

8. Empirical Results 2: LEISURE VALUATION

*If all the years were p'aying holidays,
To sport would be as tedious as to work;
But when they seldom come, they wish'd for come.
(William Shakespeare)*

8.1 Introduction

Another important way to adjust Gross National Expenditure (GNE) is to include the value of leisure. As stated earlier, people on average, enjoy more leisure time than ten years ago, and it would be unfortunate to leave this change out of the income accounts altogether. It might in fact be more important to the representative household than the changes in the quantities of goods and services consumed. Thus, various ways are now applied to impute for the value of leisure, using the time- budget survey compiled by the Australian Bureau of Statistics, and other data from the bureau. This, and other survey data, show how Australians allocate their stock of time between alternate activities. This information was used in the calculations.

To facilitate the discussion, this chapter observes the following order. Section 8.2 introduces the various ways of imputing for leisure. A comparison of the various approaches is presented in Section 8.3. Problems associated with leisure are discussed in Section 8.4, followed by a summary in Section 8.5.

8.2 Adjustments for Leisure

The leisure and adjusted GNE values, derived using estimates 1 to Vb (chapters 4 and 5) are presented in Tables 8.1 to 8.7. The values are 3-year moving averages, hence the starting point or base values of 1963 are the averages of 1962, 1963 and 1964. Column 2 is conventional GNE as reported by the ABS, and calculated by adding the respective quarterly GNE's. Column 3, the value of leisure, was derived by using the various estimates. Column 4, the total adjusted GNE, was calculated by adding column 2 to column 3. As for the index value of columns 5, 6 and 7, 1963 was assigned an index value of 100 because it was the base year. The indices for columns 5 and 7 were calculated using the formula $[(GNE_t / GNE_{1963}) \times 100]$, and that for column 6 was calculated using the formula $[(Leisure_t / Leisure_{1963}) \times 100]$. The

percentage of the value of leisure to the adjusted GNE (column 8) was determined by dividing column 3 by column 4, and then multiplying by 100.

8.2.1 Estimate I

Estimate I is based on equation (4.50) of chapter 4, which with some modifications in notation, is written as

$$\hat{Y}_t^{3I} = Y_t + w_{e,t}(L_{e,t}, Z_{e,t}) \quad (8.1)$$

where

\hat{Y}_t^{3I} = real income inclusive of the imputation for leisure using estimate I

Y_t = real income without the imputation for leisure

$L_{e,t}$ = hours of leisure of the employed in year t

$w_{e,t}$ = average wage rate in year t

$z_{e,t}$ = productivity of leisure of the employed

To see how the equation works out in practice, estimate I was computed by

- (a) calculating the total value of leisure by multiplying total leisure hours per year by the average wage rate per hour, ignoring unemployment, and then
- (b) adding this value to the reported GNE (Y_t) to get the adjusted GNE (\hat{Y}_t^{3I}).

In the actual computations variable $Z_{e,t}$ was assumed to be equal to one for all t , because it is believed that the progress of the Australian economy relies primarily on the people's capacity to make things rather than on the peoples capacity to enjoy them. The same assumption was made by Usher (1980) in his leisure imputations for Canada.

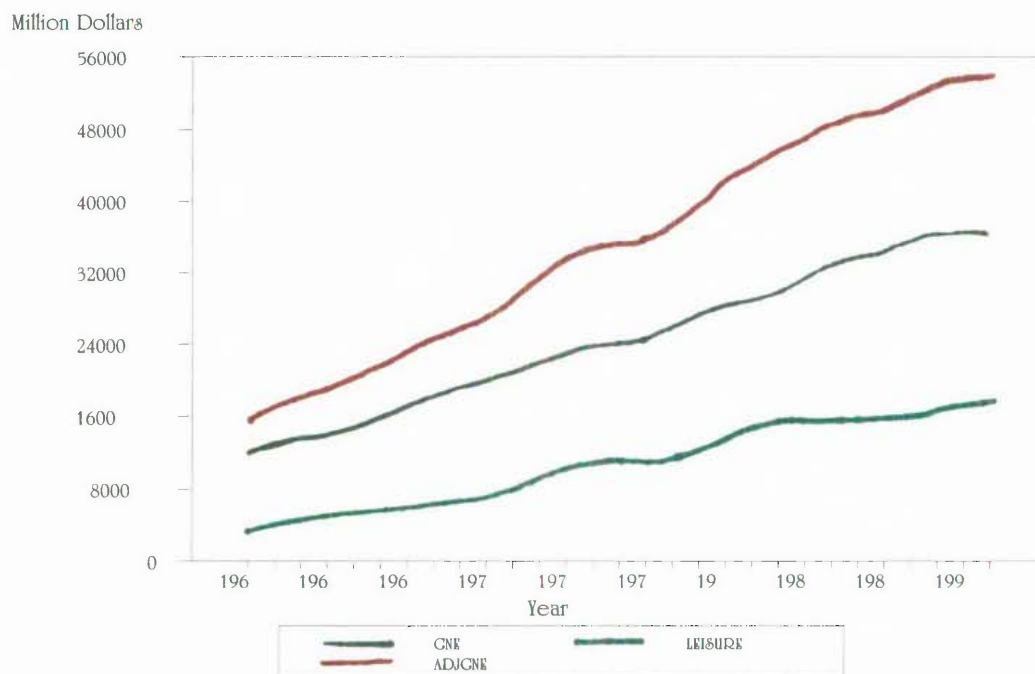
In the result for estimate I, the value of leisure increased from \$ 33 491M in 1963 to \$173 609M in 1991 (column 3). Likewise, the percentage of leisure to adjusted GNE grew from 21 per cent to 32 per cent (column 5), and the leisure index (column 7) increased more than 5 times during the period.

Table 8.1:
**Adjustments to Gross National Expenditure for the
 value of leisure for 1963 to 1991 using Estimate I**

