

4. The Projection of Corporation Income Tax

In order to project corporation income tax, a number of methods could be useful depending on the adequacy of existing data. The general approach was to project the total number of taxable corporation returns and then to subdivide the number into their corresponding tax brackets, and finally to multiply this number of returns by the mean net taxable income for the corresponding bracket in order to arrive at the total net taxable income of the particular bracket.

Good bases for making Low, Middle and High estimates of total net taxable income should require (i) a good estimate of the bracket means, giving their fiducial limits, and (ii) a good estimate of the number of corporation in each particular bracket for a given year ahead. For (i), we have taken fiducial limits corresponding to 95% confidence probability. In (ii), we can make two assumptions: first, to consider the projected number of corporations in each bracket as fairly stable along its line of growth indicated by the trend regression equation and second, to consider the variability of this number as it moves through time.

5. The Bracket Means and their Fiducial Limits

Denote

X_i = Net taxable income of a corporation in the i th bracket

$[i = 1 (0-\text{P}50,000), \dots, 4(\text{above P}250,000)]$

R_{it} = Number of taxable returns in the i th bracket in year t

λ_i = Lowest value of net income in the i th bracket

γ_i = median of the values in the i th bracket

The transformation

$$y_i = \log_e \left(\frac{x_i - \lambda_i}{\gamma_i - \lambda_i} \right)$$

has a distribution following approximately that of the normal. The observation was based on plotting the cumulative "less than" percentage distribution of the y_i 's on normal probability paper.

Theory says that if y_i is normally distributed with mean μ_i and variance σ_i^2 , the quantity $(x_i - \lambda_i)/(\gamma_i - \lambda_i)$ follows a lognormal distribution with mean α_i and variance β_i^2 given respectively by

$$(1) \quad \begin{aligned} \alpha_i &= e^{\mu_i + 1/2 \sigma_i^2} \\ \beta_i^2 &= \alpha_i^2 (e^{\sigma_i^2} - 1) \end{aligned}$$

Denote by a_i and b_i^2 the maximum likelihood estimations of α_i and β_i^2 , respectively.

A 95% confidence interval for α_i may be constructed: thus,

$$(2) \quad a_i - \frac{1.96 b_i}{\sqrt{n_i}} \leq \alpha_i \leq a_i + \frac{1.96 b_i}{\sqrt{n_i}}$$

For fixed λ_i and γ_i , the expected value of the net taxable income of a corporation in the i th bracket is then given by

$$E(x_i) = (\gamma_i - \lambda_i) \alpha_i + \lambda_i.$$

A corporation in the first bracket with marginal tax rate r_1 would have a tax assessment with an expected value of

$$E(r_1 x_1) = [(\gamma_1 - \lambda_1) \alpha_1 + \lambda_1] r_1.$$

By replacing α_1 by a_1 , the right member of the equation above gives us the Middle estimate of the tax assessment for a corporation in the first bracket. Low and High estimates may be obtained by utilizing the fiducial limits of the 95% confidence interval in (2) for $i = 1$. That is,

$$L.E. = [(\gamma_1 - \lambda_1)(a_1 - 1.96 \frac{b_1}{\sqrt{n_1}}) + \lambda_1]r_1,$$

$$H.E. = [(\gamma_1 - \lambda_1)(a_2 + 1.96 \frac{b_1}{\sqrt{n_1}}) + \lambda_1]r_2.$$

If r_2 is the marginal rate in the second bracket, the Middle estimate of mean tax assessment would be

$$(3) M.E. = (50,000)r_1 + [(\gamma_2 - \lambda_2)a_2 + \lambda_2 - 50,000]r_2$$

and the Low and High estimates are, respectively, obtained from the Middle estimate by replacing a_2 in (3) by $(a_2 - 1.96 \frac{b_2}{\sqrt{n_2}})$ and

$$(a_2 + 1.96 \frac{b_2}{\sqrt{n_2}}).$$

Middle estimates for the third and fourth brackets with marginal rates r_3 and r_4 are, respectively:

$$(4) M.E. = (r_1 + r_2)(50,000) + r_3[(\gamma_3 - \lambda_3)a_3 + \lambda_3 - 100,000]$$

$$(5) M.E. = (r_1 + r_2)(50,000) + r_3(150,000) + r_4[(\gamma_4 - \lambda_4)a_4 + \lambda_4 - 250,000].$$

