Appendix 2: Further Data and Methodological Issues in the GPI Revisions

While Chapter 7 (proper) argued the reasons for adjusting the GPI and Chapter 7a extended this to make estimates of what such revisions might look like, this Appendix sets out in more detail how those adjustments were made and the data used.

Gender Wage Gap

Why an Index?

I have turned the gender wage gap figures into an inequality index measuring changes relative to a base year. This was necessary because simply multiplying the Consumption base figure by women's share of income would overwhelm the rest of the GPI. The simple multiplication of Private Consumption by women's percentage of male income would reduce the Weighted Consumption figure by up to 40% and have a major impact on the whole GPI. Figure A2.1 shows the impact on the GPI of revising the GPI for gender inequality without using an index.

Figure A2.1 Revised GPI p.c. Using Raw Gender Wage Gap Figures
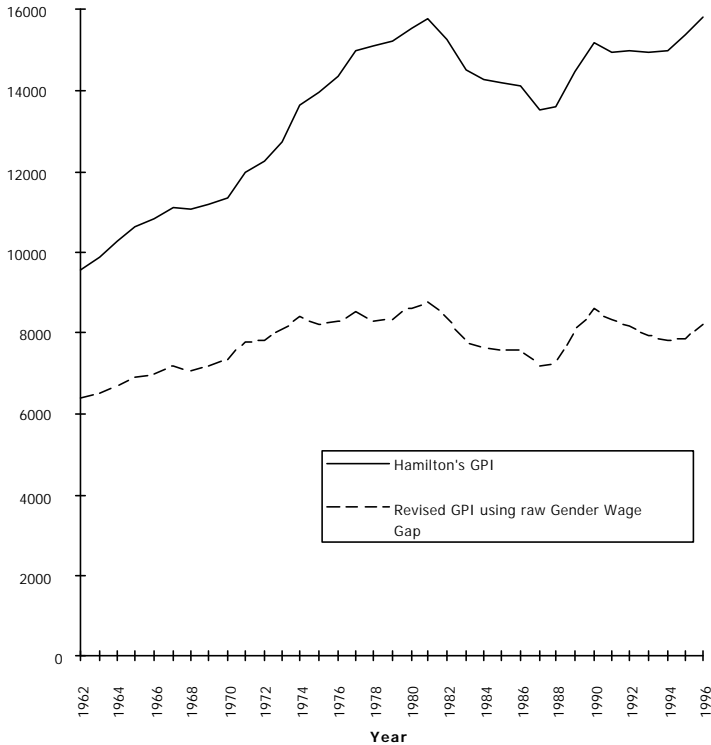
Over the whole period Hamilton's GPI increased by 60.6%, but the (non-indexed) gender revised version increased by only 18%. Arguably this impact out of proportion to the importance of the issue of income inequality, particularly in relation to Hamilton's inequality adjustment (because gender inequality becomes much more important than the relative poverty of the bottom 20% of income earners). But more problematic is the fact that in the time covered by the GPI the gender wage gap has decreased markedly and its inclusion should have shown up as an increase in economic welfare. It does not do so here, although of course had the gender wage gap not decreased, the revised GPI would have been even worse. The raw adjustment for gender inequality thus both overwhelms the GPI and gives a somewhat counter-intuitive result - hence the use of an index which measures year by year changes in the gender wage gap relative to a base year.

The Data

Perhaps surprisingly, the data for this index proved problematic. Despite a reasonable sized literature on the gender wage gap, I could find no straight tabulation of the gender wage gap over time in any of the secondary literature. There were many articles based on gender wage gap statistics, but usually based over a more limited time frame - most often from 1981 when the current ABS time series began.[1] Alternatively, articles contained analyses of figures for one or two years with various econometric calculations to isolate the impact of particular factors on the gender wage gap.[2] However, while these articles often presented their formulae and calculations in detail, they did not present the raw data on women and men's earnings.

Thus in order to develop the index of gender wage inequality I used the raw ABS data on men's and women's wages, but even this was problematic as there was no continuous data series for the entire period. Moreover, there is no relevant data published on earnings (as opposed to award rates) before 1962 - hence the start date and base year for my revisions to the GPI.

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[1]   See for instance, Malcolm Langford (1995) "The Gender Wage Gap in the 1990s" *Australian Economic Papers*, Vol 34, No. 64, pp 62 - 85.

