



Chair in Public Finance
Victoria Business School



Inland Revenue
Te Tari Taake



The Elasticity of Taxable Income in New Zealand: *Evidence for personal taxpayers from unit record data*

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Objectives & Motivation

Project Objective:

- Analyse how 'taxable incomes' respond to N.Z. tax reforms?

Motivation:

- Help Inland Revenue and Treasury better understand taxpayers' responses to tax reform
- Improve evidence base for advice to *Minister of Finance* for 2010 Budget
- Help develop internal (IR, Tsy) capability to analyse unit record data via collaborative research
- Make better use of IRD's underutilised micro data
- Improve accuracy of response estimates (compared to studies using aggregated data) and identify *specific* compliance responses

Research approach

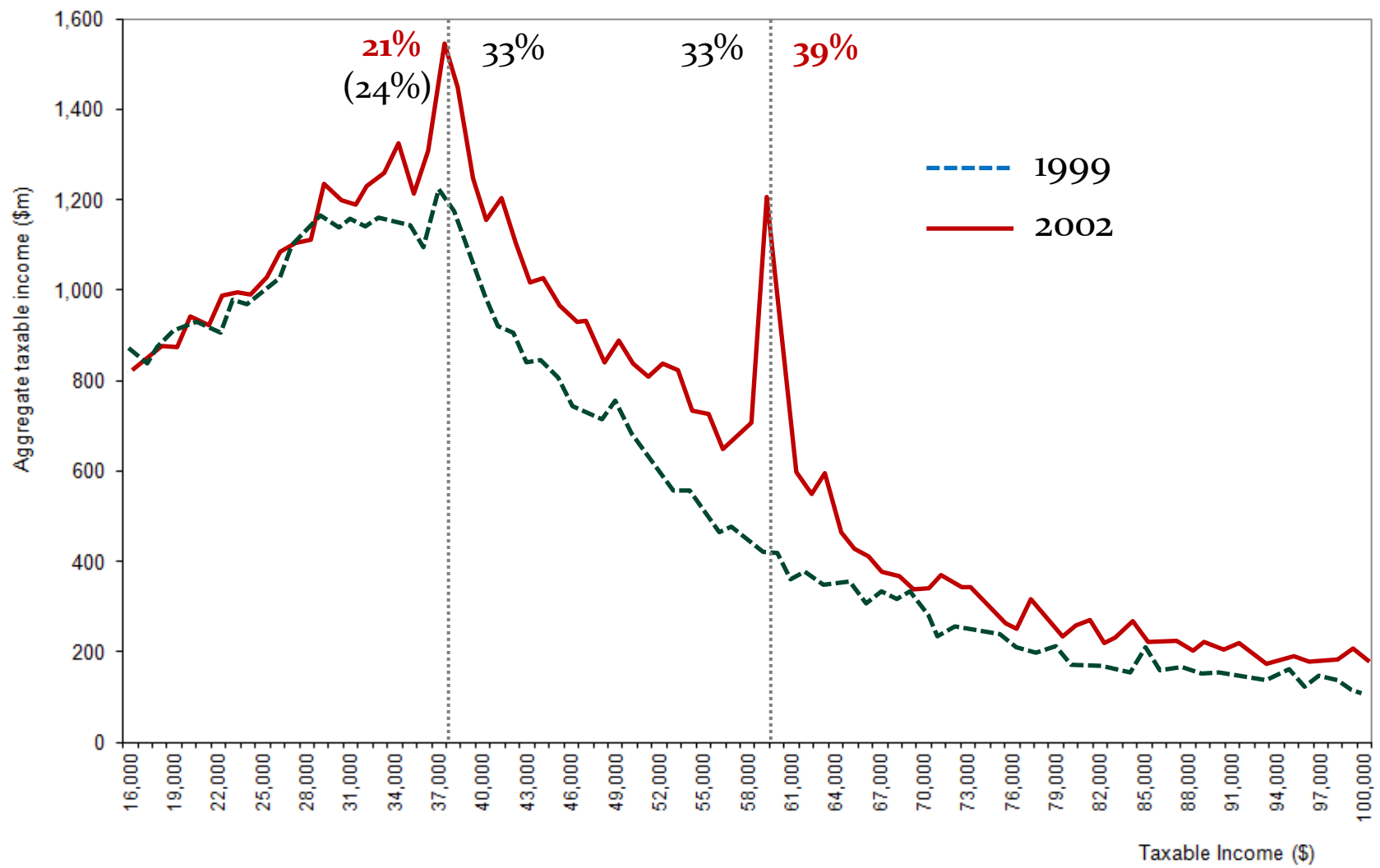
- *Question:* How does 'taxable income' respond to tax reforms?
- Use elasticity of taxable income, ETI (Feldstein, 1995):
$$ETI = \% \text{ response of taxable income to a 1\% change in the 'net-of-tax' rate } (1 - \tau)$$
- Captures combined effect of variety of responses:
(labour supply, wage/salary setting, tax avoidance/evasion) *and*
 - Easily related to revenue outcomes (C & G, 2012)
 - Direct welfare measurement is possible
- Many empirical estimates using variety of methodologies (mainly US; some Europe).
- Emerging range of values: 0.12 – 0.4 (US; Saez et al, 2012); but Weber (2014) ~ 0.9 (US)

