

i.e., the capital stock level in the first period for the study, should be based on the original cost or current replacement cost of assets.¹⁰² We also noted that USTA used proprietary telephone plant indices (TPIs) to deflate plant additions to constant dollars, and asked several questions regarding the sources and reliability of USTA's TPIs.¹⁰³

54. In the Price Cap Fourth Further Notice, we also noted that USTA's original model aggregated capital into six asset categories, and then developed a depreciation rate for each category to use in calculating the implicit rental price of capital stocks. We asked whether USTA's six classes were the most appropriate classification scheme, noting that the Commission prescribes depreciation rates for 30 asset categories.¹⁰⁴

55. Discussion. Both USTA and AT&T agree that the perpetual inventory model is a theoretically correct and practical method of constructing capital stocks. Therefore, we have decided to use the Perpetual Inventory Model for calculating capital stocks in our analysis.

56. Both USTA and AT&T use BEA asset price indices to deflate their capital stock additions to constant dollars. USTA, AT&T, and Ad Hoc agree that BEA asset price indices avoid the proprietary issues raised by TPIs based on incumbent LEC data. BEA asset price indices measure the movement of asset prices in the U.S. economy. Although BEA asset price indices do not measure precisely the prices of LEC assets, BEA's indices are sufficiently disaggregated that they can be used to develop a surrogate for LEC capital asset prices. Therefore, we have decided to use BEA asset indices.

57. AT&T uses USTA's original six asset categories, but USTA's simplified TFP model reduced the number of asset categories to three. Although USTA and AT&T use different numbers of asset categories, they have not criticized each other's choices, and no one else has criticized either model on the basis of number of asset categories. In our staff analysis, we have used one asset category, and one depreciation rate, because further disaggregation does not appear to provide a more accurate measure of TFP growth, and one asset category simplifies the calculation.

¹⁰² Price Cap Fourth Further Notice, 10 FCC Rcd at 13666 (para. 41).

¹⁰³ Price Cap Fourth Further Notice, 10 FCC Rcd at 13666 (para. 45).

¹⁰⁴ Price Cap Fourth Further Notice, 10 FCC Rcd at 13665 (para. 39).

(3) Adjustments to Capital Stock

58. Background. In the Price Cap Fourth Further Notice, we treated as separate issues measurement of the accumulated depreciation used in the perpetual inventory model used to calculate the benchmark capital stock, and the depreciation rates in the implicit rental price. Upon review of the record, we find that these issues are interrelated, and consider them together here. For example, USTA emphasizes the need for the starting value of capital in the perpetual inventory equation to be consistent with the depreciation assumptions used elsewhere in the study.¹⁰⁵

59. In the Price Cap Fourth Further Notice, we observed that the implicit rental price calculation in USTA's original study relied on depreciation rates it characterizes as "economic" depreciation rates, developed by an economist named Dale Jorgenson.¹⁰⁶ We questioned whether it was reasonable for carriers to use depreciation rates in TFP calculations that differ from the Commission's prescribed depreciation rates.¹⁰⁷ In our discussion of benchmark capital stock adjustments, we noted that the perpetual inventory model in USTA's original study multiplied the replacement cost of capital by "economic stock adjustment factors," and sought comment on economic stock adjustment factors.¹⁰⁸

60. Discussion. Ad Hoc and AT&T contend that we should use the depreciation rates prescribed by the Commission, and these parties use those rates in their studies.¹⁰⁹ They criticize Jorgenson's "economic" depreciation analysis on which USTA relied in its

¹⁰⁵ USTA Comments, App. A at 15.

¹⁰⁶ Price Cap Fourth Further Notice, 10 FCC Rcd at 13665 (para. 37), citing Jorgenson, Productivity and Economic Growth, in Fifty Years of Economic Measurement (E.R. Berndt and J.E. Triplett, eds., 1990), at 19-118. In the Price Cap Fourth Further Notice, we sought comment on depreciation rates in the context of the "implicit rental price." Implicit rental prices are used to weight the indices for different asset categories into one aggregate capital input index. (We discuss the implicit rental price in detail below.)

¹⁰⁷ Price Cap Fourth Further Notice, 10 FCC Rcd at 13665 (para. 38), citing Section 220(b) of the Communications Act, 47 U.S.C. § 220(b). The 1996 Act subsequently revised Section 220 of the Communications Act so that the Commission is now permitted rather than required to prescribe depreciation rates. We asked whether we should require TFP depreciation rates to fall within the bands established in the Depreciation Simplification Order, if we were to permit TFP depreciation rates to differ from the prescribed depreciation rates. Price Cap Fourth Further Notice, 10 FCC Rcd at 13665-66 (para. 40), citing Simplification of the Depreciation Prescription Process, Report and Order, CC Docket No. 92-296, 8 FCC Rcd 8025 (1993) (Depreciation Simplification Order) (petitions for reconsideration pending). Because we decide below to rely on our prescribed depreciation rates in our analysis of the record, we need not address this issue further.

¹⁰⁸ Price Cap Fourth Further Notice, 10 FCC Rcd at 13666 (para. 43).

¹⁰⁹ Ad Hoc Comments, Att. at 20; AT&T Comments at 22; Ad Hoc Reply at 5. See also MCI Comments at 18-19.

original TFP study, as well as in its simplified study. Ad Hoc and AT&T state that Jorgenson's analysis was based on a 1981 article by Hulten and Wykoff,¹¹⁰ which in turn was based on data ending in 1971, and examined depreciation of business assets for the economy as a whole rather than of telecommunications assets specifically.¹¹¹ USTA explains that it adopted only the depreciation method developed in the 1981 article, and substituted the most recent BEA data on telecommunications equipment lifetimes to develop depreciation rates.¹¹²

61. Some commenters argue that the depreciation rates should be those prescribed by the Commission.¹¹³ Ad Hoc maintains that the prescribed rates are designed to reflect the actual rate of plant retirement.¹¹⁴ MCI asserts that the prescribed rates in fact adequately reflect the economic life of plant and equipment.¹¹⁵ MCI includes a study of depreciation rates to support its conclusions.¹¹⁶ In particular, MCI asserts that the study shows that depreciation reserve deficiencies are not excessively high at this time.¹¹⁷ A number of LECs criticize MCI's study.¹¹⁸

62. We conclude that USTA has not shown that the depreciation rates it developed for its TFP calculations are in fact "economic" depreciation rates, or are reasonable for use in a LEC TFP study. First, although USTA states that it has updated the depreciation rates from the 1981 Hulten-Wykoff article with more recent BEA data, USTA has not shown that the depreciation rates it has developed are applicable to LEC equipment. Ad Hoc notes that the depreciation rates in the USTA study are lower than either the prescribed depreciation rates or the rates advocated by LECs in depreciation rescription proceedings, and argues

¹¹⁰ Charles R. Hulten and Frank C. Wykoff, The Measurement of Economic Depreciation, in Depreciation, Inflation, and the Taxation of Income from Capital (Charles R. Hulten, ed., 1981) at 95.

¹¹¹ Ad Hoc Comments, Att. at 20-21; Ad Hoc Reply, Att. at 33; AT&T Comments at 22, App. A at 47-49, App. B at 9; AT&T Reply at 32-34. But see AT&T Reply, App. B at 48-49 ("hyperbolic decay model" used by BLS inferior to "geometric decay model" used by Jorgenson).

¹¹² USTA Reply, Att. A at 19-20. See also Bell Atlantic Reply, Att. 1 at 11-12; Pacific Reply at 13-14.

¹¹³ MCI Comments at 18-19; Ad Hoc Comments, Att. at 20; AT&T Comments at 22; Ad Hoc Reply at 5.

