achieve a competitive result. Incorporation of this differential — based upon actual LEC data for the post-divestiture time period — shows that the current X factor is too low. The consequences of this finding for LEC ratepayers are significant. Because the nature of the inputs used by local telephone companies is not representative of inputs for the economy generally, the price of LEC inputs does not increase at the same rate as the average for the economy overall. Thus, unless this condition is expressly recognized, the price adjustment mechanism applies an incorrect inflation rate for LEC inputs. Since the current X factor does not reflect the fact that LEC input prices are rising *more slowly* than those for the economy generally, LECs are, in effect, being reimbursed at a higher rate than their actual expenses, and the rates charged to ratepayers for LEC services are excessive and unreasonable.

VI. Adoption of USTA's 1.7% X factor would inappropriately shift wealth from consumer and other sectors of the economy to LEC shareholders.

According to USTA, the productivity study prepared by Dr. Christensen would suggest a nationwide LEC productivity growth rate (relative to the overall economy) of only 1.7%.[26] However, the Christensen Study originally omitted the input price results which detail the price inflation rates of the inputs that LECs purchase, such as equipment, labor, and supplies. These were made public by USTA in response to a *Motion to Compel* initiated by the Ad Hoc Committee. The now-public input price data clearly confirm that LEC input prices have risen far more slowly than the general inflation rate in the post-divestiture time period. Specifically,

- The newly-disclosed USTA input price data summarized in Tables 7 and 8 show that since divestiture in 1984, national LEC input prices rose at an annual rate of 1.1%. This contrasts with GDP-PI which rose at an annual rate of 3.7%. This yields an input price differential of 2.6%, i.e., LEC input prices are growing at a rate that is 2.6% below the annual growth rate of GDP-PI.

- In contrast, USTA and its experts Drs. Laurits Christensen and William Taylor all *assume* a LEC input price growth rate of 4.6%, calculated by adding the 0.9% economy-wide productivity rate to the 3.7% GDP-PI growth rate. The LEC *claim* that input prices are rising at a rate of 4.6% annually is thus *3.5 percentage points higher* than the actual LEC *facts* calculated by Dr. Christensen.

26. Technically, Christensen finds a LEC productivity growth rate of 2.6%, which he and USTA then reduce to 1.7% by adjusting for their assumed level of LEC input price growth, which they portray (without empirical support) at GDP-PI plus 0.9%. This assumption, which the newly-disclosed USTA data proves to be false, is the basis for the so-called "differential" LEC productivity calculation advocated by USTA, and their experts, Dr. Christensen and Dr. William Taylor.

- Put another way, USTA is contending that LEC input prices rose a total of 45.0% over the 1984-1992 time period.[27] This is contradicted by the actual LEC data presented in its own Table, which shows that LEC "total input prices" actually rose a mere 8.8% for the entire time period.[28] It is thus eminently clear that there is a huge gap between what the LECs claim and what the newly-disclosed LEC data show.[29]

- This input price effect is not the result of astute management decisions that produce LEC productivity and efficiency gains. Rather, it is a fortuitous result which is clearly outside of the control of LEC management, arising from dramatic declines in interest rates and from technological innovation and competition in LEC input markets — particularly those associated with capital equipment and facilities.

- That LEC input prices are rising considerably slower than overall economy-wide inflation rates is a type of "exogenous cost change" that should be captured in the price cap formula. Unlike "Z adjustments," which tend to be nonrecurring in nature, the consistent and established pattern of LEC input price changes requires express recognition, as we recommend here.

Failure to capture the difference between the USTA input price *assumption* and the *actual input price conditions* has the effect of transferring wealth from consumers and other sectors of the US economy that utilize LEC services to LEC shareholders. The difference between the LECs' proposed 1.7% X factor and the 5.7% X factor estimate that we show in this study represents approximately $800-million in excessive rates in each year in which the price cap system remains in effect. Moreover, because each year's excess rate level is cumulative with respect to previous years, over the coming five-year period such excessive rates would effectively transfer more than $12-billion in wealth to the LECs.[30] Such shifts impose a heavy burden on consumers and other (non-telecommunications) sectors, threaten national competitiveness, diminish investment in adjacent markets which require LEC essential services, and (depending upon how the excess revenues are used by the LECs) could undermine the future of the US telecommunications infrastructure.

