

**Measuring The Constant Dollar Value Of Labour Input Of The  
Federal Public Service**

by

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March 1998



## OVERVIEW

This paper demonstrates an improved methodology for the direct measurement of real labour compensation of the Federal Public Service (FPS).<sup>1</sup> This methodology incorporates the change in the composition of the FPS workforce by aggregating employees based on their category and level and provides an explicit estimate of the change in labour quality. It also addresses the problem of properly weighting part-time employees. These adjustments represent significant improvements in measuring the change in gross domestic product (GDP). Between 1986 and 1992 the FPS labour input increased by 0.7% due to additional hiring. However, the quality adjustment results in an additional 4.2% improvement for an overall increase of 4.9% in labour input during the period. In the period from 1992 to 1996, with both quality and Full Time Equivalent (FTE) adjustments in place, the increase in labour input due solely to the adjustments was 3.4%. Government downsizing during the period decreased labour input of FTEs by 15.4% for an overall decrease in labour input of 12%. On a 1986 base year, the quality adjustment increased the labour input of the FPS by \$426,653,000 in 1992. Constant dollar labour compensation increased from \$10,158,394,000 before the adjustment to \$10,585,047,000 after the adjustment.

## METHODOLOGY

Over time, the composition of the FPS has changed and this change is reflected in the FPS's employee classifications.<sup>2</sup> The new methodology calculates the constant dollar labour input of the FPS using salaries and wages and supplementary labour income based on an employee aggregation by classification. The new methodology deals with the evolving issue of part-time employment. This was achieved by creating a FTE count for each classification. The FTE count is the total aggregate number of hours worked in the year divided by the number of hours in a full time work week.

Using calendar year data, a base year salary by classification was derived. From the base year information, a constant dollar salary bill can be calculated for any subsequent year. This is done by taking each classification and multiplying the average salary in the base year by the number of employees in the classification during the year in question. For example, assuming a 1986 base year, if the 1986 average salary of a ZZ-01 was \$25,000 and there were 10 ZZ-01s in 1987, the 1987 constant dollar salary bill for ZZ-01s would be \$250,000. However, there is one problem that can undermine this exercise if overlooked and that is if the classification did not exist or was zero in the base year. In this case it is necessary to estimate a base year salary figure for the classification. This is done by calculating an average growth rate in salaries on an aggregate level between the base year and the year in question. Then the salary for the year in question is divided by this aggregate growth rate to derive a base year salary figure for those classifications

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<sup>1</sup> Labour compensation includes salaries & wages and supplementary labour income.

<sup>2</sup> The employee's classification is comprised of group and level such as ES-01, ES-02, CO-01, CO-02, etc.