Low and High estimates in each case are obtained by replacing a_3 in (4) by $(a_3 - 1.96 \frac{b_3}{\sqrt{n_3}})$ and $(a_3 + 1.96 \frac{b_3}{\sqrt{n_3}})$ and a_4 in (5) by $(a_4 - 1.96 \frac{b_4}{\sqrt{n_4}})$ and $(a_4 + 1.96 \frac{b_4}{\sqrt{n_4}})$.

Table 1.3 shows estimates of mean tax assessment on a corporation in various brackets for $r_1 = r_2 = .22$ and $r_3 = r_4 = .30$.

Table 1.3 Estimates of Mean Tax Assessment on a Corporation by Brackets

<u>Bracket</u>	<u>Low</u>	<u>Middle</u>	<u>High</u>
0- P 50,000	3,019	3,121	3,223
P 50,001- P 100,000	16,490	16,944	17,397
P 100,001- P 250,000	41,082	42,850	44,618
Above P 250,000	414,659	445,922	447,185

As might be expected, gaps in the estimates are larger for higher taxable brackets with the last bracket experiencing the largest gaps between estimates. Whereas, the lowest taxable bracket has a gap between estimates of about P 100, the highest taxable bracket has over P 31,000 gap between estimates.

6. The projected number of corporations

Denote by R_t the number of taxable corporations in year t , with 1954 as $t=1$. R_t has grown throughout the 8-year period in somewhat a steady manner:

t :	1	2	3	4	5	6	7	8
R_t :	2359	2429	2733	2784	3014	3477	3586	3889.

The least squares linear fit turned out an equation given by

$$(6) \quad \log_{10} R_t = 3.3301 + .0323t$$

Assuming the percentage distribution to follow the pattern of 1962 and considering the statistical tests made in section 3, equation

(6) was used to project the number of taxable corporation returns for 1964 (t=11) and 1965 (t=12), and then the projected number apportioned to the brackets according to the 1962 percentage distribution which was 67:11:10:12. The table below gives the number in each bracket

Table 1.4 Projected Number of Taxable Corporations by Net Taxable Brackets

	1964 (t=11)	1965 (t=12)
0- P 50,000	3,247	3,498
P 50,001- P 100,000	533	574
P 100,001- P 250,000	485	522
More than P 250,000	<u>581</u>	<u>626</u>
Total Number, R_t :	4,846	5,220

7. Tax Assessment Estimates

The total tax assessment, by taxable bracket and by projected year, can now be directly computed from Tables 1.3 and 1.4 of the previous sections. The products of numbers in each column of Table 1.3 by the corresponding numbers in each column of Table 1.4 give the total amount of tax assessment by bracket.

Table 1.5 Projected Corporation Tax Assessments by Taxable Brackets: 1964 and 1965
(In million pesos)

	1 9 6 4			⋮	1 9 6 5		
	L	M	H	:	L	M	H
0- 50,000	9.80	10.13	10.47		10.56	10.92	11.27
50,001-100,000	8.79	9.03	9.27		9.47	9.73	9.99
100,001-250,000	19.92	20.78	21.64		21.44	22.37	23.29
Above 250,000	240.92	259.08	277.24		259.58	279.15	298.72
Total	279.43	299.02	318.62		301.05	322.17	343.27

Part III. ESTIMATING INDIVIDUAL INCOME TAX

This part of the paper deals with the estimation of revenue from the individual income tax (i) under no change in the tax system, (ii) under certain structural changes in tax rates and bracket sizes, and (iii) under given increases in personal exemptions.

