New Zealand Journal of Psychology, 1991, 20, 49-55

Are women perceived as underpaid? Magnitude estimation of the value of male- and female-dominated occupations.*

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One hundred and sixty members of the general public (77 of them women) assessed the perceived value to society of 58 occupations using the method of magnitude estimation. Individual and aggregate power functions relating the median estimated values to the incomes of those pursuing the occupations were obtained. Similar power functions were obtained for male- and female-dominated occupations, for male and female respondents, and for respondents completing questionnaires with or without job descriptions. Female-dominated occupations were both worse paid and perceived as lower in value than male-dominated occupations; but the same relationship between perceived value and income described both types of occupation.

The aim of the present research was to investigate how New Zealand men and women perceived the value of different occupations, and to see if the same relationship between perceived value and remuneration held for occupations pursued predominantly by women as for occupations pursued mainly by men. This research is essentially applied, and related to the general issue of *comparable worth* (e.g. Greig, Orazem, & Mattila, 1989).

There has been great interest both internationally and in New Zealand in the issue of pay equity, as it has been frequently found that the average earnings of women are lower than those of men (e.g., Hyman, 1981). The pay disparity persists despite the fact that in New Zealand, as in many other countries, employers are required by law to pay women and men equally for doing the same jobs. However, men and women tend to pursue rather different occupations, with women, on average, being concentrated in those that are lower paid. Here arises the issue of comparable worth: Are women paid the same as men for doing work that is different but of comparable worth or value?

Obtaining answers to this question entails measuring the value of an occupation or of a particular position, and there is now a considerable literature on how this might be accomplished (e.g., Burns, 1989; Greig et al., 1989; Hutner, 1986). The problem is not trivial, because estimates of the value of a job may be biased either by the knowledge that a particular occupation is usually women's (or men's) work (e.g., Mahoney & Blake, 1987) or, and apparently a more potent source of bias in practice, by knowledge of existing pay rates (Mount & Ellis, 1987; Rynes, Weber & Milkovitch, 1989; Schwab & Grams, 1985).

Determining the value of an occupation is clearly difficult, and a number of different criteria have been suggested for doing this. Waluchow (1988) distinguishes market, dessert, and contribution criteria. Market criteria involve calculation of the ruling rate paid for a particular kind of job, usually by reference to other, apparently similar jobs; dessert criteria take into account the skill and training level an individual should have to perform the job properly; while contribution criteria assess the worth of a particular job to society or an employing organisation. Typically, the values of jobs are rated on a number of different dimensions, each reflecting one of these criteria. Overall values are finally obtained by weighting and averaging these ratings (e.g., Greig et al., 1989; Mahoney & Blake, 1987). A good reason for using multiple measures is to try to average out existing societal biases. It might be remarked, however, that there are conceptual

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as well as practical difficulties in obtaining measures uncontaminated by societal bias, since different societies and individuals do have different values with regard to occupations: Bookmaking, for example, is a respectable occupation in some countries but illegal in New Zealand.

The present research had a somewhat different aim and approach. The objective of the present study was to measure people's *perception of the value* contributed to society by someone pursuing the occupations rather than to try to obtain estimates of the *actual value* of the occupations. Ideally, perceived value and actual value are distinguishable. We would expect perceived value to incorporate existing societal attitudes into the valuation, and thus be an inaccurate and perhaps biased measure of actual value. On the other hand, perceived value should measure the present consensus of society and so be politically relevant.

The present study employed the method of magnitude estimation (Stevens, 1957, 1975) to measure the perceived value of the occupations. Although magnitude estimation is more typically used to assess sensory dimensions like the loudness of sound, it has been used to measure variables of social significance as well. For example, the prestige of occupations (Coleman & Rainwater, 1978; Hamblin, 1974) and the utility or value of government and privately supplied goods and services (Kemp, 1988; Kemp, 1991) have been determined in this way.

Frequently when the method of magnitude estimation is used to measure some subjective or psychological variable, Ψ, this variable is more or less closely related to a physical or more objectively measured variable, Φ. In such cases, Stevens' power law,

$$\Psi = k\Phi^{\beta}, \qquad (1)$$

where k is a constant and β an exponent, has often been found to hold. When both Ψ and Φ are logged and plotted against each other, the fitted straight line,

$$\log_{10}\Psi = \log_{10}k + \beta\log_{10}\Phi \qquad (2)$$

describes the relationship between Ψ and Φ. Of course, it is not expected that when logged perceived value (Ψ) is plotted against logged income (Φ) all the occupations will fall on this line. Indeed, variation of occupations from the line can be used to discover relatively over- and under-paid occupations: the former will appear below the line and the latter above it. These can then be inspected to see if they are predominantly male or female occupations. We can also see whether predominantly male and predominantly female occupations are described by the same power function: different functions would indicate gender bias one way or the other.