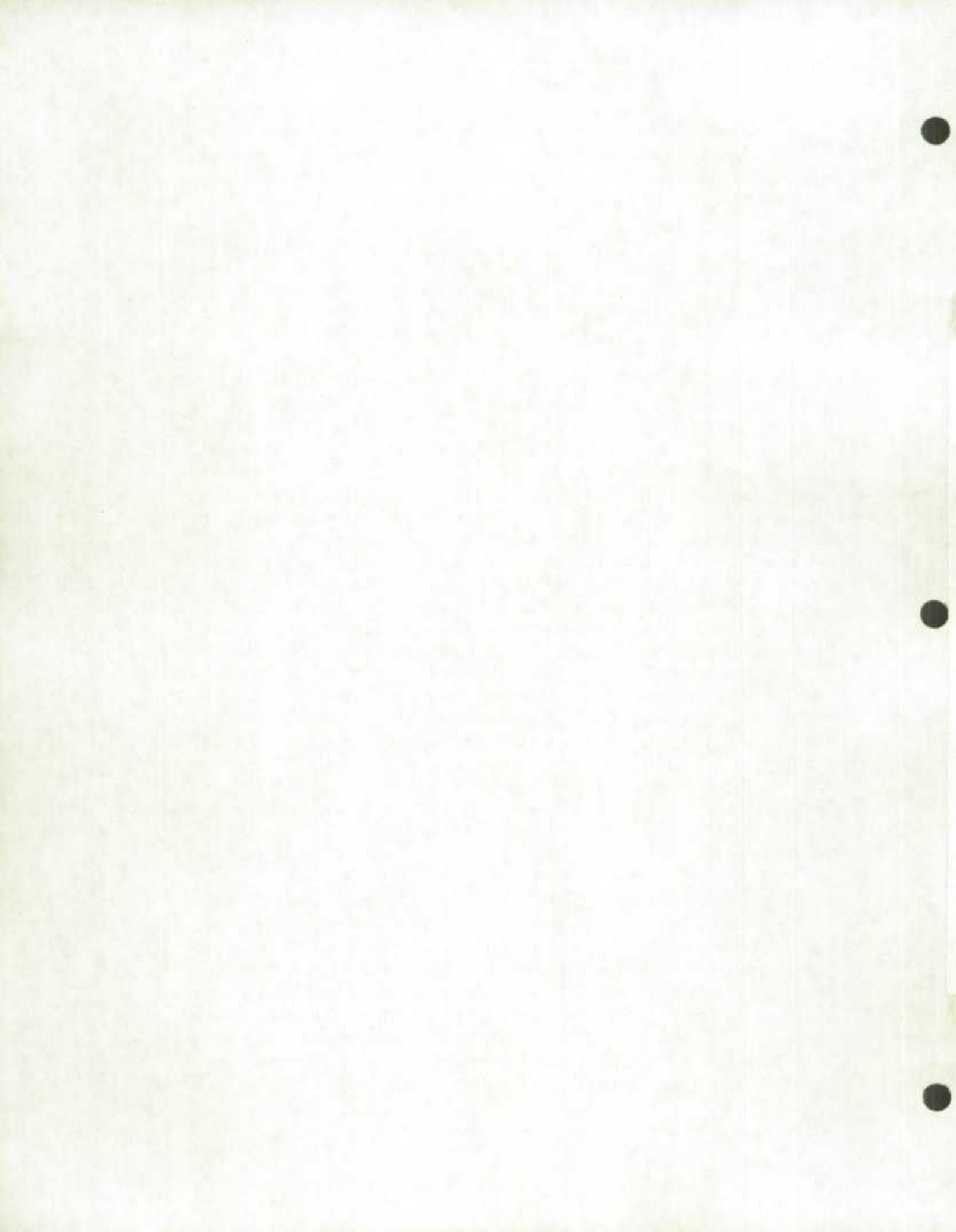
which did not exist or were zero in the base year. For example, if the classification YY-01 did not exist in the base year, and again we assume 1986 to be the base year, an average salary for YY-01's in 1986 would need to be estimated. This would be done based on 1987 information by taking the average YY-01 salary in 1987 and dividing it by the aggregate average growth rate between 1986 and 1987.

$$\text{Estimated 1986 Average YY-01 Salary} = \frac{\text{1987 Average YY-01 Salary}}{\text{Average Growth Rate Between 1986 \& 1987}}$$

If the 1987 YY-01 salary was \$28,000 and the average growth rate was 3% the 1986 salary would be estimated at  $\$28,000 / 1.03 = \$27,184.47$ .

Once all classifications have a base year average salary the constant dollar salary bill is calculated by multiplying the base year salary for each specific classification by the number of employees in that classification for the year in question. The resulting product is the constant dollar salary bill for that classification and by summing over all classifications the total constant dollar salary bill is achieved. Now that the constant dollar aggregate salary bill has been derived it can be used to calculate a weighted number of employees. The weighted number of employees is calculated by dividing the constant dollar salary bill for the year in question by the average salary in the base year. For example, in 1987 the constant dollar salary bill was \$7,005,777,920 and the 1986 Base Year average salary was \$30,130.04. This results in a weighted number of employees of 232,518. The weighted number of employees represents the number of employees that would have been employed in the base year at that salary bill. By comparing the actual number of employees to the weighted number of employees one can build a quality index that provides insight into how labor quality has evolved over the period relative to the base year. The quotient of weighted number of employees to the actual number of employees provides this index measure. If the weighted number of employees is greater than the actual number, meaning the index number is  $>1$ , then the quality of the FPS was higher. More specifically, the ratio of high salary employees to low salary employees had increased relative to the base year. Conversely, if the quotient is  $<1$ , meaning the weighted number of employees was less than the actual, the quality of the FPS would be lower. That is, the ratio of high salary employees to low salary employees had decreased relative to the base year.

This methodology used data on the FPS obtained from Treasury Board and included information on the number of employees by classification and their corresponding salaries. The data was quarterly and ran from 1982 to the 2nd quarter of 1997. The data was converted into calendar year data by summing over the quarters and taking the average. FTE data became available in the second quarter of 1993 and a link was made to estimate data for 1992. FTE data was used on a 1992 Base and from this point on the quality index will be based on FTEs because, as stated earlier, it provides a truer measure of the workforce. The data to carry out this exercise is available at Statistics Canada monthly so that updating the measure on an ongoing basis will be a relatively simple task.



The following section contains the results, including the quality indexes and the effect they have on the labour input of the FPS.

