On the Limits of Fiscal Financing in Australia

A Dynamic General Equilibrium Analysis

Chung Tran[1] Nabeeh Zakariyya[1]

[1]Research School of Economics
The Australian National University

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Motivation: Fiscal stress in Australia

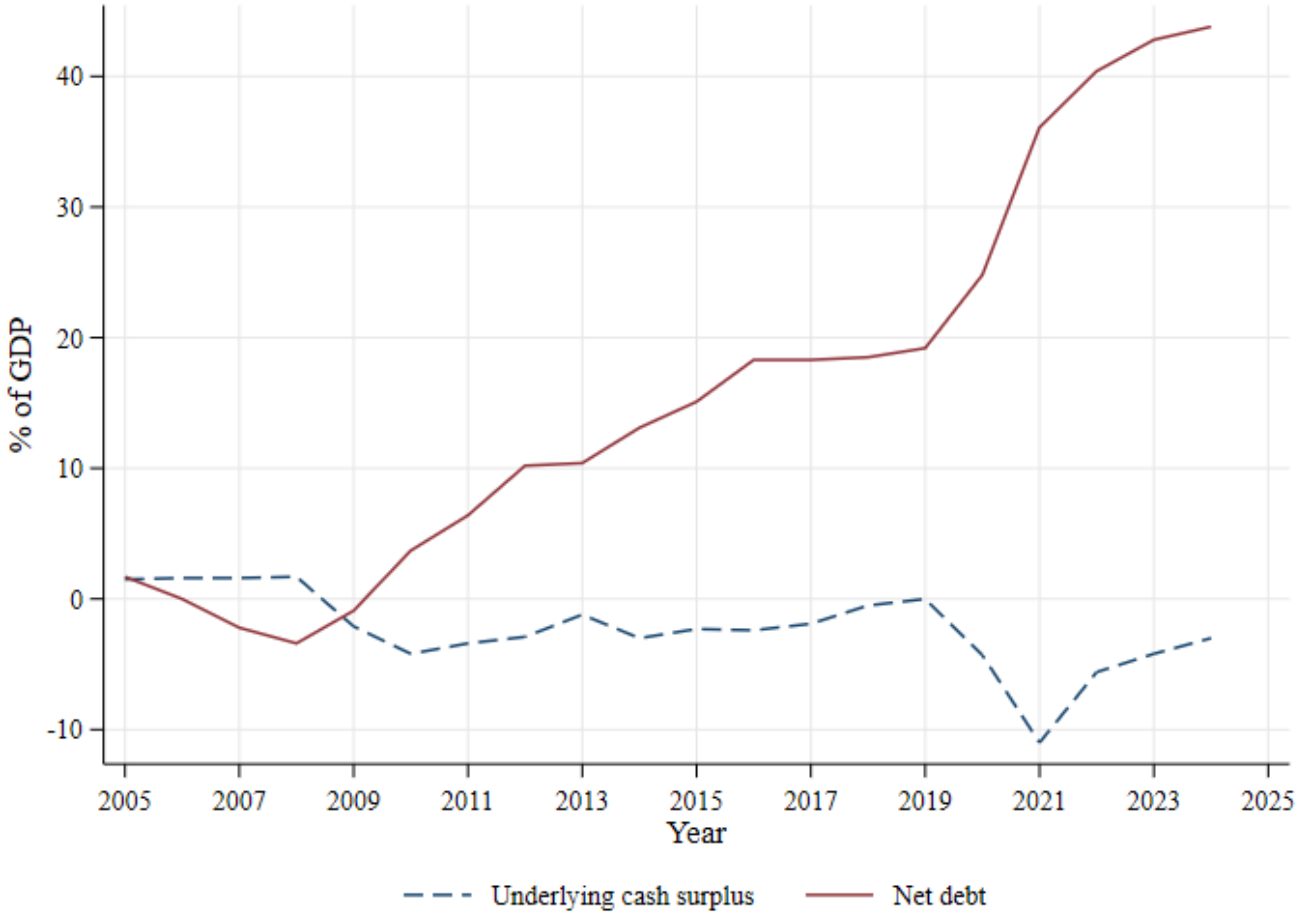


Figure: Underlying cash balance and net debt 2005-2024

Source: Australian Government Historical Data (Australian Government, 2019)

Our research

- Aims to examine the fiscal limit and fiscal space of Australia's tax system
- By quantifying the Laffer curves for various taxes
  - Income tax
  - Consumption tax
  - Company income tax
- Tool: Using a stochastic dynamic general equilibrium OLG model for Australia (SOLGA)