Year	GNE (\$M)	Leisure Value (\$M)	Adjusted GNE (\$M)	Index of GNE	Index of Leisure Value	Index of Adjusted GNE	% Leisure Value to Adjusted GNE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1963	121 424	33 491	154 914	100	100	100	21.62
1964	129 712	38 791	168 503	107	116	109	23.02
1965	135 410	44 672	180 081	112	133	116	24.81
1966	139 160	48 031	187 191	115	143	121	25.66
1967	147 910	51 472	199 382	122	154	129	25.82
1968	160 036	54 963	214 999	132	164	139	25.56
1969	173 216	58 329	321 545	143	174	149	25.19
1970	182 979	62 181	245 161	151	186	158	25.36
1971	190 157	65 489	255 646	157	196	165	25.62
1972	198 632	69 927	268 559	164	209	173	26.04
1973	209 680	79 590	289 270	173	238	187	27.51
1974	221 062	91 790	312 852	182	274	202	29.34
1975	232 288	103 837	336 125	191	310	217	30.89
1976	236 648	109 517	346 166	195	327	223	31.64
1977	242 359	111 259	353 618	200	332	228	31.46
1978	245 219	109 649	354 869	202	327	229	30.90
1979	258 004	110 779	368 783	212	331	238	30.04
1980	273 121	119 896	393 017	225	358	254	30.51
1981	286 059	136 207	422 266	236	407	273	32.26
1982	289 150	147 377	436 527	238	440	282	33.76
1983	297 919	154 039	451 958	245	460	292	34.08
1984	313 785	154 461	468 246	258	461	302	32.99
1985	330 929	156 116	487 044	273	466	314	32.05
1986	338 818	155 818	494 636	279	465	319	31.50
1987	342 422	156 116	498 497	282	466	322	31.31
1988	355 239	158 146	513 385	293	472	331	30.80
1989	362 609	166 408	529 016	299	497	341	31.46
1990	365 179	170 131	535 311	301	508	346	31.78
1991	362 019	173 609	535 628	298	518	346	32.41

Table 8.1 shows that the reported GNE of column 2, has been increasing since 1963 except in 1991. The reported GNE decreased slightly from \$ 365 179M in 1990 to \$362 019M in 1991. This fall in the reported GNE value was partly due to a fall in private gross fixed capital expenditure. Similarly, the leisure values of column 3 have been increasing except in 1978. The decrease in leisure value in 1978 can be explained by a fall in the hourly wage rate of both men and women in that year.

Figure 8.1:
Reported GNE, Adjusted GNE and Leisure Value
for 1963 to 1991 using Estimate I



The proportion of leisure to adjusted GNE, as illustrated in column 8, grew from around 21.62 per cent in 1963, to 30.04 per cent in 1979 to almost 32.41 per cent in 1991. Graphically, Figure 8.2 reveals that reported GNE and adjusted GNE have been increasing since 1963. In a like manner, the leisure value has been consistently increasing except in 1978 for reasons earlier cited.

8.2.2 Estimate II

Estimates IIa and IIb are computed in the same manner as estimate I, but this time the leisure of the unemployed was now included in the imputation for the value of leisure. Thus, equation (8.1) is extended to

$$\hat{Y}_t^{3IIa} = Y_t + w_{e,t}(L_{e,t}, Z_{e,t}) + w_u(L_{u,t}, Z_{u,t}) \quad (8.2)$$

where

\hat{Y}_t^{3IIa} = real income inclusive of the imputation for leisure using estimate IIa

$L_{u,t}$ = hours of leisure of the unemployed in year t

$w_{e,t}$ = average wage rate in year t of the employed

$w_{u,t}$ = average wage rate in year t of the unemployed

$Z_{u,t}$ = productivity of leisure of the unemployed

The value of the leisure of the unemployed is priced at the prevailing average wage rate per hour for the period. In computing estimate IIa, it was assumed further that the growth rate of productivity of leisure for both the employed and the unemployed is constant, which implies that $Z_{u,t} = Z_{e,t} = 1$.

The value of leisure has been steadily increasing since 1963. The leisure value in this case was computed by adding the imputed value of leisure of the employed and the unemployed. For the unemployed, leisure was valued by multiplying the total number of hours of leisure by the number of unemployed and the average wage rate. Here it is assumed that hours not spent working are all converted to leisure. The computations show that although the leisure value of the unemployed decreased in 1978, the leisure value of the unemployed increased in all the other years. The increase in the leisure value of the unemployed was due to increases in the number of unemployed and the hourly wage rate of both men and women.

Likewise, the leisure index and adjusted GNE index show a stable increase from 1963 to 1991. The ratio of leisure to adjusted GNE (column 8) was at its highest in 1991 at 52.34 per cent. The second highest ratio was recorded in 1983 at 52.88 per cent. The

Table 8.2:
**Adjustments to Gross National Expenditure for the
 value of leisure for 1963 to 1991 using Estimate IIa**

Year	GNE (\$M)	Leisure Value (\$M)	Adjusted GNE (\$M)	Index of GNE	Index of Leisure Value	Index of Adjusted GNE	% Leisure Value to Adjusted GNE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1963	121 424	124 623	246 047	100	100	100	50.65
1964	129 712	132 993	262 705	107	107	107	50.62
1965	135 410	138 917	274 327	112	111	111	50.64
1966	139 160	142 978	282 138	115	115	115	50.68
1967	147 910	151 343	299 254	122	121	122	50.57
1968	160 036	163 812	323 848	132	131	132	50.58
1969	173 216	176 972	350 188	143	142	142	50.54
1970	182 979	186 733	369 713	151	150	150	50.51
1971	190 157	194 301	384 458	157	156	156	50.54
1972	198 632	203 677	402 309	164	163	164	50.63
1973	209 680	215 783	425 463	173	173	173	50.72
1974	221 062	227 412	448 474	182	182	182	50.71
1975	232 288	245 408	477 697	191	197	194	51.37
1976	236 648	249 445	486 093	195	200	198	51.32
1977	242 359	258 104	500 463	200	207	203	51.57
1978	245 219	262 228	507 448	202	210	206	51.68
1979	258 004	274 950	532 955	212	221	217	51.59
1980	273 121	291 471	564 592	225	234	229	51.63
1981	286 059	304 255	590 314	236	244	240	51.54
1982	289 150	312 010	601 160	238	250	244	51.90
1983	297 919	334 277	632 196	245	268	257	52.88
1984	313 785	346 880	660 666	258	278	269	52.50
1985	330 929	362 584	693 513	273	291	282	52.28
1986	338 818	369 014	707 832	279	296	288	52.13
1987	342 422	372 145	714 566	282	299	290	52.08
1988	355 239	381 611	736 850	293	306	299	51.79
1989	362 609	388 907	751 516	299	312	305	51.75
1990	365 179	390 707	755 886	301	314	307	51.69
1991	362 019	397 577	759 597	298	319	309	52.34

notable increase in leisure in 1991 was due to the increased leisure of the unemployed. The number of the unemployed increased by 24.57 per cent from 1990 to 1991.

Figure 8.2 reveals that both the leisure of the employed and the unemployed has been increasing since 1963. The same diagram also shows that the leisure value for the employed is relatively higher than that of the unemployed. The difference can be explained by (a) the greater number of people employed than unemployed for any given year and (b) the declining average working hours of the people employed thus freeing more time for leisure.

