0.55
IA	2,869	51.4	44.6	101.39	0.61
WA	5,756	86.5	82.9	109.42	0.64
VT	594	64.2	27.9	100.98	0.66
KS	2,654	32.4	56.4	98.61	0.68
MI	9,864	173.6	82.6	126.04	0.70
TX	20,044	76.5	84.5	92.87	0.72
OR	3,316	34.5	72.7	106.14	0.73
NE	1,666	21.7	51.8	89.35	0.75
GA	7,788	134.5	68.9	91.15	0.75
NC	7,651	157.0	67.1	92.14	0.77
DE	754	385.4	81.6	116.95	0.78
CT	3,282	677.4	95.6	112.45	0.79
VA	6,873	173.6	78.1	98.77	0.80
IL	12,128	218.2	84.5	100.41	0.81
OK	3,358	48.9	60.5	96.72	0.81
WI	5,250	96.7	67.8	105.90	0.86
TN	5,484	133.0	67.8	90.17	0.86
KY	3,961	99.7	48.3	99.34	0.89
NY	18,197	385.3	91.9	101.31	0.93
ME	1,253	40.6	35.8	96.72	0.93
PA	11,994	267.6	84.5	103.60	0.94
NH	1,201	133.9	60.2	96.89	0.98
AL	4,370	86.1	70.1	93.94	0.99
AZ	4,778	42.0	87.8	95.17	1.01
MD	5,172	529.1	92.7	105.24	1.03
WV	1,807	75.0	41.9	102.87	1.04
NJ	8,143	1,097.6	100.0	109.09	1.06
UT	2,130	25.9	76.7	91.15	1.09
MA	6,175	787.9	96.1	107.70	1.11
NV	1,809	16.5	86.1	97.46	1.12
MT	883	6.1	33.4	94.51	1.21
MN	4,776	60.0	70.1	109.25	1.21
ID	1,252	15.1	38.3	93.61	1.36
DC	519	8,452.8	100.0	133.33	1.92
Average	5,248	424.4	70.3	101.86	0.92
Ireland	3,752	141.1	58.8	71.00	???

Sources: World Development Indicator Data Query; Ireland's population, population density, and degree of urbanization data downloaded from the World Bank's web site at <http://devdata.worldbank.org/data-query/> on Oct. 24, 2001; U.S. population, pop. density, and degree

of urbanization data from U.S. Census Bureau; Wage Rate Index from U.S. Department of Labor, Bureau of Labor Statistics (Sept. 2000); Embedded costs from DALE E. LEHMAN & DENNIS L. WEISMAN, THE TELECOMMUNICATIONS ACT OF 1996: THE "COSTS" OF MANAGED COMPETITION 100 (Kluwer 2000); Access rates from Billy Jack Gregg, A SURVEY OF UNBUNDLED NETWORK ELEMENT PRICES IN THE UNITED STATES (Spring 2001), available at [www.nrri.ohio-state.edu/programs/telcom/pdf/UNEMatrix50701.pdf](http://www.nrri.ohio-state.edu/programs/telcom/pdf/UNEMatrix50701.pdf).

As Table 2 shows, Ireland's total population, population density, degree of urbanization, and wage rate index are less than the corresponding averages for the U.S. states. There are several U.S. states, however, that have similar populations, population densities, and degrees of urbanization as Ireland. A regression model reveals the relationship between those demographic and economic characteristics and the adjustment ratio. Once that relationship is understood, the parameters of the model can be used to predict the appropriate adjustment factor for Ireland.

The data set encompasses each of the thirty-four U.S. states (and the District of Columbia) for which the final average access rate in 2000 and the average embedded costs in 1999 were available. It is appropriate to use the U.S. data to infer the desired relationship because of the common manner in which each state established a final access rate. In particular, each state received a "proxy rate" from the FCC. The states issued interim rates based on the FCC's proxy rate and then invited interested parties to present economic evidence as to why the interim rate was too high or too low. Any deviations from the interim rate – that is, any decisions to change the extent to which the incumbent carrier could recover its historical costs – were influenced by the idiosyncratic characteristics of each state, as reflected in the data. Thus, we define the ratio of average access rates to average embedded costs by the following equation:

$$\frac{\text{Access Rate}}{\text{Embedded Costs}} = \alpha + \beta_1 P + \beta_2 D + \beta_3 U + \beta_4 W + e,$$

where, for each jurisdiction in the sample,  $P$  is the total population,  $D$  is the population density,  $U$  is the degree of urbanization,  $W$  is the wage rate index, and  $e$  is the error term. Coefficients are represented by the various beta terms, and the alpha term is a constant. The results of this regression model appear in Table 3, and the regression statistics appear in Table 4.