Measurement: Laffer curve approach

Raising tax revenue: Trade off between tax base and tax rate

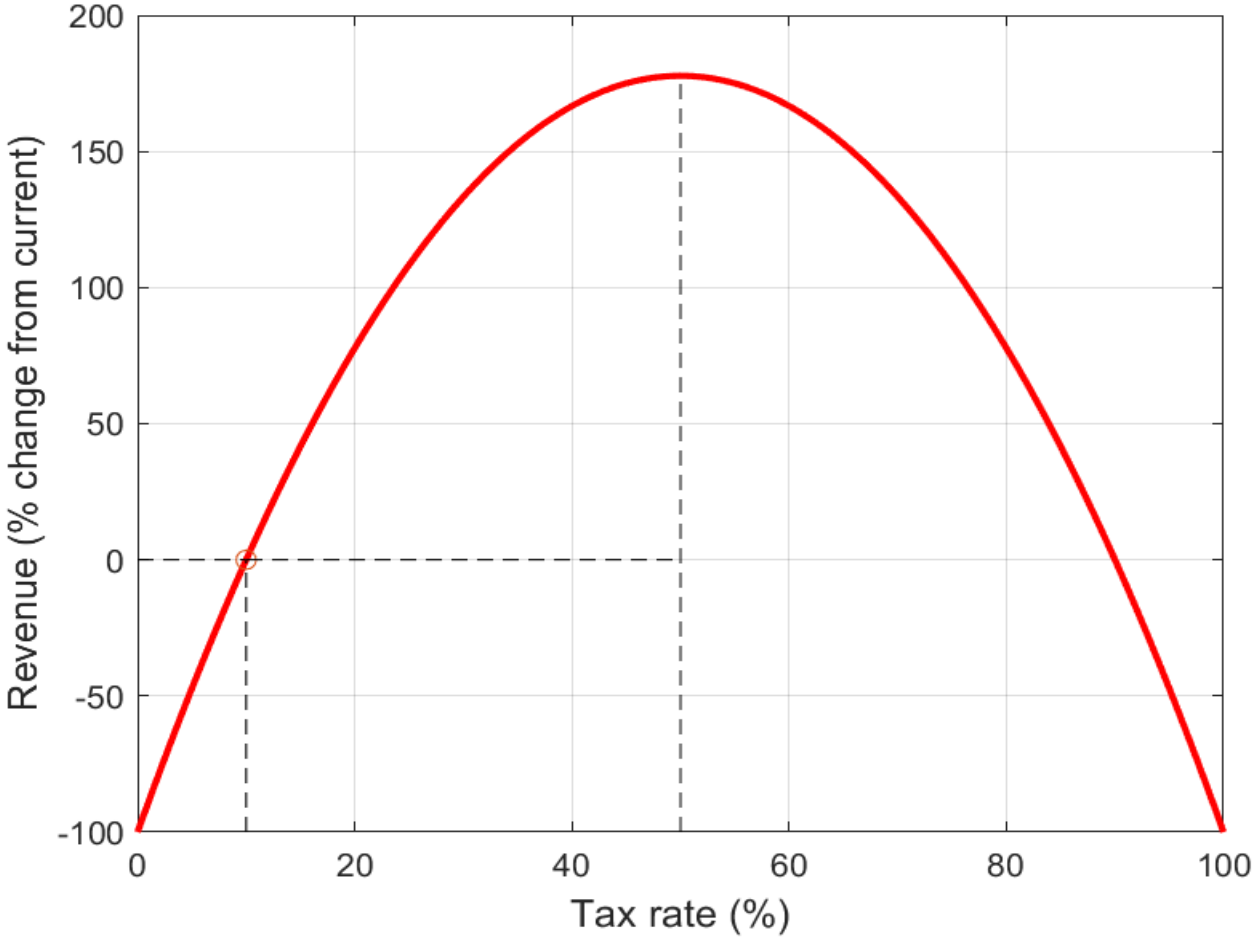


Figure: Example Laffer curve

Measurement: Fiscal limit and space

Tax financing: Fiscal limit and space defined by Laffer curve

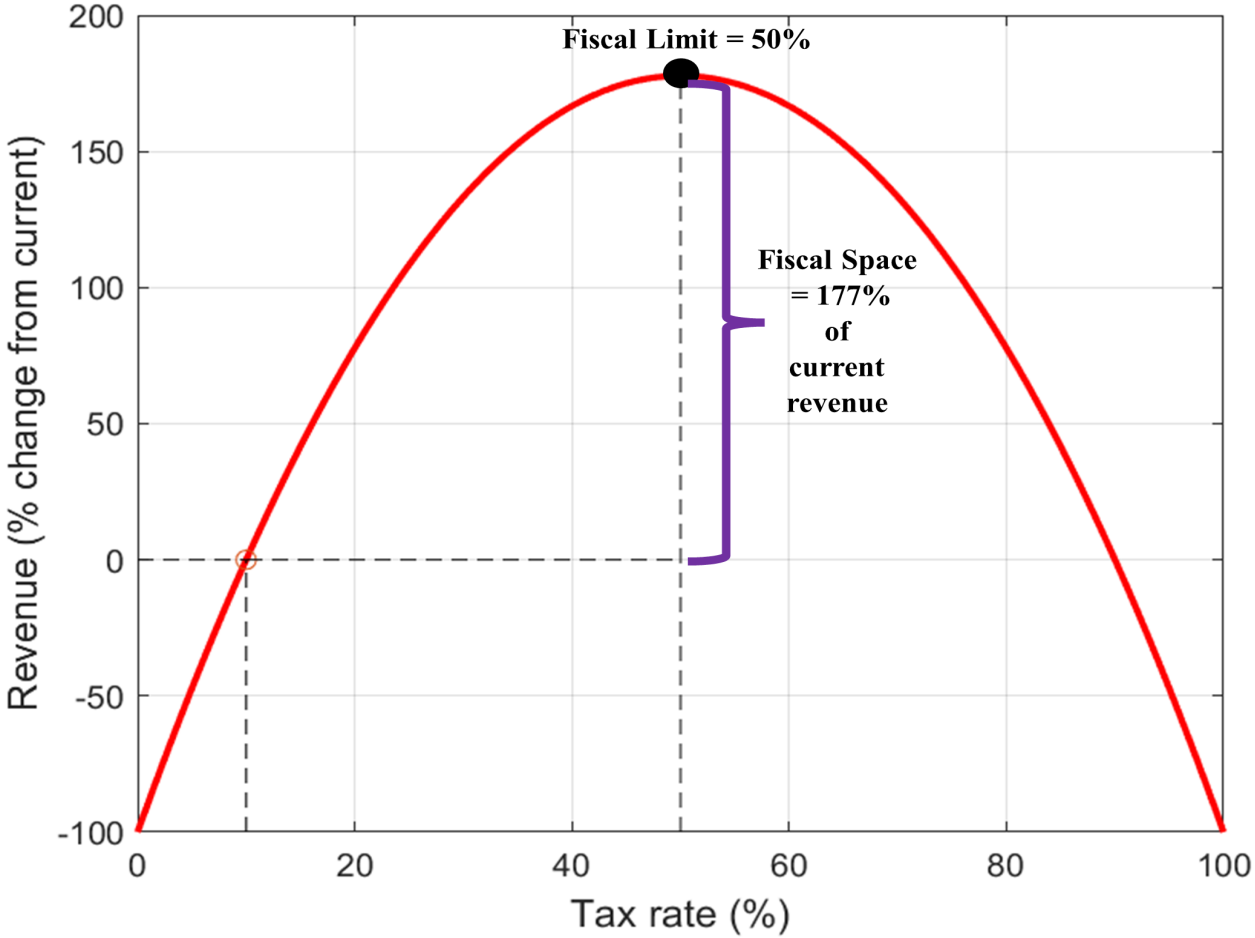


Figure: Example Laffer curve

Main results

- Considerable fiscal space in Australia's tax system
  - via raising personal income and consumption taxes
- Personal income tax generates the largest fiscal space.
  - Negative spillover general equilibrium effects
- Government can maximize its tax revenue by making the tax code less progressive.
  - Reducing progressivity reduces tax free threshold $\rightarrow$ Increases tax base
- The fiscal limits and fiscal spaces are sensitive to capital mobility assumptions.
  - 60% (closed economy) to 95% (small open economy with perfect capital mobility)

