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The *eJournal of Tax Research* is a refereed journal that publishes original, scholarly works on all aspects of taxation. It aims to promote timely dissemination of research and public discussion of tax-related issues, from both theoretical and practical perspectives. It provides a channel for academics, researchers, practitioners, administrators, judges and policy makers to enhance their understanding and knowledge of taxation. The journal emphasises the interdisciplinary nature of taxation.

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Tax experiments in the real world

Lisa Marriott[*], John Randal[#] and Kevin Holmes[+]

Abstract

This article reports on the findings of a tax experiment conducted online with 2,600 individuals comprising a representative sample of the New Zealand population. We find that, in agreement with previous research, compliance increases with age. We find the population sample is significantly more compliant than previous experiments using student subjects. In contrast to prior experiments, we find no significant response to audit probability and no significant differences in behaviour among males and females. We find our experimental results produce compliance outcomes that are similar to those found in practice. Overall, the results suggest that caution should be exercised in the interpretation of experimental results from student subjects.

Keywords: tax experiments, student subjects

1. INTRODUCTION

The potential contribution to be gained from tax experiments is well established. The experimental environment facilitates control over variables and non-compliant behaviour is readily apparent. Actual levels of tax evasion, through non-declared income or over-declared expenses, cannot be accurately gauged through taxpayer filed data, while they are immediately evident in an experimental environment. Nonetheless, several criticisms have been attached to experimental research on tax evasion. Perhaps the primary criticism is that experimental research frequently utilises student subjects.[1]

As is typical of experimental research in tax, the objective of this research is to examine behavioural responses to hypothetical tax situations. Thus, the research uses an experimental design to elicit preferences in taxpaying behaviour in response to selected variables. However, this research departs from previous experiments in a number of ways. First, it uses 'real world' taxpayers in an online experiment. The authors have previously used a student sample using a similar experimental design in a lecture theatre environment (Marriott, Randal and Holmes, 2010). This research follows a similar method, but in an online setting. Second, a large sample of 2,600 subjects is used. Previously, experimental designs have been limited by access to participants. The online environment utilised in this research design has facilitated access to a large sample. Third, and again due to the research design utilised, a

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[1] For a comprehensive discussion on laboratory experiments, see Levitt and List (2007).

representative sample of the New Zealand population is presented. This departs from previous experiments that have not used students, as these typically use organisational samples, which limits the external validity of the research findings.

The primary objective of this article is to report the findings of the online experiment. However, the article also compares the results from the online experiment with previous data collected using a student sample. As with prior research, we find that age has a positive relationship with compliant behaviour. However, we do not find any significant relationships with the 'traditional' variables of tax rate, audit probability, audit penalty or gender when the experiment subjects are a sample of the population. In addition, we find compliance levels in the online experimental environment are more aligned with those found in practice, suggesting that the experiment design and the population sample used may provide greater generalizability to the taxpaying population.

The paper commences with a discussion of the current state of the literature on tax experiments. We briefly outline prior research findings on the primary variables tested in this experiment in section two. This is followed by an overview of the research design and demographic characteristics of the sample in section three. The findings are outlined in section four, with conclusions drawn in the final section.

2. WHERE ARE WE NOW WITH TAX EXPERIMENTS?

There is no shortage of research on tax evasion behaviour. A number of common variables are frequently investigated to test their impact on tax payment behaviour. Specifically, individual characteristics such as age, gender, amount and source of income, and education are frequently considered. Also of interest are tax variables: the likelihood of audit, penalties in the event of detected non-compliance and tax rates are all frequently investigated for their explanatory potential for tax behaviour. Each of these variables is tested in our experiment. Thus, a brief outline of the current literature pertaining to these variables is provided in this section. Individual characteristics are discussed first, with tax variables subsequently outlined.

2.1 Age and Gender

There are few variables that research tends to agree influence tax behaviour. Two exceptions to this are age and gender. A number of researchers have found a correlation between younger taxpayers and tax evasion (e.g. Vogel, 1974; Mason and Calvin, 1978; Warneryd and Walerud, 1982; Clotfelter, 1983). In addition, researchers have typically found greater tax evasion by male taxpayers (e.g. Vogel, 1974; Mason and Calvin, 1978; McIntosh and Veal, 2001; Birch, Peters and Sawyer, 2003). The correlation between females and tax compliance also extends to more general ethical decision making, where a number of researchers find higher levels of ethical behaviour among females (e.g. Burton, Johnston and Wilson, 1991; Barnett and Brown, 1994; Shaub, 1994; Borkowski and Ugras, 1998).

One of the limitations of much experimental research that uses students as a proxy for the population is that students represent a younger cohort. Moreover, often their experience as a taxpayer is minimal and it is possible they have no experience of paying income tax. This research avoids this limitation with the use of a population based sample.

2.2 Amount and Source of Income

Literature on the impact of income source and level of income is relatively scarce. However, in general, research concurs that there is a positive relationship between opportunity to engage in tax evasion and actually doing so (e.g. Mason and Calvin, 1978; Warneryd and Walerud, 1982; Weigel, Hessing and Elffers, 1987; Wallschutzky, 1988). Opportunity is more prevalent in certain forms of employment and, in particular, from individuals who are self-employed, or earn revenue that is not taxed at source. By way of example, Wallschutzky (1988) finds that taxpayers, such as the self-employed, that had greater opportunity to either increase deductions or reduce income declarations are more likely to evade their tax obligations. A similar study by Madeo, Schepanski and Uecker (1987) also finds that the source of income is important in explaining compliance. Research by Clotfelter (1983), which uses observations from individual tax return data to investigate tax payment behaviour finds that levels of after-tax income have a significant effect on under-reporting of income. Clotfelter also finds that wages, interest and dividend income was associated with high levels of compliance. Clotfelter suggests that this high level of compliance may be the result of a simple reporting structure for these forms of income, together with a perception of high probability of detection for non-compliant behaviour. However, limited opportunity for non-compliance may be a further contributing factor in this behaviour.

2.3 Education

There is limited literature on the relationship between education and tax evasion. However, the literature that does exist tends to produce contrasting findings. For example, Mason and Calvin (1978) find that individuals with higher levels of education believe that their chances of detection by audit are lower, but this does not translate into higher levels of tax evasion. Research by Birch, Peters and Sawyer (2003) uses a questionnaire survey to investigate New Zealanders' attitudes towards tax evasion. The survey is undertaken on university students. One of the key findings is the positive relationship between tax education and taxpayer compliance. In particular, participants from a tax course and those with a post-graduate degree were least likely to consider non-compliant behaviour as acceptable. However, the tax course participants were those most likely to have actually engaged in non-compliant behaviour in the five years immediately prior to the course. Conversely, experimental research carried out by Tan and Chin-Fatt (2003) also in the New Zealand environment finds that increased tax knowledge did not impact significantly on perceptions of fairness and tax compliance attitudes. However, it has been suggested that education, and in particular, tax education, is helpful for tax evasion in practice. By way of example, Vogel (1974) suggests that some familiarity with the tax system may facilitate evasion through awareness of opportunities to evade tax.

2.4 Audit Probability

There is no shortage of experiments, and other methodological approaches, investigating the impact of audits on tax behaviour. In general, most research finds that increased audits, or the perception of increased audits, act as a deterrent to tax evasion (e.g. Dubin and Wilde, 1988; Dubin, Graetz and Wilde, 1990; Sheffrin and Triest, 1992; Beron, Tauchen and Dryden Witte, 1992; Iyer, Reckers and Sanders,

2010; Kleven, Knudsen, Kreiner, Pedersen and Saez, 2010). Indeed, Mason and Calvin (1978) find that the independent variable with the strongest correlation to admitted tax evasion is the belief that the individual is unlikely to be detected by audit. Typically, experiments find that greater certainty of audit likelihood is positively correlated with tax compliance (Spicer and Thomas, 1982; Alm, Jackson and McKee, 1992; Alm and McKee, 2006; Alm, McClelland and Schulze, 2006).