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27. The 45% increase since 1984 is the result of the annual changes of 4.6% per year which USTA claims.

28. This is obvious from the input price index which USTA shows rose from 1.000 in 1984 to 1.088 in 1992. This is shown in Table 1 of the Christensen Supplementary Data and summarized in Table 8 above.

29. In fact, if the LECs were required to flow through only the difference in input prices to consumers, this component alone would have amounted to substantial price declines in telecommunications service.

30. That is $800-million in the first year, $1.6-billion in the second year, $2.4-billion in the third year, $3.2-billion in the fourth year, and $4-billion in the fifth year.

Overall, the conclusions of this study are:

- The correct calculation of the X factor includes the historic post-divestiture LEC productivity growth rate, *plus* the LEC input price differential, *plus* the appropriate "consumer dividend."

- Based upon Dr. Christensen's *complete* results, the bare minimum value for a national LEC X factor would be a 2.6% productivity growth *plus* a 2.6% input price differential *plus* a consumer dividend. The consumer dividend would be 0.5% if the LEC elects to begin sharing at 100 basis points over the authorized rate of return or 1.5% if the LEC elects to begin sharing at 200 basis points over the authorized rate of return. Thus, the correct X factor for the FCC's LEC price cap system is not less than 5.7% with sharing at 100 basis points or 6.7% with sharing at 200 basis points.[31]

- Any value for the X factor below the 5.7% to 6.7% level would constitute a direct transfer of wealth from ratepayers to LECs.

- Our 5.7% X factor estimate is in the same range as other studies by AT&T at 5.47% and MCI at 5.9%. The fact that all three studies use different methods and data sources and yet still obtain similar results confirms the reasonableness of our estimate.

31. The difference between the consumer dividend of 0.5 with sharing and 1.5% without sharing is derived as follows. In the current LEC price cap plan, the FCC provides that LECs can, at their option, increase the sharing threshold by 100 basis points by accepting an X factor that is 1 percentage point higher than under the full sharing requirement. This would be the very minimum compensatory adjustment.

Technical Appendix - Analysis of the LECs' Incorrect Assumption

The difference between the LEC input price assumption (originally adopted by the Commission[32]) and the correct X factor can be expressed and clarified via several equations. The LECs start with the assumption that the rate of change of LEC input prices is equal to the rate of change of input prices for all firms in the US economy. This is expressed as

$$d\,IP_T = d\,IP_{US} \tag{1}$$

where IP denotes input prices and the subscripts T and US denote the telecommunications industry and the US economy respectively. This fundamental assumption is the sole reason for the subtraction of US economy productivity (as implemented by the Commission) in the price cap formula. In fact, this is clearly documented in LEC-sponsored studies by Taylor, Christensen, and Shankerman.[33] This LEC argument flows from the assumption in equation (1). In order to prove their result, the LECs then use the well-known macroeconomic relationship that US input prices grow at the US output price (OP) growth rate plus the growth in US total factor productivity (TFP):

$$d\,IP_{US} = d\,OP_{US} + d\,TFP_{US} \;. \tag{2}$$

Substituting the results of equation (2) into equation (1) yields the result, according to the LECs, that telecommunications input prices grow at a rate faster than the US national output price growth rate:

$$d\,IP_T = d\,OP_{US} + d\,TFP_{US} \;. \tag{3}$$

32. In the LEC Price Caps CC Docket 87-313 *Second Report and Order* at para. 74, the Commission states: "[t]he productivity offset subtracts the amount by which LECs can be expected to outperform economy-wide productivity gains." Although the Commission never explicitly investigated the assumption embodied in equation (1), it is clear from the quotes above that the Commission accepted the LEC argument and especially the final LEC result cited in equation (6) below.