Figure 8.2
Reported GNE, Adjusted GNE and Leisure Value
for 1963 to 1991 using Estimate IIa

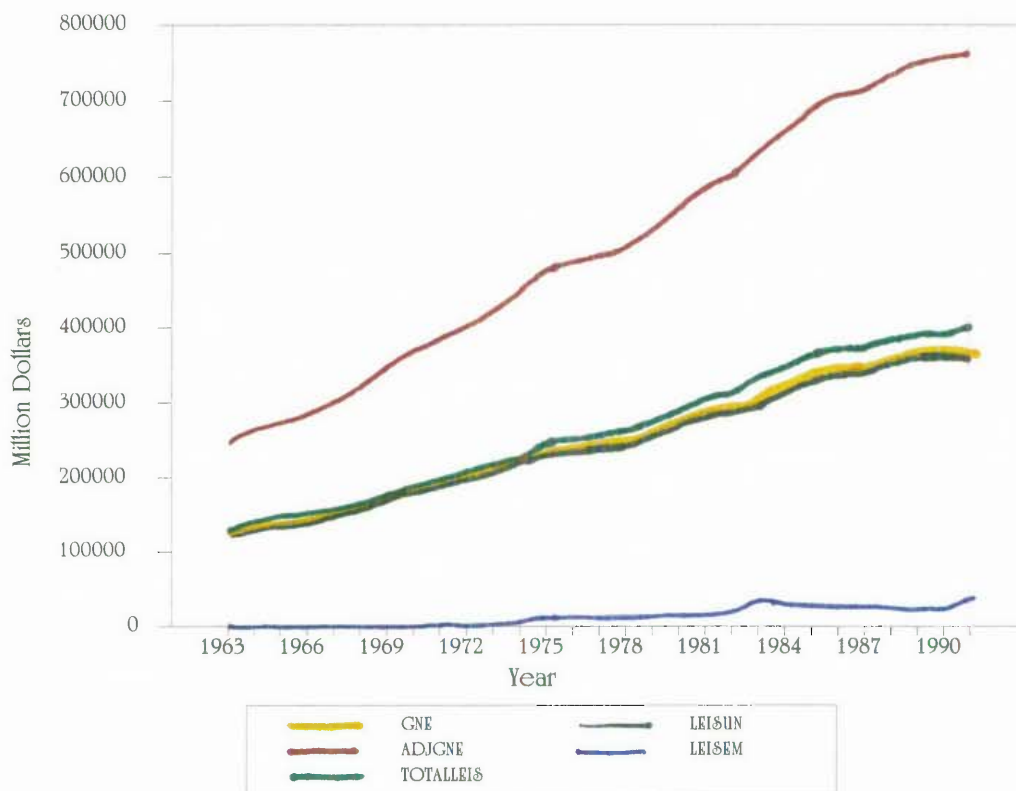


Table 8.3:
**Adjustments to Gross National Expenditure for the
 value of leisure for 1963 to 1991 using Estimate IIb**

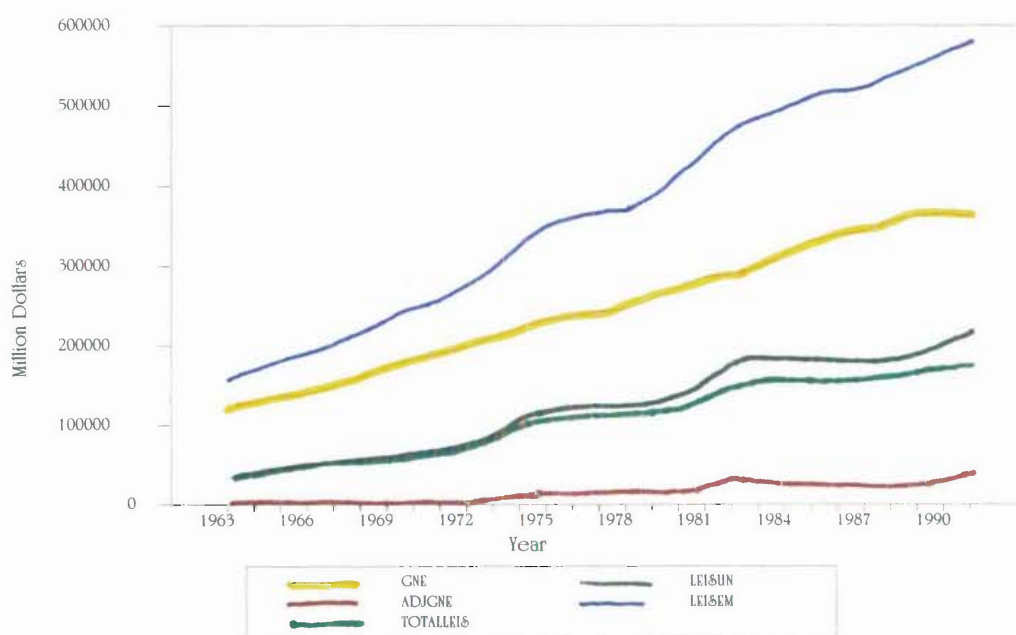
Year	GNE (\$M)	Leisure Value (\$M)	Adjusted GNE (\$M)	Index of GNE	Index of Leisure Value	Index of Adjusted GNE	% Leisure Value to Adjusted GNE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1963	121 424	34 778	156 201	100	100	100	22.26
1964	129 712	40 713	170 425	107	117	109	23.89
1965	135 410	47 112	182 521	112	135	117	25.81
1966	139 160	50 332	189 493	115	145	121	26.56
1967	147 910	53 787	201 697	122	155	129	26.67
1968	160 036	57 492	217 528	132	165	139	26.43
1969	173 216	60 798	234 015	143	175	150	25.98
1970	182 979	65 350	248 329	151	188	159	26.32
1971	190 157	69 348	259 505	157	199	166	26.72
1972	198 632	75 994	274 626	164	219	176	27.67
1973	209 680	89 572	299 252	173	258	192	29.93
1974	221 062	109 417	330 479	182	315	212	33.11
1975	232 288	119 575	351 863	191	344	225	33.98
1976	236 648	123 787	360 435	195	356	231	34.34
1977	242 359	125 950	368 309	200	362	236	34.20
1978	245 219	123 624	368 843	202	355	236	33.52
1979	258 004	126 257	384 262	212	363	246	32.86
1980	273 121	135 369	408 491	225	389	262	33.14
1981	286 059	158 046	444 105	236	454	284	35.59
1982	289 150	180 552	469 702	238	519	301	38.44
1983	297 919	186 049	483 969	245	535	310	38.44
1984	313 785	182 428	496 213	258	525	318	36.76
1985	330 929	182 869	513 797	273	526	329	35.59
1986	338 818	180 310	519 128	279	518	332	34.73
1987	342 422	178 628	521 050	282	514	334	34.28
1988	355 239	180 374	535 614	293	519	343	33.68
1989	362 609	190 104	552 713	299	547	354	34.39
1990	365 179	201 643	566 822	301	580	363	35.57
1991	362 019	214 187	576 206	298	616	369	37.17

Having no evidence on the growth rate of the productivity per hour of leisure, estimate I Ib assumes that the productivity of hours of leisure is the same as that of the real wage. The results of the computation are summarised in Table 8.3.