Recent research by Gemmell and Ratto (2012) uses taxpayer data to investigate the impact of a random audit process on behaviour. Gemmell and Ratto use 8,300 United Kingdom tax returns to compare randomly selected taxpayers that were audited and not audited. Gemmell and Ratto's research analyses compliant and non-compliant taxpayers independently, finding that compliant taxpayers, once audited, reduce their subsequent compliance. In addition, the authors find that non-compliant taxpayers increase their compliant behaviour after audit.

An alternative methodological approach was used by Slemrod, Blumenthal and Christian (2001) who investigate real world taxpayers in an experiment. Slemrod, Blumenthal and Christian find that when sent letters indicating that an audit would be forthcoming, low- and middle-income taxpayers increased their subsequent tax payments. However, somewhat perversely, high-income earners decreased their tax payment. One suggestion offered for this unusual result, is the possibility that high-income taxpayers sought specialist tax advice in response to the letter, which then facilitated legal avenues of minimising tax payments. These research findings, using 'real' people and data that challenge the results from experimental tax research, provide support for the use of real world subjects in experimental research in order to provide greater insights into behaviour.

2.5 Penalties for Detected Tax Evasion

One of the most counter-intuitive findings from much of the research on tax evasion, is that evasion does not often appear to decline as penalties for evasion increase. Researchers frequently find little or no impact from increased fines or sanctions applied for tax evasion (e.g. Mason and Calvin, 1978; Weigel, Hessing and Elffers, 1987). Research by Devos (2002) in Australia illustrates this point. Penalties increased significantly over a 2 0-year period investigated: fines increased from A$5,000 to A$200,000 and the number of tax offences with potential terms of imprisonment also increased, allowing Devos to explore whether the levels of compliance with tax law in Australia were influenced by increased penalties. Devos (2002) finds that over the 20-year period investigated, there were not significant changes in taxpayer compliance. However, Devos does not attempt to control for increasing sophistication of audit processes at the tax authority, which may provide some explanation for this outcome.

One of the key contrasting findings is the experimental research of Friedland, Maital and Rutenberg (1978) that suggests that fines provide a greater deterrent than frequent audits. However, as this experiment was undertaken on a small group of students (15), the findings are not widely generalisable. More often recent research indicates that severity of penalty has little impact on tax compliance.

2.6 Tax Rates

Tax rates have frequently been investigated for any possible link to increased tax evasion. This is a further area where the research field is dominated by contrasting findings. A wide range of intuitively attractive ideas have been raised for why high tax rates may result in higher levels of tax evasion. These include general dissatisfaction with the tax system due to perceived unfairness, lack of 'benefits' from taxes paid, or beliefs that others are not paying tax: any of which may result in an attempt to seek 'relief' from taxes paid (Vogel, 1974; Mason and Calvin, 1978). Graetz and Wilde claim '*the myth that high marginal tax rates cause non-compliance is the most pervasive of all. In fact, that lowering tax rates will induce greater compliance is a claim supported neither by the theory of tax compliance nor by the empirical evidence'* (1985:355).

Sweden has been a common case study for investigation of the impact of tax rates on tax evasion. In part, this is motivated by Sweden's historically high tax rates. Research by Vogel (1974) using a sample of nearly 1,800 Swedish taxpayers found high levels of tax evasion, which were exacerbated by the high tax rates of the time.[2] The high tax rates created incentives to evade tax, which then had the corresponding result of tax increases to meet revenue requirements. Clotfelter (1983) uses data from the United States Internal Revenue Service and finds that tax rates have a significant impact on reporting behaviour. However, challenging Vogel (1974) and Clotfelter (1983), Wahlund (1993) finds that no changes to tax evasion were found during the period of tax reform, despite significant reductions in the marginal tax rate. This finding may be partially explained by the time period used for investigation: during this time the highest marginal tax rate reduced from 65 per cent to 50 per cent, thus it may not have reduced sufficiently to influence behaviour. Wahlund suggests that higher tax rates create an animosity towards taxes, which in turn generates greater acceptance of tax evasion.

3. EXPERIMENT OVERVIEW

The experimental design used in this study is loosely based on those of Friedland, Maital and Rutenberg, 1978), and Spicer and Becker (1980). However, a number of changes are made to the original experimental design. Perhaps most significant was that the experiment was run in an online environment. This approach was facilitated with the use of an independent research company with a database of individuals who were members of New Zealand's largest retail rewards programme. The research company was employed to email the experiment to individuals on their database. Individuals emailed were rewarded with 'points' for participation.[3] In addition, a charitable donation was made on behalf of participants. Participants were advised that the amount donated to charity would link to the 'net income' earned in the experiment. The primary advantage with using an independent research company to target their

[2] During the period of most of the Swedish-based research, marginal tax rates were high even for average income taxpayers. The average tax rate was 60 per cent in the late 1960s/early 1970s (Vogel, 1974).

[3] The contractual arrangements allowed for a specified number of responses. A total of 7,589 invitation emails were sent out, 2600 responses were received: a response rate of 34.2 per cent.

members is that it was possible to email a representative sample of the New Zealand population. We excluded those aged under 18 due to their limited experience with the tax system.

Upon receipt of the email, individuals were provided with a link to the experiment. Completion of the experiment provided individuals with a code that allowed collection of the reward points. The research commenced with a screen explaining that the research was undertaken by Victoria University of Wellington. Participants were advised that the research was investigating individual responses to hypothetical tax decisions, with the objective of investigating behavioural responses to certain elements of the tax system. Individuals were also advised that responses were anonymous. In order to move from the first screen, individuals had to choose a charity that they would be 'playing for' in the experiment. Individuals could choose from three charities: the Royal Forest and Bird Society; the New Zealand Red Cross; or the New Zealand Society for the Prevention of Cruelty to Animals (SPCA). Logos and mission statements for the charities were provided on the first screen, along with links to their respective websites.

Once the charity was selected, the research commenced. There were three primary components to the research. First, information was requested on age, gender, location of residence in New Zealand, ethnicity, qualifications, total annual income, industry of employment, and sources of income over the previous 12 months. Second, individuals were asked to answer 14 questions on the tax system. A 5-point Likert Scale was used for this purpose: strongly disagree, disagree, neither agree or disagree, agree, strongly agree. The questions asked are reproduced in Appendix A.

The third component of the research was an experiment, run over eight rounds. Prior to the experiment commencing, individuals were told that they would need to decide how much gross income they would declare. They were advised that they did not need to declare all of their income in each round, but there was a chance of being audited and incurring penalties if they did not. Moreover, they were advised that if they were audited, the previous round would also be investigated, and penalties applied for any non-payment of tax obligations in that round also. At this point individuals were advised that the amount donated to charity would be determined by the net income at the end of the tax experiment.

Tax rates and income in the experiment were allocated to individuals based on their earlier declaration of actual income. Those indicating a high income were allocated a high or medium income bracket in the experiment; those indicating a medium income were allocated high, medium, or low income in the experiment; and those indicating a low income, were allocated a medium or low income in the experiment. The high incomes were taxed at 45 per cent in the experiment, the medium incomes were taxed at 33 per cent and the low incomes were taxed at 20 per cent. Audit probabilities of 10, 20, 40 and 50 per cent were randomly allocated. Similarly, fines of 1.5, 3, 5 or 10 times the amount of evaded tax were randomly allocated.

Once participants clicked on a button, the experiment commenced and an income amount was provided. The individual would disclose how much income he or she would declare. Once this information was received, a screen would advise if that individual had been audited in that round. In the event of an audit, and non-declaration of income, penalties were applied. This information was displayed on the screen, so the participant could clearly see the financial implications of behaviour.

The experiment was repeated over eight rounds. Retrospective audits occurred when an individual was audited and income had not been declared. However, when an individual was audited twice consecutively, penalties for the previous round were not applied: that is, there was no 'double counting' for fines. On completion of the experiment, participants were advised if they were better or worse off due to their behaviour, together with the positive or negative value of their experimental outcome.