¹¹⁴ Ad Hoc Comments, Att. at 22-23.

¹¹⁵ MCI Comments at 18-19; MCI Reply at 7.

¹¹⁶ MCI Comments, App. A.

¹¹⁷ See, e.g., MCI Comments, App. A at 1-4. See also NCTA Reply at 7-8.

¹¹⁸ Southwestern Bell Reply at 15-16 and App. A at 1-2; US West Reply at 23-28; NYNEX Reply at 11. USTA Reply, Att. C at 18-19, Att. D at 6-8, 12-13.

that underestimating depreciation artificially reduces TFP and the X-Factor.¹¹⁹ USTA has not explained why it used depreciation rates lower than our prescribed rates,¹²⁰ when in other comments its members advocate higher depreciation rates.¹²¹

63. In our analysis, we have decided to use our prescribed depreciation rates. We find that it would not be reasonable, based on this record, to prescribe a set of depreciation rates for TFP calculations that differs from the depreciation rates currently in place for determining operating expenses. First, there is no sound basis in the record in this proceeding for determining whether and to what extent our depreciation rates differ from economic depreciation rates. Second, developing an additional distinct set of depreciation rates would clearly increase administrative burdens, and the record before us does not reveal any countervailing benefits that would justify this additional burden.¹²² Third, under our recently established streamlined procedures for determining LEC depreciation rates, incumbent LECs have considerable influence and some discretion in setting their specific depreciation rates.¹²³ Commenters in this proceeding have not persuaded us that the depreciation rates we have currently prescribed do not reflect the LECs' depreciation costs.

64. To incorporate the effects of accumulated depreciation on its benchmark capital stock level, USTA states that, in its simplified TFP model, it multiplies gross book values by "economic stock adjustment factors" derived by dividing BEA market value measures by BEA original cost measures for certain asset classes.¹²⁴ For the same reasons we find above that the Commission's prescribed depreciation rates are better suited than USTA's

¹¹⁹ Ad Hoc Comments, Att. at 23.

¹²⁰ In the Price Cap Fourth Further Notice, we stated that our prescribed depreciation rates for the BOCs, GTE, and SNET from 1984 to 1992 was about 7.1 percent, while the depreciation rates in USTA's original TFP model averaged 5.7 percent for those BOCs over that period. Price Cap Fourth Further Notice, 10 FCC Rcd at 13665 n.59.

¹²¹ See, e.g., USTA 1997 Comments, Att. 13.

¹²² USTA asserts that "the age-efficiency trends of assets" are independent of any regulatory depreciation rates, and therefore recommends using the depreciation rates in its simplified TFP model regardless of how the Commission may revise its depreciation rates in the future. USTA 1997 Comments, Att. 5 at 12-13. We can think of no reason why incumbent LECs should be permitted to use different depreciation rates for different regulatory purposes. Furthermore, we reject USTA's categorical claim that the Commission's depreciation rates do not and never will reflect the LECs' depreciation costs. We therefore disagree that USTA's depreciation rates are preferable to any depreciation rates we may develop in the future.

¹²³ Under this procedure, proposed depreciation rates are considered reasonable if the rates fall within specific bands established for each asset category by the Commission. See Depreciation Simplification Order, 8 FCC Rcd 8025.

¹²⁴ USTA Comments at 21 and App. A at 16.

depreciation rates for our TFP analysis, we are not using USTA's economic adjustment factors to adjust the benchmark capital stock level for the effects of depreciation. Instead, we have decided to base the benchmark capital stock calculations in our analysis on net book costs: gross book costs minus the accumulated depreciation reserves associated with our prescribed depreciation rates.

65. We note that we are making only limited findings in this Order regarding depreciation: (1) TFP calculations for purposes of determining an X-Factor at this time should use the same depreciation rates as those the incumbent LECs are required to use to determine their operating expenses, and (2) USTA has failed to show that the depreciation rates used in its simplified TFP model measure depreciation better than the Commission's depreciation rates. We reach no decision in this Order on the possible use of "economic" depreciation methods in general. In the Access Reform Notice, we sought comment on whether some portion of the incumbent price cap LECs' "residual" or "legacy" costs might be the result of underdepreciation.¹²⁵ We plan to address this issue in conjunction with the other residual cost issues we raised in the Access Reform Notice. Nor are we suggesting that we plan to continue exercising our Section 220(b) prescription authority indefinitely. The 1996 Act amended Section 220(b) of the Communications Act, so that we are no longer required to prescribe depreciation rates. The telecommunications industry is evolving, and this evolution may well require us to revise our prescription methods, or possibly discontinue depreciation rate prescriptions altogether. If we do revise the price cap LECs' depreciation rates substantially, or if we permit them to develop their own depreciation rates, we will determine the effect of the revised depreciation rates on TFP and the X-Factor in our next performance review.

(4) Hedonic Adjustments

66. Background. Both AT&T, initially, and Ad Hoc apply "hedonic" adjustments to their capital asset price indices, *i.e.*, adjustments to reflect that new equipment differs from the old in technology as well as in price. AT&T and Ad Hoc argue that capital input prices must be adjusted for technological improvements to avoid understating the change in the effective level of real capital stocks. AT&T states that, to the extent that succeeding generations of capital equipment are more productive, a hedonic adjustment increases the computed level of capital stock, increases the flow of capital services, and, holding output constant, decreases measured TFP. AT&T also states, however, that a hedonic adjustment would decrease the price of capital input, thus increasing the input price differential. AT&T

¹²⁵ Access Reform Notice at paras. 250-55.

therefore argues that its computed X-Factor is not greatly affected by its hedonic adjustment.¹²⁶ By contrast, Ad Hoc asserts that a hedonic adjustment would increase the X-Factor, rather than merely result in offsetting changes in TFP and the input price differential. Ad Hoc makes no recommendation at this time, however, as to how to adjust for technological improvements, but asserts that, if this adjustment caused a 10 percent annual decrease in the price indices for the capital input asset categories that include computers, the X-Factor would increase by about 0.4 percent.¹²⁷

67. Discussion. We find nothing in the record to suggest that our TFP calculation would be more accurate with a hedonic adjustment. AT&T observes that its hedonic TFP adjustment results in an offsetting adjustment to its input price differential, leaving its X-Factor recommendation unchanged.¹²⁸ In addition, neither AT&T nor Ad Hoc have shown that their hedonic adjustments accurately measure the effects of technological improvements. The hedonic adjustment to the price per unit of capital proposed by AT&T in its TFP model is incompletely documented, and the details on all the components of the hedonic adjustment are not clear and replicable. Ad Hoc's 10 percent per year adjustment to certain asset price indices is not supported, but stated as an assumption. Based on the record before us, there is no need to include a hedonic adjustment.

(5) Deriving the Level of Capital Services from Capital Stock

68. Background. We invited comment on whether capital services should be measured by "capital consumption," i.e., the loss of efficiency in the capital over time, or by the level of capital stock. We noted that basing capital services on the level of capital stock assumes that the level of capital services is proportional to the level of the capital stock, and that the factor of proportionality does not vary over time. Alternatively, we sought comment on whether capital services could or should be based on some combination of the amount of capital consumption and the change in the level of capital stock.¹²⁹

69. Discussion. Our review of the economic literature on TFP and the pleadings of AT&T and USTA support the view that capital services (the quantity of capital services input) should be measured as proportional to the level of capital stock, and that capital consumption (such as depreciation expense) should be included in the measure of the cost

¹²⁶ AT&T Comments, Att. A at 34-35.