Like estimate I Ia, the value of leisure and adjusted GNE has been increasing since 1963. The leisure index (column 6) increased by more than six times from 1963 to 1991. Because of this significant increase in leisure value, adjusted GNE increased by more than three times during the period 1963 to 1991 (column 7). As a result, the leisure values for estimate I Ib for 23 years are relatively higher than that of estimate I Ia. Thus, adjusted GNE values for estimate I Ib are higher than that of estimate I Ia. The major explanation rests on the assumption that in estimate I Ib, leisure productivity per hour grows at the same rate as the real wage.

From column 8, percentage of leisure value to adjusted GNE increased from 22.26 per cent in 1963 to 37.17 per cent in 1991. Leisure constituted more than 20 per cent of adjusted GNE for all the years. Increases in the imputed value of leisure in the observed years are partly due to increases in the level of unemployment.

Figure 8.3
Reported GNE, Adjusted GNE and Leisure Value
for 1963 to 1991 using Estimate I Ib



Like estimate IIa, the value of leisure of the employed and unemployed are shown to increase steadily from 1963 (Figure 8.3). As a result, adjusted GNE is also increasing consistently in the same period.

But the question remains, should the leisure of the unemployed be added to reported GNE? Unemployment conveys a wholly negative identity: if there is no work to be had, then people must find a purpose in a work substitute. Leisure at first sight seems to be the obvious answer. If leisure is non-work, then it is logical to add leisure of the unemployed to reported GNE. If leisure begins where the obligation of work ends, which implies that the unemployed have no leisure, it is inconsistent to add the leisure of the unemployed to reported GNE. In addition, Glyptus (1989) argues that for the unemployed additional free time is not converted easily to leisure. Rather, most see extra hours as a burden that represents a disutility. Also, it might be argued that although some leisure of the unemployed may add to total utility, it is not clear what percentage of the additional hours is the optimal quantity of leisure, beyond which additional hours would decrease total utility. Thus, inclusion of leisure in the computations is not warranted.

8.2.3 Estimate III

The leisure values from estimate III, which corresponds to Zolotas' (1981) and Usher's (1980) methods are lower than those for estimates I and II. Mathematically, the estimate is expressed as:

$$\hat{Y}_t^{4III} = Y_t + w_{e,t}(L_{e,t}Z_{e,t} - L_{e,t-1}Z_{e,t-1}) \quad (8.4)$$

where

\hat{Y}_t^{4III} = real income inclusive of the imputation for leisure
using estimate III

Y_t = real income without the imputation for leisure

$L_{e,t}$ = hours of leisure of the employed in year t

$L_{e,t-1}$ = hours of leisure of the employed in year $t-1$

$w_{e,t}$ = average wage rate in year t

$z_{e,t}$ = productivity of leisure of the employed in year t

$z_{e,t-1}$ = productivity of leisure of the employed in year $t-1$

Here, it is assumed that the productivity of leisure is constant and is assigned a value of one. For the period 1963 to 1991, the value of leisure actually decreased from \$4 240M to \$943M (**Appendix G**). This fall in the value of leisure was due to a higher number of employed men in 1990 than in 1991 and an increase in the average hours worked by women by 34.2 minutes per week in 1991. The highest leisure value was recorded in 1989 at \$6 755M. Factors that contribute to the high leisure value are: (a) the increase in the number of employed men and women, (b) the decrease in the average hours worked by both men and women, and (c) the increase in the hourly wage rate of both men and women.

From column 4 (**Appendix G**), the value of adjusted GNE steadily increased, except in 1991. Although leisure values fluctuate between 1963 to 1990, a fall in leisure from the previous year was more than offset by the rise in reported GNE. However, in 1991 both the leisure value and the reported GNE fell.

Like the previous estimates, the index of reported GNE (column 5) steadily increased since 1963, except in 1991. As for the leisure index (column 6), the highest recorded value occurred in 1989 because of a simultaneous increase in wage rate and an increase in the number of men and women employed. Likewise, the lowest index of 0.26 was in 1991. In similar manner, the adjusted GNE index (column 7) which is the sum of column 5 and 6, has been rising since 1963, although it failed to do so in 1991.

The contribution of leisure to adjusted GNE (column 8) in this estimate is relatively lower compared to estimates I and II. For instance, the highest percentage is 3.64, compared to 34.08 and 52.88 of estimates I and IIa respectively. On the average, the results show that leisure contributes around 0.82 per cent to adjusted GNE.

To illustrate the relationship further, consider **Appendix G**. The number of employed persons changes year to year, the marginal quantity of leisure also changes, and as a result changes in the leisure value are erratic. However, it is important to note that in all years the value of leisure is positive and serves to increase the level of adjusted GNE.

The marginal quantity of leisure is negative where there is a decrease in the number of people employed and an increase in the number of average hours worked per week. Because of the decreasing marginal quantity of leisure, this method could have negative values for leisure.

8.2.4 Estimate IV

Estimates IVa and IVb were based on the following equation

$$\hat{Y}_t^{1IV} = Y_t + m_{e,t}(L_{e,t}Z_{e,t}) \quad (8.4)$$

where

- \hat{Y}_t^{1IV} = real income inclusive of the imputation for leisure using estimate III
- Y_t = real income without the imputation for leisure
- $L_{e,t}$ = hours of leisure of the employed in year t
- $m_{e,t}$ = marginal wage rate in year t
- $z_{e,t}$ = productivity of leisure of the employed in year t

The equation was operationalised by

- (a) multiplying total quantity of leisure per year by the marginal wage rate per hour, and
- (b) adding the leisure values to the reported GNE.

Again, it is assumed that the productivity of leisure is constant. The only difference between estimates IVa and IVb is the nature of the marginal wage rate used to impute for the value of leisure. Estimate IVa uses actual marginal wage rate per hour while estimate IVb uses the computed marginal wage rate per hour.

The leisure value (column 3) has a negative value 22 times out of the 29 years (Table 8.4). The highest recorded leisure value was in 1969 at \$ 5 650M. The negative leisure values can be explained by the size and sign of the actual marginal wage per hour. There are for instance 25 negative marginal hourly wage rates for men and 21 negative marginal hourly wage rates for women. These negative values were due to either a fall in the number of hours worked or a fall in the hourly wage rate. The lowest marginal hourly wage rate for men was -\$16.04 while the highest was \$1.42. With regards to women, the lowest wage rate was -\$3.97 and the highest was \$1.25. It is of no surprise then, that there are negative leisure values (column 4).