[2]   See for instance, William Even and David Macpherson (1993) "The Decline of Private Sector Unionism and the Gender Wage Gap" *Journal of Human Resources*, Vol 28, No. 2, pp 279 - 96. Sarah Rummery (1992) "The Contribution of Intermittent Labour Force Participation to the Gender Wage Differential" *Economic Record*, Vol 68, No. 203, pp 351 - 64. Stephanie Spilsbury and Michael Kidd (1997) "The Gender Wage Gap: What Has Happened Between 1973 and 1990 in Australia?" *Australian Economic Papers*, Vol 36, No. 69, pp 205 - 23. Martin Watts (1993) *The Relative Earnings of Female and Male*

There were also other problems of data availability. As noted in Chapter 7a, my preference was to use figures for total earnings for all employees rather than only full-time employees. The current ABS series, *Average Weekly Earnings*, gives figures for average earnings of both full-time and all employees.[3] The gender wage gap can then be calculated for both categories of workers, but these figures only date back to 1981. While the previous series for full-time workers extends back to 1962, comparable data for all employees was not really published.

The ABS did publish data on "Average Weekly Earnings per Male Unit" prior to 1981, which involved calculating the average ratio of female to male earnings which was then published almost as a footnote. [4] However, these statistics were not collected in all states and were only published yearly back to 1973. A single estimate of women's earnings as equal to 52.5% of all male earnings was used for 6 years prior to that and no such statistics were published before 1966.

In any case the choice of statistics here makes little difference to the impact on the GPI's Weighted Consumption figure. Despite the gender wage gap for all employees' total earnings being about 13 percentage points larger than for full-time employees, the trend is very similar, with a substantial closing of the gap in the early to mid 1970s followed by a levelling out through the 1980s and 1990s. Any yearly variations between the two sets of figures were not significant or sustained enough to make a major difference to the gender inequality index. Given this, and the longer time period covered I preferred to use the figures for full-time employees (rather than for all employees).

However, even using the ABS figures for Full-Time Workers' Average Weekly Earnings, there is no continuous time series. The current ABS data series is based on a purpose designed survey of employers whereas data prior to 1981 was based on payroll tax data collected by the ABS. The pre-1981 figures I have used are those reported in the Reserve Bank's summary of

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[3] *Employees: Does Occupational Segregation Matter?*, Department of Economics, University of Newcastle. Occasional Paper 191.

[3] Australian Bureau of Statistics *Average Weekly Earnings*, Canberra: ABS. Cat No. 6302.0.

[4] The "male unit" here was defined as "total male employees plus a proportion of female employees, the proportion being derived from the estimated ratios of female to male earnings." Australian Bureau of Statistics (1973) *Official Year Book of Australia*, Canberra: ABS. p 255.

ABS figures and cover only private sector, non-managerial earnings.[5] Figures including public sector employees are available from 1976, but because the gender wage gap was less in the public sector than in the private sector, inclusion of public sector employees in the late 1970s would exaggerate the growth of gender wage equality. For instance, in 1977 full-time adult women employees earned on average 76.6% of men's earning in the private sector by comparison with 81.0% of earnings when all full-time employees were considered.[6]

While the figures covering all adult full-time employees might be more inclusive, they do distort the series and the gender inequality index as their inclusion from 1976 would exaggerate the extent of closure of the gap in the late 1970s. Thus the figures dealing only with private sector employees provide a more consistent coverage over a much longer period prior to 1981, when the data set changed. The post-1981 figures do include public sector employees, but in creating the gender inequality index for these years I have re-indexed the series thereby minimising the statistical impact of the different data set.

This re-indexing is evident in the figures for 1981 in Table 7a.1 There are two sets of figures for 1981: the first are the old data set figures for May, the second line is when the new data series begins in September. In order to construct an index across the whole time period for which gender statistics are available I have used the last figure in the old data series as the base for the new series and measured the annual changes from 1981-96 against the old series 1981 values. While this gives a smooth data series which reflects the increments each year, it does not solve all the problems of continuity between the two data sets.

The content and methodology underlying the data sets remains different, although this is not fatal. What is important here is not the absolute figures - the dollar value of average weekly earnings - but the ratio of male to female earnings. As long as both male and female earnings are calculated from the same data sample each year, then the ratio of female to male earnings should be equivalent across the different methods of data collection. Given this I think the advantages of having a longer time series outweigh the potential distortions of using different data sets.

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[5]   R.A. Foster and S.E Stewart (1991) *Australian Economic Statistics: 1949-50 to 1989-90*, Reserve Bank of Australia. Occasional Paper 8. pp 177 - 179.