33. See, e.g., the Christensen and Taylor testimony cited in footnote 21 *supra*. Also see "Testimony of M. Shankerman on behalf of GTE California, Inc.," California PUC Docket No. I.87-11-033, *In the Matter of Alternative Regulatory Frameworks for Local Exchange Carriers*, May, 1989 at 12.

In the next step, the LECs utilize an undisputed relationship that in a price cap program adequately simulates competitive conditions, *viz.*, the telecommunications output price growth rate equals the telecommunications input price growth rate minus the telecommunications total factor productivity growth rate:

(4) $$d\ OP_T = d\ IP_T - d\ TFP_T\ .$$

Substituting the results of equation (3) into equation (4) yields

(5) $$d\ OP_T = d\ OP_{US} + d\ TFP_{US} - d\ TFP_T$$

which, after substituting the GDP-PI for the US output price growth rate, can be rearranged to the LECs' (and the Commission's) final result:

(6) $$d\ OP_T = GDPPI - \{ d\ TFP_T - d\ TFP_{US} \}\ .$$

This is in direct contrast to the alternative formulation, discussed above, that recognizes the *fact* that LEC input prices grow less, not more, rapidly than GDP-PI.

(7) $$d\ OP_T = \{ GDPPI - IPDIFF \} - d\ TFP_T\ .$$

where IPDIFF is the average post-divestiture input price differential between the GDP-PI and the LEC telecommunications input price growth rate. This formulation clearly does not employ the assumption embodied in equation (1). Rather, it relies upon an empirical analysis of actual LEC data for the post-divestiture time frame to *directly calculate* the undisputed equation (4). The difference between the GDP-PI and actual LEC input prices can be calculated directly from LEC data in an objective empirical analysis as shown in Tables 7 and 8 above.

It is important to point out that *the sole difference between the LEC results in equation (6) and the formulation shown in equation (7) is the assumption in equation (1) that telecommuni-*

cations input prices grow at the same rate as national economy US input prices.[34] The critical problem with the LEC assumption in equation (1) is that the Christensen Supplementary Data, summarized in Tables 7 and 8 above, show that the assumption is obviously incorrect. In fact, the magnitude of the difference between the LEC assumption and the actual LEC data is quite large.

Finally, a brief explanation of the manner in which Christensen utilized the empirical input price growth data in his productivity calculations is in order. The difference between the actual aggregate input price growth rate shown in Table 7 and the assumed input price growth rate claimed by the LECs could create a serious problem for Christensen's 2.6% TFP growth rate calculation. If the LECs now admit that input prices grew at a 1.1% annual rate as shown in Table 7, the TFP calculation of 2.6% is correct as it stands. However, if the LECs continue to argue that their input prices grew at the 3.7% *plus* 0.9% rate, then the 2.6% productivity growth rate calculation is *computationally incorrect*. Specifically, had Christensen utilized the 4.6% input price growth rate in his calculation of TFP, he would have calculated a lesser increase (indeed, possibly a decrease) in aggregate input *quantity*, which in turn would have resulted in a considerably higher TFP growth rate result. The TFP productivity study must show an aggregate input price growth rate in its underlying data (such as Table 1 in the Christensen Supplementary Data) which corresponds identically with the input price growth rate that LECs claim that they face. Any other rate would be incorrect and inconsistent.

34. As discussed earlier, economists who prepare LEC-sponsored studies, typically argue that the average U.S. Total Factor Productivity average annual growth rate of 0.9 for the 1984-1992 time period should be added to the GDP-PI to measure economywide input prices. See, for example, the Christensen Study at ii and 12 and the Taylor USTA Attachment 5 at 8-11 especially footnote 9 therein. This results in a proposed (incorrect) LEC input price assumption of GDP-PI *plus* 0.9. Combining this input price assumption with the Christensen LEC productivity growth rate of 2.6% yields the USTA's proposed price adjustment formula: GDP-PI *plus* 0.9 *minus* 2.6. This simplifies to the GDP-PI *minus* 1.7% currently proposed by USTA.