## RESULTS

The results on a 1986 base are shown in Table 1 below. The quality index shows that for all but two years, 1987 and 1988, the index is  $>1$  implying that the quality of labor had improved relative to 1986. The index does imply that in 1987 and 1988 the ratio of high salary employees to low salary employees decreased relative to 1986. However, in 1988 the trend reversed and the level of quality continued in an upward trend for the duration of the period. The quality index tells us that between 1986 and 1992 the labour input of the FPS increased by 4.2%. Labour input also increased in terms of numbers, adding another 0.7% to labour input during the period for an overall increase of 4.9%.

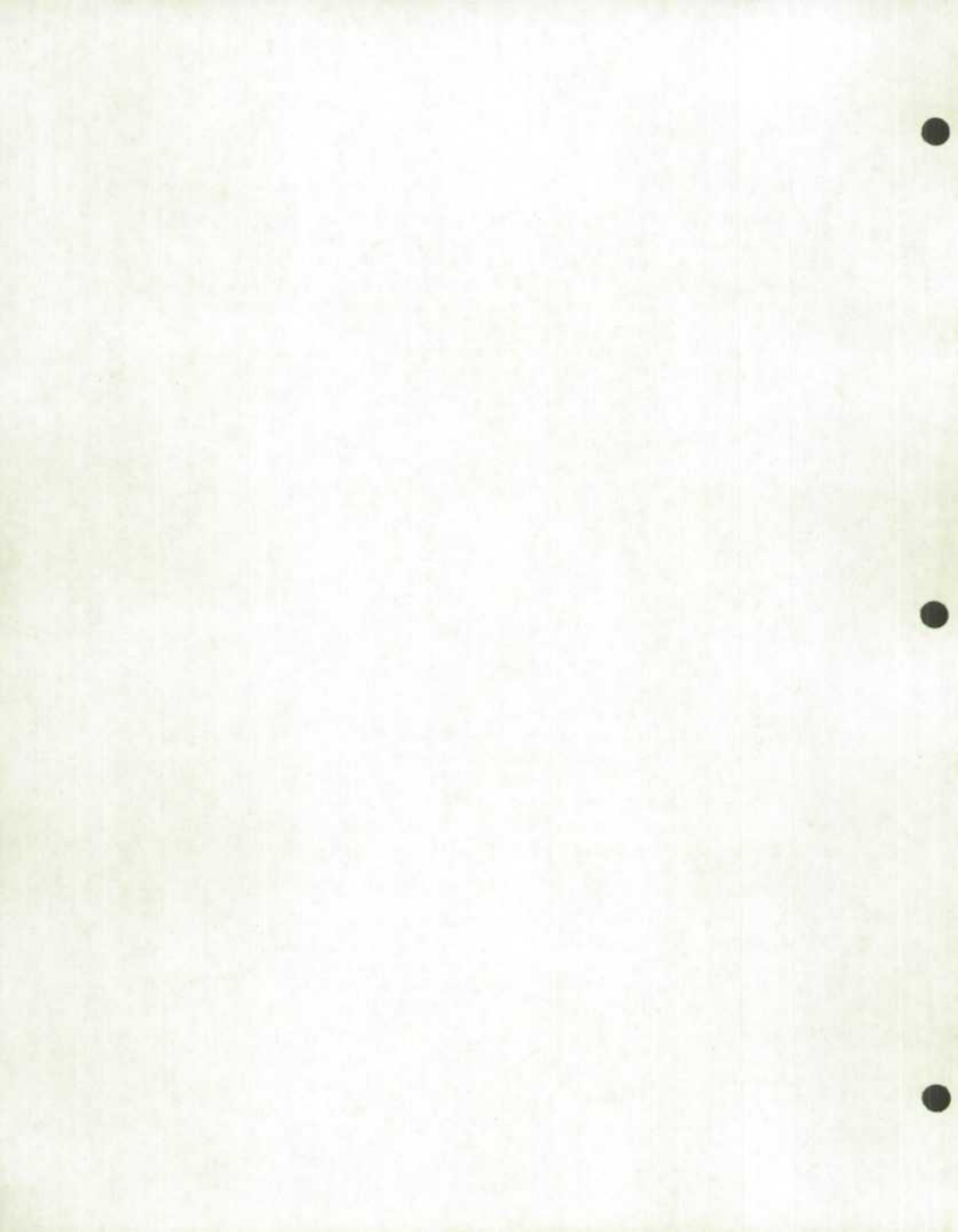
**Table 1: Quality Index on a 1986 Base**