Method

Questionnaire

Two questionnaires were used, one with job descriptions, the other without. Each questionnaire consisted of a list of occupations preceded by instructions to estimate the value of the occupations to society. Respondents were instructed to disregard the income earned by occupation members, and to "rate the occupations according to how much you feel someone practising it contributes to society as a whole". They were told to value each occupation relative to the standard of a secondary school teacher who was designated as contributing 100 units of value. If an occupation was five times as valuable, it should be assigned 500 units of value, if half as valuable, it should receive 50 units, and so on. Fractions or decimals were permitted, and respondents were reminded there were no "correct answers."

The questionnaire without descriptions simply listed the occupations (See Table 1); that with descriptions included brief (3 to 10 lines) descriptions of what people practising the occupations did. These descriptions, which were adapted from those given by the New Zealand Standard Classification of Occupations Manual (Department of Statistics, 1976), made no reference to gender, occupational prestige or income derived from the occupations. As an example, the description for a restaurant manager read:

"Plans, coordinates and supervises activities of workers in dining-rooms, kitchen, bar and other areas; hires, instructs and discharges staff as necessary; purchases food and confers with chef to plan menus; organises and supervises arrangements for special functions; plans entertainers; adjusts complaints concerning food and service; keeps cost and other records."

In all, respondents rated the values of 58 occupations. Twenty-six of these were male-dominated: According to the 1986 NZ census, all had at least 72 percent male membership (Av. male membership = 91 percent). Twenty-six were female-dominated, each featuring at least 62 percent female membership (Av. female membership = 86 percent). Six were neutral, with female memberships ranging

Table 1: *Occupations, percentage of male membership, median income, value predicted from the income according to the equation, and median estimated value and interquartile range of the estimated values. (Higher predicted than median estimated value indicates an occupation is underpaid, according to the criterion of perceived value.)*

Occupation	Percentage male	Median income	Predicted value	Median estimated value	Interquartile range
Hospital doctor	72	32,500	112	200	180
Judge	96	50,000	149	168	200
Police	94	27,500	100	160	200
School principal	80	32,500	112	128	100
Lawyer	85	37,500	123	110	120
Registered nurse	5	18,750	77	110	100
Dentist	96	37,500	123	110	73
Physiotherapist	24	18,750	77	100	70
University lecturer	80	37,500	123	100	50
Veterinary	85	32,500	112	100	73
Occupational therapist	9	16,250	70	100	65
Accountant	77	27,500	100	100	70
Builder	100	18,750	77	100	35
Prison officer	94	22,500	87	100	35
Primary school teacher	28	22,500	87	100	50
Traffic officer	92	22,500	87	100	110
Ambulance driver	95	22,500	87	100	115
Airline pilot	98	37,500	123	100	100
Kindergarten teacher	2	16,250	70	100	20
Social worker	51	18,750	77	100	75
Member of parliament	85	50,000	149	100	134
Secondary school teacher	55	27,500	100	100	0 (Standard)
Fireperson	100	27,500	100	100	120
Electrician	99	18,750	100	90	30
School dental nurse	0	22,500	77	85	30
Plumber	99	18,750	77	80	50
Motor vehicle mechanic	99	16,250	70	80	30
Librarian	15	18,750	77	80	50
Carpenter	99	16,250	70	80	40
Administration officer	48	22,500	87	80	50
Hospital/nurse aid	8	11,250	54	80	50
Drainlayer	100	16,250	70	78	40
Hospital orderly	91	13,750	62	70	50
Cook	28	11,250	54	70	39
Hostel manager	38	13,750	62	63	15
Bus driver	86	16,250	70	60	50
Restaurant manager	52	16,250	70	60	35
Accounts clerk	19	16,250	70	60	30
Data-processing operator	15	16,250	70	60	40
Veterinary assistant	0	11,000	53	60	48
Secretary–typist	2	16,250	70	60	33
Bank teller	16	11,250	54	60	33
Aircraft steward(ess)	35	22,500	87	55	45
Painter	97	13,750	62	50	38
Waiter/waitress	11	8,750	46	50	37
Telephone operator	9	16,250	70	50	40
Kitchenhand	20	11,250	54	50	35
Hairdresser	18	11,250	54	50	40
General clerk	22	13,750	62	50	35
General typist	1	16,250	70	50	35
Mail sorting clerk	49	16,250	70	50	40
Receptionist	1	13,750	62	50	46
Milk vendor	91	18,750	77	50	35
Shop assistant	27	11,250	54	50	40
Sewing machinist	2	8,750	46	50	45
Hotel porter	82	11,250	54	40	30
Florist	11	8,750	46	40	30
Bartender	51	13,750	62	40	35