ETI: Approaches to testing

- Saez, Slemrod, Giertz (2012, p.18):
*“to isolate the effects of the net-of-tax rate, one would want to compare observed reported incomes after the tax rate change to the incomes **that would have been reported had the tax change not taken place.** Obviously, the latter are not observed and must be estimated”*
- **Income shares** - Saez, Chetty *et al.* pioneered tests using changes in income shares of segments of income distribution, after tax reform. Claus-Creedy-Teng (2012) report for New Zealand.
- **Difference-in-difference methods** applied to panels of ‘treated’ (affected) and ‘control’ (unaffected) groups of taxpayers
→ key issue: correct identification of each group?
- **Regression methods** of ‘pre/post’ reform seek to hold all relevant non-tax changes constant. But: a number of challenges ...

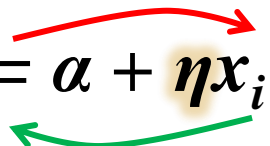
The 2001 tax rate reforms

| Income bands | 1999 Rates | Change | 2002 Rates |
|---------------------|------------|--------|------------|
| \$1 - \$9,500 | 15% | - | 15% |
| \$9,500 - \$34,200 | 21.75% | -0.75% | 21% |
| \$34,200 - \$38,000 | 24% | -3% | 21% |
| \$38,000 - \$60,000 | 33% | - | 33% |
| > \$60,000 | 33% | +6% | 39% |



ETI: regression approach

Typical ETI regression:

$$q_i = \alpha + \eta x_i + Z_i + u_i$$


Where: q_i = change in log taxable income

x_i = change in log net of tax rate

η = ETI measure

Z_i = other controls (e.g. age, past income)

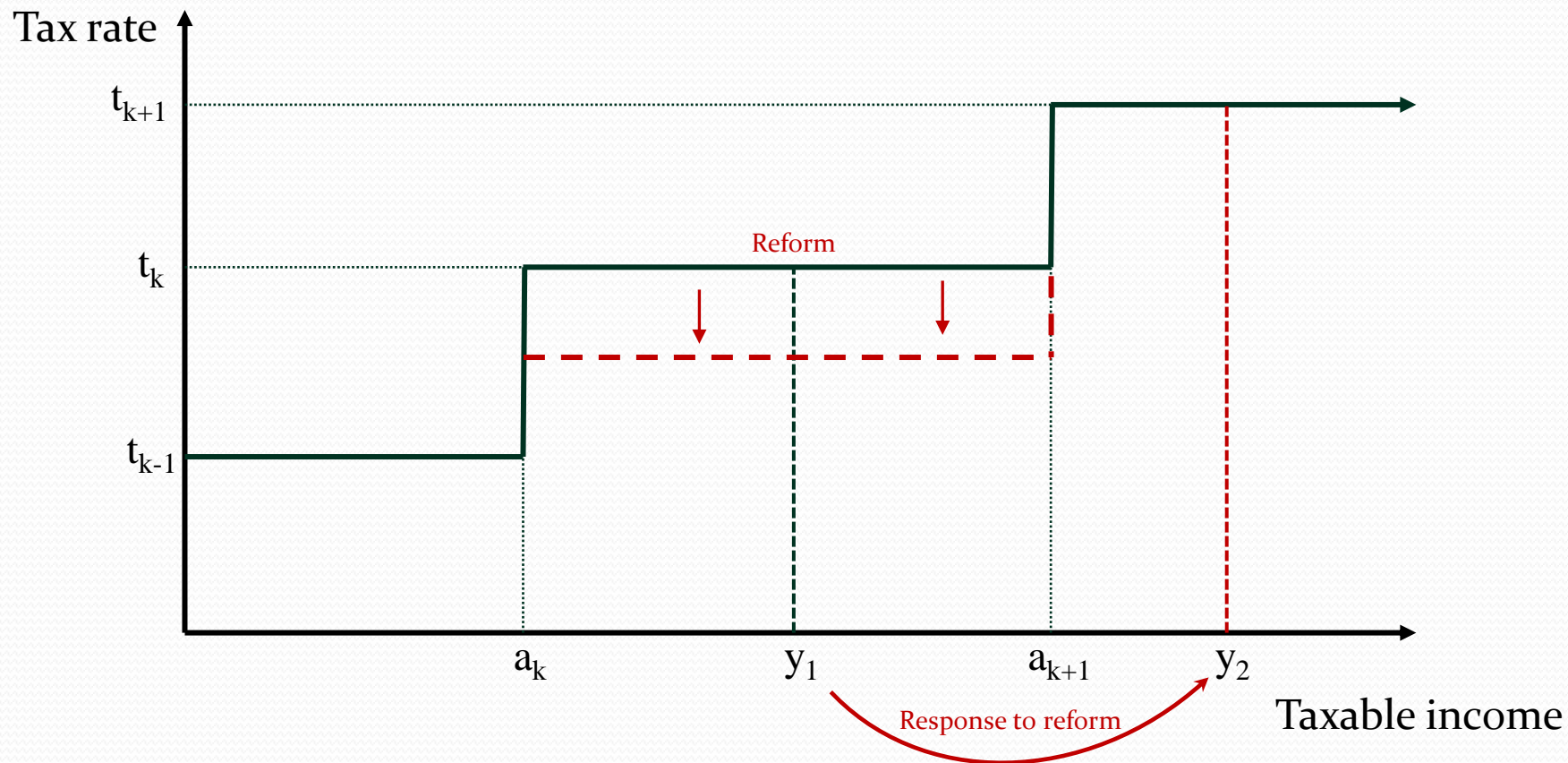
This reduced-form equation leads to problems of endogeneity...