[6]   See Mumford, who uses the same data. Karen Mumford (1989) *Working Women: Economics and Reality*, Sydney: Allen & Unwin. p 33.

The Index

Having thus constructed a series of numbers which trace changes in the gender wage gap since 1962, there remains the issue of how to put them into an index analogous to the distributional inequality index in the GPI. There are two issues here: one is the choice of base year, the second is how the gender index is to be combined with other distributional inequality figures in a revised GPI.

The choice of base year is important in terms of the impact of the gender inequality index on the GPI. It makes no difference to the rate of change of the index or to the size of the adjustment to the Weighted Consumption figure in the GPI, but it does make a major difference to its direction. On the assumption that the broad direction of change over the GPI period has been toward greater gender equality, then positing 1962 as the base year would mean that all index figures would be above 100. The gender adjustment would then increase the GPI inequality index and increase Weighted Consumption. By contrast, if the final year was chosen as the base, then all index figures would be less than the original and the Weighted Consumption figure smaller than in Hamilton's estimate.

As noted above, a decrease in the magnitude of the core Weighted Consumption figure means that all other positive and negative adjustments become relatively more important. The extent of relative change here is nowhere near as large as in the earlier example of adjusting for the raw value of women's share of income, but it does again highlight that the ISEW/GPIs are about changes over time not about measuring a reified 'thing' with an absolute quantum.
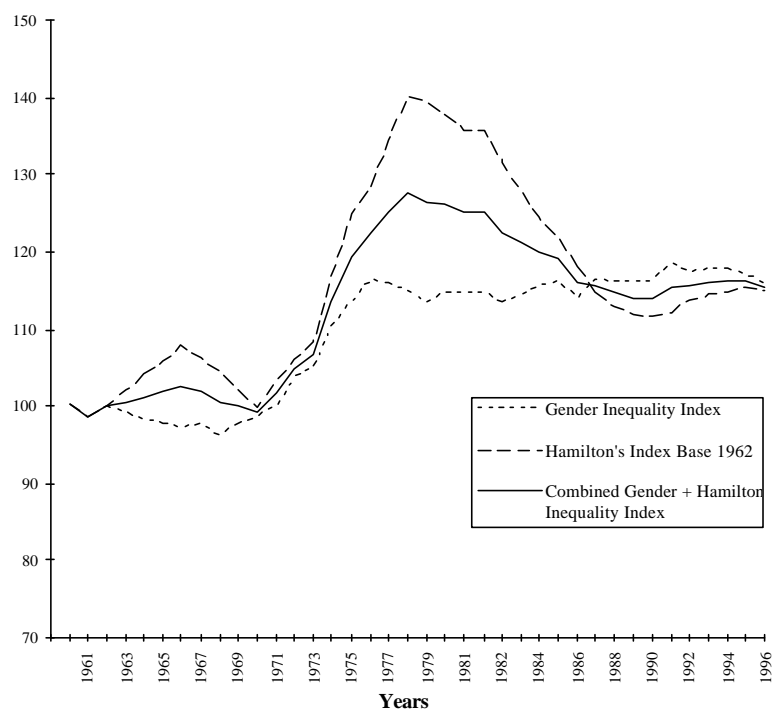
Figure A2.2: The Inequality Indexes

Figure A2.2 shows the trend of both Hamilton's inequality index and the gender inequality index, as well as the combination of the two. Ideally it would be desirable to follow the Austrian example of using the initial year of the ISEW survey as the base year, but since the gender wage gap figures only go back to 1962 I have used this as the base year and adjusted Hamilton's distributional inequality, weighted consumption and final GPI figures accordingly. A combined income inequality index is calculated by taking a simple average of Hamilton's (1962) Inequality Index and the Gender Inequality Index, as per Table A2.1 below. It is this index which weights the consumption figure in the revised GPI index in Table 7a.2.