from 45 to 52 percent (Av. female membership = 49 percent). The principal criteria for choosing the actual 58 occupations were availability of income data and whether respondents knew what the occupations were. (This knowledge was checked on a small pilot sample.) The actual occupations used and the proportions of males are shown in Table 1.

The only useful source of income data in NZ for a wide variety of occupations comes from the Department of Statistics (1986). These data, median values of which are shown in Table 1, are not salaries or wages of different occupations, but rather income derived from all sources for people working 30 hours or more in particular occupations. The income data were not made available to the respondents.

Finally, respondents were asked their age, sex, and occupation.

Respondents and Procedure

Respondents were obtained from 13 randomly chosen streets in Christchurch. Dwellings on the streets were successively visited until either 16 people, who had to be 15 years of age or older, agreed to complete a questionnaire or the street came to an end; half the people in each street were given questionnaires with descriptions, half questionnaires without descriptions. Questionnaires were subsequently collected or posted to the researchers. In all, 160 questionnaires (86 percent of those distributed) were returned; 79 of these were the questionnaire with descriptions. The survey was carried out in the winter of 1990.

The final sample of 160 respondents contained 83 males. Twenty-eight respondents were aged between 15 and 25, 32 between 26 and 35, 35 between 36 and 45, 23 between 46 and 55, 17 between 56 and 65, and 23 were 66 years old or more. Socioeconomic status (Elley & Irving, 1985) was calculable for 109 respondents: 21 respondents fell into group 1, 22 into group 2, 26 into group 3, 21 into group 4, 11 into group 5, and 8 into group 6. Overall, the sample was reasonably representative, although with slight underrepresentation of lower SES groups.

Results

The correlation (Pearson product-moment) between median values of male and female respondents was .91 ($p < .001$); median values of those completing the two forms of questionnaire correlated .94 ($p < .001$).

Male-dominated occupations were on average better paid than female-dominated occupations. Those pursuing male-dominated occupations had significantly higher median incomes, $t(50) = 4.92$, $p < .001$, averaged over the 26 male-dominated occupations, of $26,009, than those pursuing female-dominated occupations (Mdn = $14,750). The median values assigned by the respondents to each occupation were calculated. The average of these median values for the male-dominated occupations of 98.2 was significantly higher, $t(50) = 3.90$, $p < .001$, than the average median value of 66.6 for the female-dominated occupations. Clearly, those pursuing male-dominated occupations had higher median incomes and were perceived to be doing work of higher median value than those pursuing female-dominated occupations. The chief question addressed by the remainder of the data analysis is whether the relationship between value and income is different for the two categories of occupation, and thus whether, on average, work of comparable perceived worth is paid the same for female as for male dominated occupations.

In order to check that Stevens' power function was a reasonable description of the aggregate data, the median estimated value for all respondents, regardless of which questionnaire they completed, was calculated for each occupation separately. These median values and their associated interquartile ranges are shown in Table 1. When the median values were regressed linearly on the median income for that occupation, income was found to account for 52.2 percent of the variance in value. When the logarithm of median value was regressed on the logarithm of median income, the latter accounted for 59.5 percent of the variance in logged value. The higher variance accounted for with the logged values indicates that the power function is a better description of the relationship between value and income than a straight line, and so this function was used in the remainder of the analyses. The actual equation obtained was $\text{Log}_{10}(\text{Value}) = .679\ \text{Log}_{10}(\text{Income}) - 1.016$. In this equation the slope of the line corresponds to the exponent of the power function, while the constant is the logarithm of k. (See Equations 1 and 2.)