¹²⁷ Ad Hoc Comments, Att. at 57-58. In its reply, Ad Hoc claimed that a 10 percent hedonic adjustment would increase the X-Factor by 1.0 when based on data from 1990 to 1994, or 1.1 percent when based on 1989 to 1993, or from 1989 to 1994. Ad Hoc Reply at 4 and Att. at 36-37.

¹²⁸ AT&T Comments, Att. A at 34-35.

¹²⁹ Price Cap Fourth Further Notice, 10 FCC Rcd at 13667 (para. 47).

(price) of the capital stock.¹³⁰ Further, the parties argue that capital services do not decline over the useful life of a unit of the capital stock. A piece of capital equipment with a ten-year life does not provide 10 units of capital services in its first year and only 3 units in its eighth year.¹³¹ All the TFP studies submitted in the record of this proceeding measure the change in capital services as the change in the level of capital stock.

(6) Implicit Rental Price

70. Background. The weight given to the capital services input when it is aggregated with labor and materials inputs is based on the capital cost, which is the product of the implicit rental prices of the total capital stocks for the asset categories. The implicit rental price represents the hypothetical price of renting the LECs' capital stock in a competitive market, if such a market existed.¹³² In the Price Cap Fourth Further Notice, we observed that the implicit rental price in USTA's original TFP model is based on the rate of return, the depreciation rate, certain tax rates, and its TPIs.¹³³ In addition to asking specific questions regarding the rate of return, depreciation, and taxes, we sought comment on whether USTA's method of calculating the implicit rental price is reasonable. We also asked whether data would be available on a timely basis to make these calculations in the future, and about alternatives to USTA's method.¹³⁴

71. We also asked questions regarding the rate of return component of USTA's implicit rental price. We observed that USTA's original TFP model used Moody's Yield on Public Utility Bonds as the rate of return, and questioned whether it would not be more reasonable to include the cost of equity as well as the cost of debt in the rate of return.¹³⁵ We also noted that we have determined the LECs' rate of return in our past rate-of-return rescription orders, and questioned whether it would be reasonable to allow LECs to use any other rate of return. We also sought comment on how often, and by what method, the rate of return should be updated for purposes of TFP calculations. Finally, we invited

¹³⁰ See, e.g., Berndt and Fuss, 33 J.Econometrics at 11.

¹³¹ See USTA Comments, Att. A at 21.

¹³² See Price Cap Fourth Further Notice, 10 FCC Rcd at 13677 (para. 48).

¹³³ Price Cap Fourth Further Notice, 10 FCC Rcd at 13667 (para. 48).

¹³⁴ Price Cap Fourth Further Notice, 10 FCC Rcd at 13667 (para. 49).

¹³⁵ Price Cap Fourth Further Notice, 10 FCC Rcd at 13665 (para. 34).

comment on whether a represcription of the rate of return applicable to carriers subject to rate-of-return regulation should also be incorporated into TFP calculations.¹³⁶

72. Discussion. USTA estimates the rate of return in its implicit rental price calculation by deriving a nationally averaged return on capital from the National Income and Product Accounts. AT&T claims that USTA's implicit rental price introduces unreasonable distortions because it does not reflect price cap LECs' actual payments to capital. AT&T bases its weight for the capital input, or the "cost of capital" in terms of TFP calculations, on LEC revenues less the costs of labor and materials.¹³⁷ We find that AT&T's residual earnings method is a more accurate estimate of the contribution of capital to the production of output than USTA's method of measuring rate of return, because AT&T's method measures the actual flow of funds to capital. In other words, the residual earnings method reflects actual payments to capital. We have decided to use AT&T's approach in our analysis of the record, with the minor modifications discussed below.

73. AT&T cites several economic articles supporting the use of residual earnings as the cost of capital in TFP calculations.¹³⁸ For example, to correct for the potential distortion in the measurement of TFP growth, Berndt and Fuss propose two measures of implicit rental prices as alternatives to the equation proposed by USTA, one of which is similar to the implicit rental price proposed by AT&T.¹³⁹ Dhrymes calculates an implicit rental price in a similar manner.¹⁴⁰ Additionally, AT&T states that Christensen, USTA's consultant, has used a similar construction in a TFP study Christensen presented to the Public Service Commission of North Dakota on behalf of US West.¹⁴¹

¹³⁶ Price Cap Fourth Further Notice, 10 FCC Rcd at 13665 (paras. 35-36).

¹³⁷ Specifically, AT&T's proposed implicit rental price is calculated as property income divided by a measure of capital stock, where property income is total revenues plus depreciation less materials and labor payments.

¹³⁸ AT&T 1997 Reply, App. G at 27-29, citing e.g., Jorgenson and Griliches, The Explanation of Productivity Change, 34 Rev. Econ. Studies 249-80 (July 1967); Christensen and Jorgenson, The Measurement of Real Capital Input, 15 Rev. of Income and Wealth 293-320 (Dec. 1969); Berndt and Fuss, Productivity Measurement with Adjustments for Capacity Utilization and Order Forms of Temporary Equilibrium, 33 J.Econometrics 7-29 (Oct./Nov. 1986) (Berndt and Fuss).

¹³⁹ Berndt and Fuss.

¹⁴⁰ Dhrymes, The Structure of Production Technology: Evidence from LED Sample I, in U.S. Dept. of Commerce, Bureau of the Census, Proceedings of the 1990 Annual Research Conference, at 206.

¹⁴¹ AT&T Reply, App.A.

74. USTA and a number of LECs assert that AT&T's weighting of the capital input index replicates the incentives of rate-of-return regulation because it results in limiting carriers to a particular rate of return.¹⁴² We disagree. Under rate-of-return regulation, increases in a LEC's earnings lead directly to reductions in that LEC's rates. Under AT&T's capital weighting method, an increase in a LEC's earnings will increase the weight placed on its capital input index relative to its labor and materials indices. This would increase TFP and the X-Factor only to the extent that capital is growing less quickly than labor and materials. Also, the X-Factor is based on an industry average, and an increase in a particular LEC's TFP has only a limited effect on the industry average.

75. In our TFP calculation, we follow AT&T's proposal with modifications. The estimated implicit rental price is measured in terms of gross returns to capital divided by the capital stock. The weight used for aggregating capital services into the overall input quantity index is the share of gross payments to capital in total payments to all factors.

76. As a result of our decision to rely on AT&T's rather than USTA's implicit rental price, we need not determine whether a rate of return based on National Income and Product Accounts, Moody's bond indices, or the Commission's prescribed rate of return would be the most reasonable measure of the rate of return to incorporate into an implicit rental price calculation. We also do not need to address AT&T's contentions regarding USTA's treatment of depreciation or taxes in its calculation of the implicit rental price. Depreciation rates are relevant to AT&T's treatment of capital stock, however, and accordingly, we considered depreciation issues above.

b. Labor

77. Background. Labor is the second of the three factors of the TFP input index. In the Price Cap Fourth Further Notice, we noted that USTA's original TFP study used two categories of labor: management and non-management. We asked whether labor should be further disaggregated to account for different levels of education and vocational experience in the work force.¹⁴³ We also asked about adjustments for carrier "outsourcing," *i.e.*, replacing the services of workers employed by carriers with services provided by outside firms.¹⁴⁴

78. Discussion. In USTA's simplified TFP model, there is one category of labor, and the quantity of labor is measured as the number of employees. AT&T's TFP

¹⁴² USTA Reply at 20-21; Att. A at 17, Att. C at 4-6; NYNEX Reply at 15-16; BellSouth Reply, Att. at 23-29; GTE Reply at 9-10; Bell Atlantic Reply at 3; Southwestern Bell Reply at 10.