3.1 Demographic Information

The experiment produced 2,614 responses from locations throughout New Zealand. After excluding non-response answers, 2,556 responses were used for further analysis. Respondents were asked to provide eight different categories of demographic information: age, gender, ethnic group, educational qualification, total income, occupation, geographic location, and income sources during the past 12 months. The key characteristics of the experiment participants are outlined in Table 1, with the exception of occupation and geographic location. Responses were received from individuals located throughout New Zealand, and from 19 different industrial occupations as defined by the Statistics New Zealand census classification.

Table 1 indicates that we had slightly higher participation among females than males, with 54 per cent female participation. We received a wide range of age responses, with the largest numbers in the 31-40 age group (22 per cent) and the 51-60 age group (19 per cent). The data also shows that 12 per cent of respondents do not have any educational qualifications, while 28 per cent have an undergraduate degree and 16 per cent have a postgraduate qualification. The majority of the respondents (90 per cent) earned less than NZ$80,000, while 14 per cent earned less than NZ$20,000.

Overall, we received responses from people identifying with 28 different ethnicities. The primary ethnic groups are outlined in Table 1. Small numbers (that is, those with less than 10 responses) were received from a number of other ethnic groups, including those identifying as: Cook Island Māori, Tongan, Niuean, Fijian, Other Pacific Peoples, Filipino, Japanese, Korean, Sri Lankan, Polish, German, and Latin American.[4] The majority of respondents earned income from employment (69 per cent), with earnings from investment (30 per cent) also common. Those receiving income from their own business accounted for 21 per cent of respondents.

Table 1

Characteristics of Experiment Participants

Gender	%	Count	Total
Male	45.8	1170	2557
Female	54.2	1387	

[4] For the purposes of categorisation we have incorporated Cook Island Māori, Tongan, Niuean and Fijian ethnicities into the 'Other Pacific Peoples' group. Filipino, Japanese, Korean and Sri Lankan individuals are included in the 'Other Asian' group. Polish and Germany individuals are included in the 'Other European' group.

Age	**%**	**Count**	**Total**
18	0.4	10	2556
19-25	10.3	263	
26-30	12.3	313	
31-40	22.3	569	
41-50	18.0	459	
51-60	19.2	489	
61-70	13.7	349	
71-80	3.7	95	
80+	0.4	9	
Qualifications	**%**	**Count**	**Total**
No qualifications	11.8	303	2557
NZ School Certificate, NCEA Level 1	13.2	337	
NZ 6th Form Certificate, NCEA Level 2	14.8	378	
NZ Higher School Certificate, Scholarship, NCEA Level 3	16.3	417	
Under-graduate degree	28.3	723	
Post-graduate degree	15.6	399	
Income	**%**	**Count**	**Total**
None	1.4	36	2559
$1 - $20,000	12.7	326	
$20,000 - $40,000	22.9	586	
$40,000 - $60,000	26.4	675	
$60,000 - $80,000	17.3	443	
$80,000 - $100,000	9.0	230	
$100,000+	10.3	263	
Ethnic Group	**%**	**Count**	**Total**
New Zealand European / Pakeha	78.8	2013	2556
New Zealand Māori	4.2	107	
Samoan	<1	13	
Australian	<1	14	
Chinese	2.7	69	
Indian	1.7	44	
Other Asian	1.5	38	
British/Irish	4.6	117	
Dutch	<1	24	
Other European	2.4	60	
North American	<1	15	
African	<1	11	
Other Pacific Peoples	<1	20	

Income Source[5]	**%**	**Count**	**Total**
Wages, salary, and bonuses paid by an employer	68.6	1784	N/A
Self-employment or own business	21.1	549	
Interest, dividends and other investments	29.8	775	
Rents	13.0	337	
Accident Compensation (ACC) income[6]	3.1	80	
New Zealand Superannuation[7]	10.7	278	
Other pension payments	3.3	86	
Social welfare benefits	7.0	182	
Student allowance	3.8	99	
Other income	5.7	149	

The preferred charity selected in the experiment was the SPCA, with 48 per cent of participants selecting this charity to receive their payment. The other two charities, the New Zealand Red Cross and the New Zealand Forest and Bird Society, were chosen 38 and 14 per cent of the time respectively.

4. FINDINGS AND ANALYSIS

This section discusses the research results from both the questionnaire and the experiment. The analysis commences with an outline of the descriptive statistics, and is followed by analysis based on the 'total proportion of income declared', factor analysis, correlation of grouped variables and univariate analysis of variance.

4.1 Tax Questionnaire

The descriptive statistics are outlined in Table 2, which summarises the results of the questionnaire. Responses are coded from 1 – 5: Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, Strongly Agree. In order to follow the consistency of the direction of the responses, questions 3, 4, 5, 7, 8 and 10 were reverse coded.

[5] Income source does not total to 100 per cent as individuals could nominate multiple income sources.
[6] The Accident Compensation Corporation provides no-fault personal injury cover for all New Zealand residents and visitors. Injury cover includes assistance with income when individuals cannot work as the result of an accident.
[7] New Zealand Superannuation is a retirement pension paid to individuals aged over the age of 65. The pension is not income- or asset-tested, although individuals must meet a 10-year residency requirement.

Table 2

Descriptive Statistics

	N	Mean	Median	Strongly Disagree (%)	Disagree (%)	Neither Agree nor Disagree (%)	Agree (%)	Strongly Agree (%)
Question 1	2556	3.85	4.00	1	9	19	43	27
Question 2	2556	3.86	4.00	1	8	20	46	26
Question 3	2556	3.38	3.00	3	15	32	38	11
Question 4	2556	1.77	2.00	48	37	10	4	2
Question 5	2556	1.87	2.00	37	46	12	4	1
Question 6	2560	3.70	4.00	1	12	25	38	23
Question 7	2560	2.47	2.00	20	35	25	16	3
Question 8	2560	3.42	4.00	5	14	24	49	8
Question 9	2560	3.69	4.00	3	12	15	52	17
Question 10	2560	2.76	3.00	8	35	32	23	2
Question 11	2556	3.20	3.00	4	16	42	32	5
Question 12	2556	2.59	2.00	23	34	10	27	6
Question 13	2556	2.59	3.00	24	26	24	19	7
Question 14	2556	2.25	2.00	22	44	23	9	2

Results from the questionnaire indicate that 70 per cent of the respondents "agree" or "strongly agree" that existing tax rates are too high and more than 70 per cent "agree or "strongly agree" that the tax system is unfair (questions one and two). Another 20 per cent provided a neutral response to these two questions, leaving approximately 10 per cent of respondents indicating that they did not believe that tax rates are too high or the tax system is unfair. Nearly half of the respondents (49 per cent) "agree" or "strongly agree" with the suggestion that it is common to evade tax (question three) with 18 per cent who "disagree" or "strongly disagree" with this statement. We find a high level of apparent disapproval of tax evasion, where 85 per cent of the respondents "disagree" or "strongly disagree" with the statement that "*it does not matter that some people evade tax*" and 83 per cent of the respondents "disagree" or "strongly disagree" with the statement that "*there is nothing bad about underreporting taxable income*" (questions four and five).

Despite the indication of disapproval of tax evasion, reports on individual behaviour provide weaker results, with 61 per cent of respondents who "agree" or "strongly agree" with the statement *"I would never evade taxes"* and 25 per cent who "neither agree nor disagree" (question six). A similar, albeit also weaker, response was received in relation to question seven *"I would evade taxes if I had the opportunity"* with 55 per cent of respondents disagreeing or strongly disagreeing with this statement, and 19 per cent of respondents agreeing or strongly agreeing. This apparent disapproval of tax evasion is not visible in the response to the following question (question eight) on whether an individual would declare cash income of NZ$200 received in tips. This question reveals that 57 per cent of respondents would not declare this amount. Conversely, question nine, which asks about declaration of a significantly higher amount of employment income (NZ$10,000) produces a higher

level of indicated compliance, with 69 per cent agreeing or strongly agreeing that they would declare this income to the Inland Revenue Department.

Question ten, which queried what respondents would do when they were unsure about the tax treatment of income, produced a weaker response, with 43 per cent of respondents responding that they would report this income. This question resulted in a high level of neutral responses, with 32 per cent of respondents indicating they neither agreed nor disagreed with this statement.