⇒ need ‘**instrument**’ for x_i that is not affected by q_i .

⇒ ‘**standard instrument**’ (Auten-Carroll, 1999; Gruber-Saez, 2002):

tax rate that would have been faced *after reform*, with **unchanged income**

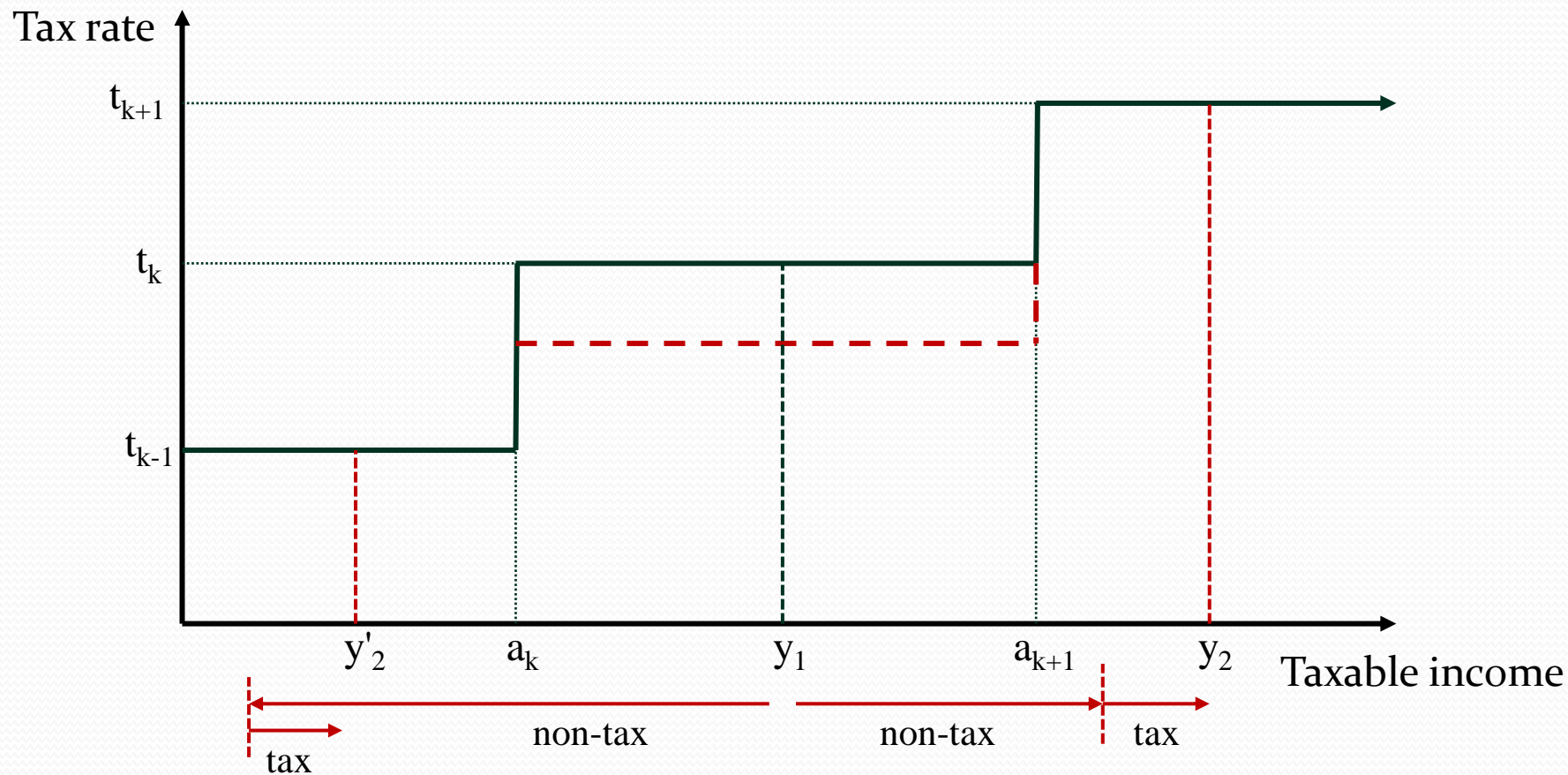
The need for an instrument ...