¹⁴³ Price Cap Fourth Further Notice, 10 FCC Rcd at 13667 (para. 52).

¹⁴⁴ Price Cap Fourth Further Notice, 10 FCC Rcd at 13667 (para. 52).

calculations are based on two categories, full-time and part-time employees. AT&T measures the quantity of labor as number of employees, with part-time employees counted as a fraction of a full-time employee. No one has suggested a more disaggregated labor input index. In our analysis of the record, we base the rate of growth of labor on total number of employees, to be consistent with our current collections of ARMIS data.

79. We agree with USTA that, when outsourcing occurs, the decrease in labor input growth is offset by an increase in expenses for services, and is reflected in the materials index.¹⁴⁵ Because materials expenses are inputs to the TFP calculation, no additional adjustment for outsourcing is needed.

c. Materials

80. Background. The original USTA TFP study derived materials quantities indirectly. USTA calculated materials expenses by subtracting depreciation and amortization expense, and employee wages, salaries, and benefits, from total operating expenses, and then deflated (or divided) this residual expense by the GDP-PI to construct a materials input index. AT&T's TFP study calculated materials expense by subtracting total labor compensation and the change in the depreciation reserve from total operating expense. AT&T deflated this residual expense by a materials price index. In the Price Cap Fourth Further Notice, we sought comment on whether it would be preferable or possible to construct a LEC-specific price index for deflating materials expense instead of relying on GDP-PI for that purpose. We stated that our objective was to measure TFP accurately with data that are verifiable and publicly available. In this section, we address only materials price and quantities index issues. We will address materials index weighting issues below.

81. Discussion. All the parties use the residual expense method of measuring materials. USTA uses the GDP-PI as the materials price index to deflate residual expense to derive materials quantities in its simplified TFP model. We find that USTA has not shown that use of GDP-PI accurately measures the prices of LEC materials and, therefore, TFP, because it does not reflect price changes in the narrow range of inputs used by LECs. This significantly affects measured TFP, and it disguises a significant portion of the input price differential.

82. The record contains a materials price index created by AT&T based on a subset of categories of national input/output expenditures prepared by the U.S. Bureau of Labor Statistics (BLS) that is more narrowly focused on materials purchases of communications industries than the economy-wide GDP-PI. We have replicated the index using the same

¹⁴⁵ USTA Comments at 24.

BLS data that AT&T used in an ex parte filing received on April 11, 1996.¹⁴⁶ AT&T's materials price index is a Tornquist index calculation, where the logarithmic percentage changes are replaced by arithmetic percentage changes. Because AT&T's materials price index is more narrowly focused on communications services than GDP-PI, we use AT&T's materials price index.

d. Weighting of Materials and Labor Indices

83. All the models placed in the record base the weight of the materials index in the final input index on materials expense. Since all the models determine materials expense as the residual expense left after labor compensation and depreciation are subtracted from total operating expense, both the labor and the materials shares of total inputs are affected by the specification of labor and depreciation expense.

84. USTA notes that AT&T's materials input index weight is calculated residually on the basis of total operating expenses minus total labor compensation and the change in depreciation reserves. USTA claims that AT&T's treatment of both labor expense and materials expense is flawed, and that those calculations distort the weights placed on the materials and labor input indices. USTA further claims that distorting the weights placed on the materials and labor input indices results in distorting the capital input index as well.

85. First, USTA claims that AT&T erred in subtracting total labor compensation from total operating expense. USTA claims that the proper measure of current period labor expense is wages, salaries and benefits. According to USTA, total labor compensation includes labor costs that are capitalized rather than expensed in the year in which they are incurred. Each year a portion of previously capitalized labor expense enters the current year total operating expense as part of depreciation expense. USTA claims that total labor compensation results in some double counting of labor expense,¹⁴⁷ and thus improperly shifts weight from the materials expense index to the labor input index.

86. Second, USTA claims that AT&T improperly calculated materials expense because it used the change in depreciation reserves instead of recorded depreciation and amortization expense. The increase in depreciation reserves may be less than depreciation and amortization expense because plant retirements draw down the reserve. This issue is different from the depreciation rate issue discussed above. Here, the issue is not to determine the proper rate of depreciation, but to determine materials expense by subtracting the depreciation (and labor) expense components of operating expense from total operating expense. USTA claims that changes in depreciation reserves understate depreciation

¹⁴⁶ AT&T Ex Parte Letter of April 11, 1996.

¹⁴⁷ USTA 1997 Comments, Att. 6 at 17-18.

expense, and, thus, overstate materials expense and place too great a weight on the material input index.

87. USTA claims that these errors result in an understatement of 0.2 percent in TFP for the period from 1988 to 1994, and an understatement of 0.3 percent for the period from 1989 to 1994.¹⁴⁸ USTA also admits, however, that these errors would have offsetting effects on the calculation of the input price differential in AT&T's model, and, consequently, no overall effect on an X-Factor that includes an input price differential.¹⁴⁹ In its 1997 reply, AT&T states that it has switched to using depreciation and amortization expense, rather than changes in depreciation reserves,¹⁵⁰ for this calculation.

88. Both USTA's and AT&T's models double count some labor costs by basing labor quantities on the number of employees. This double-counting occurs because capitalized labor expense is reflected in capital stock as well as labor. USTA has not solved this problem by basing labor expense on wages, salaries, and benefits rather than total compensation, because capitalized labor remains fully reflected in capital stock. Instead, USTA's approach merely changes the relative weights placed on the labor, materials, and capital input indices. We have decided in our staff analysis to weight the labor input index in our analysis on total compensation rather than wages, salaries, and benefits.

89. In summary, we base the weight placed on the materials input on Total Operating Expense, less total labor compensation, as AT&T recommends, and depreciation/amortization expense, as USTA recommends.

90. In the Price Cap Fourth Further Notice, we were "particularly concerned" about whether to adjust labor costs for other post-employment benefits (OPEBs) given that we had first permitted price cap LECs to make an exogenous cost increase to reflect these costs, and then later required those LECs to make an exogenous cost decrease.¹⁵¹ We decide that no

¹⁴⁸ USTA 1997 Comments, Att. 6 at 19-20.

¹⁴⁹ USTA 1997 Comments, Att. 6 at 20.

¹⁵⁰ AT&T 1997 Reply, App. G at 34-35. Upon review of AT&T's submitted data, however, it does not appear that it has in fact made this revision to its model.

¹⁵¹ Price Cap Fourth Further Notice, 10 FCC Rcd at 13667 (para. 52). OPEBs are post-employment benefits such as severance pay and other benefits for separated workers, and employee post-retirement liabilities other than pensions, such as retirees' life insurance and medical and dental care benefits. Southwestern Bell Corporation, GTE Service Corporation, Notification of Intent to Adopt Statement of Financial Accounting Standards No. 106, Employers' Accounting for Post-retirement Benefits Other Than Pensions, 6 FCC Rcd 7560 (Com. Car. Bur. 1991) (SFAS-106 Order); RAO Letter 22, 8 FCC Rcd 4111 (Com. Car. Bur., Accounting and Audits Div. 1993); LEC Price Cap Performance Review, 10 FCC Rcd at 9082-83 (para. 276), aff'd. Bell Atlantic v. FCC, 79 F.3d at 1204.

special adjustment of the labor input index is needed to reflect our changing regulatory treatment of OPEBs. The only relevant OPEB issue for purposes of TFP is whether amortizing OPEB expenses over longer or shorter periods can have any effect on the labor index, and thus TFP. We find that it does not because LECs record OPEB costs in their books at their present value, regardless of the amortization period we require. As a result, recording OPEB costs now has no greater or lesser effect on the labor input index than recording those costs in the future.