**Table 3: Regression Model Summary**

	Coefficients	Standard Error	t -Statistic
Intercept	1.534779	0.420098	3.653382
Total Population	-0.000012	0.000009	-1.450077
Population Density	0.000141	0.000030	4.760198
Degree of Urbanization	0.001488	0.002185	0.680952
Wage Rate Index	-0.007047	0.004461	-1.579419

**Table 4: Regression Statistics**

$R^2$	0.7324
Adjusted $R^2$	0.53641
Standard Error	0.18585
Observations	35

As the  $R^2$  in Table 4 shows, this regression model explains 73.2 percent of the variation in the adjustment factor over and above the variation that can be explained by simply using the mean ratio of average access rate to average embedded costs. Thus, if Comreg were to incorporate the total population, population density, degree of urbanization, and the wage rate index into its adjustment model, Comreg would set *eircom's* LLU monthly rental rate at 1.0955 times *eircom's* embedded costs.<sup>24</sup> To place this estimate in context, *eircom's* predicted adjustment factor is nearly equivalent to the factor chosen by the Massachusetts Department of Telecommunications and Energy (equal to 1.11).

This estimation derives an interim rate for *eircom* through a straightforward method of statistical inference that could be replicated by any student in an introductory econometrics course. In contrast, the IAG's selection of Denmark as the ideal proxy for Ireland is completely arbitrary. Because *eircom's* average embedded cost equals to € 16.81, the simple econometric approach used above would set the interim monthly rental rate equal to € 18.41. That statistically estimated rate is 36 percent higher than by interim rate of € 13.53 that the ODTR set for *eircom* in April 2001.<sup>25</sup> It is 123 percent higher than the

<sup>24</sup> The ratio of average access rate to average embedded costs for Ireland =  $1.534779 + (-0.000012 * 3,752) + (0.000141 * 141.1) + (0.001488 * 58.8) + (-0.007047 * 71) = 1.0955$ .

<sup>25</sup> Office of the Director of Telecommunications Regulation, Local Loop Unbundling – *eircom's* Access Reference Offer (ARO), Decision Notice D8/01, Dkt. No. ODTR 01/27 at Figure 2 (released Apr. 2001).



interim rate of € 8.24 that would result if Comreg were simply to mimic Denmark's LLU rate, as the IAG hints Comreg should consider doing.<sup>26</sup>

### 3.2.2. Estimation of eircom's LRAIC

There is a second econometric methodology by which Comreg could estimate an interim LLU rate for *eircom*. Like the analysis used to produce Tables 3 and 4 above, this alternative method is very simple and could be replicated by any student in an introductory econometrics course.

The IAG could have estimated a regression model that explains the variation in LRAIC across the EU countries. The IAG had access to this very regression model, for it was published in our earlier article in the *Journal of Network Industries*.<sup>27</sup> It is therefore not reasonable to believe that the IAG did not have access to this econometric model.

In our article, we found that demographic and economic characteristics explain roughly one-quarter of the variation in the LLU rate in EU countries *over and above that which can be explained by using the mean LLU monthly rental rate alone*.<sup>28</sup> That greater explanatory power offers, relative to the IAG's recommendation, a measurable improvement in the quality of regulation. That is because the IAG would use solely the mean LLU monthly rental rate to set the interim rate – *after* excluding three inconvenient data points that would drive the interim rate higher.

Using the estimated parameters of our regression model, we predicted that, had Comreg (still ODTR at that time) incorporated the total population, population density, degree of urbanization, and the wage rate index into its pricing model, Comreg would have set *eircom*'s LLU monthly rental rate at € 19.22.<sup>29</sup> Again, this simple methodology is superior to the IAG's approach because it makes use of valuable information that the IAG's preferred approach would simply ignore. Estimation of a regression model that explains the variation in LRAICs across the EU countries also addresses the problem raised by the IAG, but in a different manner.

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<sup>26</sup> Imposing Denmark's price of € 8.24 would be based on a ratio of average access rates to average embedded costs ( $€ 8.24 / € 16.81 = 0.49$ ) that is lower than the ratio in *every one* of the thirty-five available observations from the U.S. states and the District of Columbia contained in Table 1 above. By this standard, Denmark's LLU price is an outlier. It would defy commonsense to use a statistical outlier as a benchmark.

<sup>27</sup> Sidak & Singer, *supra* note 2, at 289.

<sup>28</sup> *Id.*

<sup>29</sup> *Id.*

Either of the two alternative methods that we have described here for setting the interim price of an unbundled local loop would mitigate, if not avoid entirely, the social costs associated with the IAG's approach. It is the nature of those social costs to which we now turn.

#### 4. CONCLUSION

There are two viable approaches to estimate *eircom's* LRAIC of providing an unbundled loop. First, Comreg could estimate the relationship between historical costs and LRAICs across the EU countries and apply that "adjustment factor" to *eircom's* historical-cost estimate. Alternatively, Comreg could predict *eircom's* LRAIC with a regression model that mapped demographic and economic characteristics into a LRAIC. Comreg could borrow from the model that we have developed, or it could estimate its own model.

In contrast, the proposal that the IAG offers bears no relationship with the problem facing Comreg. Because it resorts to benchmarking, the IAG's approach would impose large costs on Ireland's consumers and telecommunications carriers.

Comreg should abandon benchmarking and embrace a more thoughtful alternative method for setting interim rates for unbundled loops. Moreover, Comreg should reexamine whether economic analysis justifies its compelling *eircom* to share its network with rival carriers at regulated rates. Platform competition between cable modem providers and DSL service providers is sufficient to maximize social welfare in Ireland in the market for residential high-speed Internet access.