Table 8.4
**Adjustments to Gross National Expenditure for the
 value of leisure for 1963 to 1991 using Estimate IVa**

Year	GNE (\$M)	Leisure Value (\$m)	Adjusted GNE (\$m)	Index of GNE	Index of Leisure Value	Index of Adjusted GNE	% Leisure Value to Adjusted GNE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1963	121 424	1 628	123 051	100	100	100	1.32
1964	129 712	364	130 076	107	22	106	0.28
1965	135 410	-1 591	133 818	112	-98	109	-1.19
1966	139 160	-3 100	136 061	115	-190	111	-2.28
1967	147 910	-5 724	142 186	122	-352	116	-4.03
1968	160 036	-101	159 935	132	-6	130	-0.06
1969	173 216	5 650	178 867	143	347	145	3.16
1970	182 979	-4 019	178 960	151	-247	145	-2.25
1971	190 157	1 206	191 363	157	74	156	0.63
1972	198 632	-16 926	181 706	164	-1 040	148	-9.32
1973	209 680	-9 838	199 842	173	-604	162	-4.92
1974	221 062	-25 449	195 613	182	-1 563	159	-13.01
1975	232 288	-11 401	220 887	191	-700	180	-5.16
1976	236 648	-4 797	231 852	195	-295	188	-2.07
1977	242 359	-4 471	237 883	200	-275	193	-1.88
1978	245 219	267	245 487	202	16	199	0.11
1979	258 004	-64 859	193 146	212	-3 984	157	-33.58
1980	273 121	-77 710	195 411	225	-4 773	159	-39.77
1981	286 059	-117 764	168 295	236	-7 234	137	-69.97
1982	289 150	-44 531	244 619	238	-2 735	199	-18.20
1983	297 919	-29 177	268 742	245	-1 792	218	-10.86
1984	313 785	5 052	318 837	258	310	259	1.58
1985	330 929	-17 774	313 155	273	-1 092	254	-5.68
1986	338 818	-17 710	321 108	279	-1 088	261	-5.52
1987	342 422	-25 279	317 143	282	-1 553	258	-7.97
1988	355 239	-10 907	344 332	293	-670	280	-3.17
1989	362 609	-14 739	347 869	299	-905	283	-4.24
1990	365 179	-1 367	363 812	301	-84	296	-0.38
1991	362 019	632	362 651	298	39	295	0.17

The adjusted GNE grew less than the reported GNE in 28 out of the 29 years. The most significant falls in the adjusted GNE value were in 1972 and in 1981. In 1981, the marginal hourly wage of men was at its lowest at -\$16.04 and in 1971, the marginal wage of both men and women were both negative. Furthermore, in 1981 the number of women employed increased by 44 per cent from the previous year. Likewise the number of men employed increased by 1.8 per cent in 1981. As the number of persons employed increases, the total leisure hours also increases thus with a negative hourly wage rate, the leisure value becomes negative and the adjusted GNE declines.

The negative value of the leisure index indicates the extent of the decrease in the leisure value from the 1963 level. The positive entries on the other hand, imply a rise in the leisure value as a proportion of the 1963 value. Leisure value increased by the greatest amount (by 3 times) in 1984 and decreased the most (by 72 times) in 1981.

Figure 8.4
Reported GNE, Adjusted GNE and the Leisure Value for 1963 to 1991 using Estimate IVa



The adjusted GNE index (column 7) increased by almost 3 times between 1963 and 1991. The only times that adjusted GNE decreased from the previous year were in 1971, 1974 and 1981, for the reasons earlier cited. Also, in 1981 the percentage decrease in the leisure value was around 70 per cent of adjusted GNE (column 8). Figure 8.4 graphically illustrates the relationships between reported GNE, the leisure value and adjusted GNE.

Reported GNE has been increasing since 1963 while adjusted GNE has been following the trend of the leisure value (Figure 8.4). When leisure values were negative, the adjusted GNE was less than the reported GNE. Of the 29 years, 22 years portray a situation where adjusted GNE was less than reported GNE and only 7 years when it was the reverse.

For estimate IVa, the marginal wage for a given year was calculated as the change in total wages divided by the change in work hours between years. These computations are labelled 'actual marginal wage' in the study. The actual value of the marginal wage, calculated this way, varied between \$1.42 and -\$16.04 per hour. Because of the unlikely value of -\$16.04 per hour and the many negative values (95 quarters out of 1116), another way of computing the marginal wage was explored. In an attempt to obtain a generalised procedure to assess marginal wage, a model was estimated to relate the marginal wage to factors which could cause variation (refer back to Chapter 5 for details). The results will now be discussed.

The estimated regression for women is:

$$MWW = 55.814 + 0.569GR + 0.0000016EW - 2.15WHW + 0.029WRW \quad (8.5)$$

(1.5)* (1.5)* (1.9)** (-1.5)* (1.7)**

$$\bar{R}^2 = 0.52 \quad n = 116$$

where

MWW = marginal wage of women

GR = growth rate

EW = number of women employed

WHW = total working hours of women

WRW = average wage rate of women

The regression for men is:

$$\begin{aligned}
 MWM = & -154.43 - 0.803GR - 0.00(0079EM + 4.385WHM + 1.028WRM \\
 & \quad (-1.5)^* \quad (-1.7)** \quad (-1.5)^* \quad (1.5)^* \quad (1.7)** \quad (8.6) \\
 \bar{R}^2 = & 0.50 \quad n = 116
 \end{aligned}$$

where

MWM = marginal wage of men

GR = growth rate

EM = number of men employed

WHM = total working hours of men

WRM = average wage rate of men

The values in parentheses represent the t-ratios. All of the variables in equations (8.5) and (8.6) follow the predicted signs. Variables EW , WRW , WRM , WHW , WHM and GR are significant in explaining variations in the marginal wage rate at the 5 per cent level. The variable GR was included to capture trends in the economy. The significance of GR indicates that the marginal wage is influenced by the economic conditions of the country. The results also show that some 52 per cent of variations in the marginal wage rate for women can be explained by the specified variables and 50 per cent for men. To check for problems of multicollinearity, the correlation matrix for each equation was observed. None of the variables had a correlation coefficient of more than 0.31.