Related literature

Focus	Paper	Result
Top tax payers	Kindermann and Krueger (2020)	Higher top tax rates
	Badel, Huggett and Luo (2020)	Lower top tax rate (with endogenous human capital).
	Holter, Krueger and Stepanchuk (2019)[x]	**Revenue increases by 63% when current tax code is replaced by a flat tax rate of 60%.**
All taxpayers	Guner, Lopez-Daneri and Ventura (2016)[x]	Marginal increases in tax revenue with increasing progressivity.

- [all] Labor income tax only.
- [all] Closed economy
- [x] Net tax rather than pure tax.

Benchmark model: key features

- Stochastic dynamic general equilibrium OLG for Australia (SOLGA)
  - Treasury's Overlapping Generation Model of Australian Economy (OLGA)
- Stationary demographics (constant population growth, age dependent survival probability)
- Sectors:
  - Households (heterogeneous): 5 skill types
    - Labor productivity (deterministic and stochastic shocks over lifecycle)
  - Government: Australia's tax and transfer system
  - Firm (representative) and foreign (small open economy)

Household heterogeneity

- 5 skill types

$$\varrho \in \{very\,low, low, medium, high, very\,high\}$$

- Deterministic labor efficiency

$$e_{\varrho,j}: \text{ differs by skill type \& evolves over age } j$$

- Stochastic shocks

$$z_{\varrho,j} = [very\,low, low, medium, high, very\,high]$$

- Markov transition matrix

$$\pi_j\left(z_{\varrho,j+1}|z_{\varrho,j}\right)$$

Household decision problem

- Optimal decisions over a sequence of consumption c, leisure l and savings a over life time (j=1, ..., J).
- The household program is written recursively as

$$V^j(\chi_j) = \max_{c_j, l_j, a_{j+1}} \left\{ u(c_j, l_j) + \beta \left[\psi_{j+1} \sum_{\eta_{j+1}} \pi_{\varrho,j}(\eta_{j+1}|\eta_j) V^{j+1}(\chi_{j+1}) + (1 - \psi_{j+1}) \phi b(a_{j+1}) \right] \right\}$$

subject to:

$$a_{j+1} = \frac{1}{1+g} \left[a_j + e_j (1 - l_j) w + r a_j + b_j + st_j + \mathcal{P}(a_j, y_j) - t(y_j) - (1 + \tau^c) c_j \right]$$

$$a_j \geq 0, \qquad 0 < l_j \leq 1$$

Government and fiscal policy

- Taxes
  - Personal income tax: Progressive marginal rate $T(y)$
  - Company income tax: Flat rate τ^f
  - Consumption tax: GST τ^c
- Spending
  - Means-tested age pension for retirees: P
  - Public social transfers for working population: ST
  - general government purchases: G
  - Interest payments: rD

Main features of Australia's fiscal system

	Behavior	Earns/Spends	Tax
(1) Households	Work	wh	$\boldsymbol{T(y)}$
	Save	ra	
	Consume	c	$\boldsymbol{\tau^c}$
(2) Firm	Production	π^f	$\boldsymbol{\tau^f}$
(3) Government			

$$Revenue = \boldsymbol{T(y)} + \boldsymbol{\tau^c} C + \boldsymbol{\tau^f} \pi^f$$
$$Spending = P + ST + G + rD$$

Progressive personal income tax I

- A complex tax code: 4 marginal rates and 4 income thresholds + deductions + offsets
- Approximation: Using a parametric tax function from Tran and Zakariyya (2021)

$$T(y) = y - \lambda y^{1-\tau}$$

  - $T(y)$ denotes net personal tax payment as a function of pre-tax income y
  - τ : a progressivity parameter and λ is a scaling parameter

Progressive personal income tax II

- There are few special cases depend on value of τ:

$$\begin{cases} (1)\ \textbf{Full redistribution:}\ T(y) = y - \lambda \text{ and } T'(y) = 1 & \text{if } \tau = 1 \\ (2)\ \textbf{Progressive:}\ T'(y) = 1 - \overbrace{(1-\tau)}^{<1}\lambda y^{(-\tau)} \text{ and } T'(y) > \frac{T(y)}{y} & \text{if } 0 < \tau < 1 \\ (3)\ \textbf{No-Redistribution (proport.):}\ T(t) = y - \lambda y \text{ and } T'(y) = 1 - \lambda & \text{if } \tau{=}0 \\ (4)\ \textbf{Regressive:}\ T(y) = 1 - \overbrace{(1-\tau)}^{>1}\lambda y^{(-\tau)} \text{ and } T'(y) < \frac{T(y)}{y} & \text{if } \tau < 0 \end{cases}$$

Estimating the tax function

- Let $\hat{y} = \lambda y^{1-\tau}$ be post-tax income. Taking log yields $ln\hat{y} = \lambda + (1-\tau)\, lny$.
- τ and λ can be easily estimated from data