2.1 The Data on Individual Income Tax^{1/}

Although at the time of study (1963) information on the total number of taxable individual returns was available, the latest information (on gross income, net taxable income and tax assessments) that were directly useful were for 1960. It was decided then to utilize the 1960 data available for all taxable returns filed in Manila.^{1/} There were a total of 103,137 taxable income tax returns filed by residents of the Philippines^{2/} (Table 2.1). Of this total, a list of only 33,739 from the Manila Office at Canonigo Street had information on gross income, net income and tax assessment (Table 2.2).

The sub-sample from the Manila list

In order to study further the characteristics of the 1960 taxable returns for the entire Philippines, it was assumed that the Manila list was (hopefully) a representative sample.^{3/}

^{1/} These data were available from the BIR Manila Office on Canonigo Street.

^{2/} These exclude some two hundred non-resident aliens.

^{3/} The coverage of each office is as follows:

Manila Office - City of Manila

Cubao Office - Quezon City, Pasay City, Caloocan City, Cavite, Rizal and Bulacan

Central Office - All other chartered cities and provinces not included elsewhere.

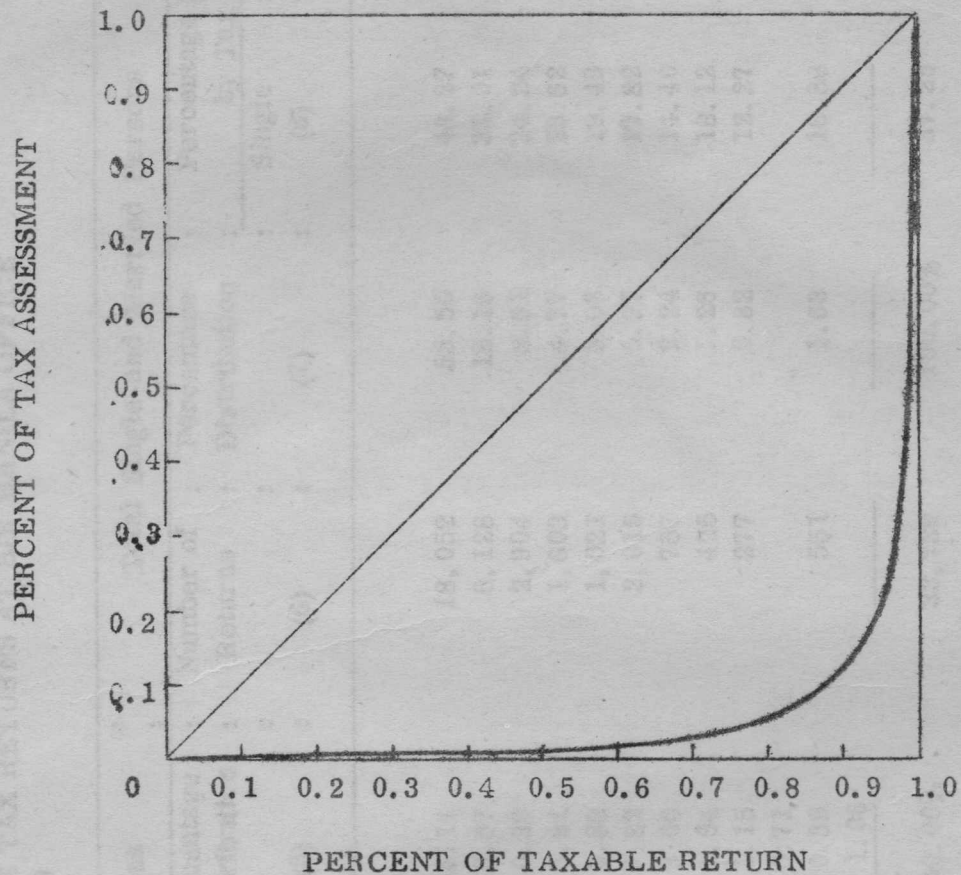
Table 2.1 GROSS INCOME, NET TAXABLE INCOME, AND TAX
ASSESSED ON INDIVIDUALS IN THE PHILIPPINES, 1960