A model was also estimated for the marginal wage for both men and women in aggregate, with total numbers employed (TE), average wage rate (AWR) and total working hours (TWH). The regression is:

$$\begin{aligned}
 MW = & -0.819 - 0.0090TR + 0.0006TE + \\
 & \quad (-0.7) \quad (-0.9) \quad (1.4)^* \\
 & \quad 0.0014AWR - 0.015 TWH + 0.0065GR \\
 & \quad (2.3)** \quad (-0.5) \quad (0.6) \\
 \bar{R}^2 = & 0.53 \quad n=29
 \end{aligned} \tag{8.7}$$

Table 8.5:
**Adjustments to Gross National Expenditure for the
value of leisure for 1963 to 1991 using Estimate IVb**

Year	GNE (\$M)	Leisure Value (\$m)	Adjusted GNE (\$m)	Index of GNE	Index of Leisure Value	Index of Adjusted GNE	% Leisure Value to Adjusted GNE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1963	121 424	2 712	124 135	100	100	100	2.18
1964	129 712	1 662	131 374	107	61	106	1.27
1965	135 410	2 741	138 151	112	101	111	1.98
1966	139 160	2 370	141 530	115	87	114	1.67
1967	147 910	-5 723	142 187	122	-211	115	-4.02
1968	160 036	-9 801	150 235	132	-361	121	-6.52
1969	173 216	-9 438	163 778	143	-348	132	-5.76
1970	182 979	-2 505	180 474	151	-92	145	-1.39
1971	190 157	1 761	191 918	157	65	155	0.92
1972	198 632	1 301	199 934	164	48	161	0.65
1973	209 680	-1 127	208 553	173	-42	168	-0.54
1974	221 062	-3 943	217 119	182	-145	175	-1.82
1975	232 288	-9 262	223 027	191	-342	180	-4.15
1976	236 648	-8 004	228 644	195	-295	184	-3.50
1977	242 359	-12 210	230 149	200	-450	185	-5.31
1978	245 219	-6 549	238 670	202	-242	192	-2.74
1979	258 004	-19 874	238 130	212	-733	192	-8.35
1980	273 121	-21 822	251 300	225	-805	202	-8.68
1981	286 059	-20 067	265 992	236	-740	214	-7.54
1982	289 150	-7 700	281 449	238	-284	227	-2.74
1983	297 919	-11 326	286 593	245	-418	231	-3.95
1984	313 785	-16 248	297 537	258	-599	240	-5.46
1985	330 929	-9 032	321 897	273	-333	259	-2.81
1986	338 818	2 751	341 569	279	101	275	0.81
1987	342 422	12 157	354 578	282	448	286	3.43
1988	355 239	6 987	362 226	293	258	292	1.93
1989	362 609	9 797	372 405	299	361	300	2.63
1990	365 179	14 715	379 894	301	543	306	3.87
1991	362 019	13 419	375 438	298	495	302	3.57

The t-values indicate that variable WR is significant at 5 per cent, while variable TE is significant at 10 per cent. The other variables proved to be insignificant in explaining the variations in the marginal wage rate. Also, the correlation matrix revealed that the correlation coefficient between TE and AWR is 0.99. On this basis, it was decided to use equations (8.5) and (8.6), instead of (8.7) to estimate marginal wage rates.

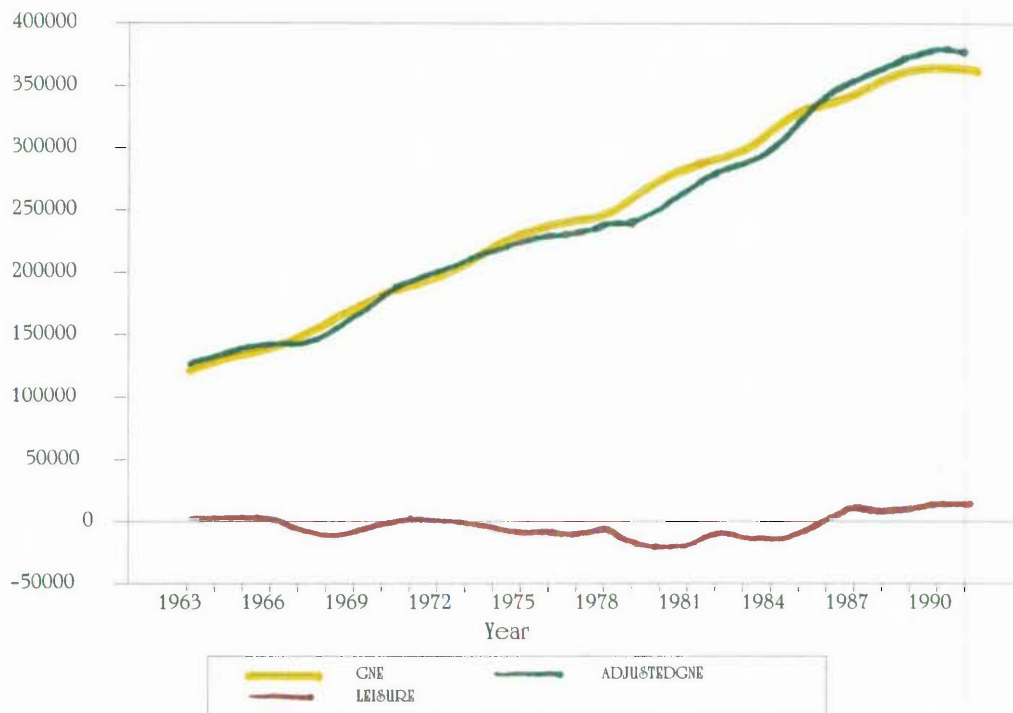
To test the functional form of the equation, a logarithmic function was specified for men, for women and for both in aggregate. The \bar{R}^2 values were found to be very low at 0.06, 0.4 and 0.1 respectively, and so it was decided to use the linear function. Additionally, the t-values were low and all of the variables except number of employed persons proved to be insignificant.

Equations (8.5) and (8.6) were then used to estimate the marginal wage per hour for men and women respectively. The observed data of EW , EWR , WHW , GR , EM , WRM , and WHM for each quarter were substituted in the equation. Using estimate IVb, the marginal wage per hour (calculated) was multiplied by the total quantity of leisure to determine the total leisure value for the quarter. The totals for each quarter were then added to get the yearly values. The results using this estimate are summarised in Table 8.5.

The computed method, when used gave the lowest marginal wage rate for men at -\$1.03 and the highest at \$0.94. With regards to women the highest value was \$2.23 and the lowest value was -\$5.38. The computed marginal wage rate was then used to impute the leisure value. The results show (column 3) that 17 out of the 29 years registered a negative value for leisure. The number of negative values for leisure actually declined from 21 to 17. The reasons for the existing negative values were either (a) a negative marginal wage rate for men, or (b) a negative marginal wage rate for women or (c) both. The increase or decrease in leisure values of estimate IVb were relatively smaller than that of estimate IVa. Likewise, the fluctuations in leisure values for estimate IVb were less pronounced than estimate IVa. Because of these, the adjusted GNE values (column 4) were subsequently less volatile.

From column 6 and Figure 8.5, it can be seen that the size of the increase in the imputed value of leisure using estimate IVb is smaller than that of estimate IVa. As a result, the adjusted GNE index has been steadily increasing since 1963. Also, Figure 8.5 shows that the difference between the reported and adjusted GNE for a given year is very minimal. Finally, the diagram shows that reported GNE, leisure and adjusted GNE move in the same direction.