The remainder of the questions (11 – 14) are intended to capture information on attitudes that may influence behaviour, such as whether the individual considers they are a religious person or whether they regularly purchase lottery tickets. Questions 12 (on lottery ticket purchases) and 14 (on whether attention would be desired on an achievement) were included as a proxy for risk seeking behaviour and 'ego' respectively. Prior research indicates that both a higher risk preference and stronger egotistical attitudes are correlated to higher levels of non-compliance with the tax system (e.g. Friedland, Maital and Rutenberg, 1978; Bosco and Mittone, 1997; Holt and Laury, 2002; Trivedi, Shehata and Lynn, 2003). We find that 37 per cent of respondents considered themselves as lucky and 42 per cent are neutral on perceptions of luck; 33 per cent regularly purchased Lottery tickets; 26 per cent regarded themselves as religious; and only 11 per cent would want an award widely reported in the news media. These measures are used in the following analysis.

4.2 Total Proportion of Income Declared

In order to identify the extent to which the respondent evades paying tax, the total proportion of income declared in eight rounds of the tax-simulation experiment are presented in Table 3. The total proportion of income declared was calculated using the following formula. Let $D_{i,t}$ be the declared income in dollars for individual i at round t, where I is gross income in that round:

$$y_i = \sum_t D_{i,t} / \sum_t I_t \qquad (1)$$

Declared income may have been influenced by audit and fines in some respondents and not in others. However, the main assumption is that these events are sufficiently randomly distributed among these sub-groups to enable meaningful comparison.

In the sample data, respondents were divided into three groups based on their actual income (as declared by the respondents in the first component of the research). We classified these as high, medium and low. As outlined in the previous section, those who declared a high actual income were streamed into the high or middle income group; those who declared a medium actual income were streamed into the high, medium or low income groups; and those who declared a low actual income were streamed into the medium or low income groups. The total income ($\sum_t I_t$) over the 8 rounds of the experiment is as follows:

- high income group - NZ$62,300
- middle income group - NZ$39,800

- low income group - NZ$22,700.

Using each individual's income declarations and formula (1) the proportion of income declared was calculated for each individual. The sample distribution of these proportions is summarised in Table 3 for various sub-samples of the entire dataset. The columns are the percentiles for the distributions: the 5th, 10th, 25th (lower quartile), 50th (median), 75th (upper quartile), 90th and 95th.

Table 3

Sample Distributions of Proportion of Income Declared

	5%	10%	25%	50%	75%	90%	95%	Count	Mean
Tax Rate									
20%	0.200	0.493	0.831	0.969	1.000	1.000	1.000	838	0.85
33%	0.203	0.514	0.827	0.986	1.000	1.000	1.000	1,084	0.85
45%	0.429	0.562	0.810	0.972	0.998	0.998	0.998	638	0.86
Audit Probability									
10%	0.196	0.449	0.820	0.982	1.000	1.000	1.000	669	0.85
20%	0.318	0.567	0.808	0.975	1.000	1.000	1.000	653	0.86
40%	0.251	0.504	0.800	0.974	1.000	1.000	1.000	632	0.85
50%	0.253	0.574	0.863	0.982	1.000	1.000	1.000	606	0.87
Audit Fine									
2x	0.217	0.479	0.783	0.970	1.000	1.000	1.000	653	0.84
3x	0.227	0.568	0.837	0.983	1.000	1.000	1.000	650	0.87
5x	0.200	0.479	0.816	0.969	1.000	1.000	1.000	621	0.85
10x	0.269	0.584	0.845	0.987	1.000	1.000	1.000	636	0.87
Age									
0-18	0.000	0.000	0.156	0.707	0.923	0.958	1.000	10	0.58
19-25	0.158	0.280	0.694	0.923	1.000	1.000	1.000	263	0.79
26-30	0.220	0.527	0.795	0.955	1.000	1.000	1.000	313	0.85
31-40	0.222	0.510	0.802	0.958	1.000	1.000	1.000	569	0.85
41-50	0.225	0.546	0.810	0.989	1.000	1.000	1.000	456	0.86
51-60	0.281	0.612	0.885	0.998	1.000	1.000	1.000	489	0.88
61-70	0.341	0.677	0.895	0.997	1.000	1.000	1.000	349	0.89
71-80	0.436	0.687	0.881	0.998	1.000	1.000	1.000	95	0.89
80+	0.096	0.096	0.749	0.995	1.000	1.000	1.000	9	0.84
Gender									
Female	0.211	0.566	0.832	0.982	1.000	1.000	1.000	1387	0.86
Male	0.244	0.490	0.808	0.972	1.000	1.000	1.000	1170	0.85

Qualification									
None	0.031	0.347	0.757	0.965	1.000	1.000	1.000	303	0.82
NZ School Certificate	0.187	0.486	0.793	0.968	1.000	1.000	1.000	337	0.84
NZ 6th Form Certificate	0.209	0.565	0.851	0.973	1.000	1.000	1.000	378	0.87
NZ High School	0.200	0.452	0.736	0.963	1.000	1.000	1.000	417	0.83
Undergrad degree	0.349	0.635	0.857	0.987	1.000	1.000	1.000	723	0.89
Postgrad degree	0.213	0.623	0.854	0.991	1.000	1.000	1.000	399	0.88
Ethnicity									
African	0.157	0.191	0.575	0.904	0.998	0.999	1.000	11	0.75
Australian	0.471	0.498	0.673	0.882	1.000	1.000	1.000	14	0.83
British/Irish	0.159	0.447	0.837	0.978	1.000	1.000	1.000	117	0.85
Chinese	0.043	0.241	0.733	0.947	1.000	1.000	1.000	69	0.81
Dutch	0.580	0.775	0.939	1.000	1.000	1.000	1.000	24	0.95
Indian	0.002	0.095	0.570	0.863	0.998	1.000	1.000	44	0.73
NZ European	0.290	0.592	0.839	0.982	1.000	1.000	1.000	2,013	0.87
NZ Māori	0.243	0.330	0.745	0.952	1.000	.000	1.000	107	0.82
North American	0.000	0.327	0.776	0.998	1.000	1.000	1.000	1	0.84
Other Asian	0.001	0.083	0.811	0.995	1.000	1.000	1.000	21	0.84
Other European	0.015	0.231	0.733	0.972	1.000	1.000	1.000	50	0.82
Samoan	0.010	0.153	0.443	0.960	0.999	1.000	1.000	13	0.73
Others	0.000	0.200	0.648	0.929	0.998	1.000	1.000	59	0.77

The summary of the sample distributions using the measure of total proportion of income declared suggests a number of broad conclusions. Distributions in the low and medium tax rate groups are similar, with only five per cent declaring less than 20 per cent of their income. This 5th percentile is much higher for those in receipt of the highest tax rate, with very few subjects declaring less than 43 per cent of their income. However, it is also at the highest tax rate that fewer subjects declare all their income. Thus, the high tax rate subject declarations are less variable, but tend to be slightly lower. Despite differences in the shape of the distributions the means are almost identical. There is no clear trend on the influence of audit probability or audit fine.

As expected, we find compliance increases with age, with the exception of those aged over 80 years. Tax evasion is highest in younger age groups and female respondents generally declare more income than male respondents. We also find that evasion is higher for those with no educational qualification or New Zealand High School Certificate or equivalent. Respondents with undergraduate and postgraduate degrees demonstrate the highest levels of compliance. While we find lower levels of compliance among those identifying as African, Australian and Indian, and higher levels of compliance with those identifying as Dutch, North American or other Asian ethnicities, the sample sizes of these ethnicities are small, and therefore unlikely to provide significant results.

We have also included sample distributions of the proportion of income declared for two of the questionnaire responses: Question 5 – *"There is nothing bad about underreporting taxable income"*; and Question 6 – *"I would never evade taxes"*. These responses are outlined in Table 4 and show that individuals indicating that they would not evade taxes, or that they viewed underreporting of taxable income as undesirable, declared higher proportions of income in the experiment.