5. Summary

91. Total factor productivity (TFP) is the relationship between the output of goods and services to inputs of basic factors of production -- capital, labor, and materials. A TFP study attempts to quantify this ratio of output to inputs and measure the improvement in the ratio over time. The following outlines the staff TFP analysis, which is presented in detail in Appendix D.

92. We measured the change in the quantity of output using the change in physical measures such as access lines, messages, and minutes. Output quantities are then converted to index numbers and combined using their relative shares of total revenues as weights.

93. For inputs, the quantity of labor is measured directly, using the reported number of employees. We create the labor quantity index by taking a ratio of number of employees in a year to the number of employees in the base year, 1985. We measure capital services as a constant proportion of the capital stock. Thus, the change in capital services is proportional to the change in the capital stock. We have no direct measure of the quantity of materials consumed in the production of any period's output. Instead, we calculate materials expense by subtracting from total operating expense the operating expenses attributable to labor, and depreciation and amortization expense. To convert materials expense into a quantity, we deflate materials expense by a price index specifically created to measure changes in materials prices. To combine these inputs into a single index of inputs, we need to calculate weights (or factor shares) that represent the relative contributions of the inputs in the production process. We assume the contribution of each input is proportional to the payments to that factor of production. The weight for each factor is its share of total factor payments. For labor, this is total employee compensation. For materials, we use a number we have already calculated -- total material expense. The payment to capital is equal to gross return to capital, which is the difference between total revenue and the sum of materials and labor expense.

94. Estimating the change in total factor productivity allows us to develop an input price index that measures the change in the unit cost of purchasing basic resources. The labor and capital prices are transformed into indices, and the three input price indices are combined using the factor shares calculated above.

D. Other X-Factor Calculation Issues

1. Input Price Differential

95. Background. In the LEC Price Cap Performance Review, we noted that changes in a firm's costs of producing a unit of output are the product of both changes in the quantity of resources used, *i.e.*, changes in productivity, and changes in the prices paid for those resources, *i.e.*, changes in input prices.¹⁵² We tentatively concluded that the X-Factor should include both a measure of productivity growth and a measure of input price changes.¹⁵³ Specifically, we found that, as a theoretical matter, because LEC unit costs are also affected by the prices they pay for inputs, an input price differential should be included in the X-Factor.¹⁵⁴ In general, any TFP study generates an estimate of the change in input prices over the study period, in the price indices used to calculate the input indices. "Input price differential" refers, in the present context, to the difference between the rate at which input prices change in the economy in general and the rate at which LEC input prices change. Thus, when USTA claims that the long-term input price differential is zero, it is saying that the prices LECs pay for the resources they use in producing telecommunications services change at about the general rate of inflation. An input price differential of 2 percent, on the other hand, would mean that the prices LECs pay for the resources they use rise more slowly than the general rate of inflation. A higher input price differential produces a higher X-Factor.

96. Based on data USTA supplied in its comments filed in this proceeding prior to the LEC Price Cap Performance Review, and in *ex parte* statements filed in January and February 1995, we tentatively concluded in the Price Cap Fourth Further Notice that the input price differential was about 2.7 percent for the period from 1984 to 1990.¹⁵⁵ We found that USTA's conclusion that the long-term input price differential is zero was theoretically

¹⁵² LEC Price Cap Performance Review, 10 FCC Rcd at 9033 (paras. 160-61) and 9213-40 (App. F). See also Price Cap Fourth Further Notice, 10 FCC Rcd at 13668 (para. 54).

¹⁵³ LEC Price Cap Performance Review, 10 FCC Rcd at 9033 (para. 160); Price Cap Fourth Further Notice, 10 FCC Rcd at 13668 (para. 54).

¹⁵⁴ LEC Price Cap Performance Review, 10 FCC Rcd at 9222 (App. F).

¹⁵⁵ LEC Price Cap Performance Review, 10 FCC Rcd at 9222 (App. F). In Appendix F, we referred to the study provided as Attachment 5 to USTA's 1994 comments as the "NERA Study," and the study provided in its February 1, 1995 *ex parte* statement as the "Christensen Study," in reference to the consultants hired by USTA to conduct those studies. In this Order, we will continue to refer to these studies as the NERA Study and the Christensen Study.

unsound, and unsupported by USTA's data.¹⁵⁶ In the Price Cap Fourth Further Notice, we also sought comment on whether the input price differential should be based on a long-term trend as USTA suggested, or on a shorter period, such as the period used for the TFP analysis, as Ad Hoc suggested. We invited comment on the data that should be used to calculate the input price differential.¹⁵⁷

97. Discussion. USTA and other parties agree that changes in LEC input prices should be reflected in the X-Factor if productivity is measured using a TFP method, because TFP adjusts input and output prices to "real" or constant dollar terms to measure "real" productivity. USTA advocates a long-run analysis of input prices, and asserts that, in the long run, there is no statistically significant difference between LEC input price changes and economy-wide input price changes. Other parties contend the relevant period is roughly from 1984 to the present. AT&T estimates that the input price differential was 2.54 percent per year from 1985 to 1994, using BLS data rather than the data in the Christensen Study sponsored by USTA.¹⁵⁸ AT&T also estimates that the input price differential between 1985 and 1995 was 2.35 percent.¹⁵⁹ Ad Hoc claims that the input price differential from 1984 to 1993 is 2.1 percent based on USTA's data, or 3.4 percent based on USTA's data corrected for certain errors alleged by Ad Hoc.¹⁶⁰ Sprint compares its price indices for capital, labor, and materials to its economy-wide input price index, and finds that the five-year moving averages for the period from 1985 to 1993 range from 0.84 percent to 1.64 percent.¹⁶¹

98. On the basis of the record before us in this proceeding, we conclude, for the reasons discussed below, that short-term data should be used to select an input price differential for use in prescribing a TFP-based X-Factor. All the TFP models in the record include price indices for capital, labor, and materials, and the weights needed to calculate an average input price index. All parties used TFP models that determined an X-Factor by estimating productivity and input prices simultaneously, because both the inputs and outputs must be measured in real, or inflation-adjusted, terms. Therefore, any estimate of TFP includes an estimate of an input price differential. If we adopted a methodology that used one set of assumptions and data to measure LEC input prices for use in calculating TFP, and a different set for measuring the input price differential, the calculations would be

¹⁵⁶ LEC Price Cap Performance Review, 10 FCC Rcd at 9224 (App. F).

¹⁵⁷ Price Cap Fourth Further Notice, 10 FCC Rcd at 13668 (paras. 57-60).

¹⁵⁸ AT&T Comments at 12-13 and App. A at 17-22.

¹⁵⁹ AT&T 1997 Reply, App. G at 34.

¹⁶⁰ Ad Hoc Reply, Att. at 12.

¹⁶¹ Sprint Reply, Att. A at 41-43.

inconsistent. We see no reason to calculate TFP using one set of data and assumptions, and then calculate the input price differential using a different set of data and assumptions. Therefore, we do not estimate the input price differential separately from TFP, and we will not make independent prescriptions of the productivity and input price components of the X-Factor. Instead, we will focus directly on selecting the appropriate combined X-Factor. Accordingly, in the table in Section III.E. below, we display X-Factor estimates which are combined TFP and input price differentials, rather than separate forecasts of TFP and input price differentials.

99. The LECs make four arguments in favor of setting the input price differential equal to zero: (1) the input price differential should be based on long-term studies; (2) short-term studies do not show a positive input price differential, but rather a temporary effect of divestiture; (3) it is not reasonable to estimate input price changes on the basis of the price indices in TFP calculations; and (4) including an input price differential might make the X-Factor volatile in a moving average-based price cap plan. For the reasons discussed below, we find none of these arguments persuasive.