Tax Bracket (Pesos) (1)	Taxable Number of Returns ^{1/} (2)	Gross Income (Thousand Pesos) (3)	Net Taxable Income (Thousand Pesos) (4)	Tax Assessed (Thousand Pesos) (5)
Under 2,001	65,578 (.6360) ^{2/}	379,671 (.2450) ^{2/}	45,706	1,407 (.01830) ^{2/}
2,001- 4,000	15,905 (.7900)	230,381 (.3935)	47,227	1,906 (.0430)
4,001- 6,000	7,112 (.8599)	146,829 (.4883)	40,119	2,333 (.0733)
6,001- 8,000	3,883 (.8975)	111,308 (.5600)	28,983	2,310 (.1033)
8,001- 10,000	2,465 (.9214)	89,019 (.6174)	23,908	2,515 (.1359)
10,001- 20,000	4,482 (.9649)	204,495 (.6806)	62,722	9,140 (.2544)
20,001- 30,000	1,618 (.9805)	109,388 (.7011)	40,101	7,955 (.3576)
30,001- 40,000	749 (.9878)	68,589 (.7459)	25,890	5,602 (.4303)
40,001- 50,000	440 (.9921)	49,200 (.7775)	20,543	5,614 (.5031)
50,001- 60,000	272)	33,078)	14,922	4,386)
60,001- 70,000	145)	17,806)	9,681	3,086)
70,001- 80,000	95)	12,403)	7,316	2,464)
80,001- 90,000	66)	11,069)	5,620	1,956)
90,001-100,000	63)	10,023)	5,925	2,150)
100,001-120,000	80) (1.000)	16,260) (1.000)	8,757	3,361) (1.000)
120,001-140,000	51)	11,254)	6,536	2,643)
140,001-160,000	27)	5,247)	4,075	1,721)
160,001-200,000	38)	10,444)	6,779	3,002)
200,001-250,000	18)	6,293)	4,062	1,958)
250,001-300,000	13)	4,765)	3,844	1,886)
300,001-400,000	8)	3,333)	2,843	1,437)
400,001-500,000	7)	3,329)	3,199	1,673)
500,001-and over	12)	15,531	11,468	6,454)
Totals	103,137	1,549,715	430,226	76,959

Source: Joint Legislative-Executive Tax Commission.

^{1/} Excludes the returns of some 200 non-resident aliens.

^{2/} "Cumulative less than" per cent distribution. The number in parentheses () is the proportion of total value in the given tax bracket and those brackets above it.



About 64% (Table 2.1, column 2) of taxable returns contribute less than 2% (column 5) of total assessment. Approximately 90% of taxable returns are in the 8,000 bracket or less with assessment slightly over 10% of the total. Less than 1% of the taxable individuals carry half the total burden of individual tax assessment.

Per peso tax assessment from gross income appears to pamper too much the lowest and highest taxable brackets. The distribution (by bracket) of gross income per peso of assessment is as follows:

<u>0-2</u>	<u>2-4</u>	<u>4-6</u>	<u>6-8</u>	<u>8-10</u>	<u>10-20</u>	<u>20-40</u>	<u>40-50</u>	<u>50-60</u>	Above <u>60</u>
₱ 270	121	63	48	36	22	14	9	8	

Table 2.2

NUMBER OF TAXABLE INDIVIDUAL INCOME TAX RETURNS AT BIR MANILA OFFICE
1960

Single Persons		:	Married Persons		:	Total Single and Married Persons			
Number of	Percentage	:	Number of	Percentage	:	Number of	Percentage	:	Percentage Distribution
Returns	Distribution	:	Returns	Distribution	:	Returns	Distribution	:	by Tax Bracket
:	:	:	:	:	:	:	:	:	Single : Married
(2)	(3)	:	(4)	(5)	:	(6)	(7)	:	(8) : (9)
8,714	69.33		9,338	44.11		18,052	53.50		48.27 51.73
1,900	15.12		4,228	19.97		6,128	18.16		31.01 68.99
704	5.60		2,200	10.39		2,904	8.61		24.24 75.76
380	3.02		1,220	5.81		1,609	4.77		23.62 76.38
199	1.58		822	3.88		1,021	3.03		19.49 80.51
359	2.86		1,656	7.82		2,015	5.97		17.82 82.18
109	0.86		648	3.06		757	2.24		14.40 85.60
77	0.61		348	1.64		425	1.26		18.12 81.88
34	0.27		243	1.15		277	0.82		12.27 87.73
			151	0.71					
93	0.74		83	0.39		551	1.63		16.83 83.12
			224	1.06					
12,569	100.00%		21,170	100.00%		33,739	100.00%		37.25 62.75