Table 4

Sample Distributions of Proportion of Income Declared

	5%	10%	25%	50%	75%	90%	95%	Count
Q5. There is nothing bad about underreporting taxable income								
Strongly agree	0.0045	0.0227	0.3678	0.8384	0.9984	1.0000	1.0000	31
Agree	0.1369	0.2954	0.5757	0.8764	0.9872	1.0000	1.0000	102
Neutral	0.1230	0.3411	0.7085	0.9296	0.9956	1.0000	1.0000	307
Disagree	0.3292	0.6261	0.8416	0.9758	1.0000	1.0000	1.0000	1,170
Strongly disagree	0.2408	0.6030	0.8611	0.9984	1.0000	1.0000	1.0000	946
Q6. I would never evade taxes								
Strongly disagree	0.0146	0.2577	0.7085	0.9322	1.0000	1.0000	1.0000	31
Disagree	0.3689	0.5156	0.7687	0.9427	0.9984	1.0000	1.0000	314
Neutral	0.2010	0.5247	0.8008	0.9583	1.0000	1.0000	1.0000	639
Agree	0.2335	0.5720	0.8485	0.9849	1.0000	1.0000	1.0000	977
Strongly agree	0.1661	0.5226	0.8342	0.9984	1.0000	1.0000	1.0000	599

4.3 Principal Component Analysis and Correlation Matrix

The questionnaire responses were analysed using a factor analysis to identify common themes among the responses. Principal component analysis was used to examine the underlying structure of responses, as this approach reduces a large number of variables into interpretable factors. Principal component analyses are run and six components are extracted that have eigenvalues of over 1. The component matrix for this analysis is shown in Table 5.

Table 5

Component Matrix

	Component					
	1	**2**	**3**	**4**	**5**	**6**
Question1	-.142	**.830**	.031	-.087	.147	.194
Question2	-.164	**.858**	-.084	-.038	.022	-.042
Question3	**.231**	-.245	.289	-.375	.160	.635
Question4	**.548**	.007	-.674	.095	.139	.203
Question5	**.672**	.000	-.568	.089	.086	.105
Question6	**.696**	.216	.178	-.029	-.051	.159

Question7	**.732**	.048	.206	-.064	-.101	.066
Question8	**.645**	.075	.329	.002	-.057	-.098
Question9	**.607**	.022	.107	.080	-.138	-.204
Question10	**.618**	.119	.207	.103	-.070	-.181
Question11	.033	-.101	.071	**.712**	.166	-.065
Question12	-.109	.170	.156	**.532**	-.430	.283
Question13	.170	.039	.226	.069	**.775**	-.282
Question14	-.179	-.038	.161	.380	.317	**.484**

On the basis of this component matrix, we combined the questionnaire responses into five factors as follows.

Factor 1: Tax Compliance Behaviour
Question 3 (It is common to evade tax), Question 4 (It does not matter that some people evade tax), Question 5 (There is nothing bad about underreporting taxable income), Question 6 (I would never evade taxes), Question 7 (I would evade taxes if I had the opportunity), Question 8 (If I received $200 in cash tips, I would not report it), Question 9 (If I was paid $10 000 in cash for working on a farm, I would report it to the Inland Revenue Department), and Question 10 (If in doubt about whether or not to report an amount of income from a particular source, I would not report it). Note that questions three and four load highly onto component three in Table 5, but we elect to include those responses into a single tax compliance factor.

Factor 2: Attitude to the Tax System

Question 1 (Taxes are too high) and Question 2 (The tax system is unfair).

Factor 3: Luck

Question 11 (I consider myself a lucky person) and Question 12 (I regularly purchase Lotto tickets).

Factor 4: Religion

Question 13 (I regard myself as a religious person).

Factor 5: Award

Question 14 (If I was given an award for an outstanding achievement, I would want it widely reported in the news media, rather than just accepting it and keeping a low profile.)

These groups were created by adding responses to each of the statements in accordance with the above groupings. The correlation coefficients are shown in Table 6. The results show the correlation coefficient of the tax compliance behaviour factor (factor 1) has a statistically significant correlation with four factors (attitude to the tax system, luck, religion and award). The highest positive correlation identified was between factor 1 and factor 4, indicating a relationship between tax compliance behaviour and identification with religion. The highest negative correlation was between factor 1 and factor 5, indicating a negative relationship between tax

compliance behaviour and wishing to have publicity after winning an award. As expected, a significant relationship between tax compliance behaviour and attitude to the tax system is also evident. Of less relevance is the significant correlation between factor 3 (luck) also and factor 5 (award).

Table 6

Correlations

		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor1	Pearson Correlation	1	-.102**	-.046*	.119**	-.119**
	Sig. (2-tailed)		.000	.020	.000	.000
	N	2556	2556	2552	2552	2552
Factor2	Pearson Correlation		1	.023	.005	.008
	Sig. (2-tailed)			.236	.808	.670
	N		2556	2552	2552	2552
Factor3	Pearson Correlation			1	-.020	.074**
	Sig. (2-tailed)				.324	.000
	N			2556	2556	2556
Factor4	Pearson Correlation				1	.009
	Sig. (2-tailed)					.640
	N				2556	2556
Factor5	Pearson Correlation					1
	Sig. (2-tailed)					
	N					2556

Asterisks denote significance at the 1% (**) and 5% (*) levels

4.4 Experimental Findings

We use univariate analysis of variance and regression analysis to examine the findings of the experiment. First, we use univariate analysis of variance to examine whether the income source of the respondents has an influence on the total proportion of income declared in the study. Table 7 shows the between-subjects factors of the various income source variables. Where individuals report having income of that particular source, the response is coded as 1, otherwise it is coded as 0. Table 7 shows the numbers of respondents reporting each income type, with the average proportion of income declared. In all cases, with the exception of student allowance income, respondents who report that source of income, declare a higher proportion of income than those who do not report that source of income. The two that are significantly different are in bold: interest income from investments and rental income. The interest income result supports Clotfelter's (1983) finding of higher compliance among those who receive this income source.

Table 7

Between-Subjects Factors of Income Sources

Income Source		N	Mean
Wage salary bonuses	0	697	0.921
	1	1863	0.941
Self employed	0	1997	0.926
	1	563	0.936
Interest Investments	0	1823	**0.908**
	1	737	**0.954**
Rent	0	2244	**0.912**
	1	316	**0.950**
Accident Compensation Corporation Income	0	2511	0.924
	1	49	0.938
NZ superannuation	0	2294	0.917
	1	266	0.945
Pension payments	0	2475	0.907
	1	85	0.955
Social welfare	0	2376	0.929
	1	184	0.933
Student allowance	0	2459	0.940
	1	101	0.922
Other	0	2411	0.913
	1	149	0.949

We undertake a regression analysis to examine the relationship between the total proportion of income declared and the control variables. The independent variable is divided into three different groups: tax parameters (the tax rate, audit probability and fine), demographic characteristics (gender and age), and tax preferences (based on the factors outlined above in section 4.3). Based on the regression model, we propose a null hypothesis and 10 alternative hypotheses to be tested. The null hypothesis is:

H_0: The amount of tax paid is not systematically connected to any of the explanatory variables.

The alternative hypotheses are:

H_1: "Tax rate hypothesis" – The amount of tax paid is systematically connected to the tax rate.

H_2: "Audit probability hypothesis" - The amount of tax paid is systematically connected to the audit probability.

H_3: "Audit penalty hypothesis" - The amount of tax paid is systematically connected to the penalty applied when non-compliance is detected.

H_4: "Gender (Male) hypothesis" - The amount of tax paid is systematically connected to gender.

H_5: "Age hypothesis" - The amount of tax paid is systematically connected to age.

H_6: "Factor 1 hypothesis" - The amount of tax paid is systematically connected to tax compliance attitudes.

H_7: "Factor 2 hypothesis" - The amount of tax paid is systematically connected to attitudes to the tax system.

H_8: "Factor 3 hypotheses" - The amount of tax paid is systematically connected to whether people consider themselves to be lucky.

H_9: "Factor 4 hypothesis" - The amount of tax paid is systematically connected to whether people consider themselves to be religious.

H_{10}: "Factor 5 hypothesis" - The amount of tax paid is systematically connected to whether people are attention seeking.