Figure 8.5
**Reported GNE, Adjusted GNE and the Leisure Value
 for 1963 to 1991 using Estimate IVb**



8.2.5 Estimate V

Estimates Va and Vb were derived using the marginal quantity of leisure, rather than the total quantity of leisure, and the marginal wage. Like the other procedures the leisure values were then added to the conventional Gross National Expenditure. Thus, equation (8.2) is modified to become

$$\hat{Y}_t^{2V} = Y_t + m_{e,t} (L_{e,t} Z_{e,t} - L_{e,t-1} Z_{e,t-1}) \quad (8.7)$$

where

$$\hat{Y}_t^{2V} = \text{real income inclusive of the imputation for leisure using estimate V}$$

- Y_t = real income without the imputation for leisure
 $L_{e,t}$ = hours of leisure of the employed in year t
 $L_{e,t-1}$ = hours of leisure of the employed in year $t-1$
 $m_{e,t}$ = marginal wage rate in year t
 $z_{e,t}$ = productivity of leisure of the employed in year t
 $z_{e,t-1}$ = productivity of leisure of the employed in year $t-1$

Estimate Va will be discussed first. For a full explanation, consider **Appendix H** which summarises the results for estimate V. Column 3 reveals that most of the imputed values for leisure were negative. The highest value was \$206M in 1963 and the lowest was in 1981 at -\$2 281M. Negative values for leisure may be due to (a) negative marginal wage rate for men or women or both, and/or (b) negative marginal quantity of leisure hours for men or women or both.

Although the imputed values of leisure were mostly negative, the adjusted GNE continued to increase from its 1963 level (column 4). The leisure index in column 6 shows that leisure value has been falling significantly since 1963. There were only three years wherein the leisure value had increased. But looking at the adjusted GNE index, one would not fail to note that the index value has increased almost three times since the base year. From column 3, the proportion of leisure to adjusted GNE was very small, on the average around 11 per cent.

The imputed leisure value for a given year was minimal, and differences between the reported and adjusted GNE were small (**Appendix H**). For reasons cited in estimate IV, estimate Va was recalculated using a computed marginal wage rate, and the results are summarised in **Appendix H**.

From column 3, the number of negative leisure values has decreased considerably compared to estimate Va. Likewise, the leisure values were relatively lower and less volatile than estimate Va. As a result, the adjusted GNE value has been continuously increasing since 1963 (column 4). Unlike the previous studies and estimates presented, the proportions of leisure to adjusted GNE for most years were very small.

The diagram shows that differences between reported GNE and adjusted GNE were small (**Appendix H**). In fact, reported GNE and adjusted GNE move in the same direction. On the other hand, the contribution of leisure to adjusted GNE is negligible and often represents a fall.

Several procedures to stabilise and remove the negative values for estimate V were attempted. Other than the estimation procedure presented (estimate Vb), the values were also standardised per worker and per hour. But all the attempts failed to eliminate the negative values.

8.3 A Comparison of the Approaches

The principal focus of accounting and valuation systems is the creation of better measures of welfare than can be obtained by simply looking at output alone. Accounting for leisure could provide a better interpretation of trends in welfare.

Each of the estimates presented in this study have their uses. Estimates I, II and IV, for instance, could be used to assess total welfare. Estimate I uses the total quantity of leisure and average wage to derive the value of leisure. This procedure was the procedure suggested by Sametz (1958). The estimate will give an indication of the level of total utility derived from leisure. In Gronou's (1974) study, it was also assumed that the value of individual's time is equal to his or her wage rate. The same assumption is used for this estimate. However, it should be noted that this assumption does not carry any utility considerations. Relaxing this assumption means that one has to adjust the value of time for the money equivalent of marginal utility (or disutility) of work (Johnson 1966). On the other hand, one of the major strengths of this estimate is the fact that imputed values of leisure are positive and could easily be interpreted.

Similarly, estimate II uses the same concepts but includes the value of the leisure of the unemployed. But this estimate is not appropriate in assessing society's total utility from leisure, because additional hours of leisure prove to be a burden for the unemployed (Glyptus 1989). Likewise, additional leisure may incur a negative value (disutility) for many who are unemployed. The expectation that large numbers of unemployed people will turn to active leisure activities, especially sport, to use their surplus time and energies may be ill-founded. For most, the sudden change from being in work to being out of work, and the sudden surplus of time on their hands, is but the latest addition to a welter of disadvantages, any of which alone limits the likelihood of leisure participation. One way to improve this estimate is not to assume that all time not spent working is spent on leisure but rather to segregate the non-work time into productive household activities and leisure. The money value for the household productive services has to be imputed as well as for the money value of

leisure. Weaknesses noted for estimate I also holds for this estimate. Adding the household productive activities of both for the employed and the unemployed, especially services of housewives, will give a better picture of society's welfare.

Unlike estimates I and II, estimates Va and IVb multiply the total quantity of leisure by the marginal wage rate, to calculate the value of leisure. Estimate IV would be a good measure when computing for total utility since the marginal wage represents the price a person will pay for an additional unit of leisure. However, marginal wage information is difficult to find and the computed marginal wage values are mostly negative. As a result, adjusted GNE although increasing is lower than reported GNE in most years. Negative values for marginal wages results in negative values for leisure. This is apparently the greatest weakness of this estimate. Although there are two ways of computing for marginal wage presented in this study, both methods resulted in negative values for marginal wage. Other ways of solving for marginal wage could be explored. The full income approach might be one method to consider. The full income approach provides a meaningful resource constraint and one which is firmly based on the facts that goods and time can be combined into a single overall constraint because time can be converted into goods through money income. The basic resource constraint states that full income is spent on either directly on market goods or indirectly through the forgoing of money income. However, marginal, not average prices are relevant for the analysis. After some mathematical manipulations, Becker (1965) was able to determine the marginal wage equation expressed as

$$li = \frac{\partial L}{\partial T_i}$$

where

li = marginal wage

L = total earnings forgone

T = time

A second method that could be employed is known as the intra-family allocation of time approach. In this approach, the consumption activity is regarded as a production process in which time and goods are combined to produce utility. The intra-family allocation of time approach recognizes that the members of the family each play a different role in the production of utility. This approach is discussed in detail in Gronau (1974) and also in Apps and Rees (1994). The procedure is lengthy and complicated and thus be discussed in this thesis.

Estimates III and V are the estimates to use to measure changes in utility. Estimate (III) would be most appropriate if the average wage rate approximates the price the consumer values leisure. Estimate V is theoretically more appropriate. However, details on marginal wage rates are not available and mathematical calculations are bound to have negative values. For instance, Usher (1980) advocated estimate V in valuing leisure for Canada but due to difficulties in obtaining estimates for the marginal wage, assumed marginal wage to be equal to average wage in his computations.