Year	Number of Employees	Weighted Number of Employees	Quality Index
1986	236,924	236,924	1.000
1987	232,902	232,518	0.998
1988	231,788	231,005	0.997
1989	232,837	233,231	1.002
1990	235,131	240,166	1.021
1991	236,625	243,774	1.030
1992	238,685	248,682	1.042

The results on a 1992 FTE Base can be seen in Table 2 below. They suggest improvements in the quality of labour between 1992 and 1996. In terms of FTEs labour input fell by 15.4% due to the downsizing of government during the period, but once again the remaining labour force exhibited a higher level of quality which offset this decrease by 3.4%. This resulted in an overall decrease in labour input of 12% between 1992 and 1996 on an FTE base. Approximately 90% of the offsetting increase in labour input is achieved with the quality adjustment and 10% can be attributed to using a FTE measure (See Appendix A for details).

**Table 2: Quality Index on a 1992 FTE Base**

Year	Number of FTEs	Weighted Number of FTEs	Quality Index
1992	235,702	235,702	1.000
1993	231,331	234,523	1.014
1994	223,618	229,017	1.024
1995	211,939	218,471	1.031
1996	199,278	206,038	1.034





The index allows for a better measure of labour input because it provides a procedure by which changes in quality are captured. The index is applied to the salaries and wages input and to supplementary labor income. The change this quality adjustment makes in the dollar value of labour input of the FPS can be seen on a 1986 Base in Table 3.

**Table 3: Comparison of Federal Public Service Labour Input With and Without Quality Adjustment**

<b>Year</b>	<b>With Quality Adjustment</b>	<b>Without Quality Adjustment</b>
1986	\$ 9,798,915,000	\$ 9,798,915,000
1987	\$ 9,471,009,000	\$ 9,489,989,000
1988	\$ 9,521,046,000	\$ 9,549,695,000
1989	\$ 9,644,300,000	\$ 9,625,050,000
1990	\$ 9,958,704,000	\$ 9,753,873,000
1991	\$ 10,452,193,000	\$ 10,147,760,000
1992	\$ 10,585,047,000	\$ 10,158,394,000

### SUMMARY

This paper has demonstrated a new methodology being utilized in the measurement of the constant dollar labour input of the FPS. By adjusting for the quality of labour and full time equivalency the new methodology offers a better workforce measure. The increase in the number of employees between 1986 and 1992 resulted in an increase in FPS labour input of 0.7%, but due to the higher quality level of the workforce labour input increased by an additional 4.2% for a total improvement of 4.9%. With both the quality and full time equivalency adjustments in place the increase in labour input attributable solely to these adjustments was 3.4% between 1992 and 1996. The decrease in labour input due to downsizing was 15.4% for FTEs and as a result the overall change in labour input was a decrease of 12%. The significance of the adjustments becomes apparent when examining the change in the FPS labour input as it is increased by \$426,653,000 for 1992 in 1986 dollars.

It is recognized that a methodology of measuring and deflating output directly, as is now being done in other Non-Business Sectors such as for hospitals and education, is the most correct way to measure output. However, since the deflating of inputs is the best way of estimating output of the FPS at this time, it is important to do this as accurately as possible. While not measuring output directly, this new methodology does represent a further improvement in measuring the constant dollar output of the Non-Business Sector of the economy as it improves on the manner in which real labour inputs are measured. This exercise has revealed significant increases in labour input of the FPS. It seems



likely that a similar trend has occurred in other Non-Business Sectors and this may be an area for further examination.

#### APPENDIX A

##### *Quality Index on 1992 Base Without FTE Adjustment*

Table A below shows the quality index on a 1992 Base. The quality index shows that for all years the index is >1 implying that the quality of labor had improved relative to 1992. Labour input during this period in terms of number of employees fell by 15.2 % due to government downsizing. At the same time the quality of those working went up and proceeded to offset the decrease in labour input by 3.1% from 1992 to 1996. Overall labour input fell by 12.1% during the period.

**Table A : Quality Index on a 1992 Base**

<b>Year</b>	<b>Number of Employees</b>	<b>Weighted Number of Employees</b>	<b>Quality Index</b>
1992	238,685	238,685	1.000
1993	234,218	237,027	1.012
1994	226,519	231,454	1.022
1995	214,925	221,004	1.028
1996	202,289	208,605	1.031

The difference between the increase from adjustments with the FTE based index and this index is 0.3% (3.4%-3.1%). As such, we can conclude that 3.1 or 90% of the increase in labour input is a result of the quality adjustment while 0.3 or 10% of the increase can be attributed to the adjustment to an FTE base.

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