We separately test these 10 hypotheses to examine the relationships between each of these variables and the total proportion of income declared. The sample has nine different age groups therefore the univariate analysis of variance (ANOVA) was utilised to examine the relationship between these age groups and the total proportion of income declared. The results of the statistical tests are presented in Table 8.

Table 8

Statistical Test Results

	Variable	**Relationship to dependent variable**	***P*-values**	**Significance**
H_1	Tax rate	Positive	0.884	Not Significant
H_2	Audit probability	Positive	0.237	Not Significant
H_3	Audit penalty	Positive	0.123	Not significant
H_4	Gender (Male)	Negative	0.172	Not Significant
H_5	Age	Positive	0.000*	Significant
H_6	Factor 1	Positive	0.000*	Significant
H_7	Factor 2	Negative	0.001*	Significant
H_8	Factor 3	Negative	0.208	Not Significant
H_9	Factor 4	Positive	0.989	Not Significant
H_{10}	Factor 5	Negative	0.000*	Significant

Asterisks denote significance at the 5% (*) level

The results of the regression analysis in Table 8 show that age and Factor 1 have significant and positive relationships with the total proportion of income declared. Factor 2 and Factor 5 also have significant but negative relationships with the total proportion of income declared. This means that the null hypothesis can be rejected in favour of the alternative hypothesis for H_5, H_6, H_7 and H_{10}. However, the null hypothesis cannot be rejected in favour of the alternatives tax rate, audit probability, audit penalty, and gender (male), Factor 3 and Factor 4: hypotheses H_1, H_2, H_3, H_4, H_8 and H_9, respectively. These variables do not have a significant impact on the total proportion of income declared in the sample.

4.5 The New Zealand Population and Students

We have previously used a similar experimental design with 483 undergraduate student subjects (Marriott, Randal and Holmes, 2010). While the experimental designs are similar, the experiment environment is different: our population sample completed the experiment online, while our student sample completed the experiment in a lecture theatre. Despite these differences, some similarities and differences warrant comment. We use the Pearson's chi-squared test to investigate differences in the questionnaire responses between the population sample and the student sample. Results of the chi-squared test are outlined in Table 9.[8]

Table 9
Chi-Squared Test Results

Statement	Pearson Chi-Square	Significance (p value)
1.Taxes are too high	1017.429	0.000**
2.The tax system is unfair	273.493	0.000**
3.It's common to evade tax	61.354	0.000**
4. It does not matter that some people evade tax	107.132	0.000**
5. There is nothing bad about underreporting taxable income	161.772	0.000**
6. I would never evade taxes	43.978	0.000**
7. If I received $200 in cash tips, I would not report it	244.361	0.000**
8. If in doubt about whether to report an amount of income, I would not report it	39.220	0.000**

Asterisks denote significance at the 1% (**) level

Table 9 shows that the value of the chi-squared results for all statements is highly significant, indicating that the respondent group (population or student) has a significant impact on the responses to each of these statements. The detail of each of the responses is shown in Table 10, with more detailed discussion following the table.

[8] All the questions are not included in this table, as the questionnaires were not identical. This table outlines those questions that were the same.

Table 10
Group Responses to Questions

Statement	Response					Total
	Disagree	**Strongly Disagree**	**Neither Disagree nor Agree**	**Agree**	**Strongly Agree**	
Statement 1: Taxes are too high						
Population (% within group)	1.4	9.0	19.2	43.3	27.0	100%
Students (% within group)	19.3	50.7	21.9	7.9	.2	100%
Statement 2: The tax system is unfair						
Population (% within group)	.9	8.2	20.1	45.3	25.6	100%
Students (% within group)	2.9	26.5	35.8	28.0	6.8	100%
Statement 3: It's common to evade tax						
Population (% within group)	3.4	15.1	32.0	38.4	11	100%
Students (% within group)	5.0	21.3	41.8	29.0	2.9	100%
Statement 4: It does not matter that some people evade tax						
Population (% within group)	47.4	36.7	9.7	4.1	2.1	100%
Students (% within group)	24.6	47.8	18.6	8.1	.8	100%
Statement 5: There is nothing bad about underreporting taxable income						
Population (% within group)	37.0	45.8	12.0	4.0	1.2	100%
Students (% within group)	12.4	50.5	25.9	10.1	1.0	100%
Statement 6: I would never evade taxes						
Population (% within group)	1.2	12.3	25.0	38.1	23.4	100%
Students (% within group)	2.1	20.3	29.6	34.4	13.7	100%
Statement 7: If I received $200 in cash tips, I would not report it						
Population (% within group)	5.1	13.7	23.5	49.3	8.4	100%
Students (% within group)	4.5	12.8	21.4	49.1	12.1	100%
Statement 8: If in doubt about whether to report an amount of income from a particular source, I would not report it						
Population (% within group)	7.9	35.3	32.1	22.5	2.2	100%
Students (% within group)	5.8	35.2	22.4	32.1	4.6	100%

Table 10 indicates that 70.3 per cent of our population sample agree or strongly agree that taxes are too high. However, 70 per cent of our student sample disagree or strongly disagree with this statement. Examination of a standardised residual of each cell can assist in assessing its significance. Table 10 shows that more respondents than expected from the population group agree or strongly agree with the statement that taxes are too high and less respondents than expected from our student group agree or strongly agree with this statement. Conversely, more respondents than expected from the student group disagree or strongly disagree with this statement, while less respondents from our population group disagree or strongly disagree.

In relation to statement two (the tax system is unfair) we find that 70.9 per cent of respondents in our population sample agree or strongly agree with this comment, while only 34.8 per cent of our student sample agree or strongly agree. The results show that significantly more respondents than expected from the population group agree or strongly agree that the tax system is unfair, while significantly less respondents than expected from the student group agree or strongly agree with this

statement. Conversely, significantly fewer of the population respondents disagree with this statement, while significantly more of the student respondents disagree or strongly disagree with it.

In response to the statement that it is common to evade tax (statement three), 49.4 per cent of the population sample agree or strongly agree, in comparison to the student sample where 31.9 per cent agree or strongly agree. For this statement we find significantly less than expected students agree or strongly agree with this statement, while significantly more than expected from our population sample strongly agree.

Statement four suggests that it does not matter if some people evade tax. We find strong responses to this among both our groups, with 84.1 per cent of the population respondents disagreeing or strongly disagreeing with this statement and 72.4 per cent of the student group disagreeing or strongly disagreeing. We find significantly fewer respondents than expected from the student group strongly disagreeing with this statement and significantly more than expected from the population group strongly disagreeing with this statement.

Statement five questions views on underreporting of taxable income. We find that 82.8 per cent of our population respondents, and 62.9 per cent of our student respondents disagree or strongly disagree with the suggestion that there is nothing bad about underreporting taxable income. This statement shows significantly more than expected population respondents strongly disagree and significantly fewer than expected student respondents strongly disagree with this statement. Conversely, significantly fewer than expected population respondents agree with this statement, while significantly more than expected student respondents agree with it.

Statement six is a statement on tax evasion behaviour. Of our population sample, 61.5 per cent agree or strongly agree that they would never evade taxes. In the student sample, the response was 48.1 per cent. All the standardised residuals for the population group are insignificant for this statement. However, significantly more than expected respondents from the student group disagree with this statement, and significantly less than expected strongly agree.

Statement seven questions the likely response to reporting NZ$200 in cash tips. We find 57.7 per cent of our population subjects agree or strongly agree that they would not report NZ$200 in cash tips, while 80.3 per cent of our student subjects respond similarly. We find significantly fewer than expected population respondents strongly agree with this statement, and significantly fewer than expected student respondents disagree or strongly disagree with it.

The final statement questions if income would be reported if there was doubt about how it should be treated. Of the population sample, 24.7 per cent agree or strongly agree that they would not report income in this situation, while 36.7 per cent of the student sample agree or strongly agree. All standardised residuals for the population group were insignificant for this statement. However, significantly more student respondents than expected agree or strongly agree with these statements.