Standard instrument: recent challenges

- Standard instrument may not deal with inconsistency (bias) of OLS (Weber, 2014)
 - Instrument is **inconsistent** with plausible assumptions about income generating process
 - So-called 'treated' and 'untreated' may not only differ in exposure to tax reform? (e.g. non-random selection for treatment).
- **Weak** instrument with volatile income dynamics (exogenous). Largely ignored till now, *but* important in N.Z. data

The standard instrument & income dynamics



An alternative approach

- Estimate **income dynamics** from period of *no tax reform*
- Use to construct ‘expected’ income – and associated ‘expected’ marginal tax rate – if no reform.

Approach:

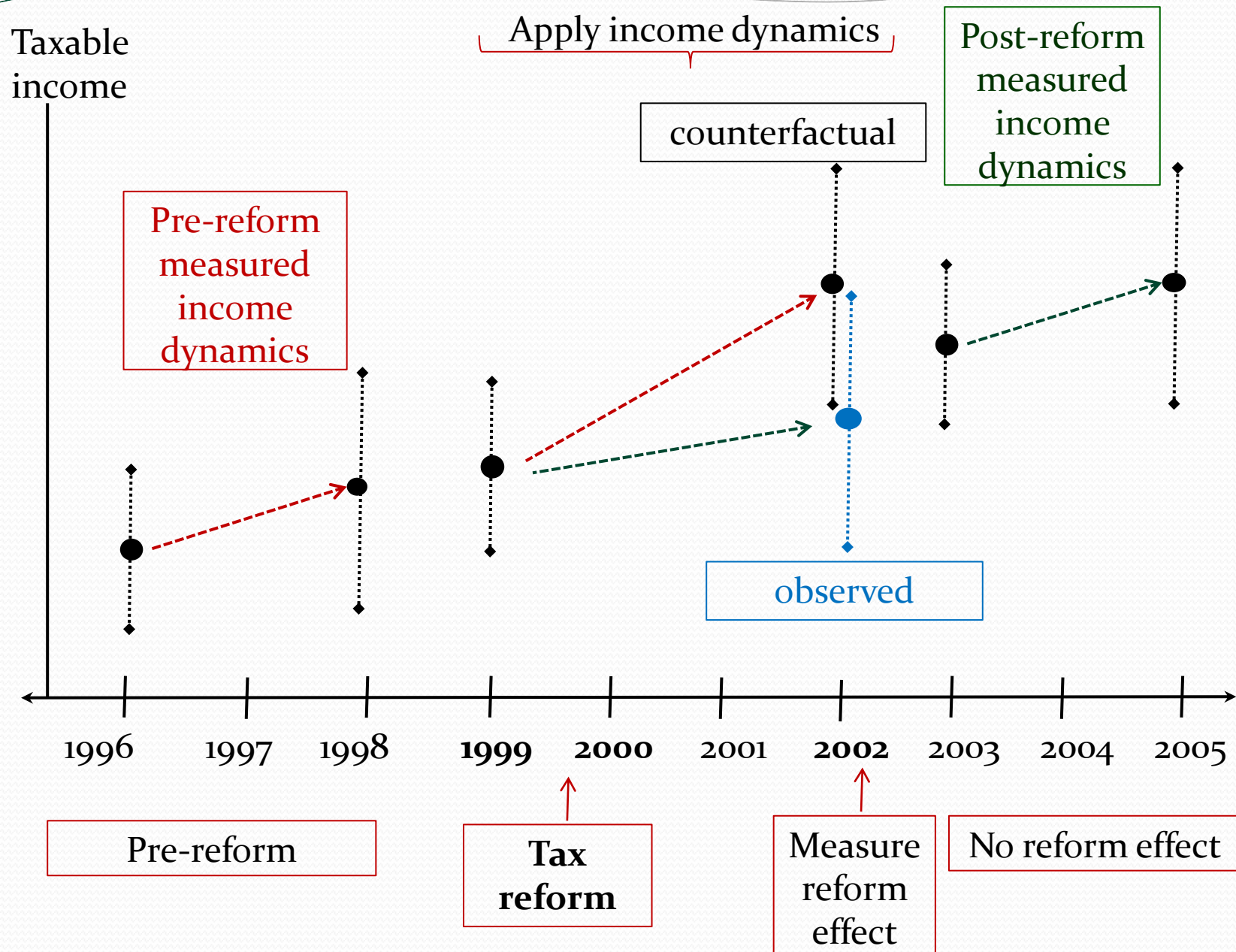
Take period without any tax changes, and run autoregressive process:

$$\log y_{i,j} - \mu_j = \alpha_1 (\log y_{i,j-1} - \mu_{j-1}) + \alpha_2 (\log y_{i,j-2} - \mu_{j-2}) + u_i$$

Incorporates:

- *regression towards the mean*
- *serial correlation* in relative income changes.