A stratified simple random sample of about a thousand taxable returns was obtained from the Manila list using sampling fractions such that reasonable numbers of taxable returns, by single and married persons, were obtained for each income tax bracket. The sampling fractions which were pre-determined in order to have approximately sample sizes in the neighborhood of 20 or 30 are given in Table 2.3, columns (2) and (5).

Table 2.3A gives the number and per cent distribution of the smaller tax brackets (within the current, large bracket structure) for both single and married taxable individuals. The mean net taxable incomes for these sub-brackets are given in Table 2.7.

2.2 Estimating the total proportion of taxable married persons

Denote by p the total proportion of taxable married persons in 1960. Denote, further, brackets 0-2,000; ...; 40,001-50,000; and 50,000 above as brackets 1, 2, ..., 10. If the proportion (Table 2.2, column (9)) of taxable married persons in the Manila list in bracket h is an estimate \hat{p}_h of p_h in the 1960 list (Table 2.1), then p may be estimated by \hat{p} , where

$$(1) \quad \hat{p} = \sum_{h=1}^{10} \frac{N_h}{N} \hat{p}_h,$$

N_h being the taxable number of returns in the h th bracket (Table 1.1, column 2), and $N = 103,137$. The last bracket $N_{10} = 272 + 145 + \dots + 12 = 895$.

An estimate of variance of \hat{p}_h is $(N_h - n_h)\hat{p}_h(1 - \hat{p}_h)/N_h(n_h - 1)$, where n_h (Table 2.2, column (6)) is the total number of taxable returns in the Manila list for the h th bracket. Since

Table 2.3

**SAMPLING FRACTION AND SAMPLE SIZES OF TAXABLE INDIVIDUAL
INCOME TAX RETURNS FROM BIR MANILA OFFICE
1960**

Tax Brackets (Pesos) (1)	Returns of Single Persons:		Returns of Married Persons :		Total
	Sampling :	Sample	Sampling :	Sample	Sample
	Fraction :	Size	Fraction :	Size	Size
	(2)	(3)	(4)	(5)	(6)
0 - 2,000	1/93	94	1/157	163	257
2,001- 4,000	1/23	83	1/130	33	116
4,001- 6,000	1/18	39	1/80	27	66
6,001- 8,000	1/11	34	1/59	21	55
8,001-10,000	1/8	24	1/44	18	42
10,001-20,000	1/19	19	1/80	20	39
20,001-30,000	1/6	19	1/30	22	41
30,001-40,000	1/2	13	1/15	24	37
40,001-50,000	1/2	17	1/9	28	45
50,001-60,000			1/5	30	
60,001-70,000	1	93	1/3	28	375
70,001 and over			1	224	
Totals		<u>435</u>		<u>638</u>	<u>1,073</u>

Table 2.3A

NUMBER (PER CENT DISTRIBUTION OF THE SMALLER TAX BRACKETS)
WITHIN THE CURRENT BRACKETS FROM A SAMPLE OF TAXABLE RETURNS
IN THE MANILA LIST, 1960