The sample distributions of proportion of income declared for the student subjects are replicated at Appendix B. The most notable difference in behaviour between the two subject groups is in relation to the overall proportion of income declared. In the student sample we find that nearly every sub-sample has 0 per cent disclosed as its

minimum, and 100 per cent disclosed as its maximum. In the population sample, we find only those aged under 18, and those identifying with North American or Other ethnicity have 0 per cent declared as the minimum. By way of comparison, with reference to Table 3, 50 per cent of the population respondents at any tax rate have declared over 95 per cent of their income, whereas 50 per cent of the student respondents at any tax rate have declared less than 50 per cent of their income. These levels of compliance are more aligned with what is expected in practice (Kleven, Knudsen, Kreiner, Pedersen and Saez, 2010). We acknowledge that the experimental environment, at least to some extent, potentially exacerbates a risk-seeking strategy. This may have been mitigated in our online experiment as the 'reward' was paid to a charity rather than the individual, which introduces a third-party impact not present in the student sample.

We observe that those who receive student allowance income within our population sample (affording the assumption that these are students), declare less income in the online experiment than those in the online experiment who declare other sources of income. The student allowance income group is the only income source group to demonstrate this behaviour.

While our age variable adheres to previous research findings (compliance generally increases with age), we did not find alignment between the two samples in response to the audit probability variable or gender. The outcome contrasts with previous findings that suggest audit probability is a significant explanatory variable of behaviour in tax experiments. It similarly contrasts previous studies that find that males are less compliant than females. We witnessed a strong response to the audit variable in our student sample, but this was not evident in our population sample. However, as the population sample is significantly more compliant in their behaviour, the absence of a significant response to audit may be partially explained by this compliant behaviour; that is, most respondents are compliant and an audit experience will persuade those who are non-compliant to become more compliant.[9] Thus, the strong response we see to audit probability among student samples may be partly attributable to risk-seeking behaviour among student subjects in the experimental environment.

We find higher levels of significant results among our student sample. For example, tax rate, audit probability and gender all produce significant results in our student sample, but not in our population sample. Audit penalty is not significant in either sample.

In summary, the responses to changes in variables in the population sample for age are similar to responses from the student sample. However, the response to audit probability is not significant in the population sample nor is any gender impact evident. The population sample responses in the questionnaire are, in all instances, significantly different to those from the student subjects. This finding concurs with research that has investigated the appropriateness of using students as a proxy for a real world population. A number of differences are reported between student and 'real world' subjects, such as:

[9] We acknowledge that the potential remains for audit to cause non-compliant behaviour among compliant individuals, as found by Gemmell and Ratto (2012).

- less-crystallised attitudes, with social and political attitudes developing later in life;
- a less formulated sense of self, with a stronger need for peer approval and over-identification with peers;
- stronger cognitive skills;
- stronger tendencies to comply with authority; and
- less conservative behaviour (Cunningham, Anderson and Murphy, 1974; Sears, 1986).

These factors would lead to the conjecture that student subjects may have weaker opinions on the tax system. This supposition is supported by the results of the questionnaire, but not in the experiment.

The use of student subjects in experimental research remains a contentious issue. This study does not provide support for the use of student subjects as a proxy for the taxpaying population. Similar behaviours among our student population and our population sample are not evident. Moreover, our finding that age has a significant relationship with compliance leads to further weaken the argument that students are an appropriate substitute for taxpayers, as student samples are typically considerably younger than the population as a whole. Thus, in the absence of strong evidence to suggest that students are an appropriate proxy for the taxpaying population as a whole, caution must be exercised in the interpretation of findings from experimental research using student subjects.

5. CONCLUSION

This article has reported on the findings of a large-scale tax experiment using nearly 2,600 'real world' respondents. The objectives of this research are to first report on the findings of a large sample population-based survey, and second to investigate similarities and differences in behaviour witnessed in the population-based experiment and experiments we had previously undertaken with student subjects. We find that only the age variable produces similar responses, both to previous research and to our own experiments using student subjects. No significant response to audit probability is visible in the online experiment. This result may, in part, be driven by the overall significantly higher levels of compliance in the experimental setting by the population sample, which is representative of tax compliance in practice. However, differences in attitudes to paying tax and to the tax system are also visible in response to the questionnaire component of the research. We therefore conclude that caution should be taken when research findings using student subjects are extrapolated to the broader population.

REFERENCES

Alm, J., B. Jackson, and M. McKee, 1992. "Estimating the Determinants of Taxpayer Compliance with Experimental Data." *National Tax Journal* 45 (1), 107-114.

Alm, J., and M. McKee, 2006. "Audit Certainty, Audit Productivity, and Taxpayer Compliance." *National Tax Journal* 59 (4), 801-816.

Alm, J., G. McClelland, and W.D. Schulze, 2006. "Why Do People Pay Taxes?" *Journal of Public Economics* 48, 21-38.

Barnett, T., and G. Brown, 1994. " The Ethical Judgments of College Students Regarding Business Issues." *Journal of Education for Business* 69 (6), 333-339.

Beron, K.J., H.V. Tauchen, and A. Dryden Witte, 1992. "The Effect of Audits and Socioeconomic Variables on Compliance." I n Slemrod, J (ed), *Why People Pay Taxes: Tax compliance and enforcement*. The University of Michigan Press, Ann Arbor.

Birch, A., T. Peters and A. Sawyer, 2003. "New Zealanders' Attitudes Towards Tax Evasion: A demographic analysis." *New Zealand Journal of Taxation Law and Policy* 9, 65-109.

Borkowski, S.C., and Y.J. Ugras, 1998. " Business Students and Ethics: A meta-analysis." *Journal of Business Ethics* 17 (11), 1117-1127.

Bosco, G., and L. Mittone, 1997. " Tax Evasion and Moral Constraints: Some experimental evidence." *Kyklos* 50, 297-324.

Burton, S., M.W. Johnston, and E.J. Wilson, 1991. "An Experimental Assessment of Alternative Teaching Approaches for Introducing Business Ethics to Undergraduate Business Students." *Journal of Business Ethics* 10 (7), 507-517.

Clotfelter, C., 1983. "Tax Evasion and Tax Rules: An analysis of individual returns." *The Review of Economics and Statistics* 63 (3), 363-373.

Cunningham, W.H., T. Anderson Jr, and J.H. Murphy, 1974. " Are Students Real People?" *The Journal of Business* 47 (3), 399-409.

Devos, K., 2002. "Penalties and Sanctions for Australian Taxation Crimes and the Implications for Taxpayer Compliance." *Australian Tax Forum* 17 (3), 257-286.

Dubin, J.A., M.J. Graetz, and L.L. Wilde, 1990. "The Effect of Audit Rates on the Federal Individual Income Tax, 1977-1986." *National Tax Journal* 43 (4), 395-409.

Dubin, J.A., and L.L. Wilde, 1988. "An Empirical Analysis of Federal Income Tax Auditing and Compliance." *National Tax Journal* 41 (1), 61-74.

Friedland, N., S. Maital and A. Rutenberg, 1978. "A Simulation Study of Income Tax Evasion." *Journal of Public Economics* 10 (1), 107-116.

Gemmell, N., and M. Ratto. 2012. " Behavioral Responses to Taxpayer Audits: Evidence from Random Taxpayer Inquiries." *National Tax Journal* 65 (1), 33-58.

Graetz, M., and L. Wilde 1985. "The Economics of Tax Compliance: Fact and fantasy." *National Tax Journal* 38 (3), 355-363.

Holt, C.R., and S.K. Laury, 2002. "Risk Aversion and Incentive Effects." *The American Economic Review* 92 (5), 1644-1655

Iyer, G.S., P.M.J. Reckers and D.L. Sanders, 2010. "Increasing Tax Compliance in Washington State: A field experiment." *National Tax Journal* 63 (1), 7-32.

Kleven, H.J., M.B. Knudsen, C.T. Kreiner, S. Pedersen and E. Saez, 2010. "Unwilling or Unable to Cheat? Evidence from a randomized tax audit experiment in Denmark." National Bureau of Economic Research Working Paper 15769. NBER, Cambridge.