Table A2.1 Derivation of the Revised Distributional Inequality Index

Year	Hamilton's Distribution Index	Hamilton's Index Base 1962	F/T Workers Gender Index	Combined Gender + Income Inequality Index
1962	92.97	100.00	100.00	100.00
1963	94.95	101.98	99.03	100.51
1964	97.03	104.06	98.41	101.23
1965	98.82	105.85	97.84	101.84
1966	100.77	107.80	97.26	102.53
1967	99.17	106.20	97.62	101.91
1968	97.34	104.37	96.38	100.37
1969	95.10	102.13	97.80	99.96
1970	92.76	99.79	98.55	99.17
1971	96.30	103.33	100.13	101.73
1972	98.92	105.95	103.77	104.86
1973	101.20	108.23	105.29	106.76
1974	109.51	116.54	110.35	113.44
1975	117.97	125.00	113.45	119.23
1976	121.21	128.24	116.56	122.40
1977	127.33	134.36	116.01	125.19
1978	133.18	140.21	115.00	127.61
1979	132.38	139.41	113.54	126.47
1980	130.75	137.78	114.59	126.18
1981	128.66	135.69	114.72	125.21
1981	128.66	135.69	114.72	125.21
1982	124.58	131.61	113.51	122.56
1983	120.82	127.85	114.42	121.14
1984	117.55	124.58	115.56	120.07
1985	114.74	121.77	116.35	119.06
1986	111.20	118.23	114.07	116.15
1987	107.78	114.81	116.60	115.71
1988	105.79	112.82	116.36	114.59
1989	104.93	111.96	116.27	114.12
1990	104.71	111.74	116.32	114.03
1991	105.06	112.09	118.56	115.32
1992	106.75	113.78	117.39	115.58
1993	107.41	114.44	117.85	116.15
1994	107.60	114.63	117.85	116.24
1995	108.46	115.49	116.95	116.22
1996	107.87	114.90	116.09	115.49

Exchange Expenditures

Changes in ABS Industry Classifications

The current classification system which forms the basis of ABS production and Input-Output accounts is based on the Australian and New Zealand Standard of Industry Classification (ANZSIC). It is a relative recent taxonomy, being introduced in the 1990s to replace the system relating to Australian Standard Industry Classification which had been in use since 1969 (although this was itself revised in 1978 and 1983).[7]

While the accounting for Wholesale and Retail activity is straightforward throughout, the accounting for the FIRE industries is much more complex. The 1962 Input-Output accounts published data on 30 industry groups disaggregated into 105 industry classifications. Industries listed in the 105 table as (I1) Finance and life insurance, (I2) Other insurance, (I3) Investment and Real Estate, (I4) Business services, combined to form industry group number 25, Finance, Insurance, Real Estate and Business Services. In subsequent accounts this industry group changed to "Finance, Property and Business Services" in a 28 industry group taxonomy comprising Banking 61.01, Non-bank finance 61.02, Investment and services to finance and investment 61.03, Insurance and services to insurance 61.04, and Business services not elsewhere included 61.05, in a 108 industry classification. In 1992/93 the industry group was split into two: Finance and Insurance (Group K) and Property and Services (Group L) in a 35 industry group classification creating further problems of continuity of data (discussed below).[8]

Nevertheless, despite the changes in the names and categorisations of the published data, the content of what is counted in the sectors which fit what I have called the FIRE component of exchange activities remains essentially the same. For instance, the I3.1 Real Estate Agents and the I3.3 Share and Stock Brokers of the 1962 classification are part of the 7702 Other Property Services category in 1992/93. Similarly the legal, accounting and auditing, advertising, architectural, engineering and surveying, and security services of the 1962 sub-

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[7]   Australian Bureau of Statistics (1993) *Australia and New Zealand Standard Industrial Classification*, Cat 1292.0. Canberra: ABS. p 1.

[8]   Australian Bureau of Statistics *Australian National Accounts: Input Output Accounts*, Canberra: ABS. Various years. See also ABS, ibid.

group "Business Services" all form part of categories 7801, 7802, and 7803 of the current classification, "Property and Business Services" industry group.[9]

The later categorisations tend to be broader (eg. "Non-bank finance" replacing "Building Societies" and "technical services" replacing "engineering") in order to reflect a greater range of financial mechanisms and business services. However even where new forms of services or financial tools have grown, in general, they have not been shifted from other industry sectors in a way which would exaggerate the growth of exchange activities. Despite the changes in both categorisations and industrial landscape, the major FIRE activities have remained within or grown from the broad categories listed above. For this reason, in calculating the value of the FIRE activities to be deducted from the GPI I have used the broader industrial group figures, rather than the more disaggregated figures which, given the category changes, are unnecessarily complex for the order of magnitude figures being considered here.