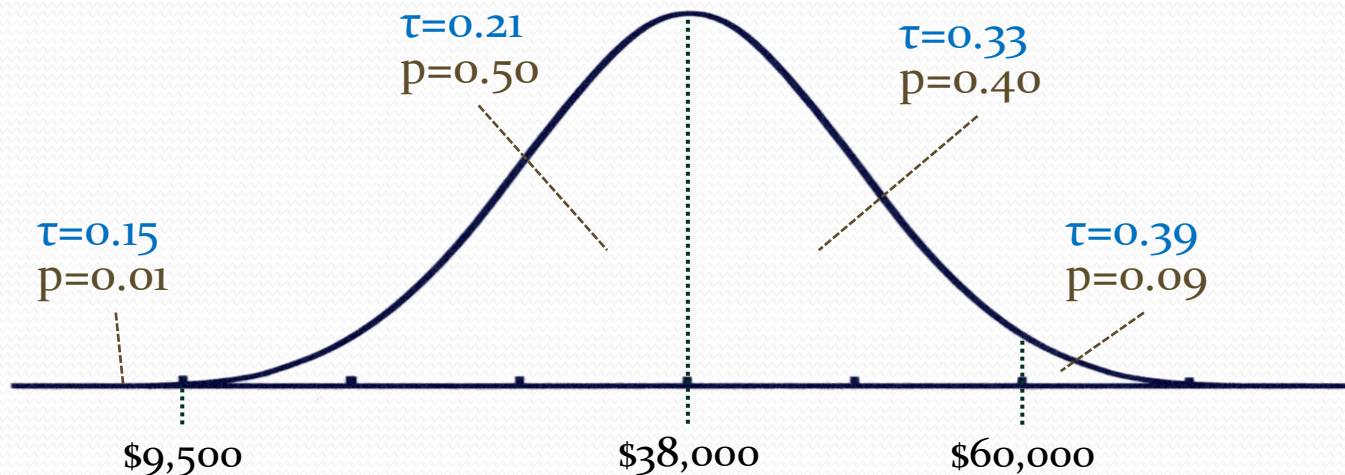
⇒ Parameters α_1 , α_2 used to project *counterfactual* incomes after reform year



Alternative instruments

1. Tax rate at **expected income**, with *no reform* (e.g. \$38,000)
2. **Expected tax rate** - weighted average using mean & *variance* from income dynamics.

Basic example:



$$E(\tau) = (0.15 \times 0.01) + (0.21 \times 0.50) + (0.33 \times 0.40) + (0.39 \times 0.09) = 0.27$$

The Data

NZ Inland Revenue data on individual (personal) taxpayers 1994-2009

Random sample of approx. 139,000 taxpayers, weighted up to represent NZ taxpayer population of approx. 2.9 million.

Our sub-sample:

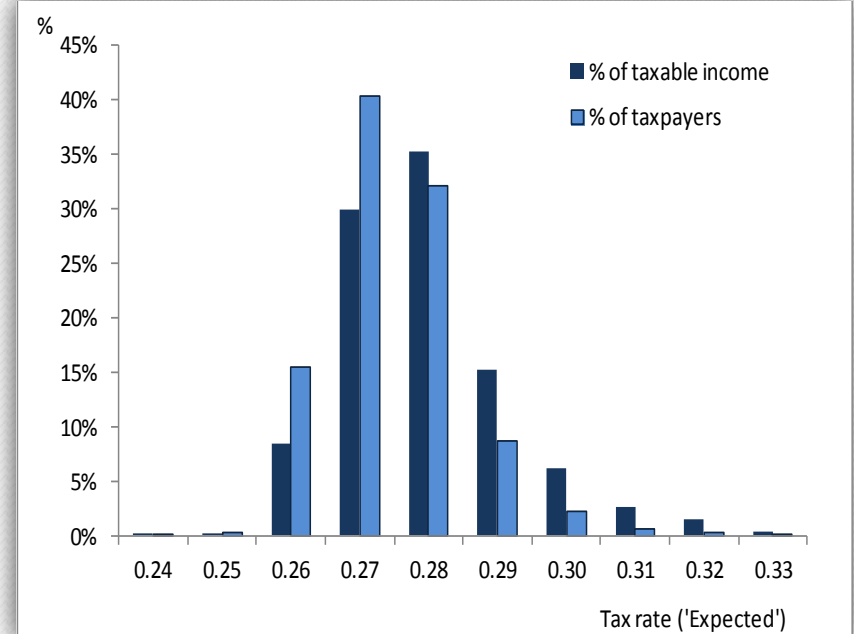
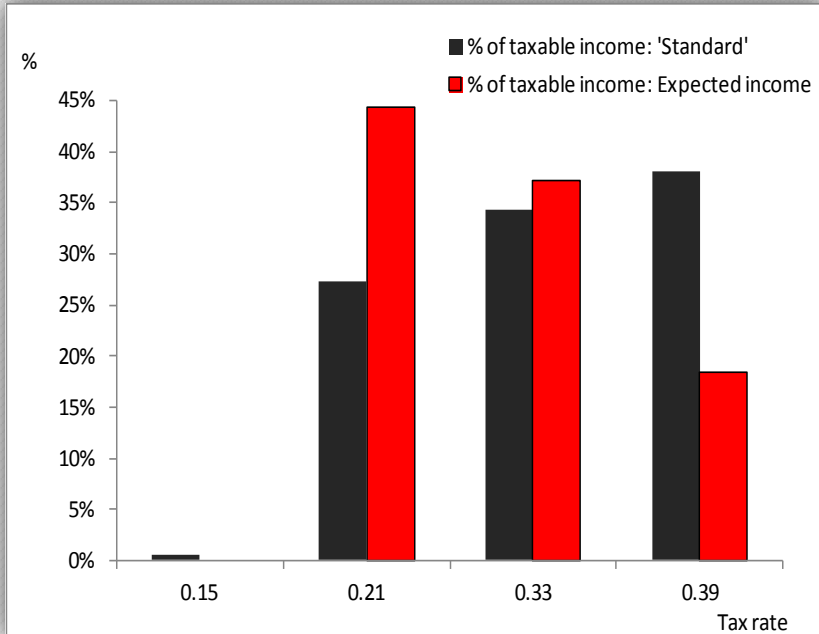
Panel of taxpayers aged 25-64 and income between \$16k and \$1 million