Appendix 4

EFFECT OF INCONSISTENT USE OF SHORT-RUN AND LONG-RUN INPUT PRICE RELATIONSHIPS IN USTA/CHRISTENSEN TFP STUDY AND X FACTOR DEVELOPMENT

(Excerpts from Ad Hoc Telecommunications Users Committee
Ex Parte Filing, FCC CC Docket No. 94-1,
October 26, 1994)

USTA seeks to "cherry-pick" its way through fundamentally conflicting positions of its own experts

- Taylor asserts that LEC input price movements are not "statistically different" from economy-wide input price changes, which he contends are growing at the rate of GDP-PI + 0.3%, i.e., 4% annually since 1984.
  - Taylor bases his claim on the use of long-term, mostly pre-divestiture input price experience for the period 1948-1979
  - But he also contends that growth in post-divestiture (1984-92) input prices are not statistically different from economy-wide price movements
- Christensen, however, studied LEC Total Factor Productivity (TFP) for the post-divestiture period (1984-92) and in that study employs post-divestiture LEC input price data showing LEC input price growth for the period at an annual rate of 2.6% less than GDP-PI, the very same data that Taylor rejects as anomalous!

USTA relies on Christensen's TFP growth rate estimate (2.6%) but jumps over to Taylor's position when it comes to LEC input prices

Christensen:

LEC Productivity grew at least 2.6% per year for 1984-1992.

Productivity growth is best measured by Total Factor Productivity ("TFP").

TFP growth rate = output quantity growth rate – input quantity growth rate

Based on the Christensen May 1994 Study for 1984-1992 period

LEC output quantity grew at 3.5%

LEC input quantity grew at 0.9%

Therefore, LEC TFP annual growth rate = 2.6%.

Christensen's TFP using Taylor's input price theory:

The GDP-PI minus 2.6% input price component is integrally related to the 1.1% input price growth rate and the 0.9% input quantity growth rate used in the Christensen May, 1994 study.

The integral relationship between input price and input quantity is a known economic fact in the context of TFP studies. If one changes, the other must also change.

- **Thus if USTA wants now to discredit Christensen's input price measure, the result would be a direct and immediate change in the measure of TFP.**

- **Our analysis shows that changing the input price growth rate to USTA's claimed value, and then recalculating TFP using Christensen's process, leads to essentially the same X Factor as under the Ad Hoc formulation.**

Christensen's TFP using Taylor's input price theory:

While the lack of all input data used by Christensen precludes a complete replication of his process, a rough calculation illustrates this point.

Because USTA did not supply the input expenditure data that Christensen utilized, it was first necessary for us to extrapolate this value from the data that was supplied

- **Christensen had calculated that total LEC input quantity increased at a rate of 0.9% by, in effect, subtracting the rate of change in input prices from the rate of change in dollar expenditures on inputs.**

On that basis, and using his input price growth rate of 1.1%, total dollar expenditures on inputs must have increased at an annual rate of 2.0%.

Christensen's TFP using Taylor's input price theory:

Suppose USTA replaces Christensen's 1.1% input price growth rate with Taylor's claimed 4.0% input price growth rate. Since the growth in total dollar expenditure on inputs was 2.0%, input quantity must have decreased at a rate of 2.0% (i.e., 2.0% growth in expenditures minus 4.0% increase in input prices).

Christensen study:

Input quantity growth = 2.0% expenditure growth – 1.1% input price growth = 0.9%
TFP growth = 3.5% output quantity growth – 0.9% input quantity growth = 2.6%

Christensen study revised per Taylor input price growth:

Input quantity growth = 2.0% expenditure growth – 4.0% input price growth = –2.0%
TFP growth = 3.5% output quantity growth – –2.0% input quantity growth = 5.5%

TFP would then be calculated as output quantity growth of 3.5% minus the input quantity growth of –2.0%, resulting in a TFP growth rate of 5.5%.