Current Brackets (P1,000)	Sub-brackets (P1,000)	Single	Married	Total
0 - 2		94 (1.0000)	163 (1.0000)	257 (1.0000)
	0 - 1	74 (.7772)	94 (.5767)	168 (.6537)
	1 - 2	20 (.2128)	69 (.4233)	89 (.3463)
2 - 4		83 (1.0000)	33 (1.0000)	116 (1.0000)
	2 - 3	51 (.6145)	21 (.6364)	72 (.6207)
	3 - 4	32 (.3855)	12 (.3636)	44 (.3793)
4 - 6		39 (1.0000)	27 (1.0000)	66 (1.0000)
	4 - 5	23 (.5897)	11 (.4074)	34 (.5152)
	5 - 6	16 (.4103)	16 (.5926)	32 (.4848)
6 - 8		34 (1.0000)	21 (1.0000)	55 (1.0000)
	6 - 7	20 (.5882)	11 (.5238)	31 (.5636)
	7 - 8	14 (.4118)	10 (.4762)	24 (.4364)
8 - 10		24 (1.0000)	18 (1.0000)	42 (1.0000)
	8 - 9	15 (.6250)	13 (.7222)	28 (.6667)
	9 - 10	9 (.3750)	5 (.2778)	14 (.3333)
10 - 20		19 (1.0000)	20 (1.0000)	39 (1.0000)
	10 - 12	6 (.3158)	9 (.4500)	15 (.3846)
	12 - 14	5 (.2632)	3 (.1500)	8 (.2051)
	14 - 16	5 (.2632)	3 (.1500)	8 (.2051)
	16 - 18	1 (.0525)	2 (.1000)	3 (.0769)
	18 - 20	2 (.1053)	3 (.1500)	5 (.1282)
20 - 30		19 (1.0000)	22 (1.0000)	41 (1.0000)
	20 - 22	2 (.1052)	7 (.3182)	9 (.2195)
	22 - 24	5 (.2633)	3 (.1364)	8 (.1951)
	24 - 26	6 (.3158)	3 (.1364)	9 (.2195)
	26 - 28	4 (.2105)	4 (.1818)	8 (.1951)
	28 - 30	2 (.1052)	5 (.2272)	7 (.1707)
30 - 40		13 (1.0000)	24 (1.0000)	37 (1.0000)
	30 - 32	2 (.1539)	8 (.3333)	10 (.2703)
	32 - 34	2 (.1539)	4 (.1667)	6 (.1622)
	34 - 36	4 (.3077)	6 (.2500)	10 (.2703)
	36 - 38	3 (.2307)	2 (.0833)	5 (.1350)
	38 - 40	2 (.1538)	4 (.1667)	6 (.1622)

(Table 2.3A Cont'd -p. 2)

Current Brackets (P1,000)	Sub-brackets (P1,000)	Single	Married	Total
40 - 50		<u>17 (1.0000)</u>	<u>28 (1.0000)</u>	<u>45 (1.0000)</u>
	40 - 42	1 (.0588)	8 (.2857)	9 (.2000)
	42 - 44	3 (.1765)	3 (.1072)	6 (.1333)
	44 - 46	4 (.2353)	8 (.2856)	12 (.2667)
	46 - 48	4 (.2353)	3 (.1072)	7 (.1556)
	48 - 50	5 (.2941)	6 (.2143)	11 (.2444)
50 - 60		<u>28 (1.0000)</u>	<u>30 (1.0000)</u>	<u>58 (1.0000)</u>
	50 - 52	8 (.2857)	8 (.2667)	16 (.2759)
	52 - 54	4 (.1429)	8 (.2667)	12 (.2069)
	54 - 56	8 (.2857)	1 (.0333)	9 (.2069)
	56 - 58	3 (.1071)	5 (.1666)	8 (.1379)
	58 - 60	5 (.1786)	8 (.2667)	13 (.2241)
60 - 70		<u>15 (1.0000)</u>	<u>28 (1.0000)</u>	<u>43 (1.0000)</u>
	60 - 62	3 (.2000)	8 (.2857)	11 (.2558)
	62 - 64	2 (.1333)	7 (.2500)	9 (.2093)
	64 - 66	1 (.0667)	5 (.1786)	6 (.1395)
	66 - 68	4 (.2667)	4 (.14285)	8 (.1860)
	68 - 70	5 (.3333)	4 (.14285)	9 (.2093)
70 - 80		<u>5 (1.0000)</u>	<u>58 (1.0000)</u>	<u>63 (1.0000)</u>
	70 - 75	4 (.8000)	28 (.4828)	32 (.5079)
	75 - 80	1 (.2000)	30 (.5172)	31 (.4921)
80 - 90		<u>7 (1.0000)</u>	<u>26 (1.0000)</u>	<u>33 (1.0000)</u>
	80 - 85	5 (.7143)	11 (.4231)	16 (.4848)
	85 - 90	2 (.2857)	15 (.5769)	17 (.5152)
90 -100		<u>6 (1.0000)</u>	<u>21 (1.0000)</u>	<u>27 (1.0000)</u>
	90 - 95	2 (.3333)	13 (.6190)	15 (.5556)
	95 -100	4 (.6667)	8 (.3810)	12 (.4444)
100-120		<u>8 (1.0000)</u>	<u>42 (1.0000)</u>	<u>50 (1.0000)</u>
	100-105	4 (.5000)	13 (.3095)	17 (.3400)
	105-110	2 (.2500)	11 (.2619)	13 (.2600)
	110-120	2 (.2500)	18 (.4286)	20 (.4000)
120-140		<u>11 (1.0000)</u>	<u>19 (1.0000)</u>	<u>30 (1.0000)</u>
	120-130	4 (.3636)	15 (.7895)	19 (.6333)
	130-140	7 (.6364)	4 (.2105)	11 (.3667)