100. We give no weight to USTA's estimate of the long-term trend. Both the Christensen Study and the NERA Study submitted by USTA, and discussed in Appendix F of the LEC Price Cap Performance Review, base their conclusions on four different TFP studies, each covering different periods of time. Each of these studies was conducted using disparate and inconsistent techniques. For example, different methods of measuring materials input prices, and different depreciation rates, were used to develop capital input prices for different portions of the study period. In addition, the data in the Christensen Study could support a conclusion that the input price differential is either zero or 2.6 percent.¹⁶² Although the LECs focus their attention on the fact that zero is within the range of possible input price differentials supported by USTA's studies,¹⁶³ none adequately addresses the fact that the data support a wide range of other possible outcomes. Because neither the Christensen Study nor the NERA Study is based on a consistent set of data or methodology throughout the period covered by either study, we find that their conclusions about the long-term trend of LEC input prices are not supported.

¹⁶² LEC Price Cap Performance Review, 10 FCC Rcd at 9224-25 (App. F).

¹⁶³ USTA Comments at 26 and App. C at 3-6; US West Comments at 7, 16; Southwestern Bell Comments at 11; NYNEX Comments at 21; BellSouth Comments at 14-16; Bell Atlantic Comments at 11-12; Lincoln Comments at 4; Ameritech Comments at 4-5; GTE Comments at 11 and App. B, App. F; NYNEX Reply at 5; USTA Reply, Att. A at 23-25; Pacific Reply at 4. According to USTA, AT&T places too much emphasis on its estimate and not enough emphasis on the fact that 0 is within the 95 percent confidence interval. USTA Reply, Att. B at 17-19.

101. We agree with the parties who argue that consistency requires us to use data from the same period to determine both TFP growth and input price differential.¹⁶⁴ Furthermore, our objective here is to prescribe an X-Factor that will set a reasonably aggressive productivity goal for LECs for the near future until completion of the next performance review. Given all the changes that have occurred in telecommunications during the 44 years covered by the long-term input price studies that have been placed on the record here,¹⁶⁵ we find that data from a recent, shorter period of time provide a more reliable basis for estimating input price trends for the near future than the longer term data.

102. Some incumbent LECs contend that any input price differential revealed by an analysis of the data from 1985 to 1994 is a temporary effect of divestiture. According to these commenters, the input price differential appears in 1984, returns to zero in 1989 or 1990, and is likely to continue to be zero in the future. USTA, on the other hand, claims that the input price differential is not related to divestiture at all, and that the input price differential started to increase in 1980 and began declining in 1990.¹⁶⁶ USTA also contends that the difference in input price differential in the Christensen Study before and after 1984 is a result of the different methodologies used to generate the pre- and post-1984 data series.¹⁶⁷ We conclude that the input price differential is not a temporary effect of divestiture. LEC input prices have grown at a different rate from input prices in the economy as a whole for all the years analyzed in our study. Furthermore, no party making this argument provides any theoretical argument to explain why the input price differential was exclusively a result of divestiture, and therefore could not ever recur. Therefore, we are not persuaded by this record that the observed LEC input price differential was merely a temporary effect of divestiture, or is unlikely to continue.

103. AT&T argues that LEC input prices for capital and materials in USTA's simplified TFP model are closely related to GDP-PI, and thus artificially reduce the input price differential.¹⁶⁸ USTA adopts GDP-PI as its materials input price index for LECs, and bases its capital input price indices for LECs on National Income and Product Account data. Thus, USTA's TFP study simply assumes away much of the difference between LEC input

¹⁶⁴ Ad Hoc Comments, Att. at 43-45; Ad Hoc Reply at 3 and Att. at 11-13. See also TRA Reply at 3-4 (use of long-term data for input price differential hides the effects of divestiture.)

¹⁶⁵ USTA cites in particular a study in filed prior to our adoption of the LEC Price Cap Performance Review, analyzing input price changes from 1948 to 1992. USTA Comments at 26-27. See also USTA Reply, Att. A at 26-28.

¹⁶⁶ USTA Reply, App. B at 14-15.

¹⁶⁷ USTA Comments, Att. A at 46.

¹⁶⁸ AT&T Reply, App. B at 25-28.

price growth and U.S. input price changes by basing most of its input price information on data directly related to GDP-PI and U.S. input price growth. Using GDP-PI to measure input prices is unreasonable because GDP-PI measures output prices, *i.e.*, the prices of final goods and services, rather than input prices, the prices of intermediate goods and services. Therefore, we base our analysis of the input price differential on the input price indices we use in our analysis of the record.

104. A number of LECs assert that the design of USTA's original TFP model precludes any derivation of a meaningful estimate of LEC input price changes. These parties argue further that the Commission erred in Appendix F of the LEC Price Cap Performance Review in concluding that the price indices in USTA's TFP study can be used to produce reliable results regarding the input price differential for our purposes.¹⁶⁹ Ad Hoc argues that the Commission's input price differential results are not unreliable simply because USTA did not intend its TFP study to be used to derive the input price differential.¹⁷⁰ We agree with Ad Hoc on this issue. The LECs have not explained why we should assume that the price indices used for their TFP calculations do not reflect their input prices for purposes of calculating the input price differential.

105. Several parties assert that the X-Factor should represent a prediction of the LECs' achievable future productivity growth, and that including the input price differential in the X-Factor would make it too volatile to have any predictive power, and could cause rate churn.¹⁷¹ As we explain further in Section V. below, we have decided to adopt a fixed X-Factor, which will preclude any volatility in the input price differential from being reflected in the X-Factor. Finally, we reject Southwestern Bell's assertion that the past input price differential should not be relevant for setting a future X-Factor.¹⁷² Changes in input prices affect incumbent LECs' unit costs, and so should be reflected in the X-Factor. We have no more reliable basis for predicting future input price changes than past input price changes.

106. In the LEC Price Cap Performance Review, we defined the input price differential as the difference between the rate of change in LEC input prices and economy-

¹⁶⁹ Lincoln Comments at 4; Southwestern Bell Comments at 11; Southwestern Bell Reply at 11-13; USTA Reply at 12 n.4.

¹⁷⁰ Ad Hoc Reply at 13-14.

¹⁷¹ Pacific Comments at 3-6; Pacific Reply at 4; US West Comments at 16; Lincoln Comments at 4; NYNEX Comments at 22; NYNEX Reply at 6; USTA Reply, Att. A at 22-26.

¹⁷² Southwestern Bell Reply at 15.

wide input price changes, rather than the difference between LEC input prices and GDP-PI.¹⁷³ We estimate LEC input prices on the basis of the price indices we use to calculate TFP, and we have chosen to use the BLS Non-Farm Business Sector Input Price Index as our measure of economy-wide input price changes, as AT&T used.¹⁷⁴ We have chosen the BLS Non-Farm Business Sector Input Price Index for economy-wide input prices because this is the broadest index of the prices of non-farm input goods and services available. It is also produced in conjunction with, and is therefore consistent with, our measure of productivity growth for the economy as a whole. We did not choose GDP-PI because the input price differential measures the difference between LEC input prices and input prices in the economy in general, and GDP-PI is a measure of price changes for final goods and services. The most recent published data in these series is for 1994. We estimate the 1995 changes using the average of the five most recent years.