- **This calculation can be readily confirmed by the Commission were it to obtain from USTA all data necessary to replicate Christensen's analysis**

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Before the

PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Investigation on the Commission's own Motion into the Second Triennial Review of the operations and safeguards of the Incentive-Based Regulatory Framework for local exchange carriers.	**I.95-05-047**

Rebuttal Testimony

of

LEE L. SELWYN

on behalf of the

California Committee of Large Telecommunications Consumers (CCLTC)

September 18, 1995

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Introduction 1

The LEC witnesses ignore the fact that their own evidence confirms the presence of substantial and sustained real decreases in LEC input prices during the post-divestiture period, and that these must be reflected in the NRF price adjustment mechanism in order to avoid an enormous revenue windfall for Pacific and GTEC. 2

Pacific's position on pricing flexibility as a means of responding to competitor pricing initiatives is fundamentally at odds with its persistent denial that LEC input price growth differs from economy-wide changes. 11

The LECs persist in overstating the potential impact of competition upon their productivity, profitability and growth merely because local entry barriers may soon be lifted. 14

Transitional effects of competition upon LEC output growth and productivity, to the extent they may exist, should not be considered in developing price cap parameters. 16

Mr. Evans' testimony misrepresents Pacific's pre- and post-NRF performance, and understates the substantial gains that Pacific has enjoyed under NRF. 19

Neither Pacific nor GTEC have demonstrated a clear linkage between the potential entry and growth of competition and the specific price cap reforms that are being requested. 24

1 REBUTTAL TESTIMONY

2

3 **Introduction**

4

5 Q. Please state your name, position and business address.

6

7 A. My name is Lee L. Selwyn. I am President of Economics and Technology, Inc., One
8 Washington Mall, Boston, Massachusetts 02108.

9

10 Q. On whose behalf is this testimony being submitted?

11

12 A. This testimony is submitted on behalf of California Committee of Large Telecommuni-
13 cations Consumers (CCLTC).

14

15 Q. What is the purpose of your testimony at this time?

16

17 A. I will respond to and rebut testimony offered by Pacific Bell witnesses Christensen,
18 Schmalensee, Evans and Harris, and GTEC witnesses Duncan and Sappington regarding
19 LEC productivity and competition in the California local service market.

20

The LEC witnesses ignore the fact that their own evidence confirms the presence of substantial and sustained real decreases in LEC input prices during the post-divestiture period, and that these must be reflected in the NRF price adjustment mechanism in order to avoid an enormous revenue windfall for Pacific and GTEC.

Q. Dr. Selwyn, in your direct testimony, you present an extensive discussion concerning the need to include an input price differential in the calculation of the X-factor in order to reflect the fact that LEC input prices are rising at a slower rate than overall economy-wide input price levels — i.e., that LEC inputs are experiencing real decreases in price. Is this issue addressed in the testimony submitted by Pacific and GTEC?

A. Yes, Drs. Christensen and Schmalensee for Pacific appear to concede that if LEC input price growth deviates from the economy-wide experience, that differential should be captured in the X-factor.[1] However, these witnesses also assert that over the long run there is no difference in input price growth for LECs vis-a-vis that for the entire US economy. Dr. Christensen relies upon the same arguments he presented in the FCC's price cap review proceeding on behalf of the United States Telephone Association (USTA), arguments that, as I discussed at length in my direct testimony, were considered and rejected by the FCC in its Price Cap Review order issued in April, 1995.[2] In his

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1. Christensen (Pacific) at 2; Schmalensee/Taylor/Tardiff (Pacific) at 12, and footnote 17.