Calculated and estimated marginal wage rates revealed some negative values. Is it appropriate to accept negative values in imputing the value of leisure? A negative marginal wage is associated with additional work beyond the optimum hours the individual is willing to work. For estimates IV and V, the negative values for leisure were mostly due to arithmetic. Marginal wage is defined in this study as the change in total wage divided by a change in hours worked. Following this method, values for the marginal wage are mostly negative. Negative values for leisure are possible, especially when additional hours of leisure are beyond the maximum leisure the individual requires. This may come from a shortage of paid work which results in a surplus amount of leisure time available. Another possible explanation is the inability of the economy to provide the goods and inputs required for recreational activities needed to cater to the growing amounts of leisure time. Lastly, arithmetic calculations may result in negative values for leisure.

8.4 Problems of Leisure Valuation

The theoretical model suggests that only discretionary leisure should be valued, not forced leisure due to involuntary unemployment. The range of situations is set out in Table 8.6. When the number of job vacancies increases and the number of unemployed persons increases *ceteris paribus*, there is clearly an increase in discretionary leisure (combination 1 in Table 8.6). That is, for a given population and at a given wage, the unemployed will not offer their services for hire because they value their hours of leisure more than the wage they can earn. Combination 2 represents the more conventional situation where the number of unemployed decreases as the number of job vacancies rises. This situation results in a clear increase in discretionary work. In instances where the number of job vacancies declines and the number of unemployed grows, there is an increase in forced leisure (combination 3). But when the number of jobs and the number of unemployed both

fall, and if unemployment falls more than the fall in the number of job vacancies, discretionary leisure increases (combination 4). There are however some exceptions to this rule. A decrease in number of unemployed might be due to decreases in numbers in the labour force and the increases in the number of discouraged workers. Under the current system, discouraged workers are not included in the unemployment statistics.

Table 8.6
The relationships between Job Vacancies and Unemployment

Combination	Number of Job Vacancies	Number of Unemployed	Outcome
1	Rise	Rise	increase in discretionary leisure
2	Rise	Fall	increase in discretionary work
3	Fall	Rise	increase in forced leisure
4	Fall	Fall	increase in discretionary leisure

Equations (8.4) and (8.5) were extended to account for these changes in discretionary leisure, available employment and the complementary changes in discretionary unemployment. The figures for available jobs were derived from data published by the Commonwealth Employment Service (CES) and data compiled by the Australia and New Zealand Bank (ANZ). The number of notified jobs for men and women (from the CES) and the number of advertised jobs (from the ANZ) were added separately to equations (8.4) and (8.5). It was hypothesised that as the number of vacancies increases, the number of discretionary leisure hours increases, while discretionary unemployment will decrease. Neither variable was significant and the R^2 value reduced. Thus, the variables number of job vacancies and number of unemployed were dropped from equations (8.4) and (8.5).

8.5. A Summary of the Results

Consider first the estimates as presented in a summary Table 8.7.

Table 8.7
Adjustments to Gross National Expenditure for the value of leisure for 1963 and 1991,
using the different methods to estimate leisure values

Year	1	2	3	4	5	6	7	8
	Year	GNE (\$M)	Leisure Value (\$M)	Adjusted GNE (\$M)	Percentage Leisure Value to Adjusted GNE	Index of GNE	Index of Leisure Value	Index of Adjusted GNE
(I) Total Quantity of Leisure and Average Wage : excluding leisure of the unemployed								
	1963	121 491	33 491	154 914	21.62	100	100	100
	1991	362 019	173 609	535 628	32.41	298	518	546
(II) Total Quantity of Leisure and Average Wage : including leisure of the unemployed								
* Assuming productivity of leisure is constant over time								
	1963	121 491	124 623	246 047	50.65	100	100	100
	1991	362 019	397 577	759 597	52.34	298	319	309
b. Assuming productivity of leisure grows at the same rate as real wage								
	1963	121 491	34 778	156 201	22.26	100	100	100
	1991	362 019	214 187	576 206	37.17	298	616	369
(III) Marginal Quantity of Leisure and Average Wage^a								
	1963	121 491	4 240	125 664	3.37	100	100	100
	1991	362 019	943	362 962	0.26	298	22	289
(IV) Total Quantity of Leisure and Marginal Wage^a								
a. Using actual marginal wage								
	1963	121 491	1 628	123 052	1.32	100	100	100
	1991	362 019	632	362 651	0.17	298	39	295
b. Using estimated marginal wage								
	1963	121 491	2 712	124 135	2.18	100	100	100
	1991	362 019	13 419	375 438	3.57	298	495	302
(V) Marginal Quantity of Leisure and Marginal Wage^a								
a. Using actual marginal wage								
	1963	121 491	206	121 629	0.17	100	100	100
	1991	362 019	30	362 048	0.01	298	14	298
b. Using estimated marginal wage								
	1963	121 491	342	121 766	0.28	100	100	100
	1991	362 019	79	362 098	0.02	298	23	297

^a These estimates exclude the leisure of the unemployed.

(a) Except for estimate III, the growth in the index of adjusted GNE (column 8) is higher than or equal to the growth in the index of GNE (column 6). For estimate III, the index of adjusted GNE for 1991 is lower than the index of GNE for 1991 because of a large decrease in the value of leisure from 1963 to 1991 with the method of estimate III. The adjustment for leisure increases GNE, but for estimates Va the indices did not change and varied only slightly for estimate Vb because the leisure addition was too small.

(b) With regards to the percentage of leisure value to adjusted GNE (column 5), estimates IIa and IIb register the highest percentage at 36 and 52 per cent respectively. Estimates Va record the lowest percentage at 0.01 per cent.

(c) For estimate III, the percentage of leisure to adjusted GNE reduced from 3.37 per cent in 1963 to 0.26 per cent in 1991. Since the value of leisure decreased by 78 per cent in estimate III, the adjusted GNE index is lower than the reported GNE index.

(d) The index of leisure value (column 7) shows that estimates I and IIa recorded the highest growth in leisure at 5.197 and 5.234 times respectively. Both estimates used total quantity of leisure and the average wage in their calculations.

(e) Estimates IV and V record negative values for leisure in their respective tables (Tables 8.4 and 8.5, and **Appendix H**). Although negative values for leisure are feasible, there is little evidence to support the idea that consumers attach a negative price to leisure.

The results therefore depend upon which method of estimation is selected. Consider for example the results of estimate I, which follows the theoretical model that is standard in most time studies literature

- (a) the value of leisure increased by 5 times between 1963 and 1991 (100 to 518).
- (b) the value of reported GNE increased almost three times (100 to 298).
- (c) the percentage of leisure value to adjusted GNE increased by 30 percent from 2 per cent to 32 per cent
- (d) average wage computations show a positive value for leisure unlike the marginal wage computations illustrated by estimates IV and V.