Levitt, S.D. and J.A. List. "What Do Laboratory Experiments Measuring Social Preferences Reveal About the Real World?" *Journal of Economic Perspectives* 21 (2), 153-174.

Madeo, S., Schepanski, A., and W. Uecker, 1987. "Modelling Judgments of Taxpayer Compliance." *The Accounting Review* 62 (2), 323-342.

Marriott, L., J. Randal and K. Holmes. 2010. "Influences on Tax Evasion Behaviour: Insights from a behavioural simulation experiment." *New Zealand Journal of Taxation Law and Policy* 16 (4), 369-394.

Mason, R., and L. Calvin, 1978. "A Study of Admitted Income Tax Evasion." *Law and Society Review* 13, 73-89.

McIntosh, R., and J. Veal, 2001. "Tax Evasion and New Zealanders' Attitudes Towards It." *New Zealand Journal of Taxation Law and Policy* 7, 80-110.

Sears, D.O., 1986. "College Sophomores in the Laboratory: Influences of a narrow data base on social psychology's view of human nature." *Journal of Personality and Social Psychology* 51 (3), 515-530.

Shaub, M.K., 1994. "An Analysis of the Association of Traditional Demographic Variables with the Moral Reasoning of Auditing Students and Auditors." *Journal of Accounting Education* 12 (1), 1-26.

Sheffrin, S.M., and R.K. Triest, 1992. "Can Brute Deterrence Backfire? Perceptions and Attitudes in Taxpayer Compliance." In Slemrod, J (ed), *Why People Pay Taxes: Tax compliance and enforcement*. The University of Michigan Press, Ann Arbor.

Slemrod, J., M. Blumenthal, and C. Christian. 2001. "Taxpayer Response to an Increased Probability of Audit: Evidence from a controlled experiment in Minnesota." *Journal of Public Economics* 79, 455-483.

Spicer, M.W., and L. Becker, 1980. "Fiscal Inequity and Tax Evasion: An Experimental Approach." *National Tax Journal* 33 (2), 171-176.

Spicer, M.W., and J.E. Thomas, 1982. " Audit Probabilities and the Tax Evasion Decision: An Experimental Approach." *Journal of Economic Psychology* 2 (3), 241-245.

Tan, L.M. and C. Chin-Fatt, 2003. "The Impact of Tax Knowledge on the Perceptions of Tax Fairness and Attitudes Towards Compliance." *Asian Review of Accounting* 8 (1), 44-58.

Trivedi, V., M. Shehata, and B. Lynn, 2003. "Impact of Personal and Situational Factors on Taxpayer Compliance: An experimental analysis." *Journal of Business Ethics* 47 (3), 175-197.

Vogel, J. 1974. "Taxation and Public Opinion in Sweden: An interpretation of recent survey data." *National Tax Journal* 27 (4), 499-513.

Wahlund, R. 1993. "Tax Changes and Economic Behavior: The case of tax evasion." *Journal of Economic Psychology* 13, 657-677.

Wallschutzky, I., 1988. *The Effects of Tax Reform on Tax Evasion.* Australian Tax Research Foundation, Sydney.

Warneryd, K.E., and B. Walerud, 1982. "Taxes and Economic Behavior: Some interview data on tax evasion in Sweden." *Journal of Economic Psychology* 2, 187-211.

Weigel, R., D. Hessing and H. Elffers, 1987. "Tax Evasion Research: A critical appraisal and theoretical model." *Journal of Economic Psychology* 8, 215-235.

APPENDIX A: QUESTIONS ASKED IN ONLINE EXPERIMENT

1. Taxes are too high
2. The tax system is unfair
3. It is common to evade tax
4. It does not matter that some people evade tax
5. There is nothing bad about underreporting taxable income
6. I would never evade taxes
7. I would evade taxes if I had the opportunity
8. If I received $200 in cash tips, I would not report it
9. If I was paid $10,000 in cash for working on a farm, I would report it to the Inland Revenue Department
10. If in doubt about whether or not to report an amount of income from a particular source, I would not report it
11. I consider myself a lucky person
12. I regularly purchase Lotto tickets
13. I regard myself as a religious person
14. If I was given an award for an outstanding achievement, I would want it widely reported in the news media, rather than just accepting it and keeping a low profile

APPENDIX B: SAMPLE DISTRIBUTIONS OF PROPORTION OF INCOME DECLARED – STUDENT SUBJECTS [10]

	5%	10%	25%	50%	75%	90%	95%	Count
Tax rate								
20%	0.0000	0.1277	0.3059	0.4920	0.7766	0.9840	1.0000	161
33%	0.0399	0.0878	0.2061	0.3875	0.6436	0.9814	1.0000	161
45%	0.0000	0.0133	0.1676	0.3896	0.6822	0.8750	0.9628	161
Audit probability								
10%	0.0000	0.0293	0.1649	0.3457	0.6144	0.8532	0.9798	243
20%	0.0475	0.1473	0.2919	0.504	0.8005	0.9947	1.0000	240
Audit fine								
5x	0.0000	0.0798	0.2074	0.4255	0.7128	0.9947	1.0000	245
10x	0.0000	0.0604	0.2261	0.4309	0.6888	0.9093	0.9656	238
Gender								
Female	0.0698	0.1064	0.3092	0.4947	0.7934	0.9628	1.0000	222
Male	0.0000	0.0133	0.1729	0.3457	0.6290	0.9069	1.0000	261
Ethnicity								
NZ Euro	0.0000	0.0439	0.2068	0.4043	0.6449	0.9035	0.9992	244
Chinese	0.0810	0.1198	0.2104	0.4747	0.6350	0.887	0.9641	62
Asian	0.0911	0.1463	0.2400	0.3431	0.6117	0.8564	0.9761	46
Indian	0.0372	0.0763	0.2593	0.4548	0.6024	0.8436	0.9665	19
NZ Other	0.0202	0.1505	0.2985	0.4987	0.9189	1.0000	1.0000	34
NZ Māori	0.0824	0.1218	0.2128	0.3404	0.4681	0.6340	0.7771	23
Pacific Is	0.0319	0.1883	0.6782	0.7766	0.9081	1.0000	1.0000	17
European	0.0404	0.0473	0.2028	0.6556	0.8668	1.0000	1.0000	20
Age								
17	0.0000	0.0324	0.2447	0.4521	0.6649	0.8915	0.9585	45
18	0.0000	0.0399	0.1676	0.3245	0.5745	0.8553	0.9713	193
19	0.0000	0.0606	0.2753	0.4043	0.5439	0.7787	0.8872	75

[10] Marriott, Randal and Holmes (2010).

20	0.0379	0.0842	0.2055	0.4455	0.7254	0.9606	1.0000	58
21	0.1138	0.1259	0.2620	0.5851	0.8032	0.9388	0.9705	35
22	0.0638	0.1963	0.3271	0.6250	0.8218	0.9266	1.0000	17
23-58	0.1612	0.2354	0.3919	0.6888	0.9876	1.0000	1.0000	59
Audit fine x audit probability								
0.5	0.0000	0.0304	0.1523	0.387	0.5691	0.8743	0.9994	124
1	0.0128	0.0902	0.2227	0.4096	0.7194	0.9622	1.0000	240
2	0.0120	0.0904	0.2952	0.5059	0.7965	0.9436	1.0000	119
Statement 11: “I would never evade taxes”								
Strongly agree	0.0818	0.1243	0.3570	0.6077	1.0000	1.0000	1.0000	64
Agree	0.0592	0.1064	0.2693	0.4973	0.7467	0.9476	0.9948	158
Neither	0.0122	0.0511	0.2221	0.3596	0.5652	0.8580	0.9649	139
Disagree	0.0000	0.0000	0.1280	0.2766	0.5678	0.7985	0.8414	94
Strongly disagree	0.0000	0.0000	0.0133	0.2367	0.8218	1.0000	1.0000	9
Student ID Number provided for reward purposes								
No	0.0000	0.0000	0.1184	0.4016	0.6792	0.8779	0.9985	48
Yes	0.0094	0.0819	0.2221	0.4362	0.7041	0.9447	1.0000	435