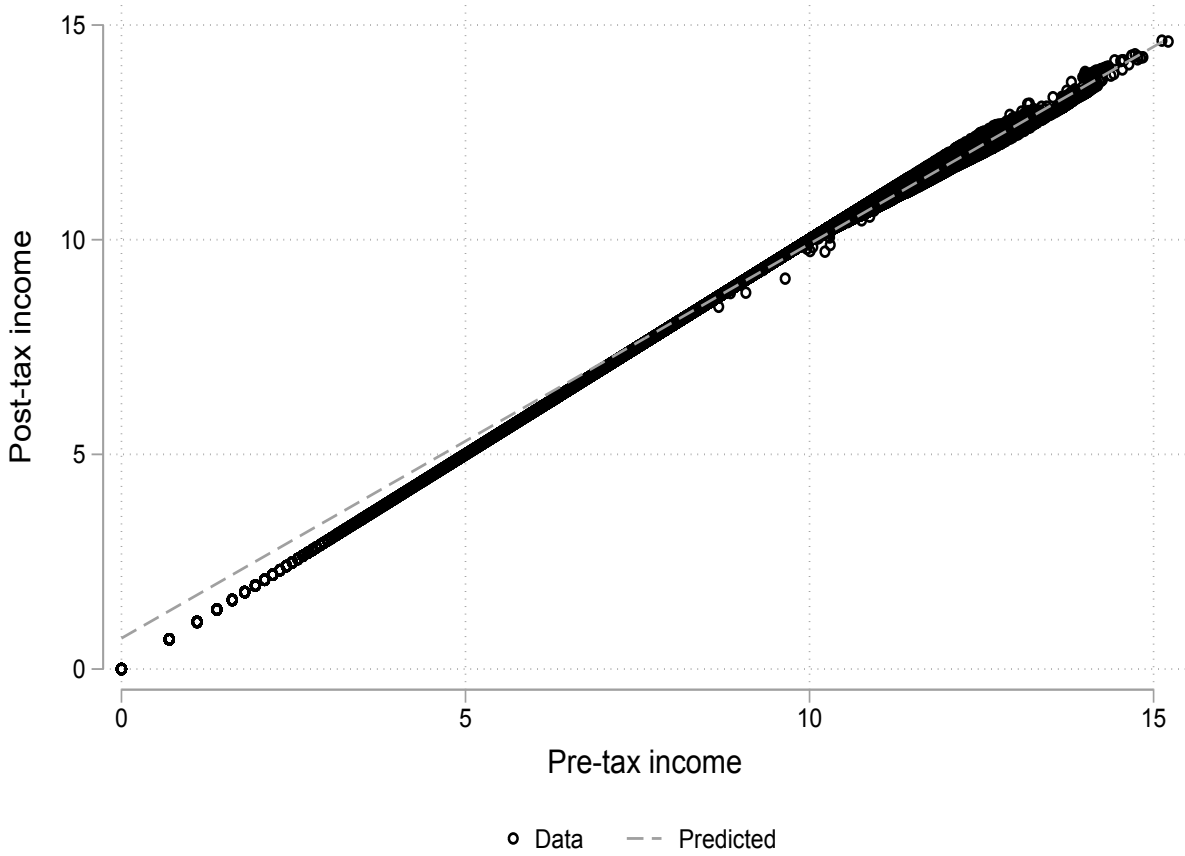
VARIABLES	(1) $ln(y)$
$1-\tau$	0.919***
	(0.000528)
Constant (λ)	0.717***
	(0.00569)
Observations	246,384
R-squared	0.994

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: ATO tax data in 2016

The tax function: Statistical fit

- This estimated tax function fits data well.



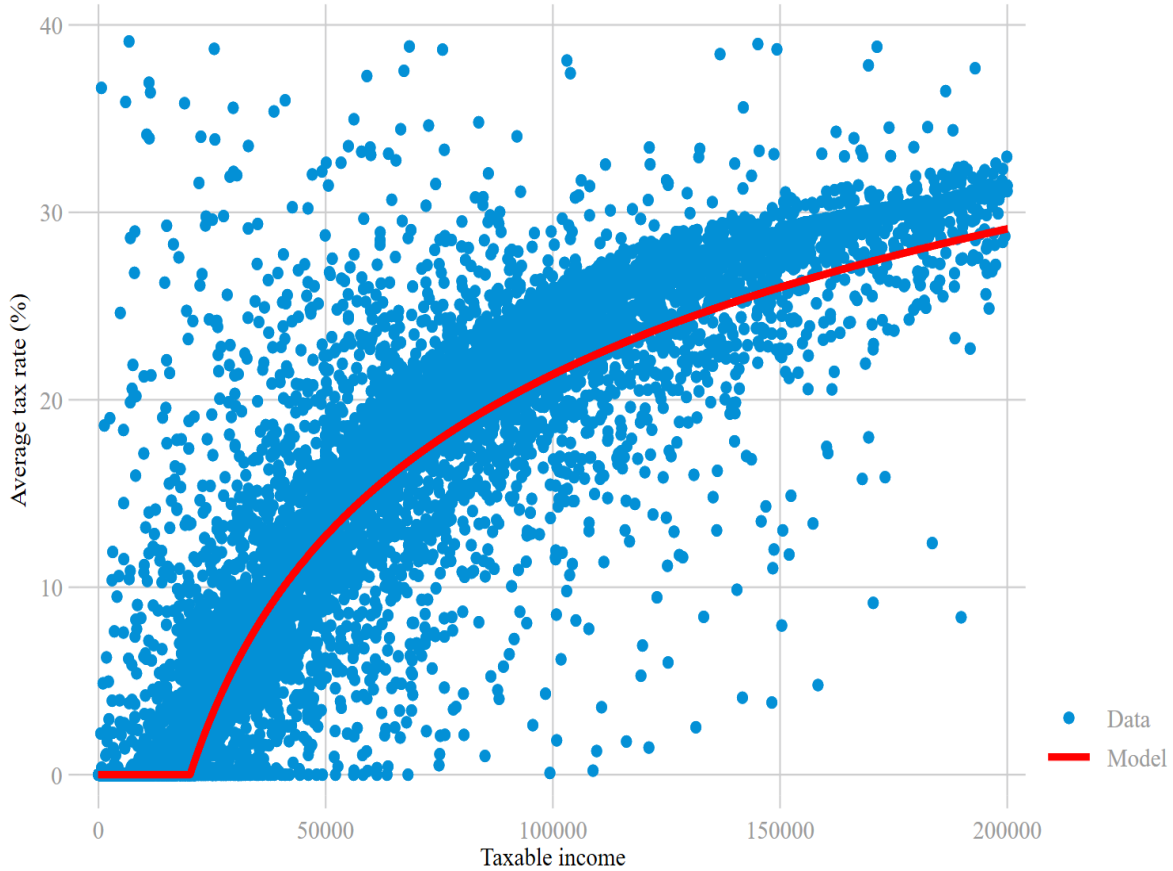
Note: ATO tax data in 2016

Parameterization and Calibration

- Goal: match data from Australia in late 2010s
- Data sources:
  - HILDA: labor supply, productivity shocks, income, assets
  - ATO: tax data
  - ABS: macro aggregrates and fiscal variables
  - Previous studies: preferences and technology forms and parameters

Personal income tax: Data versus model

Figure: Average tax rates



Note: HILDA data

Benchmark model: Aggregates

Table: Key variables in the benchmark economy

Variable	Model	Data
Investment	18.94	26.51
Consumption	52.91	56.30
General government expenditure	11.00	18.05
Age-pension	2.29	2.54
Public transfers other than age-pension	6.62	6.42
Government debt	16.00	18.85
Personal income tax	15.72	9.77
Consumption tax	3.70	3.29
Company income tax	4.40	4.25

Note: All variables are expressed in terms of percentage of GDP.