Figure 1 shows the results of plotting median value taken over all respondents and both questionnaires against income. Since median income is not a perfect predictor of an occupation's perceived value, there is considerable spread of data around the regression line. If the point representing a particular occupation lies above the line then the occupation has higher than average value for its income and can be regarded as relatively underpaid, according to the criterion of perceived value. Similarly, if it lies under the line it can be regarded as relatively overpaid. Following this criterion, 13 male, 14 female and 1 neutral occupations are underpaid. Table 1 shows the actual and predicted values for individual occupations and can be used to identify which occupations are relatively over- and under-paid.

Multiple regression was also used to test how much of the difference in the values ascribed to male- and female-dominated occupations could be attributed to differences in income and how much to differences in the proportion of female workers

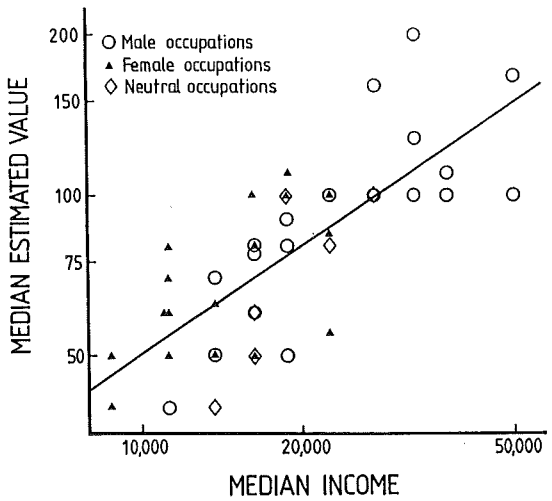

Fig. 1. The perceived value of predominantly male, female and neutral occupations as a function of median income. The line of best fit

$$\text{Log}_{10}(\text{Value}) = .679 \log_{10}(\text{Income}) - 1.016$$

for the logarithmically scaled variables is shown. (Note: In some cases, the same point represents more than one occupation.)

in the occupation. Accordingly, logged median values were regressed on logged income and proportion of female incumbents. This analysis found a significant ($p < .01$) beta coefficient of .68 for logged income but an insignificant ($p > .5$) one of –.00003 for proportion of female workers. (A very similar result was obtained when the proportion of female workers was also logged.)

Both the result of the multiple regression analysis and the fact that similar numbers of male and female occupations are relatively underpaid suggest that whether an occupation is male or female dominated has little effect on the relationship between perceived value and income. However, these analyses are based on aggregate data, and, moreover, have ignored the important variables of respondent sex and whether or not job descriptions were available. Hence, individual power functions were determined and used for further statistical analysis.

Briefly, two regressions of logged value on logged income, one for male- and one for female-dominated occupations, were carried out on the data from each respondent. So, for each respondent and occupation dominance, three parameters were obtained: the slope of the regression line (which is the same as the exponent of the power function), the constant of the regression line, and the variance in individual value accounted for by income (r^2). Inspection of the frequency distributions of these three parameters revealed no marked departures from normality, and so analysis of variance, with one within-subjects factor (dominant sex of occupation) and two between-subjects factors (respondent's sex; questionnaire type) was then carried out on each of the three parameters separately. The results were as follows:

Slope. There were no significant effects on slope of the respondent's sex, $F(1,154) = 2.30$, ns., questionnaire type, $F < 1$, or dominant sex of occupation, $F < 1$. Nor were there any significant interaction effects of any of these variables (resp. sex X quest., $F < 1$; resp sex X domin. sex, $F < 1$; quest. X domin. sex, $F < 1$; three-way, $F(1,154) = 1.58$, ns.).

Constant. Similarly, there were no significant effects on the regression constant of the respondent's sex, $F(1,154) = 1.61$, ns., questionnaire type, $F < 1$, or dominant sex of occupation, $F < 1$. There were no significant interactions (resp. sex X quest., $F < 1$; resp. sex X domin. sex, $F < 1$; quest. X domin. sex, $F < 1$; three-way, $F < 1$).

R^2. There was no significant effect of the respondent's sex on r^2, $F(1,154) = 1.80$, ns. However, there was a significant effect of the dominant sex of the occupation, $F(1,154) = 80.02$, $p < .01$, with the proportion of variance in value accounted for by income in male-dominant occupations being larger ($r^2 = .37$) than in female-dominated occupations ($r^2 = .22$). There was also a significant effect of the form of the questionnaire, $F(1,154) = 4.99$, $p < .05$, with questionnaires containing descriptions having a smaller average individual r^2 (.27) than those without descriptions ($r^2 = .32$). There were no significant interactions between any of the independent variables (resp. sex X quest., $F < 1$; resp. sex X domin. sex, $F(1,154) = 1.23$, ns.; domin. sex X quest., $F(1,154) = 2.74$, ns.; three-way, $F < 1$).