Unfortunately, the situation is more complex when considering adjusting the WRET and FIRE GPI deductions for values already deducted from the GPI as part of designated defensive expenditure. It would be an enormous undertaking (if it is possible at all) to deduct from the exchange activity estimate a value for every exchange activity which went to a defensive end use. Using the 105/108/113 industry classifications in the Input-Output tables, it might be possible to identify the output of exchange industries which go into some of the major areas of Hamilton's defensive expenditure deductions like defence, health or education, but even with these accounts it is not possible to identify all such exchange inputs into identified defensive expenditures. For instance, the I-O accounts do not separate out tertiary from other education as do Hamilton's estimate. Nor do the I-O accounts separate public order and safety expenditure (eg. courts and police) from other government expenditure whereas Hamilton treats these expenditures differently (the former being 75% defensive, the rest being seen as welfare producing or up to half defensive).[10]

Given the data mismatch, and given that much of Hamilton's treatment involves quite arbitrary apportionings of expenditure as 25% or 50% welfare enhancing, there seems little to be gained by going below the broader level of industry group classification in the I-O tables.

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[9]   *ibid*.

However, in recognition that government expenditure is a mixed bag of defensive and welfare producing expenditure, I propose simply to use 50% of the figure for FIRE and WRET activities which went into "Government Administration" (Public Administration and Defence in the earlier accounts) in order to adjust the exchange activity estimate. Similarly I propose to use 50% of the I-O figure for Health, Education and Welfare/Community Services. In incorporating the other welfare and community services included in this category (eg. child care, community care services) these categories clearly go beyond Hamilton's health and education defensive expenditure deductions, but they may also be similarly borderline cases where the 50% figure is not entirely unwarranted (again particularly in the context of the admittedly arbitrary nature of much of this accounting - and indeed all national accounting).

Unfortunately though the published data makes even this procedure difficult. The I-O categories changed in 1992/93 and the old "Community Services" went into a number of categories, including Education, and Health and Community Services. Using simply the Education, and Health and Community Services categories which most closely approximate Hamilton's defensive expenditure deductions means a discontinuity in the data as expenditures on museums, library services and religious organisations which were previously part of the accounting suddenly disappears. To correct for this I have supplemented the figures for exchange activities which go to Education and Health and Community Services (the 35 industry groups classifications) with the figures for "Libraries, museums and the arts" from the 113 industry accounts.

It should be noted though that this is more a matter of statistical imperative than an analysis of the activities themselves. Hamilton clearly identifies such cultural and recreation services as welfare enhancing (ie. not defensive), and so they should not be incorporated into the earlier figures as defensive expenditures. However the published figures do not allow for their exclusion from the pre-1992 exchange activities category of "Community Services". For the sake of continuity I have included the value of exchange industry output which went to "Libraries, museums and the arts" in the later years alongside the adjustments for Education and Health and Community Services.

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[10]   Clive Hamilton (1997) *The Genuine Progress Indicator: A New Index of Well-being in Australia*, Australia Institute. Discussion Paper 14. pp 17 - 18.

The published data does not allow a similar procedure for the output which went to religious organisations which, prior to 1992/93, formed part of the Community Services category, but were reallocated to Personal Services in the most recent accounts. Consequently I have simply let these values drop out of my accounting. Clearly this discontinuity in the data is not ideal, but the magnitude of these expenditures is relatively small and does not impact on the overall trends of the data.

Calculation & Raw Data

The methodology for calculating the deductions for exchange activity is outlined in Chapter 7a, but can be summarised as follows. The output of certain industry groups (Finance, Insurance, Real Estate and Business Services, and 1/2 of Wholesaling and Retailing) is designated as exchange expenditure. The value of the output of these industries is derived from the Input-Output tables by adding the figures for output going as Intermediate Usage to other industries, plus Private and Government Final Consumption Expenditure: Columns 2,3 and 4 of Table A2.2 below.

Deductions are then made for the value of Intermediate Usage of exchange outputs which is deducted elsewhere or not included in the GPI - either as exchange expenditure (Columns 5 and 6 in the pre-1992/93 figures below, or columns 7 & 10 in the later figures) or as GPI defensive expenditure (Columns 7 & 8 in the pre-1992/93 figures or columns 11 & 12 in the later figures). This gives a value for Total Consumption expenditure of each exchange industry (Column 9 in the pre 1992/93, column 13 in the later figures). These are added together to give a Total Exchange Expenditure in current dollars for each year of the I-O accounts which is then transferred to Column 2 of Table 7a.3.

As noted in the chapter, these current dollar value are then translated into Constant 1989 dollars (using the Implicit Price Deflator for GDP (Expenditure) as a whole (rather than the price deflator for each industry which would have unnecessarily complicated the calculation).The blank years are then filled in by a simple linear extrapolation, and deducted from Gender Revised GPI to form the Final* Gender Revised GPI.