Benchmark model: Income and tax liability

Table: Distribution of taxable income and tax liability (model and data)

	Income share		Tax share		ATR	
	Model	Data	Model	Data	Model	Data
Quintile 1	0.46	0.00	0.00	0.00	0.00	0.00
Quintile 2	2.56	0.01	0.00	0.00	0.00	0.00
Quintile 3	6.71	6.73	1.43	0.73	4.07	0.65
Quintile 4	26.37	26.84	21.11	17.00	17.27	12.50
Quintile 5	63.90	66.42	77.46	82.26	27.01	24.19
Top 1%	9.35	10.98	13.06	19.06	32.02	37.86
Gini coefficient	0.6	0.69				
Suits index			0.23	0.23		

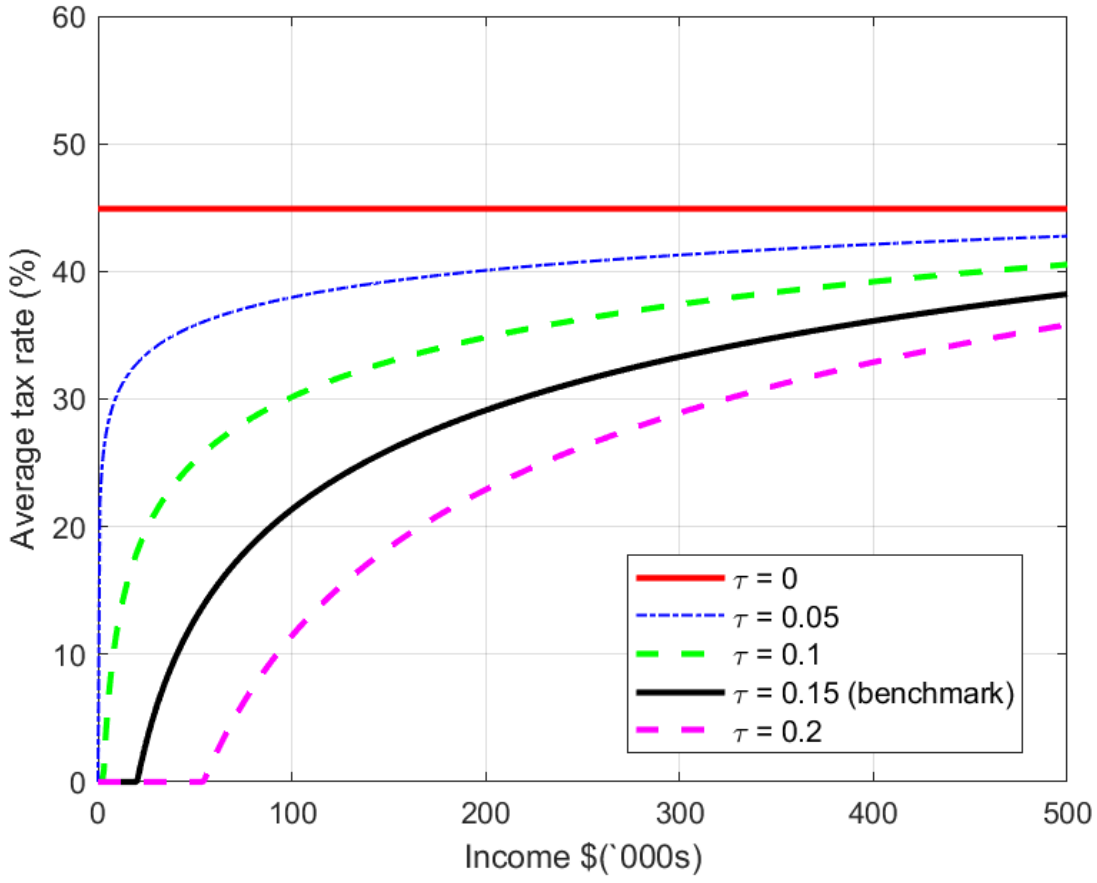
Note: Data are averages from HILDA for 2012-2016.

Experiments: Steady state analysis

- Varying both λ and τ to construct the Laffer curves for personal income tax
- Map out the Laffer curves for consumption and company income taxes
- Pin down fiscal limits and construct fiscal spaces
- Robustness check and extensions

Progressivity parameter: τ

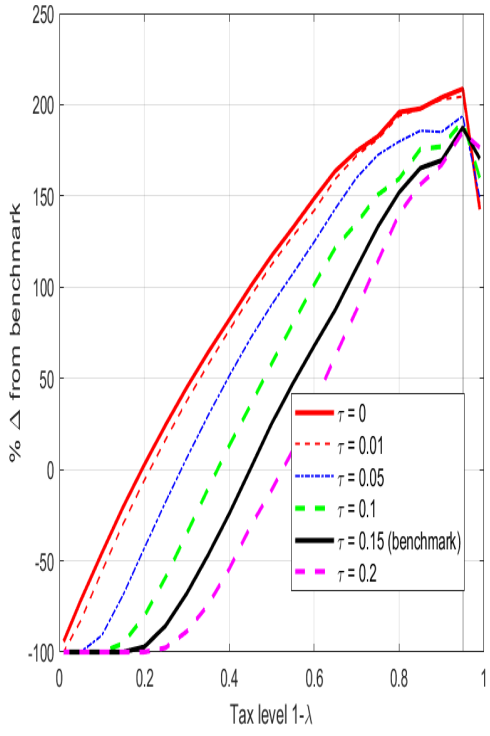
- Decrease/increase in τ makes the tax code flatter/steeper