2. Adjustment to X-Factor for Interstate-Only Activity

a. Background

107. USTA's original TFP study was based on total company data. AT&T claimed that the LECs' interstate access services have grown faster than LEC output overall, so that interstate productivity growth was greater than total company productivity growth. Thus, according to AT&T, reliance on total company data in measuring TFP tends to understate the LECs' interstate access productivity growth.¹⁷⁵ We noted that interstate and intrastate services are usually provided over common facilities, and questioned whether it would be possible to develop separate production functions for interstate and intrastate services.¹⁷⁶

108. In the Price Cap Fourth Further Notice, we invited comment on several issues related to this subject, including whether consideration of total company TFP data might exceed our jurisdiction. We also sought comment on whether there was any way to develop "economically meaningful" separate production functions for the purposes of calculating interstate TFP, or if not, whether there was any adjustment that could be made to total company TFP to account for any existing differences between interstate and intrastate productivity

¹⁷³ LEC Price Cap Performance Review, 10 FCC Rcd at 9215-16. See also Price Cap Fourth Further Notice, 10 FCC Rcd at 13668 (para. 54).

¹⁷⁴ AT&T Comments, App. B at 19.

¹⁷⁵ See LEC Price Cap Performance Review, 10 FCC Rcd at 9012-13 (para. 114).

¹⁷⁶ See LEC Price Cap Performance Review, 10 FCC Rcd at 9032-33 (para. 159). The "production function" is the technological relationship between inputs and outputs. Id.

growth.¹⁷⁷ Finally, we asked whether basing the X-Factor on total company TFP would require us to revise our ARMIS or Form 492 reporting requirements.¹⁷⁸

b. Discussion

109. We stated in the LEC Price Cap Performance Review that we would consider making an adjustment to account for differences in interstate and intrastate productivity growth if including intrastate data created a "systematic downward bias" in the X-Factor.¹⁷⁹ We also stated that we would prefer to address any such bias "directly," rather than by attempting to construct an interstate factor based on regulatory accounting and other regulatory requirements that may not fully reflect economic costs.¹⁸⁰

110. We find that the record before us does not allow us to quantify the extent, if any, to which interstate productivity growth may differ significantly from total company productivity growth. AT&T argues that interstate productivity growth is greater than intrastate growth because there are greater economies of scale for interstate services.¹⁸¹ CCTA assumes that interstate productivity growth is greater because some state public service commissions have retained rate-of-return regulation.¹⁸² On the other hand, BellSouth asserts that interstate services are more capital-intensive than intrastate services, and that capital inputs have grown faster than labor or materials inputs. On this basis, BellSouth infers that interstate productivity may have grown more slowly than intrastate productivity.¹⁸³ Neither CCTA nor BellSouth has provided any empirical data to substantiate either the effects they describe or their significance. AT&T and Ad Hoc calculate interstate TFP by measuring the growth in interstate outputs, but assume that interstate inputs grow at the same rate as intrastate inputs. USTA argues that it would be more reasonable to assume that interstate inputs grow at the same rate as interstate outputs. None of these parties, however, provides a factual or theoretical explanation as to why its

¹⁷⁷ Price Cap Fourth Further Notice, 10 FCC Rcd at 13669 (paras. 64-67).

¹⁷⁸ Price Cap Fourth Further Notice, 10 FCC Rcd at 13669-70 (para. 68).

¹⁷⁹ LEC Price Cap Performance Review, 10 FCC Rcd at 9033 (para. 159). We discussed a "systematic downward bias" in the LEC Price Cap Performance Review because in that context, IXC's argued that measuring TFP on a total company basis understated interstate productivity growth. If an incumbent price cap LEC were to claim that total company TFP overstated interstate productivity growth, we anticipate using the same analysis to determine whether there is any "systematic upward bias."

¹⁸⁰ LEC Price Cap Performance Review, 10 FCC Rcd at 9033 (para. 159).

¹⁸¹ AT&T Reply at 27, App. B at 29-34, App. C at 8-13.

¹⁸² CCTA Reply at 11-12.

¹⁸³ BellSouth Reply, Att. at 20-23.

assumptions might be correct. Accordingly, we find no basis in the record for making an adjustment to the X-Factor to account for any differences between interstate and total company productivity.

111. Arguing that interstate productivity growth is systematically greater than intrastate productivity growth, Ad Hoc and API assert that basing the X-Factor on total company TFP might give LECs a windfall unless the states also adopt regulations based on total company data.¹⁸⁴ Ad Hoc also asserts that we should require an interstate TFP adjustment because some LECs have advocated making some intrastate TFP adjustment before state public service commissions.¹⁸⁵ Unsupported claims of a potential LEC windfall do not by themselves convince us that there is any factual basis for concluding that there is a systematic difference between interstate and total company productivity. Ad Hoc's claims that some LECs have supported intrastate TFP adjustments in some state jurisdiction does not show that there is a nation-wide difference between interstate TFP and total company TFP significant enough to warrant making some adjustment to our LEC industry-wide X-Factor.

112. Legal Considerations. AT&T and others make various arguments that using total company data to calculate TFP violates Section 2(b) of the Communications Act or the requirements of Smith v. Illinois Bell.¹⁸⁶ Because we have determined above that the record does not demonstrate any systematic bias in using total company productivity growth, we need not reach this legal issue at this time.

c. TFP Adjustment for Differences in Regulated and Nonregulated Productivity Growth

113. Background. We also solicited comment in the Price Cap Fourth Further Notice on whether we should measure TFP on any less-than-total-company basis other than interstate-only, such as the TFP for regulated services.¹⁸⁷ We also asked whether we should exclude the productivity growth associated with certain specific regulated services or groups of services. The example we used in the Price Cap Fourth Further Notice was video dialtone services. We

¹⁸⁴ Ad Hoc Comments, Att. at 48-49; API Comments at 5.

¹⁸⁵ Ad Hoc Reply, Att. at 10-11.

¹⁸⁶ Ad Hoc Comments at 6-7; AT&T Comments at 14-17; MCI Reply at 8; Ad Hoc Reply at 8-9; TRA Reply at 5-6; LDDS Reply at 4-5; AT&T Reply at 30-31, citing, e.g., Smith v. Illinois Bell Telephone Co., 282 U.S. 133 (1930) (Smith).

¹⁸⁷ Price Cap Fourth Further Notice, 10 FCC Rcd at 13670 (paras. 69-70).

noted that nonregulated services might not share joint and common costs with regulated services to the same extent as interstate and intrastate services.¹⁸⁸

114. Discussion. Ad Hoc claims that the initial investment required to begin providing certain nonregulated services or video services could increase capital inputs, and thus decrease measured TFP growth.¹⁸⁹ If we adopted a moving-average methodology, Ad Hoc's assertion might warrant closer analysis. We are instead prescribing an X-Factor based on data from 1986 to 1995. We find that nonregulated investment during this time period was too small, relative to total regulated investment, to have a significant effect on our TFP calculations. We therefore make no adjustment to the X-Factor or to TFP to account for the effects of nonregulated activities.

115. In its 1997 reply, AT&T asserts that USTA has recognized the legitimacy of making a regulated/non-regulated adjustment by doing so in its TFP analysis.¹⁹⁰ AT&T does not specifically identify the adjustment that it maintains USTA has made to account for differences in regulated and non-regulated productivity, but it appears to be in USTA's miscellaneous services output index. As we discuss above, USTA's miscellaneous services output index contains several anomalous results, including negative growth in some years. As a result, we have excluded that output category completely from our output index.

d. Reporting

116. We sought comment on whether basing the X-Factor on total company TFP would require us to expand our ARMIS or Form 492 reporting requirements to collect total company data.¹⁹¹ Below, we decline to adopt a price cap plan in which LECs would be required to recalculate the X-Factor annually on the basis of a prescribed method. Instead, we prescribe an X-Factor that will remain in effect at least until the next performance review. Accordingly, we conclude that we need not expand our reporting requirements at this time.