Discussion

Overall, the major results of the study can be summarised as follows: Female-dominated occupations were perceived as less valuable, on average, than male-dominated ones, and people pursuing them were less well paid. When aggregated data were examined, approximately equal proportions of male- and female-dominated occupations were found to be underpaid according to the criterion of perceived value. A multiple regression analysis on this data also found no effect of occupation dominance. When data from individuals were analysed, there were no significant effects of occupational dominance on either the slopes or the constants of individually fitted power functions. Thus the same function described both types of occupation. In summary, the analyses of both aggregated and individual data indicated that the same relationship between perceived value and income held for female-

as well as male-dominated occupations, leading to the conclusion that, according to the criterion of perceived value to society, the gender dominance of occupations does not affect whether they are fairly paid.

The respondent's gender and whether people were given brief job descriptions had little influence on this result. There was no evidence, for example, that males systematically undervalued women's work, or that people receiving job descriptions were led to reassess the relative value of male- and female-dominated occupations.

The strength of the relationship between received value and income (r^2 analyses above) was found to be influenced by occupational dominance and by the type of questionnaire completed. The perceived value of male occupations was more closely related to income than was the case for female occupations, possibly because the female-dominated occupations featured a smaller range of incomes. It also appears that respondents given job descriptions may have been less influenced by the income associated with an occupation and perhaps more influenced by some aspect of the job description than those who were not given the descriptions.

The results of the study do not show that incomes are invariably in line with perceived values. According to our criteria, members of parliament and aircraft stewards and stewardesses, for example, are overpaid, nurses and the police underpaid, and, as Figure 1 shows, although perceived value and income are moderately strongly related, the correlation is not perfect. However, the important point for this study is that these breaches of the principle of equal pay for work of equal perceived value were not gender related.

Two matters concerning the interpretation of the results merit further attention. The first of these concerns a methodological limitation of the study. Tables (Department of Statistics, 1986) were used in which total income from all sources is broken down by occupation for all people in full-time work, defined as more than 30 hours per week. Clearly, using these data as surrogates for remuneration data, as we have effectively done here, raises the issue of whether gender related biases might have been introduced. One problem concerns the use of income from all sources, including rents, dividends, etc, rather than simply wage and salary information; the obvious implication is that remuneration will then be overestimated by income but it is not clear that a gender bias should be introduced. Also, income is coded in the tables in categories that become progressively broader until a $50,000 and over category is reached. The obvious effect is to underestimate high, and presumably in the main male, incomes. Finally, defining full-time work as 30 hours or more may mean that the remuneration per hour worked is underestimated for those, probably women in the main, who work 30 to 40 hours per week. To reduce the impact of these three sources of bias, median rather than average income was used in the present study. Nevertheless, it is regrettable that accurate wage and salary data are not available for a wide range of occupations in New Zealand, and, as has been pointed out previously (Hyman & Clark, 1987), its lack is a serious limitation on all present New Zealand research into comparable worth.

The second issue is conceptual rather than methodological. What wider inferences can be drawn from the present results? The results are compatible with the hypothesis that there is no gender bias in the way different occupations are remunerated in New Zealand, but they are also compatible with other hypotheses. For example, it could be that both male and female New Zealanders systematically undervalue work usually done by women and that this undervaluing is reflected both in the way this work is remunerated and in the perceived values obtained from our respondents. Thus, since we have measured perceived rather than actual value, it would be quite wrong to conclude on the basis of these results that there is no gender bias in the present remuneration structure.

On the other hand, what has been shown is that, subject to sample limitations and some qualification because of the income measure, gender does not influence the relationship between the perceived value of an occupation and income. Furthermore, whatever the reality of gender bias in remuneration for different occupations, differences in remuneration between male and female dominated occupations seem to reflect, or be reflected in, the differences in occupational worth that New Zealanders presently perceive.

A corollary of this conclusion is that attempts to reduce the present pay disparity by

increasing the remuneration of female-dominated occupations relative to male-dominated ones may well be perceived as unjust, because this would entail paying male- and female-dominated occupations of presently equal perceived value differently.

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