2. In particular, on page 16 of his testimony, Dr. Christensen refers to (but does not provide a detailed citation for) what he describes as a "recent" Input Price Affidavit submitted by him on behalf of USTA in the FCC price cap review proceeding, CC Docket 94-1. However, this is not a new affidavit, but was the one submitted by Dr. Christensen to the FCC as part of a USTA *ex parte* filing made on February 1, 1994. [Pacific response to CCLTC Second Set of Information Requests, item 25.] Evidence of the FCC's rejection of Dr. Christensen's arguments in presented in Appendix 2 to my direct testimony, which reproduces Appendix F of the FCC's price cap decision containing an analysis of the input price differential issue by FCC staff economists, C. Anthony Bush and Mark Uretsky.

testimony for GTEC, Dr. Duncan endorses "both the analysis and results of [the Christensen] Study."[3] However, Dr. Duncan goes on further to assert an underlying economic rationale for Dr. Christensen's position that LEC and economy-wide input price growth rates are the same: He argues that "if input prices were to deviate for one sector of the economy, the economy as a whole would adjust to make that deviation smaller and eventually cause it to disappear" such that in the long term, input prices for all sectors will tend toward the economy-wide inflation rate.[4]

Q. Do you agree with Dr. Duncan's assertion or with his reasoning?

A. No. Dr. Duncan appears to misunderstand the issue and/or to misapply basic economic theory. It is true that the price of an *individual* input will tend toward equilibrium irrespective of the sector in which the particular input is utilized. Thus, an individual input such as a person-hour of a particular skill, a 486 personal computer, a truck, etc., will tend to carry the same price whether used in the telecommunications industry or in the textile industry. This is true because, if the price being offered for a given type of input is higher in one sector than in another, that input (to the extent that it is fungible) will tend to flow to the sector willing to pay the most for it.

But Dr. Duncan is *incorrect* when he suggests that the prices of *all* individual inputs will change at the same rate in the long run as economy-wide input prices generally. The

3. Duncan Testimony, p.4.

4. *Id.*, pages 7-8.

price of labor is generally rising much faster than the price of capital, and within each of these two broad categories of inputs, there is considerable variation in the growth of labor and capital costs based upon the particular *type* of labor or capital involved.

Q. Can you provide any examples of this?

A. Yes. The prices of individual capital inputs grow at distinctly different rates depending upon, among other things, the technology, productivity, and competitiveness of the supplier sector. For example, the price growth of capital inputs comprised of computer chip technology is likely be much smaller (or even negative) vis-a-vis the price growth for capital inputs comprised of rare metals. Similarly, the prices of skilled labor (particularly for skills with high demand and for which considerable training is required) are growing at a faster rate than the price of unskilled labor. Apparently, Dr. Duncan would ignore the fact that individual inputs are not homogeneous in all respects and that the particular bundle of inputs used in the production process will vary by industry. It is clearly reasonable to expect that the LEC bundle of capital inputs will have a price growth lower than the economy as a whole because of the industry's disproportionately heavy use of inputs containing computer chips, digital electronics, fiber optics, digital switching equipment, and other high-technology items whose prices have been declining rapidly for a decade or more.

Moreover, even if the prices of all labor inputs or of all capital inputs were each to grow at the same rate in all industries (which they do not as an empirical matter, as discussed below), the aggregate or total input price growth will still vary by industry whenever

differences in capital/labor intensity occur, i.e., *whenever a different mix of capital and labor inputs is utilized in the respective production processes.* This is the general case: Different industries exhibit different capital/labor intensity in their utilization of inputs, and hence experience different rates of input price growth both vis-a-vis each other and vis-a-vis the economy-wide input price growth rate.

For example, some industries, like telecommunications, are highly capital-intensive and employ less-than-average proportions of labor; others, like health care, employ disproportionately high amounts of labor. Since labor costs are generally increasing faster than capital costs, industries employing higher proportions of labor will, all other things being equal, experience higher input price growth over time than will industries employing higher proportions of capital. And while industries that employ high proportions of labor may attract technological attention, it does not follow, as Dr. Duncan mistakenly believes, that industries employing high amounts of capital will attract labor merely because their input costs are rising more slowly than the economy-wide rate.

The basic economic theory that Dr. Duncan endeavors to apply for purposes of buttressing Dr. Christensen's arguments simply does not hold true under conditions where inputs are not homogeneous in all respects and where differences in capital/labor intensity occur. Accordingly, and contrary to what Drs. Duncan and Christensen argue, there is a strong conceptual basis for expecting that, *a priori*, LEC input prices will increase more slowly than input prices for the economy as a whole for some time to come.