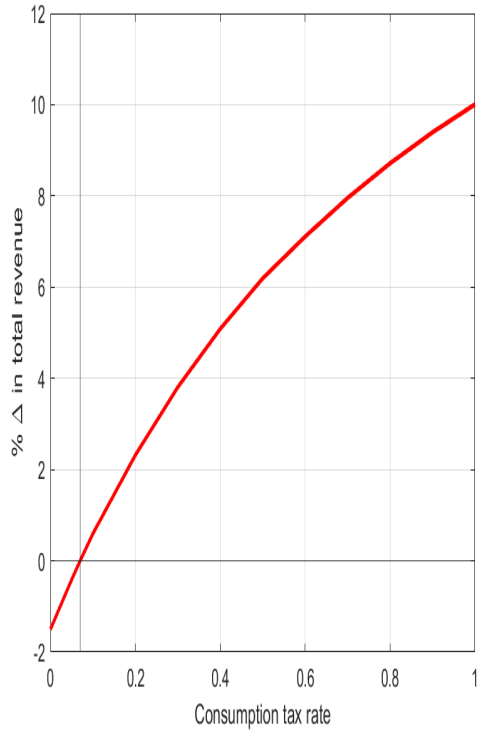
Note: The average tax rate is given by $1 - \lambda y^{-\tau}$

Laffer curves for taxes

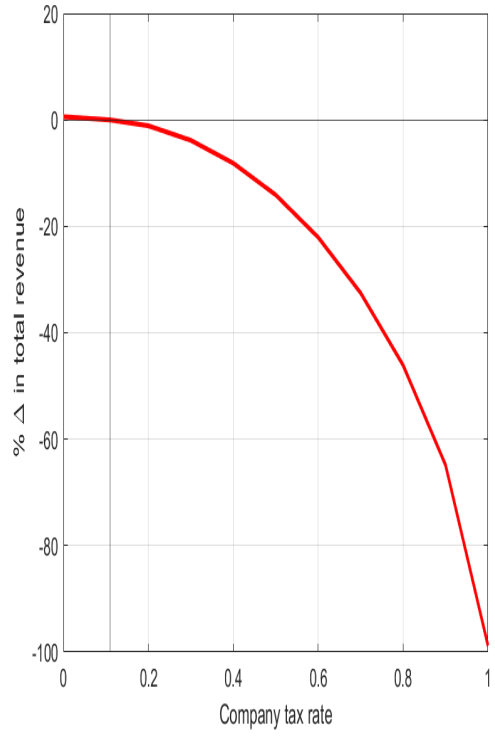
- Income tax generates the largest fiscal space



(a) Personal income tax (Fiscal space = 200%)



(b) Consumption tax (Fiscal space = 10%)



(c) Company income tax (Fiscal space = 0.1%)

Tax progressivity and income tax Laffer curve

- Less progressive income taxes results in more revenues in long run

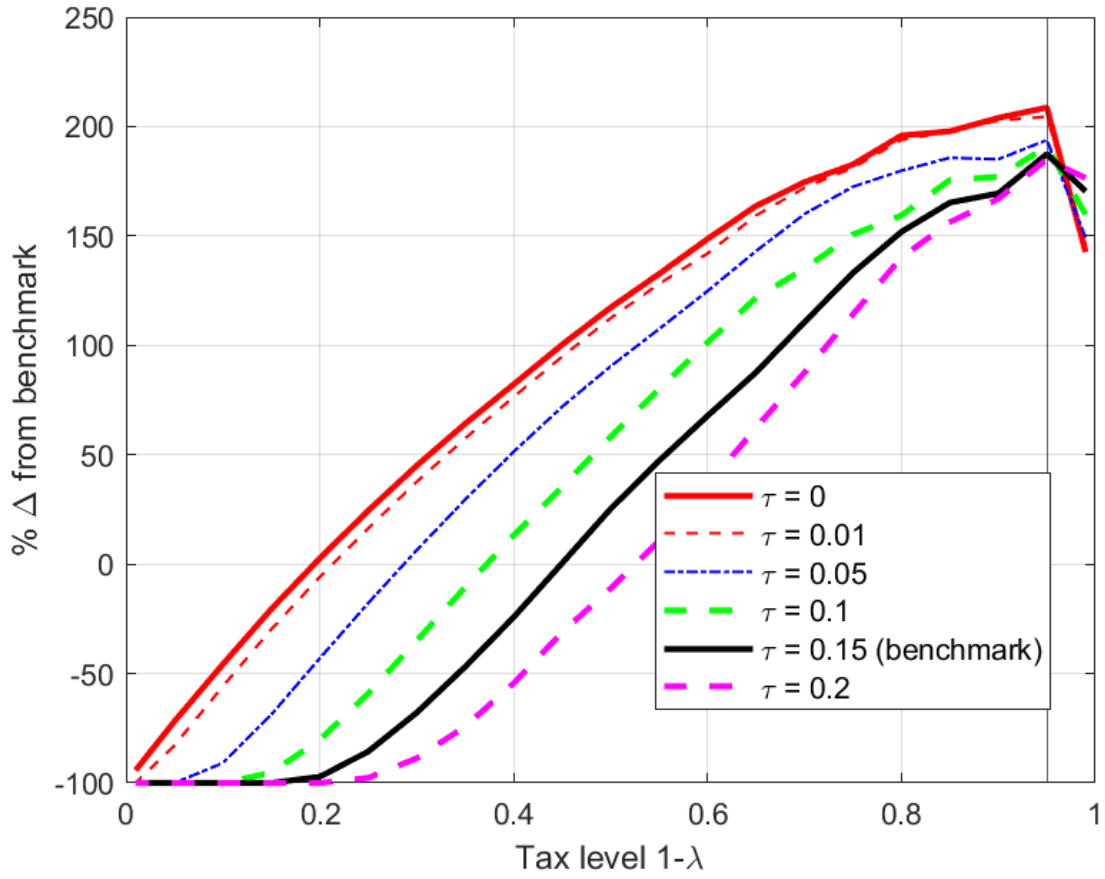


Figure: Personal income tax (Fiscal space = 200%)