Taxpayers with available data in all relevant years, 1998 to 2005: ~39,000 taxpayers weighted up to 804,000.

Access

Collaborative agreement with IRD using in-house software & anonymised data; outputs shared across all collaborators

How do the instruments compare?



ETI Results:

$$q_i = \alpha + \eta \hat{x}_i + Z_i + u_i \quad \left\{ \begin{array}{l} Z_i \text{ includes: age; age}^2; \text{ lagged incomes;} \\ \text{dummy for 'other (non-w\&s) income'} \end{array} \right.$$

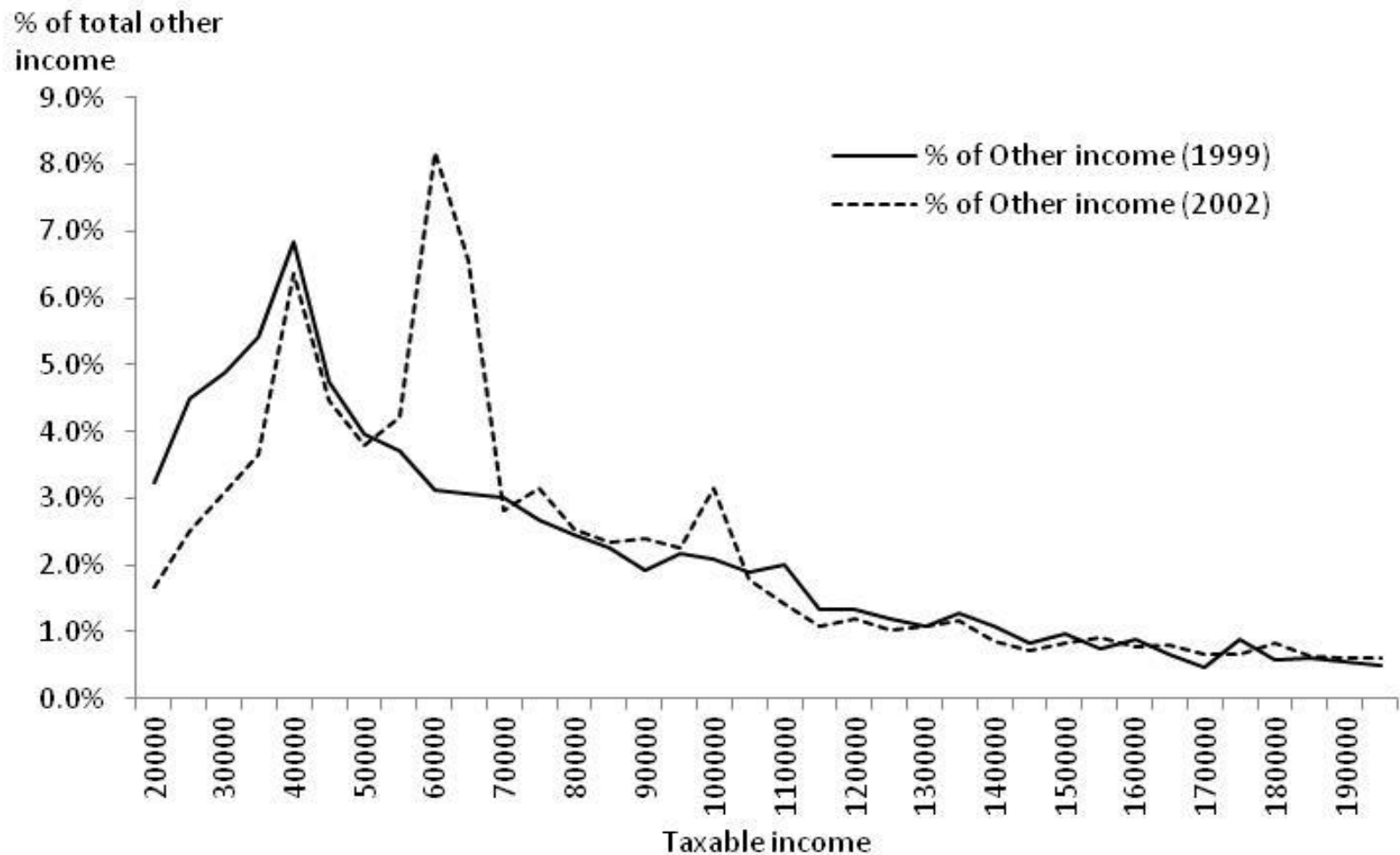
| | Standard Instrument | Expected Income Instrument | Expected Tax Rate Instrument |
|----------------------------|---------------------|----------------------------|------------------------------|
| ETI coefficient | -175.027 | 0.575 | 0.676 |
| t-statistic | -0.11 | 1.99 | 5.39 |
| Significant? | no | yes (95%) | yes (99%) |
| 'Other income' t-statistic | -0.11 | 5.71 | 6.52 |