(Table 2.3A Cont'd - p. 3)

Current Brackets (P1,000)	Sub-brackets (P1,000)	Single	Married	Total
140-160		<u>5 (1.0000)</u>	<u>7 (1.0000)</u>	<u>12 (1.0000)</u>
	140-145	2 (.4000)	5 (.7144)	7 (.5833)
	145-150	2 (.4000)	1 (.1428)	3 (.2500)
	150-155	1 (.2000)	1 (.1428)	2 (.1667)
	155-160	0 (0)	0 (0)	0 ()
160-200		<u>3 (1.0000)</u>	<u>18 (1.0000)</u>	<u>21 (1.0000)</u>
	160-165	0 (0)	3 (.1667)	3 (.1428)
	165-170	0 (0)	3 (.1667)	3 (.1428)
	170-175	1 (.3333)	2 (.1111)	3 (.1428)
	175-180	0 (0)	4 (.2223)	4 (.1906)
	180-185	0 (0)	1 (.0555)	1 (.0476)
	185-190	1 (.3333)	1 (.0555)	2 (.0953)
	190-195	0 (0)	2 (.1111)	2 (.0953)
	195-200	1 (.3333)	2 (.1111)	3 (.1428)
200-250		<u>1 (1.0000)</u>	<u>11 (1.0000)</u>	<u>12 (1.0000)</u>
	200-210	0 (0)	3 (.2727)	3 (.2500)
	210-220	0 (0)	1 (.0909)	1 (.0833)
	220-230	0 (0)	1 (.0909)	1 (.0833)
	230-240	0 (0)	3 (.2727)	3 (.2500)
	240-250	1 (1)	3 (.2727)	4 (.3333)
250-300		<u>2 (1.0000)</u>	<u>9 (1.0000)</u>	<u>11 (1.0000)</u>
	250-260	0 (0)	4 (.4445)	4 (.3636)
	260-270	1 (.5000)	0 (0)	1 (.0909)
	270-280	1 (.5000)	2 (.2222)	3 (.2727)
	280-290	0 (0)	2 (.2222)	2 (.1818)
	290-300	0 (0)	1 (.1111)	1 (.0909)
300-400		<u>2 (1.0000)</u>	<u>3 (1.0000)</u>	<u>5 (1.0000)</u>
	300-350	2 (1.0000)	2 (.6667)	4 (.8000)
	350-400	0 (0)	1 (.3333)	1 (.2000)
400-500		<u>0 -</u>	<u>3 (1.0000)</u>	<u>3 (1.0000)</u>
	400-450	0 -	2 (.6667)	2 (.6667)
	450-500	0 -	1 (.3333)	1 (.6667)
500 and over		-	7 (1.0000)	7 (1.0000)