Fiscal space: General equilibrium effects

- The fiscal space for **total tax revenue** is smaller due to negative spillover general equilibrium effects

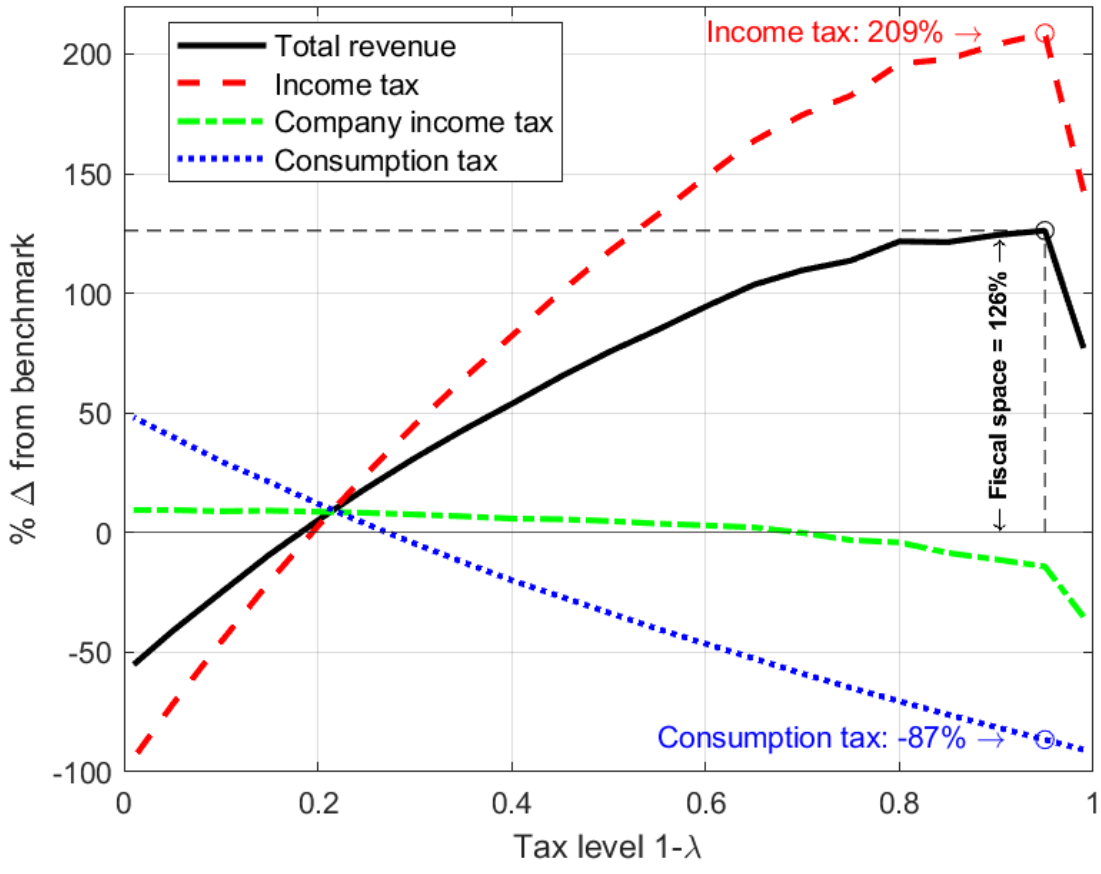


Figure: All tax revenues at the revenue maximizing income tax code

Fiscal space: Debt to GDP

- Mapping from the maximum tax revenue to the maximum debt to GDP

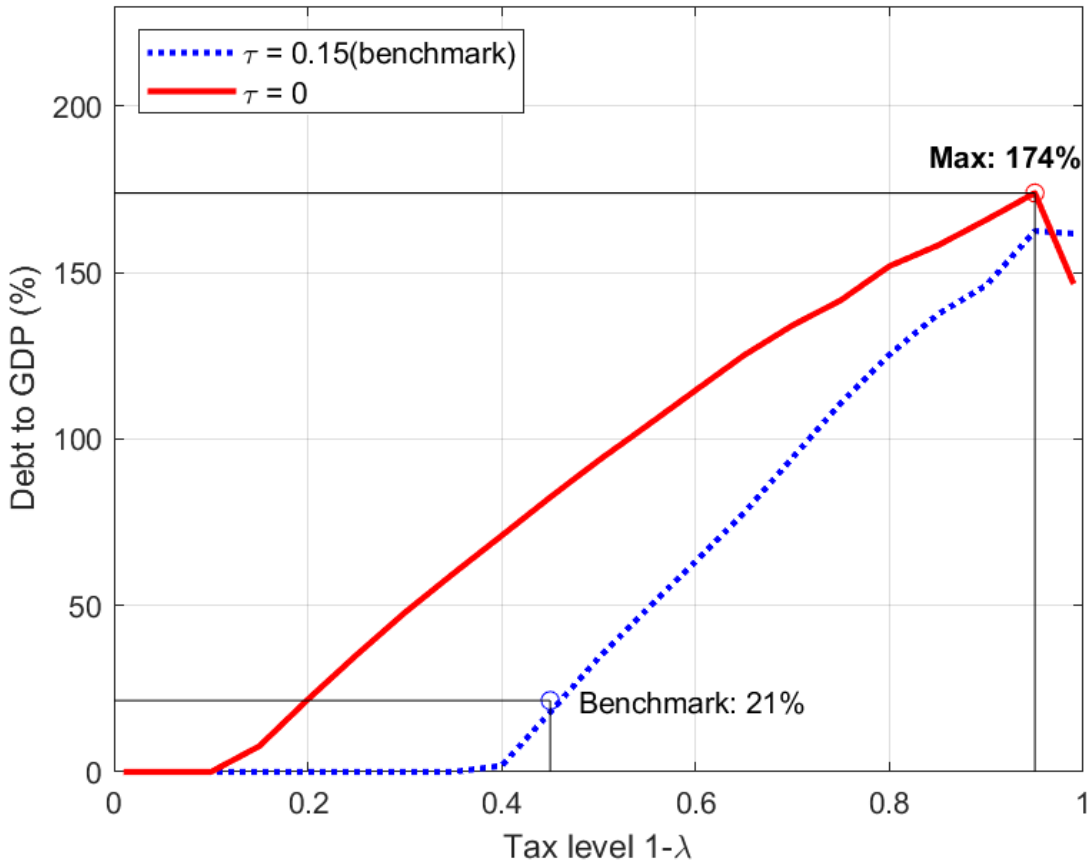


Figure: Debt to GDP ratio (maximum versus benchmark)