ETI = 0.67 implies: $\Delta\tau \approx +18\%$ (33% \rightarrow 39%); $\Delta(1-\tau) \approx -9\%$ (67% \rightarrow 61%)
 Δy response $\approx -6\%$

ETI coefficients by income & taxpayer

| | | Coefficient | t-statistic |
|--|---------------------------|-------------|-------------|
| By income type | wage/salary income | 0.414 | 2.39 |
| | other income (additional) | 0.495 | 2.13 |
| By taxpayer type | with other income | 0.514 | 3.65 |
| | without other income | 0.190 | 0.88 |
| <i>Taxpayers with other income</i> | all income | 0.220 | 1.53 |
| | other income | 2.484 | 7.28 |

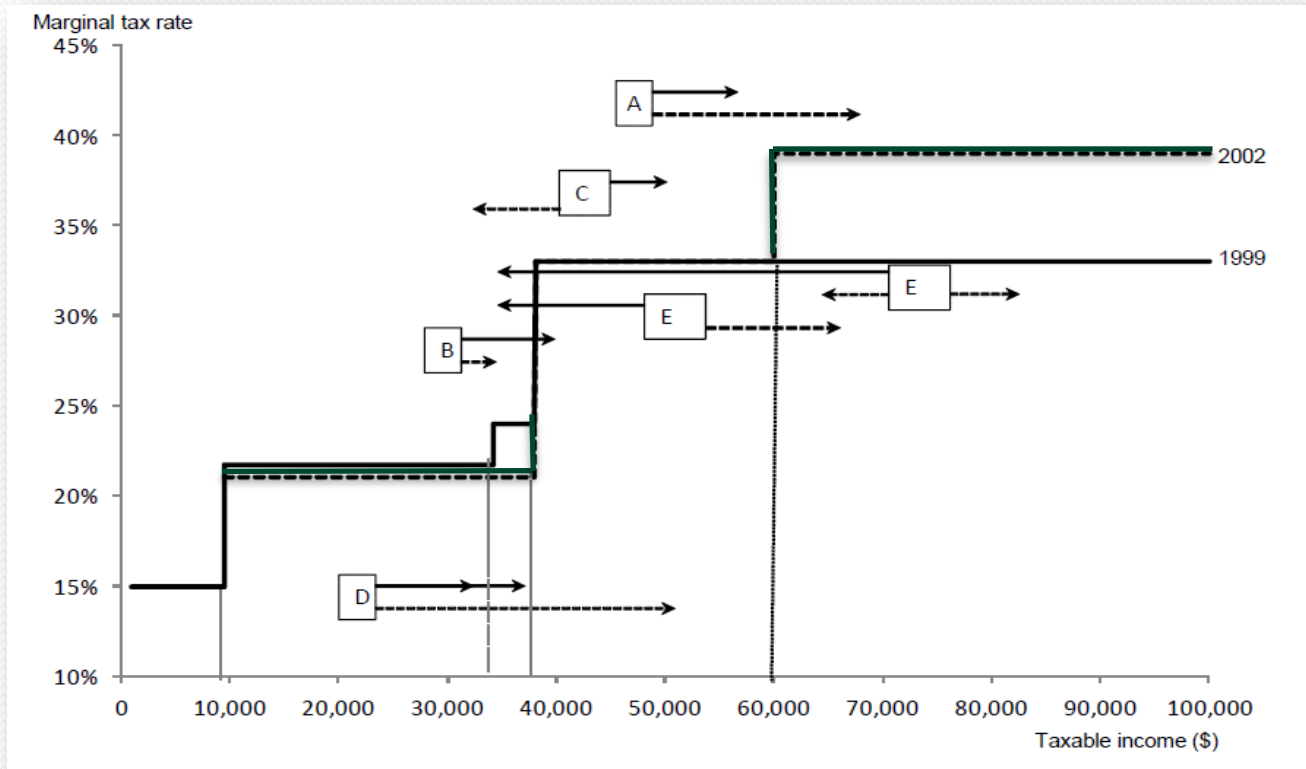
Other income responses



Who responded to the 2001 reforms?

- All taxpayers experience combinations of:
 - Income increase or decrease (before/after reform)
 - Actual net-of-tax rate increase, same or decrease
 - Counterfactual net-of-tax rate (instrument) increase, same or decrease
- Data identify mainly 5 combinations of income and net-of-tax rate change: >83% of ~804,000 taxpayers

How the 5 groups responded to 2001 reforms:



predicted
(no reform)
 observed

- Unit record data allows detailed interrogation of specific taxpayer responses.
- Reform-induced movements ... did they involve *family* income sharing?