Q. Is there empirical evidence to support your general contention that input prices grow at different rates in different sectors of the economy, and in particular, that LEC input prices will increase more slowly?

A. Yes there is, and ironically, one of the best sources of that evidence comes from Dr. Christensen's own data and previous studies. Dr. Christensen's seminal study of long-term labor and capital costs confirms sustained and substantial differences in long-term price growth as between these two input categories for the private US economy.[5] According to Christensen's data, over the 38-year period 1929 to 1967, the labor input price index for the US economy grew by 3.90% as compared with capital input price growth of only 2.26%.[6] Data available from the US Bureau of Labor Statistics (BLS) confirms that this trend has continued to the present. The BLS data shows that for the post-divesture period 1984 to 1992, labor input prices for the US economy have grown by 3.87%, *more than double* the rate of capital input price growth (1.71%).[7]

Given these marked differences in input price growth as between capital and labor inputs, the critical piece of empirical evidence on input price growth for the LECs vs. the economy generally turns on relative intensities (i.e., cost shares) of capital and labor inputs for

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5. Laurits R. Christensen and Dale W. Jorgenson, "U.S. Real Product and Real Factor Input 1929-1967," *Review of Income and Wealth*, Series 16, March 1970, pp. 19-50.

6. *Id.*, Table 4, Column 6 for Labor price growth; Table 5, Column 5 for Capital price growth.

7. Bureau of Labor Statistics, Office of Productivity and Technology, data prepared for February, 1995 Publications.

the LEC sector vs. the total US economy. Once again, compelling evidence is available from Christensen's own data. For the US economy as a whole for the post-divestiture period 1984-1992, the annual input cost share for capital is only .314, with labor's cost more than double at .686.[8] For the LECs, based on Christensen/ USTA study data for that same post-divestiture time period, the comparable annual input cost shares are a cost share for capital of .621, and a significantly smaller cost share for labor of .379.[9]

CAPITAL/LABOR
INPUT COST SHARES

	Capital	Labor
LECs	.621	.379
US Econ	.314	.686

Thus, there is clear empirical evidence (from Christensen's own data) that capital input prices have grown at a significantly lower rate than labor input prices, and that the LECs are more capital-intensive than the US economy as a whole. These two pieces of empirical data provide compelling evidence to refute the Christensen/Duncan assertion that LEC input prices will increase at the same rate as overall economy-wide input prices.

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8. BLS data, op cit.

9. See Laurits R. Christensen, Philip E. Schoech, and Mark E. Meitzen, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation, 1993 Update, January 16, 1995, Table 2, Annual Input Cost Shares. To make the LEC input cost share data provided in the Christensen study comparable to national input/output accounting data produced by the BLS, I have excluded the materials category. When the materials category is included for the LECs, the annual input cost shares are as follows: .470 capital, .287 labor, and .243 materials. While I continue to have serious concerns as to the veracity of the so-called "1993 Update," no LEC cost shares data had been provided by Christensen or USTA prior to that *ex parte* submission.

1 Q. Dr. Selwyn, what about the empirical tests performed by Dr. Duncan which he claims
2 support Christensen's finding of no long run difference in the input price series for the
3 LECs as compared with the US economy?
4
5 A. Dr. Duncan used a different statistical technique for modelling time series data, i.e,
6 Autoregressive Integrated Moving-Average ("ARIMA") analysis, as compared with Dr.
7 Christensen's use of standard regression analysis. However, the empirical tests performed
8 by Dr. Duncan rely upon the same long run data series and suffer from the same
9 infirmities as the Christensen analyses previously considered and rejected by the FCC in
10 its price cap review proceeding. Therefore, his use of a different statistical technique
11 than that adopted by Dr. Christensen does nothing to support the validity of Dr. Duncan's
12 arguments, which are essentially the same as those made by Dr. Christensen here as well
13 as in the FCC's price cap proceeding.
14
15 As I noted in my direct testimony at 38-39, the "long run input price theory" was
16 precisely the issue that was studied quantitatively by FCC economists Bush and Uretsky,
17 and which they rejected based upon critical evaluation of the evidence and numerous
18 empirical tests.[10] The Bush/Uretsky analysis explicitly tested my hypothesis that post-
19 divestiture LEC input price movements differed fundamentally from the pre-divestiture
20 condition, against the Christensen hypothesis that divestiture had no effect. Bush/Uretsky
21 showed conclusively that my hypothesis was correct and that Christensen's was wrong.
22 *Significantly, nothing in the testimony offered in the present proceeding by Drs.*