Effect on labor hours and savings

Table: Revenue maximizing tax codes: alternative model assumptions

#	Model type	Budget balancing	τ^*	$1-\lambda^*$	Fiscal space	Hours	Savings
1.	**Linear utility**	**Govt. purchases**	**0**	**0.95**	**208.68**	**-23.21**	**-103.59**
2.	**Cont. lab. elas.**	Other public transfers	0	0.95	202.65	-23.60	-103.85
3.		Consumption tax	0	0.95	208.83	-22.94	-103.60
4.	(1) + no pension	Govt. purchases	0	0.90	248.77	-11.13	-94.87
5.	Cobb-Douglas	Govt. purchases	0	0.95	264.01	-5.61	-101.67
6.		Other public transfers	0	0.95	244.83	-19.98	-102.04
7.		Consumption tax	0	0.95	264.01	-5.61	-101.67

Note: All variables are reported in terms of percentage change from the benchmark values.

Capital mobility across borders

- Relaxing the small open economy assumption leads to a lower fiscal limit.

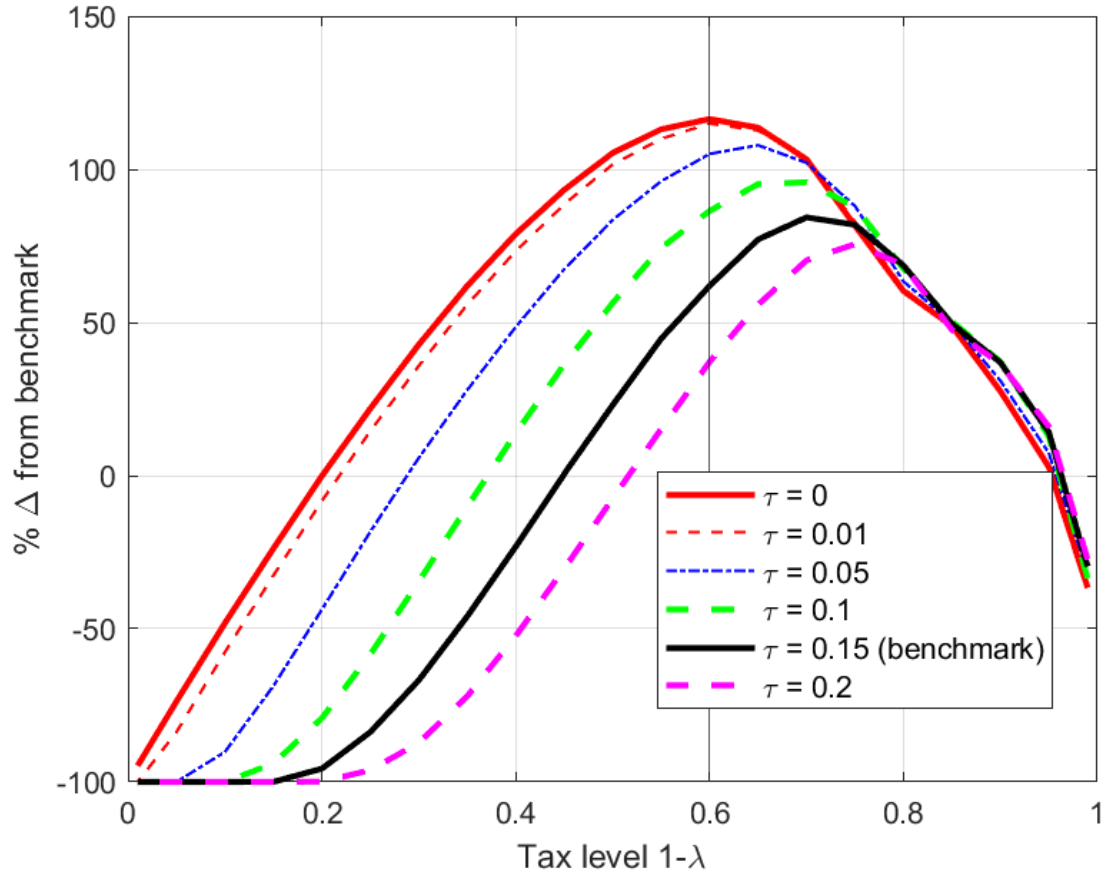


Figure: Revenue by tax levels at different levels of τ (closed economy)

The advantage of capital inflows

Capital inflows mitigate reductions in aggregate capital stock

- Negative incentive effects on household savings due to rising tax rates are mitigated by foreign capital inflows which prevent the decline in aggregate capital stock.This maintains the wage rate and domestic interest rates at their benchmark levels.
- Closed economy:
  - Increase in tax rate leads to large declines in wage rate
  - Large declines in labor supply
  - (Results the same as Holter, Krueger and Stepanchuk (2019) for the US labor income tax code)
- Truth is somewhere in between
  - Fiscal limit **60-95%**
    - No capital mobility - 60%
    - Perfect capital mobility - 95%
  - Further analysis: link between capital adjustment costs and fiscal limit.

Conclusion and remarks

- Tax financing in Australia: considerable potential
  - Up to 126% of the current tax revenue.
- The personal income tax generates the greatest fiscal space
  - But, negative spillover general equilibrium effects
- Making the income tax code less progressive potentially improves revenue in long run.
  - Reducing progressivity reduces tax free threshold $\rightarrow$ Increases tax base
- Revenue maximizing tax rate is sensitive to capital mobility assumptions.
  - 60% (closed economy) to 95% (small open economy with perfect capital mobility)
- Caveats and further research:
  - Link between capital mobility and fiscal limit requires further analysis
  - Risk premium on public debt

References I

Badel, Alejandro, Mark Huggett and Wenlan Luo. 2020. "Taxing Top Earners: a Human Capital Perspective." *The Economic Journal* 130(629):1200–1225.

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