Conclusions

ETI regressions provide strong evidence of taxable income responses in N.Z. but only when appropriate ‘instruments’ are used

Research only possible through academic/official collaboration. Extended via researcher access to confidential SNZ data (e.g. CURFS & data lab)

Unit record data (IRD or SNZ) vital for this research to provide best ‘evidence base’ for policy advice *and* academic credibility e.g. Harvard/IRS

Important insights for tax compliance analysis – who responds and how?

Helps identifies areas for data improvement e.g. collate tax return data for couples in households. Are their tax behaviours coordinated?



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SNZ data access options

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TAHIRAHUA KIRIHARA

http://www.stats.govt.nz/tools_and_services/microdata-access/confidentialised-unit-record-files.aspx

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Statistics NZ Home > Tools and services > Access our microdata > Confidentialised unit record files (CURFs)

Confidentialised unit record files (CURFs)

Confidentialised unit record files (CURFs) are unit record data that have been modified to protect the confidentiality of respondents while also maintaining the integrity of the data. Modification involves applying methods such as top-coding, data swapping, and collapsing categorical variables to the unit records. The end result is a dataset that can be made available to researchers.

Different CURFs are being used in a wide variety of research projects. A list of these is on the [Microdata research page](#). They include:

- Modelling the early life-course
- Estimating childhood obesity
- Māori life satisfaction - report
- Prevention of diabetes through lifestyle intervention and population studies
- Insecure work in New Zealand

Methods of access

Once the application is approved CURFs can be downloaded via secure internet access or they can be supplied on a CD-ROM. Researchers must keep the CURF secure and ensure that the CURF is only accessible to approved researchers. Researchers can use the CURF at their workplace but data cannot be stored on a laptop, memory stick, or other portable device. All copies of the CURF data, including the CD-ROM if supplied, must be destroyed at the end of the research project.

CURFs are licensed for a twelve-month period. The researcher can request a licence extension at the end of this period if further use is required.

[top](#)

Eligibility

All access to microdata is at the discretion of the Government Statistician.

Consideration will be given to applications for CURFs that meet the following criteria:

- The research is for a statistical purpose.
- The researchers have a proven history of research, or will be supervised by someone with a proven history of research.
- The researchers have the support of the organisation that employs them (e.g., government department, university, or independent research firm).
- The organisation supporting the research is based in New Zealand.
- The lead researcher for the project using the CURF is working in New Zealand.

If the required CURF is from a Ministry of Health survey then these additional requirements must also be met:

- The CURF will not be released to overseas-based researchers unless they are working on a joint project with an established New Zealand-based research organisation. In this case, the New Zealand organisation must be a signatory to the access agreement.
- If more than one organisation is involved in the research project, then there must be a lead researcher nominated from each organisation and each organisation must be a signatory to the agreement.

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Eligibility

Applying for access

Licences and costs


Available confidentialised unit record files

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confidentialised unit record file application form (Word, 160kB)

IRD Summary down-loadable data available on on-line



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About us

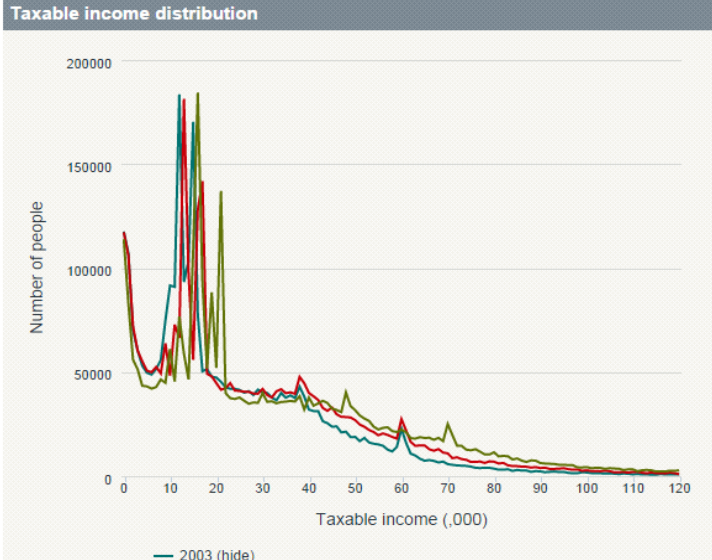
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- Our commitment to

Income distributions of individual customers, 2003 to 2012

These distributions show estimates of the number of individuals in bands of \$1,000 **taxable income** up to \$150,000, and \$5000 bands for taxable incomes from \$150,000 to \$250,000. They also show taxable income and income tax for people in each band. The income and tax information is derived from IR3 tax returns, personal tax summaries and employer PAYE information.

For individuals who are non-filers, taxable income is calculated as their total PAYE gross earnings in the year ended 31 March. PAYE gross earnings can include income from employment and also taxable welfare benefits, New Zealand Superannuation, earnings-related ACC, student allowances, and paid parental leave.


Taxable income distribution



Number of people

Taxable income (.000)

2003 (hide)



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