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23 10. See Bush/Uretsky analysis reproduced in Appendix 2 to my direct testimony.

Christensen or Schmalensee for Pacific or by Dr. Duncan for GTEC even addresses, let alone refutes, the Bush/Uretsky/FCC conclusion.

Q. Suppose, for the sake of argument, that Dr. Duncan and Dr. Christensen were, nevertheless, correct in their claim that long-term input price growth is essentially the same as economy-wide input price growth. Do competitive markets respond to long-term input price changes or to short-run price movements?

A. Clearly, they respond to short run price movements. In competitive markets, individual firms react to the prices that they *currently* pay (and that their competitors also confront) for their inputs, not to long-term trends. The local gas station raises the price of a gallon of gasoline by 3 cents in response to a price hike by its supplier, and because it knows that the competing gas station on the next block is facing the same situation. The fact that gasoline prices may be trending upward by so-many-cents a gallon per year over a 30-year time frame is entirely immaterial to the price-setting process that is employed by an individual firm. Hence, even if PacBell's and GTE's witnesses were factually correct in their portrayal of LEC input price movements, *which of course they are not*, the relevant, *competitive outcome* input price movements are necessarily those that occur in the short-term. And by these witnesses' own admission and their own data, short-term LEC input prices have risen and continue to rise at rates well short of the economy-wide inflation rate.

Q. Notwithstanding the repeated claims by Drs. Christensen, Schmalensee and Duncan that LEC input price growth and economy-wide input price growth do not differ and that

economy-wide data should be used, which data series did Dr. Christensen use in the LEC TFP study presented in his testimony in this proceeding and in USTA's submission in CC Docket 94-1 — LEC-specific input price growth or economy-wide input price growth?

A. The LEC TFP study being sponsored here and at the FCC by Dr. Christensen used *LEC-specific input price movements* for the period 1984-1992, not economy-wide input price growth. This fact is incontrovertibly confirmed in the June 2, 1994 *Response of the United States Telephone Association to Ad Hoc's Motion to Compel and Motion for Extension of Time* submitted in CC Docket 94-1, which I have reproduced as Appendix 1 to this rebuttal testimony. In that document, USTA provided several tables containing what it avers was the data underlying the Christensen LEC TFP study. At Table 1, in the column labelled "Total Input Price," the figures show input price growth from the 1984 base year index value of 1.000 to the 1992 index value of 1.088, which translates into an annual input price growth rate for the 1984-92 period of 1.1%. By comparison, the annual rate of GDP-PI growth during that same period was 3.7%.[11]

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11. Economy-wide input price growth is actually greater than GDP-PI, because it is necessary to add to the output price index growth rate the economy-wide productivity growth rate, which is currently 0.3%. See Bush/Uretsky (Appendix 2 to my direct testimony) at 3-4. Thus, if GDP-PI growth averaged 3.7% during the 1984-92 period, economy-wide *input price growth* averaged 4.0% [i.e., 3.7% + 0.3%]. When Christensen and Schmalensee/Taylor/Tardiff speak of the "expected TFP growth differential" of approximately 2.0%, what they are doing is taking an algebraic short-cut. Technically, their position is that LEC input prices are growing at the same rate as economy-wide input prices (4.0%), offset by long-term LEC TFP growth (2.3%), which is equivalent to GDP-PI (3.7%) minus X (2.0%). As I have shown, this position is not supported either by empirical data or by Dr. Christensen's own use of LEC-specific input prices in his TFP calculation.