¹⁸⁸ Price Cap Fourth Further Notice, 10 FCC Rcd at 13670 (paras. 69-70).

¹⁸⁹ Ad Hoc Comments, Att. at 50-51.

¹⁹⁰ AT&T 1997 Reply, App. G at 4-5.

¹⁹¹ Price Cap Fourth Further Notice, 10 FCC Rcd at 13669-70 (paras. 68).

3. Effect of Universal Service and Other Subsidy Programs on LEC TFP

117. Background. In the Price Cap Fourth Further Notice, we noted that there were a number of universal service or other subsidy programs at both the federal and state levels, and asked to what extent such programs affect or should affect LECs' productivity calculations.¹⁹²

118. Discussion. A number of commenters argue that total company TFP captures the effects of any universal service fund or subsidy programs, and thus no special adjustments are needed.¹⁹³ BellSouth contends that changes in universal service funding requirements are treated exogenously, and supports continuing this treatment.¹⁹⁴ CCTA supports considering universal service fund revisions in the Universal Service Order proceeding rather than here.¹⁹⁵

119. We have no reason to believe that replacing the implicit subsidies in incumbent LECs' current rates with explicit subsidies, as required to meet the 1996 Act's universal service provisions, will affect productivity significantly. The implicit subsidies were designed to promote universal service, and have been generally successful.¹⁹⁶ We expect subscribership levels to remain high under our new universal service rules. Thus, there should not be any dramatic increases or decreases in incumbent LEC outputs, and so there should be little effect on TFP. Accordingly, we will not take any further action on this issue here.

4. Inclusion of Other Firms in Study

120. Background. In the first phase of this proceeding, Ad Hoc argued that basing the X-Factor on industry-wide moving average data might encourage excessive network investment, and thus might lead to "gold-plating" incentives similar to those created by rate-of-return regulation. Therefore, Ad Hoc recommended including data from other telecommunications service providers in the TFP calculations.¹⁹⁷ We invited comment on Ad Hoc's proposal, and

¹⁹² Price Cap Fourth Further Notice, 10 FCC Rcd at 13670 (paras. 71-72).

¹⁹³ Southwestern Bell Comments at 15-16; GTE Comments at 25; USTA Comments at 31-32; US West Comments at 18.

¹⁹⁴ BellSouth Comments at 22.

¹⁹⁵ CCTA Reply at 21.

¹⁹⁶ See LEC Price Cap Performance Review, 10 FCC Rcd at 8988 (para. 62), citing Telephone Subscribership in the United States, FCC, Common Carrier Bureau, Industry Analysis Division (Nov. 1994).

¹⁹⁷ See LEC Price Cap Performance Review, 10 FCC Rcd at 9017 (para. 124).

requested parties to discuss whether the data necessary to perform an expanded TFP study would be available annually in a timely manner.¹⁹⁸

121. Discussion. Below, we decline to adopt a methodology for the X-Factor on an industry-wide moving average. Therefore, we conclude that there is no need at this time to include data from other industries to address the concern raised by Ad Hoc. At this time, we also need not address NYNEX's, GTE's, and US West's arguments against inclusion of such data.

5. Consumer Productivity Dividend

122. Background. In the LEC Price Cap Order, we added 0.5 percentage points to the X-Factor to ensure that the first benefits of the price cap plan are flowed through to access customers. We called this addition the consumer productivity dividend (CPD).¹⁹⁹ In the Price Cap Fourth Further Notice, we invited parties to discuss whether we should retain the CPD in the long-term price cap plan, in order to, for example, reflect anticipated productivity growth resulting from the elimination of sharing.²⁰⁰ We also sought comment on whether the CPD should remain at 0.5 percent or be set at some other value.²⁰¹

123. Discussion. Consistent with our practice in both AT&T and LEC price cap regulation, we retain a 0.5 percent Consumer Productivity Dividend in our revised price cap plan. We decide below to adopt a single fixed X-Factor in our revised price cap plan, based on LEC industry-wide data. The CPD will act as a mechanism to ensure that price cap LECs flow-through a reasonable portion of the benefits of productivity growth to ratepayers. The importance of this purpose in our revised price cap plan is enhanced because we are eliminating the current sharing requirements and we are not adopting a moving average method of updating the X-Factor.²⁰²

124. Parties arguing in favor of eliminating the CPD are not persuasive. Several incumbent LECs maintain that it is arbitrary and capricious to transfer any productivity gains

¹⁹⁸ Price Cap Fourth Further Notice, 10 FCC Rcd at 13671 (paras. 73-74).

¹⁹⁹ LEC Price Cap Order, 5 FCC Rcd at 6799 (para. 100). We had adopted a similar 0.5 percent consumer productivity dividend in our earlier Order adopting price cap regulation for AT&T. AT&T Price Cap Order, 4 FCC Rcd at 3001 (para. 248).

²⁰⁰ Price Cap Fourth Further Notice, 10 FCC Rcd at 13673 (para. 95).

²⁰¹ Price Cap Fourth Further Notice, 10 FCC Rcd at 13673 (paras. 94-95).

²⁰² A moving average could result in flowing through productivity gains to access customers. LEC Price Cap Performance Review, 10 FCC Rcd at 9030 (para. 153).

to access customers. In a competitive market, however, competitors will continuously provide firms with incentives to lower their unit costs more quickly than they have in the past so that they can lower their prices and win customers from their competitors. By this mechanism, a competitive market passes cost reductions on to customers in the form of lower prices. By requiring incumbent LECs to transfer at least part of their productivity gains to access customers, the CPD tends to replicate the results of a competitive market. Therefore, we find that it is reasonable to use a CPD to require incumbent LECs to transfer some portion of their unit cost reductions to their customers. USTA asserts that the price cap plan properly balances shareholder and ratepayer interests without the CPD,²⁰³ but does not explain why we should not continue our established practice.

125. Some contend that the CPD was adopted because of uncertainty regarding the X-Factors in the original price cap plan, and our experience under price cap regulation should have alleviated this uncertainty. We disagree that the passage of time by itself has eliminated the need for a CPD. The CPD remains necessary to require LECs to transfer some portion to their unit cost reductions to their access customers. Also, the CPD was, in a sense, an expression of certainty that LECs would respond to the incentives provided by the price caps plan by becoming more productive, and that there would be productivity gains that could be shared between ratepayers and shareholders. The passage of time has not altered the need to strike this balance between ratepayer and shareholder interests.

126. BellSouth and GTE argue that there was no principled basis for selecting 0.5 percent as the CPD. We explained in the LEC Price Cap Order that setting the CPD at 0.5 percent would ensure that access customers share a portion of the productivity benefits of price cap regulation.²⁰⁴ Although GTE broadly asserts that including a 0.5 percent CPD would cause the X-Factor to be excessive, we believe that a 0.5 percent CPD, with the elimination of sharing, continues to be necessary to ensure that access customers receive benefits.

127. We are mindful that, while some incumbent LECs have achieved high earnings under price caps, others have not always done so. We therefore retain the low-end adjustment mechanism for LECs with substantially below-average earnings. The low-end adjustment mechanism permits incumbent price cap LECs with rates of return less than 10.25 percent to increase their PCIs to a level that would enable them to earn 10.25 percent.²⁰⁵

²⁰³ USTA Reply at 26.

²⁰⁴ LEC Price Cap Order, 5 FCC Rcd at 6796 (para. 74).

²⁰⁵ LEC Price Cap Order, 5 FCC Rcd at 6804 (paras. 147-49).